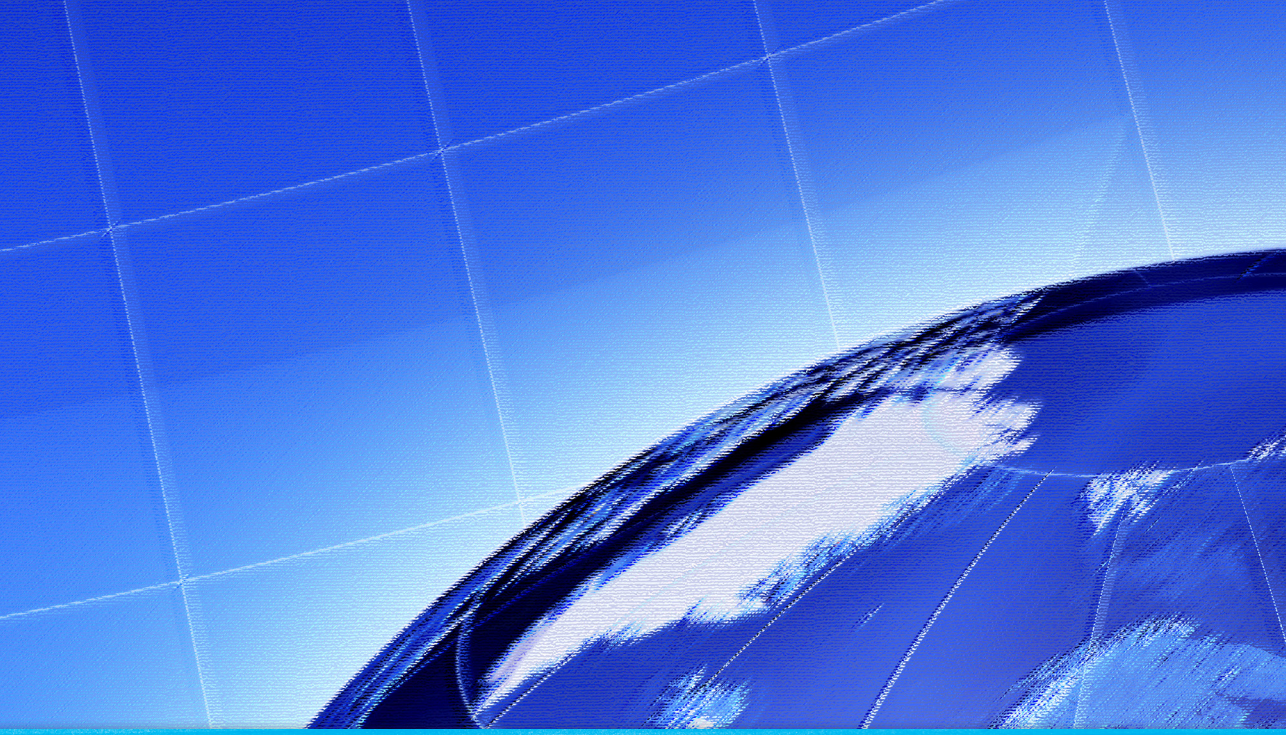

Energy and Geostrategy 2017

Spanish Institute for Strategic Studies

Spanish Committee of the World Energy Council
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MINISTRY OF DEFENCE

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ÍNDICE

Introduction

Claudio Aranzadi

The publication "Energía 2017" features one article with an essentially sectoral approach, "Renewable Energies and Geopolitical Renewal (Gonzalo Escribano) and four with a basically territorial analysis: "US Energy Policy and its Geostrategic Implications" (Isidoro Tapia), "Iran-Saudi Arabian Rivalry in the Geostrategic Context of Energy" (José Ignacio Castro), "Mediterranean Energy Geopolitics" (Pedro Moraleda) and "Energy and Geopolitics in Latin America" (José Pardo de Santayana). As was the case in the preceding issues, hydrocarbon geopolitics still occupies a prominent place in the reflections of the publication's authors, especially in the articles with a mainly territorial approach. However, this publication also aims to focus attention on the long-term importance of developing a demand for decarbonised electricity as the essential vector in global climate policy. The article by Gonzalo Escribano is devoted to the new geopolitical implications of this radical change in the long-term energy demand structure, what is also considered in the analysis of the energy strategies of the USA, Iran and Saudi Arabia, as well as Latin American countries, in articles written by Isidoro Tapia, José Ignacio Castro and José Pardo de Santayana, as well as to give some thoughts on the new possibilities for cooperation in the Mediterranean, beyond the mere hydrocarbon flows between the countries in the Basin, which is the question tackled by Pedro Moraleda.

The introductory chapter of the last year's publication mentioned a series of major events affecting energy policy that had occurred in 2015: the Paris Agreement between the UNFCCC members (COP 21) in December 2015, the July

2015 Agreement on the Iranian nuclear programme between this country and the Permanent Members of the United Nations Security Council plus Germany (P5+1), and the continuing low-price profile of oil throughout the year. Reference was also made to other geopolitical events with indirect yet significant effects on the international energy scenario: The Minsk II Agreement on Ukraine (February 2015), the Geneva Agreement on a transition plan for Syria (November 2015), the Libyan Political Agreement signed in Skhirat (Morocco) under the auspices of the United Nations, the tension between Russia and Turkey and, of course, the ongoing tension in the Middle East. Finally, emphasis was placed on the fact that the way the geostrategic energy scenario was evolving, partly illustrated by the aforementioned events, was fraught with great uncertainty, a greater attention being paid to the forecast in the short-, medium- and long-term of the evolution of the global decarbonisation policy and the oil prices (which were considered to be relevant defining parameters in that geopolitical scenario where energy was concerned).

If there was a repetition of the analysis made the year that ended when this current publication closed, it would be difficult to avoid the impression that the uncertainty, and thus the geopolitical risk in the field of energy, has done anything but increase. None of the uncertainties evoked in the preceding issue have been resolved (although it is true that the tension between Russia and Turkey has abated, domestic instability in Turkey has increased) and the election of a new President of the United States (who at the closure of the edition of this publication had still not taken office), if his statements are to be taken into account, could well have an adverse effect upon the two agreements signed in 2015 (the Paris Agreement in the conference COP 21, and the Nuclear Agreement with Iran) which should play a fundamental role in creating a more stable, collaborative and sustainable global energy scenario. Along more general lines, the fact that D. Trump (before starting his mandate) lacked a consistent geopolitical agenda, hindered the preparation of reasonable expectancies about the pattern his foreign and defence policy were going to follow. It could be speculated that this policy is unlikely to systematically clash with traditional Republican policy in the legislative body, which should make rather unlikely a persistent protectionist policy, although it would tend to encourage the climate-sceptical or opposed positions against the nuclear agreement with Iran that Trump presented during his election campaign.

The main question mark hanging over D. Trump's presidency in the area of global energy geopolitics is the potential effects that his policy might have on the way the Paris Agreement (COP 21) develops. As was pointed out in the last issue of "Energy and Geopolitics", the Paris Agreement that came into force in November 2016, was a major diplomatic success and, probably, the greatest political commitment that could be accepted by large emitting countries like the USA, China and India. With the Agreement signed by 195 countries, the importance of the climate policy was universally established and the "climate-sceptics" were isolated internationally. Yet numerous political question marks remain

unanswered. Firstly, the integration of all the "national commitments" presented at the Paris Meeting (the Intended Nationally Determined Contributions) would lead to temperature increases of over 2ºC, which will mean they would have to be corrected to adapt them to the Agreement targets. Secondly, the governance mechanisms envisaged in the Paris Agreement (transparency and revision procedures every five years) are more a form of "moral pressure" than legal constriction, what will require considerable political will of leadership from the main greenhouse gas emitting countries. Should the United States give-up its co-leadership role in global climate policy, without needing to denounce the Paris Agreement, it would considerably weaken the political efforts needed to attain the objectives of the Agreement.

The "World Energy Outlook 2016" (W.E.O. (2016)) of the International Energy Agency (I.E.A.) devotes particular attention to the different global decarbonisation policy scenarios with respect to the Paris Agreement targets, bringing to light the considerable degree of requirements regarding the energy strategies needed to reach those goals. The W.E.O. (2016) still considers a central scenario for its energy forecasts for the 2040 horizon, which reflects the policies already decided upon by the governments´ responsible officers (including among those, for the first time, the "national commitments" subjected to the Paris Agreement of December 2015); it must be pointed out that according to the I.E.A. predictions, this scenario would lead to a temperature increase of around 2.7ºC in 2100, which would amount to a non-fulfilment of the minimum commitment not to exceed 2ºC. The W.E.O. (2016), as in previous years, also includes a scenario with harder environmental requirements compatible with the 2ºC limit (in fact, as per the I.E.A. formulation, it is consistent with a 50% likelihood of limiting global warming to 2ºC); as the report indicates, this scenario would comply with the target set at the Cancun Conference (2010). However, W.E.O. (2016) recalls that the countries that signed the Paris Agreement also set the objective of keeping the average global temperature rise "well below 2 degrees Celsius" and agreed to carry on making an effort to limit the temperature increase to 1.5ºC, the report including for the very first time an analysis of the long-term evolution of a series of global energy parameters that would correspond to those two additional scenarios.

A comparison between the four above-mentioned climate scenarios analysed by the I.E.A. (limiting the global temperature to 2.7ºC, 2ºC, values significantly lower than 2ºC and 1.5ºC), all referred to in the Paris Agreement, reveals the existence of a wide range of long-term geopolitical energy scenarios that have to be considered within a reasonable interval of political credibility. Even the scenario that considers the application (without corrections) of the "national commitments" presented at the Paris Agreement and which would lead to temperature increases of 2.7ºC (and, therefore, to the non-fulfilment of the Agreement), does not seem to be of zero probability. The I.E.A. considers that a scenario limiting the temperature increase to 2ºC would require a reduction in energy related CO_2 emissions from around the current 32 Gt to 18 Gt by

2040 (with an emission peak recorded before 2020), which would mean, above all, an effort significantly greater than the one made for the first mentioned central scenario (2.7ºC) in terms of efficiency and increased use of renewable energies. Despite the above, correcting the original "national commitments" to achieve the "Cancun Goals" (the 2ºC scenario) does not seem difficult to attain, because as the I.E.A. has pointed out, both China and India have now taken steps towards surpassing their own targets and, on the other hand, the USA would not find it at all difficult to improve on its own undertakings by more rapidly replacing coal with natural gas. Nevertheless, if a central geopolitical actor like the United States were to decide politically to hinder the development of the Paris Agreement, this could disturb the correction process for the "national commitments" by, for example, adopting initiatives supporting coal (which D. Trump already announced in his electoral campaign) or other energy policy initiatives that indicate a weakening of their stand on climate commitments.

What is more, a strict pursue of the scenario corresponding to the objective of the 2010 Cancun Agreement (limiting the temperature increase to 2ºC) cannot be regarded as a satisfactory fulfilment of the December 2015 Paris Agreement, which really considers that scenario as a ceiling. As has already been stated, the W.E.O. (2016) quantifies two additional and more demanding scenarios indicative of a greater degree of ambition in the Paris targets compared to the goals set in Cancun. On the one hand, the I.E.A. adds specificity to the vague formulation of the Paris Agreement goal "well below 2ºC", transforming it into a scenario with a 66% likelihood of keeping the temperature rise under 2ºC (which would be equivalent to a 50% likelihood of limiting the temperature increase to 1.84ºC in 2100). On the other hand, it analyses the implications of the objective explicitly mentioned in the Agreement (whose attainment the signatories must strive to achieve) to limit the temperature increase to 1.5ºC. The real targets of the Paris Agreement, that ought to be considered as long-term determinants for the energy strategies, would thus be brought together in those three scenarios mentioned by the W.E.O. (2016), with temperature limits of 2ºC, 1.84ºC and 1.5ºC and that, according to the I.E.A. would require a zero net CO_2 emission level to be reached for energy by 2100, 2060 and 2040 respectively (although as the W.E.O. (2016) indicates, the long-term emission profile would depend on the implementation of technologies that made it possible to capture CO_2 in the atmosphere, such as bioenergy technology with capture and storage of CO_2).

As indicated by the W.E.O. (2016), the essential foundations on which energy policies are based, consistent with the range of climate objectives established in the Paris Agreement (that are brought together into the three scenarios mentioned in the I.E.A. publication), are the decarbonisation of the electrical sector, the electrification of road transport and the application of strict CO_2 emission standards to buildings. According to the I.E.A., in the scenario where the temperature rise is limited to 2ºC (Cancun scenario), decarbonised electrical generation capacity in 2040 (renewables, nuclear and fossil fuel, with CO_2 capture and storage) would account for over 70% of the global generation

capacity; in a scenario limiting the temperature rise to 1.84ºC (a limitation scenario considerably lower than 2ºC) this percentage would be close to 80% and in the scenario for limiting the temperature increase to 1.5%, the electrical sector would have to be virtually decarbonised. Where electrifying the road transport sector is concerned, W.E.O. (2016) offers the following figures for the penetration of electrically-driven passenger vehicles by 2040: 710 million electric vehicles (one third of the total stock) in the "2ºC limit" scenario, 1,500 million vehicles (three quarters of the total stock) in the "1.84ºC" limit scenario and 2,200 million cars and light electric lorries (the total number of passenger vehicles and light commercial vehicles), apart from making significant progress in the electrification of buses and heavy lorries, in the scenario where the temperature increase is limited to 1.5ºC. As is only to be expected, the effort to electrify road transport in the three scenarios leads to a considerable long-term reduction in the global demand for oil. According to the W.E.O. (2016), oil demand in 2040 would be around 74 million barrels/day in the "Cancun" scenario (2ºC), 63 million barrels/day in the "1.84ºC limit" scenario, and less than 40 million barrels/day in the "1.5ºC limit" scenario; these figures can be compared with the global demand for oil in 2015 (92.5 million barrels/day) and with the demand envisaged by the W.E.O. (2016) in its central scenario (a reflection of the "national commitments" in the Paris Agreement) for 2040 (103.5 million barrels/day).

The figures offered by the W.E.O. (2016) for the three scenarios consistent with the Paris Agreement and which appear in the preceding paragraph are of major importance for the geopolitical analysis. First of all, they single out the electricity sector as the central vector of the global climate policy, through its radical decarbonisation and its penetration into road transport (as well as its greater use for other activities such as heat generation). G. Escribano, in his article in this publication, analyses the geopolitical effects of this new centrality in a decarbonised electricity sector (with a predominance of renewable energies), warning about the complexity of the phenomenon and the shortcomings of an analysis focused excessively on "securitisation" and in emphasizing energy self-sufficiency. However, there is no doubt that intensive decarbonised electrification on a global scale (and making a massive penetration in the transport sector) will significantly reduce dependence on fossil fuels (coal, gas and oil) and will attach growing importance to the supply of uranium (with lower political risk) and, above all, to the free primary energy resources (the wind and the sun). If a greater degree of energy self-sufficiency becomes widespread and, thus, there is a reduction in the risks involved in supplying fuels such as gas or oil, this should have consequences on energy security strategies globally. Yet, as Escribano points out, a large-scale development of renewable energies in the electrical sector opens up new opportunities for energy collaboration between countries, not only regarding electricity exchanges, but also with respect to technological cooperation or investment. One good example of collaboration is the development of the internal electricity market within the European Union, which has received a new boost with the approval in November of what is

known as the "Winter Package" of proposals put forward by the Commission, grouped together under the more official name of "Clean Energy for All". The aim of the "Winter Package" is to comprehensively adapt the European electrical sectors, so that, by 2030, the ambitious targets of reducing greenhouse gas emissions by 40% and achieving a 50% share of renewable energies in the electrical generation mix can be reached. Precisely, one of the objectives of the package is to enhance the potential for improving the efficiency when using an intermittently-generated and geographically-dispersed renewable electrical sector in the EU, by improving market integration (already under way with the coupling of the daily markets, but not yet sufficient in the intraday and balancing markets), and, increasing the capacity of the interconnection grids. If this new European energy integration initiative comes together successfully, the European Union could continue to play its exemplary leadership role not only in setting ambitious decarbonisation targets but also in the effective deployment of regional collaboration mechanisms for developing climate policies efficiently.

The conditions for the electrical sector, required in the three scenarios consistent with the Paris Agreement that are analysed in the W.E.O. (2016), are twofold: firstly, the decarbonisation of the sector itself and, secondly, the electrification of transport. Both of these requirements show a degree of compliance that is very different at present, while they also differ with regard to the likelihood of compliance with the requirements imposed in the most demanding scenarios; what is more, they have different impacts on the global energy structure and on its geopolitical effects. Decarbonisation of the electrical sector, which, in Europe, for example, is at quite an advanced stage, makes it possible to consider as feasible, if global consensus on climate policy remains intact, even the most ambitious scenario analysed by the W.E.O. (2016), (the one in which the temperature increase is limited to 1.5ºC), which requires the sector to be virtually decarbonised by 2040. The steep slope on the learning curve for wind and photovoltaic generation technologies has led to these technologies attaining average generation costs that can compete with any alternative technology (below $50/Mw.h. in many auctions). Furthermore, the rapid progress made in storage technologies and the potential for managing the demand associated with developing smart grids and smart consumption and measurement equipment, make it easier to integrate intermittent and limited predictability generation (renewable wind and photovoltaic). Estimates of the cost of third-generation nuclear generation vary greatly from one country to another , although the I.E.A./N.E.A. figures offered in this study for countries like South Korea or China indicate competitive average generation costs (around $50/Mw.h under the hypothesis of a 10% discount rate. The degree of expansion for nuclear generation capacity shows different degrees of uncertainty in countries with high estimated costs such as the United Kingdom (which has an ambitious third-generation-reactor investment programme) or France (whose current objective is that by 2025 nuclear generation only accounts for 50% of the total generation, -it currently amounts to 75%- but where the need to preserve its nuclear technology leadership could reverse the forecast). Furthermore, it is likely that the USA, Russia, China, India, Korea and

the Middle East will develop new nuclear generation capacities, especially if the breakthroughs on the learning curve for third-generation reactors lead to the lower costs of nuclear generation estimated by the I.E.A./N.E.A.

Therefore, an estimation of the cost of generation with decarbonised technologies shows that the decarbonisation path for the electrical sector can be reached without excessive regulatory support. In this context, the degree of penetration of the generation with fossil fuels into the mix is doubly uncertain. If CO_2 capture and storage technology is developed commercially, both coal and natural gas will retain a significant share in the electrical generation mix, whereas if this is not the case, the full decarbonisation scenario will require that the use of both fuels is abolished; the utilisation of natural gas would tend to be restricted to providing backup for intermittent generation until storage technologies were fully developed at a competitive price. However, combined cycle electrical generation using gas will probably still be competitive (especially in areas where natural gas is cheap, such as the USA) at high "capacity factors", so dispensing with it would either require very high prices for the CO_2 or the establishment of stricter CO_2 emission standards. It is thus likely that in countries with abundant resources of cheap natural gas (as is currently the case of the USA) the decarbonisation of the electrical sector in the medium term is supported more by replacing coal with gas, than by renewable and nuclear energies making major inroads, and that in the long term, the electrical sector would still be more heavily dependent on natural gas than it would be in the global radical-decarbonisation scenario envisaged for the electrical sector in the W.E.O. (2016), necessary to comply with the 1.5ºC temperature increase limit.

Compliance with the transport electrification requirements that the W.E.O. (2016) considers in the three scenarios consistent with the Paris Agreement, which have been mentioned in earlier paragraphs, is currently only at an incipient stage, unlike the decarbonisation of the electricity sector. Furthermore, the intensive electrification of road transport that these scenarios require will radically affect the medium- and long-term profile where the global demand for oil is concerned, the degree of intensiveness varying greatly from one scenario to another. As has been pointed out in preceding paragraphs, according to the W.E.O. (2016), the application of the Paris Agreement would lead to a global demand for oil in 2040 that would drop from 80% of the demand recorded in 2015, in the least stringent scenario compatible with the Agreement (limiting the temperature increase to 2ºC), to 43% in the strictest scenario (limiting the temperature increase to 1.5ºC). With these predictions, it is reasonable to consider again (this question was also dealt with last year) the risk of "stranded investments" in the "upstream oil" sector. However, the W.E.O.(2016) estimates that in the scenario where the temperature increase is limited to 2ºC, in view of the exhaustion profile affecting the wells currently being exploited, it would be necessary to develop new resources and reserves amounting to 399 billion barrels (which would mean investing 6.8 trillion dollars); an investment programme adapted to these crude oil demand predictions would be sufficient (more moderate than the one for

the scenario limiting the temperature to 2.7ºC, which the I.E.A. calculates at 11 trillion dollars, but still substantial) to get around the "stranded investments" problem. Yet, firstly, the W.E.O.(2016) does not offers estimates for the amount of investment necessary in the scenarios for the temperature rises of 1.84ºC and 1.5ºC that , as has been stated, lead to sharp falls in oil demand in the long term. Furthermore, the wide range that the I.E.A. offers for the long-term crude oil demand scenarios consistent with the Paris Agreement, is an indication of the great uncertainty affecting the path of this variable even within the framework of the Agreement itself. With these premises, it is difficult to imagine that a global investment programme in the "upstream oil", resulting from the aggregation of decentralised investment decisions, could be modified, as though it were a planned system, to adapt exactly to a crude oil demand profile with considerable decreases likely in the long term and with development paths affected by great uncertainty (the W.E.O. itself (2016) analyses a disjointed scenario that it refers to as a "disjointed transition"). The risk of "stranded investment" is therefore high, and any attempts to insure against that risk by implementing a "cautious" investment programme would tend to lead the oil market along unpredictable paths. Furthermore, it seems clear that this risk will grow with the degree of strictness with which the Paris Agreement is applied, introducing complex games of interest in the development of climate policies in the medium and long term, whose stability could also be affected by the potential bias towards climate scepticism of the future United States´ presidency.

In this context, the long-term strategy of the oil producers with the greatest volume of resources is faced with a dilemma. On the one hand, the most rational response to the application of the Paris Agreement would require an extreme caution when developing resources and reserves to prevent "stranded investments", while at the same time fostering an ambitious diversification programme (along the lines of the Saudi programme "Vision 2030"). However, if the most likely application scenario for the Paris Agreement turns out to be the strictest requirements (with an oil demand of 40 million barrels/day in 2040) and if throughout the 21st Century the pressure from the climate policy is intensified, then the strategy described could lead to a "stranded resources" situation affecting a considerable volume. In the preceding issue of this publication reference is made to A. Halff who mentioned the statements made by the Saudi Oil Minister, Ali Naimi, describing the risk that Saudi Arabia could run in 2030, sitting on a sea of oil with no value whatsoever. If it is estimated that the time for a world without oil is not far off, it may well be imagined that there might be a game of strategies in which the oil producers could tend to minimise their "stranded resources", and that may lead to a less-than-optimum scenario involving investment anticipation, a gradual concentration of production among producers with lower extraction costs and a depressed price profile in the long term.

Although the W.E.O. (2016) does not offer any estimates about the way oil prices will evolve in the long term under the strictest Paris Agreement scenarios (1.84ºC and 1.5ºC limits), the scenario corresponding to the 2ºC temperature

rise limit considers the low-extraction cost production growth rate and the price moderation with respect to the central scenario (application of the already accepted policies, including the "national commitments" on climate). In the "2ºC limit" scenario, the W.E.O. (2016) forecasts a peak of $85/barrel midway through the 2020s and a drop to $80/barrel in 2040. It is clear that a price estimate for the two most demanding scenarios would have led to considerably lower figures. Whatever the case may be, the W.E.O. (2016) warns that delays in the development of new upstream projects in conventional oil wells and the slower-than-expected response rate in the exploitation of unconventional oil, could cause disturbance in the market within a growth demand context. The OPEC Agreement in Vienna to reduce crude oil production should be conducive to an upward price trend. The stability of this agreement however is far from being guaranteed. Firstly, this is mainly due to the instability inherent to this kind of oligopolistic agreements. Secondly, owing to the difficulties involved in upholding the agreement if the new Trump Administration questions the nuclear agreement with Iran. Thirdly, in view of the potential strategic reorientation of some of the producing countries as mentioned in the preceding paragraphs. In summary, the long-term crude oil price profile most consistent with the application of the Paris Agreement would logically be one of low prices, and the more demanding the scenario applied, the lower the prices (1.5ºC limit).

When the uncertainty factors that affect the two geostrategic variables considered in greatest detail in the previous issue of "Energy and Geostrategy" (i.e.: climate policy and oil prices) are re-examined for the current publication, it can thus be seen that in both cases the geopolitical risk has increased and that the essential crucial factor in this increase is probably the great question mark that surrounds the future of the new Presidency of the United States. As it has been pointed out, it seems highly unlikely that there will be a presidential agenda that systematically goes against the traditional principles of the Republican political agenda. It would appear to be more plausible the early introduction of certain lines of action suggested in the election campaign that are in line with that agenda. For example, the ideas expressed by D. Trump regarding the development of fossil fuels in the United States, the nuclear agreement with Iran and the global climate policy. A "revisionist" position in all these aspects, without there being any need to denounce the written agreements (an expression of the political will to weaken their application suffices), could bring about changes in the behaviour of the main strategic actors in the oil market in the short and medium term and, what would be more serious, could weaken the global commitment to a strict climate policy and be conducive towards a deviation from the path set out by the most demanding scenarios in the emission reduction policy inherent to the Paris Agreement. Whatever the case may be, the uncertainties that affect the future energy geopolitics scenario at the closure of this issue of "Energy and Geostrategy 2017" (at the precise moment when D. Trump is taking office) make contingent many of the opinions offered.

Chapter I

Renewable Energies and the Renewal of Geopolitics

Gonzalo Escribano

Abstract

This article analyses the geopolitics of renewable energies and tries to derive their geo-strategic implications. The objective is to provide elements to enrich future strategic exercises on the subject and offer a broader strategic reflection than that provided by current European and Spanish energy security strategies, very reductionist in their conceptualisation of energy security as the mere reduction of energy dependence. To this end, the article reviews the academic literature on the geopolitics of renewables, identifying the most relevant contributions and illustrating some of their applications to Spain and the European Union. The article concludes that the simplification of presenting renewables as clean energies also in geopolitical terms can be counterproductive. It also warns of the need to avoid the securitisation of renewables, to maintain an objective and weighted criterion to elaborate a consistent and attractive narrative, as well as a more proactive and less defensive external action that allows a better management of renewables' risks and capitalising on its strategic advantages.

Keywords

Geopolitics, energy security, renewable energies, European Union.

Introduction

What would happen to geopolitics in an energy system where renewables were predominant? Would this provide greater energy security? Would it give strategic advantages or disadvantages? If it did: which ones? Under what conditions and how would they be managed? Would this amount to a basic alteration to the regional and global political balances? As has already been written on previous occasions in this series of publications, the International Energy Agency predicts that hydrocarbons will continue to dominate the international energy scenario until midway through the 21st Century. And our coordinator has rightly remembered that "this change of paradigm in the restrictions that energy security imposes (...) will require a very long period to materialise"[1].

However, and at least from a strategic and intellectual perspective, all of these are important questions and ones that are difficult to answer, and all of them have been analysed in recent years on two different stages: energy security strategies and academic literature, the latter from different angles and using a variety of methodologies. That academic literature clearly does not constitute a sound theoretical corpus, but rather applications of energy economy, political economy or international relations, as yet insufficient in the necessary calmness to allow for a systematic analysis that would yield conclusive findings. Nevertheless, the works do contain sufficient elements to make it possible to plot the outlines of a geopolitical approach to renewable energies, extract at least some of the main strategic implications and enrich conventional energy security strategies.

Being true that conventional energy security strategies are presented in a better systemised way, this is not the case with renewable energies. In their review, they are not incorporated in a consistent way to the analysis, but more as an appendix or a supplement, considering their strategic implications in an extremely reductionist and one-dimensional way. Thus, European and Spanish energy security strategies present renewables as clean energies not only in terms of emissions but also in terms of geostrategic risks, basically because they reduce energy dependence. Far from favouring renewable energies, these simplifications do not allow to prepare a strategic reflection on their geopolitical impacts or to provide a consistent account of the global benefits of energy transition. In fact, such simplifications can even be counterproductive where the deployment of renewables is concerned, because the independence and autochthonous resources narrative could take many directions, such as nuclear or unconventional resources.

This article develops a twofold argument, the first one being that if renewable energies are properly managed, they may not only serve to improve energy

[1] Aranzadi, C. (2016): "Introduction", at the Spanish Institute of Strategic Studies, Energy and Geostrategy 2016, Ministry of Defence: 11-26: 12.

security, but also (and this is even more important) to project soft power (or eventually hard power) and to provide instruments for the external action. The second argument, that the best defence of renewables is preventing the temptation to both obviate or exaggerate their geopolitical connotations, pinpointing their weaknesses in the most possible objective way and proposing strategies aimed at minimising their risks and optimising their eventual strategic advantages.

In summary, what is proposed is the need for a strategic reflection that is better devised than merely calling for a reduction on energy dependence in order to incorporate new vectors for external projection. With a view to this, the following pages review the academic literature, too recent and limited indeed, yet on the increase, with the further aim of providing an initial overview of it. In order to illustrate the conceptual reflection without merely giving a series of anecdotes or referring to case studies, the text is accompanied by frames that deal with specific cases ranging from the Spanish National Energy Security Strategy to Norway's (self) projection as the "capacity companion" in the European energy transition, the new renewable partnership between Spain and Morocco or African hydroelectricity geopolitics.

The article is structured as follows. Section 2 examines the role allocated to renewables with respect to two energy security strategies, the 2014 European Union strategy and the 2015 Spanish strategy, pointing out the weaknesses and omissions in the way they are treated and the need to overcome the energy dependence approach. The next section reviews the academic literature that deals, in a broad sense, with geopolitical implications of energy systems characterized by a high rate of electrification and renewable energy penetration, structuring the debate around the empirical results and the conceptual approaches. Section 4 takes a look at two extreme scenarios, one transcontinental with major flows of electricity from renewable sources, and the other national, dominated by the target of energy independence, comparing their respective strategic advantages and disadvantages. Section 5 extracts from the preceding sections some potential applications for the European Union and a number of implications for Spain, concentrating on the Mediterranean area. The article ends with some final remarks that could enrich future strategic exercises concerning the geopolitical role of renewable energies.

Renewables and Energy Security Strategies

It is worth noting that most of the strategic documents dealing with energy associate renewable energies with energy security only, through the perspective of reducing energy dependence. That is for example the main point shared by the European Union and Spanish strategies on this subject.

The 2014 European Energy Security Strategy regards renewable energies only as an instrument for reducing energy dependence, while at the same time stressing

the major saving in terms of imports[2]. In the chapter on recommendations, the Commission's Communication clearly opts for the deployment of renewables, including the need to find common support mechanisms, with no other strategic reflection than the discourse concerning the reduction of energy dependence. Only at the end of the Communication does the Commission announce that "it will promote the development and trade of renewable energy technologies in bilateral and multilateral negotiations", without any further considerations for action beyond the European Union. In fact, the usual analyses do not even make reference to renewables except to summarise the allocated role: to develop own resources in order to reduce energy dependence[3].

The 2015 National Energy Security Strategy (see Frame 1) goes a bit further, referring to other vectors, such as diversifying sources, but its strategic lines aim, above all, to reduce energy dependence by developing autochthonous sources and diversify the energy mix as a result, renewables being just another source. The emphasis on dependence can be detected even in the geo-economic instrumentalisation of R&D&I to reduce it, while at the same time a proposal is made for technology exports to be increased (but, strangely enough, not the renewable sourced energy itself).

Frame 1: Renewables and Geopolitics in the 2015

Spanish National Energy Security Strategy[4]

Dependence
"The modern and resilient structure of the distribution network and the upward trend in the contribution made by renewable energies to electricity generation, are distinguishing features of the Spanish energy system. The latter leads to the corresponding reduction in foreign dependence" (p. 16).

R&D&I, dependence and geo-economy
"A definite decision to opt for R&D&I means a strategic opportunity for Spain that will enable us to improve efficiency in the current exploration and exploitation processes, maintain a privileged position worldwide in the area of renewable energies and make progress in searching for and developing new autochthonous energy sources that will enable the country to put its own resources to the best uses" (p. 21).

Interconnections
"In the field of electricity, the lack of interconnection is what causes the existence of real energy islands. An attempt has been made to alleviate

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2 European Energy Security Strategy, COM (2014) 330 to end, Brussels, 28.5.2014.

3 For example, as part of the work at the Spanish Institute of Strategic Studies: by Carlos Izquierdo, J. (2016): "The EU and Spain Energy Security Strategy", Document of Opinion issued by the IEEE, 15/2006, 11th February.

4 National Energy Security Strategy, Presidential Office, 2015: file:///Users/gonzalo/Downloads/estrategia%20de%20seguridad%20energetica%20national%20(1).pdf

this situation through a notable increase in interconnection capacity levels, which makes it possible to develop the single energy market, to harness the potential of renewable energies, autochthonous energy sources with great potential, but which owing to management difficulties and intermittency need to be backed up by conventional alternative sources" (p. 9).

"The factors that define the Spanish electricity system are soundness and strength, because it is a grid system partially connected with France and Portugal. The electricity generation mix is diversified and the considerable increase in production with renewable energies must be stressed" (p. 14).

Climate Change
"The effects of climate change affect National Security. Encouraging the use of available energy sources, in which renewable technologies play an important role" (p. 21).

"All in all, energy efficiency and renewable energies are two vital pillars for helping to further mitigate emission into the atmosphere" (p. 12).

Diversification
"Another aspect worth stressing is the diversification at source with a mix in which, together with the two predominant primary energy sources, oil and gas, the nuclear energy, coal and renewable energies constitute the energy generation scheme in Spain" (p. 15).

"There is thus a suitable balance between our dependence on oil and natural gas and the use of autochthonous sources, in which apart from coal and nuclear energy, what is outstanding is the production capacity with such renewable energies as wind, photovoltaic solar, thermoelectric, hydraulic and biomass" (p. 18).

Strategic action lines:
(2) "Guaranteeing the diversification of the national energy mix, providing an adequate cross-section of energy sources (...). It is necessary to consider all the energy sources (...) which will enable the country to reach a certain guarantee of supply (...) within a sustainable model where greater importance is gradually attached to clean energies" (p. 36).

(4) To encourage the use of autochthonous sources in order to diversify the energy mix and reduce our dependence on other countries (...). To a large extent, energy security is favoured by the use of autochthonous energy sources. It is necessary to orient actions towards the promotion of a diversified energy system that dispenses, where possible, with the dependence established by having to import conventional fuels (...). Increase energy sources beyond fossil fuels and nuclear energy by encouraging the use of all the autochthonous energy sources available, including renewable ones" (p. 38).

The importance of interconnections is also mentioned, especially for exporting (this time, yes) electricity from renewable sources, and even in an implicit way seems to refer to the possibility of importing electricity as a back-up channel, but the way to do this is still far from clear. It is especially curious that interconnections with Morocco are not even mentioned and neither are the exports of Spanish electricity to that country, which amount to about 15% of the Moroccan electricity demand and are vital for operating their electrical system, yet not one single geopolitical consequence is mentioned in this regard (neither is there any mention about Ceuta and Melilla, the genuine Spanish energy islands). Renewables also fulfil the function of mitigating climate change, which the Strategy considers as affecting national security, although it does not explain how.

This approach clearly seems to be insufficient and its findings rather unsatisfactory, because it does not provide answers to the strategic challenges of energy transition. It suffers from a very narrow concept of energy security (reducing dependence). Furthermore, in a somewhat contradictory way, it wishes to encourage the export of electricity from renewable sources and technologies at the same time. Neither does it examine key strategic opportunities like the third connection with Morocco or the soft power that would result from projecting itself as a "renewable power". In the opposite sense, it would also be necessary to give some thought to the collateral impacts of energy transition: how this would affect important neighbours, like Russia or Algeria; or the regional balances in the Middle East, the Gulf of Guinea or Latin America.

A far too unspecific reference to the impact of climate change on national security is worth a separate mention. The debate between the academic world and the security community concerning what the former calls the dangers of the "*securitisation*" of climate change, illustrates the contrast between the two epistemological communities[5]. This aspect is important because if the link between climate change and national security is not clearly established, that securitisation could affect the renewables as a mitigation tool: there is no consensus about whether the relationship between the targets for fight against climate change and national security is complementary or whether there is a trade-off between the two[6].

[5] The School of Copenhagen concept of securitisation involves invoking security arguments (an existential threat) to justify the use of extraordinary means; as such, it is an extreme form of politicization. It must be made clear that warning about the risks involved in the securitisation of climate change does not amount to denying its existence (just like doing so with the geopolitical connotations of renewables does not mean that one is opposing them), quite the opposite, to continuing with the fight against its basic causes at the top of the agenda.

[6] To go more deeply into this debate, See: Guivarch, C. and S. Monjon (2015): "Would climate policy improve the European energy security?", Climate Change Economics, 6 (2); Brown, S., H. Huntington (2008): "Energy Security and Climate Change Protection: Complementarity or Trade-off?", Energy Policy, 36 (9): 3510-3513; Bauen, A. (2006): "Future energy sources and systems-acting on climate change and energy security", Journal of Power Sources, 157: 893–901.

In general, the literature concerning securitisation tends to conclude that climate change has never been used as a security argument for taking drastic measures[7]. Yet today there are authors who see clear signs of securitisation in environmental security policies, especially in the United States[8]. The most recent literature describes different securitisation paths, but tends to conclude that there are differentiated securitisation processes[9]. Whatever the case may be, this article will not be dealing with the security aspect of climate change or, as a result, its relationship with renewable energies, the second energy security vector that, together with the reduction of dependence, is contemplated by some security strategies[10]. In order to try and enrich the strategy reflection with the developments from academic literature, the following section reviews some of the main interaction vectors between geopolitics and renewable energies identified by the former.

Renewables and Geopolitics: Empirical Evidence and Conceptual Approaches

The preceding section shows how the security strategies currently being applied have not been devised to answer the questions asked in the introduction to this work. They are all afflicted with the problem of dependence on the path and they endeavour to integrate renewables *ad hoc* instead of considering long-term energy transition scenarios and their global strategic implications. The academic literature is much richer in this sense, although it suffers from methodological dispersion and fragmentation of the object being studied. The strategies lack richness in the analysis, whereas the academic literature lacks the systematic approach and the strategic and comprehensive nature of the former.

The aim of this section is to provide some structure to the academic debate and retain certain concepts that are useful for preparing more refined and comprehensive strategies. Although the literature is very varied, a distinction can be made between empirical works that try to contrast or refute the relationship between deploying renewable energies and energy security, and more conceptual works that hypothesise the implications of energy security in low-carbon scenarios, either through conceptual experiments, different analytical frameworks for energy security or by considering such factors as vulnerability to terrorist attacks, other dependences (critical

[7] Buzan, B., O. Waever and J. de Wilde (1998): Security: A new framework for analysis. Boulder: Lynne Rienner.

[8] For example: Floyd, R. (2010): Security and the Environment: Securitisation Theory and US Environmental Security Policy. Cambridge: Cambridge University Press; and also Trombetta, M. J. (2008): "Environmental Security and Climate Change: Analysing the Discourse", Cambridge Review of International Affairs 21 (4): 585–602.

[9] See: Von Lucke, F., Z. Wellmann and T. Diez (2014): "What's at Stake in Securitising Climate Change? Towards a Differentiated Approach", Geopolitics, 19: 857–884; Selby, J., C. Hoffman (2014): "Rethinking Climate Change, Conflict and Security", Geopolitics, 19 (4): 747–756.

[10] About this question, See: Escribano, G. and L. Lázaro (in the print): "Climate Governance and Climate Integration: Beyond Securitisation", Spanish Commercial Information Journal.

technologies and minerals) or the problems associated with potential conflicts over renewable resources and to what extent there can be a "renewable rent-seeking".

The Empirical Evidence: precedence for the narrative to reduce dependence

Most of the empirical works that analyse the interaction between energy security and renewables focus exclusively on the energy dependence variable, specifically on whether high energy dependence situations mean a swifter deployment of renewables. Some of these studies have found that energy dependence levels do have a positive effect on the penetration of renewables[11], whereas others either refute the hypothesis or the findings are not statistically significant[12].

By contrast, Valdés *et al.* adopt an approach that is broader than concentrating exclusively on dependence, including other variables when dealing with energy security such as the diversification of sources and origins, obtaining findings that are statistically significant: energy dependence is an important vector in the deployment of renewables, but it is the diversification by sources and origins the one that yields greater benefits in terms of energy security, because it reduces the degree of energy vulnerability involved[13].

This finding is significant, because it indicates that attention is not being paid to other relevant security dimensions, only to the energy dependence aspect. It is also worrying, given that its logical corollary would be the development of independent, closed and autarchic renewable systems, omitting the geopolitical externalities of interdependence and suitable management of this. We would thus be facing a "renewable mercantilism" in which countries try to dispense with imports while at the same time increasing exports. This would clearly be a model that is hardly sustainable, given that it very little compatible with regional integration or cooperation schemes.

A Conceptual Experiment: geopolitics in a 100% renewable global system

Yet the paths for answering the questions asked in this section can be found in the more conceptual literature. Scholten and Bosman propose a conceptual

[11] Marques, A., J. Fuinhas, and J. Pires Manso (2010): "Motivations driving renewable energy in European countries: a panel data approach", Energy Policy, 38: 6877– 6885.

[12] See the following works: Marques, A. and J. Fuinhas (2011): "Drivers promoting renewable energy: a dynamic panel approach", Renewable and Sustainable Energy Reviews, 15: 1601–8; Popp, D., I. Hascic and N. Medhi (2011): "Technology and the diffusion of renewable energy", Energy Economics, 33: 648–662; and, finally, Aguirre, M. and G. Ibikunle (2014): "Determinants of renewable energy growth: a global sample analysis", Energy Policy, 69: 374–84.

[13] Valdés, J., G. Escribano, and E. San Martín (2016): "Energy security and renewable energy deployment in the EU: *Liaisons Dangereuses* or Virtuous Circle?", Renewable and Sustainable Energy Reviews, 62: 1032–1046.

experiment consisting of considering a global 100% renewable electrified energy system and analysing its geopolitical implications[14]. It must be pointed out that its objective does not consist of preparing a formal model, but of exploring the geopolitical implications of the technical and geographical characteristics of renewable energies. The authors analyse an alternative static reality carrying out a deliberate abstraction from other aspects, such as the technological, socio-cultural, financial or institutional, to focus on the differences on the geostrategic plane, using an energy model based on hydrocarbons.

For example, it is clear that the view of the European Union (and of its Member States) regarding energy security needs a renovation of its strategic lines so that it can incorporate the implications of a massive penetration of renewable energies. Their technical and geographical peculiarities determine not only the structure of the electricity markets, but also (and perhaps this is more important for our purposes) the trading partners, basically those neighbouring countries with which there are sufficient electrical interconnections. Furthermore, the two elements determine very different strategic realities from those of hydrocarbons and, so, require different policies. For example, when considering an electrified energy system, its maximum extension (static technology) is continental, except for those transcontinental grids that span limited distances, as is the case with the Mediterranean and the Middle East.

According to the premises of Scholten and Bosman, countries have to decide whether they want to produce or would rather purchase. The decision to purchase (which does not mean not producing) assumes that somebody has to sell, which implicitly means the acceptance of transnational electricity flows from renewable sources[15]. It also implies a centralised grid structure that leads to continental scenarios and the creation of grid communities[16]. The decision to produce (which means not purchasing) leads to closed domestic energy systems based upon a decentralised grid of *prosumers*. In this domestic scenario, the geopolitical risk associated with the security of supply (energy independence) is undoubtedly not as great, but at the expense of lower geographical diversification, less interdependence (and thus cooperation opportunities) and higher economic costs, leading to the biggest differences with the current energy model.

Although the geopolitical implications of each decision are different, as will be seen in the next section, the analysis does come to certain common conclusions that are interesting in terms of power transfer with respect to hydrocarbons.

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[14] Scholten, D. and R. Bosman (2016): "The geopolitics of renewables. Exploring the political implications of renewable energy systems", Technological Forecasting and Social Change, 103 (c): 273-283.

[15] *Ibid*.

[16] By way of an extension to the Deutsch's security communities: in a "security community" the everyday problems are solved by 'peaceful change', based on institutional mechanisms and a "community spirit" that emerges from a convergence of interest and trust between peers, so resorting to violence is highly unlikely.

Firstly, given that renewables are more geographically dispersed, there is a better energy resource distribution and thus both a greater number of producers and lower concentration of producers, which turns the balance of power in favour of the consuming countries (as well as in favour of the new renewable producers). On a second level, the market is affected by a geographical limit that suggests more localised energy geopolitics, regional at the most, but with a greater geographical content that would delight followers of classic geopolitics such as Kaplan, and would endorse his warnings about the revenge of geography[17]. Finally, and this is of great importance, a strategic reorientation occurs as a result of the transfer of power from the owner of the resource to the stakeholder with the greatest grid capacity.

Renewable energies under two energy security analysis frameworks

According to the energy security characterisation as given by Cherp and Jewell (2011), three energy security approaches coexist: sovereignty, robustness and resilience, and renewable energies can contribute to improving security from each one of those approaches[18]. A different approach consists of distinguishing between primary risks (risks caused by geopolitical or technical situations) and secondary risks (supply interruptions, environmental damage or damage to the infrastructures as a consequence of primary risks), and the degree of exposure to the risk (for example, to price volatility or a bottleneck of technical or geopolitical origins). Once again, mitigation elements could be found at each one of the phases in that chain causing the energy risks[19].

There are many arguments, and a detailed analysis of each one is beyond the bounds of this article. However, they can be briefly listed by way of explanation. First of all, a larger weight of decentralised renewable energy facilities and a greater grid intensity reduce vulnerability to technical faults and sabotage (primary risks / robustness). Secondly, with the exception of hydroelectricity, renewable energies are safer from the perspective of accidents, attacks or natural disasters (secondary risks). Finally, they are less exposed to risk because they are technologies with no marginal costs, and so they are not affected by price fluctuations of hydrocarbons (although they are affected by other raw materials such as critical minerals, albeit to a lesser extent, as will be seen later). What is perhaps more important, this means that they are disassociated with the prices of other energy sources, which amounts to a clear improvement where the risk/benefit ratio is concerned, from a portfolio choice viewpoint,

[17] Kaplan, R. (2009): "The Revenge of Geography", Foreign Policy, May/June.

[18] Cherp, A. and J. Jewell (2011): "The three perspectives on energy security: Intellectual history, disciplinary roots and the potential for integration", Current Opinion in Environmental Sustainability, 3: 202–212.

[19] Escribano, G., J. M. Marín, and E. San Martín (2013): "RES and risk: renewable energy's contribution to energy security. A portfolio-based approach", Renewable and Sustainable Energy Reviews, 26: 549–559.

as long as institutional risk-mitigation mechanisms are provided, such as for example, standard and regulatory convergence[20].

Note that as from a given renewable energy penetration level, the argument regarding the diversification of sources and origins may also be used against such energies: for example, if in the future the basic limitation imposed by climate change could be overcome by the generalisation of carbon capture and storage, hydrocarbons (and coal), as is the case now with nuclear energy, they would diversify the source and supplier portfolio. In such a scenario a balanced matrix of geopolitical and climatic risks could be obtained, yet this would again bring the debate back to the uncertainties of technological progress and the diversification of paths where R&D&I efforts are concerned.

Vulnerability to terrorist attacks: without a security-decarbonisation dilemma

Another question to be studied is the vulnerability to terrorist attacks; this is low in the European Union for both gas import and renewable electricity infrastructures, because both are diversified and have considerable buffers. It would even be difficult for major attacks to cause extensive and long-lasting damage, because the system could rapidly be restored to working order in all reasonable attack scenarios. Only a large number of simultaneous attacks could jeopardise system operations, so terrorists groups could obtain much more spectacular results with less resources by focusing on other targets, basically and unfortunately human.[21].

In this sense, there would be no dilemma between security and decarbonisation, because in both gas and renewable energy scenarios, vulnerability to terrorist attacks would be low. Some authors consider that the vulnerability is just as low for gas as it is for electricity, whereas others think that electrical structures of the Desertec type are more vulnerable, the differences not being big enough however to consider a dilemma between decarbonisation and supply security[22]. Nevertheless, assessments tend to indicate that the two main risks would be a war or a massive cyber attack, and it is estimated in the latter case that simple terrorist groups - not at a State level - would find it difficult to perpetrate the attack.

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[20] *Ibid*. Nevertheless, it is to be considered that such disassociation of the generation costs does not imply a disassociation of the prices for generated electricity, to the extent that these are set in the market place. The author thanks the coordinator Mr Claudio Aranzadi for this very pertinent comment.

[21] For an overview, refer to: Toft, P., A. Duero, and A. Bieliauskas (2010): "Terrorist targeting and energy security", Energy Policy, 38: 4411–4421.

[22] Lacher, W. and D. Kumetat (2011): "The security of energy infrastructure and supply in North Africa: hydrocarbons and renewable energies in comparative perspective", Energy Policy, 39: 4466–4478; and Lilliestam, J. (2014): "Vulnerability to terrorist attacks in European electricity decarbonisation scenarios: Comparing renewable electricity imports to gas imports", Energy Policy, 66: 234–248.

Other dependences: critical minerals and technologies

The logic of dependence is not limited to the energy, hydroelectric, solar or wind resource; it also applies to the technologies and to other raw materials in the industrial chain. Technological dependence (or leadership) is undoubtedly a prime strategic vector, and that is how industrial policies aimed at encouraging national champions are described. There is a great deal of literature on promoting renewables as an industrial policy and it goes beyond the objectives of this article, but it tends to focus on the economic and environmental aspects, and sees no cause for concern in access to technology. Rodrik, for example, considers that that strategic competition should take place in a local support environment and not at a commercial level (i.e. by subsidies and not by imposing duties)[23].

Whatever the case may be, the World Trade Organization is provided with mechanisms for managing those problems, and it has acted that way before with critical minerals, however there is no consensus about the effectiveness of the merely commercial approach. One of the strategic implications is usually China's growing role, which some attribute precisely to the World Trade Organization's inadequacy for managing the environmental aspect of those commercial disputes[24]. The strategic misbehaviour accusations levelled at China as a consequence of its rare-earths policy have been made for many years, and it is foreseeable that tensions on this issue could escalate in the future[25]. Despite this, most analyses avoid making references that could exaggerate the scale of the threat and focus on proposing solutions.

For example, Viebahn *et al.,* analyse the need for critical minerals to carry out the *Energiewende*, without finding any evidence to suggest that critical mineral resources may limit renewal generation or storage in general (Table 1). Their study concludes that hydroelectricity, concentrated solar power plants (CSP), wind generators with rare-earths magnets and photovoltaic energy based upon silicon, can be regarded as non-critical generation technologies as far as critical minerals are concerned; neither do they consider electricity grids or storage by alkaline electrolysis or fuel cells to be critical infrastructures[26].

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[23] Rodrik, D. (2014): "Green Industrial Policy", Oxford Review of Economic Policy, 30 (3): 469–491.

[24] Stockholm Environment Institute (2014): "The geopolitics of China's rare earths: a glimpse of things to come in a resource-scarce world?". Discussion Brief. Accessed on 18th November 2016: https://www.sei-international.org/mediamanager/documents/Publications/SEI-2014-DiscussionBrief-China-Rareearths.pdf.

[25] See for example Krugman, P. (2010): "Rare and foolish", New York Times, 17th October; for a more in-depth analysis of the Chinese rare-earths policy, see Hayes-Labruto, L., S. Schillebeeckx, M. Workman and N. Shah (2013): "Contrasting perspectives on China's rare earths policies: Reframing the debate through a stakeholder lens", Energy Policy, 63: 55–68.

[26] Viebahn, P., O. Soukup, S. Samadi, J. Teubler, K. Wiesen, and M. Ritthoff (2015): "Assessing the need for critical minerals to shift the German energy system towards a high proportion of renewables", Renewable and Sustainable Energy Reviews, 49: 655–671.

Table 1: Assessment of the strategic importance of critical minerals for wind and solar generation, storage and transmission.

Source	Technology	Main potentially critical element	Classification	
			Important	Potentially relevant
Generation				
Solar	PV	In, Se	X	
	CSP	Ag		X
		Ni, V		X
	Wind	Nd, Dy, Pr, Tb	X	
		Ni, Mo		X
	Hydroelectricity	Ni, V		X
Storage				
	Pumping <hydro>	Ni, V		X
	Hydrogen	Ni		X
		La, Y, Sc, Ni		X
	Battery	Li, V		X
Transmission				
	Grids	Ni, V		X

Table 1. Source: Viebahn et al., op. cit.

Only some wind, photovoltaic and battery-stored sub-technologies are identified as critical, and non-critical alternatives are generally available for them. In the case of wind energy, Neodymium (Nd) and Dysprosium (Dy) are not essential for onshore turbines, but they do help to make the maintenance of offshore farms easier, so in the long term, rare-earths magnets should be replaced by other technologies. Supply security problems were also pinpointed with Indium (In) and Selenium (Se) for some photovoltaic technologies. Large-scale storage technology with Vanadium-based (V) batteries is considered just as critical, their replacement by Lithium-ion batteries (less critical from a resource availability perspective) or by physical facilities (pumping, compressed air) being recommended.

Apart from the possibility of developing alternative technologies for the aforementioned cases, supply security can be increased by establishing recycling systems. For photovoltaic, the high concentration of Gallium (Ga), Indium (In) and Selenium (Se) in thin film technologies makes recycling easier. Rare earths magnets used for wind generators cause greater difficulties, thus recycling systems must be developed at least for Neodymium and Dysprosium.

Viebahn *et al.,* conclude that the *Energiewende* is compatible with the supply of critical minerals; although they stress that there are supply risks due to certain dependences on key suppliers and competition with other uses and other importers. Therefore, they suggest developing cooperation with the producing companies and countries, improving efficiency in the use of the more critical

resources, developing recycling and, finally, focusing the technological policy in the field of renewable energies on technologies and sub-technologies that require less critical minerals[27]. Maybe an analysis of this kind for the Spanish case could lead to more specific results.

It must be pointed out that Lithium (Li), whose price increase in recent years has caused certain alarm owing to the impact this could have on battery development and, thus, the electric automobile, was not considered critical either by this study or by the European Commission on its list of critical minerals[28] (however, it was classified as being of medium-low criticality by the European Joint Research Centre[29]). The reason why it was not regarded as high criticality was that although the demand had increased sharply, the offer had proved to be sufficiently flexible, there exists an important superfluous capacity and the main producers are non specially conflictive countries (the so called Lithium Triangle comprising Bolivia, Chile and Argentina, plus the United States, Canada, Australia and, of course, China). Lithium mining is mainly controlled by western companies that have good relations with the national companies owning the resources. Furthermore, recycling and technological development afford more options than is the case with other minerals that are just as important for other technologies vital for the development of the electric automobile, such as the ones required to produce the magnets for the motors.

In view of this, the literature generally tends to tone down the neo-Malthusian approaches and advise not to exaggerate the risks of a mineral peak, partly due to technological uncertainties. However, the literature also recommends the application of risk mitigation strategies, which basically involve developing autochthonous production, greater recycling and reuse, and the search for alternatives[30]. It is generally considered that the risks associated with critical minerals are of the economic type (price increase) rather than strategic (supply interruption). Nevertheless, this is no reason for Spain not to follow the example of other countries in its environment and count on a well-defined strategy with respect to the supply chain for the critical minerals that are most important for the technologies affected[31].

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27 *Ibid*.

28 Refer to the European Commission Communication on the revision of the list of the raw materials the EU regards as essential, and the application of the raw materials initiative, COM (2014) 297 final, Brussels, 26.5.2014.

29 Moss, R. L., E. Tzimas, P. Willis, J. Arendorf, L. Tercero et al. (2013): Critical Metals in the Path towards the Decarbonisation of the EU Energy Sector. Assessing Rare Metals as Supply-Chain Bottlenecks in Low-Carbon Energy Technologies, Joint Research Centre Scientific and Policy Reports EUR 25994 EN. https://setis.ec.europa.eu/sites/default/files/reports/JRC-report-Critical-Metals-Energy-Sector.pdf.

30 *Ibid*.

31 This argument is developed in greater depth in: Solera, M. (2013): "Critical metals: risks and opportunities for Spain", Analysis by the Elcano Royal Institute (ARI) 12/2013, accessed on 11th November 2016:

It is likewise necessary to incorporate the economic uncertainties that this causes to certain technologies and work to find alternatives. Finally, other risk dimensions must be studied, such as those of an environmental and geo-economic nature. This also means considering risk mitigation mechanisms associated with the mining exploitation of critical resources, once again giving thought to some of the questions that are already familiar where conventional energies are concerned, such as governance and rent-seeking, employment conditions in developing countries and the environmental impact of mining activity, which in the case of various rare earths tends to be considerable. This latter, for example, considers the geo-economic element of how the differences in the environmental regulation requirement levels (and employment levels) have caused the mining activity that exploits these resources to move to the Southern Hemisphere[32].

Conflicts over resources and 'renewable rent-seeking'

Both aspects are important, because they introduce two elements often forgotten in the debate concerning the strategic implications of renewable energies: firstly, that renewable resources can unleash or aggravate conflicts; secondly, that in a context of poor institutional quality, "renewable rent-seeking" situations can also arise, on a par, in extreme cases, with the consequences affecting many hydrocarbon producers. Hydroelectricity, especially in developing countries, is where the dual impact on conflict and governance can best be seen. Furthermore, it represents the contrast between the major geostrategic designs inherent to classic geopolitics and the new micro-geopolitics of human security. Frame 2 illustrates the two tensions with the cases of the *Grand Ethiopian Renaissance Dam* and the *Grand Inga Dam*.

Frame 2: African Dams: the Blue Nile and the River Congo

The first strategic implications for renewable energies became apparent with dam attacks, such as those carried out by the British "Dam Busters" against German dams and hydroelectric power stations during the Second World War, causing flooding in the Ruhr and the drowning of more than 1,500 civilians in Operation Chastise. Or in the opposite sense when in the 1948 Palestine War, after several attacks on the Naharayim Dam and its hydroelectric power station by Jordanian and Iraqi forces, the floodgates of the Degania Dam were opened to prevent Iraqi tanks from attacking the

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http://www.realinstitutoelcano.org/wps/portal/web/rielcano_en/contenido?WCM_GLOBAL_CONTEXT=/elcano/elcano_es/programas/energiacambioclimatico/publicaciones/ari12-2013-solera-critical-metals-risks-opportunities-spain.

[32] Schmitz, O. and T. Graedel (2010): "The Consumption Conundrum: Driving the Destruction Abroad", Yale Environment 360, Analysis, 25th April, accessed 17th November 2016. http://e360.yale.edu/feature/the_consumption_conundrum_driving_the_destruction_abroad/2266/.

Jewish towns in the Valley of Jordan. Although these examples are not particularly relevant for our purposes, the major hydroelectric projects were the first case studies about trans-frontier electricity flow (or of the water flows that generate electricity). To be specific, the African case makes it possible to examine two aspects of energy security hardly examined in the developed countries: access to electricity and hydroelectricity governance problems.

The Nile is the largest river in Africa and runs for almost 7,000 kilometres through 9 countries, followed by the River Congo (4,700 kilometres and 8 countries), which is the deepest in the world and partly due to this, the one with the greatest capacity in Africa, with a flow rate of 42,000 cubic metres per second. Both have been used for many years to generate electricity in the two most conflictive river basins in the world. Already in 1929, and with British backing, Egypt guaranteed for itself a special access to the Nile and the right to veto over any upstream project. After Sudan joined the agreement in 1959, Egypt reserved two-third of its flow at the expense of the other riverside countries.

The economic, energy and agricultural needs of the excluded countries (Ethiopia, Rwanda, Tanzania, Uganda, Burundi, Democratic Republic of the Congo-DRC and Kenya) led to the creation in 2010 of the Nile River Basin Cooperative Network, with the initial participation of Ethiopia, Rwanda, Tanzania and Uganda, which included the construction in Ethiopia of the *Grand Ethiopian Renaissance Dam* (GERD), with a capacity of 6,000 MW, contracted with the Italian company Salini Impreglio (just a few kilometres from the Sudanese border).

Egypt and Sudan did not hesitate to show their opposition to the project, and even Egypt began by threatening to bomb the dam, fearing a loss of discharge. However, proof that an escalation would only make the situation worse for all the stakeholders (a conflict in a delicate domestic situation for Egypt and the difficulties that Ethiopia was finding in obtaining the required financing) meant that cooperation was the prime priority. After Egypt, Sudan and Ethiopia signed an agreement concerning basic principles in 2015, the tension has gradually faded away, although there are still important aspects to be agreed upon, such as the reservoir filling rate and the use to which the discharge will be put, which will partly depend on the findings of the impact studies. Recently, the three countries have reached an agreement on who will conduct these studies.

Curiously, and in spite of the fact that the Ethiopian population have one of the worst energy poverty and lack of accessibility situations in the world, with an electrification rate of only 24%, the Ethiopian Government aims to become the biggest exporter of electricity in Africa. In recent years,

Image 1. Map credit: Wikimedia Commons/Yale Environment 360. http://e360.yale.edu/slideshow/on_the_river_nile_a_move_to_avert_a_conflict_over_water/430/1/.

electricity exports to Djibouti, Kenya and Sudan have become one of the country's main growth vectors, causing a dilemma between exports and supply for domestic demand. Ethiopia has already constructed interconnectors with Uganda, Rwanda, Tanzania and Yemen to increase electricity exports when the GERD is complete.

The case of the *Grand Inga Dam* (GID) in the Democratic Republic of the Congo is not as well known. The great hydroelectric potential of the River Congo, especially in the Inga Rapids in the Lower Congo, were first harnessed and exploited with the Inga 1 Dam (350 MW) in 1972, followed by the Inga 2 Dam (1,750 MW) in 1982. That same year, the Inga-Kolwezi high voltage corridor (HVDC) was completed, epitomising the capacity of regional electricity integration, despite the maintenance problems affecting Inga 1 and 2. In 1995, the World Bank enhanced the creation of the Southern African Power Pool (SAPP) intended to integrate the regional electricity market. The Grand Inga comprises a series of dams to be constructed in several phases, the next one being Inga 3. Once completed, the project would generate about 40,000 MW, more than twice the amount generated by the Three Gorges Dam in China and over one third of the total electricity currently generated in Africa.

The project received the support of the International Community to finance an estimated cost of $ 80,000 million, and has been regarded as a priority by several regional organisations and multilateral financial bodies, as well as the World Energy Council itself. However, the activism of civil society (especially the NGO *International Rivers*), which considers the project to be an outdated development model that gives top priority to mining companies (purchasers of most of the electricity generated at the already-constructed phases) and the export markets, to the detriment of the poor, made support from the World Bank complicated. In 2014, the World Bank gave its approval to a first credit, in spite of the USA abstaining and the fact that the Bank itself stressed that there were "significant implementation risks". Finally, in July 2016, the World Bank suspended the financing of the project increasing uncertainty about its future.

It has been argued that energy security in Africa must be approached from a perspective of development, access to energy and good governance of the energy resources. With those criteria, it is clear that the mega-projects constitute a major vector where modernisation and creating employment are concerned, although, in a context of energy poverty and poor governance, their benefits in terms of accessibility and good governance may be limited or even counterproductive. It must not be forgotten that in the Democratic Republic of the Congo little over 10% of the population have access to the electricity grid, and the situation does not only affect the rural inhabitants, the grid does not reach some major cities in the country either.

Furthermore, a country that exports electricity while having such high levels of energy poverty, low accessibility and limited governance levels brings about the well-known economic problems of the 'Dutch disease' and political problems of the "resource curse" nature, in this case owing to poor management of the profits coming from hydroelectric resources[33].

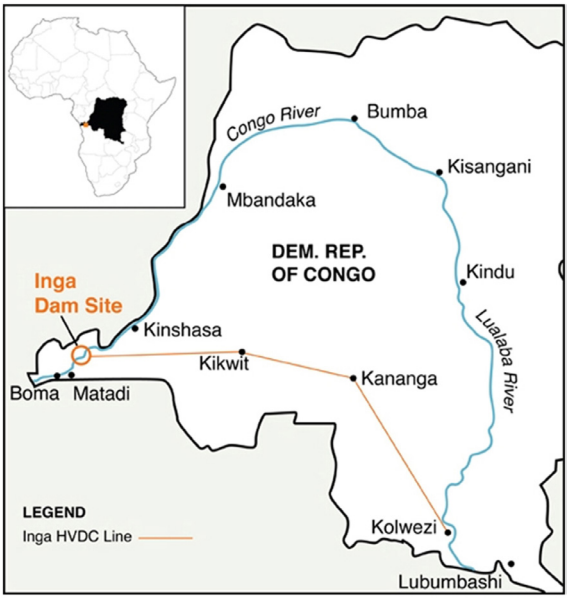

Image 2. Map credits: International Rivers. https://www.internationalrivers.org/campaigns/grand-inga-dam-dr-congo.

It has been stated that, with the exception of major hydroelectric power schemes because of their extremely centralised nature, renewables are much less likely to lead to conflict and, so, to the appearance of resource curse situations. Renewable resources are more difficult to control in time and space, given that income is generated by exploiting flows not stocks, their geographical distribution is better and their energy density is lower. All of this reduces the

[33] Frame prepared using: Escribano, G. (2016a): "The Grand Inga Dam: through the Heart of Africa", Comment from the Royal Elcano Institute 42/2016 - 26/10/2016 http://www.realinstitutoelcano.org/wps/portal/web/rielcano_es/contenido?WCM_GLOBAL_CONTEXT=/elcano/elcano_es/zonas_es/comentario-escribano-grand-inga-dam-a-traves-corazon-africa ; FOI-Swedish Defence Research Agency (2016): "The Wider Security Implications of the Grand Ethiopian Renaissance Dam (GERD)", Dispatch no. 9 (10), accessed 7th October. http://www.foi.se/Documents/FOI%20Memo%205492%20Nr%209.pdf; Green, N., B. K. Sovacool and K. Hancock (2015): "Grand Designs: Assessing the African Energy Security Implications of the Grand Inga Dam", African Studies Review, 58: 133-158; Núñez Villaverde, J. A. (2016), "Tensions over the Nile waters", post in the Elcano blog, 11th January, accessed 7th October. http://www.blog.rielcano.org/tensiones-sobre-las-aguas-del-nilo/.

economic and geopolitical incentives to cause conflicts, either between States or on a domestic level, save for local conflicts with non-State stakeholders involving competition over the land[34].

Such a special case as the solar farms in the Negev Desert, in Israel, illustrates this point. Although the farms are appreciated by public opinion because of their contribution to energy security and decarbonisation, they are not exempt from conflict. As it is an intensive land technology in a small country, it competes with other potential uses such as agriculture (politically very important, including the kibbutzes), natural reserves (very important for leisure purposes in a small and isolated country) and national defence (training camps and other military installations). This competition between groups of interest tends to take the form of securitised lobbying to attract the attention of the Government and public opinion, focusing on environmental, food, energy and military security[35].

It must be pointed out that in this rivalry to *securitise* the use of land, the defenders of the solar option failed for two reasons: firstly, because in Israel it is very difficult to compete with the traditional national security argument and the Army's pre-eminence; and secondly, because on resorting to the energy independence narrative, when the major off-shore gas deposits were discovered in the country, the gas lobby easily managed to put this argument across to public opinion and the Government. This case shows how developers resorting to securitised speeches to promote the deployment of renewables can backfire if there are other autochthonous sources being developed. Something similar happens with the development of unconventional hydrocarbons (or nuclear energy) in Europe: the energy independence argument in favour of renewables can take unexpected (but comprehensible) courses.

Apart from admitting the possibility of generating conflicts, international or domestic, Frame 2 shows how bad governance can degenerate into rent-seeking and poor distribution of the profits generated by the renewables, to the detriment of the neediest, creating unacceptable situations of lack of access to electricity and energy poverty alongside major generation projects. That is why it has been stressed here that although the technical and economic characteristics of the renewables are less prone to the appearance of predatory mechanisms, the key lies in the institutional design: in the absence of independent regulatory agencies, transparent competition frameworks or independent justice, the outcome could be a low-intensity renewable rent-seeking in which the elites cream off a disproportionate part of the profit (Escribano *et al*., 2013). Be that as it may, save in the case of hydroelectricity, the magnitude of such profits is much

[34] Månsson, A. (2015): "A resource curse for renewables? Conflict and cooperation in the renewable energy sector", Energy Research & Social Science, 10: 1–9.

[35] Fischhendler, I., D. Boymel, and M. Boykoff (2014): "How Competing Securitized Discourses over Land Appropriation Are Constructed: The Promotion of Solar Energy in the Israeli Desert", Environmental Communication, 10 (2): 147-168.

lower than the amounts involved with hydrocarbons, so the problem is more one of social (and energy) justice than major disturbances to the political systems.

Domestic scenarios versus continental scenarios

In the diagram outlined by Scholten and Bosman and explained in the preceding section, countries must take a strategic decision: opt for a closed national model that requires an energy system based upon distributed generation; or decide to supply part of its energy demand with renewable electricity imports (which means that there have to be countries able to sell), which leads to a more centralised continental network. This is clearly a case of two extremes, because there might also be more realistic hybrid scenarios, but the two extremes do help to illustrate the different geopolitical implications of each one as opposed to the current energy system. All of this leads to the well-known underlying debate, which one again must be avoided here, between centralised and distributed models[36]. In view of this article's approach to international relations, after briefly presenting the basic features of the domestic scenario, this section will concentrate on the continental scenario.

For the purpose of this article (analysing the geopolitical implications and suggesting elements for strategic reflection) the assumptions can be eased and continuity can be considered between the two extremes, with scenarios that are more scattered and with very few trans-frontier interconnections; and scenarios that are relatively more centralised and interconnected regionally. The premises of total and global electrification can also be toned down, to consider in the first case, the interaction between conventional and renewable energies; and in the second, the international asymmetries that would be brought about by energy transition at different velocities in different parts of the world (especially in Europe´s neighbourhood).

Domestic Scenarios

Once the two scenarios have been toned down, the national one still shows the biggest differences with respect to the current energy model from a geopolitical

[36] It is enough to point out that recently Elon Musk (Tesla) stated that it was not a question of choosing between one or the other, and that the two systems will coexist; he even suggested that the share out would be one third for distributed and the rest for centralised. This point is important, given that Musk is the great defender of distributed generation and a major stakeholder in the struggle between his company Solar City and the champion of centralised renewables Warren Buffet and his company Berkshire Hathaway Energy. In spite of the insistence on distribute generation (for example in his Master Plan), Tesla is already selling his Powerpack battery to electricity companies and cooperatives See Spector, J. (2016): "Elon Musk's Clean Energy Vision Includes a Strong Role for Utilities", Greentech Media, 1st November, accessed 5th November 2016. https://www.greentechmedia.com/articles/read/elon-musk-vision-energy-future-tesla-strong-role-utilities-buffett.

perspective. In it, energy dependence is minimised but the problems of technological dependence and critical minerals are not solved, although as we have seen, these are relatively minor. The real problem is that geopolitics are dynamic and adopting such a model affects the suppliers and, where relevant, the transit countries. On the one hand, in an open global governance model it is difficult to adopt mercantilist or strategic positions in matters concerning technology or raw materials. Therefore, it would be possible in the domestic scenario for strategic technological and critical mineral policies to have greater weight than in more open scenarios. What is more, the national models are less exposed to terrorist attacks in other countries, but they are still prone to cyber attacks or attacks affecting the critical national infrastructures. Clearly, this scenario does not pose long-term risks to political stability in producing countries as a result of the resource curse, quite the opposite might occur.

In fact, a rapid transition that involves a reduction in the demand for conventional resources would cause a double headache to producing countries: a fall in their exports and a drop in prices could cause major upheavals in countries that are important for the security of Europe, like Algeria or Russia, just to mention the two main non-European gas suppliers. All the more so if they are not offered an alternative, in the case of Algeria, for example, developing its solar resources and exporting the electricity thus produced. In hybrid scenarios, what would make sense is to earmark such resources for domestic consumption and release gas for export under a cooperation scheme with the European Union, of the flexibility mechanisms type. However, the domestic scenario rules out both possibilities and leaves no margin for resorting to the management of energy interdependence as an instrument for external action.

The aim of energy independence involves a reduction in international trade, as well as an interruption to one of the greatest profit transfers from consumers in industrialised countries to producers in the Global South. The impact of a decrease in oil prices in countries like Algeria, Nigeria or Venezuela could give an idea of the geopolitical challenges, which would involve a constant weakening of their economies and those of other producers located in such sensitive zones as the Middle East or Central Asia. A greater energy isolation of the European Union, for example, would have major effects on producers in African, Latin American or the Middle East, to which Spain's external action ought to give priority.

On the other hand, replacing hydrocarbons with renewables in countries like Algeria, the Persian Gulf or other producers in the Global South, requires a major institutional, almost cultural, transformation, which needs very long periods of transition, which would probably be discontinuous and fragmented. Guaranteeing political and social stability in those conditions would make it necessary to have a major adjustment to the nature of the social contract for many producers, which also requires time, incentives and expectations.

It has likewise been argued that a closed model of these characteristics can only be justified by high risk aversion, because from a portfolio choice perspective it

would involve a less than optimum combination or risks and costs, unless the geopolitical and regulatory risks of the countries belonging to a potential grid community judge them to be unacceptable and prevent their formation[37]. Finally, the decision to opt for a domestic model involves renouncing the geopolitical dividends of an eventual favourable geographical situation. Firstly, the geo-economic dividends, due to wasting the comparative static advantages provided by the renewable resources (sun, wind or water) and the dynamic ones that usually imply the pre-existence of a business base for exploiting them, whether for generation or storage. Secondly, by not making use of the geopolitical profit of a given geographical situation that enables the country to project itself as a transit country or capacity companion for a grid community.

All in all, it is a scenario with less risks, but it also foregoes many opportunities (high cost of opportunity), so the strategic decision to opt for one or the other will depend greatly on the final balance between the two vectors for each particular country's specific situation (geographical, technological, business, institutional and availability of resources and infrastructures), as well as its risk aversion. It also causes such problems as regional cooperation and unexpected (and unwanted) effects in third countries. All of this could frighten off those in favour of cosmopolitan approaches owing to the disregard for the political externalities of interdependence, yet it is coherent and the arguments in its favour are consistent.

Continental Scenarios

If on the other hand, a country decides to cover part of its energy consumption by importing renewable electricity, other countries will have to supply that demand. This means being equipped with a continental-scale grid (or at least regional or bilateral) with sufficient interconnection capacity, a liquid market and suitable regulation to withstand those flows, plus minimum geopolitical stability. The most outstanding implications for such a scenario when compared to the realities of the current situation can be summarised in the four points listed below.

Firstly, a rearrangement of the rules of the energy geopolitics game would take place around the new grid communities. In such grid communities, the major consuming countries would gain strategic influence over the producers, more so over the most efficient producers. Yet the greatest beneficiaries would be the countries with the greatest grid capacity, given that as has already been pointed out, there would be a strategic reorientation from control over the resources to control over the grids. The geopolitics of renewables in continental scenarios means greater strategic influence for those countries able to make the most of their geographical advantages to control the grid, taking on management, transport,

[37] Escribano et al., 2013, *op. cit*.

balance, storage and/or surplus generation capacity. There would be a move from geopolitics based on resources to geopolitics based on grid management. One good example of this is Norway's strategic repositioning from gas supplier to capacity companion of the European Union, as can be seen in Frame 3.

Frame 3: Norway: Europe's battery?

Norway, one of the world's major oil and gas producers, is also one of the biggest generators of hydroelectricity, thanks to the country's more than 900 hydroelectric power plants. This not only enables Norway to cover almost all its domestic electricity demand (over 95%) without resorting to its hydrocarbons, but also to export both the surplus electricity and most of its gas and oil, which is quite paradoxical for a country that has announced the prohibition of petrol and diesel for 2025.

The case is that for many years Norway's hydroelectric capacity has been projected as an energy power element in addition to (or compensatory to) the energy power provided by its hydrocarbon resources. This is true to the extent that in a European Union dominated by renewables, Norway is usually proposed as Europe's "battery": its rivers and lakes could become a storage vehicle for electricity generated by wind farms or solar farms in other European countries, by upstream pumping and subsequent generation in its dams with a view to exporting electricity back to the country's neighbours.

It has been argued that this potential electricity storage and re-exporting capacity could be crucial for the development of a European energy system based on renewable energies. The European Commission (especially Maroš Šefčovič, its Vice-President and in charge of Energy Union) has shown great enthusiasm for the idea and is drawing up a proposal in this respect. Šefčovič has stated that Norway's role is vital for the future of the North Sea Offshore Grid Initiative, a project that includes ten countries and aims to develop an offshore electricity grid that establishes two-way interconnections between different renewable energy generation sources.

Norway is already taking steps in this direction, exporting hydroelectricity to the Netherlands and exchanging renewable-source electricity with Sweden and Finland. Yet the most ambitious plans are those that intend to increase those exchanges and apply them to Germany and the United Kingdom in the next few years and, above all, to Denmark. Approximately 40% of Danish electricity demand is catered for by wind energy and in view of the lack of non-renewable sources to act as support, the country depends on Norway in two ways: to export its electricity surplus to Norway when the wind is blowing and to import hydroelectricity when there is not enough wind to cater for the Danish demand.

Although there are doubts about the short-term feasibility of such an idea, there is a broad consensus that in the long term Norway could play the

role of battery, at least in Northern Europe. However, before this could happen technical and political problems would have to be overcome. Even though the idea is technically feasible, it requires a costly network of underwater cables and interconnectors able to redirect electricity flows on the basis of the system needs. Norway is planning to connect to Germany in 2020 by laying NordLink, whose cost is estimated at about 2,000 million Euros; and in 2021 it intends to strengthen its connection with the United Kingdom thanks to the NSN Link, of similar cost. Furthermore, Statkraft, the Norwegian public hydroelectric company is prepared to lay new cables and increase the generation allocated for export.

However, the Norwegian Government itself has lowered expectations. Its Energy Minister, Tord Lien, has shown his reluctance to use the "Europe's battery" concept and would rather refer to the role of his country using the milder sounding "capacity companion". Statfnet, the Norwegian grid operator, is also cautious and warns that before embarking on any further major projects, experience must be gained in finding out how the newly commissioned interconnections interfere with the national electricity system. For example, management of the interconnection with Denmark has required several adjustments, especially when the wind exceeds 25 metres per second and the Danish turbines have to be stopped, requiring Statfnet to change the flows from import to export in a context of large volumes and in a short lapse of time.

There are some domestic political questions, too. On the one hand, groups of ecologists and local actors are against the construction of new transmission infrastructures. Furthermore, consumers fear that exporting will increase domestic prices. An analysis of the Norwegian Authorities' and stakeholders' positions shows their willingness to change from a closed domestic electricity model to an open model interconnected to their European neighbours. However, the policy of the Government and the electricity stakeholders is characterised by incrementalism and not by an abrupt break: decision-making about the new interconnectors is still taking place case by case and is not being based on a major global strategy aimed at swiftly turning the country into Europe's battery, something that should include moreover the development of other sources of renewable generation in the country.

Therefore, although in the long term, Norway could play that geostrategic axial role, in the short term the technical and political limitations could limit the country to making a contribution to balancing its neighbours' grids with the existing hydroelectric capacity .[38]

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[38] This Frame is based on: Gurzu, A. (2016): "Oil-rich Norway could become Europe's 'green battery'", POLITICO Europe, 16th August, accessed 5th October:

Secondly, the creation of a grid community would mean a new grid governance, apart from a new governance of renewable energies at a continental level as is suggested by the European energy security strategy. That new grid governance would amount to changes in the market structure and would need transnational regulation. Although the European grid regulators and operators have created embryos for this new governance framework, it has been pointed out that the European Union energy model cannot be modified with minor adaptations to function in an integrated way with a large-scale penetration of renewable energies[39]. Regulatory convergence is essential to make it possible to establish a grid community on mitigating regulatory risk[40]. In third countries it is necessary to accompany this with capacity generation strategies so such convergence can yield real effects, for example in grid management matters[41].

A third interesting aspect is to what extent an exporter of renewable-source electricity could apply strategic conduct, replicating schemes based upon petro-politics (or even petro-populism). In a certain sense it is the outer dimension of the problem of poor governance and renewable rent-seeking[42]. As has been seen, the characteristics inherent to renewable energies make these approaches difficult. Being so difficult to store, unlike hydrocarbons, exports cannot be stopped without wasting the resource and increasing the time taken to recover the cost of the facilities. Neither is it so simple to redirect the flows in the short term, which is what happens with crude oil carriers or LNG carriers, (although oil pipelines and gas pipelines share both characteristics). It is true that breakthroughs in storage capacities and grid capacity could shade both benefits and be conducive to strategic behaviour, but the strongest argument in favour of grid communities is that the cost is very high for those who indulge in opportunist activities: the possibility of being expelled, or at least side-lined, from the community concerned.

Finally, (trans) continental scenarios mean a more contained de-globalisation where energy flows between countries and regions are concerned. That is to say, a situation involving a greater regionalisation of the flows than at present because of the geographical imperatives of renewables and electricity grids, yet much more interdependent than national scenarios. It is true that consideration of the combined characteristics of renewables and electrical grids amounts to a geographical regression; in this sense, it could be interpreted as a facelift

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http://www.politico.eu/article/norways-glaciers-could-fill-europes-energy-gap-green-battery-renewables/ ; and Gullberg, A. T. (2013): "The political feasibility of Norway as the 'green battery' of Europe", Energy Policy, 57: 615–623.

39 See recently, for example: Glachant, J-M. (2016): "Tacking stock of the EU Power Target Model"... and steering its future course", Energy Policy, 96: 673–679.

40 Escribano et al., 2013, *op. cit*.

41 Carafa, L., G. Frisari, and G. Vidican (2016): "Electricity transition in the Middle East and North Africa: a de-risking governance approach", Journal of Cleaner Production, 128 (1): 34–47.

42 Månsson, *op. cit*.

for what has been referred to as classic map geopolitics[43]: a transition from horizontal power towards new stakeholders (producers of renewables, stakeholders with grid and storage capacity, *prosumers*, renewable industry) and, as a consequence, a new geography of energy security. Such a transition can be analysed with classic geopolitical tools, as long as the energy power is projected in the geographical sphere and alters the strategic balances. There is generally a marked geographical component to security communities, which in a grid community based on renewables would be enhanced by its technical characteristics: neighbours are now more important, almost minute by minute, to match supply and demand and to keep the energy system secure.

Yet at the same time, a vertical movement could take place from an energy power based on the material resources (reserves, production, investment, market size), towards a soft energy power based on standards and vectors involving ideas, such as sustainable development, the fight against climate change and energy poverty or the good governance of energy resources, including renewable resources[44]. These post-material vectors constitute 'geopolitics of ideas' just as able to transform geopolitical balances: soft power can have hard-edge consequences[45].

Thus the geopolitics of renewables in transnational scenarios could also be more geostrategic and more *ideational*, highly focused on the management of interdependence in the heart of a grid community organized around infrastructures and regulations, encompassing material and regulatory resources to obtain an optimum combination of hard and soft power.

Renewable energies and the Renewal of European Energy Geopolitics

The concepts explained in the preceding pages are not always easy to apply to specific questions, and neither is it easy to derive their geopolitical implications to specific cases. This section outlines some applications for Europe and a series of implications for Spain, all of which are speculative. The intention is not to make an exhaustive analysis, but to point out potential lines of strategic reflection.

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[43] Escribano, G. (2016): "Energy: from the geopolitics of maps to the geopolitics of ideas", Tribune in The World Order in the 21st Century, 17th June: http://elordenmundial.com/2016/06/energia-la-geopolitica-los-mapas-la-geopolitica-las-ideas/.

[44] Here, the term 'soft power' is used in Nye's sense, as the power that is exerted by countries by way of example, proposing energy models that appeal to the rest of the world because of their contribution to the fight against climate change or environmental deterioration, sustainable development or energy justice. J.S. Nye (2004): Soft Power: The Means to Success in World Politics. New York: Public Affairs.

[45] Goldthau, A. and N. Sitter (2015): "Soft Power with a Hard Edge: EU Policy Tools and Energy Security", Review of International Political Economy 22 (5): 941-965.

Applications for Europe

Potential applications can be found for the preceding concepts without having to leave the European Union itself, and there are those who laugh at the thought of the Commission proposing interconnection with neighbours when it is not even capable of promoting cable-laying across the Pyrenees, unless it does so with difficulty, at great expense and taking a long time to execute. Everything that has been said reinforces the boost given by the Spanish Government to both electricity and gas interconnections, and achieving one single energy market. In scenarios where there is a high penetration of renewables with a major role for gas, the gas interconnections also become more important, and some of the strategic implications of the grid communities will be strengthened by the interaction between the two sources and their respective grids.

In the grid communities suggested by the continental scenario (as hybrid as one would wish for), electrical interconnections are the key to balances of influence, but are not sufficient. Apart from being interconnected, a country that wishes to exert grid influence must be able to serve as a utility for its partners (supply them, balance their systems and/or store their electricity), as well as to cooperate with them in a way based upon institutionalisation and on the reputation between peers. However, as the intra-European aspects are important, this section will be focusing on the implications for third countries. Evidently, the continental scenario contains transcontinental systems when distances and interconnection infrastructures allow for them. So, the European Union should not just limit itself to consider other European countries, but should consider non European countries as well, whether they are members of the Energy Community Treaty (the Balkans, Ukraine and Moldavia), or only observers (such as Norway or Turkey) or merely third countries (Russia and Belarus, for example). With this design, the European Union's continental scenario includes its European neighbours but eventually it will also include Asian and North African neighbours.

In fact, in recent years numerous electricity interconnections have been proposed between the northern and southern shores of the Mediterranean, although at present the only transcontinental interconnections in the Mediterranean are those between Greece and Bulgaria with Turkey, and those between Spain and Morocco. And within the latter, only the most recent interconnections have enough capacity to synchronise the Moroccan, Algerian and Tunisian electricity systems with the European system, whereas the interconnections with Turkey are asynchronous only. Some of the proposals fell into oblivion, such as the possibility of laying an electrical cable between Algeria and Spain, running parallel to the Medgaz gas pipeline. However, others are still very much alive, like an HVDC line between Italy and Tunisia, which would appear to be the most advanced in development, in spite of an unfavourable geopolitical context, and others which are at a much less advanced stage of development, for laying HVDC lines between Spain and Algeria, Algeria and Sardinia and a link between Libya and Sicily.

As far as the Mediterranean is concerned, the European Union has been relatively active on an institutional level, with initiatives such as the Euro-Mediterranean Electricity Ring (MEDRING) launched in 2000, which achieved the synchronisation of Morocco, Algeria and Tunisia, although it has not been able to progress any further for technical and regulatory reasons and, since 2011, for the political instability and violence unleashed in several key countries, such as Libya, Egypt and Syria[46]. A Mediterranean grid operators association (Med-TSO) was also launched, as was one for regulators (MEDREG), in an attempt to follow a bottom-up approach with the participation of all the stakeholders, which is more effective in achieving electricity integration. Mention must be made of the active high profile of the Italian regulator and grid operator in all these initiatives[47].

That same region, however, has seen the failure of two star projects intended for promoting renewable energies on the southern shore of the Mediterranean: Desertec and the Mediterranean Solar Plan[48]. The precedent was the Trans-Mediterranean Renewable Energy Cooperation (TREC) in 2003, intended for harnessing the renewable potential in the region by integrating it into the community energy market. As from 2007, the TREC initiative became the Desertec Project, this time mainly focusing on concentrated solar power technology (-CSP), managing to get the support of the European Union (thanks to German pressure) and numerous European (and Spanish) energy companies. However, the project was a resounding failure and the consortium broke up *de facto* in 2014.

The Mediterranean Solar Plan had been launched in 2008 as the star project of the new Union for the Mediterranean (UpM) (once again thanks to German pressure) with a view to exporting electricity of solar (photovoltaic and concentrated solar) and wind origin from the southern shores of the Mediterranean to the European Union. The Plan included cooperation with Desertec, whose fall took its alter-ego down with it. In 2013, and faced with open Spanish opposition, the Master Plan prepared by the Secretariat of the UpM failed to be passed by the Energy Ministers and the project was abandoned[49].

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[46] Tagliapietra, S. (2016): "Renewable Energy in the Southern and Eastern Mediterranean: Current Trends and Future Developments", in Rubino, Costa, Lenzi and Otzurk: Regulation and Investments in Energy Markets. Solutions for the Mediterranean. Oxford: Academic Press: 41-71.

[47] For a recent analysis of Euro-Mediterranean energy relations, refer to the monographic work coordinated by Rubino, A., M. Costa, V. Lenzi, and I. Otzurk, *op.cit*.

[48] The ups and downs of both can be seen in: Escribano, G. (under printing): "RES in the Hood and the shrinking Mediterranean Solar Plan", in Solorio and Jörgens (eds.): A Guide to EU Renewable Energy Policy. Cheltenham, Edward Elgar; and Carafa, L. and G. Escribano (under printing): "Renewable energy in the MENA: Why did the Desertec approach fail?" en Looney (ed.): The Routledge Handbook of Transitions to Energy and Climate Security. Oxon, Routledge.

[49] Vantaggiato, F.P. (2015): 'Defining Euro-Mediterranean Energy Relations', in Rubino *et al.* (eds), op. cit.: 24-40.

Both initiatives failed for several reasons, but the two most outstanding elements were their lack of realism, which made them lose credibility; and an erroneous narrative that limited their appeal on both sides of the Mediterranean. The lack of realism arose from the generation of unachievable expectations in a framework lacking in interconnections, with incompatible policies and energy regulations and, above all, at a time when Europe had a surplus generating capacity and a waning demand, whereas the southern shores of the Mediterranean needed new generation capacities to supply a sharply growing demand. Market reality dictated that it was Europe (if it had had more interconnections such as the one making it possible to export electricity from Spain to Morocco) that would export its electricity south, to at least Northern Africa.

Another aspect that was crucial in the failure of the two projects was the adoption of an erroneous (and unnecessary) narrative, presenting them merely as replacing hydrocarbon imports with renewable-source electricity, and gas pipelines with HVDC lines. Instead of presenting the project as a development vector for the Mediterranean neighbourhood of the European Union, contributing to their sustainable energy development, as a means for creating employment and transferring technology and capacities, the narrative utilised was more directed at rewarding European companies (industry, engineering companies and electricity firms) and transferring those energy resources to a Europe that did not really need them[50].

This aspect aroused the opposition of those who thought that the deployment of renewables on the southern shores of the Mediterranean should be supplying their growing energy needs, and even as an industrial policy for enhancing the development of their own renewables sector. Opposition also came from producers like Spain, which felt the project was detrimental because the country would not be able to export its surplus of renewables due to the insufficiency of the interconnections with France. Furthermore, Spanish producers did not want to have to absorb new renewables from Northern Africa, especially in the middle of an economic crisis and renewable fatigue after a painful remodelling of the domestic support systems.

This latter stance was suitably dressed up with arguments about energy security and the reduction of dependence. That is to say, once again a position that was more defensive than offensive, more averse to the short-term risks than proactive with the long-term strategic opportunities. Furthermore, it was not always consistent, adopting a favourable attitude towards interconnections when these were running north, but a restrictive attitude when they ran south; especially when the latter were contingent (and highly unlikely in the short term), whereas the Spanish electricity exports to Morocco are a reality with clear strategic implications.

[50] Escribano, G. and E. San Martín (2012): "Morocco, the European Energy Policy and the Mediterranean Solar Plan: A Driver for the Development of Whom?", in Morata and Solorio (eds.): European Energy Policy: An Environmental Approach. Cheltenham, Edward Elgar: 193–210.

By contrast, the projects in Northern Europe have managed to progress thanks to clearer and more realistic narratives. One outstanding example is the North Seas Countries' Offshore Grid initiative (NSCOGI), established in 2010 and composed of Germany, Belgium, Denmark, France, Ireland, Luxembourg, Netherlands, Sweden and the United Kingdom. Its explicitly declared mission is to develop an offshore grid to maximise the use of renewables and to comply with the European Union's objectives in this area. The initiative can count on the signatory governments represented by their Energy Ministers, supported by the grid operators organised into the ENTSO-E (European Network of Transmission System Operators for Electricity), the regulators organised around the Agency for the Cooperation of Energy Regulators (ACER), and the European Commission.

Implications for Spain

From a Spanish perspective, apart from the new perspectives that an approach like the above one offers to the already mentioned (and well-known) stress on the interconnections with France, it would seem to be important to assess the strategic implications for the Mediterranean. That is to say, divest oneself of the intellectual straightjacket of dependence and energy security, and incorporate the new risks into the reflection, plus the potential for a Spanish external action in the growing renewable energy models. Taking for granted the contribution in favour of less dependence, this subsection concentrates on the other vectors indicated in this work.

If the transition towards electrified energy models with renewable high-penetration involves a transfer of the power from the owner of the resource to the stakeholder with the greatest grid capacity, a Pan-Euro-Mediterranean grid community would add greater strategic weight to those countries able to make the most of their geographical advantages in order to control the grid, and as has already been pointed out, assuming the management, transport, balancing and storage capacities and/or a surplus generation capacity. Frame 4 illustrates this aspect with the uncertainty of the third interconnection proposed by Morocco to Spain.

Frame 4: Encounters of the Third (Morocco-Spain) Interconnection

For many years, Morocco has been demanding a third electricity interconnection with Spain, without managing to arouse the enthusiasm of the Spanish Government. The countries are currently connected by two electrical lines, one 600 MW line and the other 900MW, and Morocco has requested a third interconnection of 900 MW. In 2015, 14% of Morocco's electricity demand was met by Spain, more than Morocco's joint wind and hydraulic generation together (7% and 6%, respectively) and almost as much as the electricity generated with gas (17%). The studies conducted by Medgrid suggest that a third interconnection would bring major social benefits by facilitating the deployment of renewable energies in Morocco. Although in the medium term Spain would increase electricity exports to Morocco, the Government fears

that this could slightly increase prices on the Iberian market (while lowering them considerably in Morocco). Faced with Spanish indecision, Morocco has proposed that this interconnection be made with Portugal, to apply pressure on Spain, given that the economic and technical feasibility of that project is more debatable than a third interconnection with Spain.

It must be remembered that Morocco is one of the most advanced neighbours to the south of Europe where energy reforms are concerned, although it is still far from being comparable with the European context. In fact, it was one of the candidates for joining a Mediterranean version of the Energy Community Treaty (ECT) proposed in 2011 by the EU (and quickly forgotten) as a new incentive in response to the Arab uprisings in the document "Partnership for democracy and prosperity with the Southern Mediterranean". In view of the difficulty of a full convergence into the community energy wealth as demanded by the ECT, a decision was taken for a differentiated convergence in the form of three platforms for renewables, electricity and gas. Morocco's greater proximity in the energy area reflects in the existence of consolidated civil servant grids (policy networks), what generates an ecosystem that is more prone to cooperate and apply domestic pressure towards a modernisation of the regulations.

In the Elcano Report entitled "Spain Looking South" it was concluded that the complexities of the risks and opportunities of an extended Northern Africa make it necessary to adopt a comprehensive approach including all the instruments, public and private, pursuant to the Spanish external action. It also highlighted the absence of comprehensive mechanisms that allow for the development of long-term intervention strategies. For special application to an eventual third electrical interconnection, it recommended encouraging collaboration between the public and private sector, as well as using the EU funds available and also exerting a positive influence on projects that satisfy the Spanish interests.

In order to find out what Moroccan consumers thought about their electricity sector and the role that Spain could play, the Spanish Image Observatory at the Royal Elcano Institute asked two questions in Morocco: How do you think the Moroccan electricity system works? Do you think that the Moroccan electricity system could be improved if it received energy from another country, and if so, which country? Approximately half the interviewees considered that the Moroccan electricity system functioned averagely, badly or very badly, not a very great degree of satisfaction. When it came to the second question, 28% of the interviewees considered that Spain could help Morocco by exporting electricity, a much higher percentage than those who said Algeria, 6.7%, or the 4% who mentioned other countries (including Portugal). These findings suggest that the Moroccans positively rate electricity interconnection with Spain, offering a vector of structural cooperation aligned with European, Moroccan and Spanish preferences.

In spite of competition from Italy, Spain would be the clearest candidate for playing this role in the Western Mediterranean, because of its interconnections with Morocco and indirectly through the latter with Algeria (and Tunisia), because of the situation income of its geostrategic position, and owing to its grid management abilities. In this scenario, Spain could work on the strategic implications of positioning itself as the battery of the Western Mediterranean; or better still, following Norway's preference for a narrative based on soft power, projecting Spain as a new capacity companion not only for the European Union, but also for its Mediterranean neighbourhood. Otherwise, in an exclusively European grid community or one that is significantly interconnected with Northern Africa, but only via Italy, Spain would keep being a peripheral country unable to project its comparative and geostrategic advantages.

It is true to say that Italy's more central geographic position, able to project itself to both the Eastern and Western Mediterranean, has been tempered by the geopolitical disturbances affecting Italy's natural partners (Tunisia, Libya and Egypt) and those affecting the Eastern Mediterranean. All the Italian options are also inferior to Morocco (despite its insufficiencies) in terms of regulatory convergence, energy policy and policy networks with the European Union[51]. Nevertheless, Italy's disadvantages are made up for by the country's strategy of institutional positioning and its proposing capacity, be it in MedReg, Med-TSO, the proposal for Mediterranean platforms or its participation in European projects, which taken as a whole, constitute a formidable deployment in the Mediterranean energy space. A high Spanish profile, presence and activity, public and private, in all these initiatives would appear to be a necessary first step. Monitoring other initiatives such as the *North Seas Countries' Offshore Grid initiative* (NSCOGI) also seems interesting.

The second vector favourable to Spain is the acceptance that the heterogeneous nature of the renewable energies context on the southern shores of the Mediterranean requires the European Union to make differentiations country-by-country[52]. Furthermore, the failure of the European schemes suggests that the bilateral approach could be more effective, given that it could be designed in a more context-specific way. However, more realism is required, together with a greater and more elaborated political and financial support from the European Union[53]. Therefore, as well as being more inclined to participate in the regional or multilateral way in the Euro-Mediterranean renewable and electricity platforms, Spain is interested in producing bilateral proposals aligned with the European and Northern African

[51] Katsaris, A. (2016): "Europeanization through Policy Networks in the Southern Neighbourhood: Advancing Renewable Energy Rules in Morocco and Algeria", Journal of Common Market Studies, 54 (3): 656–673.

[52] Escribano, G. (2010): "Convergence towards Differentiation: The Case of Mediterranean Energy Corridors", Mediterranean Politics, 15 (2): 211-230.

[53] Tagliapietra, S. and G. Zachmann (2016): "Energy across the Mediterranean: a call for realism", Bruegel Policy Brief 2016/03, accessed 7 November. http://bruegel.org/wp-content/uploads/2016/04/pb-2016_03-1.pdf.

preferences. Once again, Morocco seems to be the most immediate partner, but it would be advisable to offer perspectives to other neighbours such as Algeria and Tunisia. It should be remembered at this point that the new Energy Union provisions involve a degree of *communitarisation* of the bilateral energy agreements, although it is not clear how it would be applied to electricity and much less so to the flows of renewable resources with third countries.

Anyway, on that bilateral plane, it might be advisable to consider geo-economic aspects as a third element, especially the extent to which a rivalry approach rather than a *complementarity* approach might be given precedence in the electricity exchanges between Spain and Morocco. One thing that experience has shown in relations between Spain and Morocco, is that protectionist approaches (reducing imports) or even mercantilist approaches (increasing exports as well) have a short run in the European Union. Compared to positions that could be described as "renewable mercantilism", the shared competitiveness approach could help to overcome rivalry and promote *complementarity*, thereby preventing a recurrence with renewable electricity, of the irritating problems that arose with tomatoes[54]. Especially considering that, in contrast to what is happening in Europe, the Moroccan (and North African) demand for electricity will carry on increasing rapidly in the future; therefore, in the medium term, it is to be expected that Spain will continue to export electricity to Morocco; and also that if in the long term and under European decarbonisation scenarios, Northern Africa has to supply renewable-source electricity to Europe, the participation of the Spanish companies could be predominant if work has been done for a suitable positioning.

The recent agreement signed in the COP-22 in Marrakech between Spain, Morocco, Portugal, France and Germany to facilitate the exchange of electricity from renewable sources between Morocco and the European Union through the progressive integration of their electricity markets, can be interpreted along these lines. So far, the agreement consists of a declaration to draw up a roadmap containing the different technical, economic, environmental and legal elements with a view to reaching an implementation agreement in COP 23[55]. From the preceding paragraphs it is easy to infer that it could also be advisable to consider the external action elements of the initiative.

To complete the regional dimension, it is worth remembering that Spain is a transcontinental energy system, but that there is no electricity interconnection with the Canary Isles systems or with Ceuta and Melilla. From a strategic

[54] See Escribano, G. (2010): "On tomatoes and cables: from competition to complementarity in Hispano-Moroccan Relations", Casa Árabe Economics & Busness Bulletin no. 17; and, more recently, Escribano, G. and C. Sánchez (2015): "For a renewal of the Hispano-Moroccan Discourse", Foreign Policy, 166: 74-85.

[55] Ministry of Energy, Tourism & Digital Agenda (2016): "Spain signs an agreement to enhance the exchange of renewable electrical energy between the European Internal Market and Morocco", Press Note, 17/11/16. http://www.minetad.gob.es/es-es/gabineteprensa/notasprensa/2016/documents/np%20acuerdo%20interconnections%20marrakech%2017%2011%2016.pdf.

perspective, the case of Ceuta and Melilla is particularly interesting, because these outposts are genuine energy islands in the literal sense of the term. They are both small and isolated subsystems where there is no transport network and they have to generate the electricity they consume, which has a crucial influence on the cost, stability and quality of the supply. Most of the electricity is generated in small diesel plants (Ceuta, 99 MW; Melilla, 85 MW) which also operate with high reserve margins due to the absence of alternative generation sources for peaks in demand, and the lack of interconnections with Morocco or with the Iberian Peninsula to help balance the two subsystems.

Funnily enough, although they have high insolation levels, in this case the roof based photovoltaic and solar thermal technologies do not seem to be conceived as means for reducing dependence on imported fuels or the vulnerability involved in single generation. The second paradox is that while Spain exports electricity to Morocco, Ceuta and Melilla are not connected to the Moroccan grid, which would undoubtedly be the most rational solution from an economic perspective for the autonomous cities in question. However, strategic considerations carry more weight than economic rationality in this case, because the current situation is estimated to be less vulnerable than depending on electricity from Morocco. In the case of Ceuta, the electrical infrastructure plan in force at the moment considers the solution to be the construction of an electricity link with the Spanish mainland whose cost is estimated at about 130 million Euro.

And several versions of a third paradox could be given: that a third interconnection with Morocco and another with Ceuta could be constructed (two unconnected interconnections), or only one of the two at the expense (or not) of the other. Furthermore, Melilla would invariably be awaiting interconnection. Such a situation would be reminiscent of the current economic regime in the two autonomous cities: part of the European Union but not part of the Customs Union; in a Euro-Mediterranean grid community but without interconnections (or only partial connections) to it. The academic literature does not clarify the role of the electricity interconnections as a tool for helping to overcome conflicts, even if the European Commission's functionalist approach has resorted to it (selectively, and perhaps as a result, with little success) in its neighbourhood, especially on the southern shores of the Mediterranean and in the Balkans.

It is another question that has aroused incipient interest and that is closely associated with this work, but in the same way as the relationship between security and climate change, it goes beyond the scope of these pages. All that needs to be mentioned here is that the political and economic aspects are not sufficiently taken into account when it comes to preparing trans-frontier interconnection projects, and this could explain the major difficulties that most of them face[56]; and why the effects of electricity interconnections on conflicts

[56] See: Puka, L. and K. Szulecki (2014): "The politics and economics of cross-border electricity infrastructure: a framework for analysis", Energy Research and Social Sciences, 4: 124–134.

are ambiguous and are determined by the nature of the bilateral relations concerned, and whether the cross-border flows involve frontiers where there is conflict, coexistence or integration[57].

Finally, there is one element that transcends the regionalised area of an energy system with renewable high-penetration: the soft power that it would provide beyond its grid community and would reconnect it to the countries with other (eventually) continental systems. That is to say, the geopolitical and geo-economic dividends yielded by projecting one's country as a sustainable power not only regionally, but also on a global level. If in addition to a traditional horizontal geopolitical transition, the energy transition also involves a vertical movement towards ideational and regulatory vectors, it seems important that this should be present on the idea drawing board[58]. Such soft power can be projected globally as a contribution to climate governance (mitigating climate change and sustainable development), as would be expected from a medium power like Spain. But also as a medium power with regional projection, this could become an instrument for Spanish action abroad in the Mediterranean and Latin America, both with regard to economic (promoting Spanish companies) and political aspects (climate diplomacy).

Final Remarks

This article examines theoretical frameworks and concepts that tackle the complexity of geopolitical renovation involving renewable energies, in order to enrich future strategic exercises concerning energy security, but also to offer elements for constructing a more complete and appealing narrative towards the European neighbourhood. Basically, the article concludes that renewables have both geopolitical and geo-economic implications much more complex than merely reducing energy dependence: new risks and vulnerabilities to be managed, and potential strategic advantages that are worth examining.

If in addition, the medium- and long-term projections are considered for a global energy mix where hydrocarbons continue to play a major role, the increasing penetration of renewables means adding an additional element: a geopolitics with renewables conserves most of the traditional elements of energy geopolitics, but adds its own strategic implications and those of its interaction with conventional sources; far from disappearing, energy geopolitics with renewables become even more complex, making it necessary to renovate

[57] For an example of the role of electrical interconnections at frontiers between conflict and coexistence (and return to conflict), see: Itay Fischhendler, I., L. Herman and J. Anderman (2016): "The geopolitics of cross-border electricity grids: The Israeli-Arab case", Energy Policy, 98: 533–543.

[58] Escribano, G. (2016): "Towards a Mediterranean Energy Community: No roadmap without a narrative", in Rubino, Costa, Lenzi and Otzurk: Regulation and Investments in Energy Markets. Solutions for the Mediterranean. Oxford: Academic Press: 117-130.

the strategic reflection. That reflection must also include new interdependence guidelines, as well as the undesired effects on regional and global security brought about by the collapse of certain key hydrocarbon-producing countries. It must likewise contain reference to the new strategic competition to access critical minerals and renewable technologies. In fact, energy security is just one part of this strategic reflection; and within it, the energy independence discourse turns out to be particularly reductionist, and may have counterproductive effects, as has been the case in Israel with solar energy.

To provide a more all-encompassing strategic overview, the article also suggests the inclusion of externally-projected geo-economic and geopolitical elements, either through soft power or hard power, software (models, standards, technology) or hardware (infrastructures for generation, storage and interconnection). A combination of the two is thus examined in the case of Norway and its projection as a "capacity companion". In the case of Spain, emphasis is placed on the importance of interconnections with the European Union and of overcoming France's reluctance; notwithstanding, a warning is issued about the risk of conduct that could be termed "renewable mercantilism" and of not making use of strategic externalities that could lead to the establishment of a Pan-Euro-Mediterranean grid community. The recent renewable agreement reached on the limits of the COP22 may offer an interesting possibility and these pages could provide an initial framework for analysing its strategic implications.

Finally, it should be stressed that there is a need to avoid the politicisation, or at least the securitisation of renewable energies, and to have an objective and weighted criterion capable of preparing a consistent narrative regarding renewables and external action without simplifications or reductionisms, more proactive and less defensive, more global and less dominated by the one-dimensional drive towards energy independence. At the same time, this narrative must be able to arrange for the management of new energy-security geographies driven by the penetration of renewables and their potential for ideational projection, presenting a panorama that is both more geostrategic and with greater weight for regulatory power. In summary, taking renewables into consideration, far from heralding the disappearance of energy geopolitics, means increasing its complexity.

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Chapter II

The US energy policy and its geostrategic implications

Isidoro Tapia Ramírez

Abstract

US energy policy has changed throughout history, swinging between the three sides of the so-called energy trilema. In a first period, the US pursued a competitive access to the sources of energy to sustain the strong growth of its demand. After the Suez Canal crises and the subsequent oil crisis in the 1970s, the US energy policy focused primarily on ensuring the security of supply. Since the mid-eighties, US energy policy is much more multi-sided, with growing concern about environmental issues, without detriment to the importance given to security of supply and competitiveness. The effects of the so-called unconventional revolution are analyzed: first, on the international oil markets, where Saudi Arabia's ability to play its traditional pivotal role has been eroded, and second on natural gas markets, discussing the potential integration of the largest three regional markets. Finally, the implications on the US energy policy of the election of Donald Trump and the incoming Administration are discussed, as well as its geopolitical effects in the medium and long term.

Keywords

Geopolitics, Energy Policy, Energy Security, Unconventional, Oil, Natural Gas, United States, Saudi Arabia, Donald Trump.

A historic review of US energy policy

It has become commonplace, to begin the analysis of a specific energy policy, in this case that of the USA over the past hundred years, by making reference to the all-too-well-known energy policy trilemma: competitiveness, security and sustainability. The energy policy, it is said, must contribute to enabling the energy supply to be cheap (competitiveness), to minimising the risk of supply interruption (security) and to guaranteeing environmental sustainability. In my opinion, the energy trilemma is a conceptual framework that is deceptive to a certain extent: none of the three variables is really independent from the others, they are closely linked. The relationship between scarcity and prices (between supply security and competitiveness) is not only close, but also unambiguous: they basically depend on the same set of factors. Furthermore, the exogeneity of the environmental aspects wanes at the same rate as the negative externalities of the energy models are corrected by the action of the regulators and internalised by the agents. However, that is a matter which is far from being achieved as yet.

In spite of the shortcomings of the energy trilemma, it is a powerful visual framework that, at least for explanatory purposes, is extremely useful. This is because the emphasis placed by those responsible for the energy policy has certainly changed throughout history, swinging between the three sides of the trilemma. At times interest in having a competitive source of energy resources (competitiveness) is the priority, whereas at other there is greater concern for a stable supply (security), or environmental effects (sustainability).

It might be advisable to take a step back and ask ourselves what we understand by energy policy, or to put it more modestly, what we will be meant by energy policy throughout this chapter. It is a good idea to make a clear distinction between two levels in the analysis: the energy policy that the authorities define and pursue at every moment, and what we could refer to as the energy model, the result of the interaction between this policy and the decisions of all the agents that participate in the energy system, including not only governments and regulators, but also companies, consumers, third countries, etc. Running the risk of certain stigmatisation, one could use a terminology that has fallen into disuse, namely the energy superstructure and the energy infrastructure.

It is undoubtedly much easier to historically trace the former dimension, the energy superstructure. Traces of the energy policy can be found in many sources, like speeches, government programmes or regulatory acts. This first dimension of the energy policy in the USA has passed through three distinct historical moments: an initial period (which we are going to situate between 1918 and 1956, these dates being arbitrary to a certain point but whose choice will be explained later) where competitiveness is the primary objective of the energy policy; a second period that commences in 1956 as a result of the Suez Crisis and the consequent definition of the so-called Eisenhower Doctrine, that placed energy supply security firmly in the foreground, a concern that was to reach its peak in 1973 as a consequence of the embargo that the Arab countries

applied to the USA because of its support for Israel during the Yom Kippur War. Supply security virtually monopolised the energy debate in the USA throughout the 1970s, and to a greater or lesser degree it was to remain at the centre of the debate in the following years. And, finally, a third period, which started midway through the 1980s, when the debate was a lot more multi-sided. On the one hand, as we have pointed out, an interest in energy security never waned, whether due to military conflicts in strategic zones (Gulf War in 1990-91, Afghanistan in 2001 or Iraq in 2003), the emergence of global terrorism with ramifications on the energy markets (one of Bin Laden's recurrent accusations levelled at the USA was having "stolen our oil at ridiculous prices, the greatest robbery that mankind has ever witnessed"[1]), the sharp increase in energy demand in the emerging countries, which reintroduces into the North American strategic lexicon the concept of "competition for resources"[2], which, in turn, generates a sharp increase in international energy prices, reaching their maximum levels in the first quarter of 2009; these high price levels were to reintroduce the debate about the "competitiveness" of the North American energy model. Finally, the sustainability of the energy model becomes a major factor in debates in the USA during this third period, with different emphasis depending on the political party in power (greater in the second mandate of Clinton-Gore between 1996 and 2000, and in the Obama Administration as from 2008), but always with a trend towards increasing with the passage of time. As it is of special interest, we will devote a specific section to US environmental policy.

First Period: from Wilson to Eisenhower. The concern for growth: the US energy policy until 1956

The industrial revolutions of the 19th Century meant a huge step in the long-term growth rate of the economies affected and, at the same time, in the scale of the energy transformation processes. In 1850, US energy consumption hardly reached 2.1 billion Btu[3], nearly all timber. In 2010, timber consumption was similar. However, total energy consumption in the USA stood at 91.1 billion BTUBtu, a major share being accounted for by oil, coal, natural gas, nuclear energy and hydroelectric power.

The tensions caused by a growing dependence of economic progress on energy supply did not go unnoticed. In 1865, a book was published written by an english economist William Stanley Jevons. His core thesis was that the international supremacy of the United Kingdom was threatened because it was based upon a finite and non-renewable resource, namely coal. As we shall see, "competition

1 BIN LADEN, Osama. "Letter to America". Observer Worldview. 24th November 2002.

2 This expression appears as from 2006, in the annual report issued by the Defense Department as a potential case of conflict with China, at the same level, for example, as Taiwan.

3 British thermal unit. Source: US Energy Information Administration (EIA).

for scarce resources" was to become a constant feature of the energy debate throughout history.

To a certain extent Jevons was right in anticipating the decline of the United Kingdom, which was not due to the Malthusian result of running out of coal reserves, but because of the discovery of a new fuel, oil, originally used to provide domestic lighting by kerosene, one of its by-products, and which was later used for innumerable industrial and everyday purposes (transport, electricity generation, plastics, asphalt, lubricants, detergents, etc.). Some of the properties of oil were known centuries before. There are records of bitumen being used in the Middle East as early as the first century B.C. to build the walls of Jericho and Babylon[4]. However, as was so often the case with many other classic discoveries, there was no continuity in world scientific research, and the use of oil gradually declined throughout the Middle Ages. When people started to use utilise oil products midway through the 19th Century for lighting, this was largely regarded as a new discovery, a new product. The USA was to become the main beneficiary of this complete commercial success. First and foremost because its initial development took place on American land, first in the oilfields of Pennsylvania, and later, after the American Civil War, in the States of Ohio, New York and West Virginia. When its success had spread to Europe, the USA was to receive major profits. Between 1870 and 1880, kerosene became the fourth most important product among US exports, and was the leading manufactured product[5]. Yet at the same time, the USA was enjoying further advantages: industrial growth by applying oil by-products to an increasing number of production processes, as well as a strategic position in the maritime trade of petroleum and petroleum products. In fact, the transition from coal to oil, was famously portrayed by the well-known decision adopted by Winston Churchill, after he was appointed First Lord of the Admiralty in 1911, to promote the change from coal to oil for the British fleet, after anticipating that an increase in speed plus a decrease in refuelling times with the new commodity, would lead to a strategic advantage where "ruling the waves" was concerned[6].

Throughout these decades, the price of oil fluctuated greatly. In 1864 crude oil reached what some estimates continue to regard as the highest price ever recorded, this being no more than a historic anecdote owing to the limited nature of the market at that time. Later on, we will go back to this period of the oil industry, because of the similarities between the development of unconventional oil and gas during the first decade of this century.

The truth is that once the major oilfields in Texas and Louisiana were discovered at the beginning of the 20th Century, guaranteeing a sufficient supply of crude oil, concern over supply security gradually faded away. During that same period, between 1870 and 1914, the international community experienced what has

4 YERGIN, Daniel "The Prize: The Epic Quest for Oil, Money & Power", 1990.
5 Idem.
6 Idem.

come to be known as the "first economic globalisation". The debate about the exhaustion of resources was buried under the weight and strength of economic growth. The emphasis was placed on conditions for the free trading of goods, such as freedom of transit through the high seas. The outbreak of the First World War in 1914 did not change this context in any fundamental way. In fact, many interpret this war as a natural consequence of the voluptuousness of the growth. That is why, when in January 1918, the US President, Woodrow Wilson, in a speech to the US Congress, explained what would rapidly become known as the "Fourteen Points", a set of political principles about how peace ought to be in Europe, economic freedom was still stressed as being the guarantor of sustained growth.

Wilson's fourteen points are generally associated with an idealistic view of international diplomatic relations, including his defence of the free will of nations (Point 5), the disarmament of nations (Point 4) or the defence of open diplomacy and not a secret one (Point 1) and the proposal to set up the League of Nations (Point 14).

The Fourteen Points also contain several clauses aimed at protecting US energy supply: however, none of them refer to competition over scarce resources, and neither do they show the genuine concern regarding accessing the supply. Yet what they do mention is freedom of navigation on the seas (Point 2), no economic barriers between nations (Point 3), or the proposal that "passage through the Dardanelles should be permanently open to free transit and trade for all nations under international guarantees". In summary, the main view was that energy security was better protected by collaboration than by competing over the resources.

Nevertheless, Wilson's perspective was not the one that regulated the Post-War period. At the start of the Paris Peace Negotiations, President Wilson fell ill, which was surely one of the reasons that accounted for the triumph of the harder lines defended by the French President Georges Clemenceau, contained in the famous Article 231 of the Treaty of Versailles. Apart from the extensive and expensive economic repairs and the loss of all its colonial possessions, the Treaty of Versailles also imposed severe restrictions on German production of coal and steel. All in all, as Keynes wrote, the German Empire had been built on "coal and steel (industrially) more than on blood and steel (militarily)"[7]. However, it was quite striking that, although oil consumption was now growing very quickly, the Treaty of Versailles ignored the energy transition under way, and kept absolutely silent about the supply limitations imposed on Germany where other products apart from coal and steel were concerned, especially crude petroleum or its by-products, which were to become the cornerstone of industrial development for the coming years. Once again, any approach to petroleum in this period was only outlined and very sketchy.

[7] KEYNES, John Maynard, "The Economic Consequences of the Peace", 1919.

The Great War did not change the profile of the energy policy, which was still at a phase of intense growth. However, it was to have two consequences. Firstly, Governments played a more important role to the detriment of private initiative, or to put it a better way, in symbiosis with it, which had led the development of the sector at the turn of the century. And secondly, a protectionist movement arose, which would threaten the economic globalisation process that was setting in before the war. The effects of this new, historic Post-Versailles context on American soil were immediate. The USA began to go through a period of introspection and progressively distanced itself from the international community. In 1920 the Mineral Leasing Act was passed. It banned the granting of mining rights to foreign companies, unless these were reciprocal. President Wilson was replaced by the Republican Warren Harding in 1921, and the latter almost immediately rejected US participation in the already watered-down League of Nations. Harding died in 1923 and Vice-President Coolidge took over; the latter's view of the USA's role in the world was even more isolationist.

During this period the "Merchant Marine Act" (commonly known as the Jones Act) was also passed, requiring all cargos transported between ports in the USA to be carried by vessels constructed and registered in the USA; it also required the ship owners to be US citizens. In the energy sector, the Jones Act imposed severe restrictions on trading with crude oil and its by-products, which are still in force today. At present, for example, it makes it difficult for the crude oil coming from the Great Lakes and the ports in the Gulf of Mexico to be transported to the refineries on the East Coast, which has made it necessary to lift certain restrictions for spells to guarantee the energy supply (for example, during Hurricane Katrina).

The Great Depression, which started with the Wall Street Crash in 1929, merely served to heighten these isolationist trends. The International community entered a spiral of protectionist measures, which in the case of the USA was combined with a wave of bankruptcies affecting the banks and credit restrictions. As is well known, the country emerged from the Great Depression thanks to two aggregated demand enhancement programmes. The first one, known as the New Deal, and the second one known as the Second World War.

In the energy sector, the New Deal became a programme of major public infrastructures that, on the one hand, was to open the floodgates to the ongoing growth in oil consumption, thanks to the construction of more than 40,000 miles of new roads, over 45,000 bridges and about a thousand airports, including facilities, installations and repairs[8]. The New Deal was also to lay the foundations for incorporating three sources into the US energy matrix: hydroelectric generation (by constructing hydraulic dams), natural gas (by building the first interstate transport infrastructures in the form of gas pipelines) and, later on, nuclear power generation, which as is well known, was originally boosted during the second war

[8] Data from the Civilian Conservation Corps (CCC) and the Civil Works Administration (CWA).

period via the Manhattan Project, in which, under military directorship, many of the most prodigious minds of the period shut themselves away in the Alamos Desert until they developed a prototype atomic bomb, which would later be used to bomb Hiroshima and Nagasaki in 1945. Sometime later, that same technology would be reconverted into civil use as from the famous "Atoms for Peace" speech given by President Eisenhower in the United Nations in 1953. The hydraulic contribution rapidly stabilised and covered around 2.5% of primary energy consumption, once the major water potential had been harnessed. The contribution made by nuclear energy rose, especially as from the second half of the 1970s, when most of the major plants in the USA came into operation. At the time, their contribution was slightly below 10%, a threshold that would not be exceeded, as from the new nuclear developments as from the Three Mile Island accident in 1979. Natural gas underwent a highly significant growth, eventually contributing towards 25%. Meanwhile, the importance of oil was still on the increase in the US as a commodity, on occasions exceeding the 40% threshold. In view of its quantitative importance, and the changes undergone in recent years, we will devote two chapters to the analysis of the oil and natural gas markets.

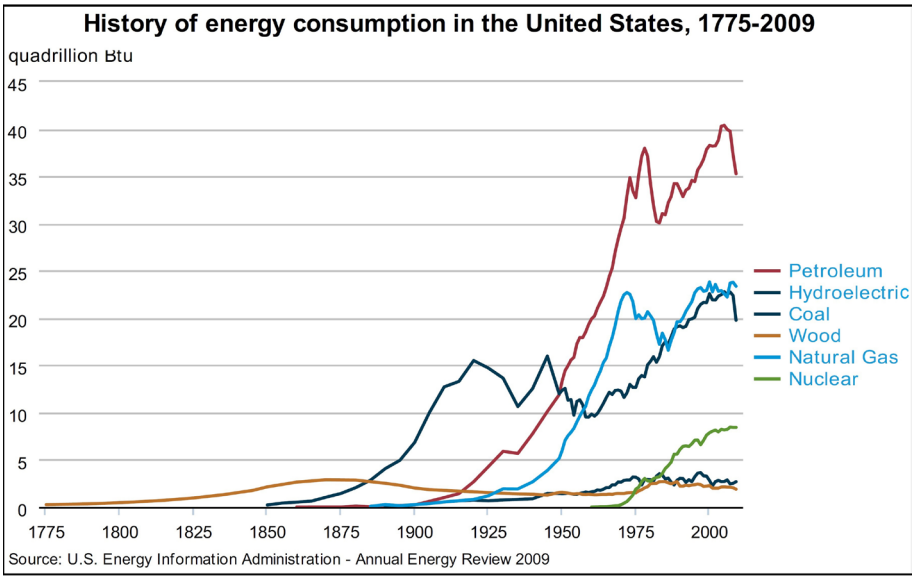

Image 1.History of energy consumption in the United States, 1775-2009.

Going back to our historic account, we have referred to concern over the competitiveness of the energy model characterised this first period until 1956. Two major landmarks justify this thesis: first of all, the splitting up of John Rockefeller's oil monopoly, Standard Oil, decreed in 1911 by the US Supreme Court in application of the antimonopoly legislation (often known as the Sherman Act). The history of Standard Oil is probably one of the most fascinating industrial stories in the USA.

Founded in 1870 by Rockefeller, this company not only developed the production, refining and transporting of oil products in the USA –where it managed to obtain a market share of 80%-, but it was also the pioneer of the vertical integration of these activities, until it eventually became the first industrial conglomerate in history. In many respects, the role of Standard Oil was positive for the development of the oil by-products market: it was not only responsible for its growth, but also for stabilising oil prices at the end of the 19th Century, which as we have already pointed out, experienced major fluctuations that brought about several rise and fall cycles. Nevertheless, Standard Oil's success went too far. Some of its trading practices, which were very aggressive, caused great controversies in public opinion after a series of reports were published in McClure's Magazine by the woman who many considered to be the first "great North American female journalist", Ida Tarbell[9]. For example, the so-called "rebates" were highly controversial; these were a way in which Standard Oil received a discount from the railroad companies when they transported oil by-products from other companies. The effects of this kind of information on public opinion, the protests from the independent producers and from the railroad companies themselves, formed an amalgam that gave rise to the so-called "progressive movement", leading to a reaction from the authorities in defence of the consumers and respect for the elementary rules of competition. Standard Oil was to be split into as many as thirty-three companies, many of which would end up by merging with each other or with other international companies, to form what would later come to be known as the "seven sisters": Anglo-Persian Oil Company (currently BP), Gulf Oil, Standard Oil of California (currently Chevron), Texaco (later merged with Chevron); Royal Dutch Shell, Standard Oil of New Jersey (Esso/Exxon) and Standard Oil Company of New York (Socony) (known as Mobil, now part of ExxonMobil). The splitting up of Standard Oil was a landmark in the economic history of the USA and it can be categorically stated that it marked the advent of a new industrial policy, more focused on maintaining effective competitive conditions on the markets.

The second milestone that we must stress in this first period of the US energy policy was the passing of the Smoot-Hawley Act in 1930, as a result of the protectionist pressures of the era, which increased the tariffs on more than 20,000 articles, putting them, on average, at their highest levels for nearly one hundred years[10]. In a more striking way, and in spite of the attempts by the so-called "interventionists" to protect the oil industry from petroleum coming from Venezuela, the oil duties were not increased, making oil one of the few articles that were saved from the protectionist pyre[11].

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9 Idem 3.

10 KRUGMAN, Paul. WWS 543: Class notes, 2/17/10, February 16, 2010, Presentation, slide 4.

11 To be exact, in 1932 a duty was finally applied on oil, fuel oil and petrol. Despite the proximity in time, the reason was different, and was a response to the attempt to rationalise the industry because of the sharp fall in prices during the early years of the Great Depression, seeking to keep up the production capacity in the long term. Furthermore, in proportion to the prices, the duty levels on petroleum products were well below those passed by virtue of the Smoot-Hawley Act in 1930.

As we have seen, not only in the economic globalisation context at the beginning of the century, but also in the aggressive context of Versailles or in the more protectionist context of the interwar period, the oil industry is characterised by sharp growth. The result of this expansive energy policy, the development of the industry itself and the finding of new oilfields, can be observed in the following graph[12]: both oil prices and natural gas prices in the USA were extremely low during this period, especially when compared to later periods.

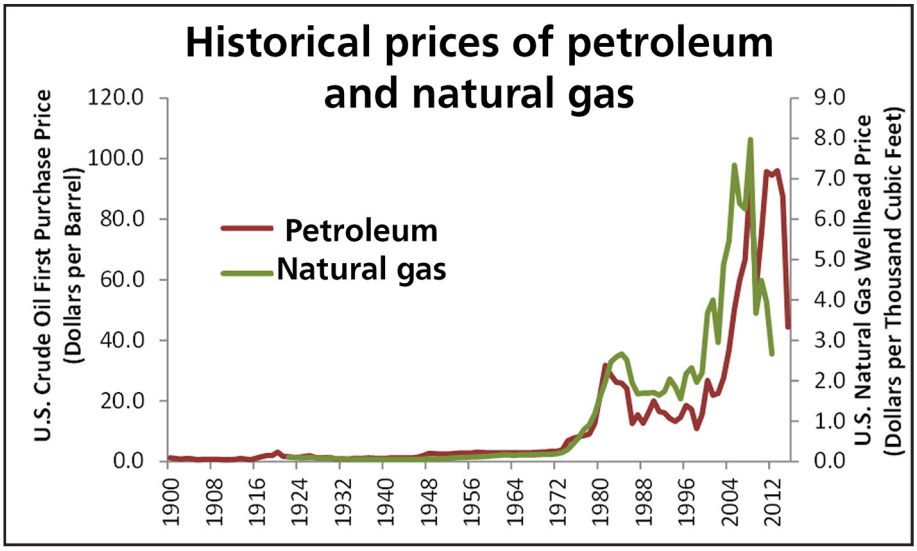

Image 2. Historical prices, oil and natural gas.

In fact, it would be of interest to zoom in on the period that concerns us, up to 1956, shown in the next graph[13]. The way the price of natural gas evolves is of less interest, in view of the limited size of the market at that time. However, the oil price peak coincided with a rise in demand for military use during the First World War, starting with international demand and followed by domestic demand when the USA joined the conflict in 1917. The peak was also a response to an increase in transport and distribution costs owing to interruptions to maritime traffic when the German Army decided to use its fleet of submarines to attack merchant shipping heading for the allied powers, mainly Great Britain and France, incidents that caused the USA to enter the conflict, given that free navigation on the seas was under threat, and this was one of the pillar of the economic model at that time.

12 Source: US Energy Information Administration and own preparation.
13 Source: US Energy Information Administration and own preparation.

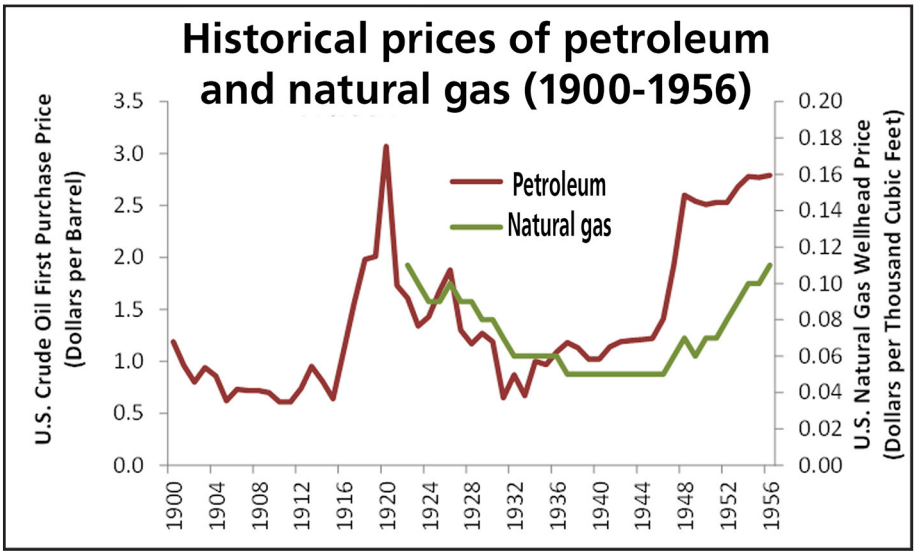

Image 3. Historical prices, oil and natural gas (1900-1956).

The price of oil fell sharply once the war ended, and this trend remained constant until the second half of the 1930s. In this case, not even the outbreak of the Second World War caused an upsurge in prices, given that the fall in demand during the years of the economic crisis in the 30s had left the oil market with a large surplus capacity.

The first significant rise in oil prices occurred in 1948, coinciding with the State of Israel's Declaration of Independence in May of that year, which was followed (the next day) by a joint invasion of Egypt, Jordan and Syria, together with Iraqi forces. After 10 months of fighting, Israel had not only held onto the area indicated by the United Nations in the 1948 Partition Plan, but had also gained control over a significant part of the territory initially reserved for the State of Palestine, such as Galilea, West Jerusalem and much of the West Bank.

Second period: access to the resources: from Eisenhower to Reagan. The US energy policy between 1956 and 1980

The Arab-Israeli conflict would effectively be a turning point for the energy markets. Therefore, we could have chosen 1948 to close this first period, but the truth is that the price of oil remained fairly stable until the beginning of the seventies, once the initial increase had been absorbed. Why then did we choose 1956? Because that was the year of the Suez Crisis, the year that the canal was nationalised by Nasser's Government in Egypt, which was met with a combined attack from Israel, France and Great Britain, with the opposition of the USA. The Egyptian forces suffered a military defeat, but managed to block

the Canal, completely closing it to shipping from October 1956 to March 1957, thereby cutting off a basic route for oil transport by sea.

The Suez Crisis ended with the withdrawal of British troops and the confirmation of Egyptian sovereignty over the Canal. For many historians, the crisis marked the final episode in Great Britain's hegemonic role, which had been in decline since the beginning of the century. The Suez Crisis also sped up the decolonisation processes. Many of the former colonies of Great Britain itself and France gained independence in the ensuing years. As far as we are concerned, there were two direct consequences of the Suez Crisis that were to change the geopolitics of energy forever: on the one hand, Eisenhower Doctrine. On the other hand, the creation and development of the national oil companies (NOC, English).

In January 1957, President Eisenhower announced a new position in USA international relations ratified by Congress two months later. According to the new doctrine, any country could request economic assistance and/or military aid from the USA, if that country felt threatened in a military way by another State. This doctrine marked one of the decisive moments of the Cold War, with explicit references to the threats coming from countries "controlled by International Communism". The decision made by the Eisenhower Administration was prompted by incipient Arab hostility and the Soviet Union's growing influence in the region. All in all, it was a change of direction in US foreign policy from the more passive positions of the years after Yalta, where Soviet hegemony over its sphere of influence was accepted with resignation, to a more belligerent position, where this hegemony is contested in those zones that are not clearly aligned to either of the world powers. The Eisenhower Doctrine would not be applied only to the Middle East, but would also have major consequences in South-East Asia (Korea and Vietnam), Latin America or even off the US Coast itself, on Cuba. However, the origins have their epicentre in the Middle East and in the aforementioned energy transition: the USA passed from being concerned with competitiveness in the previous period, to being preoccupied with guaranteeing access to resources.

The second consequence was the establishment of national oil companies. India (ONGG) and Brazil (Petrobras) set up their own oil companies in those years, with the declared aim of attaining energy self-sufficiency. In the Middle East, there had already been fruitless endeavours to nationalise the resources, such as the attempt made by the Iranian Prime Minister Mohammed Mossadeq in 1951, which gave rise to an international boycott followed by a coup d'état backed by the USA and Great Britain, which overthrew him in 1953. The second wave of nationalisations commenced at the beginning of the sixties, and was much more successful given that it was more gradual, less aggressive and because it occurred in a more favourable international context, within the framework of the post-colonialism that followed the Suez Crisis. Kuwait established its own oil company (KNPC) in 1960, Saudi Arabia followed suit in 1962 and subsequently nationalised Aramco in several phases, paying out compensation that were

generally considered suitable. Iraq also established its own company in 1967 (INOC).

The emergence of the NOCs happened at the same time as the founding of the Organization of the Petroleum Exporting Countries (OPEC) comprising Iran, Iraq, Kuwait, Saudi Arabia and Venezuela[14]. At that time, these five countries accounted for around 40% of the world oil production but 60% of the reserves[15]. The emergence of the OPEC would change the dynamics of the international oil market forever. The following consequences can be mentioned by way of a short summary:

1) The cartelization of production, and the consequent limiting of supply, via the OPEC quota system and the consequent supply restriction, via the OPEC quota system;
2) The status of Saudi Arabia as a pivotal producer;
3) The effects on the international financial system, especially as from the end of the Bretton Woods system, after the Nixon Administration Nixon suspended the possibility of converting dollars into gold in 1971.

The effects of cartelisation were to become clear in 1973, with what came to be known as the first oil crisis. In October 1973, Syria and Egypt launched a surprise attack on Israel during the Jewish Yom Kippur celebrations. President Nixon authorised the shipment of arms and other materials to Israel. The OPEC immediately increased the price of oil by 70% (up to $5.11 a barrel), and agreed to a reduction in aggregate production of 5% every month, until it reached its objectives. The spot price of oil quadrupled, rising from $3 to $12 per barrel.

There were many reasons for the Arab embargo: it is inevitably associated with fall in the price of the dollar since its convertibility into gold was suspended two years before, because this reduces the profits of the exporting countries. Furthermore, the oil market was undergoing its particular transition of power, which as has been argued, has historically been one of the causes of armed conflicts[16]. The oil market in the seventies witnessed the battle for control between the "seven sisters" and the booming national oil companies (NOCs). At the same time, oil production in the USA had reached its maximum level in 1970 (with 9.6 million barrels per day[17], which it would not reach again until 2015), bringing to light the country's weakness when it came to responding to a reduction in oil production. The 1973 crisis must also be seen in the context of the Cold War, where, as we have already pointed out, the Arab countries played

[14] Nine further members joined the five founding members at later dates: Qatar (1961) Indonesia (1962) – whose membership was suspended between 2009 and 2015; Libya (1962); United Arab Emirates (1967); Algeria (1969); Nigeria (1971); Ecuador (1973) – suspended between 1992 and 2007; Angola (2007); and Gabon (1975) –whose membership ended in 1995 but the country re-joined in 2016.

[15] Source: BP Statistical Review 2016.

[16] ORGANSKI, A.F.K. "World Politics" 1958.

[17] Source: US Energy Information Administration.

a major geostrategic role, swinging between the influence of the USA (at that time, Saudi Arabia, Turkey, Iran and Israel) and the Soviet Union (Egypt, Syria and Iraq).

The first oil crisis had a significant direct cost where the OECD countries were concerned, which has been estimated at 2.6%[18], but the indirect effects were greater. It gave rise to the setting up of the International Energy Agency (IEA) in 1974 to coordinate the strategies of the oil consuming countries. The IEA rapidly established certain rules for coping with emergency situations, such as keeping a strategic reserve stock. In 1976, the IEA proposed a long-term plan to reduce the rate of energy consumption, which included improving energy efficiency and developing alternative sources. The reaction in the USA was also immediate: in November 1973, President Nixon announced "Project Independence," a plan to achieve energy self-sufficiency by 1980[19], which included measures such as putting the clocks back or forward on a seasonal basis, reducing the temperature in public buildings from 23-24°C to between 18 and 20°C, and reducing the speed limit for administration vehicles to 80 km/h. In 1975, Congress passed the Energy Policy and Conservation Act, which apart from creating the strategic oil reserve following the IEA recommendations, imposed efficiency standards on vehicles for the first time.

The energy independence target was welcomed by President Carter, who made it a core issue in his mandate, in a famous speech[20] in which he defined the energy crisis as the "moral equivalent of war". Carter set up the Energy Department, and allocated thousands of millions of dollars to the development of alternative technologies. It is also a known fact that he installed 32 solar panels on the roof of the White House, which Reagan ordered to be removed as one of his first decisions when he became President.

All in all, energy independence would come to form part of the US political lexicon, and would be welcomed, sometimes worshipped, by the successive administrations. As has been written, energy independence in the USA can be compared from that moment on, with the quotation from Mark Twain about the weather: everybody complains about the weather, but nobody does anything about it[21].

The second consequence of the 1973 oil crisis was to create a pivotal role for Saudi Arabia, accentuated after the Iranian Revolution in 1979, led by Ayatollah Khomeini. The effects of the Iranian Revolution were twofold: it extracted Iran from the US sphere of influence, and also reduced its production by between 3 and 4 million barrels per year (around 7% of the world production at that time),

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18 TORDO, Silvana et al.: "National Oil Companies and Value Creation". World Bank Working Paper n. 218.

19 http://www.presidency.ucsb.edu/ws/?pid=4034.

20 http://www.presidency.ucsb.edu/ws/?pid=7373.

21 WIRTH, Wirth, et al. The Future of Energy Policy, 82 FOREIGN AFFAIRS, July–Aug. 2003, 139.

a capacity that the country never recovered in full because of the successive setbacks suffered by the Iranian oil industry.

These events served to strengthen the role of Saudi Arabia and caused the formulation of what came to be known as the Carter Doctrine. In his speech on the State of the Nation in January 1980, President Carter proclaimed that the United States would use military force, to the extent that this was necessary, to defend its national interests in the Persian Gulf[22]. It was clearly the response to the Iran hostage crisis and the Soviet military presence in Afghanistan, but it was also the most serious geopolitical moment in the fight for energy resources in this second period of the history of US energy policy. Any doubts had been dispelled: oil played a fundamental role in the US economy. It was a scarce resource and the USA was prepared to use its military might, to the extent necessary, to guarantee its supply.

The geopolitics of oil and the consequences of developing non-conventional oil

We have halted our historic review of the US energy policy at the beginning of the 1980s. The reason for this, as we have stated, is that from then onwards the energy policy has become much more polyhedric, and the three sides of the energy trilemma become intertwined. That is why it would appear to be advisable to combine the chronological and sectorial discourses. We are going to begin this section by analysing the geopolitics of oil.

In the previous section we pointed out the consequences of the oil crisis in the 1970s; the cartelisation of the oil market and the pivotal role played by Saudi Arabia. We are now going to analyse these consequences separately.

The cartelisation of the oil market

The dynamics of a cartel have been accurately described by the game theory, through what is called repeated cooperative games. In the short term, each one of the participants has incentives for cheating the rest by producing more than the agreed amount (a variant of the prisoner dilemma). However, this incentive is tempered in case of a long-term relationship if the rest of the participants can credibly threaten with reprisals, the members of the cartel who fail to keep their commitments. The dynamics of the relations are also affected by the market balance (situations where there is excessive demand do favour the perpetuation of the cartel, and vice-versa), by the long-term trend affecting the market size (if any of the participants thinks that there are only a few rounds of the game left, they have a greater incentive to deviate), or by transparency where complying with the agreements is concerned. In spite of the effects of the

[22] http://www.presidency.ucsb.edu/ws/?pid=33079.

first oil crisis in 1973 (with far-reaching consequences, already indicated, on US energy policy) the truth is that the power of the OPEC cartel in the 1970s was still limited, and largely counteracted by the major oil companies. This situation was aggravated by the discovery of oil in Alaska and the North Sea midway through the 80s. The economic crisis at the beginning of those years and the consequent contraction in world demand, increased the oil market imbalance. As we have already stated, the firmness of agreements within cartels tends to be upset during a glut. And, in fact, that is exactly what happened. The OPEC countries systematically produced above the quotas officially allocated (which is a constant feature of the oil cartel) but even more than usual. Some countries, like Libya, started to sell oil with massive discounts to get around the sanctions imposed by President Reagan. And finally, Saudi Arabia started a "price war" with the declared aim of keeping its market share as a reaction to the discovery of new oilfields with much higher extraction costs[23], in a move that bore great resemblance to recent experiences. After the Iraqi invasion of Kuwait in 1990, the OPEC agreed to increase the production quotas, officially to make up for the loss of 5 million barrels per day from Iraq and Kuwait combined, and to keep the international markets stable, unofficially though it recognised the increase in production capacity of its main producers like Saudi Arabia, Venezuela and Nigeria, proof of which is the fact that the new quotas were kept up even after Kuwaiti production had been resumed after the war, and Iraqi production had been resumed as a result of the United Nations Oil-For-Food Programme in 1996. In this context, oil prices collapsed and ended up ranging from 10 to 20 dollars per barrel (falling, at times, to single-figure levels) until 1998.

In 1998, the price war between two of the major OPEC producers, Saudi Arabia and Venezuela, reached its height: Venezuela had steadily increased its production since the mid-eighties, from 1.7 million barrels per day (mbd) in 1985 to 3.5 mbd in 1998[24], thanks to a policy of opening up to foreign investment. In fact, in 1998, the Venezuelan production figures were only slightly lower than the Iranian output (3.8 mbd), making it just a step away from being the second largest producer in the OPEC, behind Saudi Arabia. It would never again get that close. Saudi Arabia, attempting to conserve its pivotal role, also increased its production from 5 mbd in the mid-nineties, to 9.5 mbd in 1998. Once again, the reasons for this were twofold, to keep up its oil profits in a low-price environment, and to force Venezuela to give up this price war, in view of the latter's higher extraction costs and, thus, its limited capacity to withstand a low-price environment. The Asian financial crisis in 1997 and the consequent drop in world demand, coupled with overproduction in Saudi Arabia and Venezuela caused oil prices to collapse that year.

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[23] EL-GAMAL, Mahoud A. and MYERS JAFFE, Amy "Oil, Dollars, Debt and Crises: The Global Curse of Black Gold", 2009.

[24] Source: BP Statistical Review 2016.

However, one event was to decisively change the dynamics of this price war: the coming to power of President Hugo Chavez in Venezuela. Chavez's political objectives were clearly short term, so he was in favour of obtaining profit from oil through prices rather than quantities. In March 1998, the OPEC agreed to a historic reduction in its production by almost 1.5 million barrels per day, which was met with satisfaction by some of the main non-OPEC producers, such as Mexico and Oman, which were even prepared to cooperate. Oil prices recovered and stood above 20 dollars. Thanks to the success of this agreement, in March 1999 further production reductions were announced, while the OPEC increased its target price to 30 dollars. A decade was about to begin where oil market dynamics were to be practically reversed: high prices, discipline in complying with the OPEC agreements, moderate production increases and, above all, the existing capacity, which led the surplus capacity of the producing countries to an all-time low.

The following table contains a summary of the oil market supply/demand balance in the second period of our analysis, from 2000 to 2007[25]:

Petroleum world market (% annual variation)		
	1991-00	2001-07
Consumption	1,3%	1,7%
Production	1,3%	1,3%
Reservations	2,6%	1,3%

Image 4. Oil market, worldwide (year to year variation, %).

Several concomitant factors account for the market imbalance in those years: on the one hand, oil consumption increased greatly owing to the dynamism of the emerging countries, together with a steady growth in the developed countries (the year-on-year growth rate in oil consumption rose from 1.3% in the previous decade to 1.7% in the period analysed). Yet the production growth rate remained at 1.3%, the same as for the previous period, thus lying below the consumption rate. Meanwhile, the growth in proven oil reserves dropped sharply (growth decreasing from 2.6% to 1.3%), as a result of a reduction in exploration activities, the effect of low oil prices recorded the previous decade.

A second decisive element would be the emergence of international terrorism as from the September 11 attacks in 2001 and the Bush Administration's reaction to them. In his speech on the State of the Union just a few months later, in January 2002, George W. Bush included Iraq, Iran and North Korea in what he

[25] Source: BP Statistical Review 2016.

called the "axis of evil". At that time, the first two accounted for 8% of the annual oil production and almost 20% of the proven world reserves. The fight against international terrorism increased the oil market risk premium, bringing about a price increase. Once again, the question of US energy independence came to the fore. A few months before the World Trade Center attacks, a task force headed by Vice-President Cheney published the National Energy Policy, which was crystal clear in its support of the thesis that already reigned supreme in the Bush Administration: "our growing dependence on foreign oil clearly shows that our nation has failed to establish an effective energy policy". This neo-conservative thesis was reinforced after the September 11 attacks: dependence on foreign oil, apart from making the USA vulnerable, is a source of financing for international terrorist activities. This would be the underlying ideology of the Iraq War in 2004, and the parallel effort to develop alternative oil supplies, summarised in another famous speech on the State of the Nation given by President Bush, in 2006, in which he stated that it was necessary to put an end to America's addiction to oil, to the surprise of those who did not expect such a pronouncement from a Texan president whose early professional career had revolved around the oil sector.

The re-emergence of US energy independence as a political aspiration is multidirectional: in 2005 the Energy Policy Act was passed; it established quotas and gave the go-ahead for a million subsidies with a view to doubling ethanol production in 2012; in 2007, the Energy Independence and Security Act came into force, imposing stricter efficiency standards on vehicles; the Act also established the target of increasing bioethanol production by almost 800% by the end of the next decade. In 2008, the bioethanol industry would be worth over 30 thousand million dollars[26]. Meanwhile, oil prices reached record levels, which added further fuel to the argument for energy independence. During that period, the Republican Party started to enthusiastically defend the need to relax conditions for hydrocarbon exploration. During the 2008 Convention, the Lieutenant Governor of the State of Maryland, Michael Steele, coined the term that Vice President Sarah Palin would eventually make famous, after repeating it during one of the campaign debates: "Drill, baby, drill".

Several conditions come together simultaneously to cause what we might call a perfect storm. The record price of oil, the threat of international terrorism, the old aspiration to achieve energy independence, an ownership system that enables the owners of the land to claim ownership of the resources below, a consolidated industry of logistical suppliers and services, a financial industry that tolerates risk[27] (even to excess, as the parallel subprime mortgage crisis would make patent), and the thousands of small entrepreneurs immersed in a new episode of the American Dream, the same mixture of adventure, risk and promises of wealth that were experienced during the 19th Century gold rush,

[26] HOMANS, Charles "Energy Independence: a Short History", 3rd January-2012. Foreign Policy.
[27] (Blackwill 2014).

or the "oil rush", all in all, the jubilant profile that has historically shaped the American character, would bring together ideal conditions that, finally, would be joined by one decisive requirement: favourable geological conditions in the New World. The unconventional oil and gas revolution was now under way[28].

The pivotal role of Saudi Arabia

To gain better insight into oil market dynamics during this period, it is advisable to take another look at the pivotal role of Saudi Arabia.

There is no formal definition of the term "pivotal producer". It is normally applied to the producer, within a cartel, that has the capacity to increase or reduce production in the short term, and thus alter the market balance. Along more general lines, we could apply the term "pivotal producer" to one whose modifications to the production level have a greater effect on the prices (thereby admitting that normally there is not just one producer able to exert an influence on the prices). Much has been written about the conditions that are required to make a producer pivotal; these conditions can be summarised as follows:

1) Having the greatest volume of spare capacity;
2) Having a significant share of the market;
3) Having low variable costs, and more generally, having the capacity to increase or reduce production in the short term, in order to be able to respond strategically to external shocks.

The US Energy Department officially recognises Saudi Arabia's pivotal role indicating on its website that the Arab country is "the OPEC's top oil producer and also the biggest exporter" and then going on to say that "historically it has also had the largest spare capacity, with a surplus capacity ranging from 1.5 to 2 mbd".

Ultimately, the status of being a pivotal producer is an empirical matter. The American Energy Agency includes the following graph on its website. It can be seen how Saudi Arabia's oil production changes have historically been closely linked with the price fluctuations. It is clear that the pivotal producer is not the only one that can alter the prices: economic growth, changing expectations about this, changes in the production in countries that are not OPEC members, and interruptions (unexpected) to production are other factors that have had a significant effect on prices in the past[29].

It is important to point out that many of these factors are endogenous: for example, the way oil prices evolve also affects economic growth or energy consumption. This, together with the role of expectations, greatly complicates

[28] LEVI, Michael "The Power Surge. Energy, Opportunity and the Battle for America's Future", 1990.

[29] What drives crude oil prices: Overview. EIA. 2015.

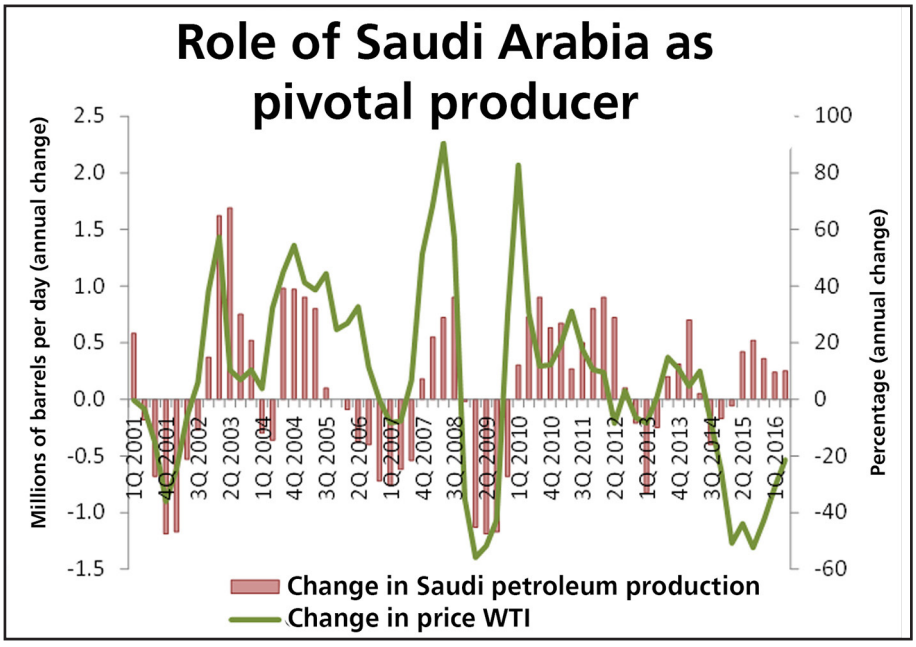

Image 5. The role of Saudi Arabia as a pivotal producer.

the econometric analysis of the factors that determine the price, especially when one wants to single out the effect of one of the variables.

Without this affecting the above, the Saudi Arabia's pivotal role has been historically recognised, which explains the geopolitical importance of the Arab country and US interest in keeping the country stable, all of which has led to privileged trading relations and military aid.

How has this role changed in recent years with the development of unconventional oil? It is advisable to show this development in figures to give an idea of the scale: from 2008 to 2015, the USA virtually doubled its oil production, going from 6.8 to 12.7 mbd. This amounts to a radical turnabout, given that US production had been falling steadily since the beginning of the seventies. Thanks to this turnabout, the USA has once again become the world's biggest producer, overtaking Saudi Arabia in 2015 (the latter's production lying at 12.0 mbd). At the same time, the US's proven oil reserves have also doubled, going from 28,400 million barrels in 2008 to the current 55,000 (in this case, still a very long way behind Saudi Arabia's 266,000 million reserves).

USA has once again become the world's number one oil producer, a position that it had lost at the beginning of the 1990s. Does this mean that the USA has become a pivotal producer? The answer is no. The USA lacks several qualities that we have described as being prerequisites for a pivotal producer: first of all, the USA has not cartelised its oil production with the rest of the OPEC

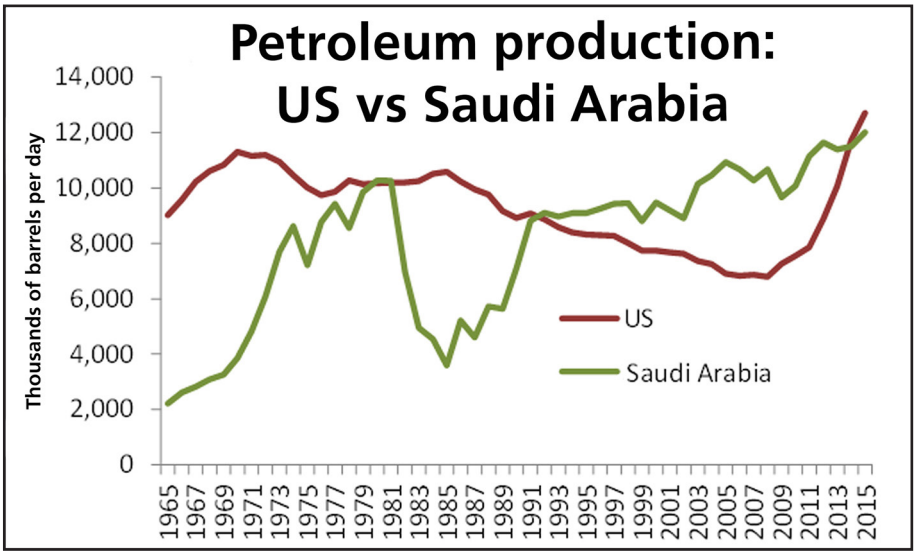

Image 6. Oil production: US vs Saudi Arabia.

countries, i.e., it does not form part of the cartel. Secondly, the USA (that is, the US Government) cannot increase or decrease its production in the short term to respond strategically to the way the market is evolving, simply because it does not control the production. The US production is the aggregate result of thousands of independent producers. Therefore, the USA does not have a fixed quota allocated, and even if it had, it would not be able to control it in a centralised way. And, finally, the variable costs of unconventional oil extraction are on the high side, complicating still further the USA's ability to respond strategically to price changes. In summary, the USA lacks several of the basic features that would be necessary for it to be a pivotal stakeholder.

Could we thus say that Saudi Arabia is still the pivotal producer on the market? The answer is necessarily NO. The thesis defended here is that Saudi Arabia has ceased to be the pivotal producer on the market without the USA having taken over the role. Although to a large extent Saudi Arabia's decision to renounce its pivotal role was voluntary, the burning question is whether or not it could also voluntarily resume this role.

Midway through 2008, with the price of oil above 100 dollars, Saudi Arabia began to show signs of its uneasiness about these price levels being able to bring about the long-term destruction of the demand for oil. In spite of the world economy collapse (and the collapse of oil prices) in 2009, the demand for oil recovered quite well, bouncing back in 2010, showing more sustained growth in the following years. Along parallel lines, the price of oil, which had fallen to an average of 60 dollars/barrel in 2009, recovered in the following years, showing notable stability, by remaining between 80 and 100 dollars per barrel.

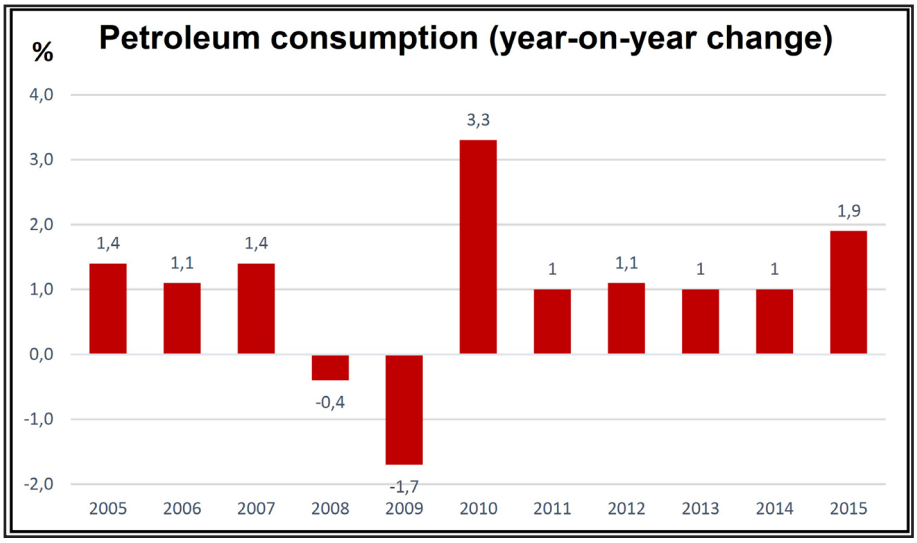

Image 7. Oil Consumption (year to year variation).

2015 was a crucial year, in which several events combined: firstly, US production grew steadily (in that year alone, production increased by more than 1 mbd), which had cumulative effects. Secondly, the nuclear pact was signed between Iran and the International community (represented by the six main powers), which limited Iran's nuclear development and, in exchange, returned the Arab country with the second largest proven oil reserves –around 160 thousand million- to the international markets. By the way, the two events were closely linked: it would have been very difficult for the USA to impose the unprecedented restrictions on Iranian oil exports established in 2012 by the Obama Administration, which ultimately forced the Iranian Regime to come to the negotiating table, without the increase in oil production in the USA, which had a cushioning effect against potential disruptions[30].

However, perhaps the most important factor, was a meeting that was held just a few months before the beginning of 2015. It was a meeting of the OPEC at which nothing was expected to happen. Oil prices had been steadily declining since midway through the year, by almost 30%. During the meeting, Saudi Arabia opposed a price reduction to check the slide in prices, adopting a position that it had defended in 1985: Saudi Arabia decided to defend its market quota by letting oil prices fluctuate freely (predictably, continuing to fall), confident that this fall would end up by ousting the unconventional producers, given that their extraction costs were much higher. The reasoning was similar to that used

[30] BLACKWILL, Robert D., O'SULLIVAN, Megan L. "America's Energy Edge: The Geopolitical Consequences of the Shale Revolution", 18 Mar 2014, Foreign Affairs.

by Saudi Arabia two decades earlier, when it tried to contain the growth in production, first in the North Sea and later in Venezuela.

The Saudi strategy was fraught with two glaring weaknesses. First of all, its success depended on the period of low prices being relatively short (or to put it better, that the ability of the unconventional producers to withstand was not as greater as the OPEC countries' ability to withstand the drop in their revenue). The second weakness lay in the assumption that later on, when oil prices had recovered, the unconventional producers would not return to the market.

So far, the first aspect of the Saudi strategy does not seem to have worked, and the second has not even been put to the test: the price of oil plummeted to a minimum of 30 dollars, and has remained below 50 dollars. This has not been a deterrent to unconventional production, which has managed to adjust costs better than expected. The failed Saudi strategy has in fact been considered one of the reasons for the departure of the all-powerful Saudi Oil Minister Ali Al-Naimi in May 2016, after two decades in the post, after the new Saudi monarch Salman bin Abdulaziz came to the throne. Final proof of the failure of the Saudi strategy came at the end of this November, when the OPEC announced its first production cutback for 6 years, which brought an end to the battle to banish unconventional production from the market.

As we pointed out, the role of pivotal producer is voluntary. In 1985, Saudi Arabia announce that it rejected the role of acting as a pivotal producer pivotal and thus modify its production to stabilise oil prices, preferring to conserve its market quota. The main question now, as it was then, is that if once this transitory period (during which it voluntarily renounced it pivotal role) has passed... Can Saudi Arabia take on this role again? It is a well-known fact, or at least that is what is taught in business schools, that price wars have very harmful effects on all those involved, not only on the losers but also on the winners. It is much easier to start a war than to stop it. That is exactly what happened in the 90s, when the oil surplus lasted for more than a decade. Only at the end of the decade did a series of circumstances make it possible to adjust the overproduction and, with it, restore Saudi Arabia to its central role in the oil market.

However recurrent historical comparisons may be, and in this review of US energy policy we have probably overdone them, no two cycles are completely identical. The singular aspects of the current cycle of low oil prices will be explained below.

The first aspect is that there are reasons to believe that the low-price period may be shorter than these periods have been in the past. Firstly, it is true to say that the production of unconventional oil has been maintained (in fact, it has fallen by about 15%[31]), yet exploration activities have dropped sharply (from 780 thousand million dollars in 2014 to around 440 in 2016). Furthermore, the production

[31] World Energy Outlook 2016.

yield from conventional oil wells dropped by approximately 2 mbd every year (a significant volume out of a total production that in 2015 was around 91.6 mbd). And the volumes extracted from newly-discovered conventional oil reserves have been decreasing continuously since 2010, falling in 2015 to their lowest level in the last 70 years[32]. Finally, there is considerable uncertainty concerning the volume of unconventional oil reserves (in the USA the estimates for these reserves range from a minimum of 30,000 to a maximum of 120,000 million barrels) and about the recovery capacity of the wells, not only for geological reasons but also economic reasons, given that the structure of the industry, highly atomised could be causing an effect well known in economic history, referred to as the "tragedy of the commons", which was already recorded with conventional wells in the USA at the end of the 19th Century. The consolidation of the oil industry, with the emergence of the major integrated oil companies, meant that the latter used a longer period of exploitation for the wells, less short-term than the independent producers. However, this transition has yet to take place in unconventional production.

On the demand side, the first symptoms of adjustment correction are also appearing in the oil market. The low oil prices caused 2015 to have the highest oil consumption rate for the last 5 years, and this was expected to continue at the closure of 2016.

The second set of singularities in the current cycle, are effects of a structural nature. It may be the case that each phase of the cycle has common features (for example, the dynamics, with a period of high prices that increases investment in exploration, with a greater time lag in the increase of supply than in the reduction in demand, which will also generate a production surplus followed by a price correction, thereby bringing investments to a halt, a reduction in supply, etc.) but the structural factors generated by each cycle are idiosyncratic to a large extent. Let's briefly review some of these effects in the current cycle.

The first effect concerns the future role of unconventional reserves. In spite of the aforementioned considerable uncertainty, even the most pessimistic scenarios give unconventional production a fundamental role at least until 2020; during this period it is expected that nearly all the increase in supply will be composed of unconventional production. The increasingly plausible possibility must also be considered, that the period of low prices comes to an end relatively quickly without leading to the unconventional producers being squeezed out of the market.

It seems clear that unconventional production is here to stay, at least over the next few years, which will necessarily mean that the OPEC countries will undergo a relative loss of influence. The ramifications begin as from 2020. If unconventional production spreads to other regions, we will be faced with a new factor in the oil market. If this does not happen, the situation as from

[32] Idem.

2020 will be rather similar to the situation at the beginning of the 1970s, given the concentration of proven reserves among the OPEC countries (mainly Saudi Arabia, Iraq and Iran).

But before we go so far, let's return to the structural effects of the current cycle of low oil prices. We have already analysed the case of Iran, where a confrontation with a potential destabiliser has been redirected, albeit with the necessary reservations about the agreement, which have become more marked since Trump's victory in the US Elections, a matter that we will be returning to in the final chapter.

A second effect within the OPEC concerns Saudi Arabia. In this case, there are two opposing factors. On the one hand, the low-price cycle, combined with accidental factors such as the death of King Abdullah bin Abdelaziz, has brought about slight but significant reformist moves within the Saudi oil sector. We have already mentioned the replacement of the Oil Minister, to which we must add the tentative plan to float on the capital market, 5% of the national company Aramco[33], which would be an unprecedented achievement since its nationalisation. If such gestures materialise, a more professionalised management of the oil sector in Saudi Arabia could put an end to decades of underinvestment in exploration and reverse the gradual loss of proven reserves in the Saudi Kingdom and the decline in the country's production.

An effect in the opposite sense is as follows: for years there has been speculation about the possibility of the Saudi oil reserves being overestimated. In 2005, a book by an American investment banker that had considerable effects, warned of this possibility[34]. In 2008, President Bush himself raised doubts about Saudi oil capacity after the Arab country refused to increase production in an environment of record prices. Subsequently, a confidential communication between a Saudi executive and the American Administration, made public after the filtering of data known as WikiLeaks, indicated that the Saudi reserves could be overestimated by about 40%[35]. If these suspicions are correct, the oil cycle beginning after the OPEC meeting held in 2014 would be in perfect conditions to reveal the weaknesses of the Saudi industry: the increase in Saudi production with a view to maintaining its market quota, combined with a low-price environment that drags investment into further explorations and strains the public accounts, which could make it necessary to increase the Saudi State's participation in oil profits. Therefore, it would hardly be surprising that if this low-price cycle were to last for longer than originally envisaged by the Saudi Kingdom, and if the suspicions about the Saudi oil capacity proved to be true, the country's role as a pivotal producer could be seriously jeopardised.

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33 The big float. The Economist. 30th April 2016.

34 SIMMONS, Matthew. "Twilight in the Desert: The Coming Saudi Oil Shock and the World Economy". 2005.

35 The Guardian, 8th February 2011. WikiLeaks cables: Saudi Arabia cannot pump enough oil to keep a lid on prices.

Let's go on to analyse the structural effects on another of the main OPEC producers, Venezuela. At times, Venezuela has been referred to as the marginal producer, when compared to the pivotal role of Saudi Arabia. This dubious honour is justified because of the high cost of extracting Venezuelan heavy crude oil, which according to some estimates would be as costly as oil extraction in the United Kingdom and Brazil. However, owing to its greater volume, the cost of extraction in Venezuela would often determine the international price of oil. It is true to say that Venezuela has played a major role in the oil market in recent decades, not only in the low-price cycle in the second half of the 80s and in the 90s, but also in the reduction in supplies agreed to in 1998, as we have already stated. The structural effect of the current low-price cycle on the Venezuelan Regime is undoubtedly taking place, although the way it evolves is almost impossible to predict. It is becoming increasingly difficult for Maduro's regime to survive the fiscal, economic and political strain, but to speculate on the way the Venezuelan political system and its oil industry will develop in the next few years, goes far beyond the purpose of this analysis.

A clearer structural effect has taken place on Mexico, where the current cycle has brought about an oil reform, including a modification to the Constitution, which seemed unimaginable just a few years ago. In spite of the doubts still aroused about the way energy reform will develop in Mexico[36], it is clear that these efforts are heading in the right direction to revert decades of progressive fall in the Mexican oil sector. However, the Mexican oil reform could, in the best of cases, stabilise the country, undoubtedly with major geopolitical effects, but it is unlikely to have a major impact on the international markets, in view of the limited volume of Mexican production (around 2.6 mbd, which in the most optimistic scenarios could be increased to 3.0-3.5 mbd in 2030).

And finally, there is Russia, an unknown player, the biggest non-OPEC producer of oil after the USA. Russian producers have shown a notable capacity to resist the current cycle. In fact, in 2015, Russian production reached an all-time record, 11.1 mbd. In view of the Russian fiscal structure, the falls in oil prices are mainly absorbed by the Russian State. Therefore, the doubts are more of a fiscal and political nature. How much longer will the Russian State be in a position to support a constant decrease in its income from taxation in a situation that is aggravated by the economic sanctions imposed by the European countries because of Russian military intervention in Ukraine? Once again, the situation is fraught with uncertainty. However, the Russian demographical ageing, the structural weaknesses of its economy, the tensions created by its search for its own geopolitical space and its own internal political evolution, all suggest that Russia is likely to carry on losing its influence over the next few decades, and that its role in the oil industry on the international markets will probably follow suit.

In this section, we have summarised some of the partial effects of the current oil cycle, trying to distinguish between the dynamics repeated in other past

[36] Mexico Energy Outlook: World Energy Outlook Special Report, 2016.

cycles, and their structural effects on the market. In the last section, we will go back over these effects in an attempt to put the pieces into a more systematic scheme, taking into account their complex interrelations, and the direction that the new US Administration might take as a result.

The geopolitical consequences of the development of unconventional gas in the USA: an integration of the world gas markets?

In the past, natural gas has invariably played the role of oil's "younger brother", or even oil's "orphan brother" [37]. It has always played second fiddle in the energy matrix, but not very far behind. In the USA, natural gas accounts for 31.3% of the total consumption of primary energy, only slightly behind oil (37.3%). On a worldwide scale, the distance is somewhat greater (23.8% for natural gas and 32.9% for oil, respectively[38]).

However, the weight of natural gas has increased in time. In 1965, natural gas hardly accounted for 15% of the world primary energy matrix. Yet curiously, its importance was already significant in the USA, where in percentage terms, it was at a similar level to todays.

The differences between natural gas and oil go beyond their respective percentages on the primary matrix: the major one being the different dimension of the markets. In view of the greater cost involved in transporting natural gas long distances, its markets are basically regional, whereas oil is global.

Another big difference is that the gas market is, in a natural way, less likely to be organised into a cartel than oil, owing to the greater need for investment to use the resources. It has been estimated that to obtain 1% additional capacity of the world gas production it would be necessary to invest 13,800 million dollars, whereas only 2,200 would be required for oil. And economic theory rightly predicts that it is much more complicated to cartelise capacity increases than production levels.

For similar reasons, the natural gas market has always been less volatile in the past. It is much more expensive to overproduce gas than oil, so any imbalances in the natural gas market have to be redressed more quickly.

Finally, the fact that oil is so important in the transport sector must be stressed, which makes it play a decisive role in military and geopolitical terms. For example, it was a lack of fuel that prevented the allied forces led by General Eisenhower from reaching Berlin before the Russian Army in the final months of the Second World War, which was to have geopolitical consequences for at least the next 50 years[39].

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37 YERGIN, Daniel "The Prize: The Epic Quest for Oil, Money & Power", 1990.

38 Source: BP Statistical Review 2016.

39 BEEVOR, Antony. "The Fall of Berlin", 1948.

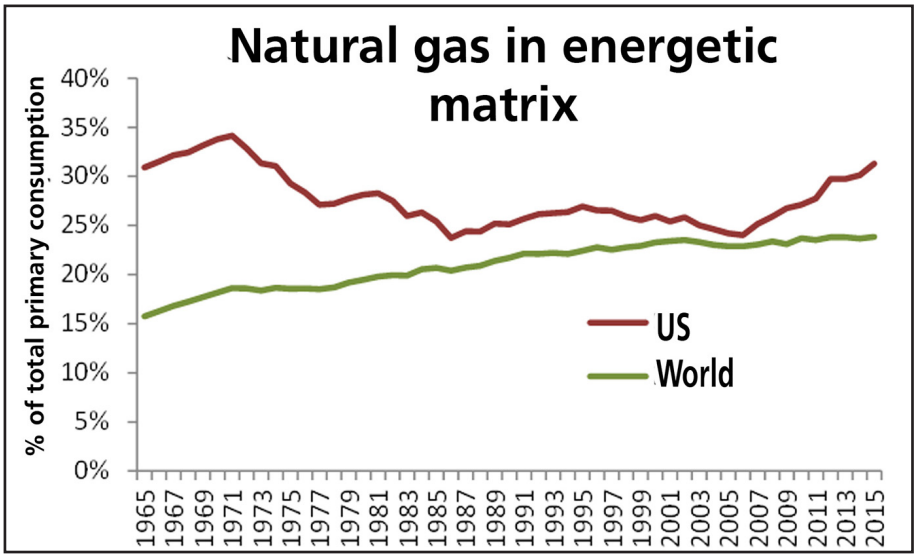

Image 8. Natural gas in the energy matrix.

To put the role of natural gas into perspective in the US energy policy and analyse the consequences of the changes that have occurred in recent years, we will carry out a historic review, much briefer in this case, of its role in the US energy matrix.

In fact, we could go back for a moment to the Second World War, when fuel rationing was a constant threat to the allied forces and began to cause great inconvenience to the Americans in their daily lives. President Roosevelt wrote to his Secretary of the Interior with an original idea: "I'd like it if you could put some of your team to work on the possibility of using natural gas. I've been told that there are a lot of wells in the West and South-West of the country where hardly any oil has been found, but where there is a vast amount of natural gas that is unutilized because it is too far from populated zones" [40].

It was obviously not a question of discovering a new fuel, because its applications were well known. However, it was thought that its potential was severely limited by the cost of transporting it. What President Roosevelt was proposing was not a discovery, but it was an unusual measure: using natural gas to cover the shortage of oil. The regulatory context was ideal. In 1938, the Natural Gas Act had been passed, which put under public control the interstate natural gas transfer network.

The construction of the great gas pipeline networks in the USA got under way, as from the 1940s, and would make it possible to connect the gas reserves in the south-west with the industrial and urban consumption centres in the north-east, and the

[40] YERGIN, Daniel "The Quest: Energy, Security, and the Remaking of the Modern World", 2011.

New Mexico and Texas reserves with the consumption centres in California. Gas underwent its first expansion phase until the mid-seventies. It was so successful that it was about to die. In the hard winter of 1976-77, part of the Midwest had to close its schools and factories because of a lack of gas supply. The main reason for this was not geological but economic. The low prices of gas, strongly regulated, had caused a progressive reduction in the supplies available. To redress this balance, the Carter Administration decided to deregulate gas prices, which became one of the most difficult domestic battles during his Presidency. Energy Secretary James Schlesinger said about this state of affairs: "Now I know what hell is:" The Natural Gas Policy Act of 1978 initiated the deregulation of the gas market in the USA. As part of that legislative package, Congress also passed the Fuel Use Act, which treated natural gas in a curious way: its utilisation for producing electricity was prohibited, its use being reserved exclusively for activities that were considered to have greater added value, such as industrial, cooling and heating processes. Natural gas was then known as the "Prince of Hydrocarbons". It had taken hardly thirty years to rise from orphan to heir.

Price deregulation fulfilled its purpose and the sector grew sharply. At the start of the nineties, the restrictions on the use of natural gas to produce electricity were lifted, which ushered in the era of what was known as the "dash for gas", not only in the USA but also in Europe. In fact, at present, the major use for natural gas in the USA is electricity generation (approximately 35%), followed by industrial consumption (30%) and domestic consumption (about 20%[41]). Over the past 20 years, the growth in gas demand in the USA is entirely attributable to electricity generation, because both industrial and domestic consumption have declined.

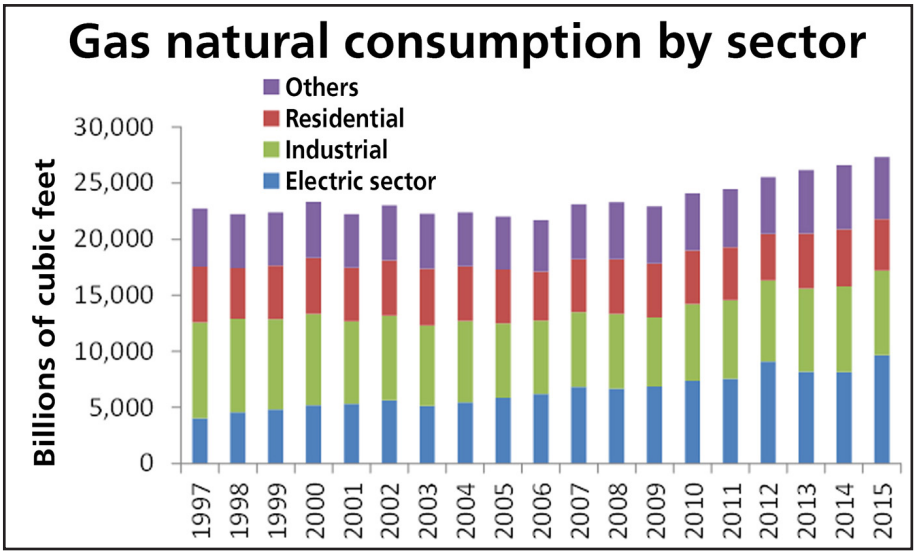

Image 9. Natural gas consumption, by sector.

[41] Source: EIA.

Most natural gas consumed in the USA is produced domestically. Imports account for less than 10% of the demand (and in net terms, deducting exports, less than 5%).

Most of the imports (nearly 97%) reach the United States via the gas pipeline connections with Canada, while small amount arrives both from Mexico and, in the form of Liquid Natural Gas (LNG), from Trinidad and Tobago.

The USA's situation is, to a certain extent, unusual, but not entirely so if compared to other countries. Worldwide, the percentage of natural gas that comes from a country other than where it is consumed is 30.1%, whereas in the case of oil and its by-products, it is 65%. Furthermore, the natural gas market is much less flexible. Around two-thirds of international gas transactions are conveyed by pipelines, which by definition restrict the movement of the molecules. Furthermore, even the third of this resource that is traded in liquid form (LNG, approximately 10% of the consumption) is often bound by clauses that do not allow it to be re-exported to third countries.

Therefore, there is no single international natural gas market, there are many. The major ones where volume is concerned, are those that supply the European Union (with net imports of about 265 bcm, somewhat more than 60% of the annual consumption), and Japan and Korea (175 bcm, 98% of their consumption). The main exporters are Russia (180 bcm), the Middle East (120 bcm), the Caspian (80 bcm) and North Africa (53 bcm). Yet as we have pointed out, they are not the only ones, there are a host of regional markets connected by pipelines running for tens or hundreds of kilometres.

The USA has also experienced its own unconventional gas revolution. To be exact, the hydraulic fracturing and horizontal drilling techniques whose use became widespread at the end of the last decade, were originally developed for gas extraction, and this has increased natural gas production in the USA by approximately 50% since 2007.

Unlike the case of oil, natural gas has not had such an effect on international markets, mainly because there is no real international market as such, as we have already pointed out. However, this does not mean to say that there have been no geopolitical consequences, just that the discrete way they have filtered in, showed up, has made it less obvious.

The first consequence is that the USA has had a sort of economic and social dividend. The increase in North American production after 2007 caused a desynchronization in domestic prices. The price of natural gas in the USA since then has ranged from 2 to 4 $/MBTU, approximately half the price that it costs in Europe and one-third of the price in Japan, differences that are much greater than in the past. The USA has benefitted from this in a variety of ways: through an increase in domestic consumption, but also from the industrial sector becoming more competitive, which has injected life into the chemical industry, amongst others. The gas dividend has had a twofold impact on the US economy. On the

one hand, it has had a cyclic effect, helping the recovery after the financial crisis of 2008-09, to be much stronger than in other parts of the world. On the other hand, it has had a structural effect, making it more competitive, which has served to reactivate industries that had been in slow decline in the USA for decades.

A second consequence is the displacement of other sources of primary energy. In 2015, for the first time in the USA, electricity production from natural gas exceeded production from coal, a landmark that would not have occurred if it were not for the fall in natural gas prices. It is estimated that since 2012 almost 44 GW of the coal based electrical power generation plants have been closed down[42]. In fact, in the current price scenarios, generating electricity from gas is more competitive in the USA than generating it from coal, regardless of the plant utilization factor, whereas for example in Asia, gas is only more competitive than coal when catering for demand peaks (i.e., for a plant utilization factor below 35% [43]). In fact, replacing coal with natural gas has enabled the USA to comply with the emission reduction commitments, contained in the Kyoto Protocol, but never ratified.

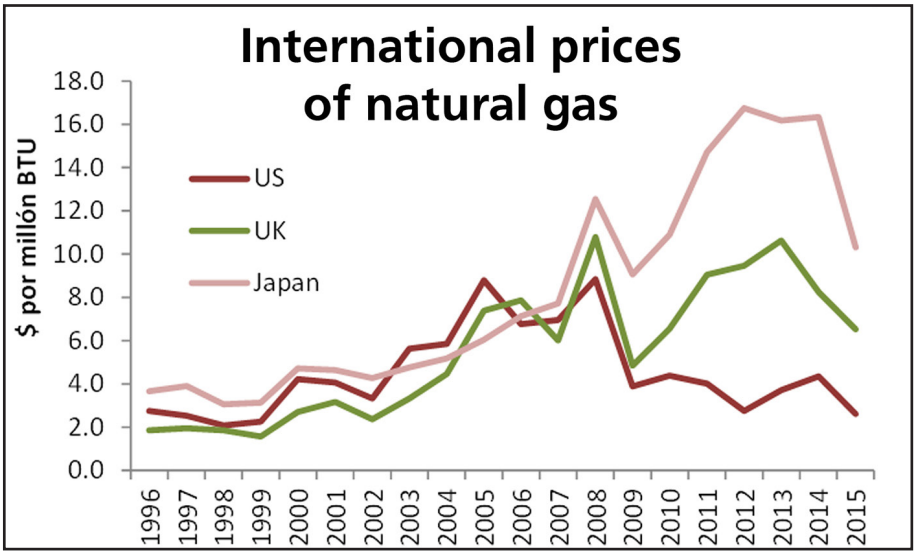

Image 10. Natural gas international prices.

A third set of consequences can be identified by looking at the gas markets themselves. As we have already stated, they are surely the least visible results but the most significant: the long-term effects depend on whether the production

[42] LADISLAW, Sarah O. "US Election Note: Energy and Climate Policy After 2016". Chatham House.

[43] World Energy Outlook 2016.

of unconventional gas in the USA structurally alters international market dynamics. If it does not, it could be the case that the same thing will happen to the gas dividend in the USA as happened with the discovery of hydrocarbon reserves in the North Sea, which have benefitted the producing countries (United Kingdom and Norway, mainly) like manna from heaven, increasing the profit available for some decades without substantially modifying the international market balances.

In this sense, it must be mentioned that regasification plants are currently being constructed in the USA, to be used for exports, with an aggregate capacity of around 75 bcm; these will gradually come into operation in the coming years. These plants amount to approximately 50% of the total that are now being constructed in the world, where regasification capacity is concerned. This capacity will contribute to an increase in the volume of the international gas trade (the IEA predicts that this will increase at an annual rate of 2.1% compared to an increase of 1.5% in the consumption rate), mainly through LNG, that could increase its share until by 2030 it exceeds resources transported by gas pipelines. Apart from being beneficial to the USA, this could also be of great use to other countries that are investing heavily in LNG infrastructures, such as Australia, and later on, Canada and Turkmenistan, and even Mozambique and Tanzania in Africa. In the Middle East, Qatar (more LNG oriented) might benefit, to the detriment of Iran (more oriented towards gas pipelines because of its strategic position). Among the consumer group, Europe would be in conditions to obtain significant yields in its endeavour to diversify its sources of Russian gas supply.

What is not so clear, is whether the inroads made by the USA as an LNG exporting country would lead to a radical transformation of the international gas markets, causing the different regional markets to integrate. US production, in volume, is not prepared to bring about such an effect, although it would undoubtedly make the market more flexible, due to the typical lack of re-export prohibition clauses in American exports, and in view of the ceiling that American production would impose (extraction costs plus transport costs) on the domestic price of gas on the European and Asian markets.

In summary, the revolution experienced in the US natural gas sector is similar to the oil experience. However, as is only to be expected, the consequences are not nearly as great. The fact that natural gas is more lightweight on the primary matrix and, above all, the national, or at most regional, nature of most gas markets, means that any impacts felt in the USA will be much slighter in the rest of the world. Yet the effects are by no means negligible. First of all, natural gas is moving towards a state of commoditization, although this process is still far from completion. The effects are also considerable on other associated markets, mainly the biggest consumers of gas, such as the electricity sector itself (where replacing coal with natural gas in the USA looks like being structural) or the industrial sector, with an appreciable upsurge in activity in the industries that consume a lot of natural gas.

The evolution of US policy in the fight against climate change and the Trump Administration's energy plans

It may seem to be a contradiction, almost a provocation, to devote a whole chapter to the President-elect Donald Trump and the US policy in the fight against climate change. However, there is good reason for this. At this very moment, a policy against climate change (or to put it a better way, a lack of such a policy), could be the only clear aspect of the Trump Administration's energy policy. Yet as we shall see, not even that is clear. But by comparison, everything else is one big question mark. At this point in time, it is adventurous, almost random, to forecast what the Trump Administration will do with any sector, including energy. At best, one can predict an increase in uncertainty and, thus, market volatility. In this chapter we are going to analyse how American policy has evolved against climate change, and close it with a few intuitive lines, about the Trump Administration's future energy policy and its geopolitical consequences.

The USA was not only one of the countries that signed the UN Framework Convention on Climate Change in Rio de Janeiro in 1992, but it could also be said that, to a certain extent, the movements to make people aware of the effects of human activity on the environment had their origins in the USA[44]. The USA also signed the Kyoto Protocol in 1998, during Clinton's Second Presidential Term. However, during that period the Republican Party had a majority in the House of Representatives and the Senate leading to a major political confrontation that led to an attempt to oust the President. In the midst of this confrontation, in 1997, the Senate gave its approval to the Byrd-Hagel Resolution, which rejected any international agreement that did not require the developing countries to reduce their CO_2 emissions and that might "damage the US economy". This Resolution was passed by an overwhelming majority in the Senate (95-0). Therefore, when Clinton signed the Kyoto Protocol, his seal of approval was essentially symbolic, because at that time it was already clear that the possibilities of this Protocol being accepted by the Senate were negligible. In fact, the Protocol was never even sent to the Senate for ratification.

The exemption of the developing countries from Annex 1 of the Kyoto Protocol, was always the argument used by the Republican Party to justify its rejection of the agreement. In March 2001, not long after Bush became President, he formally announced that the USA would not be implementing Kyoto.

As we have already stated, the climate action policy was largely omitted by the Bush Administration. This initial situation became aggravated by the September 11th attacks on the World Trade Center, which were to make the fight against international terrorism an absolute priority for the American Administration. Only a partial consequence, already mentioned, can be drawn from this. The Iraq

[44] In this sense, frequent reference is made to the work Silent Spring, by Rachel Carson, which warned of the effects of pesticides on the environment, as the original denouncement that gave rise to the ecologist movements.

War meant, on the one hand, the distancing of the USA from its traditional allies in the OPEC, especially Saudi Arabia, which had opposed the armed intervention. On the other hand, the chaotic management of post-war situation in Iraq, when the dismantling of the Ba'ath Administration triggered off violence in Iraq, and the relationship between Iraqi oil and terrorist activities became closer. It was from this time on that Bush promoted the development of alternatives to oil, but he was never to play an active role again in the fight against climate change.

This situation was to change once Obama arrived in the White House in 2008. Obama attended the Copenhagen Summit in 2009, although in view of the blockade, he left before it ended. One of the lessons he seemed to have learnt was the need to supplement the multilateralism of climate negotiation, with the leadership of the main powers. This new strategy, combined with the US foreign policy's new orientation towards the Pacific (known as the "Pivot to Asia") facilitated the historic agreement, in November 2014, between the USA and China, to reduce their emissions during the next two decades[45]. The agreement gave a decisive boost to international climate negotiation that was to culminate successfully in Paris in December 2015.

What prospects are there for this climate agreement after the election of Trump? The problem when analysing Trump's proposals in energy matters is that we are not dealing with a programme as such. Compared to the great detail contained in the proposals put forward by the candidate for the Democratic Party, Trump's proposals are nothing more than a series of ideas and slogans, strung together in speeches, TV appearances or messages on the social networks.

Most of his proposals concerning energy matters (called the "America First Energy Plan") were announced in May in a speech in North Dakota, one of the places that is well-known for its increase in the production of unconventional hydrocarbons in recent years. During this speech, Trump accused Hillary Clinton of "having declared war on American workers" and of "wanting to close down all the coal mines", and he also accused President Obama of "wanting to stop the production of oil and natural gas in America". He likewise accused the Justice Department of having filed a lawsuit against the oil companies of North Dakota over the death of "28 birds" when "the Administration's wind farm projects kill more than a million birds every year". Apart from this haranguing, Trump announced a series of specific measures, including the following:

- To include "American energy supremacy" among the USA's strategic economic objectives and foreign policy
- To achieve total energy independence from the OPEC countries or any other hostile nation.

[45] In the agreement, the USA undertook to reduce its emissions, before 2025, by between 26 and 28% with respect to 2005, and China agreed to reach its emission peak before 2030, and that by that date 20% of its energy would come from non-emitting technologies (renewable, nuclear and CO^2 capture & storage).

- To remove all administrative obstacles to exploration, and to adopt a neutral position towards the development of new technologies, for example, between renewable energies and nuclear energy.

To be even more specific, Trump listed a set of measures that would form part of his plan of action for the first 100 days, which included the following energy policy measures:

- To revoke all the executive decisions taken by President Obama in recent years in matters concerning energy and climate, including the *Climate Action Plan* and the *Waters of the US Rule*.
- To "save" the coal industry.
- To "ask" TransCanada to submit again the permits to construct the Keystone Oil Pipeline, a line almost 2,000 kilometres long linking the Alberta oil reserves in Canada with the refineries in Texas and Illinois, which was rejected by the Obama Administration in 2015.
- To lift all restrictions on exploration and drilling for hydrocarbons.
- To cancel" the Paris climate agreement and suspend all the US contributions to the UN programmes fighting climate change.
- To "get rid of" the nuclear agreement with Iran (one of Trump's favourite phrases was that while Obama was lifting economic sanctions on Iran, he was imposing economic sanctions on America, in reference to the restrictions on prospecting for new deposits).

As we have pointed out, it is difficult to analyse the implications of this set of proposals, many of which are mere propagandistic outbursts. Some of these promises are no more than declarations of principles (like "save" the coal industry, which clearly goes far beyond the ability of even the President of the USA).

The proposals for the Keystone Pipeline or lifting the restrictions on exploration and drilling are much more specific, although they do raise certain doubts about encroaching upon the powers of agencies formally independent from the American government. It is possible that lifting the restrictions on exploration might consolidate or increase unconventional production. However, it is doubtful that these restrictions have served as a stumbling block to the expansion of the sector in the last few years.

Nevertheless, it is matters of climate where President Trump's decisions could have a more immediate effect. In recent years, part of the Obama Administration's agenda in this area, took the form of executive decisions, through changes in the environmental regulations, rather than via legislative measures, as Congress was opposed to regulating these questions. In view of Obama's failure, during his first term of office, to obtain the Senate's support for his legislative plan to fight climate change, Obama decided in 2014 to promote this plan through a set of executive decisions, establishing amongst other measures, and for the first time, maximum emissions of CO_2 in electricity generation plants (and requiring that these emissions be reduced by 32% between 2005 and 2030, arguing

that the alternative to this was serious economic consequences). As they are executive decisions, it is much easier for the Trump Administration to change them, although this could expose the Executive to law suits, in exactly the same way as what happened to the Obama Administration[46].

Although the promise to "cancel" the Paris climate agreement could be achieved, there would be certain questions raised about how to do this: the Paris Agreement cannot take place before three years have elapsed, although this could occur after that period. Another option would be to denounce the UN Framework Convention, on which the Paris Agreement ultimately depends, but this involves certain risks, and in fact it was not used by President Bush when he decided to withdraw from the Kyoto Protocol[47]. Finally, to add further confusion, President-elect Trump has considerably modified his statements after being elected, indicating that he has an "open mind" about the international Paris Agreement.

The situation concerning the renewable energy sector is sounder: at the end of 2015, after a real legislative *via crucis*, the US Congress decided to apply tax credits (the main instrument for promoting solar and wind energy) until 2020, lifting at the same time, in a typical legislative tit-for-tat, the restrictions on the export of oil that had been in force for forty years. It is highly unlikely that Trump will alter this taxation framework, which he has not even openly criticised, owing to the legal uncertainty that it would cause regarding investments already under way.

Come what may, it is probably more advisable, instead of analysing Trump's proposals one by one, in view of their fickleness, to assess them as a whole. One potential way of conducting this analysis is to do so by scenarios. In a recent book by two Professors at the University of Kentucky School of Diplomacy[48], adopt an original approach, using the International Futures Model (IF), developed by Professor Barry Hughes. One of the advantages of this approach is that many of the complex interrelations between the variables are modelled. For example, a high oil-price scenario has clear effects upon the development of alternative energy sources, and upon the geopolitical power of the OPEC countries. Or a conflict between China and the USA prompted by competition for scarce energy resources in an environment of considerable world growth will cause oil prices to rise.

The analysis of scenarios, combined with a mass-balance model like IF, has the advantage of making the analysis more strict: not all the scenarios are possible, because in certain cases, the way some variable evolve is inevitably interlinked

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[46] LADISLAW, Sarah O. "US Election Note: Energy and Climate Policy after 2016". Chatham House.

[47] RIBERA, Teresa. "Trump and the Chinese Tale of Climate Change". El País, 10th Nov.-2016.

[48] HILLEBRAND, Evan and CLOSSON, Stacy. "Energy, Economic Growth and Geopolitical Futures".

(for example, the way geopolitical power evolves in the Middle East and the oil price). However, in other cases, different combinations of variables can be given. For example, there are high and low energy price scenarios and strong or weak economic growth scenarios. Any of the four scenarios is plausible.

In fact, this is the greatest weakness of this approach. By dint of combining variables, any scenario ends up by being possible. That is to say, by including an increasing number of variables to enrich the analysis, one ends up by covering virtually the entire spectrum, which weakens the analysis concerned.

Having said this, the analysis of scenarios is of special interest, especially in a context of great uncertainty about specific aspects, such as the situation arising from the election of Trump as US President. The authors define three basic variables, whose combinations generate eight potential development scenarios, for three periods (the current decade, the period from 2020 to 2040 and the one ranging from 2040 to 2050). The three basic variables are: strong or weak economic growth, high or low energy prices (which can also be characterised as scarcity/abundance of energy resources) and peaceful coexistence or conflict in international relations. How does the election of Trump affect these three variables?

Let's begin with the last one, whose effect is perhaps the clearest. The election of Trump opens up a period of great conflict in international relations, at least, greater conflict than the alternative to Trump. Trump's position regarding the nuclear agreement with Iran, which could derail it, his belligerence with China (that he has repeatedly accused of manipulating its exchange rate), his proposals to bombard Syria and the ISIS enclaves independently of the International community, and all in all, the heterodoxy and isolationism that could hang over his Presidency, enhanced not only by his character and the profile of his team, but also by the nature of his relations with most of the Republican Party, indicate a period of greater conflict in international relations.

The second variable is the scarcity/abundance of energy resources. Once again, it should be pointed out that we are referring to the scenario of a Trump Presidency as opposed to the alternative, represented by Clinton. Furthermore, and to the extent that this is possible, we will endeavour to isolate the evolution of this variable from the previous one, given that a more conflictive situation generally causes energy resource prices to rise. Having said this, the Trump Administration could be characterised by a period of relative abundance of energy resources. The first reason for this could be the lifting of restrictions on exploration and drilling for both conventional and unconventional resources. This could also occur because of the removal (or attenuation) of restrictions on the use of other sources such as coal, including its use for generating electricity. And all of this would probably happen while incentives were kept for promoting the use of renewable technologies, whose expansion worldwide, does not depend only on the Trump Administration's attitude to them, i.e. such an expansion could perfectly well take place independently, without that meaning the USA would not benefit from a reduction in costs.

And, finally, there is the economic growth variable. The most likely situation is that there would be two distinct periods. In the short term, there could be a certain expansion in the US economy, in view of the huge infrastructure plan announced by President Trump, and his close relations with the construction sector. However, in the medium- and long-term, there are many other factors that that things might go in the opposite direction. Trade protectionism, with the announced end to the Trans-Pacific Partnership Agreement (TPPA), and the Transatlantic Trade and Investment Partnership (TTIP), the latter severely damaged after the election of Trump, and the questioning of trade agreements, such as the NAFTA between Mexico and the USA, which has been in force for more than two decades and whose effects, both political and economic, are considered by the majority to be very positive.

If we accept the direction of these three variables (low energy prices, weak economic growth and international conflict), the resulting scenario is what the authors call "global setback", which would be characterised by "high volatility and low economic growth in the main countries, which reduces growth and weakens geopolitical stability. Protectionist trading policies are implemented everywhere, which further reduces growth and causes discord in the international community. Low economic growth gives rise to a lower demand for energy, which combined with new sources of conventional and unconventional energy, lead to a drastic reduction in energy prices".

We are faced with a "tumultuous multipolar world". The producers in the Middle East resort to desperate tactics to hold on to power. Iran emerges as the regional power and on several occasions enters into conflict with Israel. Russia goes through decades of decline, the Eurozone falls apart and Central-Northern Europe and Southern Europe start to drift apart and remain apart for the following decades. The USA gradually but steadily loses economic and geopolitical power, but there is no change of leadership, because China never manages to become a stable and modern economy, and goes through a permanent internal struggle between elites to control power. Most of the OECD countries are considerably worse off in 2040 than they were in 2020.

Having cast the shadows, let's look for some light. That is indeed the scenario for the lowest economic growth, but definitely not the worst in terms of welfare. In others, peaceful coexistence is threatened by a great rivalry between China and the USA or the sharp economic growth puts an end to climate stability on the planet. Maybe we will have to live in a future full of conflict, but multipolar, without greater leaderships, with low economic growth but abundant energy resources. In summary, it is a world without historic comparison, at least in the last two centuries. So we can console ourselves with the fact that this will be a new experience.

Chapter III

Energy and Geopolitics in Latin America

José María Pardo de Santayana wy Gómez-Olea

Abstract

In a historical period of great uncertainties and geopolitical tensions, Latin America, comparatively more stable and predictable, could gain importance in global energy geopolitics. The social and economic developments produced during the Latin American super-cycle associated to the raw materials boom have strengthened their societies to face the future. On the other hand, the experience of the deep crisis induced by the sharp drop in oil price is making it necessary to push for long-needed reforms. A region so generously gifted by nature shall always offer great expectations. Only time will provide the answer. It is advisable to pay attention.

Keywords

Latin America, geopolitics, energy, oil, natural gas, electricity, renewables, growth, United States, China.

Introduction

For the purpose of this work we are using the term Latin America in its broadest sense, including both Mexico and the Latin countries of the Caribbean. When in order we will distinguish between South America, Central America and the Latin Caribbean as the three sub-regions of Latin America.

The aim of this document is to examine energy geopolitics in Latin America, a region with enormous potential and one which arouses great interest in Spain and the World. The hydrocarbon-producing countries in the region are immersed in a bad patch and it is interesting to know what prospects there are for recovery in the medium and long term. Following the criterion of the *World Energy Outlook 2016* (WEO 2016), the document establishes its maximum horizon as 2040. It is advisable to find out if the region will at last be able to live up to expectations that so far are underachieved, lagging behind the development rates of other emerging regions.

Chapter 2. "General Presentation", offers an overview of the energy sector in the region and its long-term prospects. Furthermore, certain considerations are postulated about the impact that the world´s geopolitical evolution might have on the development of the Latin American energy sector, special attention being paid to the role of the United States in relation to the growing influence of China. Chapter 3. "Background", explains the process leading up to the current situation, taking an in-depth look at some of the problems afflicting the hydrocarbons sector and highlighting the importance of Latin American's Golden Decade, as well as the impact of the subsequent sharp drop in oil prices. Chapter 4. "Current Panorama of the Energy Sector in Latin America", first presents the general economic situation and its prospects, placing emphasis on specific questions such as environmental sustainability, social progress, renewable energies, the essential regional integration and the potential of unconventional hydrocarbon resources. Chapter 5 brings the work to an end by presenting the energy profile of the main Latin American countries, followed by some brief final conclusions.

General Presentation

Situation and Prospects for the Latin American Energy Sector

Anywhere in the world, the policies associated with the energy sector are an essential part of any political-economic strategy aimed at supporting and developing a society. In Latin America the reasons are twofold. Apart from its cross-cutting influence on the rest of society's activities –as in any other region– the energy sector constitutes a substantial part of both commercial exchange and the budget income of most of the States, especially in South America.

The countries in Central America depend to a large extent on the vicissitudes of the United States economy and, with the exception of Mexico, do not have major hydrocarbon reserves. In the case of Mexico, although it has a more diversified

economy and is thus less subordinated to the energy sector than the producing countries in South America, its Achilles' heel is the dependence that the federal budget has on the income it receives from Pemex, the state-owned company that monopolises the oil industry.

Although the weight of oil in the world energy matrix is slowly diminishing and this trend is expected to continue until 2030, when it will lose its supremacy, that hydrocarbon is the main actor in energy geopolitics, and will continue to be so for a long time, not only because of its specific weight, i.e.: the value of its trading but also due to the effect its price has on the other energy sectors. In Latin America, this is very much the case. Despite having a fairly diversified energy matrix, oil accounting for almost half, this resource constitutes the main part of its energy resource exports.

According to the World Energy Outlook 2016 (WEO 2016) the global demand for crude oil will continue to grow at least until 2040. In the most likely scenario the expected increase will be a quarter of the current demand, China and India accounting for the greatest growth. By contrast, in the USA –currently the biggest importer of Latin American hydrocarbons– the demand is going to fall from 18.0 mb/d in 2015 to 13.1 mb/d in 2040, which will mean that by then, thanks to unconventional production and energy efficiency measures, the country will hardly import any oil. China, which in the past decade has been progressively increasing its Latin American oil imports, will quite soon replace the United States as the top destination for regional oil exports.

An average annual growth in oil demand of 0.4% is forecast for Latin America in the same period, slightly below the world average of 0.5%. Furthermore, production will rise from 10.7 mb/d in 2015 to 15.4 mb/d in 2040; exports will grow considerably, with Brazil and Venezuela doubling their current production[1]. In 2015, Latin American production accounted for 11.9% of world production, its demand stood at 9.4% and its refining at 7%[2]. To a large extent, the USA covers the refining deficit and leads the by-product sector regionally.

Most experts agree that oil prices will rise above 65 dollars in the medium term, and that demand will equal supply, which will be a relief for Latin American producers. A drastic fall in the number of new *upstream* investment projects for two consecutive years, with predictions in the same direction for 2017, will end up affecting world production. A question mark hangs over what might happen with unconventional oil in the United States, given that it has already shown greater resilience than expected with very low prices, and that, as the performance deadline for investments are shorter, this could, to a certain extent, hold back the price rise for a barrel of oil. When this text was completed (December 2016) we still did not know what policies the new President of the

[1] World Energy Outlook 2016.
[2] BP Statistical Review of World Energy, June 2016.

United States, Donald Trump, will be implementing, which adds further to the uncertainty.

One major component to which increasing importance is being attached in Latin American energy geopolitics is natural gas. WEO 2016 predicts that renewable energies and natural gas will be the great winners in the race to meet the increasing demand for energy until 2040, natural gas being expected to grow by one third in the region. The WEO 2016 also indicates that the energy growth will be slowed down by the rapid progress being made in energy efficiency. The WEO calculates that the increase in world energy demand will be 35%. Nevertheless, natural gas demand will increase by 50%, exceeding coal in the global energy mix. The growth in world gas production will come mainly from unconventional gas, which will increase by 3.5% per year, reaching around 1,700 bcm in 2040[3].

All of this strengthens Latin America's role, because although it only has 4.1% of the proven reserves[4] today, the potential is extraordinary, almost 30% of the recoverable unconventional gas reserves being concentrated in Latin America –especially in Argentina (23 tcm) and Mexico (15 tcm)[5]–, multiplying by eight its proven conventional gas reserves[6]. To date, the United States, Canada and Australia lead unconventional gas development and it is calculated that it will be necessary to wait until the next decade for production to take off in other countries with major unconventional gas resources, such as Argentina. Mexico's proximity to the United States and its connection via gas pipeline with the USA will delay for a few years more the moment when local development becomes profitable. The WEO 2016 calculates that in 2040 Argentina may produce 40 bcm and Mexico 15 bcm of unconventional gas. Even if production growth is lower in the long term, conventional Latin American gas will still account for the greatest production volume, with Brazil gaining positions to become the main producer in 2040.

Excluding Mexico, Latin America is a net exporter of natural gas but only by a narrow margin. In time, the unconventional revolution will enable the region as a whole to be a net exporter. At present, this hydrocarbon accounts for a quarter of the Latin American electricity mix, tending to carry on growing until it doubles its volume by 2040, overtaking hydroelectricity to become the electricity matrix leader[7]. Liquefied natural gas (LNG), which will account for two thirds of the increase in the world gas trade until 2040, will play a major role in readjusting Latin American market requirements.

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3 World Energy Outlook 2016.

4 BP Statistical Review of World Energy, June 2016.

5 World Energy Outlook 2016.

6 ESCRIBANO, Gonzalo, "The Energy Scenario in Latin America", Economía Exterior no. 65, summer 2013.

7 VERGARA, Walter, ALATORRE, Claudio, ALVES, Leandro, a document for debate "Rethinking our energy future", International Development Bank.

In Latin America, coal (1.7% of the world's reserves and 1.8% of the production[8]) is hardly of any geopolitical importance, which sets it apart from the rest of the word. Brazil and Colombia are the only Latin American countries with any significant production, and the latter is the only one where the coal sector is relatively important in its economy and in the energy mix; this is good news, because as it is the resource that pollutes the most, its use is clearly in decline.

Renewable energies, with 60% of its electricity matrix, are now a reality in Latin America, the region having one of the cleanest energy mixes in the world. Nature has provided the region with so many huge rivers, wind and sunlight hours that their harnessing potential for renewables is much greater than its demand potential. Biofuels, led by Brazil, are in expansion. The competitiveness of renewable energies is evolving rapidly and the WEO 2016 forecasts that in the most likely scenario for 2040, over 60% of world energy produced in this way will not require subsidies. Breakthroughs in electricity storage, transport and distribution could have a huge impact on the region. The digitalisation of distribution will be a factor to take very much into account. In general, the development of a more suitable and homogeneous regulatory framework is vital for the growth of renewable energies in Latin America.

Considering hydroelectric power alone, it accounts for 54% of the regional electricity matrix and 10% of the primary energy demand[9]. On the one hand, hydroelectricity has great potential for improving energy efficiency and, on the other hand, it is subjected to the growing impact of climate variability, which has become increasingly felt in Latin America in recent years. As droughts in a part of the region generally take place at the same time as excessive rainfall occurs in another, as is the case with *el Niño* and *la Niña*, infrastructures and mechanisms that can effectively respond to production fluctuations on both a regional and a local level become increasingly important. Therefore, climate change has to be borne in mind when developing and planning infrastructures, as it enhances the value of complementarity, interconnectivity and regional cooperation in the electricity sector.

Wind energy is making inroads into the electricity matrix, this being the most rapidly growing energy in the region. Solar energy is also gaining ground, as the prices are becoming more competitive. Petroleum products, accounting for less than 10% of the electricity mix, are losing ground, whereas nuclear power, which only provides 2% of electricity production, plays only a minor role[10]. Only three countries, Argentina, Mexico and Brazil have nuclear power plants.

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8 BP Statistical Review of World Energy, June 2016.

9 International Renewable Energy Agency, "Latin America renewable energy market analysis", 2016.

10 VERGARA, Walter, ALATORRE, Claudio, ALVES, Leandro, a document for debate "Rethinking our energy future", International Development Bank.

Being 40% of the planet's biodiversity found in Latin America, ever-increasing importance is attached to both environmental matters and relations with the local and indigenous communities, where energy development is concerned, and these questions must be carefully borne in mind in the future. Approximately 4% of Latin Americans still have no access to electricity. As 80% of the population is urban and the problem is exclusively rural, the challenge is by no means insignificant.

Geopolitical Introduction

One of the most striking aspects of energy geopolitics in Latin America is the huge importance of its hydrocarbon reserves –more than 20% of the world's proven oil reserves[11]– and their consequent geopolitical potential, in contrast with their negligible influence in the configuration of oil prices. It could thus be said that during the recent sharp drop of crude oil prices as from June 2014, Latin America has acted as a "major consumer" in world energy geopolitics, but only "playing a very minor role" in it. This is mainly due to its lower oil production, which only accounts for 11.9% of the world's production, plus its energy fragmentation and the fact that a considerable part of the regional oil reserves lie in Venezuela, concentrated in the Orinoco belt, requiring major investments and advanced technologies. The current situation affecting the *sick man of the region*, the investment horizon and the crude oil prices, rule out any significant change in the volume of production in the medium term.

Despite the current regional economic slump, there are reasons to believe that the general situation could change in the medium- and long term, when Latin America is called upon to enhance its role in world energy geopolitics. However, there certainly are factors that could prevent this from happening, especially if the region takes a long time to recover and socio-political disturbances occur. If this happens, the region will lose many of the positive parameters attained during the recent Latin American *super-cycle* associated with the high prices of raw materials.

If the situation develops favourably in the very long term, by 2040, Latin America could become one of the pivots in world energy geopolitics, the Middle East still being its Gordian Knot and Asia now being the major importer and transformation factor. At present, Latin America is fourth in the crude oil export rankings after The Middle East, Africa and Russia. According to the WEO 2016, it could be second by 2040.

At present, there is a general feeling that we are undergoing a geopolitical turnabout. In its *Strategic Survey 2016*, the International Institute for Strategic Studies in London states that "the foundations of global order appear alarmingly weak", that "foreign policy is becoming a branch of psychology" and that

[11] BP Statistical Review of World Energy, June 2016.

"the management of the crisis is being renationalised"[12]. In the international multipolar order that is being plotted, China and Russia, two of the leading actors in world energy geopolitics, have moved closer together and are rivalling the dominant position of the United States. China is straining its relations with its neighbours and openly demanding a different share-out in the South China Sea, of great importance to Beijing, not only as a result of the natural resources amassed below its waters, but also because of the trade routes that cross it. After Russia annexed Crimea and became involved in East Ukraine in 2014, Moscow, through its intervention in Syria is disputing Washington's leadership in the Middle East. Furthermore, the two main regional powers if the world of hydrocarbon reserves, Saudi Arabia and Iran, are challenging each other and back the groups that are in conflict in the Iraq, Iran and Yemen wars. The armed conflicts and an expanding Jihadist radicalism are threatening the stability of many of the Middle East States and of many of the neighbouring countries.

While the short- and medium-term is full of uncertainties owing to the high level of tensions and conflicts on the international scene, by around 2040 the most important geostrategic event in recent centuries will be about to take place: the rise of China to take over the pole position as the leading world´s economic power. When this happens, it will be the first time that a non-western power has occupied this post since at the end of the 15th Century Spanish and Portuguese navigators set in motion the progressive globalisation process with an order and values established by Western European powers. As Chinese supremacy creeps ever closer, all the areas of international relations will be growing in geopolitical density and Latin America will become increasingly important as a sphere of influence for the great North American power, which will find it difficult to conserve its dominant position in the great nucleus of world power that is the Eurasian land mass.

Given that China needs to guarantee and diversify its raw material supply sources, in general, and energy resources, in particular, Latin America will continue to grow as a China's -legitimate- object of desire. India and other Asian countries will, one by one, go knocking at the doors of a region that has been so well-endowed with geological assets. In 2040, it is predicted that China and India will be accounting for nearly half the world's crude oil imports[13].

The United States has changed its traditional attitude to Latin American energy resources. Until less than a decade ago, before the *fracking* revolution, global energy security –with free access to markets in a resource shortage scenario– was one of the constant vectors in the US security strategy, whereas at the end of 2016 the situation is interpreted differently.

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12 The International Institute for Strategic Studies (IISS), Strategic Survey 2016, 27th September 2016.

13 World Energy Outlook 2016.

In the current circumstances, the priorities of North American energy strategy in Latin America are economic competitiveness and climate change[14]. However, in order not to be completely displaced by China from its current position of first trading partner in Latin America, particularly in the energy sector, Washington will be forced to introduce geopolitical considerations, strengthening its presence and participation in the Latin American energy sector with geopolitical and not only trading criteria. This rivalry between superpowers to exert influence in regional energy geopolitics will revitalise the Latin American energy sector, gradually bringing the region's energy reality into line with the potential of its reserves.

In a 21st Century of great uncertainties, Latin America, with its great cultural homogeneity and conflicts in check, has the advantage of not being involved in the major upheavals underlying the new international order. In contrast to a region like the Middle East immersed in all kinds of tensions and conflicts, an unstable African continent with serious development problems, a Russia, with its growing power ambitions, and the Caspian region, geographically surrounded and disputed by its neighbours, Latin America could prove to be a more predictable and stable region, with all the consequent advantages for trade, investment and, above all, for guaranteeing a regular supply of hydrocarbons.

In view of the large number of variables that come into play, it would be reckless to go into greater detail about the geopolitical considerations in the longer term. Nevertheless, we can state that, in as much as Venezuela comes out of its general state of confusion and Brazil begins to re-launch itself and lead regional development resolutely –which is much more likely and foreseeable–, Latin America will exert greater influence on world energy matters, both countries being the axes around which regional energy geopolitics revolve.

Background

Starting Point

Traditionally, energy geopolitics in Latin America was characterised by their regional position based on supplying the US market and by the heterogeneous nature of the numerous national energy models, with major differences between producing and consuming countries but, above all, between the producing countries themselves, which means geopolitical fragmentation where energy is concerned[15].

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[14] MCLARTY, Mack, Chairman of McLarty Associates and former White House Chief of Staff for President Bill Clinton, Wilson Center, Latin American program, Latin American Energy: Issues and Prospects, 19th May 2015. https://www.wilsoncenter.org/event/latin-american-energy-issues-and-prospects.

[15] ESCRIBANO, Gonzalo, "The Energy Scenario in Latin America", Economia Exterior no. 65, summer 2013.

The growth in hydrocarbon reserves has been another major vector shaping Latin America energy geopolitics over the last few lustrums, making it second in the ranking of regions with the largest proven oil reserves in the world (340,000 million barrels), only behind the Middle East (803,500 million barrels)[16]. If the 220,000 million barrels of heavy crude oil discovered in the Orinoco Basin exceed the potential economic value of the rest of the regional reserves, the importance of the oil found under a 1,500 metre thick saline layer plus a depth of 2,000 metres under the sea, must not be ignored. That discovery, which Lula da Silva called "a gift from God", makes Brazil a top-level regional producer of hydrocarbons. Such reserves, estimated at 50,000 million barrels at an extraction cost ranging from 45 to 65 Dollars[17], which are currently at the profitability limit, will rise in value as the associated extraction technology improves. Furthermore, the predicted oil price rise will restore the Brazilian *Pre-salt* to the high profile it had before the drop in barrel prices. Argentina also came across another massive geological asset in Vaca Muerta, in the Province of Neuquen, just like Ecuador, who has found that its oil reserves have risen from 4,900 to 8,000 million barrels in 10 years[18].

Insufficient regional integration is a factor that has held back Latin America's energy development potential. Since midway through the nineties, with the development of a major trans-frontier gas and electricity infrastructure, the region consolidated an energy integration process that began with the construction of mega bilateral hydroelectric power plants in the 1970s. Yet since midway through the 2000 decade the region's energy priorities changed drastically when Argentina and Bolivia modified the *rules of the game*, Argentina failing to meet its obligations with Chile and restricting the supply of natural gas. Since then, integration has lost ground and every country has focused on guaranteeing its own energy supply by diversifying the energy sources. In the gas sector, LNG imports have made up for the differences[19].

Oil Nationalism

The association with what has come to be known as oil nationalism has been a decisive factor in regional energy geopolitics. This approach which has had its better moments and which in moderation could have its logics, has been practised in different ways in most of the producing countries in the world. Furthermore, in Latin America the major national energy companies have often been used to support State expenditure and budgets, with subsidy abuse and the creation of distortions, leading to a two-fold *Achilles´ heel*: on the one hand, this has been

16 BP Statistical Review of World Energy, June 2016.
17 Letters to readers, Economía Exterior no. 65, summer 2013.
18 BP Statistical Review of World Energy, June 2016.
19 VIDJEN, Gabriela, "Energy Integration", Institute of the Americas, Latin America Energy Outlook 2016.

conducive to corruption and, on the other hand, this state of affairs has greatly complicated making the reinvestments necessary to modernise the technology and increase, or at least maintain, the production capacity. Some Latin American countries ultimately frightened off investors and foreign companies at a time when thanks to high oil prices, there were reasonable profits for all parties.

In 1938, Mexico took the lead, when President Lázaro Cardenas decided the recovery of natural wealth, previously in the hands of foreign companies, as a question of national dignity. Subsequently, in 1968, General Velasco Alvarado's Peruvian Revolution was to follow suit with the setting up of PetroPeru and in 1976 the Venezuelan Carlos Andrés Pérez nationalised the industry and established Petróleos de Venezuela (PDVSA). More recently, in 2006, Evo Morales gave the Bolivian State complete control over hydrocarbons and, in 2012, the President of Argentina, Cristina Fernández, declared Repsol holdings, amounting to 51% of Repsol-YPF, to be of public utility and subject to expropriation.

In Mexico, until the nineties, while there was plenty of crude oil, the model was not problematic. Subsequently Pemex, which monopolised the entire sector, was plagued by debts and mismanagement, with its production in decline and using obsolete technology. In 2006, it only obtained a profit of 3,900 million dollars, in spite of selling for 97,000 million, an unprecedented figure. The reason was simple: it had to pay 54,000 million in taxes and royalties. The Central Government extracted from Pemex one third of the budget, leaving insufficient resources to invest in finding more oil and not exhausting the reserves[20]. The situation became so clear that President Enrique Peña Nieto was forced to undertake an ambitious reform to liberalise the State-owned oil company Pemex and try to attract investments for the energy infrastructure.

Argentina, so richly endowed with resources, was also infected by oil nationalism between 2003 and 2013, the years that Fernández called the "victorious decade", Argentinean oil production fell by 31.2%[21]. Neither was it a coincidence that production ceased to grow in Ecuador, whose President Correa passed a Hydrocarbons Act that removed all incentives to foreign oil companies, with regulations added in 2007 whereby the profits due to oil price rises above the price fixed by contract all went to the State. In Bolivia, in spite of the nationalisation measures and a deterioration of the taxation conditions, the Government managed to successfully negotiate with the international companies and favour a growth in gas production.

Venezuela is the most outstanding case, and brings together all the faults in Latin American oil nationalism. The projects implemented by Carlos Andrés Pérez caused chronic inflation and the public debt shot up to the extent that in 1996 Venezuela was one of the few countries where the income per capita

[20] G. MANRIQUE, Luis Esteban, "The never-ending return to nationalising resources", Economia Exterior nº 65, summer 2013.

[21] Ibid.

was less than in 1960.[22] Hugo Chávez added an unprecedented ideological and regional dimension to *petro-populism*. In 2001, he limited the shareholding of foreign companies to 49% of the capital and toughened the taxation conditions, except for extra heavy crude oil and gas, while at the same time politicising PDVSA, which caused the *oil stoppage* from 2002 to 03. Production and exports never recovered. In 2005 he established Petrocaribe, to provide the ideologically close Caribbean nations with cheap oil, Cuba obtaining the most advantageous conditions. In 2006, he nationalised crude oil exploration and production, imposing a minimum shareholding of 60%[23]. Production and exports inevitably fell. Before oil prices dropped, PDVSA was generating 80% of Venezuelan export income. In spite of including the 600,000 barrels per day of crude oil from the Orinoco Belt, that lack of investment from multinationals and their general mistrust caused Venezuelan production to drop by 900,000 since 1998. Furthermore, the petrol subsidies were costing the country about 20,000 million dollars per day, three times as much as was being spent on health[24].

Where foreign policy is concerned, Brazil has traditionally implemented an energy protection model dominated by the public sector based upon the power of Petrobras in the market and based in high local content conditions, very restrictive on foreign investors. However, the scale of the energy challenges, which exceed the capacity of public companies, encouraged a gradual and contained liberalisation of the energy sector. Making the most of the *Pre-salt* fields became Brazil's top energy priority. Petrobras also dominates the gas market with great impact on the regional Latin American market. Deficient transport infrastructures and low prices have made the market difficult to develop. In 2009, new legislation was passed to try and enhance private investment and open a new window of opportunities to international companies[25].

In contrast, Colombia appears in the region as a liberal model and an alternative to oil nationalism. Despite the depletion of the country's reserves, its production has doubled over the past 10 years. Peru is another success story with moderation and political reliability and a well-planned long-term development of the electrical sector.

In 2013, before oil prices plummeted, the production scene could not have been more contradictory: with the exception of Brazil and Colombia, the income and production had not stopped sliding in the years before. The Venezuelan PDVSA and the Mexican Pemex were de-capitalised and unable to cope with the required investments, all in the years when the price of a barrel of *Brent* had not fallen

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22 Ibid.

23 ESCRIBANO, Gonzalo, "The Energy Scenario in Latin America", Economia Exterior no. 65, Summer 2013.

24 G. MANRIQUE, Luis Esteban, "The never-ending return to nationalization of resources", Economía Exterior no. 65, summer 2013.

25 ESCRIBANO, Gonzalo, "The Energy Scenario in Latin America", Economia Exterior no. 65, Summer 2013.

below 100 dollars. In general terms, Latin America had not made the most of the great decade either to diversify its economy sufficiently, or to prepare the energy sector for future challenges, revealing evidence of structural weaknesses.

The Bonanza Decade

In view of its dependence on the export of raw materials and the lack of its own financial resources, the growth of the Latin American economy depends mainly on three exogenous factors: the external demand, consequence of expansion or contraction of world trade, the raw material price fluctuations and the international liquidity.

A favourable combination of these three factors enabled Latin America to enjoy a true golden decade, beginning in 2002 thanks to the economic boom in China and the consequent rise in the price of raw materials throughout the world. According to the IMF, between 2001 and 2008 copper, coal, iron and oil prices increased by between 350% and 600%, while nickel prices soared to over seven times their previous price[26]. During Latin America's bonanza decade, China doubled its oil consumption, which led Beijing to diversify its supply sources and invest in fields all over the world, including Latin America. The economic growth rates in the region's countries reached 6% and 7%. As from 2012, the region started to feel the consequences of China's economic slowdown, the fall in raw material prices and the combined effect of both. After cushioning the world economy between 2009 and 2011, Chinese growth slowed down from 2-digit figures midway through 2000, to 6.7% reported in 2015[27]. The financial crisis of 2008-09 continued to make its effects felt worldwide. The three exogenous factors that had brought about the great Latin American decade then had a boomerang effect.

Although oil barrel prices remained high initially, as from June 2014 they followed the raw materials trend and fell by more than two-thirds, from 115 dollars a barrel to less than 30 dollars in 18 months, showing a subsequent slight recovery up to about 45-50 dollars.

It must be pointed out that Latin America had strengthened the foundations of its economy reducing its debt to manageable levels and providing itself with international reserves, with reasonably capitalised banks and a strong domestic demand, so its countries, except for Venezuela, are not facing the very serious problems they experienced during previous crises. Yet as we have seen, in the energy sector, some governments, tempted by such a generous source, "milked the cow but forgot to give the animal the attention it requires to carry on producing as generously as before". Now, in a context of greater international

[26] Strategic Comments, "The commodities super-cycle's end and political risk", Volume 22, Comment 5 March 2016.

[27] Ibid.

competition and in view of the horizon in sight, the necessary reforms are at last being made and the governments are beginning to show the change in attitude that the Latin American energy sector needed for some time.

Drop in Oil Prices

As a result of the fall in raw material prices and the subsequent drop in oil prices, the average growth in the Latin American region has fallen below the rate of increase in world activity since 2013, a GDP compound growth rate of 0% being observed for Latin America, compared to the 11% recorded in the rest of the world since then, albeit with major variations within the region[28]. Countries that are vital for the region like Brazil and Argentina went into a very serious recession, whereas others, such as Mexico, Chile, Colombia or Peru carried on growing but at slower rates. Mexico, with a large manufacturing sector, has been able to exploit the low costs of supplies.

The economic problems have been further complicated by cases of corruption, especially in Brazil, Chile, Argentina, Mexico, Peru, Colombia, Bolivia, Guatemala and Panama, giving rise to a crisis of confidence and governability. The Brazilian economy –the biggest in Latin America– contracted by about 4% in 2015. Its inflation and unemployment rates were close to 10%[29]. Lower revenues combined with the massive corruption scandal turned the State-owned oil company Petrobras, into a major hindrance to the economy and the political system. With the new prices, not only was there a big question mark hanging over the development of the *Pre-salt* reserves under the sea, but also the very future of the company was in doubt. In Brazil and Argentina, the situation has led to changes in the political direction driving reforms of the energy sector.

Although low energy prices did give some benefits, especially for the countries in the Caribbean and Central America, which largely depended on imports, they are also an impediment to the very necessary energy industry reforms, plagued with difficulties to attract investments. Furthermore, the high cost of electricity, the infrastructure´s deficit and a series of energy and environmental disasters, such as the floods in Chile and the droughts in Brazil, Chile and Ecuador, added to the problems afflicting the energy sector, causing additional predicaments to those affecting many countries in the region.

Venezuela requires a separate mention. In the two years following the death of President Hugo Chavez, the economy fell into a deep recession accompanied by galloping inflation. Capital controls and fixed interest rates led to a scarcity of consumer staples. A fall in oil income was aggravated by erratic and sectarian

[28] IMF Economic Prospects: the Americas, http://www.imf.org/external/pubs/ft/reo/2016/whd/eng/pdf/wreo1016s.pdf.

[29] The International Institute for Strategic Studies, Strategic Survey 2016, 27th September 2016.

policies and poor economic administration. In the parliamentary elections held in December 2015, the Opposition won two-thirds of the seats, causing a serious confrontation between the latter and President Maduro. Crime and violence have spiralled out of control, leaving the country on the verge of chaos. Conversations are currently being held between the Government and Opposition under the auspices of the Vatican, offering slight hopes. If the country stabilises and leaves the mistakes of the past behind, it could change the regional energy panorama by itself. However, it is difficult to determine the ceiling. Only time will tell whether the plummeting of the oil prices will have served to accentuate the crisis or to force the Government to seek a solution and thus offer a starting point for political and national energy recovery.

Brazil has found its role as a regional power damaged. This country is vital owing to its demand capacity and its geographical position, having frontiers with all countries in South America except Chile and Ecuador. Its dynamism is essential for developing regional integration initiatives in the energy sector. The project to link the Atlantic and Pacific oceans by rail is a good starting point. After the major corruption scandal and the looting of Petrobras, President Temer has embarked on a reform process for the energy sector that should make itself be felt in the medium term.

The importance of peace and stability in Latin America as an element to enhance its position in world energy geopolitics has been mentioned above. Two countries should be given special consideration for the impact that the fall in crude oil prices and their evolution have had and could have on this basic aspect of regional geopolitics.

The Colombian Peace Process is one of the few truly good news in 2016, in terms of world distension. It is destined to have a major material and moral impact on the Latin American region. Its success can also help to lead to a positive solution to the Venezuelan crisis and a better understanding between neighbours. The drop in oil prices has reduced the good prospects of Colombian economic growth. The Peace process will require abundant economic resources to reach fruition and, so, the fall in oil prices has proved to be an obstacle in its path.

The case of Cuba is more important than it would seem at first glance. Hugo Chavez and Fidel Castro signed an agreement whereby Cuba sent professionals to Venezuela, mainly doctors, and in return the latter provided the former with oil under very advantageous price and conditions. Petrocaribe was the formal supplier, becoming the mainstay of the Cuban economy. The country produces about half of the oil that it consumes and came to import 105,000 b/d from Venezuela (4% of Venezuela's total oil exports), which Cuba used to fulfil its needs, whereas the rest was processed and re-exported to ALBA countries. In August 2016, as a result of the Venezuelan crisis, beset by the drop in crude oil prices, the amount of oil sent to Cuba fell to around 53,500 b/d. In such circumstances, the country was obliged to stop exporting refined oil and to reduce domestic energy consumption. Cuban GDP growth decreased from 4%

in 2015 to only 1% in the first 6-month period of 2016, half what was expected, jeopardising the already shaky Cuban economy.

Thanks to the whims of nature, Cuba is an island lying in the middle of many of the natural illegal trafficking routes between North America and South America, between the Gulf of Mexico and the Caribbean, between Mexico and Florida, and as the main stepping stone in the Antillean Arc. As it is the only country in the region that has effective control over such trafficking, it serves as a plug. Given that illicit trafficking, the organised crime that such activities encourage and the problem of violence and governance that generate, are a cause of great concern for regional security; a destabilisation of Cuba would have extremely serious consequences for all the neighbouring countries, Havana eventually being turned into the centre of operations for the regional mafias. The highly skilled qualifications and the extensive network of relations and contacts of many of the civil servants of the Cuban State could serve to feed, in a desperate situation, the human resources of organised crime. A major crisis scenario in Cuba could sink the whole Caribbean region causing greater domestic violence, making governability more difficult and seriously damaging the energy sector.

At a crucial time in its history when the country has embarked on a complex transition, the man that led its revolution has died and its Government is reconstructing its relations with the United States, oil price fluctuations could be one of the key factors in its success or failure.

Current Energy Scenario in Latin America

In current circumstances, Latin America, in spite of the drawbacks that have condemned it to play a secondary role, is emerging as a more foreseeable alternative or, to put it another way, a less uncertain alternative in world energy geopolitics. The fact that current conditions give cause for certain optimism where economic recovery is concerned must also be taken into account. In general terms, the Latin American bonanza decade served to strengthen the middle classes, reduce the population's huge social and economic differences, improve training and skill in the professional bracket, reduce debt and make the necessary macroeconomic readjustment.

As has already been pointed out, the new economic slowdown situation caused by the progressive reduction in raw material prices and, above all, after the sharp drop in crude oil prices also had its positive effects in the energy sector. In a general panorama of overproduction and lower incentive to invest, Latin American governments were more inclined to discuss matters, be reasonable and flexible in their relations with companies and foreign investors in order to attract capital and obtain commitments from firms. Reforms are taking place in many countries and the archaic positions of oil nationalism are giving way to more balanced approaches.

Governance and political stability, the fight against corruption, continuity in the rules of the game, the consequent legal security, mechanisms for recovery of profits, suitable and homogeneous regulations, administrative agility, infrastructures, regional integration, are all essential for taking the direction that leads to the development of Latin American societies and their energy sector. Many countries are now following this path. It is crucial that Latin American is no longer viewed from outside as a region with no sense of the long term and whose progress and regressions are chance affairs; such perceptions must give way to the idea of a stable, predictable and reliable region.

General Economic Framework

According to the IMF's economic prospects updated on 7th October 2016, Latin American and Caribbean economic activity is expected to reach its lowest point in 2016, with a moderate recovery the following year and that after a contraction of 0.6% in 2016 –resulting from the recession in certain large South American countries–, the GDP will recover and register a growth of 1.6% in 2017[30], Brazil and Argentina being expected to grow again and it being assumed that there will be certain stable growth acceleration in Mexico, Central America and the Caribbean, Venezuela being the exception[31].

The Dominican Republic, with a 6% growth, leads the ranking of countries benefitted by the new situation, even though the inequality gap has widened and macroeconomic progress has not given rise to a substantial improvement for the poorest social sectors. Other countries in Central America are following suit with similar parameters. Although important in numbers, those countries only account for a small percentage of the Latin American population and economy volume, so their global geopolitical weight in the region is also limited.

The end of the commodities economic *super-cycle* and the slower growth of China have required, particularly for South American countries, to make major macroeconomic adjustments. Although slight external demand and the consistently low level of raw material prices still affect regional prospects, internal factors have been the main reason for the growth observed in some economies under strain. Repeatedly disappointing results in terms of growing indicate a lower potential growth, making it all the more necessary to introduce structural reforms and to stimulate production capacity, however such reforms will take some time to bear fruit. Exchange flexibility has brought about remarkable profits to the region, and in view of the changing world trends, this should still be the first line of defence against adverse *shocks*. In many cases, there is no longer a need for a contractive monetary policy, given that inflation

[30] The IMF's Economic Prospects. http://www.imf.org/external/pubs/ft/reo/2016/whd/eng/pdf/wreo1016s.pdf.

[31] The World Bank, 6-monthly report: The major turnaround in Latin America, restoring growth through trade, October 2016.

and inflationary expectations are returning to their initial levels. With maintained downside risks, the countries should make the most of the favourable financial environment worldwide to reconstruct their fiscal defences, preserving however their capital expenditure and the social contributions of vital importance. Uncertainty about how long the favourable global financial environment will last poses risks for the region, while the vulnerability of the financial and business sectors is worth scrutinising more closely[32]. Nevertheless, diverging trade policies and integration between the Pacific Alliance and Mercosur are creating a regional polarisation in South America[33].

Environmental Sustainability and Social Progress

One of the major challenges the region faces is to guarantee an environmentally sustainable energy supply, simultaneously complying with social and economic targets, reducing the impact of energy on climate change and reducing air pollution in the cities.

According to the Inter-American Development Bank, there are still over 26 million people (4% of the population) in Latin America who have no access to electricity. Furthermore, 87 million (an alarming 15%) still use unsustainable biomass, wood and charcoal, for heating purposes. The IEA predicts that universal access to electricity in the region will be achieved midway through the next decade. To increase access it will be necessary to extend the interconnected grid as far as is economically reasonable. In the case of remote areas or scattered settlements, isolated grids ought to be installed with local electricity-generation technologies, mainly based upon renewable energies.

Sustainable energy systems can only be achieved by changing energy use and production patterns. The IEA estimates that by 2035, accumulated energy investments in the region will amount to 4 billion dollars. Energy efficiency is the most important measure for increasing energy sustainability and reducing the emissions associated with energy use. Government initiative is essential. Brazil, Chile and Mexico have very effective programmes that include institutional frameworks, financing and performance indicators.

Renewable Energies

To improve environmental sustainability and meet the growing energy demand, the region needs to increase the renewable energy percentage in the countries' energy matrixes, which means that the countries will have to develop effective

[32] The World Bank, 6-monthly report: The major turnaround in Latin America, restoring growth through trade, October 2016.

[33] The IMF's economic prospects. http://www.imf.org/external/pubs/ft/reo/2016/whd/eng/pdf/wreo1016s.pdf.

political frameworks, as well as suitable incentives and regulations. Latin America contains some of the most dynamic renewable energy markets in the world, exploiting the historic role played by hydroelectric power and liquid biofuels, enhanced by Brazil's determination to diversify its fuel mix for transport. Since 2004, investment in renewable energies in the region (excluding large hydroelectric power) has shown an elevenfold increase, compared to a sixfold growth worldwide. Investment trends show the rapid evolution in the region's energy mix towards a more diversified set of technologies and countries. In 2015, and for the very first time, Mexico and Chile joined Brazil on the list of the 10 biggest renewable energy markets in the world[34].

The IEA predicts that hydroelectrical generation will continue to predominate in the region for the next 20 years, and will require accumulated investments of more than 250 thousand million dollars. Latin American region has major hydroelectric resources, only 25% of which have been developed. Nevertheless, the prominence of hydroelectricity causes such challenges as variability and environmental, as well as challenges to the communities affected, together with greater competition for water between the various sectors and countries in international basins[35].

In recent years, the use of unconventional renewable energy has increased greatly in Latin America. Wind energy has shown the most rapid growth in the region. Mexico and Central America are at the head in the geothermal rankings. However, in spite of its importance in rural zones not connected to the grid, Solar photovoltaic energy has been subjected to a scale change in many countries, including Chile and Mexico, where large-scale plants have replaced small domestic facilities. Unconventional renewable energy is becoming increasingly able to compete with other electricity generation sources in the region, even without subsidies and other support mechanisms. In 2014, some wind projects in Brazil won contracts in new general tenders, because they offered better prices than coal or natural gas projects. In many Caribbean countries, generation using renewable energies can compete with fossil fuel energy generation in periods of high demand and high prices. In Mexico, the Oaxaca wind projects can compete with natural gas and constitute a useful alternative for major consumers. Moreover, solar thermal collectors are not just proliferating in Brazil, which is one of the world's leading markets. In Chile, the mining sector is installing solar thermal systems to meet central-heating needs in remote areas[36].

Eleven countries in Latin America use biofuels for transport, including the second largest producer in the world, Brazil, where biofuels account for 13% of the fuels used for transport. Argentina is ranked fifth producer in the world, while Colombia is thirteenth. First generation biofuels are being seriously questioned

[34] International Renewable Energy Agency, "Latin America renewable energy market analysis", 2016.

[35] Norton Rose Fulbright, "Renewable energy in Latin America", October 2016.

[36] Ibid.

however and the sector is making its bet for the second generation of biofuels. If these are to play a greater role, the countries need: the standards to be made consistent; the fuel blends to be adapted to current and future vehicles; and develop the manufacture, import and export of vehicles with flexible fuel and featuring biofuel technologies. Furthermore, the nations must pay attention to land-use changes, competition with food production and water use. Along the same lines, projects for developing certain more advanced fuels, such as ligno-cellulosic biomass, waste or raw materials of non-food origins, can solve the problem of competition with food production[37].

Fossil fuel subsidies, which encourage energy waste, have damaged the development of renewable energy. What is more, variability affecting the distributed generation of unconventional renewable energy has complicated its large-scale use in electricity systems. It is necessary to develop supplementary infrastructures and regulations to attend to the generation variations between wind and solar photovoltaic technologies.

Many countries in the region have vowed to increase the percentage of renewable energy on the energy matrix. At the beginning of 2014, 19 countries had renewable energy policies, and 14 of them targeted the generation of renewable electricity, including Costa Rica, with a goal of 100% for 2021; Guatemala with 80% for 2027; Honduras with 60% for 2022, Nicaragua with 90% for 2020; and Uruguay, which in 2014 managed to surpass the 90% goal it had set. However, policies and targets are not enough, and many existing obstructions still have to be removed[38].

The use of intelligent electrical grids is one solution for achieving energy security, affordability and sustainability. Chile is developing distributed energy generation, net balance meters and intelligent grid technologies, Brazil has opted for the Buzios Smart City Project, which will serve 10,400 clients and will make the city a smart energy model, and Panama is studying the legislative, regulatory and operational actions required to adopt smart grids[39].

Regional Energy Integration

Regional energy integration is still a basic challenge. Nowadays, the characteristics of the energy systems in the region provide several options for optimisation that can be implemented almost immediately and with minimum investments: making complementary use of the huge sources of renewable and non-renewable energies (from different water basins and hydrocarbons), the

37 Ibid.

38 International Renewable Energy Agency, "Latin America renewable energy market analysis", 2016.

39 Ibid.

existing gas pipelines and the energy transmission infrastructure developed, with the flexibility made available by the regasification terminals.

Furthermore, in the medium- and long-term, energy integration could be enhanced by developing the unconventional resources in Argentina, the Brazilian *Pre-salt* reserves, the Peruvian Camisea field and the major renewable sources. Integrating them to form larger systems would increase wind and solar capacities thanks to an extended capacity for handling the rather intermittent availability of these sources. Optimising the regional energy infrastructure will contribute to energy security, economic efficiency and environmental sustainability for each energy market, and enhance general competitiveness.

Bolivia, a landlocked country, has a basic economic dependence on the export of natural gas to its neighbours and is thus the first country to show interest in encouraging regional integration. A new boost has also arrived from the current Argentinean administration, who is enhancing an open and cordial atmosphere with the market, with a solid institutionalism. The country has a great opportunity to recover the strategic role that nature and geography have granted it, permitting and promoting the complete interconnection of the Pacific and Atlantic energy markets in South America. Colombia, which has maritime outlets to both oceans, and Brazil, the great neighbour in the region, are also major stakeholders.

The most important question to speed up this new period of energy integration is to win back trust between the countries. The advantages of integration must serve to overcome the mistrust created in the past. The governments must consider these factors when making decisions. International support and sponsorship by each of the governments involved are crucial for guaranteeing institutionalism, coordination and economic feasibility[40].

Unconventional Hydrocarbons

Latin America is one of the regions with the greatest potential for developing unconventional energy resources, outside the USA. The Latin American countries with the greatest resources of recoverable shale gas are Argentina (22.7 tcm), Mexico (15.4 tcm), Brazil (6.9 tcm) and Venezuela (4.7 tcm). In the case of shale oil, they are Argentina (27,000 mb), Venezuela (13,400 mb), Mexico (13,100 mb), Colombia (6,800 mb) and Brazil (5,300 mb)[41].

Argentina is the only Latin American country that currently produces unconventional oil in commercial amounts, with a production of over 50,000

[40] VIDJEN, Gabriela, "Energy Integration", Institute of the Americas, Latin America Energy Outlook 2016.

[41] EIA/ARI World Shale Gas and Oil Resource Assessment, June 2013.

barrels per day of oil equivalent[42]. Colombia awarded its first contracts for drilling in blocks with potential shale deposits in 2012 and established regulations for exploration by hydraulic fracturing in 2014. In Mexico, the State-owned oil company Pemex produced its first shale gas at the beginning of 2011, from an exploratory well, and is planning to auction unconventional fields as part of its first round of competitive tendering now that the oil sector has been opened up to private investment.

The three countries are undergoing major changes where energy policy is concerned. Argentina has recently elected its first market-oriented government in years, Mexico is carrying out radical energy reforms and Colombia is reforming its incentives to attract investment with lower oil prices. Each of these countries has applied, to different extents, environmental regulations for the development of *fracking*. However, those responsible for drawing up regulatory policies must carry on improving the standards and practices, concentrating on two areas: relaxing and balancing the framework of state, regional and local regulations, as well as improving transparency and public communication[43].

Unconventional development in Argentina is still at the early stages. The unconventional reserves at Vaca Muerta in the west of the Province of Neuquén have attracted the interest of domestic and foreign companies. Shale resources run towards the south through the San Jorge Gulf Basin and towards the Austral-Magallanes Basin in the far south tip of Argentina and Chile. Although many companies are exploring opportunities, the oil and the shale gas have not yet been extracted in significant volumes in Argentina.

The new Argentinean President Mauricio Macri is committed to increasing foreign investment in the oil and gas sector, especially in unconventional development. In contrast to the previous Government's approach involving the negotiation of agreements with individual energy companies, it is hoped that the new Government will be more methodical, basing itself on the Law, which includes greater clarity regarding federal environmental standards.

Argentina has a two-level federal and provincial structure for the environmental regulation of hydrocarbon activities. The Constitution grants the provinces authority over the environmental regulation of oil and gas. The Federal Government can set minimum environmental standards that all the provinces must fulfil. The Ministry of Environment & Sustainable Development was recently raised from being a Secretariat to the status of Ministry by the new Government, adding further weight to federal environmental policies. Furthermore, every hydrocarbon producing province has its own energy department, and many provinces have their own State-owned energy company that can collaborate with private companies in order to develop oil and gas resources.

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42 "YPF announces that its production in Vaca Muerta exceeds 50.000 barrels per day," YPF, 9th October 2015.

43 EIA/ARI World Shale Gas and Oil Resource Assessment, June 2013.

Although Argentinean federal legislation and the regulatory process are slow, regulations at a province level have the potential for being much more adaptable to the specific needs of each province.

At present, there is very little opposition to unconventional development in Argentina outside the producing regions. Within the production zones there is considerable support for development in order to boost the economy, but some cities have tried to ban the activity within their jurisdiction. On a central government level and within the region of Greater Buenos Aires, where the general public has no direct experience with oil and gas development, some discussions are taking place about the pros and cons of unconventional development[44].

In Mexico, in spite of proximity to the frontier, where a great deal of activity is taking place in this sense, unconventional energy resources have attracted very little investment so far. Before December 2013, legal restrictions limited Pemex development and the company concentrated its limited investment capacity on more lucrative opportunities in the traditional oil and gas provinces. However, the recent energy reforms have opened up the *upstream* sector to private investment, including *fracking*. Although development may be slow, owing to the limited infrastructure, the security concerns and the low oil and gas price frame, the National Hydrocarbons Commission announced in July 2016, a fifth call for unconventional ground resources in March 2017[45].

Mexico has a strict policy for establishing regulatory and legal processes, with limited flexibility for adapting to specific situations or circumstances. This stiffness is designed to prevent actual or perceived corruption, but it also limits the system's ability to respond appropriately to the industry's changing standards.

Relations with local communities and public opinion could take a higher profile when unconventional development begins in earnest. Mexico needs the companies to consult the indigenous communities before developing, to protect these groups from the undesired encroachment of their land, although they do not have the power of veto over the projects. To reduce the risk of local interference in the development of the project, Mexican Law gives precedence to hydrocarbon activities over all other land use, potentially even above the preferences of the landowners Similar provisions for wind energy development are now undergoing teething troubles and the same could well happen to *fracking* in the next few years, because the local communities are affected by the conventional oil and gas development from the recent tenders.

Most of the shale deposits in Mexico are located in areas that are already producing oil and gas or in remote and sparsely populated regions. Although the

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[44] Ibid.

[45] Sputnik, "Mexico launches Round 2 of the oil contract tenders", 19th June 2016. Please refer to: https://mundo.sputniknews.com/economia/201607191062214313-mexico-segunda-ronda-licitations/.

Mexican Government is actively promoting unconventional development, there is still limited public awareness about the associated environmental questions. Nevertheless, some NGOs are working to raise awareness and give shape to the government policy. Once the Mexican Government starts to auction blocks of shale, it could come up against increased public pressure[46].

Colombia's unconventional energy resources have attracted the attention of major oil companies, including ExxonMobil and Shell, and the Government carried out its first shale gas exploration licence auction in 2012. However, the most recent exploration rounds have been disappointing. In 2014, only one of the eighteen unconventional blocks offered received bids. Although Colombia has already presented a series of shale blocks and there is substantial interest in the industry, the sector is still at the early stages of development.

Colombia does not have a federal system, just one single government with responsibilities delegated on national, regional and local levels. The country benefits from a simplified coordination, but it could find greater difficulties when it comes to adapting its policies and applying them to local circumstances. National legislation and the regulatory process in Colombia are long-winded and the regional bodies have limited jurisdiction over the environmental supervision of the oil and gas industry activities. It is necessary to keep on working to establish the environmental requirements at the production phase. The uncertainty surrounding the environmental regulations for unconventional oil and gas production is one of the reasons for a loss of interest in unconventional development in Colombia.

The oil companies have also refrained from investing in Colombia's unconventional blocks for fears that local opposition will block the development of the project. As is the case with Mexico, Colombia has provisions for prior consultation with the indigenous communities for activities associated with oil and gas on their land. Colombia also allows the compulsory award of rights of way and other land uses, with compensation if the oil and gas companies fail to reach a negotiated settlement with the owner. As a result, any judicial decision that is considered unfair to the local communities or landowners could trigger off a reaction against the development of *fracking*.

In 2012, when the first blocks were tendered, there was a great deal of public concern about oil and shale gas development. More recently, the sharp fall in oil prices and the lack of success in attracting investors and replenish Colombia's oil and gas reserves have meant that the public is not so concerned about the threat to the environment. Yet the Government needs to carry on granting exploration licences in new areas in order to keep up the life of the country reserves -of only 6 years, and it seems committed to auctioning more unconventional blocks in the future[47].

[46] EIA/ARI World Shale Gas and Oil Resource Assessment, June 2013.
[47] Ibid.

Energy Situation Affecting Main Latin American Countries

Venezuela

As has already been pointed out, Venezuela is the sleeping giant of Latin America as far as energy is concerned, although so far has proved to be a giant with feet of clay. As a founding member of the Organization of the Petroleum Exporting Countries (OPEC), it is a major stakeholder in the world oil market. It has the biggest oil reserves in the world (17.7%) with 300,900 mb and is tenth in production (3.1%) with 2.6 mb/d[48]. Yet its production has fallen significantly from its peak at the end of the 1990s because the Government has reinvested the petrol profits in social programmes and regional leadership instead of reinvesting them in exploration, production and refining. The country also has the largest natural gas reserves in the region (5.6 tcm), a lot of these resources being used to enhance production in its oilfields.

Venezuela is the second largest Latin American exporter of oil to the USA, after Mexico. Furthermore, the USA has advanced refineries specifically designed to cope with Venezuelan heavy crude oil and, in spite of the reduction in imports from Venezuela, US exports of oil products to Venezuela have increased, mainly because of the country's financial problems, which are preventing it from investing in and maintaining its own domestic refineries. The second and third destinations for Venezuela's crude oil exports and those with the most rapid export growth are India and China. The IEA estimates that in 2014 Venezuela sent more than 300,000 b/d of crude oil to India and 218,000 b/d to China. Exports to China have increased substantially after China signed a loan-for-oil agreement with Venezuela. According to IHS Energy, loans from China have amounted to 56 thousand million dollars since 2007. Thanks to the Petrocaribe project Venezuela provided a considerable amount of crude oil and refined products to 19 Caribbean and Central America countries, offering favourable financing and long repayment deadlines, which often included goods exchange arrangements instead of cash transactions. Economic difficulties have required the country to cut down this project considerably[49].

Venezuela allows foreign countries to invest, but requires a consortium in which PDVSA, the State-owned company for Petroleum, holds at least 60% of the capital. In recent years, Venezuela has improved its 2,750 mile long gas pipeline network that connects the eastern and western parts of the country, making natural gas more easily available to domestic consumers and for reinjection into the western oilfields. The country also has a gas pipeline linking it with Colombia. Major state-owned companies dominate the electricity sector in Venezuela, which covers over 60% of its requirements with hydroelectricity. Half the electricity generated from fossil fuels in Venezuela comes from natural gas, the rest from oil by-products[50].

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48 BP Statistical Review of World Energy, June 2016.

49 US Energy Information Administration: Venezuela international energy data and analysis, November 2015.

50 Ibid.

The sharp fall in international oil prices, together with unsuitable macroeconomic and microeconomic policies, have led Venezuela to an economic, social and political crisis of enormous proportions, having a GDP decrease of 8% in 2016[51]. What is more, as the country did not save during the economic boom, it is unable to absorb the required macroeconomic adjustment.

There is great uncertainty surrounding the country's future, and social disturbances cannot be ruled out. However, there is some hope of a political change. Such a transition could be disorderly, but the giant with feet of clay could finally waken. After the partial expropriation of foreign companies between 2005 and 2007, the country unsuccessfully tried to attract significant investments in the oil sector. As production continued to decline, after oil prices plummeted the Government became increasingly pragmatic –or desperate if you wish– and started to offer foreign partners more appealing taxation conditions, a greater control of operations and cash flow and projects that involved less significant buried investments. Things gradually began to move, with Chevron paving the way by negotiating a new type of contract. In the next few years Venezuela could become the centre of regional attention. Low prices combined with the Government's bad reputation and its terrible macroeconomic management are the major challenges. However, the energy sector offers the only hope of recovery for this or any other administration[52].

Brazil

The other regional geopolitical energy pivot is Brazil. It is the seventh largest oil consumer in the world (3.2%) with 3.16 mb/d and the tenth greatest world producer (3.0%) with 2.59 mb/d. It has 13,000 mb of proven reserves, which amount to 0.8% of the world total. It is also the third largest global consumer of hydroelectricity (9.1%). Brazil is also responsible for almost one-third of the crude oil that is refined in Latin America, with a capacity of 2.3 mb/d[53].

The drop in oil prices, difficulties in obtaining international credit, the major corruption scandal and the consequent political instability, caused the country to fall into a sharp decrease for two consecutive years, with 3.5% in 2016. A slight recovery is expected in 2017[54].

Petróleo Brazileiro S.A. (Petrobras), controlled by the State, is the predominant company in the Brazilian oil sector, is also a world leader in offshore oil exploration, and plays a major role in *upstream*, as well as in *midstream* and *downstream*. The new President, Michel Temer, has pushed through major legislative changes to attract foreign investment. Petrobras, with a debt approaching 27,000 million

[51] IMF Economic Prospects. http://www.imf.org/external/pubs/ft/reo/2016/whd/eng/pdf/wreo1016s.pdf.

[52] Latin America Energy Outlook 2016, Monaldi, Francisco J., Venezuelan transition.

[53] BP Statistical Review of World Energy, June 2016.

[54] IMF economic prospects. http://www.imf.org/external/pubs/ft/reo/2016/whd/eng/pdf/wreo1016s.pdf.

dollars, lacks the capacity to be the only operator in the consortiums for the *Pre-salt* mega-deposits, so in October 2016 the Lower House in the Brazilian Parliament reformed the Oil Act, enabling foreign companies to control. The project means that it is no longer mandatory for Petrobras to operate with at least 30%, as was required by the Act before, in all the oilfields discovered in 2007[55].

According to the NPA, half the natural gas consumed by Brazil comes from abroad, 32 bcm from Bolivia and 17.9 bcm from LNG imports. Petrobras operates the Brazilian natural gas transport system via its subsidiary Transpetro. The network has more than 7,270 miles of pipeline, mainly in the south-east and north-east areas of the country. The other major natural gas market in Brazil is the Amazon region. In 2009, Petrobras completed the construction of the gas pipeline linking Urucu with Manaus. This project is expected to enhance the development of the considerable natural gas reserves in the Amazon.

Most of Brazil's total energy consumption is oil and other liquid fuels, followed by hydroelectricity and natural gas. In 2014 fossil fuels accounted for around 60% of the national energy supply in Brazil. Renewable energy sources, including hydroelectric power and biomass, amounted to just over 40% of Brazil's energy supply (three times the world average), with renewables accounting for more than 80% of the electricity mix. Brazil also comes second to the United States, in producing and consuming bioethanol and stands out as one of the most promising markets in the world for wind energy[56].

The most important challenge for the country in the short- and medium-term is to recover its political stability and put its macroeconomic indicators in order. In the oil and gas sector, Petrobras's limitations when it comes to financing capital intensive projects will probably persist, requiring the company to further review its strategy and redefine its position in the sector. In the electrical sector, the financial problems faced by some companies, together with difficulties in attracting investments and financing new projects, indicate the need for a thorough reassessment of the current business model and the regulatory standards. Finally, environmental concerns will continue to be even more important when defining the profile of the country's future energy combination and this should increasingly affect the sustainability of some energy projects. On the positive side, it is to be hoped that the current demanding conditions bring the necessary sense of urgency and determination so that the Government and other stakeholders make the difficult decisions that must be taken to support the much-needed Reforms in the energy sector and construct a solid path towards the future[57].

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55 Telam economía, "Brazil: the Oil Act changes and encourages foreign participation", 6th October 2016.

56 US Energy Information Administration, Brazil, international energy data and analysis, October 2015.

57 Latin America Energy Outlook 2016, Hollandai, Lavinia, Macroeconomic & Political Instability.

Mexico

Mexico is the third biggest oil producer in Latin America with 2.59 mb/d and 2.9% of world production. Where proven reserves are concerned (0.6% of the worlds) its position is considerably lower, with 10,800 mb. Its natural gas production is 53.2 bcm, 1.5% of world production[58]. It is also one of the main sources of oil imports from the United States. In 2005, it exported to the US 781,000 b/d, which amounted to 11% of that country´s crude oil imports[59].

Currently, the most relevant issue is the comprehensive energy reform that the Mexican Government initiated in 2013 and that is transforming the energy sector. The reform brings to an end the monopoly of Petróleos Mexicanos (PEMEX) and reshapes the structures that have governed the energy sector for more than 80 years. Its aim is not only to encourage new investments and implement new technologies in the hydrocarbon value chain, by attracting new stakeholders to the energy sector, but also to guarantee profitable investment in electricity sources, both traditional and low in CO_2. It is likewise showing great commitment to environmental matters, especially to COP21.

The planned reform is founded on three pillars. Firstly, it is trying to mitigate the current decrease in shallow-water wells, which account for 70% of current production, by improving oil extraction techniques and constructing satellite fields around the main production complexes of Cantarell and Ku-Maloob-Zaap. However, as a second pillar, the main future growth source is expected to come from the deep-water fields, which represent almost half the oil production planned for 2040. This is a new area for Mexico, one where PEMEX has less experience and where it is expected that other companies, alone or in association with PEMEX, will play a prominent role. The third and final pillar is the potential for Mexican continental shale in the vast and difficult Chicontapec field[60].

Investment is just as crucial for revitalising Mexico's *downstream* sector, which is being burdened by poor performance, prompting the import of petrol catering for about 50% of the total demand. Modernising the refineries is expected to raise the utilisation rates from a mere 60% at present, to 90% by 2040, reducing petrol imports to one third of the consumption and making it unnecessary to import any *diesel*[61].

According to IEA forecasts, crude oil production will fall to less than 2 mb/d around 2020 and will later increase as the Reform begins to bear fruit, as long as new projects –especially in deep waters– start to operate and oil prices

[58] BP Statistical Review of World Energy, June 2016.
[59] US Energy Information Administration: Mexico international energy data and analysis, September 2015.
[60] IEA, Mexico Energy Outlook, World Energy Outlook 2016.
[61] IEA, Mexico Energy Outlook, World Energy Outlook 2016.

improve profitability. In 2040, crude oil production will rise to 2.4 mb/d, but if natural gas liquid fuels and some shale oil are added, the total production will reach 3.4 mb/d in 2040[62].

The fall in prices has also had its bright side: the better conditions for importing natural gas from the USA have given a positive boost to the Mexican electrical sector. Furthermore, energy consumption per capita stands at 40% of the average for the OECD, so there is still significant growth potential[63]. The total energy consumption in Mexico in 2014 was mainly oil (45%), followed by natural gas (40%). Natural gas is gradually taking over from oil for the generation of electrical power, for which the country also counts with growing geothermal and wind capacities. Given that the Mexican economy is more energy-oriented than the average for the OECD and as it has only shown limited improvements since 2000, there are opportunities for energy saving.

Argentina

The political change, the expected resumption of economic growth as from 2017 and the reforms implemented in the energy sector, suggest a favourable scenario for investment. However, Argentina must improve its image as a reliable country in the medium- and long term, in order to be able to make the most out of the great gifts it received from nature.

Unconventional hydrocarbon resources –already described before– place Argentina second in the world unconventional gas ranking and fourth where oil is concerned, which would enable it to multiply its gas reserves by thirty and petrol reserves by nine.[64] The progressive decline in production of both resources from conventional deposits, together with the constant increase in demand for hydrocarbons –which is causing an energy deficit– makes it essential for this country to develop unconventional resources.

Gas (53%) and oil (34.5%) account for nearly 90% of hydrocarbon energy consumption. The use of hydraulic energy (4%) and nuclear energy (2%) has also risen over the past forty years. Wind and solar energy are still incipient and have very little effect on the country's total energy supply. However, they are gradually becoming more important for electrical power generation and it is expected that in the coming years their share in the overall energy matrix will increase. Over 60% of the electricity is produced in thermal power plants that are mainly gas operated[65].

62 IEA, Mexico Energy Outlook, World Energy Outlook 2016.
63 IEA, Mexico Energy Outlook, World Energy Outlook 2016.
64 http://energiasdemipais.educ.ar/.
65 http://energiasdemipais.educ.ar/.

Argentina, which is equipped with 29,930 kilometres of gas pipelines linking the producing provinces with the capital and other demand centres, is also connected to Bolivia, from where it imported 5.7 bcm in 2014. The country also received 5.8 bcm of LNG that year, mainly from Trinidad and Tobago[66]. In 2016, it also imported Asian LNG from Chile.

Colombia

Colombia is the biggest producer of coal in Latin America, accounting for 1.5% of the world production in 2015. It is the fifth greatest exporter, 85% of its production going abroad. It has also become a major oil exporter and, although Colombia is only ranked sixth for oil reserves in the region with 2,300 mb (0.1% of world reserves), it is the fourth producer with 1.0 mb/d (1.2% of world production)[67]. The country is self-sufficient in natural gas and recently started to export to neighbouring Venezuela, with which it is connected by a gas pipeline.

Favourable investment conditions have caused Colombian crude oil production to double over the last 10 years. Furthermore, a series of regulatory reforms passed in 2003 made the oil and natural gas sector even more appealing to foreign investors. In addition, the Colombian Government partially privatised the State-owned oil company Ecopetrol in an attempt to revitalise its *upstream* oil industry.

However, the drop in oil prices since midway through 2014 has brought about a slowdown in drilling activities and new investments. As a result, oil production in Colombia has stagnated and production is expected to remain stable in the next few years. What is more, persistent guerrilla attacks on oil pipelines and gas pipelines in Colombia have caused continuous interruptions to supplies. In 2015, such attacks destroyed nearly 41,000 b/d of oil supply. Future oil production growth will require more extensive explorations and oil discoveries in order to replenish and augment Colombia's reserves, together with improvements to infrastructure security[68].

In 2015, the United States (370.000 b/d) was the main destination for oil exports from Colombia, followed by Panama. China has already expressed interest in financing new infrastructure projects in Colombia in order to transport oil to the Pacific Coast for export. The country currently has 7 main oil pipelines and 3 main gas pipelines.

Oil accounts for 37% of the total energy consumption, followed by hydroelectricity (26%), natural gas (25%) and coal (11%). Natural gas consumption increased by

[66] US Energy Information Administration: Argentina international energy data and analysis, March 2016.

[67] BP Statistical Review of World Energy, June 2016.

[68] US Energy Information Administration: Colombia international energy data and analysis, June 2016.

more than 60% in the past decade. Colombia is a net exporter of electricity, its neighbours Ecuador and Venezuela being the main customers. Hydroelectricity covers 70% of the electricity mix.

Peru

The Peruvian economy has grown rapidly since 2000, almost tripling its GDP per capita. The energy demand has also risen considerably, almost keeping pace with the economic growth. Peru has oil, natural gas and coal reserves and, in spite of its greater energy consumption, exports both oil and natural gas. The low prices of raw materials logically affected the Peruvian economy, which grew more slowly, yet the situation was not as serious as in other countries in the region. The IMF estimates a growth rate of 3.3% in 2016, after 2.5% in 2015[69].

As a result of the slowdown in economic growth, the energy demand has not reached the predicted levels. The major projects under way will lead the country to a period of surplus supply that will last until at least 2021. Combining hydro energy and gas, the country has developed a solid energy mix. Abundant and cheap energy is one of the comparative advantages that its mining and industrial sectors hold. There is great potential for exporting electricity to Chile, Ecuador and Brazil[70].

Crude oil production has been on the decline since midway through the 1990s. In 1994 Peru produced 128,000 b/d and in 2015, 110,000 b/d[71], but the country's total liquid fuel production has been enhanced by the increase in LNG production. As a consequence, the total liquid fuel production has been constantly rising in the last decade to an average of 180,000 b/d in 2014, of which nearly 60% were LNG. The Camisea gas field, located in the jungle in central Peru and discovered in 1984 is the flagship for the Peruvian energy industry. Peruvian natural gas production before Camisea was negligible, but by 2014 the country was producing 36.8 mcm/d. The project has enabled Peru to develop gas power plants that supply 50% of the country's electricity demand[72].

As is the case with the mining sector, the hydrocarbons companies face challenges to obtain environmental permits, social impact licences and approval from the affected communities. At the end of 2015, 30 blocks of hydrocarbons were in a deadlock situation for a variety of reasons, including 12 for reasons associated with environmental permits and 11 for social impact matters. In 2014, only seven blocks were made available for international tender. In 2013, the tender was suspended owing to a lack interest from investors. Some of

[69] US Energy Information Administration: Peru international energy data and analysis, July 2015.

[70] Oxford Business Group, "New projects and policy reform transform Peru energy".

[71] BP Statistical Review of World Energy, June 2016.

[72] Oxford Business Group, "New projects and policy reform transform Peru energy".

the most promising hydrocarbons reserves in the country are in the Amazon jungle, where the lack of infrastructure and a greater environmental impact can be added to the aforementioned problems, increasing costs and causing longer delays. The Camisea Project was developed using a mixed *offshore-inland* model that made it unnecessary to construct roads to the spot, the equipment and work force either arriving by helicopter or by barge from Manaus, Brazil. Because of the challenges involved in working in a tropical jungle, the exploration companies have concentrated their efforts in the north-west of the country[73].

Ecuador

Ecuador is the smaller producing country in the OPEC. It is fourth in the reserves ranking in Latin America (8,000 mb) and is its sixth largest producer. In 2015 the country produced 543,000 b/d of oil and other liquids[74]. The oil sector accounts for over half its export income and approximately two fifths of the public sector income. Oil production in the country has been stagnating in the last decade but has shown a slight rise in the past few years. Ecuador exports about 70% of the crude oil it produces[75].

Resource nationalism dominates national politics. All hydrocarbon resources in Ecuador belong exclusively to the State, who restricts foreign investment in the sector. Foreign companies can sign service contracts in exchange for a fixed rate per barrel for their exploration and production activities. This legal framework in Ecuador continues a trend towards resource nationalism policies.

Since 2009, Ecuador has signed many oil agreements with China that explicitly guarantee oil exports to the latter in exchange for loans, which require Ecuador to invest part of the amounts loaned in projects involving Chinese companies. They have been applied to the development of hydroelectric complexes and other energy-related projects. China is also loaning large amounts to Ecuador coinciding with oil supply agreements.

The reserves mainly lie in the east of the country, in the Amazon jungle. The largest (846 mb) are in the Ishpingo-Tambococha-Tiputini fields inside the Yasuni National Park. To protect the biodiversity and prevent the displacement of two isolated indigenous cultures, oil-extraction activities were suspended in those fields from 2007 until President Correa lifted the moratorium in the summer of 2013. Its development could be politically and economically complicated, because, in order to minimize the cost ant the environmental damage, foreign

[73] Oxford Business Group, article: New projects and policy reform transform Peru energy.
[74] BP Statistical Review of World Energy, June 2016.
[75] US Energy Information Administration: Ecuador international energy data and analysis, March 2015.

investment and horizontal drilling experience are required. Resistance to the development of indigenous groups' also poses challenges.

Ecuador has three commercial oil refineries, with a joint capacity of 176,000 b/d and does not have sufficient capacity to meet local demand, what means it has to import refined products, thereby limiting net oil profits. There is a project with Venezuela and Chinese financing to construct a new refinery. The country has two main oil pipelines that connect the interior of the country with the Balao oil terminal, on the Pacific Coast, and the TransAndino Pipeline that links the oilfields of Ecuador with the Colombian port of Tumaco. Ecuador's energy matrix depends to a large extent on oil, which accounts for almost 80% of the country's total energy consumption. Hydroelectricity constitutes over 45% of the electricity mix. Gas and renewables are of secondary value[76].

Bolivia

According to CEPAL estimates, in 2016 Bolivia's growth rate, the biggest in South America, will become more moderate, standing at 4.5% (it stood at 4.8% in 2015 and 5.5% in 2014). Domestic demand will continue to be the driving force of growth, mainly supported by a well-programmed increase of public investment. After the fall in oil prices, the country's external position has been protected thanks to its extensive international reserves and its small foreign debt. The hydrocarbons sector, with gas in the front line, was a driving force for growth until prices plummeted. Bolivian hydrocarbon exports accounted for half the total income from exports. The country was augmenting its industrial development, especially for the production of petrochemical liquids and natural gas, and is expecting an increased gas demand in the coming years.

Foreign and domestic investments have enabled natural gas production to increase twofold over the past decade, reaching 20.9 bcm in 2015[77]. Bolivia is a key supplier of natural gas to Brazil and Argentina via the gas pipelines. Bolivia is trying to diversify its export markets, examining the potential for sending its natural gas to both Peru and Uruguay. By connecting to the South Peruvian Gas Pipeline, currently being constructed in Peru, and with the port of Montevideo in Uruguay, it can access both oceans and reach other export markets[78].

The domestic demand is growing, mainly in the electricity sector, industries and household gas expansion. The electricity sector alone, consumed 43.47% of the domestic demand until June 2015 and it is estimated that in 2016 it will exceed

[76] US Energy Information Administration: Ecuador international energy data and analysis, March 2015.

[77] Economía Boliviana, article: The electricity sector consumes more than 43% of domestic gas, 12th June 2016. Please refer to: http://www.economiabolivia.net/2016/06/12/el-sector-electrico-consume-mas-del-43-del-gas-interno/.

[78] US Energy Information Administration: Bolivia international energy data and analysis, July 2015.

45%. In 2016 it had to reduce exports, so Brazil and Argentina have expressed their doubts that Bolivia can comply with its commitments in the future[79].

The electrification rate of 88% conceals the great difference between urban and rural settlements: more than 99% of those living in cities have access to electricity, compared to 66% of the inhabitants of rural zones. The natural gas plants and hydroelectric power are the main sources of electricity in Bolivia for those who have access to it. Traditional biomass is an important fuel for heating and cooking, especially for the 1.2 million Bolivians who have no access to electricity, according to the latest estimates made by the International Energy Agency, in 2012[80].

Chile

Chile is the only member of the OECD in South America. It is the fifth biggest energy consumer of the continent, but unlike most of the other major economies in the region, it only produces a small amount of fossil fuels, so it depends to a large extent on energy imports.

Chile has undergone severed energy supply incidents in the past decade, including major droughts, a continuous gas supply cut-off from Argentina and an earthquake in early 2010 that affected the electricity grids and refineries. The country has now managed to overcome the situation: energy costs have dropped, renewable energy is growing and the country is full of energy investment. Last year, more was invested in energy than in mining, to the extent that in 2016 the country began to export electricity and natural gas to Argentina. In 2010, the Energy Ministry was established, who encouraged competition and carried out long-term planning to use the energy sources that nature has offered the country: solar radiation in the Atacama Desert, excellent wind conditions, favourable water streams and 4,000 kilometres of coastline. The drop in the price of renewable technologies in the last five years has helped, and now they can compete with traditional technologies under the same conditions.

In view of the country´s odd and sinuous geography, Chile's energy markets are cut off from each other, mainly because the regional gas and electricity networks are not connected. In the arid north, the energy demand is dominated by the mining industry, operating with a separate electricity grid: the thermal-based Great North Interconnected System (SING). The more densely populated central region (including Santiago) operates on the more hydro-dependent Central Interconnected System (SIC). The southernmost regions, which are

[79] Economía Boliviana, article: The electricity sector consumes more than 43% of domestic gas, 12th June 2016. Please refer to: http://www.economiabolivia.net/2016/06/12/el-sector-electrico-consume-mas-del-43-del-gas-interno/.

[80] US Energy Information Administration: Bolivia international energy data and analysis, July 2015.

also the richest in hydroelectricity, are not connected to the rest of Chile where electricity and gas are concerned[81].

Conclusions

Latin America offers enormous potential in the energy sector, and it would seem that the obstructions are gradually being overcome. Investments are essential and will only be made in the amounts necessary if the governments, which must encourage and organise the regulatory and administrative frameworks, change many of the defects of the past. Paradoxically, the crisis arising from the fall in crude oil prices is having positive effects, because it does not leave many options open other than the reasonable ones. With overproduction, low prices and little international liquidity, in order for the solutions to be feasible, they have to take into account the interests of all parties concerned, which requires dialogue and flexibility. Renewable energies are already a reality in a region with a great future. Many successful cases and a particularly generous nature allow for optimism. In the long term, reliability and a legal security that can withstand false national interests, is the real challenge.

Medium- and long-term geopolitical tensions play in favour of Latin America, who must progress in security and stability when the world would appear to be moving in the opposite direction. If no serious event occurs to prevent it, China's rise to become the world's first economic power will gradually transform the international geopolitical order, which will probably revalue Latin America as a supplier of energy resources. Spain and its companies, with its special link with Latin American countries, are destined to carry on playing a major role in the development of regional energy.

[81] US Energy Information Administration: Chile international energy data and analysis, August 2015.

Chapter IV

Energy geopolitics in the Mediterranean

Pedro Moraleda

Abstract

Things have been changing substantially in the Mediterranean Region since the beginning of the current decade. While the so called "Arab Spring" influences the political and economic agendas of Southern Mediterranean countries, their Northern neighbours are still struggling to recover from the global financial crunch.

Both crises are having an impact on the traditional energy exchanges. The trade of primary energy sources may no longer be a binding element between the Mediterranean neighbours, but emerging challenges in a new energy context provide new opportunities to reinforce cooperation for mutual benefit and for many years to come.

Keywords

Barcelona Process, Union for the Mediterranean, Arab Spring, energy transition, Intended Nationally Determined Committments (INDCs).

Executive Summary

The Mediterranean, a Sea of Opportunities

So many changes have taken place in the Mediterranean Basin in the last five years that it is worth while to reflect on how the different situation could affect relations between the Mediterranean neighbours and, more specifically, cooperation where energy is concerned.

Apart from the political changes, dramatic in some of the South Mediterranean countries, there are the economic, technological and environmental changes, all of them having a major impact on the traditional energy model.

Fossil fuels export capacity from North Africa has been reduced either by the "Arab Spring" events or by energy policies that have failed to adapt to the new market dynamics.

As the offer of energy commodities from the South has decreased, the energy demand in the North has stagnated. Europe is making a difficult recovery from the global financial crisis and the growth prospects for the demand seem limited in view of the European Union climate and energy policy, a policy that has been reinforced by the Paris Climate Agreement at the Conference of the Parties (COP21) in December 2015.

The trade of fossil fuels is thus no longer the main vector for regional cooperation. Although it is still important in economic terms for some countries, this is not so much so in the case where creating dependence and prospects is concerned.

Technology is another factor that has brought about change. In the past five years, new electricity generation sources such as wind and solar energy have progressed enabling them to compete with the traditional sources. The Mediterranean is especially well provided with wind and sunlight and the percentage of these sources in the energy mix is rising rapidly.

Electrification of the energy demand is also progressing throughout the entire Region and, in the South, the capacity for generating and supplying electricity has become a priority. Furthermore, if this demand in the Maghreb and the Mashrik countries is not coped with in a sustainable way, the medium- and long-term problems will be serious and will have an extremely negative impact on the entire Mediterranean Basin.

Organising the resources to cater for emerging electricity requirements may be a cooperation vector supplementary to the exchange of fossil fuels.

The transition from fossil fuels to other types of sources has major geopolitical consequences and seems to be a secure option in the Region. The energy transition is a secure bet because there is plenty of room for energy efficiency improvement, there are abundant renewable sources and because emission reduction is an urgent matter since the Region is particularly sensitive to climate change.

The needs are clear and the means exist, but what is yet to be found is a cooperation framework reached by consensus and one that is more ambitious than a simple agreement for exchanging goods. Europe cannot regard North Africa as a mere supplier of cheap labour and raw materials, and the countries of North Africa cannot carry on treating European companies with the historical reservations that deter them from establishing themselves on the local markets. As Germaine Tillion recalls, the Europeans and their Arab neighbours may have been historical enemies, but they are complementary enemies.

A Mediterranean "partnership" cooperation framework of the type proposed at the Euro-Mediterranean Forum in Barcelona (1995) is the objective but it cannot carry on being no more than just an objective 20 years later.

Spain can play a major role in turning this objective into a reality. Spain has always been a point of reference in the North-South rapprochement and it is positioned as the western bridge not only because of its geographical location but also due to its past relations and present trading links. Therefore, it should be one of Spain's aims to contribute to cooperation and progress throughout the region in order to ensure that the Mediterranean is a sea of opportunities, not a sea of immigrant dinghies.

Introduction

The quantitative information compiled by the Mediterranean Energy Observatory (OME) is the basic source used to analyse the current situation and prospects, because their data focuses precisely on the countries in the Region. Among the scenarios proposed by the OME, we will be following the "conservative" one, which takes into account historic trends and the policies and plans currently being implemented. That is to say, a scenario that does neither include disruptive technological developments, nor voluntarist targets of governments nor the optimisation of the opportunities that constitute OME's alternative scenario, which they call "proactive scenario".

Whenever more updated information from authorised bodies has been taken into account -even if contradicting OME data-, the source is expressly indicated. I would like to thank Francisco P. de la Flor and Abel D. Enríquez from Enagás, Juan Manuel Rodriguez from Red Eléctrica Española and Angel L. Bautista and Luis Arribas from Repsol, for giving their advice on parts of this analysis. The author's opinion, based on years of contact with authorities and business leaders in the Region and on his involvement in the OME studies, has also been considered in this study.

As less is known about the South and the East of the Mediterranean countries, they have been analysed in greater detail using information from their own authorities and specialized sources.

We have included the 25 countries in the Mediterranean Basin or "the Region", considered by the OME. In the North: Portugal, Spain, France, Italy, Slovenia, Malta, Cyprus, Greece, Albania, Bosnia-Herzegovina, Croatia, Macedonia, Montenegro and Serbia. In the South: Morocco, Algeria, Tunisia, Libya, Egypt, Israel, Jordan, Lebanon, Palestine, Syria and Turkey. They cover a total surface area of 9 million km^2 and had 512 million inhabitants in 2013, a population similar to that of the European Union, amounting to approximately 7% of the world's population.

Image 1. Political Map of the Region.

The Gross Domestic Product (GDP) in the Region was 8,180 billion US dollars in 2013 (PPA 2015), which was about 10% of the world's GDP, and the *per capita* income was $16,000, around two-thirds of the Spanish *per capita* income that year.

Primary energy demand was 990 million tonnes of oil equivalent (Mtoe), over 8 times the Spanish demand. Electricity consumption *per capita* stood at 3,330 kWh, about half the consumption in Spain. Fossil fuels account for 76% of the energy matrix in the Mediterranean Basin.

The Region contains 4% of the world's proven gas reserves and approximately the same percentage of oil reserves. However, the Region is energy deficient and needs to import half its total energy requirements.

Apart from maritime transport resources, major infrastructures developed in recent decades have helped to make energy trade between the countries of the Region easier and to strengthen economic and commercial ties between neighbours.

Geopolitical Environment

North–South imbalances

The first aspect that must be stressed when conducting a geopolitical analysis of the Mediterranean Basin is the major North–South imbalance, an imbalance that has historically existed despite geographical proximity, intensive trade and a shared history.

At present, the countries on the two coastlines have similar population. However, the North Mediterranean population is expected to remain stable, whereas the number of inhabitants in the South is likely to increase by 100 million in 25 years. That is to say, the Mediterranean Basin will have an extra population by 2040 equivalent to a new country like present-day Egypt.

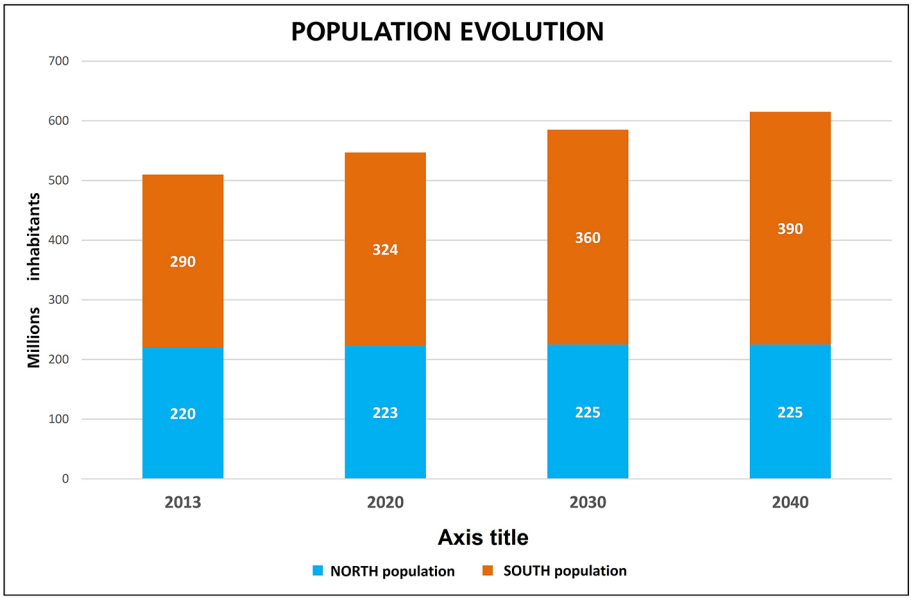


Image 2. Evolution of Population. Own elaboration based on data from the Observatory Méditerranéen de l'Energie (OME).

As far as income is concerned, the North has an average income nearly three times as great as the South.

Two-thirds of all the primary energy demanded by the Region is consumed in the North. The difference in consumption is expected to balance up in the next 15 years, given that the demand will remain at a virtual standstill in the North, whereas in the South it will tend to double owing to the foreseeable population increase plus their income rise.

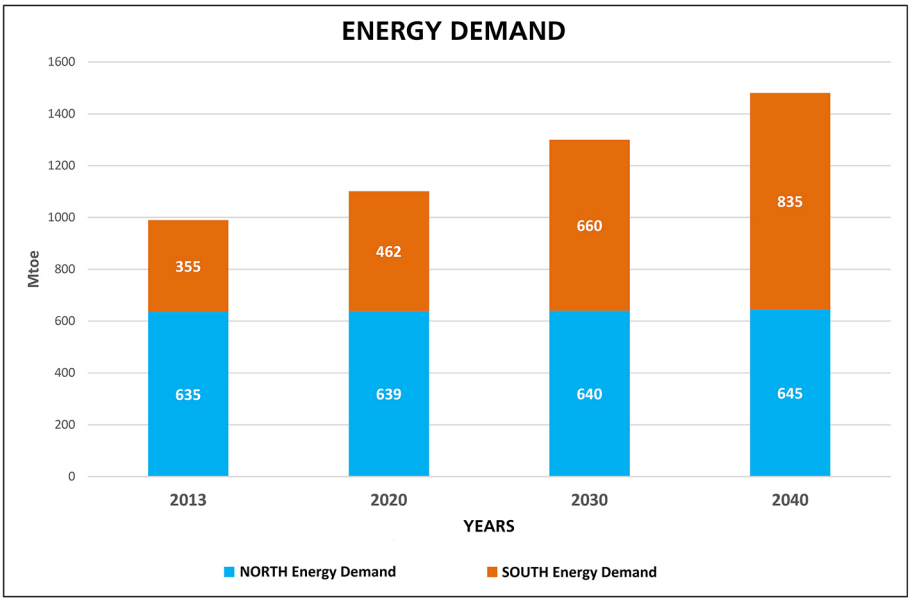


Image 3. Energy Demand. Own elaboration based on data from the Observatory Méditerranéen de l'Energie (OME).

The trends are also different regarding dependence on external supplies and on fossil fuels. The North tends to reduce its external dependency and its fossil fuel's quota thanks to energy efficiency improvements and to the implementation of renewables. On the contrary, the transition towards a cleaner and more efficient energy model is slower in the South and its reliance on supplies from other regions may be much greater in the coming decades unless indigenous resources and hydrocarbon exploration and production are promoted.

The way how electricity demand evolves is another indication of the North-South imbalance. In absolute terms the countries in the South currently consume half as much electricity as the countries in the North but, in a conservative scenario, of the "business as usual" type, the electricity demand in the South will exceed the demand in the North in 20 years time.

The use of renewable energy sources is closely linked to electricity generation. Here too there is a great difference between the generation "mix" in the Mediterranean countries. In the North, nearly 30 % of the electricity is now generated from renewable sources, including hydraulic, whereas in the South renewables only account for 15%, of which over 80% consists on hydraulic power. The trends regarding the utilisation of renewables are even more unequal in spite of the commitments to reduce emissions submitted by the South Mediterranean countries at the Paris Climate Summit.

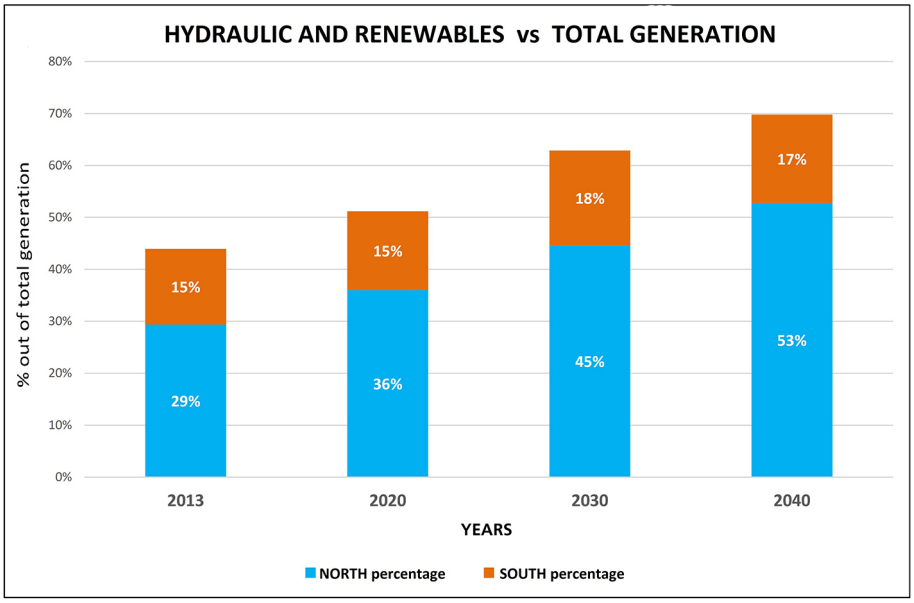


Image 4. Hydraulic and Renewables vs Total Generation. Own elaboration based on data from the Observatory Méditerranéen de l'Energie (OME).

Complementary imbalances

There are as many complementary factors as there are imbalances. North and South complement each other in demography, economy, natural and technological resources and even in security. All these complementarities are incentives to work together rather than bring about greater imbalances or unsustainable migratory flows.

Apart from providing technology, financing, experience in energy management, etc. as part of Mediterranean cooperation, Europe can help to anchor Africa close to the OECD countries. Besides, Europe needs the entire African continent because Africa has all that Europe needs: youth, markets, raw materials, investment opportunities, etc.

Energy is one of the most effective levers to promote collaboration. Hydrocarbons used to be what linked the North and South, whereas a clean and secure electricity supply could now fill the gap being left by gas and oil; tomorrow it will be water supply, because without water there is no life, yet without energy it is not easy to have sufficient fresh water in the Mediterranean Basin.

The European Union has made great progress in the complex integration of its gas and electricity markets and, more recently, in the transition towards a sustainable energy model. The first process has taken more than 20 years and is not yet completed; the energy transition process is still at the early stages but plenty of experience has been gained about what should not be done.

The neighbours from the South will not require as much time or tough learning to carry out this transformation if they make use of the North's experience.

Rather than temporary collaboration, what is necessary is structural cooperation to enable both parties to benefit from a Region that is cleaner, more efficient energy-wise and socially more united.

The Mediterranean, a bridge to Africa and a crossroads between continents

The aforementioned imbalances and complementarities between Mediterranean countries can be applied to Europe and Africa as a whole. A strengthening of ties in the Mediterranean could be the first step towards a greater vertical integration between Europe and Africa, very advantageous for both.

Europe alone would lose importance and competitiveness in between today's two major power blocks, America to the west and Asia to the east. Africa does not play the role that it should internationally owing to its lack of internal unity and its low economic profile. Neither of the two continents individually, has the size or the resources to play a major role in an increasingly globalised world.

Africa is the only continent that will still be young in 20 years, where the population grows the most[1] and megacities spring up and, furthermore, it is rich in natural resources. In this magnified geographical environment, energy is clearly one key element for enhanced cooperation.

As Jean-Louis Guigou would say, the future of Europe is now being played out in the Mediterranean and tomorrow it will be played out in Africa[2]. That is why collaboration should be more intense as well as geographically wider.

Compared to other major powers, Europe undeniable has advantages when it comes to dialoguing with Africa but maybe it also has the drawback of having a "surplus of democracy", plus not speaking in unison but also talking too much; the "neighbourhood policy" would need to be more pragmatic and effective.

The Mediterranean is not only a bridge for North–South vertical integration, but also a bridge to another Region with clear economic synergy and great growth potential, i.e. the Middle East. Europe must increase its influence in this space before the other great powers do. In fact, China, which is basically trying to guarantee a supply of raw materials, is projecting an extremely positive image in the African continent thanks to its important investments[3]. Furthermore,

[1] 30% growth between 2014 and 2035; more than in China and in India according to BP Energy Outlook 2016.

[2] Jean-Louis Guigou, «Le nouveau monde méditerranéen».

[3] Gonzalo Garcia del Campo, IEEE, quoting the Global Attitudes survey in 2014 by the Pew Research Centre.

China's rapprochement to our Region is not meant only for Africa, because it seems to have chosen Greece as its springboard to the Mediterranean.

The Mediterranean has always been the trading crossroads between three points of great strategic importance: the Suez Canal, and the Straits of the Bosphorus and Gibraltar. The Mediterranean is a melting pot or, as Michel Chevalier said "*the* wedding bed for East and West". Strengthening the Mediterranean links again through converging needs would greatly enhance the Region's world geopolitical importance.

Energy as a vector in the Region's cooperation and development

Exchanging energy commodities has created ties and dependences between North and South, but this is losing importance and must be supplemented with new cooperation levers.

Firstly, because the traditional image of the countries in the South as energy exporters is no longer valid:

- Only one of the four major gas and oil suppliers that there were just over five years ago remains, which is gradually reducing its export potential owing to the drop in production and an increase in its domestic demand;
- There are prospects for new hydrocarbon exporters in the South, but the destination may not necessarily be Europe;
- The prospect of green energy export from the South is also fading away and, for the moment, the trend is quite the opposite.

Secondly, because Europe is no longer such an appealing energy market:

- Since the global financial crisis and as the economy turns towards the services sector, energy demand in Europe tends to stabilise;
- Efficiency improvements and the rapid development of indigenous renewable energies suggest that this trend will continue;
- Europe now has a wider range of potential suppliers and means of supply: the abundant LNG offer is connecting markets more than ever before and making the gas market global and more fluid;
- The transition towards a sustainable energy model is now the priority for the European energy policy;
- Both the fall in oil prices plus the rapid evolution of the renewable energy learning curve, have prompted the traditional producers to think beyond oil and to open up new windows for cooperation.

And thirdly, because recent events in the South call for a new cooperation model:

- Socio-political instability in the South makes investors think twice;
- Instability causes unemployment, desperation and uncontrolled emigration, that the North could attenuate by becoming more involved with the affected countries;

- The continuous drop in international oil prices detracts resources earmarked for social purposes and could bring about alarming social unrest in countries that depend in that income;

Finally, it is now a priority in the South to cater for a rapidly-growing electricity demand, and it is also essential to study what part of consumption can be avoided through efficiency before making further investment but, though transition is the path to follow, the South needs to keep up its income from hydrocarbon exports, so this has to be added to the Mediterranean energy challenges that we outline here below.

Towards a sustainable energy model

Primary energy demand in the countries north of the Mediterranean has decreased since 2010 and tends to remain stable, in line with the OECD countries where the population is not increasing, the economy is focusing towards the services sector and energy intensity is falling.

OME estimates concerning the fall in energy intensity in the North and the long-term oil demand, beyond 2030, seem cautious when compared to other analysts[4] but they already show the decline in energy demand and in energy dependence.

European oil demand reached its peak in 2005, it has dropped 17% since then and it seems unlikely that the trend will be reverted[5]. Estimates made by OME only two years ago perhaps did not assess how greater efficiency and gradual electrification would affect the automotive sector.

European gas demand is also either remaining stable, according to the OME, or descending, according to other analysts: the key will be its potential for backing renewables in electricity generation, which was its market of greatest growth potential. 5 Evolution of energy matrix in the North

By contrast, the energy matrix in the South is following a different pattern:

- Primary energy demand is growing on a par with the rapid GDP increase: it will almost double in 15 years, to reach 660 Mtoe and surpassing the North by 2030; in 25 years it will multiply by 2.3 up to 835 Mtoe;
- Decoupling of economic growth and energy demand is not foreseen until the 2030-2040 decade;
- A high dependence on fossil fuels will continue: above 90% until 2030;
- In terms of quantities, this will mean that in 2040 when compared to 2013: 185 Mtoe more gas (230%), 166 Mtoe more oil (210%) and 54 Mtoe more coal (220%) (i.e., about $140,000 million per year more);

[4] BP Energy Outlook 2014-2030, McKinsey's "Energy 2050: Insights from the ground up" and others.

[5] Shell's CFO in his presentation of results on 02.11.16.

- Dependence on foreign supply will rise: the countries in the South, currently self-sufficient as a whole, will have to guarantee the means for importing almost one third of their fossil fuels needs in 2040;
- The electricity demand will grow nearly more quickly than the primary energy demand and will almost triple by 2040;
- Natural gas is their fuel of option for generating electricity;
- The renewable energies, including hydraulic power, hardly increase their weight in the energy matrix: they remain between 6% and 7%;
- Energy intensity will hardly fall over the next 20 years;
- CO_2 emissions will more than double in 25 years, as a result of the above.

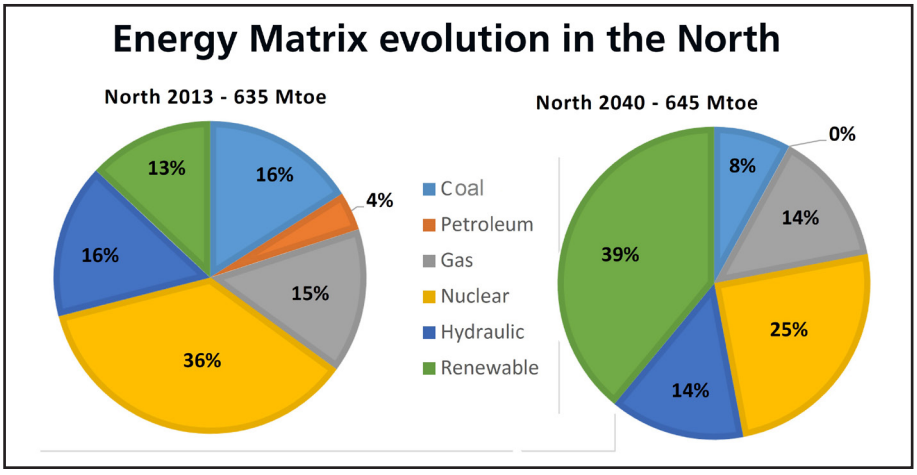
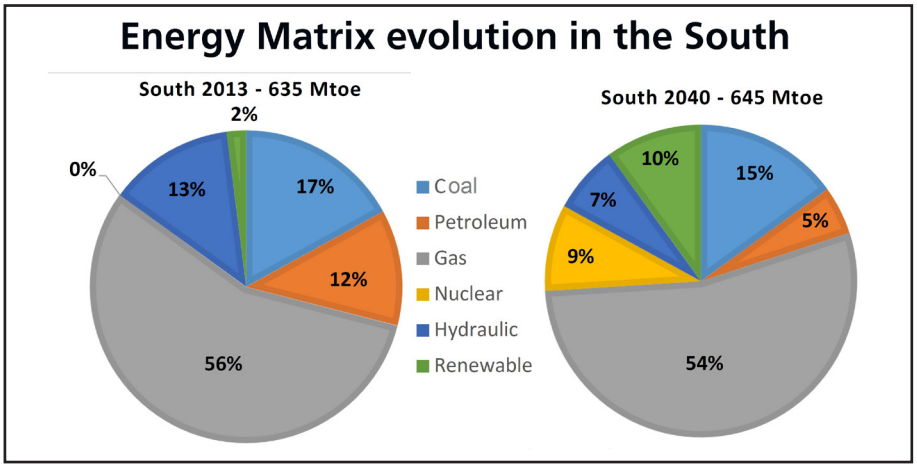


Image 5. Evolution of Energy matrix in the North. Own elaboration based on data from the Observatory Méditerranéen de l'Energie (OME).



6 Evolution of Energy matrix in the South. Own elaboration based on data from the Observatory Méditerranéen de l'Energie (OME).

These last three points, emissions, use of renewables and energy intensity, reveal that, if there is no radical change, the South's energy model is unsustainable. However, in autumn 2015 in preparation for the Paris Climate Summit, most countries made formal commitments to reducing greenhouse gas emissions, the so called *Intended Nationally Determined Contributions (INDCs)*.

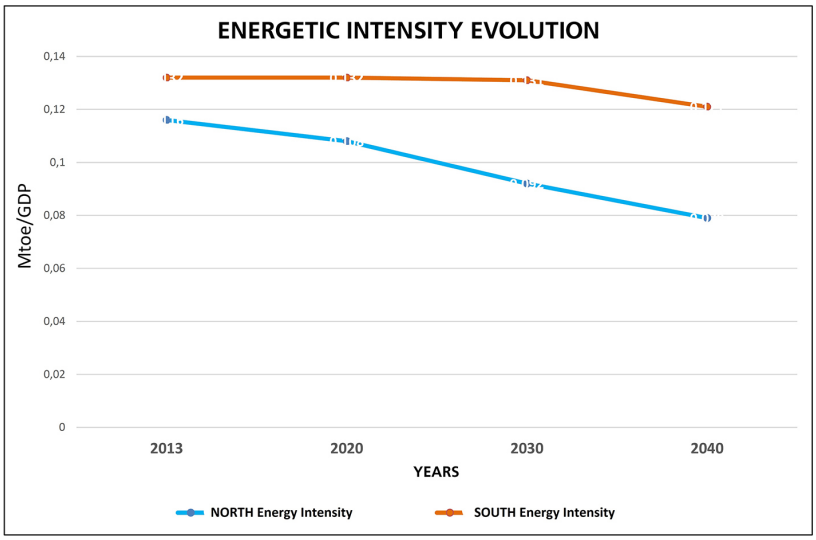


Image 7. Energy Intensity Evolution. Own elaboration based on data from the Observatory Méditerranéen de l'Energie (OME).

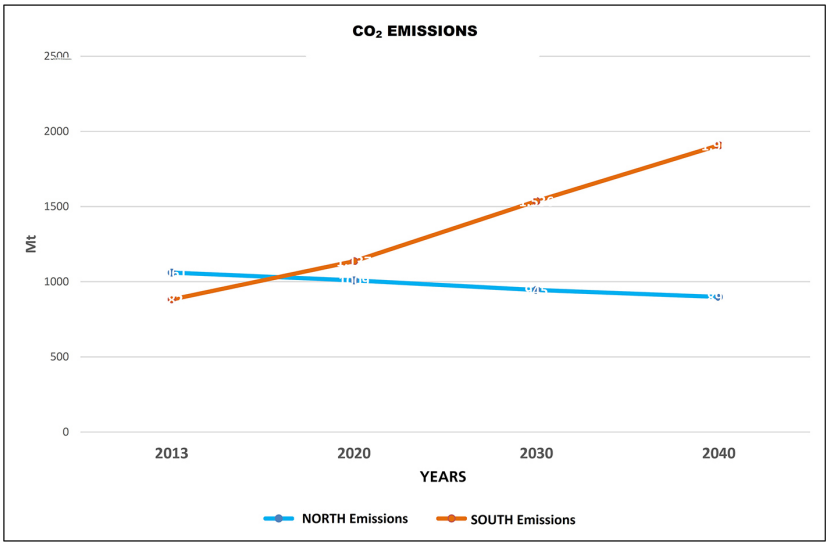


Image 8. CO2 Emissions. Own elaboration based on data from the Observatory Méditerranéen de l'Energie (OME).

These plans do contrast with the conservative scenario we have presented but they do not appear to be easy to meet in view of the current situation in those countries. They propose to cut down on emissions in 20% to 30% by 2030 when compared to a baseline scenario, and to reduce primary energy consumption and increase the contribution of renewable in power generation. The degree of ambition generally depends on each country's level of energy dependence and, in most cases, two targets have been set: those dependent on the reception of international financial aid and those that can be achieved by the countries themselves, the latter being rather modest. All Southerncountries recognize that the Region is vulnerable to climate change and they also seek to increase the availability of fresh water and to recover land affected by desertification processes.

The *INDCs* would cease to be "intentions" when the country ratifies the agreement, then becoming *National Determined Contributions (NDCs).* However, by November 2016, Morocco was the only North African State to have ratified them. The national plans are still tentative for the rest of the countries.

An analysis of how the basic magnitudes have evolved in the past four years and how the estimates made by the OME for 2020 and 2030 have changed in four years give a good idea of the progress made towards a sustainable model.

The following shows how the magnitudes evolved between 2009 and 2013 in the North:

- Primary energy demand falls by 4%, breaking away from the GDP;
- There is a sharper decline in the demand for gas and oil products, 13% and 14% less, respectively;
- The share of renewables rises, going from 9% to 13% of the primary energy demand;
- As a result, CO_2 emissions fall by 18%;
- In spite of the crisis, electricity demand shows a moderate increase.

In the South:

- The primary energy demand grows by 8% despite the impact of the "Arab Spring" on some countries during this period;
- Electricity demand rises by 15% and gas demand by 17% in four years, the latter being the prime fuel chosen for new electricity generation;
- A moderate increase in renewable energies, which reach 15% of the share for electricity generation and only 6% of the primary energy matrix.

Comparing how the predictions made by the OME in 2011 and those it made in 2015 have evolved for 2020 and 2030, it becomes apparent that:

- OME considerably reduces the gas demand estimations in the North for 2020 and for 2030, 24% and 33% respectively; while in the South, 12% only;
- OME lowers the oil demand estimations for the North more moderately, 15%, a decrease that appears short compared with other authorised estimates, but the forecasts for the South still hold.

OME estimates that CO_2 emissions from the countries in the North will fall more steeply than forecast in 2011, but their estimation for the decrease in emissions in the South remains as predicted, what is in contrast with the recently submitted IONDCs.

Keeping up the South's export capacity

The capacity of North African countries of for exporting gas and oil has known better times. Doubts are now being cast about their possible recovery after a 5-year period when those countries have not lived up to expectations and their capacity has been further weakened for political or economic reasons rather than geological ones.

A matter to highlight is that most of the oil and gas reserves and production are concentrated in only a few countries: Algeria, Libya, Egypt and Syria. Just before its political turmoil, Syria offered excellent prospects as an oil producer and exporter. Of those four countries, Algeria is the only active exporter at present and occasionally, Libya.

Other Mediterranean exporters might appear in the medium term. Israel and Cyprus for example, the latter being considered to be a country from the North in this analysis, can both be added to the list in the light of the recent discoveries within their territorial waters, but as yet no precise dates or volumes available for export can be announced.

The infrastructures in the Region are not an impediment to export: oil hardly requires them and there is more than enough capacity for transporting gas from the South to the North through the four gas pipelines in operation: Maghreb–Europe, Medgaz, Transmed and Greenstream. There are also more than enough liquefaction facilities in Algeria and Egypt and liquified natural gas (LNG) reception facilities in Europe.

Neither is the quantity of the reserves a factor that would limit production capacity in the South. Extensive areas of these countries have hardly been explored, the geological potential is very high and there are sufficient firms prepared to invest within reasonable concessionary frameworks as is the case with the latest discoveries in the Eastern Mediterranean (Levantin Basin).

With regard to unconventional reserves, they are believed to have great potential, but there is not enough information or evidence for them to be included in this analysis.

The fact that the reduction in hydrocarbon production and export is due to political reasons, makes it difficult to forecast a recovery. The conflicts going on in Libya and Syria have stopped exports from both countries or reduced them to a minimum. A rapid increase in the domestic demand in Algeria is coupled with the fact that it is a concessionary regime that does not attract investment in exploration and production. The situation in Egypt is well defined by the

term "Egypt Syndrome"[6] "a condition whereby, after a long period of denial, a government suddenly wakes up to the stark reality that production can no longer keep up with fast-growing domestic demand fueled by massive and unaffordable subsidies, ultimately leading to stranded export assets".

Hydrocarbon prices on the international markets in the past two years, and the dodgy "demand security", affect investments negatively.

Oil

Proven oil reserves in the Region stand at 69,000 million barrels, 4% of the world's reserves. Libya possesses 70%, Algeria 18% and Egypt 6%.

Production has been falling for over a decade: from 4.7 million barrels per day (mb/d) in 2000 to 3.6 mb/d in 2013, Libya being mainly responsible for this drop.

OME estimates that oil production will rise again as from 2020 after the long-awaited end to the political conflicts and Libya will be in a position to make up for the decreases from other producers.

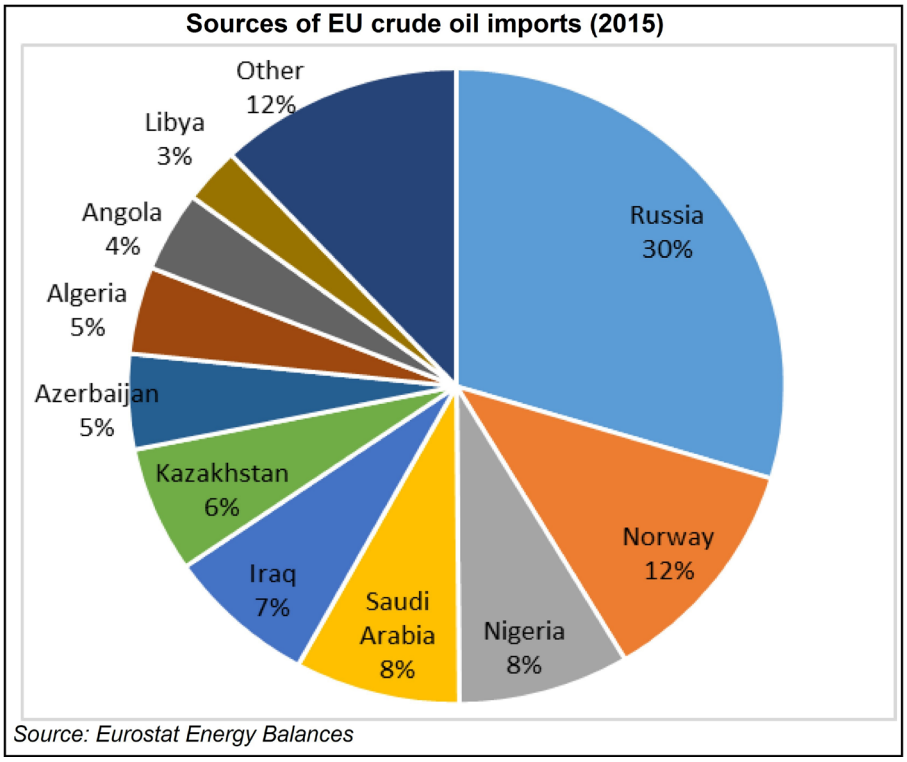


Image 9. Sources of EU Crude Oil Imports (2015).

[6] Ali Aissaoui, APICORP.

Whatever the case may be, OME has moderated its estimate of a production increase, which is already far from the peak of 6.4 mb/d for the end of the next decade that it considered in its prediction five years ago, in the MEP 2011.

Oil production in the European Union is falling more swiftly than demand, so its dependence on imports has risen up to 88%. However, the risk of supply interruption is only slight because of the large number of suppliers and because 90% of imported oil is transported by sea; 100% where European Mediterranean countries are concerned.

Pursuant to dependence, Europe only imports 8% of its oil needs from North Africa, whereas Europe is the destination for over 80% of the exports from those countries.

In contrast to what is happening in the North, oil demand in the South is still growing and the trend shows no signs of changing, so, if the basic scenario remains as it is, dependence on imports will inevitably rise.

Gas

Proven reserves in the region stand at 9,000 bcm, which is sufficient to cater for demand in the European Union for 20 years. Algeria has 50% of these reserves, Egypt 25% and Libya 17%.

Production in the South was 173 bcm in 2013, a major increase from the 137 bcm in 2000, but a decrease compared to the 194 bcm produced in 2010.

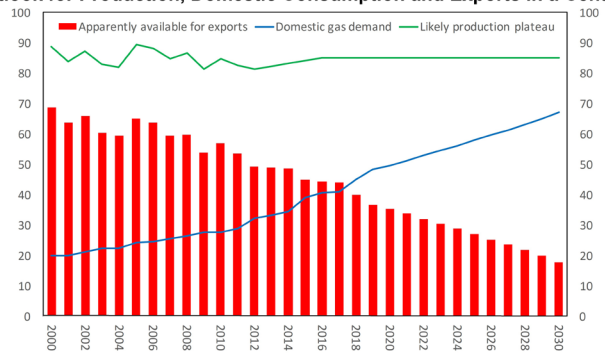
OME predictions about future production are optimistic in view of the recent discoveries in the Levant Basin, the remaining exploration potential from traditional producers and, not least, the expected rise in demand from the countries in the South. Nevertheless, despite this optimistic view, OME has substantially reduced its estimates from five years ago; thus, although in 2011 it estimated productions of 316 bcm for 2020, and 364 bcm for 2030, in 2015 OME was estimating 216 bcm and 310 bcm, i.e., about 100 bcm less in 2020 and 50 bcm less in 2030.

Exports from the South fall: from over 70 bcm in 2010 to less than 50 bcm in 2013. Egypt, which once managed to export 19 bcm, is now a gas importer; exports from Libya are more variable now but have dropped significantly.

Algeria is now almost the only gas exporter but the trend is towards a decrease as well, because its production is not rising while domestic demand grows.

Europe is the main client for Algerian gas, 83% of its gas and 81% of its LNG being exported to the continent in 2015, yet, Algeria is not an essential supplier for Europe however, because Algerian gas accounts for less than 10% of the European Union's total gas consumption.

Figure 10: Outlook for Production, Domestic Consumption and Exports in a Central Scenario



Source: Extrapolated from CREG (for domestic demand) and author's assumptions for production

OIES (Oxford Institute of Energy Studies). Algerian Gas. May 2016

Image 10. Algerian Gas.

The case is different in Spain given that it currently imports from Algeria nearly 60% of the gas it consumes[7]. Yet a total or partial interruption of these supplies would not expose Spain to any serious risk because of the country's broadeningof of supply sources and supply means, although the price might be affected, because it depends on the more volatile international price of LNG.

The South will necessarily have to recover its gas production capacity in view of its growing dependence on this prime fuel for power generation.

Natural gas Natural gas supplies to Europe, 2010-2014, (in bcm)

	2010	2011	2012	2013	2014
Supplies by major gas exporters					
OAO Gazprom (long-term contracts)	138.6	150.0	138.8	161.5	**146.6**
Algeria (including LNG)	57.3	52.4	46.5	36.6	**31.7**
Libya (including LNG)	10.3	2.5	6.7	5.7	**6.5**
Qatar	32.9	43.9	31.3	24.4	**23.7**
Nigeria	13.5	18.1	12.1	7.0	**6.0**
Total	**252.6**	**266,9**	**235,4**	**235,2**	**214,5**
Supplies by major European producers					
Norway	115.4	109.4	121.4	114.7	**116.8**
Netherlands	76.5	72.9	72.6	77.7	**63.1**
UK	64.5	51.1	43.8	41.2	**41.2**
Other	100.8	56.6	73.5	71.5	**50.4**
Total	**357,2**	**290**	**311,3**	**305,1**	**271,5**
Total	**609,8**	**556,9**	**546,7**	**540,3**	**486**

Source: Gazprom Annual Report 2014, May 2015, p. 49.
Gazprom Note: Data for 2010–13 may differ from data in Annual Report 2013 due to amendments to international statistics.

Image 11. Natural Gas supplies to Europe, 2010 (in bcm).

[7] CORES, October 2016.

Electricity

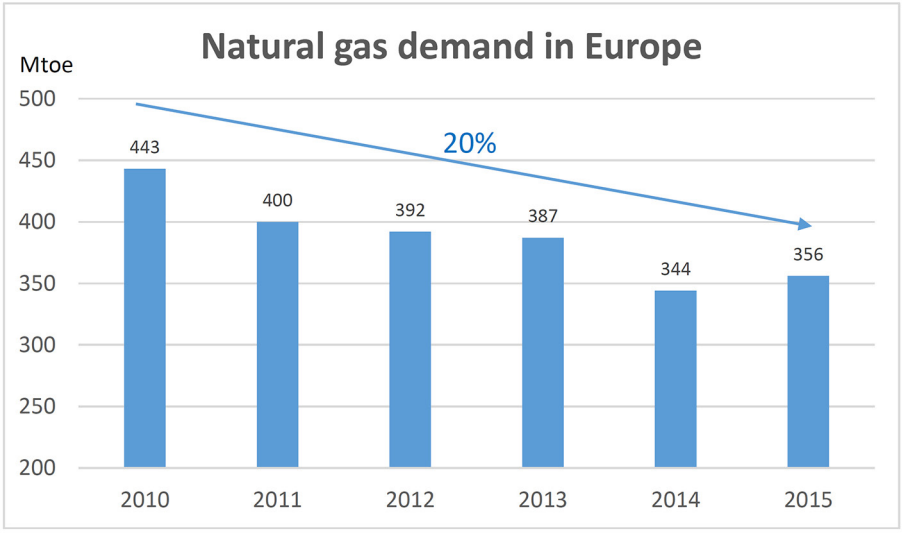
The expected "green" electricity flows from South to North have not materialised either, because the South needs all the electricity it can generate, whereas in the North there is a generation capacity surplus, so no changes in the situation are expected in the medium term.

Demand security (for gas)

Supply security is one of the European energy policy's three basic objectives and it underlies all the long-term gas purchase and sale contracts in which the purchaser undertakes to pay for an annual volume, whether or not he withdraws it, the seller undertaking the price variation risk. However, circumstances are changing, and the concept of "demand security" is emerging as one of the exporters' main concerns.

Long-term commitments, which used to be the guarantee for building infrastructures, are also losing this function, given that they are no longer as necessary in a gas market where LNG is gradually becoming the new "star" and does not need gas pipelines.

Apart from contractual changes there are also important changes in the legal framework. In the last decade the European Union removed gas purchase monopolies, banning the compulsory destination clauses and even requiring contracts' price transparency. These measures were well received by gas exporters from other regions but perhaps not so favourably interpreted by the



Source: Bloomberg

Image 12. Natural gas demand in Europe.

Mediterranean exporters, who felt their traditional operating schemes were being adversely affected.

And, after the global financial crisis of 2008, the supply and demand balance also changed. While gas demand in Europe is not growing, alternative gas offers from other zones increase, adding reasons to the South's demand security concern.

Except in the Eastern European countries, which rely heavily on Russian gas, supply security does not seem to be a priority concern for the European Union.

Russia has announced that it is in a position to increase its supply to Europe by 50 bcm and is not prepared to lose its market share to any country. The exports from Shah Deniz in the Caspian Sea (Azerbaijan) are estimated at 10 bcm/year in the medium term; the USA puts 70 bcm of LNG on the market that can be unloaded anywhere in Europe as Europe has a capacity for receiving 150 bcm/year, excluding the United Kingdom, and is only using a quarter of this capacity.

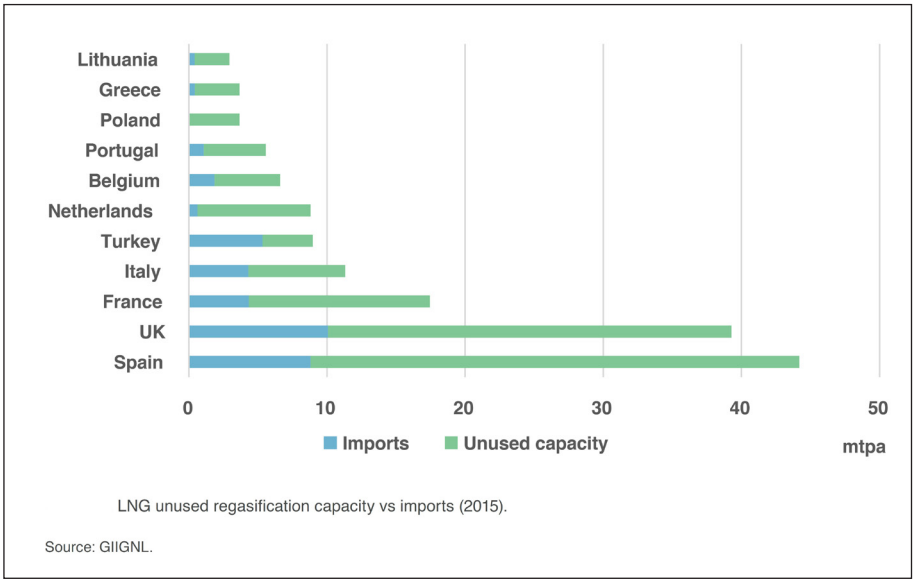


Image 13. LNG unused Regasification capacity vs Imports (2015).

Algeria is the only country that can compete with Russia in cost and means of transport when supplying gas to the Region, but its exporting capacity is in decline and its long-term contracts expire before Russia's.

Hydrocarbon exporters must seek demand security in countries in the South whose gas demand growth predictions seem unstoppable, and to do this the interconnections between them will have to be developed further because they are currently rather limited.

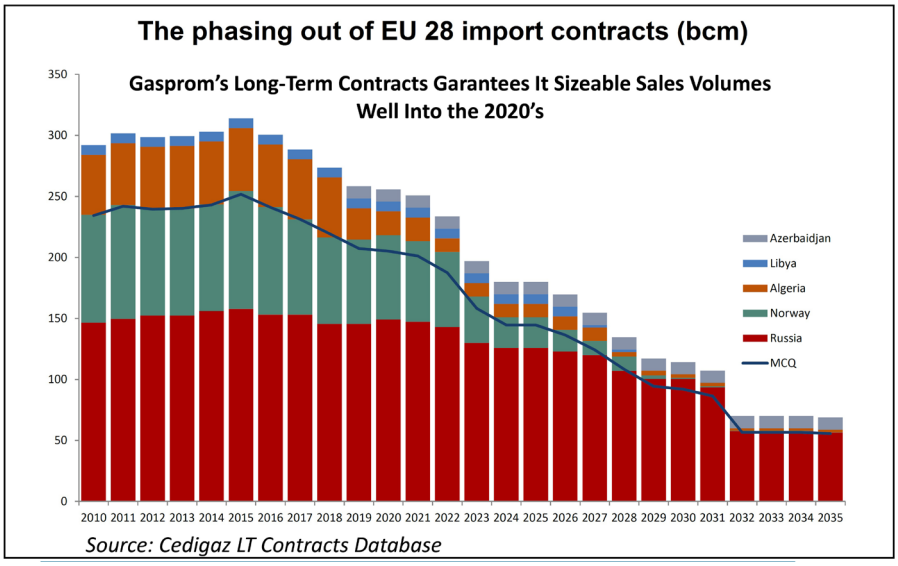


Image 14. Phasing out of EU28 Import Contracts (bcm).

Potential of new discoveries

Some of the biggest offshore gas deposits recently discovered are located in the Levant Basin (Eastern Mediterranean): Tamar and Leviathan in Israeli territorial waters, Aphrodite in Cypriot waters and Al-Zohr in Egyptian waters in front of the Nile Delta.

According to the experts, the proven gas reserves in these deposits are only an indication of the great hydrocarbon-reserve potential in the Mediterranean.

In 2010, the *United States Geological Survey* (USGS) estimated that the technically-recoverable reserves in that zone would be approximately 3,450 bcm and 1,700,000 barrels, which is sufficient gas to cater for that region's requirements almost indefinitely and the oil demand for 20 year. Such is the potential that OME is wondering whether a new "North Sea" has been found in the Mediterranean.

The question now is not how great the zone's potential is, but how to "monetise" these reserves, i.e. how to put them on the market, how much for the domestic market and how much for export, whether to export as LNG or by gas pipeline, etc. The threats to its commercialization are the marine frontier disputes between the countries involved. Disputes between Israel and Cyprus over the Aphrodite deposits, with Gaza, Lebanon and Egypt about territorial waters and, not least, the conflict with Turkey over Greek Cypriot sovereignty of the island's maritime zones.

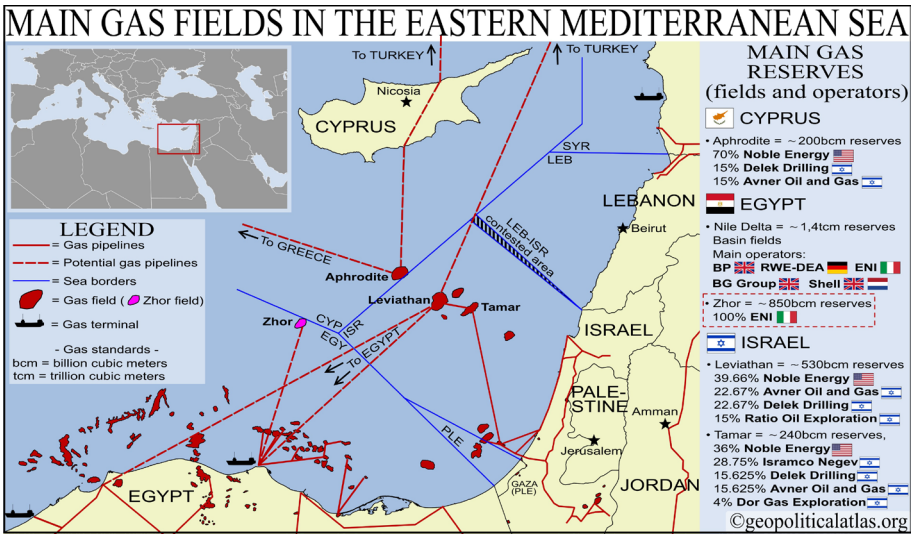


Image 15. Levant Basin wells and infrastructures.

Israel

In 2009 and 2010, two major gas fields were discovered in Israeli territorial waters: Tamar, with reserves of approximately 300 bcm and Leviathan with 450 bcm. The former came into operation in 2013 and has an average annual production of 7 bcm; the latter will enter production between 2018 and 2019.

The use of these reserves has been delayed due to internal discussions regarding such matters as jurisdiction, taxation and the choice between energy security or exports. In May 2016 these questions were successfully dealt with and the Israeli Government called for new tenders for exploration and production in marine blocks, the deadline for submission being April 2017.

In Israel, electricity is currently generated with gas and coal in equal proportions. In 2015, 9 bcm of gas were consumed, three quarters of them dedicated to power generation, and it is estimated that this volume will increase threefold by 2040 and that the main use to which this gas is intended will continue to be electricity generation.

Israel's initial plans are to reserve 450 bcm or domestic consumption until 2040 and the rest of the production will be exported as from 2020. To achieve this goal, the Israelis are jointly considering with the EU a gas pipeline to Cyprus, Greece and eventually to Italy. However, the Israeli Minister of Energy, Yuval Steinitz, considers that just one route would be insufficient.

Cyprus

The Aphrodite gas field was discovered in 2012 in the territorial waters of Cyprus. Its most recent proven gas reserves are estimated at 130 bcm and production can commence in 2019.

These reserves are not sufficient for investing in a gas liquefaction plant or in an underwater gas pipeline unless further explorations increase the estimates or Cyprus collaborates with one of its neighbours to jointly commercialize these reserves.

Although energy demand is low in Cyprus, the high cost of current generation would be reduced by resorting to gas for their electrical generation.

Egypt

Egypt became a net importer of gas in 2013 shutting down two liquefaction plants, Damieta and Idku, with annual capacities of 7 bcm and 11 bcm respectively, the Arab Gas Pipeline also being closed down.

However, Egypt has always been very active in hydrocarbon exploration and willing to collaboration with other countries. As a result of such collaboration, in 2015 the Al-Zhor offshore deposits were discovered, with gas reserves initially estimated at 850 bcm. Furthermore, there would appear to be major reserves in Nooros (Nile Delta), Meleiha (Western Desert), Salamat (offshore Damietta), etc.

However, after the painful experience referred to above as the "Egypt Syndrome", gas exports are unlikely to be resumed in the short term and neither is it probable that more gas will be exported than necessary to fulfil Egypt´s commitments with the Damietta and Idku liquefaction plants.

Algeria

Although Algeria is not a potential supplier because it actually is a supplier already, and is not placed in the Levant Basin of the Mediterranean, it deserves a few lines in this chapter because of its great potential where undiscovered conventional reserves are concerned that the USGS estimated in about 1.1 tcm in an assessment conducted in 2012.

To a certain extent, this estimation makes up for the reduction in proven reserves from 4,500 bcm to 2,745 bcm, formally announced by the Algerian Government in November 2015.

Apart from this optimistic prospect from the USGS, there is also the statement often repeated by Algeria's public company Sonatrach, that two thirds of the country has either not been explored or not been explored sufficiently.

Furthermore, Algeria is considered to be one of the countries with the largest unconventional reserves in the world.

Finally, there are the unknown quantities surrounding two countries with great potential yet very negatively affected by political conflicts:

Libya

As is the case with Algeria, Libya is not a potential supplier but an actual supplier already. Although it is not in the Mediterranean Levant it is worth a special mention because it has the potential for becoming the Qatar of the

Mediterranean; all it requires is to have the structures of a State, which is what could happen if the international community commits itself to preventing the country from falling apart.

Libyan oil exports had dropped from 1,600,000 to 207,000 b/d[8], but they recently managed to climb back to 500,000 b/d; the country is expected to export 900,000 b/d in 2017 and to keep up the 9 bcm of gas transported via the Greenstream.

The economic impact of these exports on a population of 6 million is a good incentive for the two main yet opposed political groups to reach an agreement. An equally great incentive is to remember that before General Gaddafi was overthrown Libya had the highest income *per capita* in Africa.

Another positive sign was the recent announcement by the Libyan NOC (National Oil Corporation) that it was reopening the oil pipelines from Sharara, where Repsol has a shareholding, and from Elephant, where ENI has a shareholding, which oilfields had been blocked for two years[9]. This agreement could add about 400,000 b/d to exports, given that Libya is not affected by the Algiers Accord to cut back on crude oil exports.

Syria

Syria also has extensive reserves, especially of oil, 2,500 million barrels according to the Energy Information Administration (EIA).

Catering for electricity demand in the South Mediterranean countries

Half the world's population without reliable access to electricity supply live in Sub-Saharan Africa, over 600 million people according to the International Energy Agency (IEA). This is a chronic problem in Africa and it brings to light the fact that the short-term challenge faced throughout the whole African Continent is catering for a rapidly-growing population for whom electricity is becoming more and more essential.

It was only just over five years ago that the idea predominated of Europe being supplied by "green" electricity sourced in the deserts of North Africa. A variety of political-business initiatives were taken, fruit of this idea, and they indeed were correct that it was necessary to construct renewable electricity generation capacity in the South, but what they did not anticipate correctly was the direction of the electrical flows. Europe has developed so much renewable and backup generation that it now has a capacity surplus, whereas in the South, all the new generation that comes into service is hardly going to be sufficient to cope with its own needs and replace obsolete technologies.

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[8] Mustafa Sanalla, President of the NOC (Libyan National Oil Company) to the Financial Times, 11.08.2016.

[9] "I want to thank all the parties involved in making this happen," "Everybody realised that the only route to rebuilding Libya is through cooperation between us as Libyans", 20.12.2016.

At present, North African countries have to put up with frequent electricity supply cuts, especially in summer owing to the demand for cooling. Morocco is the exception, because it is the only South Mediterranean country connected to the European electricity system via the Strait of Gibraltar, which in 2015 covered 14% of its electricity requirements with imports from Spain.

The differences in electricity consumption between the countries on the two Mediterranean shores are significant. The consumption *per capita* in the North is 5,300 kWh/year, whereas in the South it is 1,870 kWh per year, with the exception of Israel and Turkey, which are closer to the average figures in the North. The growth of the electricity demand has also evolved in very different ways: in the North it has been 1.6% per year since 1990, whereas in the South it has been 5.7%, three and a half times as great, despite the political conflicts affecting the South in recent years.

The long-term estimates suggest that electricity demand in the South will almost triple in the next 25 years, but in the North this increase will only be by 25%.

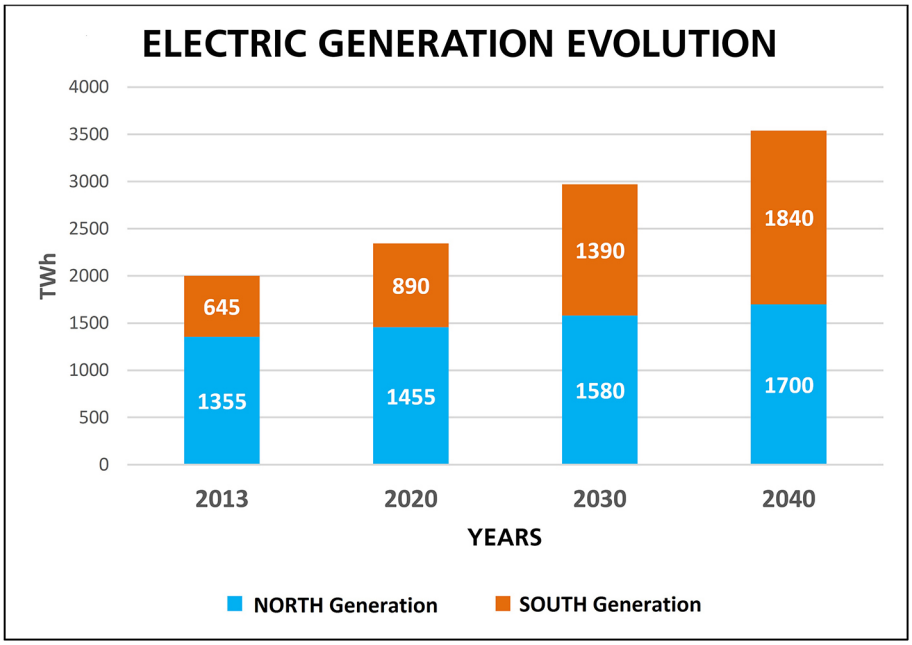
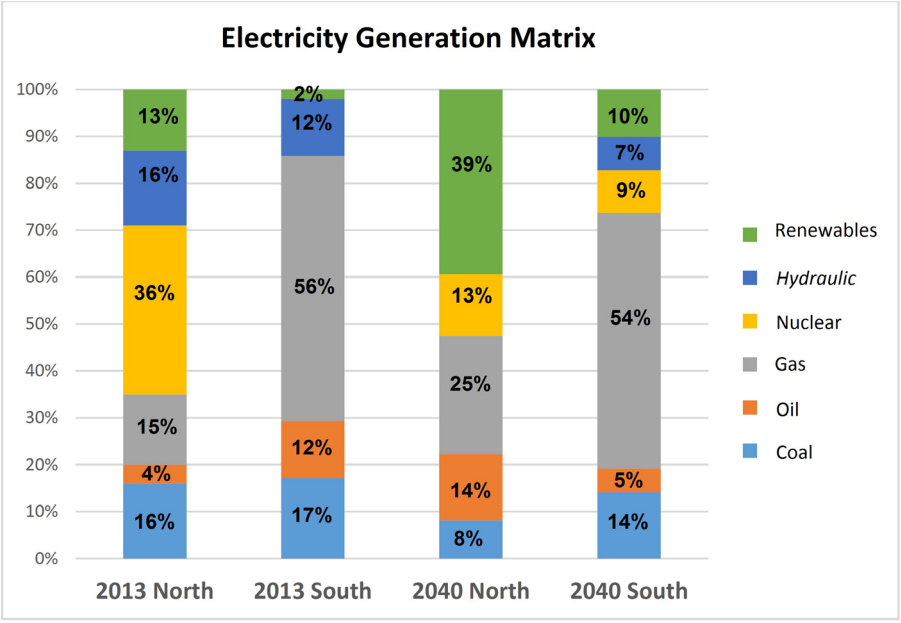


Image 16. Evolution of Electricity Generation. Own elaboration based on data from the Observatory Méditerranéen de l'Energie (OME).

The only significant North–South electricity exchanges take place where there are connecting infrastructures; i.e. between Spain and Morocco and between Bulgaria/Greece and Turkey. The South-South interconnections are virtually non-existent or have a very low capacity, failing to make the most of the complementarities between the different demand curves in each country.

The electricity generation matrix in the North is highly diversified and nearly all the capacities envisaged are based on renewable energies. By contrast, the predominant technology for the new facilities in the South will be combined cycle gas turbines (CCGTs), and that is how the situation will remain at least until the 2030s, renewables being expected to start thereafter playing a more important role in electricity generation.



Source: OME, MEP 2015

Image 17. Power Generation Matrix. Own elaboration based on data from the Observatory Méditerranéen de l'Energie (OME).

The role of nuclear energy in the North is much more uncertain after Fukushima, the German Nuclear "Phase-Out" and the long delays affecting the Olkiluoto Plants in Finland and Flamanville in France. However, some countries in the South, like Turkey and Egypt, plan to have nuclear power plants in operation as from 2030, however these plans were announced some time ago and are being recurrently postponed.

Estimates concerning the generation capacity required in the South in coming years are huge because, if the trend envisaged by the OME continues, 183 GW will be needed to be put into operation over the next 15 years and a further 106 GW before 2040, i.e. almost 300 GW in 27 years.

In a theoretical exercise to quantify these investments, we assume that of the total investment necessary, 60% would be in generation and 40% in transport and distribution, and that the average investment per GW would be $1,300

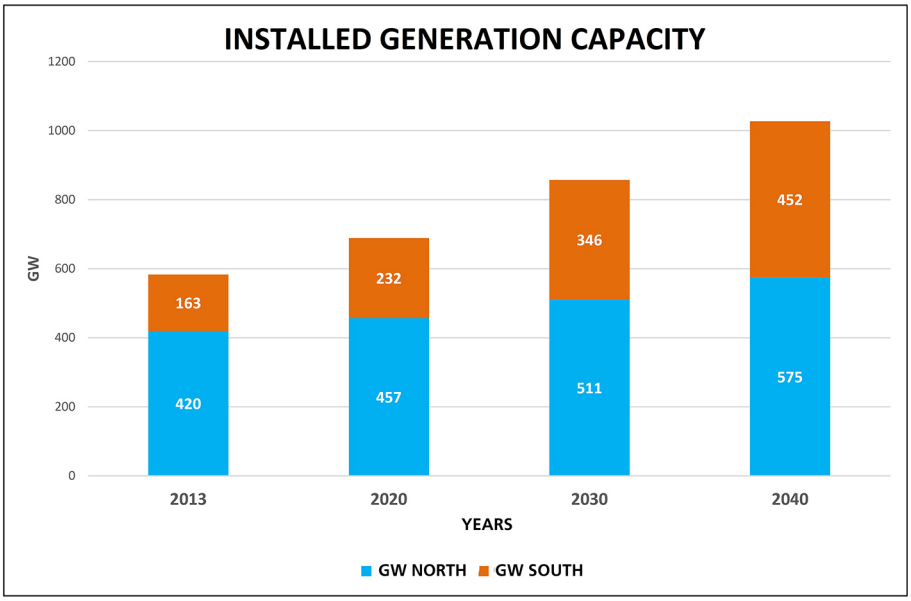


Image 18. Installed Generation Capacity. Own elaboration based on data from the Observatory Méditerranéen de l'Energie (OME).

million. Thus the total investment needed from 2013 to 2040 would be $650 billion, over half the Spanish GDP in 2015.

The countries in the South face two difficulties when trying to cope with this huge investment: financing, more problematic with their own funds when there is no budget surplus and when international investors are skeptical about investing in fossil fuel projects, and country risk, which has increased after the recent political conflicts and that makes financing more expensive.

It is interesting as well to compare the estimates made by the OME in 2001 with the ones they made in 2005. In only 4 years, the OME reduced by nearly 10% the generation estimate needed in the North, but increased the amount required in the South by a quite similar percentage.

With regard to generation technologies, the OME has updated its estimates:

- The reduction of capacity in the North is taking place basically at the expense of gas, which finds renewables to be a strong competitor;
- Gas is gaining prominence in new generation in the South where a significant contribution from renewables is delayed until 2030;
- The share of nuclear energy will decrease in the North as from 2020 but will appear on the scenario in the South after 2030, perhaps as an act of willingness;
- Generation using coal will rise in the countries in the South, which is contrary to the plans announced by these countries (INDCs) in 2015.

To complete this analysis it is worth taking a closer look at the real situation and the plans of the main electricity markets in the South Mediterranean.

Egypt[10]

In addition to the aforementioned "Egypt Syndrome" drama, the country is faced with the urgent challenge of catering for an electricity demand that has been growing at a rate of 5.6% annually for the last 10 years, faster than the new generation that can eventually be put into service.

This task involves constructing at least 20 GW before 2020 to reach a capacity of 54 GW that year.

The plans by technologies for the new generation reveal a growing dependence on gas and a shy development of renewables:

- 14.4 GW of gas combined cycle;
- 2.5 GW wind;
- 1.7 GW photovoltaic;
- GW of solar concentration.

The investment announced by the Government to implement these plans amounts to $45 billion, two thirds for generation and one third for transport and distribution.

After 2020, the investment effort would aim to diversify the generation mix to include coal and nuclear energy plants, 12 GW and 4.8 GW, respectively.

All of this begs the following question: Who will pay for these projects and how?

Nearly all the responsibility for electricity supply has fallen on the State via the public companies Egyptian Electricity Holding Company (EEHC) and Egyptian Electricity Transmission Company (EETC), yet the Egyptian Government cannot afford this investment; its reserves have been whittled down to half the 2010 figure, the Egyptian Pound has been devalued by 48% and the country cannot offer sufficient guarantees to private investors. It has to resort to public financial institutions like the World Bank, the European Bank for Reconstruction and Development (EBRD) and the International Monetary Fund (IMF), but these institutions require major structural reforms and they do not seem particularly inclined to finance fossil fuel projects.

To get around this impasse, the current Government, whose Prime Minister Sherif Ismail is an energy expert who headed the Ministry of Oil from July 2013, has launched an ambitious and necessary reform plan, but one that needs clean energies to play their part:

- Attracting independent power producers (IPPs), who are more efficient than public generators in cost and project performance time;

[10] APICORP Energy Research, November 2016.

- Introducing competition in the generation market enabling private generators to sell directly to major consumers at the freely agreed price;
- Allowing free access to the grids;
- Revising up the electricity prices: 47% increase for the domestic market and between 10% and 20% for the commercial market last July.

Algeria

In December 2011, an important Algerian delegation led by the then Minister Youcef Yousfi and consistent of the leaders of the leaders of the two Algerian State owned companies, Sonelgaz and Sonatrach and other persons responsible for energy and environmental matters, formally presented to the European Commission in Brussels, plans to construct 22 GW of renewable generation in 2030; half of the production would be allocated to catering for domestic requirements and the other half earmarked for exports to Europe.

At that particular time, there were already difficulties when it came to preventing supply cut-offs. They knew that demand was increasing at a rate of approximately 8% per year and were aware of the investment effort required. In spite of this they were hopeful of being able to export green electricity to Europe.

The situation 5 years later is that domestic requirements exceed forecasts; according to official data, consumption in 2015 was 65 TWh; in the summer, there were peak demands difficult to cover with the 15 GW capacity installed at the end of 2014, and the plans had to adapt quickly to respond to those needs.

Aware of this, the Cabinet, on 24th May 2015, gave its approval to a revision of the National Renewable Energies Plan that distributed the 22 GW in two phases: 4.5 GW before 2020 and 17.5 GW before 2030; technologies to be used: 62% photovoltaic, 23% wind, 9% solar concentration, 6% others. The immediate target is to double the installed capacity before 2020 and to construct, apart from the aforementioned 4.5 GW of renewables, 10 GW with combined cycles using gas that are more efficient than most of the country's current thermal plants. The obvious challenge was not to reduce the amount of gas available for exports.

To encourage renewables, Algeria has set a feed-in-tariff system that is generous considering current costs; thus they pay back 11.6 dollar cents for every solar kWh and 9 dollar cents for every wind kWh. However, the country is considering changing the system in the light of examples in Europe, offering feed-in-tariffs only for supplying small domestic facilities calling for tenders for large facilities.

The financial challenge is also considerable, since it is not the best moment to resort to the public budget when reserves drop, the prospects for hydrocarbon exports are not good and fossil fuel projects are not the international financial institutions' favourite option.

In some projects, it will be necessary to resort to private investors and see what their reaction is to the support measures envisaged in the National Renewable

Energies Plan, a plan could have been developed as a reaction to the plans submitted by Tunisia and Morocco.

Finally, the high percentage of fossil fuels in the Algerian energy mix seriously jeopardizes the fulfilment of the ambitious target of 27% renewable generation in 2030, when the current share is only 1%[11].

Turkey[12]

Electricity demand in Turkey could more than triple before 2040, if the trend in the last few years continues. Turkey and Egypt together account for 60% of the entire electricity demand increase in the countries in the South over this period.

The Turkish case is rather different from others in the South: the Turks had already opted for gas and their gas-based electrical generation share leapt from 37% in 2000 to 48% in 2014. However, this high dependence is so worrying that the Government is considering cutting the gas share in the electricity matrix down to 30%.

The Turkish electricity market structure, regulatory framework and way of operation are more similar to the countries in the North; the market has been privatised and liberalised and is now connected to the European electrical system, albeit with a very low interconnection capacity.

Just like in the North, the prospects of a sharp growth in the demand did not materialise and there is now a generation capacity surplus, the reasons for

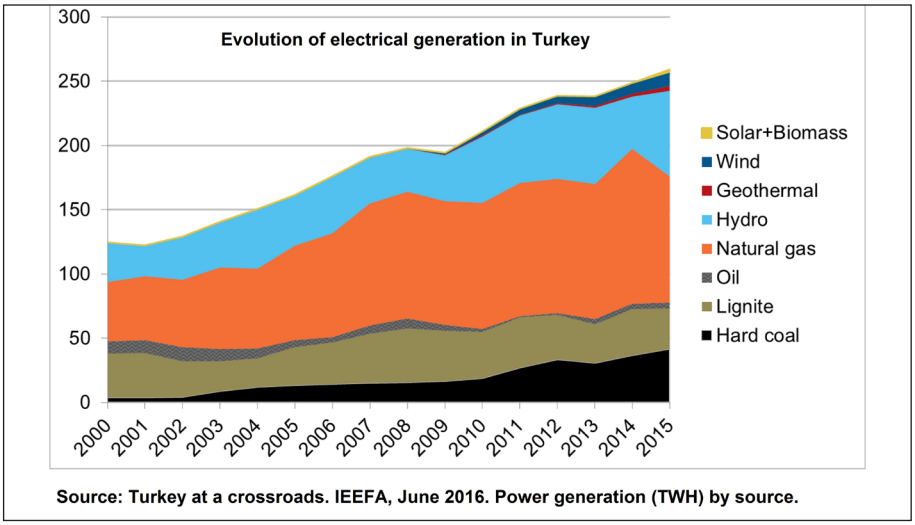


Image 19. Evolution of electrical generation in Turkey.

[11] Presentation by the Algerian Ministry of Energy and Mines. Brussels, 19th January 2016.
[12] Turkey at a Crossroads, Pelin Yenigun Dilek and David Schlissel, IEEFA, June 2016.

this being: the economic crisis, although less impacting than in Europe, a very optimistic planning and generous subsidies for new technologies.

At present, demand is relatively stagnant, with a growth of around 3.3% since 2012, much lower than the 6% maintained in the previous decade. Generation with high variable costs such as that using gas or coal is no longer competitive; last year, generation using gas fell by 18% and with coal by 10%.

In view of the above, official forecasts for electricity demand and the need for generation until 2030 may be optimistic, and the same optimism applies to OME estimates[13] though they were more cautious.

The Turkish Government is considering energy policy targets and guidelines different from those implemented in recent years. Such objectives include a greater energy-mix diversification, reducing dependence on one single gas supplier, given that nearly 60% comes from Russia, and encouraging the utilisation of indigenous prime fuels for power generation, i.e. lignite.

As investors are no longer attracted to financing lignite or coal plants, the Government is considering a subsidy plan. However, the plan carries clear risks, like increasing the cost of the electricity, increase that could not be transferred to the market and would aggravate the sector´s deficit; altering the competitiveness on the generation market, a Government objective since 2001; slowing down the energy transition process and rendering it impossible to reduce CO_2 emissions by 20% in 2030.

At present there are projects for 71 coal plants, many of which use lignite that is abundant in Turkey, so that there will be a rise from the 31 TWh generated in 2015 with this raw material, to 57 TWh in 2018, with legislation being studied envisaging major subsidies.

As the Government needs to enhance base-load generation in view of the high weight and volatility of hydraulic generation, it has also opted for nuclear energy and has signed agreements with Russia to construct four 1,300 MW reactors and with Japan and others for four 1,100 MW reactors, which will be commissioned at the end of the next decade.

Both options, subsidised lignite and nuclear energy, reduce the role of the private investors, IPPs, who have dominated investment in the past decade. Generation based on renewable sources made great progress during the past investment cycle, encouraged by private initiative and by the high price of natural gas. However, the current share of renewables (7% of all generation) is well below their potential, given that Turkey is one of the best equipped countries in the Region where solar and wind resources are concerned; this means that Turkey is not on target for fulfilling the commitments announced by the Government before the COP 21 in Paris.

[13] OME, MEP Turkey.

Morocco

The Moroccan situation is very different from that of the above countries. Morocco is also a large country, covering a surface area of nearly half a million km^2, with a population of 33 million in 2013, but lacking energy raw materials.

Primary energy demand in 2014 was 19 Mtoe, broken down as follows

As only the last two prime fuels are indigenous, the import of energy commodities accounted for 44% of the trade deficit in 2015; a percentage that even exceeded 50% in the years when oil prices were higher. Such a high dependence could explain why energy consumption per inhabitant is among the lowest of all the countries in North Africa and why the price of electricity is the highest.

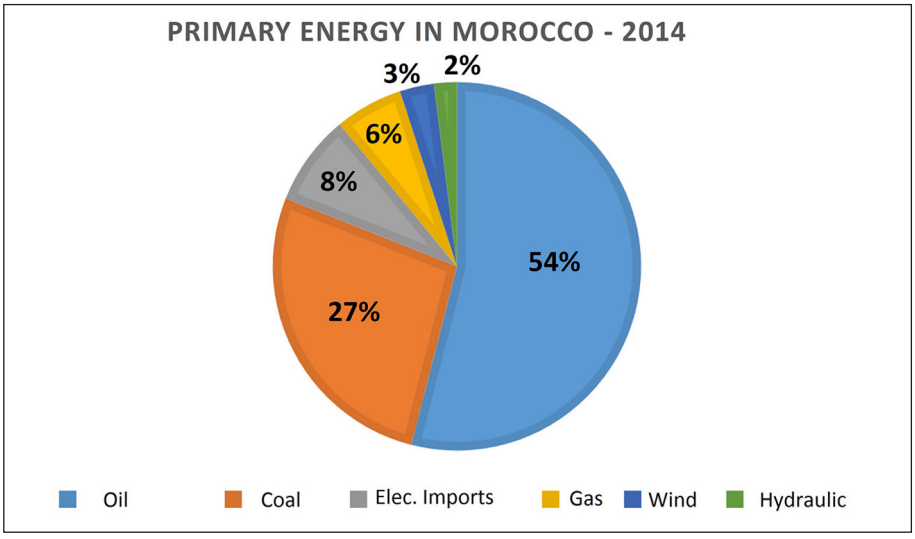


Image 20. Primary energy in Morocco – 2014.

Electricity production in 2015 was 29 TWh with this generation matrix

The Moroccan Government estimated that the electricity demand would grow at a rate of 6.1% between 2014 and 2016 and 6.2% between 2017 and 2025, reaching 38 TWh in 2016 and 65 TWh in 2025.

In the light of these electricity demand prospects and in order to comply with the objective of reducing CO_2 emissions, very high in Morocco due to the percentage of coal in generation, the Government took two important decisions: increase the share of gas in its energy matrix, especially for electrical generation, and encourage the development of renewables sources.

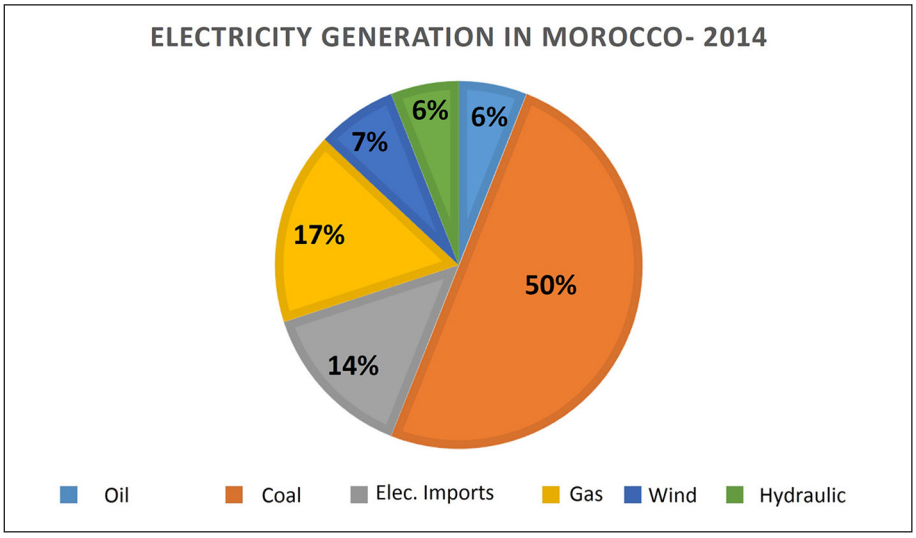


Image 21. Electrical Generation in Morocco – 2014.

To guarantee the gas supply the Government opted for LNG. In view of the importance of this plan that will position Morocco as one of the few countries with this capacity in North Africa, it is worth writing a few lines about the formal announcement done in December 2014[14].

Objectives:

- To cater for the growing electricity demand;
- To reduce dependence on one single foreign gas supplier;
- To increase energy supply security in a country that hardly has any energy resources apart from renewables;
- To have available sufficient base generation capacity to make up for the intermittent character of the considerable capacity planned for renewables.

Instruments:

- A regasification plant in Jorf Lasfar with an initial production capacity of 4/5 bcm year;
- A network of gas pipelines that connects up with the Maghreb Pipeline (GME) and with the main gas consuming centres and generation plants;
- 3,900 MW in combined cycle gas plants (CCGTs) between 2020 and 2025, including the 385 MW at Tahaddart and the 450 MW at Ain Beni Mathar already operating and the conversion of other thermal plants (Mohammedia and Kenitra);
- A total of 6,300 MW in CCGTs in the longer term;

[14] Presentation by the Minister Dr. Abdelkader Amara on 16th December 2014.

- Contract with international LNG suppliers for amounts sufficient to supply these plants and supplement the current volumes: 0.75 bcm "redevance" from the GME and 0.64 bcm from the contract with Algeria signed on 31st July 2011, a curious initiative given that the two countries broke off diplomatic relations a long time ago.

Planned investment, over 4,600 million dollars broken down as follows:

- 600 million methane tanker reception port;
- 800 million LNG regasification terminal
- 600 million gas pipelines;
- 400 million storage facilities;
- 2,200 million first phase of CCGT plants.

Commissioning date: as from 2021.

Pursuant to the support given to renewables, Morocco is probably the country in the South that has clearly opted for renewable energies more than any other, and is well on the way to reaching its target of having 2 GW of wind generation and 2 GW of solar generation by 2020. This is consistent with the commitments presented before the COP 21 stating that over 50% of all new generation capacity to be installed before 2030 would have to be from renewable sources.

As far as incentives for renewables are concerned, Morocco does not have a feed-in-tariffs system but a similar one called *EnergiePro,* which enables industrial consumers to invest in renewable generation for their own use and the public electricity company purchases their surplus generation at "reasonable" prices.

Morocco is the only North African country with an electrical system integrated into the European one, being connected with two underwater electricity lines each of 700 MW, allowing for an exchange capacity of 800 MW. ONEE (*Office National de l'Electricité et de l'Eau Potable*), Morocco's "sole purchaser", has been importing from Spain between 5 and 6 TWh annually over the last years.

The Moroccan Government is now seeking political and economic support from the EU to lay another connection line, preferably with Portugal. As Portugal and Spain have formed one single electricity market, it does not seem that the Moroccan request indicates an intention to diversify its electricity supply sources. In fact, in view of the country's ambitious electrical generation plans explained here, the objective could be to fulfil Morocco´s old ambition of exporting green electricity to Europe via the Iberian Peninsula.

We can sum up this chapter by saying that the South faces the energy "*trilemma*" faced by the North: secure, affordable and clean energy, but with the complication that in the South it is difficult, if not impossible, to make these objectives compatible with each other. Guaranteeing the electricity supply is the priority, and this will be achieved at the expense of the other two objectives; the clean energy target will have to be shelved for the time being.

Apart from renewing their rather inefficient generation capacity, the countries in the South will have to triple their current capacity in 25 years and the technology they have chosen is combined cycles using gas because this requires less investment per MW, the plants are constructed faster, they provide for base-load generation and, as yet, there are no problems in obtaining the prime fuel.

Nevertheless, increasing dependence on gas for the producing countries is tantamount to less exports, where exporting is generally more profitable than consuming the gas domestically, while for importers it means a greater trade deficit and, for all concerned parties, it means postponing the transition towards a sustainable energy model.

One alternative model for the countries in the South could be the one used by its neighbours in the Middle East, where by means of imaginative financial structures and neutrality used with respect to the ownership of electricity generation, are coping with the growth in demand utilising renewable and highly competitive generation plants.

As we have already stated, a 3-way collaboration, North-South-East, would be very advantageous for all.

Energy transition in the South Mediterranean

If the aim of catering for the growing electricity demand in the countries in the South does not seem to be an easy task, doing so sustainably will be even more difficult.

The transformation of the energy model has already begun in the North: a reduction in demand growth has commenced, renewables, including hydraulic energy, exceed 13% of the total energy demand and amount to 30% of electricity generation, energy intensity is constantly falling and the trends in this sense will not only continue but will be further enhanced by the EU energy and climate targets.

This process has yet to start in the South: fossil fuels account for more than 90% of the primary energy consumed, no significant changes are expected in the next 25 years and energy intensity is not going to drop before 2030.

In a wishful scenario, OME´s "proactive scenario" for example, which assumes that governments effectively comply with the efficiency and diversification plans announced regarding transit to renewables in the energy matrix, major benefits could be obtained.

For example, within a period of 25 years:

- 24% of primary energy would be saved, around 200 Mtoe;
- 106 GW of new generation would not have to be constructed, thanks to demand management measures;
- Approximately 560 TWh could be saved by 2040 and the share of renewables in generation would be 23% instead of the 10% envisaged in the conservative scenario;

- Nearly 600 million tonnes less of CO_2 would be emitted;
- The greater percentage of renewables would amount to a saving of over 170 Mtoe of fossil fuels, of which 70 Mtoe would be natural gas;
- Dependence on foreign supply for energy commodities would fall to almost zero.

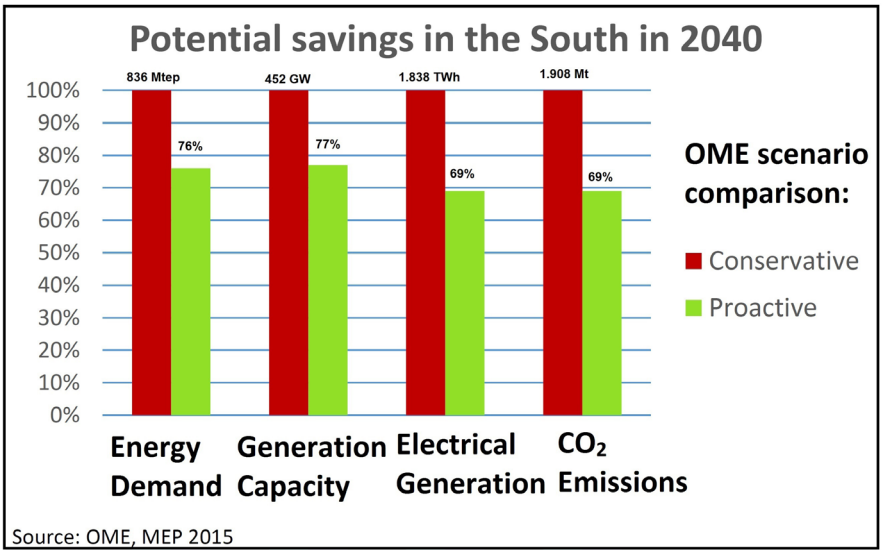


Image 22. OME Scenario Comparison. Own elaboration based on data from the Observatory Méditerranéen de l'Energie (OME).

In order to approach this ideal scenario, almost all governments in the South recently prepared detailed standards and plans with regard to efficiency and renewables, as well as setting up institutions to enforce them.

Special attention should be paid to the plans submitted in preparation for the Paris Climate Summit, referred to as INDCs, because they make public the countries' commitments in the fight against climate change.

Nearly all South Mediterranean countries submitted their INDCs before December 2015 and a summary is shown below.

Morocco

On 2nd June 2015, the Moroccan Government submitted a plan with detailed targets for all the economic sectors in order to mitigate climate change. With a view to involving all Moroccan society and international partners in this ambitious project, the Moroccan Competence Centre for Climate Change (4C Morocco) was established and the Government undertook to allocate 15% of its investment budgets to this aim.

The global objective is to reduce greenhouse gas emissions by 32% as from 2030, with respect to a baseline scenario; this would amount to preventing 400 million tonnes of CO_2 equivalent from being emitted between 2030 and 2040. It is calculated that this programme will cost $45,000 million, 35,000 million of which should be obtained from the funds allocated in the Climate Agreement. Its unconditional target, i.e., the one not bound to external financing, would be to reduce greenhouse gas emissions by 13% in 2030.

The energy sector would be responsible for 50% of the global emission-reduction target and the measures to be taken are:

- 50% of the installed electrical generation capacity to be from renewable sources in 2025;
- A 15% saving in total energy consumption by 2030;
- Reforming the energy subsidy system;
- A greater percentage of natural gas (LNG) in the energy matrix.

Morocco stresses that the availability of fresh water is one of the worrying effects of climate change.

Algeria

The new national plan approved by the Cabinet on 24th May 2015 updates the 2011 institutional framework promoting energy efficiency and renewable energies; it also sets up the National Climate Committee to develop the plan and lead all the implementation and monitoring process.

The overall objective is to reduce emissions of greenhouse gases by between 7% and 22% from the baseline scenario by 2030, this percentage depending on the foreign financing available.

The specific targets of the energy sector are:

- A 9% saving on energy by 2030;
- 27% of the electricity generated from renewable energy sources by 2030;
- Gas flaring reduced to less than 1%
- Increasing the role of natural gas and LPG (liquefied petroleum gas) for end consumers.

The mitigation plan affects all sectors of the economy but places particular emphasis of reforestation, because stopping desertification is one of its priorities.

Tunisia

The country presents one of the most comprehensive and detailed plans for adapting to climate change. The permanent fight against climate change in Tunisia is one of the points included in the Constitution of 24th January 2014, and the plan submitted in August 2015 brings together the strategies defined for all sectors of the economy as well as the updated national plans for energy efficiency and renewable energies.

The overall objective of the plan is to reduce coal intensity (emissions per unit of GDP) by 41% in 2030 when compared to 2010, which means preventing the emission of 200 Million tons of CO_2 equivalent between 2015 and 2030. If Tunisia does not receive foreign financing, it can only guarantee a 13% reduction in CO_2 equivalent emissions.

The year of reference is 2010, the plan implementation period being 2015-2030.

The energy sector is the main focus of the emission reduction plan and will contribute to 70% of the total goal. The specific targets for this sector are:

- To reduce energy consumption by 30%, approximately 50 MTOE, 2/3 by efficiency and 1/3 by using renewables;
- To reach a 30% share of renewables for electricity generation by 2030: 1,755 MW through wind energy, 1,610 MW using photovoltaic panels and 450 MW with solar thermal energy;
- To triple the surface area earmarked for solar water heaters: 220 m^2 per inhabitant.

The budget required for the effective implementation of this plan is US $ 18,000 million, of which Tunisia can contribute 10%. 86% of this budget would be allocated to the energy sector, 9% to farming and 5% to waste treatment.

An additional budget of US $ 2,000 million is estimated as being required to adapt to climate change in water resources, coastal areas, ecosystems, farming and tourism, which is an amount that the Government does not have, making it a task Tunisia would not be able to undertake without foreign aid.

The Tunisian Plan pays special attention to measures for its monitoring and correct implementation and is equipped with instruments such as the NAMAs (Nationally Appropriate Mitigation Actions), of which MRV (Measurement- Notification-Verification) and the MEDPRO prediction model were pioneers,.

Tunisia is very active in the fight against climate change because it is particularly vulnerable to rainfall changes, the rise in the sea level, desertification of arable land and water shortage.

Egypt

Its plan is based on the document "Sustainable Development Strategy: Egypt's Vision 2030" approved in 2015.

It begins by accepting its vulnerability to the impact of climate change on rainfall, Nile discharges and groundwater salinisation.

It proposes a large number of objectives and measures broken down into sectors. In the case of energy, it stresses the need to modernise obsolete generation plants, promote cogeneration and reform the subsidy system It also includes plans to implement nuclear energy.

However, this list of objectives contains no quantifications and the only figures that appear refer to the cost of implementing the mitigation plan, which is calculated at $73,000 million for the period 2020-2030, an amount that is recognized is much greater than their financing possibilities and could not be carried out without considerable foreign aid.

Israel

This Plan stands out owing to its simplicity and because its commitments are not subject to receiving foreign aid.

They cover the entire economic system and, in the energy sector, these commitments involve reducing the *per capita* emissions to 7.7 tonnes of CO_2 equivalent by 2030, which amounts to a decrease of 26% compared to 2005. The Plan also considers reducing global electricity consumption in 17% by 2030 compared to the baseline scenario and to ensure that 17% of the electricity generated in that year comes from renewable sources.

Lebanon

Everything in Lebanon seems to be conditioned nowadays by containing the problems caused by the civil conflict in Syria, which has brought about a 20% increase in the country's population in 2 years. The urgent needs are thus to provide water and essential services for this huge migratory influx.

The Government presented its mitigation and adaptation plan in September 2015 after updating its national energy efficiency plan, while its renewable energies plan is still being drawn up.

It makes a clearer distinction than in any other country between the objectives that are to be undertaken on their own and those that could be achieved with international aid. In Lebanon's case, such aid would not only be financial but also technical, to assist in the preparation of procedures for implementing the measures, monitoring them and assessing the results.

The targets for 2030 are:

- To reduce by 30% greenhouse gas emissions, or by 15% without foreign aid;
- 20% of electricity and heat from renewable sources, 15% without aid;
- 10% reduction in electrical demand, 3% without aid.

It its plans, there is an estimated growth of the electrical demand of 3.5% per year, one of the lowest percentage for the countries in the South.

Turkey

Turkey begins its commitments with the National Climate Change Strategy and the Climate Change Action Plan adopted in 2010 and 2011 respectively.

The global undertaking for 2030 is to reduce the emissions of greenhouse gases by 21% with respect to a baseline scenario. This commitment affects the industry, transport, construction, agriculture, waste and forestry sectors. For the electrical

sector this means: putting into operation 10 GW of solar energy and 15 GW of wind energy, as well as reducing transmission and distribution losses by 15%.

Achieving these targets is also linked to foreign financing.

It can be concluded, from the INDCs submitted by all the countries, that:

- Without considerable financial aid, the objectives of all the countries except Israel, are low and clearly insufficient to contribute to the global objective of fighting climate change;
- Even with international aid, the objectives are ambitious and difficult to achieve in view of the extent to which previous plans have been fulfilled: international cooperation is strongly advisable to implement, monitor and check compliance;
- A major concern shared by all countries is the reduced availability of fresh water and its salinisation: the next challenge for the Region, closely linked to the immediate objective of electricity supply, will be water supply and treatment; the figure of the IWPP (Independent Water and Power Producer) which is becoming so important in the Gulf countries is fully applicable to those in North Africa.

All in all, the challenge to ensure the supply of electrical power and eventually of water in the South, could be a source of opportunities for collaboration, especially if the challenges are faced with a view to progressively transforming the energy sector.

Efficiency and renewables, pillars of the energy transition, can be applied not only to electrical generation but also to the residential and transport sectors, both having greater potential for development in the South than in the North.

Where efficiency is concerned, because the societies in the South are currently growing, planning new constructions that are easier to adapt than those already built and urban settlements that can be developed with better mobility efficiency criteria, and because in the area of insulation, electrical appliances and vehicles there is a great potential for improvements. Where renewable sources are concerned, because there is more space and greater solar irradiance per m^2, as well as more potential for self-supply and decentralised generation, and this would make costly infrastructures unnecessary.

Insofar as wind generation, the North and the South follow the same path, although there are few offshore facilities in the South. Photovoltaic generation in the South is at the stage of large plants far from the consumption centres (utility size). However, domestic facilities (roof top) are more suitable in sparsely-populated areas, because electricity is not lost in transport and, what is even more important: such facilities help to create a local industry for installation and maintenance, thus generating long-term employment.

The initial investment and the cost competitiveness are no longer impediments for renewables: the Gulf countries have demonstrated that there are independent

producers prepared to invest with reasonable guarantees and that their bids have dropped to 30 $/MWh in contracts lasting for more than 15 years. The IEA[15], traditionally skeptical about the potential of renewables, accepts that wind and photovoltaic contribution to electrical generation in the world could rise to between 37% and 60% by 2040 depending on the policies and measures supporting these technologies. The countries in the South, which are in optimum conditions to make use of these resources, do not even come close to these percentages, even with their most ambitious plans.

Towards Mediterranean Cooperation

This final chapter refers to useful initiatives for dialogue and cooperation in the Region.

The Barcelona Process

Improving cooperation in the Mediterranean is a goal that has long been pursued. The first serious political initiative was the so called Barcelona Process launched at the Euro-Mediterranean Forum in 1995, but all attempts to narrow economic cooperation failed to yield the hoped-for results, perhaps because the political willingness was unable to motivate private initiative. In fact, even at that Forum in the fall of 1995 in Barcelona, participants calling for less political statements and more specific action could already be heard, but nothing changed for many years.

In 2008, the Union for the Mediterranean (UfM) was set up to give a new boost to the Barcelona Process. The UfM brings together 43 countries, 28 EU Member States and 15 countries from the South and the Eastern Mediterranean. A permanent Secretariat is organized, placed in Barcelona, that becomes co-ordinator of proposals from the relevant States, financial institutions, regional organizations, firms and experts in the field of renewable energies, energy efficiency and integration for the Mediterranean markets.

Cooperation Platforms

In November 2014, and under the auspices of the UfM, a proposal was made to establish three Platforms to enhance cooperation between North-South and South-South in the energy environment, with three specific spheres of action:

- Regional Electricity Market (UfM REM Platform), with a view to making progress with integrating the energy systems and markets and, more specifically, in improving the electrical exchanges and the interconnections

[15] World Energy Outlook 2016.

in order to obtain a secure, affordable and sustainable supply for the benefit of the Region's citizens and companies. This platform was officially launched on 12th October 2015 in Rabat.

- Renewables and Energy Efficiency (UfM REEE Platform), for the progressive implementation of renewable energy sources and the promotion of energy efficiency measures in order to encourage socioeconomic development in the Region and give citizens and companies access to advanced energy services while at the same time contributing to emission mitigation and adaptation to climate change. This platform was officially launched on 14th November 2016 at the COP 22 held in Morocco.
- Gas (UfM Gas Platform), which purpose is to give regional dialogue a chance to make it possible to implement a secure, transparent and predictable Euro-Mediterranean gas market, with respect to the supply and demand expectations, so a fair balance can be reached between the interests of the producing and consuming countries and to lay the foundations for the long-term development of the abundant reserves in the Region. This Platform was officially launched in Brussels on 11th June 2015.

The objectives of these three platforms fit perfectly in keeping with the priorities or challenges that affect mainly the countries in the South, as expressed in this analysis: guaranteeing the electrical supply, doing so in a sustainable way (energy transition) and recovering the great hydrocarbon potential in the Region.

These platforms form part of a European neighbourhood policy that aims to promote overall socioeconomic development cooperating in terms of equality.

Overcoming Energy Nationalism

It is to be hoped that these Platforms go beyond merely performing analyses and are able to effectively influence political decisions in order to overcome, amongst other, the "nationalism" that characterises energy legislation in some countries.

Energy nationalism puts off foreign investment and is an impediment to creating joint ventures, but it is difficult to eradicate. It is based upon the idea that the State has to keep control over its gas and oil reserves, over the terms and conditions for accessing exploration and production, taxation, domestic prices and export conditions; under no circumstances can a Government be accused of selling national wealth to foreigners and not thinking about the needs of future generations[16].

There are recent examples of a change in this outlook. One of these is Mexico, where it has even been necessary to change one of the principles of the Constitution, which had been in force for a century. Mexico is also setting an example in its capacity to adapt exploration bids in view of the lack of success of its first auctions.

[16] Jean Marie Chevalier, The New Energy Crisis.

Closer to home, are the example, of the Middle East, where new electricity generation is offered to independent operators; Egypt, where the auctions for exploration and production blocks are open and competitive bids and producing good results; in Israel where the Minister responsible synthesised this view by inviting bidders to include a foreign partner because the national companies did not have sufficient professional experience[17].

The Maghreb-Europe gas pipeline is another even closer example of successful North-South cooperation, without threatening "national heritage".

This 1,100 km long gas pipeline connects the Algerian deposits of Hassi R'Mel in Algeria with the Spanish network in Cadiz and runs as far as Portugal. It was a joint project involving Algeria, Morocco, Spain and Portugal that came into operation in November 1996 after a Hispano-Portuguese firm completed the 540 km Moroccan section in the record time of 16 months. The ownership of this section was transferred to Morocco, whereas the operation and maintenance was commissioned for 25 years to Metragaz, a Hispano-Portuguese company in which the Moroccan Government has a symbolic shareholding. Metragaz has been operating the Moroccan section of the gas pipeline, the underwater ducts jointly with Enagás, two compressor stations and four maintenance centres, without any major incident or supply interruption for 20 years. The firm currently has a staff of 100 persons, of whom 99% are Moroccans.

In short, freedom of management in this case has served as a guarantee for the foreign investors, resulting in the joint venture being run in an optimum way, contributing to create jobs and provide professional training in the country where the investment was made.

Financing

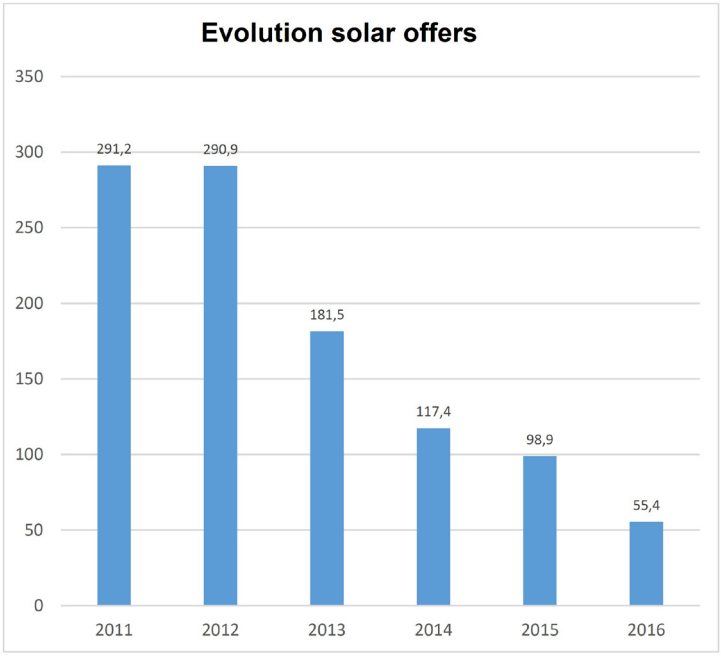
When presenting their contribution commitments or INDCs, nearly all the countries in the South have stated that financing is essential.

The financing required in energy is focused on three areas: generating facilities, transport infrastructures and hydrocarbon exploration & production.

For the new generating facilities that we estimated at 300 GW and US $390,000 million until 2040, independent investors (IPPs) would be necessary, as is the case with the Gulf Countries[18]. It is a highly efficient model to be followed because the State does not have to invest and, furthermore, because IPPs are more effective in investing than public companies. IPPs also complete the projects more quickly and are breaking records for low bids in solar facilities. In October 2015, there was a bid in Dubai for 30 $/MWh according to BNEF.

[17] "They could bid together with local partners but each group must have a foreigner because today in Israel there still are no serious operators".

[18] APICORP, September 2016.



Source: BNEF (2016 for 1q only)

Image 23. Average Price (USD/MWh) for solar bids.

The drawback lies in the requirement to have a firm commitment of more than 15 years, during which the bid cannot be lowered if electricity demand stops growing, and the contract terms and conditions cannot be altered in the event of disruptive technological breakthroughs or if changes affect the market structure. IPP contracts are well suited to the "single buyer" model that prevails in many countries in the South.

Although the complexity of building new generation capacity in North Africa has little to do with the problems faced in the rest of Africa, it is interesting to see, by way of example, how the "Power Africa" initiative launched by President Obama in 2013 has been developing[19].

The initial target for this initiative was to double, in 5 years, the number of people in Sub-Sharara Africa with access to electricity.

The planned financing was $7,000 million to encourage private initiative to participate, to put into operation 10,000 MW and to reach 20 million homes, thereby ensuring that the consumers would no longer spend millions on highly-polluting gasoil generators.

[19] Power Africa. Bloomberg, 21st September 2016.

Three years after launching, the progress of this initiative became fraught with various problems, both political and regulatory, in the countries where it was implemented. It also suffered from financial problems at the source, because the main bank, the Export-Import Bank, has only released US$132 million and, especially, all kinds of bureaucratic problems everywhere.

400 MW have been constructed in 3 years, 5% of the target, although there now appear to be agreements with private investors for further 4,600 MW.

Despite these results, the developers are hopeful and state that nothing of real importance has been built in a short period of time. Such is their confidence that the period for the initiative has been extended to 15 years, the budget increased to US$ 10,000 million and the target has been increased to 30,000 MW of power so that up to 60 million households or firms can be provided with electricity.

One important lesson to be learnt is that the initiative is changing the original approach from the large generating plants originally planned(utility type) to smaller solar facilities disconnected from the grid instead (roof-top type). Private investors are responding better to this new approach and an industry is flourishing around the photovoltaic panels value chain. The uncertainty at present concerns the willingness of the new US Administration to carry on with this project.

The key to financing electricity transport and distribution infrastructures, which we estimated will require $260,000 million between 2013 and 2040, is to guarantee "reasonable profit" to the investment. What constitutes "reasonable profit" will be different in each case, depending on the country risk amongst other, a long-term commitment however will attract at this moment enough investors.

In view of the recent discoveries in the East and the US GSS reports, the Mediterranean Basin is a very attractive prospect for investment in hydrocarbon exploration and production; the only incentive needed being to set legislation in line with international standards as IOCs count today on.a larger number of investment options.

How can Europe help with the financing?

Europe has a European Fund for Strategic Investments promoted by President Juncker and has undertaken to make major contributions to the Climate Change Adaptation Fund. Faced with the important "Mediterranean challenge" the European Union would do well to analyse where its financial resources can obtain their best return in terms of creating employment, regional progress and political stabilisation.

Energy subsidies

Energy prices do not reflect actual costs, in practically any countries of the South or those in the North.

Apart from making foreign financing more difficult, subsidies to energy consumption discourage saving. Removing them without stiff social opposition has to be done gradually, with good awareness campaigns and public debates to explain the reasons, the process and the benefits to be obtained by society as a whole.

One good example of the negative effect of subsidies is fuel smuggling between Algeria and its neighbouring countries that, in 2012, was equivalent to 1.3 billion dollars[20]. In Algeria in 2013, petrol could be bought at one third of the price in Tunisia and one fifth of the price in Morocco, which made stopping smuggling really difficult. As a result of this price disparity, fuel demand in Tlemcen, an Algerian city with 150,000 inhabitants on the Moroccan border, is greater than the fuel demand in Algiers, the capital, whose population is ten times greater, besides the frontier between Algeria and Morocco has been closed to trade since 1994.

As long as subsidies exist, it is out of consideration that energy prices could include the cost of externalities, which is the starting point from which to initiate the process of greater efficiency and substitution of polluting energies.

Mediterranean Electricity and Gas Rings

This ambition dates back almost as far as the Barcelona Process, and almost became a reality, however, the process was interrupted by the serious political conflicts in some North African countries. The projects mainly affected are the Arab Gas Pipeline from Egypt to Syria and planned to run as far as Turkey and the electrical connection via Libya. And, to mention among the lost opportunities, a direct electricity connection between Algeria and Spain when the Medgaz gas line was built.

Completing the rings would help to form one single Mediterranean gas and electricity market, would improve supply security and optimise complementarities for different demand curves, as well as encouraging efficiency by allowing for competition between neighbourings systems.

The Mediterranean Gas Hub

If, as it seems, the Mediterranean Basin gas market is going to be more active than the European one, a wholesale liquid or gas hub contracting centre could make exchanges much easier and help to establish one single price not very different from the one set in the hubs consolidated in Europe: the North Balance Point (NBP) in the United Kingdom and the Title Transfer Facility (TTF) in The Netherlands.

[20] Youcec Yousfi, former Oil Minister, "Fuel smuggling is gangrene on the national economy...".

Maros Sefcovic, Vice President of the European Commission and the person in charge of the Energy Union, recently insisted on the need for a Mediterranean gas hub; several countries, basically Spain Italy, Greece and Turkey, having shown interest in being the headquarters for this hub. However, few offer the same advantages as Italy:

- Gas pipeline connections with the main suppliers from the North: the TAG that connects with Russia, and Transitgas connecting with Holland and Norway, having a capacity of over 60 bcm between the two;
- Work under way to ensure that Transitgas can convey gas in both directions;
- Connection with the main exporters in the South: Transmed with Algeria and Greenstream with Libya, having a capacity of more than 40 Bcm;
- Two LNG reception plants with a capacity for processing over 14 bcm/year and other plants being planned;
- Participation in the Trans-Adriatic Pipeline (TAP) project that will connect with the Caspian region across South-East Europe;
- The third biggest gas market in Europe, 62 bcm/year, and the largest market in the Mediterranean Region;
- Concurrence of having a large number of suppliers as well as a liberalised and competitive gas market.

The most recent news that strengthens Italy's position is the statement from the ENI's CEO in New York on 13th December, in which he stated that Sonatrach would recognise the Italian hub as the benchmark for its gas prices.

Spain was the first liberalised gas market in the continent, it is highly competitive and has the largest number of suppliers as well as the highest reception capacity for LNG in Europe, however, its limited number of connections with the continent however, and the northern neighbour's lack of transport network integration, limit its potential for becoming the main Mediterranean gas hub. In the short term, neither Greece nor Turkey are reliable candidates for hosting a gas hub, which does not mean to say that each country may decide to have its own hub as an instrument for balancing the supply and demand; nonetheless, it does not seem feasible for these local hubs to have enough liquidity to set gas prices and to facilitate price hedging.

The special relationship that Algeria has with the European Union, the Algeria's great potential as a reference partner, and its political role as a frontier between Europe and high-risk zones in Africa, makes it worth a separate study within this chapter on the conditions that are conducive to cooperation.

The Dialogue with Algeria

At a first glance, Algeria is the ideal partner in the Mediterranean Region because it:

- Is a country with 40 million inhabitants covering a surface area of 2,380,000 km^2, nearly 5 times the size of Spain;

- Lies in the centre of the Maghreb and close to Spain, Italy and France;
- Has the second largest gas reserves in Africa, is third in the world oil rankings and unconventional hydrocarbon potential;
- Has more than enough infrastructures to export hydrocarbons: two gas liquefaction plants at Arzew and Skikda able to process over 40 bcm per year, and three gas pipelines that link it to the European markets, GME, Medgas and Transmed with an export capacity above 53 bcm/year;
- Has hydrocarbon production and transport costs that make them very competitive on the European markets.

Yet abundant natural wealth is not always managed properly and problems arise whose causes do not lie underground but over the ground:

- Since the start of the decade, oil and gas production has found it difficult to keep up the same rate as before, while domestic demand has increased rapidly meaning that export potential is in constant decline;
- It is more difficult to hold back domestic demand in a subsidised country, where prices do not reflect costs and where subsidis to gas and electricity consumption accounted for 11% of the GDP in 2013, the total subsidies amounting to 30% of the GDP that year;
- Developing the potential of hydrocarbons is not easy when the exploration and production legislation is obsolete in relation to the new energy context and does not encourage investment;
- The failure of the blocks tender in 2014 and the cancellation of the tenders scheduled for 2015 for fear of a repeated failure, appear in all the analyses of the exploration conditions in Algeria;
- As a consequence of the drop in exports, there are costly export infrastructures on which large investments were recently made without taking into account the market changes, that are working at only 50% of their capacity;
- The regions pinpointed as being of great potential for unconventional hydrocarbons are in remote areas and the local public opinion is proactively against this type of exploration.

Apart from internal management problems, there are also external and socio-political problems:

- The international price of oil already kept low for two years has depleted currency reserves by 30%, since hydrocarbons account for 95 % of Algerian exports;
- Unstable frontiers: this affects more than 1,000 kilometres of frontier with a Libya in the throes of unrest, with Tunisia, one of the breeding grounds for international Jihadism, with Mauritania, Mali, and Niger, apart from the long-standing conflict with Morocco over the Western Sahara;
- The largest military expenditure in Africa, approximately US$ 11,000 million, which is more than 5% of the GDP and difficult to maintain in times of revenue crisis;

- A young population, with an average of less than 30 years, who can find no future in their country or responses from the traditional political parties tempting them to resort to radical Islam as a solution.

The European Union is fully aware of the opportunities and threats of this neighbour in the South Mediterranean and has struck up a constructive dialogue at the highest level because, as Professor Escribano says *"it is not a question of whether or not Algerian gas can be used to replace Russian gas, but rather what can Europe do to enable Algeria to make a greater contribution to the supply security instead of becoming the next problem"*[21]. We are all conscious of the fact that the current drama in Syria would be mild compared to the destabilisation of a country like Algeria.

This dialogue is taking place through a Business Forum to deal with the potential areas of cooperation in the energy sector as well as sensitive questions such as hydrocarbon exploration, production and sales contracts. In particular, the questions put to the Algerian Government are the following:

- Low potential for the blocks tendered and scarce information given in advance
- Inflexible conditions for exploration or eventual withdrawal
- Discouraging taxation, royalties and calculation methodology;
- Functioning of the joint ventures and Sonatrach not very flexible;
- Slow and complex tender procedures;
- General business environment not adapted to current requirements: very bureaucratic.

Although the Algerian Government is not prepared to change the February 2013 Hydrocarbons Act, it is considering these suggestions except for those concerning taxation and royalties. Proof of this could be the apparent agreement reached with ENI in November to refer the price of gas to the Italian gas hub, PSV. If this were confirmed, it would be a historic event because of Sonatrach's flat refusal in the past, to disassociate the price of gas from the price of oil.

The points put to the Algerian Government regarding gas contracts concern the inflexibility of the take-or-pay contracts in the long term and the -now apparently overcome- indexing of gas to the price of oil. Negotiating these questions is no easy matter because at present the Algerian Government does not seem to mind reducing delivery commitments that it it is finding difficult to comply with.

The development of renewable energy sources and energy efficiency has also been dealt with. As it has already been explained, the targets are ambitious for renewable energies, but the Algerian Government's objective to ensure that the equipment is supplied by local industry is just as ambitious. Competitive price and quality conditions seem difficult to achieve for a hitherto still non existing

[21] *A political economy of low oil prices in Algeria. Gonzalo Escribano. Expert Comment 40/2016, 19 October 2016.*

industry, hough, if the investment conditions are reasonable, it would be a good opportunity for the European components industry.

With regard to energy efficiency, the potential for collaboration is large, given that energy intensity is very high in Algeria, four times greater than in Spain. The attention is focused on buildings, lighting and electrical appliances, and the Algerian Government has shown interest in learning about and adapt the measures that have proved efficient in Europe.

Although political and economic stand still has been typical of the Algerian attitude in the past, they are so much aware of the enormous challenges faced by the country that this dialogue and cooperation initiative might lead to changes in the Algerian energy policy and legislation beneficial for both parties.

Some Conclusions

Europe faces a major challenge along its southern flank, and it is one that not only has an economic aspect that could have serious social and political consequences, but also an environmental aspect that could threaten life in zones that are particularly sensitive to climate change in the Mediterranean Basin.

That South frontier delimits a Region that apart from the aforementioned challenges, offers great opportunities. However, that does not necessarily mean to say that Europe can can take advantage of these opportunities despite the Regions' historical and geographical proximity and the complementary nature of resources between the countries of the South and North Mediterranean.

To be able to compete with other international stakeholders in the exploitation of those opportunities, Europe has to prove itself not only reliable, which it is, but also efficient, which is not quite as clear.

Traditional trade with raw energy materials has established stable cooperation ties between the Mediterranean countries, but this exchange is losing prominence as a new energy model is emerging and developing faster in the North than in the South.

The different stage of progress towards a more sustainable energy model, which is becoming urgent in the Mediterranean Basin, and the manifest complementarities between neighbours are paving the way for cooperation, initially with North Africa, and afterwards, with the whole of the African continent.

It is essential that all the Mediterranean countries are committed to this cooperation in order to feed, supply energy and provide employment to 100 million inhabitants more that will be living in the Region in 25 years' time and, consequently, to reduce inequality, poverty, migration and the temptation to drift towards ideological radicalism.

Extending this cooperation between Europe to cover the rest of Africa is the way to achieve greater vertical geographical integration, which is key to guarantee

that both continents continue to be globally important from an economic and political perspective.

Abbreviations and Acronyms

INDC (Intended Nationally Determined Contribution): National commitments to reduce greenhouse gas emissions presented at the Climate Summit.

COP21: Conference of the Parties held in Paris in December 2015.

MOE (Observatoire Méditerranéen de l´Energie): Association of Mediterranean energy companies with headquarters in Paris.

Mte: Million tonnes.

Mtoe: Million tonnes of oil equivalent.

b/d: Barrels of oil per day.

kW, MW, GW, TW: Kilowatt, megawatt, gigawatt, terawatt.

bcm: Billion cubic metres of gas.

LNG: Liquified natural gas.

OECD: Organisation for Economic Co-operation and Development.

CO_2: Carbon dioxide.

IEA: International Energy Agency.

US GSS: United States Geological Survey Service.

EIA: Energy Information Administration, US Department of State.

IMF: International Monetary Fund.

EBRD: European Bank for Reconstruction and Development.

IPP: Independent Power Producer.

IPWP: Independent Power and Water Producer.

UfM: Union for the Mediterranean.

Feed-in-Tariff: Supplement paid to some generation technologies.

BNEF: Bloomberg New Energy Finance.

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Chapter V

Rivalry between Iran and Saudi Arabia in the geostrategic context of energy

José Ignacio Castro Torres

Abstract

Iran and Saudi Arabia are opposing rivals struggling for being the regional powers in the Middle East. Energy is important in this fight, since it is the driving force behind both countries' economies. Apart from hidrocarbon production, transportation is a critical issue, because it has to be done through safe maritime or land routes. Maritime straits and transit routes are vital for transporting energy products to their destinations. It is in these areas where Saudis and Iranians are involved in a "proxies´ war", to obtain control over the communication routes. Both players´ long-term plans foresee an end to the oil era, therefore, they have both initiated diversification processes for their economies and also for their power sources. How successfully they implement their plans could well be the deciding factor where the Middle East´s next regional power is concerned.

Keywords

Saudi Arabia, Iran, Energy, Transport, Conflict, Proxies.

The Geopolitical frame of Energy deposits in the Middle East

The Middle East has been considered of paramount interest since time immemorial. The classic Greek historian Herodotus himself considered that the most important region of his time laid between the east of the Mediterranean and the Iranian-Afghan plateau, because it was the zone where the Eurasian landmass converges with the African continent, and also where the Mediterranean Basin connected with the Red Sea, the Indian Ocean and the Persian Gulf waters. This vast tract of land contains three distinct geographical features, comprising the Anatolia land-bridge, the Arabian Peninsula and the Iranian plateau[1].

Iran is recognised as being one of the most firmly established nation-states in the zone, given that it has a perfectly laid-out framework within which it has built up a standardising ethnic and cultural context that clearly makes it different from the rest of the peoples that surround it, such as the Turks to the north, the Hindus to the east and the Arabs to the west[2].

One of the factors that further enhances Iran's privileged position is that its territory straddles the Persian Gulf and Caspian Sea Basins, which jointly contain the biggest gas and oil reserves on the planet. Practically all the hydrocarbons obtained in the Great Middle East[3] come from this area. It must be remembered that the biggest network of oil pipelines in the world leads off from the Caspian and the largest network of maritime routes leads off from the Gulf.

Another advantage that Iran has lies in the fact that it is the only country capable of exerting influence on the two aforementioned basins, because it controls the southern zone of the Caspian Sea, so the Central Asian States depend on Iran if they want to trade their hydrocarbons towards the Indian Ocean. Furthermore, Iran is able to dominate the Persian Gulf region, its outlet via the Strait of Hormuz and most of the Gulf of Oman[4].

Iran is also especially fortunate where hydrocarbons are concerned, because it is estimated that it could contain 10% of the crude oil reserves and 17% of the gas on the planet. The oil deposits lie in sensitive zones of the Persian Gulf, given that many of them are close to frontiers, near the coast or off-shore, some fields being shared with Iraq, Qatar, Kuwait and Saudi Arabia. Other deposits lie under the waters of the Caspian Sea, where there are jurisdictional disputes with the rest of the bordering States on this sea, mainly with neighbours Turkmenistan and Azerbaijan[5].

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1 KAPLAN, Robert D., "The revenge of geography: what the map tells us about coming conflicts and the battle against fate" Random House, 2012, Pages 55 and 256.

2 HOURCADE, Bernard, "Géopolitique de l'Iran", Armand Colin, Paris, 2010, Page 56.

3 REZA, Mohammad, "Iran: Force et Faiblesses d'une Puissance Régionale" Casa Arabe e Instituto Internacional de Estudios del Mundo Musulmán, Córdoba, 2007, Page 9.

4 CORDESMAN, Anthony H, "Iran, Oil, and the Strait of Hormuz" Center for Strategic and International Studies, Washington D.C 2007, Pages 2-3.

5 EIA, "Iran Country Analysis Brief", available at: https://www.eia.gov/beta/international/analysis.cfm?iso=IRN. Reference date 19.10.2016.

The different attitudes towards how the Caspian resources ought to be shared out is also a cause for tension with Russia, although Teheran and Moscow do agree that the presence of western companies in the zone, mainly in Azerbaijan, goes against their common interests. The construction of the Baku-Tiflis-Ceyhan (BTC) oil pipeline and the Baku-Tbilisi-Erzurum (BTE) gas pipeline is harmful to Iranian interests, as Iran would rather see the hydrocarbons from the Caspian and Central Asia finding their way to the sea across its territories. Russian energy companies utilise these infrastructures to play their part with Azerbaijan, Georgia and Turkey, which receive economic compensation for the hydrocarbons that cross their land.[6] Furthermore, the Russian oil company Lukoil is guaranteed a permanent outlet to the Black Sea, given that the old Baku-Novorossiysk oil pipeline is inoperative in the winter months.

The oil discoveries in the Caspian in 2001 prompted Russia to opt for a sharing out of the marine bed, in order to protect its interests, because if Iran wanted to participate in any project, there was a risk that it might not be carried out owing to the sanctions imposed on the latter. In addition, the Russians would also be able to take part in the exploitation of Azeri crude oil alongside western producers, Iran being excluded due to its poor relations with the Government in Baku. Iran would thus continue to be dependent on business with Russia[7].

Pursuant to natural gas, Iranian fields lie mainly in the South Pars zone, in the waters of the Persian Gulf, where they extend into Qatar territorial waters. There are also other gas fields in the Gulf and the Caspian Sea; Iranian gas exploration in these areas as a whole have had success rates as high as 80%, whereas the world average is about 30%[8].

One particularly vulnerable aspect affecting the gas and oil resources is the fact that many of them lie in the coastal areas and the interior of the Iranian Province of Khuzestan, where the majority of the inhabitants are ethnically Arab and tensions have always run high. However, the fact that they are Shiites serves as a unifying factor where the integrity of the State is concerned[9].

The points that are particularly vital in the energy-product economy are the Abadan refinery, where all the oil pipelines in the region converge, and the loading and storage terminals; these include the terminals on the islands of

[6] DALY John C. K., "Russian Oil to Feature in Baku-Tbilisi-Ceyhan Pipeline—Circumventing Possible Sanctions?" available at https://jamestown.org/program/russian-oil-to-feature-in-baku-tbilisi-ceyhan-pipeline-circumventing-possible-sanctions/#sthash.ZX1IgR2q.dpuf. Reference date 19.10.2016.

[7] CAIN, Michael, IBRAHIMOV, Rosvham, BILGIN Fevzi, "Linking the Caspian to Europe", Rethink Institute, 2012, Washington, D.C.

[8] International Energy Outlook "Report Number: DOE/EIA-0484(2016)" available at https://www.eia.gov/forecasts/ieo/nat_gas.cfm. Reference date 21.10.2016.

[9] ELLING, Christian, "Minorities in Iran: Nationalism and Ethnicity After Khomeini", Palgrave Macmillan, New York, 2013.

Kharg and Lavan, which could easily be destroyed in a conflict or have their access points blockaded[10].

The waters of the Persian Gulf are controlled by Iran thanks to the layout of its coastline, with its many creeks, bays and small islands, from which merchant shipping could be harassed. Furthermore, the depths of the waters make them rather unsuitable for large vessels, such as oil tankers; this question is all the more important at the Strait of Hormuz chokepoint, where the nature of the seabed means it can only provide two navigation channels for deep-draft vessels[11].

This Strait is of paramount importance for transit, it being estimated that 30% of all the world's maritime oil and liquid natural gas passes through this point, mainly on its way to Asian countries[12].

The Iranian population is a third element overlaying the aforementioned substratum of Iran's geographical position and the country's access to the sources of the oil resources, both Iran's autochthonous population, as well as those who regard themselves as Shiite in the Middle East, who could affect the difficult balance of power with the country's neighbour, Saudi Arabia.

Iran is a country with 80,000,000 inhabitants, one of its characteristics being ethnic variety. In spite of this diversity there is an agglutinating factor, i.e. the majority of Iran´s population are Shiites, almost 90% claiming to belong to this branch of Islam. The Sunnis, such as the Baluchis or Kurds, are more likely to oppose the actions of the State[13]. The fact that there are Shiite groups living beyond the bounds of Iran is a factor that could cause destabilisation, especially where the power of Saudi Arabia is concerned, and such destabilisation could occur either within the borders of Saudi Arabia or in its immediate vicinity.

Saudi Arabia is the largest of the states on the Arabian Peninsula, although it has less than 30,000,000 inhabitants. Its main source of power lies in its huge hydrocarbon deposits, which are estimated to be the biggest in the world for oil, and the fourth in the ranking of natural gas.

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10 CORDESMAN, Anthony, COUGHLIN-SCHULTE, Chloe, GOLD, Bryan, "Iran: Sanctions, Energy, Arms Control, and Regime Change", Rowman & Littlefield, 2014, Lanham MD, Pages 34- 35.

11 The territorial disputes between Iran and the United Arab Emirates further complicate this situation, the bones of contention being the islands of Abu Musa, Big Tunb and Small Tunb, which give Iran control over the Strait's northern channel and a dominant position over the southern channel.

12 EIA, "World Oil Transit Chokepoints", available at: http://www.eia.gov/beta/international/analysis_includes/special_topics/World_Oil_Transit_Chokepoints/wotc.pdf. Reference date 24.10.2016.

13 MIR MOHAMMAD, Seyede Zahra, HOMAYOUNIB, Behzaz, "Backgrounds of Divergence and Obstacles of Convergence of Ethnic Minorities in Iran from Constitutionalism to the Present" Reef Resources Assessment and Management Technical Paper, Noumea, New Caledonia, 2014, page 513.

In spite of the size of these reserves, their location makes them vulnerable, because they are very close together and half of the extraction operations are carried out from only eight oilfields, the one at Ghawar being the largest in the world. Furthermore, the Saudis not only possess the largest reserves and extraction capacity, but are also able to process oil products, the Abqaiq plant being the biggest facility anywhere in the world for oil stabilisation and processing[14].

The Saudi oilfields are mainly found towards the east, therefore the transportation of the oil to other places in the country without going through the Strait of Hormuz requires the resources to flow through oil and gas pipelines to ports on the Red Sea. The construction, operation and maintenance of this infrastructure is costly, so Saudi Arabia should carefully weigh up the benefits and risks involved both in transporting their resources via the Strait of Hormuz and pumping hydrocarbons to the Red Sea ports.

Except for the currently existing pipelines in Saudi Arabia and in the United Arab Emirates (UAE), most of the options for avoiding the Strait of Hormuz by using oil pipelines do not seem politically viable. The Saudis' "Petroline" or "East-West Pipeline" is 746 miles long and is equipped with two different pipe transporting systems, oil running through both, although in the past one of them was used to convey natural gas. This change enables the Saudis to transport, if necessary, 4.8 thousand million barrels per day, although at present only 3 thousand million barrels are flowing through, so there is room for a considerable increase. Saudi Arabia is also equipped with an LNG line, for transporting the gas from the Abqaiq plant to the port of Yanbu, which with a capacity of 2.8 thousand million barrels per day, is operating at its limit. The UAE line is much smaller, having a capacity for only 1.5 million barrels only, it transports Emirate´s crude oil from the coastal concentration point of Habshan, in Abu Dhabi, as far as the port of Fujairah, in the Gulf of Oman.

Asia is the destination of most of the Saudi oil loaded in the Red Sea ports, which means the travelling distance from the port of Yambu is 760 nautical miles longer than it would be if were loaded in Ras Tanura or the Ras al Ju'aymah terminal, so the journey from one port takes five days longer than it would from the other[15].

Another major problem involved in loading hydrocarbons on the Red Sea side of the Peninsula is that the maritime waters do not lead to the open sea. The Suez Canal lies to the north, and in the south, vessels taking products to Asia have to pass through the Bab-el-Mandeb Strait, whose coasts are between Yemen, on

[14] EIA, Saudi Arabia, Analysis, available at: http://www.eia.gov/countries/analysisbriefs/Saudi_Arabia/saudi_arabia.pdf. Reference date 26.10.2016.

[15] EWELL, Wester, BRITO, Dagonert and NOER, John, "An Alternative Pipeline Strategy in the Persian Gulf", Paper sponsored by the James A. Baker III Institute for Public Policy, the Center for International Political Economy and the Office of the Secretary of Defense, 2000, http://bakerinstitute. org/publications/TrendsinMiddleEast_AlternativePipelineStrategy. pdf.

the Asian side, and Djibouti and Eritrea, on the African side. The 18-mile wide Strait has two navigation channels each 2 miles wide, so it is also a critical region for maritime traffic and this alternative route for oil products destined for the Asian market is by no means secure[16].

It can thus be seen that any event occurring in Yemen would affect the traffic in this Strait and destabilise the situation in Saudi Arabia. A direct Saudi intervention to deal with such a problem would not be viable, because Yemen has nearly as many inhabitants as Saudi Arabia and many of its sectarian groups are openly hostile to the Saudi regime, so the latter would have to seek support from like-minded groups. Furthermore, as Yemen is a highly fragmented territory, as Saudi Arabia went inland, it would find itself losing link and support capacity[17]. This weakness has been well exploited by Iran, attempting to weaken Saudi power in its own back yard.

Going back to Saudi Arabia's facilities, the location of the aforementioned Abqaiq processing plant close to the eastern oilfields, is vital because of its enormous dimensions and because it is used to pump the processed hydrocarbons to the ports in the east, in the direction of the Persian Gulf. The oil products and the natural gas are also sent from this plant in an east-west direction through oil and gas pipelines to the port of Yambu, although the potential for this transport system has the limitations described above[18].

Saudi Arabia is not only characterised by an abundance of oil and gas, but also by a lack of fresh water. As the country has nearly 30,000,000 inhabitants, the need for this vital resource is critical for the Saudi State. Most of the large towns and cities have had to resort to desalination plants, which consume large amounts of power. The most significant case is the Jubail Desalination Plant, the largest of its kind in the world, which supplies the Saudi capital, Riyadh[19].

From a religious perspective, the population is heterogeneous, given that 15% profess to be Shiites, mostly living in the east of the country, close to the main hydrocarbon deposits. The Saudis are not only concerned about religious differences, but also about the eventual questioning of their own regime[20].

In this respect, it must be remembered that the monarchs on the Arabian Peninsula, Sunnis, rule large Shiite minorities within their State structures. The

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16 CORDESMAN, Anthony, "America, Saudi Arabia, and the Strategic Importance of Yemen" March 26, 2015, Center for International and Strategic Studies https://www.csis.org/analysis/america-saudi-arabia-and-strategic-importance-yemen.

17 KAPLAN, Robert, Op. Cit, p.266.

18 Southfront, "Analysis: Oil and gas pipelines in the Middle East (Exclusive)", available at https://southfront.org/analysis-oil-gas-pipelines-middle-east/. Reference date 30.10.2016.

19 IRFAN, Mohammed, "SWCC's desalinated water output is world's largest", Arab News, December 2013, available at http://www.arabnews.com/news/487231#. Reference date 30.10.2016.

20 WEHREY, Frederic, "Saudi Arabia Has a Shiite Problem", Foreign Policy, December 2014, http://foreignpolicy.com/2014/12/03/saudi-arabia-has-a-shiite-problem-royal-family-saud/.

notable exception is Bahrain, where Shiites are the majority. At times they have risen up against their governing elites.

The problem of religious differences among the Saudi population are further complicated by social questions and legitimacy, which together tend to suggest destabilisation in the long term. The reign of the last King Abdullah bin Abdulaziz Al Saud was characterised by caution. After he died in 2015, his elderly brother Salman bin Abdulaziz adopted a much more active line, attributed to the influence of his youngest son, Prince Mohammad bin Salman, who has taken over responsibility for economic affairs and the defence of the State[21]. The Prince has embarked upon an ambitious yet risky economic project, called "Vision 2030" to modernise and privatise the Saudi economy and provide youth employment in a sector where that age bracket is fraught with unemployment problems. He is also considered to be the mastermind behind the military operations against the Houthis in Yemen. Although these operations were expected to be brief, they have dragged on for over a year[22].

One case of particular importance is the conflict between the Sunnis and Shiites in Yemen, which could directly affect the maritime communication channels through which the oil products are carried.

The situation in Yemen has caused the factions to diversify and terrorist groups and movements to abound. Such groups include the Aden Abyan Islamic Army (AAIA), Al-Qaeda in the Arabian Peninsula (AQAP) and the Houthi Movement, of special interest in the conflict between Iran and Saudi Arabia.

Although the origins of the Houthi Movement lie in Zaidism, one of the more moderate branches of Shiism, it has evolved towards the twelfth branch following the indoctrination of its leaders in Iran. This Movement has been spreading from the north of the territory, through the Province of Saada, and currently controls large tracts of land[23].

It is estimated that Iran and the Houthi Movement have been carrying out coordinated activity against Saudi Arabia for several years[24]. The conflict

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[21] It is very important to mention the problem of succession and the power struggles going on in the Saudi royal family. The founder of the current kingdom, Ibn Saud had many wives, and is estimated to have more than 30 sons and 20 daughters, who have between 7,000 and 8,000 descendants, grouped into 35 family branches of different categories, depending on their degree of Arab purity. Taking into account the fact that these princes are now third generation, the family ties that kept the second generation united are not necessarily as strong anymore.

[22] AARTS, Paul and ROELANTS, Carolien, "The perils of the transfer of power in the Kingdom of Saudi Arabia", Contemporary Arab Affairs, (9), 4, 596-606, Routledge, New York, 2016.

[23] Times of Oman, "Houthi rebels rally in Sanaa, demand resignation of Government", August 22nd, 2014, available at http://timesofoman.com/article/39005/World/Houthi-rebels-rally-in-Sanaa-demand-resignation-of-government. Reference date 30.10.2016.

[24] There are reports indicating that in 2009 a plot was devised by the Iranian Pasdaran and the Houthi movement to harass the Yemeni Central Government and Saudi Arabia simultaneously.

stepped up still further towards the end of 2016, when North American navy units were attacked from the Yemeni Coast with anti-ship missiles[25].

The United States is another major stakeholder because of its physical presence and military power. Traditionally, the "Carter Doctrine" has guided US actions in the Gulf Region[26]. The US Fifth Fleet is deployed in the zone, its headquarters being on the island of Bahrain together with the Naval Forces Central Command (NAVCENT)[27]. The investments made by the USA in its facilities give the idea of a long-term commitment to stay in the zone[28]. Furthermore, the greatest capacity of the US Air Force is found on the Qatar Peninsula, where it has the Combined Air Operations Center (CAOC), a huge airbase with all the resources needed to quickly organize a Mechanised Brigade[29].

The USA is also the main arms supplier to the Gulf Cooperation Council (GCC)´s members, so the US can guarantee the effective defence of these States while at the same time securing a market that is extremely important in the area of defence plus a constant supply of oil.

In this geopolitical scenario, both Saudis and Iranians are confronting a time that hydrocarbons are going through a period of low prices and when, depending on how they manage their capabilities, they could come out for better or for worse at this point in time.

Between 2011 and 2014, oil prices were stable, at an average of 105 dollars per barrel. There was slight global economic growth during those three years of stability, characterised by consumer demand, while at the same time producers were able to increase or decrease output to vary their supply option. In this atmosphere, consumer concern over a supply reduction made the OPEC countries, where Saudi Arabia has a privileged status, to establish a price policy ranging from 90 to 110 dollars per barrel[30].

Technological breakthroughs in obtaining oil added a further twist to this situation; these include the *fracking* method utilised by the USA, which, at the very high oil prices before summer 2014, made exploitation with this method

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[25] KUBE, Courtney, "U.S. Officials: Iran Supplying Weapons to Yemen's Houthi Rebels, NBC News, October 27th, 2016, available at http://www.nbcnews.com/news/us-news/u-s-officials-iran-supplying-weapons-yemen-s-houthi-rebels-n674181. Reference date 30.11.2016.

[26] At the beginning of the 80s, the administration of US President, Jimmy Carter, stated that they would defend their interests in the Persian Gulf, even with the use of force.

[27] The United Kingdom also established a large naval base in Bahrain, intended to keep a constant presence in the zone.

[28] KATZMAN, Kenneth, "Bahrain: Security, Reform, and U.S. Policy", CRS Report for Congress, Congressional Research Service, Washington D.C., 2016, Pages 22-23.

[29] International Institute for Strategic Studies, "The Military Balance", Routledge, Oxford, 2014, Page 391.

[30] MARZO, Mariano, "The Fall in Oil Prices (2014-2015): causes and short-term predictions" FUNSEAM, Barcelona, 2015, Pages 5-6.

profitable. In such an environment, the abundance of the product and the supply security meant that consumers were confident of an uninterrupted supply.

A detailed analysis of other underlying causes of what has been described as the new energy order, firstly reveals the already indicated production surplus, when Asian demand dropped sharply. At the same time, European consumers began to reduce their orders, owing to the increased efficiency of their energy policies.

In summer 2014, oil prices were above 100 dollars a barrel, when they started to depreciate sharply, reaching historic levels. In early 2015, prices had fallen to around 46 dollars and during that year they fluctuated, reaching a minimum of about 40 dollars in the summer. The way these values evolved eventually led to prices dropping to below 30 dollars at the beginning of 2016, after which there was an irregular recovery to around 45 dollars by the end of the year[31].

Energy markets are currently inundated with products for a variety of reasons. One of these reasons is that the growth of the Chinese economy has not increased at the expected rate, so it has not been possible for the market to easily absorb the suppliers' output.

At the same time as the Chinese phenomenon was taking place, the US oil companies raised their production above nine million barrels per day, which reduced the demand to less than ten million barrels and also caused its refined products to enter the energy market. In such a situation of supply surplus and a reduction in consumption, the exporting countries found themselves faced with a price war to maintain the stability of their dependent economies[32].

The Saudi Containment Strategy: evolution as a vehicle for progress

Saudi Arabia has traditionally based its economy on the oil industry, because it has the largest reserves of this product in the world. Although the State has hitherto strictly controlled its exploitation and management, it did not seem that this system would continue to be profitable in the long term. In view of this, the Saudis have been examining different solutions for privatising the oil sector, while at the same time trying to diversify their economy into other sectors, like those energy related, the petrochemical industry, natural gas exploration or telecommunications[33].

The depreciation of oil in 2014 was particularly significant for the Saudis and really brought it home that they had to change their approach in the future. Saudi

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[31] Trading Economics, "Crude Oil. Evolution 1946-2016". Available at: http://www.tradingeconomics.com/commodity/crude-oil . Reference date 02.11.2016.

[32] SEZNEC, Jean-François, "The Impact of the Restructuring of the Oil Sector in Saudi Arabia", Arab Gulf States Institute in Washington, Washington, D.C., 2015.

[33] CIA, "The World Fact Book", 2016, https://www.cia.gov/library/publications/the-world-factbook/geos/sa.html.

estimates were that in the long term the supply would tend to outweigh demand, whereas the greater or lesser fluctuations would be caused by emerging crises, such as conflicts in the Middle East and, in some cases, by decisions that might be taken by the OPEC.

As a consequence of the abundance of oil products, Saudi Arabia found itself in the dilemma of either having to reduce its output to increase prices or having to keep output stable and sell more cheaply.

In view of the potential consequences and the possibilities for the rest of the exporters, the Saudis decided to keep up production levels that, even if this were to bring about an income reduction, would enable them to maintain their market share; this decision was backed by the Saudi Minister of Petroleum and President of the Aramco oil company, Ali al-Naimi, who at the same time exerted great influence over the long-standing Supreme Petroleum Council, where the King and the main members of the royal family used to take decisions about the sector. Protecting their market share thus took precedence over potential profit, putting the Saudis in an advantageous position when price trends changed[34].

The Saudi position, as the world's main producer, lead to a series of effects on the energy market. The first to be affected were those producing oil from bituminous shales in North America, who no longer found it profitable to process and extract their products. However, US technology was soon to find a way to cheapen the cost of the *fracking* process, so the production costs fell from some 70 dollars per barrel to around 35. To a certain extent, this enabled the North Americans to adapt to the low oil prices imposed by the Saudis, as long as prices rose high enough to make it sufficiently profitable for both[35].

Now that the North American problem had ben overcome, it was the Russian producers who would be mainly affected by the low Arabian prices. The role of Russian as a potential moderator must be taken very much into account here, because the country is an ally of Iran in the Middle East conflict and the repercussions of the Saudi actions could influence relations between Russian and Iran at all levels[36].

Saudi Arabia's approach to Russian production was made known by Naimi himself, when he announced that it would not be logical for an efficient producer like Saudi Arabia to protect an inefficient producer like Russia by keeping

[34] This was to cost the Saudis a deficit of 39,000 million dollars in 2015. If military costs, estimated in 80,000 million dollars and not included in the budget were added to this figure, the total deficit could reach approximately 120,000 million dollars.

[35] EIA, "Future U.S. tight oil and shale gas production depends on resources, technology, markets", August 22nd, 2016, available at: http://www.eia.gov/todayinenergy/detail.php?id=27612. Reference date 03.11.2016.

[36] WALD, Ellen R., "Saudi Arabia, Iran, Russia Head Towards Showdown In November", forbes.com, September 28th, 2016, available at: http://www.forbes.com/sites/ellenrwald/2016/09/28/saudi-arabia-iran-russia-head-towards-showdown-in-november/#638313403364. Reference date 03.11.2016.

prices high. Naimi considered that the way the Russians exploited their oil was technologically inadequate, which forced them to seek new reserves and extract them at a high cost, resulting that, if the Russians closed their extraction valves they could find it impossible to open them up again. Unlike the Russian wells, the Saudi wells can be opened and closed without this affecting their future production, because the deposits are still young and have not been overexploited[37].

The Russian predicament in a world of low prices is even more worrying than Saudi´s situation, in view of the fact that the Saudi reserves are estimated at 730,000 million dollars, which could be augmented, whereas the Russian deposits barely reach one third of that amount. The Saudis thus have bargaining power when negotiating scenarios with Russia other than energy, such as the latter's intervention in the Middle East and, especially, its support to Iran. The energy question could thus indirectly be the moderating force for Iranian power through Iran's allies of convenience, the Russians.

A greater understanding between Saudis and Russians would enable Russia to free itself from the Saudi's grip in a situation where Arabia could keep its share of the market with slightly higher prices and Russia would feel the benefit of that increase. Nevertheless, the bone of contention is Iran, which had emerged as a new opportunity for the markets during the negotiations concerning nuclear matters.

The nuclear question had major repercussions on the rivalry between Saudis and Iranians, because the nuclear negotiations between Iran and the P5+1 Group were bearing fruit. If the Saudis reduced their output to keep up oil prices, they would be relieving the pressure over the Iranian regime[38].

A lack of consensus among the OPEC States would be a further element complicating the rivalry between Saudis and Iranians. At other times producers had been aware of the fact that the way of moderating rising prices was to reduce the production quota, thus ensuring that the market was not overflowing with oil.

On previous occasions this market balancing role had been played by Saudi Arabia. However, other producers were not prepared to share the reduction and even countries like Iran, Iraq, Venezuela, Mexico or Russia wanted to increase their output as a way of solving their economic problems. In such a situation, the Saudis were not only exposing themselves to the risk of their rivals benefitting, but also running the risk of losing their market share, given that their competitors

37 SEZNEC, Jean-François, Op.cit.

38 The Economist, "The new oil order", April 23, 2016, available at http://www.economist.com/news/leaders/21697221-impetuous-prince-rattling-middle-east-may-also-bring-bold-reform-new-oil. Reference date 04.11.2016.

could withstand the Saudi production cut, leading to the Saudis losing part of their important position where their client portfolio was concerned[39].

In view of all this, it is easy to understand why the OPEC Meeting in November 2014 failed to reach a consensus about reducing production to protect prices. In this context, in which the then Saudi Minister of Petroleum, Naimi, played an important role, it was agreed to keep production levels above 30 million barrels per day. The consequence would be that from then on the OPEC would no longer be running the market, it was the market itself that would be determining the prices[40].

The 2015 Summit was to have even more depressing results for the Saudis, given that it was the first time the producers failed to even reach an agreement about their production ceiling, deciding to wait and see how events developed throughout 2016[41]. The lack of an agreement caused prices to plunge during the year, when they hit rock bottom as mentioned above. It was under those circumstances that a meeting took place on November that year, in which an attempt had to be made to a solution based on cutting the output.

Finally, during the meeting of the OPEC in Vienna, the countries managed to reduce production in order to keep the markets stable. However, at that meeting it was the Saudi output that was to be cut back most, while the Iraqis also agreed to reduce production. Apart from those two countries the other OPEC member agreeing to cuts was Russia, but not Iran though, who negotiated a production increase, because it had been punished since 2012 with international sanctions, lifted thanks to the agreement reached about nuclear matters towards the end of 2015[42].

In this environment of short-term instability, the Saudis would appear to have been seeking some kind of solution through a gradual increase in prices as the world economy and demand evolved. Nevertheless, Saudi Arabia would be needing to establish a long-term policy, to prevent the progressive decline of its economy, which would have a direct effect on its status as a regional power and on its internal stability, owing to the harm done to its social and employment policies.

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39 FATTOUH, Bassam, SEN Anupama, "Saudi Arabia Oil Policy: More than Meets the Eye?", Oxford Institute for Energy Studies, 2015.

40 LAWLER, Alex , SHEPPARD David, El GAMAL Rania, "Saudis block OPEC output cut, sending oil price plunging", November 28th 2014. Reuters, available at http://www.reuters.com/article/us-opec-meeting-idUSKCN0JA0O320141128. Reference date 03.11.2016.

41 RAVAL, Anjli, SHEPPARD, David, HUME, Neil, "OPEC meeting ends in acrimony", December 4th, 2015, Financial Times, available at https://www.ft.com/content/20474556-9a62-11e5-9228-87e603d47bdc. Reference date 04.11.2016.

42 EL GAMAL, Rania, LAWLER, Alex, GHADDAR, Ahmad, "OPEC in first joint oil cut with Russia since 2001, Saudis take 'big hit'", December 2nd, 2016, Reuters, available at http://www.reuters.com/article/us-opec-meeting-idUSKBN13P0JA, reference date 04.12.2016.

As a starting point for devising its long-term strategy, Arabia had such major parameters as its energy product reserves, an economy based upon oil income and the difficulties the country faced when trying to diversify its economy branching out into other industrial sectors. In this context special attention must be paid to its own investment capacity and how to attract foreign investment, to the diversification of the economy from a sector based upon energy products and to the impact of the new climate change policies worldwide.

First of all, Arabia's reserves management is an adjustment mechanism, because the Saudis can determine their exploitation rate, given that the amounts involved are vast, production costs are low and the security environment is relatively stable for investors. The fact that the cheapest reserves in the world have not yet been overexploited could lead to a situation in which low- and high-cost producers coexist, with oil prices fluctuating between two values. The minimum value would be determined by the cost of producing the cheapest oil, whereas the upper limit would be established by the appearance of replacement products on the market and new oil supplies.

In such a situation the Saudis would have to play the so called "Hobson's Choice", seeking an average price, so they should be finding a balancing point for their production. If they were to produce at maximum capacity they would have little leeway in the market and their profits would be insufficient. Yet if they were to cut down their output excessively, the global economy could go into recession, so the crisis would prevent its clients from developing and thus, curtail their energy demand. Furthermore, production should not be so low that price volatility caused consumers to seek other suppliers, making the Saudis lose their market share. On the other hand, production ought not to be so high that an oil surplus required suppliers to make their bids lower[43].

Meanwhile, in the coming years the Saudis would have to find an alternative to their main source of income, allaying the myth that pumping oil was what they knew how to do best. In fact, this belief was dispelled years before when the petrochemical industry model was adopted and refined products were produced. Furthermore, Saudi projection abroad included establishing business in Asian and US refineries, which included Aramco's attempts to control the largest refinery in the USA, located in the Texan city of Port Arthur.[44].

This refining capacity was to save the growing Saudi domestic demand, a worrying factor, because its own consumption could have led to a reduction in exports to the point that the economy was no longer viable. Bearing in mind that solar or nuclear-power do not appear to be short-term solutions, the arabs were

[43] Leach, Dirk, "Future Oil Prices, Saudi Arabia, and OPEC", Mar. 15, 2016, available at http://seekingalpha.com/article/3958480-future-oil-prices-saudi-arabia-opec. Reference date 01.11.2016.

[44] KENNEDY, Charles, "Largest U.S. Refinery Now Belongs To Saudi Arabia", March 17, 2016, CDT Oil Prices, available at http://oilprice.com/Energy/Energy-General/Largest-US-Refinery-Now-Belongs-To-Saudi-Arabia.html. Reference date 02.11.2016.

to find themselves in a dilemma difficult to solve. Hence, the potential solution to this problem would involve a rationalisation of the currently inefficient energy consumption in the Saudi state. Meanwhile, the search for alternative sources and the diversification of the economy have become almost essential for the future stability of the Saudi Regime[45].

In addition, the recent expansion of Saudi refining capacity, now enables the country to compete not only in the crude oil market but also in the refined fuel products market. Trading with these products is very different from commercialising crude oil products, since the various fuels possess special characteristics and requirements depending on the clients' specifications and regulations. All of this is particularly important for purchaser loyalty, e.g. in the very demanding European market, which is extremely demanding when it comes to the quality of products prepared for energy consumption. A greater in-depth analysis of this circumstance would mean that a greater amount of Saudi unrefined oil would be allocated to consumption in its domestic refineries, so a lower amount of unrefined oil on the international market could correct the rising prices, while at the same time the quality of Saudi Arabia's refined products would win over the loyalty of a larger number of clients[46].

Another important aspect is that the refined product is considered to be the first step towards branching out into other sectors and towards creating more jobs. Refining will thus not only be the link between crude oil and prepared hydrocarbons, but also the first stepping stone towards establishing a major petrochemical industry. As the refining process has already been achieved, the move towards diversification is much simpler, which would give rise to new industries. Approximately 40 years have gone by since the petrochemical group Sabic was established, but new incentives are needed in this sector, such as the successful completion of new projects, like the Sadara Declaration, which will be dealt with later[47].

This change in Saudi Arabia's role as an unrefined crude oil supplier could also change the traditional security paradigm linking the Saudi State with the USA, what was traditionally known as "Oil for Security", whereby the "Carter Doctrine" insisted that any incident adversely affecting hydrocarbon traffic in the Gulf also adversely affected US interests. Ever since, the USA has spent an estimated 50,000 million dollars per year on protecting the Gulf monarchies, in return for a guaranteed constant flow of crude oil[48].

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45 Lahn, Glada y Stevens, Paul, "Burning Oil to Keep Cool, The Hidden Energy Crisis in Saudi Arabia", Chatham House, The Royal Institute of International Affairs, London, 2011.

46 KRANE, Jim, "A refined approach: Saudi Arabia moves beyond crude" Energy Policy 82, 99-104, London, 2015.

47 Oxford Business Group, "Key players investing further down the petrochemicals value chain in Saudi Arabia, available at https://www.oxfordbusinessgroup.com/analysis/aiding-diversification-key-players-are-investing-further-down-petrochemicals-value-chain. Reference date 09.11.2016.

48 STERN, Roger J., "United States cost of military force projection in the Persian Gulf, 1976-2007".Energy Policy, vol. 38, no 6, Pages 2816-2825, London, 2010.

Should circumstances change, the US may find that this high cost is no longer economically worthwhile. The result is that the Saudis would need to find a new situation to provide themselves with security against such important potential rivals as their neighbour Iran[49].

Climate change is particularly significant in such a vulnerable environment as Saudi Arabia, where the population desperately needs drinking water, in a zone where the few aquifers are small and overexploited. At the same time, the temperature rise creates a greater demand for energy to produce water and for cooling, and facilities have to be readapted to this new situation[50].

On an international level, climate change has led to the implementation of palliative energy measure, particularly in the most developed countries. This greater awareness and energy efficiency are now beginning to work, and, although the results so far have not been significant, in the future it would appear that dependence on fossil fuels will gradually diminish. Such a situation can be expected to affect price policy and the long-term future of the Saudis, unless they transform their current economic structure. In view of the situation, Saudi Arabia, as with other producers, must keep at sight the end, in the long term, of the hydro carbon era[51].

It is not clear what the Saudis' long term aim will be when it comes to fixing the price of a barrel of oil, but the price ought to be sufficient to alleviate their budget, while at the same time ensuring that the world economy is not so strained that it falls into recession. Some analysts estimate that this target could be achieved in the range from 80 to 100 dollars, the lowest price being the one that would mark a deficit of 60,000 million dollars, or 8% of its gross domestic product, the highest being a deficit-free scenario[52].

The environmental question appeared in the 2015 Paris Agreement and in its implementation at the end of 2016. The Agreement requires the main emitters

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[49] The energy alliance vetween the USA and Saudi Arabia goes back over 70 year, when in 1933 the North American company Standard Oil of California (now Chevron) was granted the licence to explore on Saudi territory. Ever since, Saudi Arabia has leaned towards the North Americans, against the criterion of some of its neighbours, like Iran or Iraq, more oriented towards European investors. In fact, the Saudi energy giant Aramco came from the American Arabian Oil Company, established by Texaco, Exxon and Mobil. The Saudi Kingdom was later to purchase the foreign shares, making it 100% national in the 1980s, although the North American companies would invariably retain trading links in Saudi territory.

[50] DENICOLA, Erica, et al, "Climate Change and Water Scarcity: The Case of Saudi Arabia; Climate change and water scarcity", Annals of global health, 81(3), 342-353, Philadelphia, PA, 2015.

[51] HINCKLEY, Elias, "Historic moment: Saudi Arabia sees End of Oil Age coming and opens valves on the carbon bubble" January 22, 2015, available at Energy post http://energypost.eu/historic-moment-saudi-arabia-sees-end-oil-age-coming-opens-valves-carbon-bubble/. Reference date 14.11.2016.

[52] CHAU, Collin, "Falling Oil Prices (2014-2016): To what extent do Saudi Arabia's oil-price cuts hurt Russia, Iran, Syria?", January 29th, 2015, Quora, available at https://www.quora.com/Falling-Oil-Prices-2014%E2%80%9316-To-what-extent-does-Saudi-Arabias-oil-price-cuts-hurt-Russia-Iran-Syria. Reference date 15.11.20.

of greenhouse gases to undertake to reduce these emissions to prevent the Earth overheating with disastrous consequences. Nevertheless, it remains to be seen exactly how the different States are going to apply their commitments, especially the new US Administration[53].

In this changing environment, the new regime in Saudi Arabia is aware of the need for its global approaches to evolve. Prince Mohammad bin Salman, in his capacity as the President of the Economic and Development Affairs Council, among other posts, has presented the document called "Vision 2030". The long-term intentions of the Saudi Authorities are to transform their country, tendering out business opportunities to investors and making the most of their excellent geographical position and the natural wealth of Saudi territory, because apart from the abundant energy resources, there are also deposits of gold, phosphates or uranium.

One of the main aims of document "Vision 2030" is the economy diversification, express reference being made to the transformation of Aramco from an oil extraction and production company to a comprehensive industrial conglomerate. Together with this plan, there is also an ambitious project to produce half the material needed to cover the requirements of the Saudi armed forces, all within a framework that is designed to create a very large number of jobs and locate more resources within the Saudi State[54].

With a view to achieving the series of Saudi objectives for the future, the regime of the new King Salman, supported by his youngest son Muhammad bin Salman, has initiated a host of changes placing special emphasis on the restructuring of the energy sector.

The first change to be made was to separate the oil company Aramco from the Ministry of Oil and Mineral Resources. This has meant that the great planner of the past profits provided by oil, Ali al-Naimi, now 80 years old, has ceased to be the Chairman of Aramco. Naimi occupied this post for more than twenty years after having been the company's executive director. During his mandate he had supervised the Saudi Supreme Petroleum Council on behalf of the monarchs, obtaining a position of strength within the OPEC and keeping prices relatively stable in time, in spite of it clients being affected by periods of crisis or financial booms.

Although this separation has taken place *de facto*, the Minister of this Department is still the Chairman of the main oil company. Meantime, the removal of Niami could be a step prior to his retirement, paving the way for Khalid al-Falih to take

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53 SPINDLE, Bill and HARDER, Amy, "U.N. Climate Change Conference Turns to Implementing Paris Agreement" Nov. 7, 2016, The Wall Street Journal, available at http://www.wsj.com/articles/u-n-climate-change-conference-turns-to-implementing-paris-agreement-1478514604. Reference date 15.11.2016.

54 Kingdom of Saudi Arabia, "Vision 2030/رؤية المملكة العربية السعودية 2030", available at: http://vision2030.gov.sa/sites/default/files/report/Saudi_Vision2030_EN_0.pdf. Reference date 16.11.2016.

his place, the latter being an engineer who received his training in the USA, to whom reference will be made later[55].

Meanwhile the role of the House of Saud in this Ministry is being played by Prince Abulaziz bin Salman, another of the King's sons, who is the Deputy Minister. Despite being a member of the royal family, Prince Abdulaziz is a technocrat, because for many years he was Naimi's right-hand man[56].

However, the disappearance of Naimi has led once again to uncertainties surrounding the continuity, in the long term, of the aforementioned policy of keeping up the market share to the detriment of prices. This situation causes a dilemma, given that Arabia needs to increase the price of oil so that it will not lose its economic cushion because of the deficit. Yet such a rise will also benefit its Iranian rivals, with great potential on the market open to them. Russia would also benefit, given that with a lot less economic reserves, urgently needs more profit from oil sales. Apart from this, an increase in Russian power could indirectly benefit its Iranian allies in the struggle for power that the Middle East is currently experiencing.

The next change, a result of the former, was that the Chairmanship of Aramco went to the Supreme Council of the Saudi Aramco Oil Company (SCSA). Within the SCSA, reference must be made to the presence of the "strong man" in the new regime, Prince Mohammed, who chairs the Council as well as being Minister of Defence.

At a first glance, this change could be considered a revolutionary landmark, but on taking a closer look the transformations have not been so drastic. The disappearance of the Supreme Petroleum Council (SPC) could be interpreted as meaning that the royal family has lost its status in the Saudi State energy policy. Nevertheless, this had already happened to a certain extent with the previous structure of the SPC, because its technocratic members, such as Naimi himself, used to redirect the situation on economic parameters that were given precedence over the considerations of many of the royal family members. This state of affairs would seem to be perpetuated by the setting up of the CCSA, in which the royal family retains its influence through its members with experience in technical matters. In fact, four members of this council are members of the royal family, whereas the rest are outstanding individuals from the world of energy and economics[57].

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[55] MAHDI, Wael and RAZZOUK, Nayla, "Saudi Aramco Chief Named Oil Minister as Energy Policy Firms", May 7th, 2016 Bloomberg, available at: http://www.bloomberg.com/news/articles/2016-05-07/saudi-aramco-chairman-al-falih-replaces-al-naimi-as-oil-minister. Reference date 16.11.2016.

[56] The Telegraph, "Saudi Arabian oil minister weakened by elevation of king's son", 20th November 2016, available at http://www.telegraph.co.uk/finance/oilprices/11382653/Saudi-Arabian-oil-minister-weakened-by-elevation-of-kings-son.html. Reference date 22.11.2016.

[57] ARAMCO: "Leadership Team", available at: http://www.saudiaramco.com/en/home/about/governance/leadership-team.html. Reference date 19.11.2016.

It seems that the technocrats are best represented at Aramco by two persons from the world of oil. The first of these is the former executive director of the company, Khalid al-Falih, who remains as Chairman of the firm while at the same time being head of the Ministry concerned. During his mandate he has tried to get the firm to operate in a way similar to the rest of the western oil companies. The second technocrat, Amin H. Nasser, who has replaced Falih as executive director, has been in the background at the company for over 30 years. He is an expert in oil exploration, extraction and pumping[58].

Khalid al-Falih, after being moved from his post as Aramco's Executive Director, was given other responsibilities in addition to those in the energy sector. He was appointed Minister of Health as well as retaining the Chairmanship of the company's Supreme Council. Falih's appointment as Minister of Health seems to be the Saudi leaders' answer to a need for stability of the State, in view of the fact that having an efficient public health system could help to win over the population and prevent unrest. Putting one of the country's best managers at the head of the Ministry of Health could also be a prerequisite to improving public health conditions.

Falih's dual responsibility appears to be a response to the royal household's faith in his management, at a time when it is necessary for the Saudi State to function more efficiently in the social and industrial areas. Should there be a beneficial sequence of events, reorganising the industrial sector would lead to more jobs, which would swell the State coffers and give rise to employment stability and social benefits. In this sense it is possible that Aramco would not limit itself to oil products, but branch out into other fields, especially the chemical sector.

This is feasible, taking into account the fact that the firm has already been involved in joint ventures with private companies through PetroRabigh, which has been operating together with the Japanese firm Sumitono since 2005; making the Japanese one of the main foreign investors in Saudi Arabia[59]. Another major example of Aramco being involved in joint projects is Sadara, which in the summer of 2016 and in cooperation with the German firm Dow Chemical, started to produce plastics and other chemical products using *cracking* techniques[60].

Everything would appear to indicate that the aim of Aramco's diversification into the chemical sector is to establish a network of petrochemical plants that can supply the world market with numerous prepared products of considerable value that are needed for modern life. The company's intention is to make the biggest public bid in Saudi history in 2018, following Falih's idea to make it "a

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58 BARNETT, Andrew, FRENCH, Jason and SAID, Summer, "How big is Aramco?" November 16th, 2016, available at http://graphics.wsj.com/what-is-aramco/. Reference date 19.11.2016.

59 PetroRabigh, "PetroRabigh at a glance", available at: http://www.petrorabigh.com/en/at_a_glance.aspx. Reference date 17.11.2016.

60 Dow Chemical, "Dow Announces Start-up of Sadara Mixed Feed Cracker" August 29, 2016 available at http://www.dow.com/en-us/news/press-releases/dow-start-up-sadara-mixed-feed-cracker. Reference date 18.11.2016.

company capable of being global in a host of ways". However, it will take several years to completely develop a petrochemical industry[61].

Meanwhile, Arabia is preparing to be able to produce the energy required for its development by diversifying sources. Nuclear energy is a major future project, and it is expected to be able to provide 7 gigawatts in 2032 and 17 by 2040. According to Khalid Al-Falih, the first sites for the power plants will be selected in the near future, and, before the end of 2017 the specific nuclear energy plans will be announced. Solar and wind energy will also have a special place in the Saudi energy mix[62].

However, this path that Saudi Arabia has just set out along is by no means risk free. All the reforms that are to be undertaken depend on a principle of the oil economy and especially of the oil prices. Price recovery is the key to reducing the Saudi deficit and the beginning of the diversification of its economy, while at the same time creating jobs and increasing social welfare.

The other side of the coin is one where the reforms are not successfully achieved, which would greatly increase the current economic and social problems, and could lead to social unrest. In fact, any opening-up measure could place the Monarchy in a position of weakness, in what Samuel Huntington would call the "King's Dilemma". Other regimens in the Middle East, like the Shah's in Iran or El Assad's in Syria, have experienced opening-up situations ultimately leading to revolutions against their leaders[63].

The Great Iranian Strategy: Iranshahr energy projection

Iran, since 2005, has its own vision for 2025. This project, called "A Document on Iran's 20-Year Perspective" aims to position Iran as the first regional power, on the basis of its energy resources, its population and its territory. To begin with, its inhabitants will have had to reach a considerable level of education and training, which will enable them to find a stable social environment and acquire the ability to generate wealth. On such a foundation, Iran will be able to be an "economic and technological power" giving priority to economic development above all other policies. This situation would consolidate Iran's position as a driving force for regional stability and a supplier of raw materials[64].

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61 GOLD, Russell, SPINDLE, Bill and SAID, Summer, "Why Saudi Arabia's Oil Giant Aims to Be Big in Chemicals, Too", The Wall Street Journal, Nov. 20, 2016, available at: http://www.wsj.com/articles/why-saudi-arabias-oil-giant-aims-to-be-big-in-chemicals-too-1479675420. Reference date 18.11.2016.

62 RASCOUET, Angelina and MAHDI, Wael, "Saudi Arabia to Select Nuclear Power-Plant Site 'Very Soon'", Bloomberg, October 20th, 2016, available at: https://www.bloomberg.com/news/articles/2016-10-20/saudi-arabia-to-select-nuclear-power-plant-site-very-soon. Reference date 19.11.2016.

63 AARTS, Paul and ROELANTS, Carolien, "The perils of the transfer of power in the Kingdom of Saudi Arabia", Contemporary Arab Affairs, Centre for Arab Unity Studies, Beirut, 2015.

64 MALEKI, Abbas, "Iran's 20-Year Perspective Document & Iran's Foreign Relations Conference on Iran's 20-Year Perspective", Document and Public Participation, Sharif University of Technology, May, 18th, 2005.

Understanding Iran's energy strategy from a western perspective is very complicated, because it is subject to different factors, which often exert a greater specific influence than the economic factor. There are certain domestic actors in Iran forming power groups that, under the authority of the Supreme Leader Ali Khamenei, include the fundamentalists, the traditional conservatives, the pragmatic conservatives and the liberals.

Superimposed on these factions, there are all kinds of organisations such as State-owned companies, charitable trusts (*bonyads*), family groups and company associations of private nature. Certain individuals are found at the nodes of all these structures superimposed into networks, who have more power or less power depending on the number of groups to which they belong and how close they are to the Leader[65].

Unlike its rival Saudi Arabia, Iran is not completely integrated into the market economy. There is a greater or lesser degree of integration depending on who is governing, within the internal struggle between factions. On the one hand, the most conservative elements defend the traditional economy and are supported by the traders in the bazaars and the trusts (*bonyads*), which are heavily subsidised. On the other hand, the reformist sectors are more in favour of a market economy and opening businesses up to the exterior. These differences vary within a tight margin controlled by the Leader[66].

The highest authority in energy matters is the Supreme Energy Council, which is managed by the Iranian President and made up of the Ministers of Petroleum, Economy, Trade and Agriculture, Mines & Industry. The main companies in the energy sector depend on the Ministry of Petroleum, and are the National Iranian Oil Company (NIOC), the National Iranian Gas Company (NIGC) and the National Petrochemical Company (NPC). These companies, in turn, have several subsidiaries[67].

In the energy market chain in Iran the production elements are separate from the refining and distribution elements. Throughout this chain, individuals from the different power factions are found in all the structures, without any of these factions ever completely holding the power, but being able to monitor the actions of the individuals belonging to the rival groups.

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[65] TANAKA, Koichiro, "Economic Decision Making in Iran", Green, J. D., & Wehrey, F. (eds.), Understanding Iran, Pages 107-110, Rand Corporation, Santa Mónica, 2009.

[66] These differences can be appreciated in the different presidencies that Iran has recently had. The reformist posture of President Khatami based on his "Dialogue between Civilisations" made him tend towards establishing private business with foreign companies. The orientation of the next President Ahmadinejad, fundamentalist in nature, was highly protectionist towards the traditional bazaar economy, the *bonyads* and the Pasdaran. The pragmatics, such as President Rohani, are found somewhere between these described tendencies: he moves in a more flexible strip following events as they develop.

[67] EIA, "Iran International Energy Data and Analysis", June 19th 2015, available at https://www.eia.gov/beta/international/analysis.cfm?iso=IRN. Reference date 19.11.2015.

Constitutional orders forbid Iranians to allow natural resources to fall into the hands of foreigners or become private property. Furthermore, joint exploitation agreements are prohibited by law. Faced with this, the traditional solution for foreign investors has been to obtain contracts for exploration and subsequent production projects via the Iranian oil companies.

When the production project is deemed feasible it is sent to the NIOC or the NIGC for exploitation and it is since that moment when the foreign investor can obtain profits. This way the external company receives compensation, generally in kind, in exchange for financing the activity. Contractors usually see the profits between the fifth and seventh year after having made their investment[68].

As will be seen later, this constitutional restriction has proved to be a real obstacle when Iran has tried to rejoin the international markets, after signing in 2015 the nuclear agreement with the Group P5+1, paving the way for the gradual lifting of the sanctions that had been imposed on the Iranian regime.

It must be pointed out that a system of official structures, superimposed by other informal ones in the struggle for power, is very difficult to control and tends to produce cases of corruption or diverting capital towards certain groups or factions. In this environment, foreign investment is exposed to high risk parameters, because instability tends to ensure that the Iranian economy moves in short cycles and investors tend to collect their profits as soon as possible, rather than projecting their businesses in the long term.

Furthermore, Iran's economic and social stability have invariably been closely associated with the ability to generate profit from hydrocarbons, given that the people's acceptance of those in power has always been associated with the prosperity of the State.

In times of economic booms, the system has been able to generate resources for its social policies while leaving room for manoeuvre to buy allegiances and thus silence symptoms of dissidence. By contrast, in periods when there has been a lack of resources, social expenditure has decreased and discontent has increased, this became clear in 2011 with the explosion of social unrest known as the "Green Movement", which occurred at the same time as the "Arab Spring", when the imposing of sanctions on the energy sector in Iran coincided with low investment and productivity, an increase in the foreign debt, a balance of payments deficit and an increase in inflation, revealing Iranian vulnerability to external actions[69].

It can thus be seen how reliant the Iranian economy is on energy resources, in a market where it has been dependent on the amount of product that it has been able to supply, the price of hydrocarbons and the amounts that the sanctions

[68] Ibidem.

[69] SAHAR, Semira, "The Impact of Economic Sanctions on Iran´s Foreign Policy". MA Thesis in Public Policy and Policy Management, Georgetown University, 2011.

have enabled it to negotiate, so any of these variables has major repercussions on all aspects of life in Iran.

As the Iranian economy is highly dependent on energy sources, it has frequently suffered from the symptoms of the so called "Dutch Disease", which occurs when a scarce resource, such as hydrocarbons might be, produces huge profits for the State's domestic economy. The result is an internal overabundance of capital and the attraction of the labour force to the sector creating the wealth, while at the same time the internal demand increases. The consequence is that the less competitive sectors tend to disappear so what they used to produce has now to be imported, thereby rendering it impossible for the economy to branch out and thus impeding a multi-sectoral balance[70].

Certain Iranian peculiarities have to be added to this general symptom of the "Dutch Disease", in view of there being a vicious circle between the exports of energy products, the Gross Domestic Product (GDP) and the internal demand for this type of products. An increase in exports means an increase in the GDP and a sharing out of wealth among the inhabitants, which causes domestic consumption to rise. As the domestic demand goes up, supply items have to be allocated to the domestic market instead of exporting them, until a point is reached when production can no longer continue to grow, so a period of recession sets in. If one bears in mind the fact that the way of dealing with unrest in Iranian society is by means of subsidies, exports and domestic consumption become extremely elastic depending on the situation of the Iranian economy cycle[71].

Another phenomenon that accentuates the domestic consumption problem is the low refining capacity of the Iranian petrochemical industry, which forces the country to import petrol at the times when demand is at its highest. The State has made great efforts to overcome this problem, and in 2013 it opened the Shazand petroleum processing plant, with a capacity of 16 million litres per day of this product. Furthermore, cuts in the energy product subsidies caused them to be used more rationally, although the extent to which such subsidies can be reduced before social unrest sets in must be carefully calculated[72].

A further problem is the high VAT charged on transactions; this causes trading relations to be conducted under cover in the bazaar economy, otherwise the private sector is at a serious disadvantage when compared to the public sector or the trusts, so it tends to take a back seat to the benefit of these latter stakeholders.

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[70] CORDEN, W. Max and NEARY, J. Peter, "Booming sector and de-industrialisation in a small open economy" The economic journal, vol. 92, No. 368, Pages 825-848, Royal Economic Society, London, 1982.

[71] GREEN, Jerrold D., and FREDERIC Wehrey, Understanding Iran, Rand Corporation, Santa Monica CA, 2009.

[72] CORDESMAN, Anthony H., GOLD Bryan and COUGHLIN-SCHULTE Chloe, "Iran: Sanctions, Energy, Arms Control, and Regime Change", page 109, Rowman & Littlefield, Lanham MD, 2014.

Foreign investors find themselves in a worse situation, because they have to pay very high taxes both on their companies and their employees working in Iran, these taxes remaining constant regardless of the amount of business the companies have managed to do. So, once they have made their profits, it is not profitable for them to stay on a permanent basis. Furthermore, the Central Bank of Iran requires foreign firms to establish commercial branches in Iran to be able to carry out economic transactions[73].

Not only does the inefficient taxation system serve as a deterrent to foreign investment, but Iran's bureaucratic system complicates matters still further, given that the standards issued by the Central Bank or the various ministries are often poorly implemented or are re-interpreted by the individuals appointed to the key posts of the administration. Firms frequently have to adapt to the decisions taken by the key civil servant, which often change when a new one is appointed, simply because the newly arrived happens to belong to a different faction than the previous civil servant[74].

Russian companies have been some of the few that have so far managed to operate in Iran with positive results, in this environment of energy business that is so specific to Iran. Russia has traditionally attempted to participate in and control Iran's enormous wealth where natural gas is concerned. The Russians also wish to have under their control, the transport of Iranian gas to the Asian markets, while at the same time preventing a direct relationship between Iran and European countries in the sale of gas. The "Nabucco" gas pipeline project would be the alternative to the networks of gas pipelines in which the companies Gazprom and Rosneft are involved, so Russia must act cautiously to stop the Iranians from independently breaking into the European market[75].

The two States established the Gas Exporting Countries Forum (GECF), with the same intentions as OPEC for oil, coordinating the efforts of the supplying countries. Since 1997, Gazprom has been involved in the exploitation of the South Pars Gas Field and in 2001, after Putin became President, an agreement was signed to export Iranian gas via Russia. The increase in the number of countries joining this Forum, and especially the membership of Qatar has led the Russians and Iranians to forge a new alliance, making it impossible for the US to intervene via its Qatari allies[76].

The arms trade is closely linked to the Russian gas business, given that the "lobbies" controlling the two sectors are fully interrelated and are also highly

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73 TANAKA, Koichiro, "Economic Decision Making in Iran", Op. Cit, Pages 105-113.

74 GREEN, Jerrold D. and FREDERIC Wehrey, "Understanding Iran", Op. Cit, Pages 108-109.

75 TRENIN, Dmitriĭ and MALASHENKO, Alexey, "Iran: A View from Moscow", Pages 21-22, Carnegie Endowment for International Peace, Washington, D.C., 2010.

76 EFIMOV, Vladimir, "It is necessary to dissolve the Gas Exporting Countries Forum and create a Russian-Iranian gas alliance", Iran.ru, 19th September 2014, available at: http://eng.iran.ru/news/analytics/149/It_is_necessary_to_dissolve_the_Forum_of_Gas_Exporting_and_create_a_Russian_Iranian_gas_alliance. Reference date 20.11.2016.

influential in Russian foreign policy. Iran is thus controlled by arms supply, to the extent that it cannot manoeuvre against Russian interests in the energy sector[77].

China also has a business tradition in Iran, because when it commenced its industrial development in the nineties, China found that the energy market was occupied by other operators, leaving potential for relations with those States where US sanctions had prevented western companies from investing. The State-owned companies China National Petroleum Corporation (CNPC), China Petroleum & Chemical Corporation (SINOPEC) and the China National Offshore Petroleum Company, operate extensively in Iran. In exchange, China has made its arms and manufactured products available to the Iranian market and has collaborated in establishing the Nuclear Technology Centre of Isfahan. However, the Chinese have always feared that their relations with Iran might damage the US market[78].

India has also traditionally had relations with Iran. The country has shown great interest in enlarging the Iranian port of Chabahar, to compete with Pakistan for access to Iranian and Central Asian natural resources. In view of this rivalry, the Iran-Pakistan-India (IPI) gas pipeline would appear to be unfeasible, so an undersea gas pipeline is being studied that would link the Port of Chabahar with an as yet undefined point on the Gujarat Coast[79]. Meanwhile, India still has a high business turnover with Iran through its oil company Essar, but Russia is unwilling to permit this relationship to grow beyond its control, so it has purchased a major shareholding in Essar through the Russian company Rosneft[80].

The effects that international sanctions have had on Iran's trade relations have further complicated this basic situation of the oil economy. The sanctions were imposed on Iran because the country had possibly violated certain clauses of the Treaty on the Non-Proliferation of Nuclear Weapons, suggesting that this State was attempting to embark on a military nuclear program. Since Iran denounced the 2004 Paris Agreement, a series of sanctions were applied to the Teheran Regime, mainly imposed by the USA.

Despite the fact that the Russians and Chinese had generally prevented sanctions being imposed within the framework of the UNO, in 2010 they changed their

77 Frear, Thomas, "The Russian-Iranian Military Agreement: Another Perspective", The Diplomat, February 16, 2015, available at: http://thediplomat.com/2015/02/the-russian-iranian-military-cooperation-agreement-another-perspective/. Reference date 20.11.2016.

78 DOWNS, Erica, "Getting China to Turn on Iran", The National Interest, July 19th, 2012, available at http://nationalinterest.org/commentary/getting-china-turn-iran-7215. Reference date 21.11.2016.

79 BHAT, Aditya, "India, Iran close to strike $4.5B undersea gas pipeline deal", International Business Times, March 17th, 2016, available at http://www.ibtimes.co.in/india-iran-close-strike-4-5b-undersea-gas-pipeline-deal-671072. Reference date 21.11.2016.

80 SUNDRIA, Saket, "Iran Set to Lose India Oil Market Share as Rosneft Elbows In", Bloomberg, August 9th, 2016, available at: https://www.bloomberg.com/news/articles/2016-08-09/iran-set-to-lose-oil-market-share-in-india-as-rosneft-elbows-in. Reference date 22.11.2016.

position because Iran wished to dispense with dependence on Russia in nuclear matters.

In that year, Iran reached an agreement with Turkey and Brazil, in the so-called "Teheran Declaration" whereby Iran would send low-enriched uranium to Turkey and would receive this product enriched to allegedly manufacture isotopes for medicinal purposes. Maybe the Iranians underestimated international reactions, because this time a consensus was reached at the UN Security Council, which passed Resolution 1929 imposing a series of sanctions on the Iranian nuclear program and on the Guardians of the Islamic Revolution or Pasdaran. This time, the Russians had spelt out the message loud and clear to the Iranians. If they wanted to carry on progressing in nuclear energy they would have to take into account the fact that Russia possessed the key that opened the door to negotiation with Europe and the USA with a view to lifting sanctions[81].

However, the Iranians felt that the Russian reaction had gone beyond mere dependence on nuclear material; they were under the impression that the Russians were going to prevent them from placing their products on the European market. A good relationship with Turkey could have enabled Iran to open up a new land route for gas supply to Europe, across Anatolia, linking Iran with Europe. Should this be possible Iran could compete with Russia for supplying gas to Europe, while at the same time Moscow would lose the control it has over the European gas market. Under such circumstances Russia could not afford to lose its market share or its influence over Iran[82].

The sanctions began to bite hard in 2012, when the European Union followed suit and joined the USA in its actions[83]. The impact on the energy sector would be notable, because the sanctions combined a reduction in oil and gas exports with a lowering of refined product imports, in an environment in which investment and technology from abroad were minimised[84]. The Iranians were soon to react, using one of their recurring themes as a warning, because when tensions run high on the international front, Iran usually resorts to threat with the closing of the Strait of Hormuz[85].

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[81] OMELICHEVA, Mariya, "Russia's Foreign Policy toward Iran: A Critical Geopolitics Perspective", Journal of Balkan and Near Eastern Studies, 14(3), Pages 331-344, University of East London, 2012.

[82] TAZMINI, Ghoncheh, "Russian-Iranian Relations in the Context of the Tehran Declaration", Iranian Review of Foreign Affairs, vol. 1, Pages 7-32. Tehran, 2010.

[83] At the end of 2011 the International Atomic Energy Agency (IAEA) issued a report in which it stated that, although the Agency did not have any proof, it strongly suspected that Iran was developing a nuclear weapon.

[84] KENT, Sarah, "Sanctions Slash Iranian Crude Capacity Near 20%", Wall Street Journal, March 21st, 2013, available at: http://www.wsj.com/articles/SB10001424127887324103504578373752237196658. Reference date 22.11.2016.

[85] VOA, "EU Agrees to Ban Iranian Oil Imports" January 4, 2012, available at: http://www.voanews.com/content/eu-agrees-to-ban-iranian-oil-imports-136682358/150299.html. Reference date 22.11.2016.

Political and public life in Iran were thrown into confusion by the sanctions, and the Rial fell to its lowest ever level against the Dollar. The gradual dismantling of the subsidy system, which had commenced in 2010, had to be stopped because of the urban disturbances[86]. At the same time as families began to see their welfare in jeopardy, there was a reduction in subsidised energy, a shortage of commodities and a lack of spare parts, all of which severely slowed down the industrial production chains. All of this threatened diversification, while many workers lost their employment and joined the dole queues, adding to the social unrest[87].

In this environment of sanctions, domestic consumption and oil imports, the Iranian nuclear program seemed to be justified by the Iranian Authorities' argument that this program was given over to the production of nuclear-electric energy. The Iranians claimed that they could earmark its production for export, whereas nuclear energy would give the country a domestic supply, which would also make them less dependent on importing refined petrol[88].

Russia is fully involved in the Iranian nuclear energy program, given that the construction of the Bushehr Plant was carried out by the firm Atomstroyexport, albeit based on what was originally a German Project. The Russian firm also provided fuel to operate it, under the supervision of the IAEA. After several controversies during the different stages of its construction, the reactor was connected to the grid in 2011 and became fully operational in 2012[89].

Russian involvement in supplying the fuel is particularly significant, because Iran aims to acquire complete uranium-enrichment capacity, which is why it has the enriching plants at Fordow and Natanz. Yet Russia agreed to build the reactor in exchange for supplying fresh fuel and removing the spent fuel, which would create nuclear dependence on the Russians, preventing Iran from seeking other suppliers, such as China. Once the Russians had finally achieved Iran's much-desired energy dependence on them, where nuclear matters and arms sales

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86 RECKNAGEL, Charles, "As Sanctions Bite, West and Tehran Play Risky Game", Radio Free Europe, October 13th, 2012, available at http://www.rferl.org/content/iran-sanctions-west-nuclear-economy-politics/24738311.html. Reference date 22.11.2016.

87 FASSIHI, Farnaz. and SOLOMON, Jay, "In Iran's Factories and Shops, Tighter Sanctions Exact Toll", The Wall Street Journal, January 2nd, 2012, available at http://online.wsj.com/news/articles/SB10001424127887324595904578120250597512768?mod=WSJ_hps_MIDDLENexttoWhatsNewsThird&mg=reno64-wsj&url=http%3A%2F%2Fonline.wsj.com%2Farticle%2FSB10001424127887324595904578120250597512768.html%3Fmod%3DWSJ_hps_MIDDLENexttoWhatsNewsThird. Reference date 22.11.2016.

88 WOOD, David, "Iran's strong case for nuclear power is obscured by UN sanctions and geopolitics" Atoms for Peace: an International Journal, 1, (4), Pages 287-300, Rome. 2007.

89 World Nuclear News, "Bushehr reaches full capacity", 3rd September 2012, available at http://www.world-nuclear-news.org/NN-Bushehr_reaches_full_capacity-0309125.html. Reference date 24.11.2016.

were concerned, the Russians were a lot more willing for the sanctions on Iran to be lifted by the P5+1 group of countries[90].

The above-mentioned Russian arms sales to Iran are in keeping with the Iranian concessions in nuclear energy matters. Apart from national arms technology, Iran is dependent on the large-scale purchase of arms from Russia, mainly through Rosoboronexport. One of Iran's long-sought-after capacities is an anti-aircraft and anti-missile defence system that can give security to its critical installations. The Russians, manufacturers of the S-300 system, which has this capacity, signed a contract to supply it but delayed it during the sanctions period, making it subject to the building of a second nuclear plant with Russian technology in Bushehr[91].

Now that there was a better understanding with Russia, a change in US policy and a context where Europeans wished to go back to doing business in Iran, conversations about nuclear matters began to become more fruitful, and towards the end of 2014 Sergei Ryabkov, the Russian Deputy Foreign Minister, Wendy Sherman, the US Under Secretary of State for Political Affairs and Abbas Araqchi, the Iranian Deputy Foreign Minister established positive contacts[92].

The fact that since 2013 the Iranian President, Hassan Rohani had sent abroad greater signs of opening up than the previous President Ahmadinejad, could have helped to create this atmosphere of détente. Furthermore, in 2014 the Iranian Minister of Energy, Ali Majedi, made a gesture to the Europeans when he referred to the possibility of Iran supplying gas to Europe if the Nabucco gas pipeline were resumed[93].

The new environment was conducive to détente and in Summer 2015 a comprehensive agreement was reached in nuclear matters, after which Federica Mogherini, EU Representative for foreign and security affaires, had talks with the Iranian Foreign Minister, Javad Zarif, in which they dealt with the terms of the agreement. Subsequent to this meeting the representatives from France and

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[90] Беларуская праўда, "Россия готова возобновить поставки оружия Ирану после подписания соглашения по ядерной программе Тегерана / Russia is prepared to resume arms supplies to Iran after the signing of an agreement concerning Teheran's nuclear program", 03.03.2015, available at http://belprauda.org/rossiya-gotova-vozobnovit-postavki-oruzhiya-iranu-posle-podpisaniya-soglasheniya-po-yadernoj-programme-tegerana/. Reference date 24.11.2016.

[91] AGHAJANYAN, Mikhail, "Russia-Iran: Western Sanctions as a Stimulus for Development of Relations", Strategic Culture Foundation, 15/05/2014, available at http://www.strategic-culture.org/news/2014/05/14/russia-iran-western-sanctions-as-stimulus-development-relations.html. Reference date 26.11.2016.

[92] MALONEY, Suzanne, Three Reasons Why Russia Won't Wreck the Iran Nuclear Negotiations, March 25th, 2014, available at http://www.brookings.edu/blogs/markaz/posts/2014/03/22-russia-us-tension-sabotage-iran-nuclear-deal. Reference date 26.11.2016.

[93] PANNIER, Bruce, "Could Iranian Gas Be The Solution For Europe?", Radio Free Europe, February 24th, 2015, available at http://oilprice.com/Energy/Natural-Gas/Could-Iranian-Gas-Be-The-Solution-For-Europe.html. Reference date 27.11.2016.

Germany, Laurent Fabius and Sigmar Gabriel, went to Teheran to position their States in the new era that was to come[94].

The signing of the new comprehensive agreement served to enable Iran to increase its production putting its oil industry back into action and in 2016 it progressively augmented its volume until it almost attained the production level it had prior to the moment when the European Union joined the sanctions.

In order to be able to attract foreign investment again, Iran needed to find some way of getting around the legal impediments concerning the exploitation of energy sources. With a view to this, the "Iranian Petroleum Contract" (IPC) was devised, which combined the exploration and exploitation phases, so that investors could remain in the long term, providing their expertise and technology for around 20 to 25 years. To by-pass the constitutional requirements, the foreign investor would have no rights over the exploitations, but at certain supply points the extracted hydrocarbons would be delivered to them.

The reactions to these IPCs within the Iranian power factions vary greatly, depending on their orientation. The most conservative elements are in favour of developing their own technology and preventing foreign dependence, in view of the fact that when the sanctions were imposed on Iran, the foreign companies abandoned the country, so they are not reliable. For the aforementioned group, the foreign policy approach in connection with the oil and gas export should look to the States with which there has been most business in recent times, namely Russia, China or India. At the same time, the current situation benefits Iran's own companies and trusts (*bonyads*), so the arrival of foreign investment could put them at a disadvantage. Furthermore, the implementation of the IPCs would be harmful to their electoral interests, because Rohani could claim that the contracts were a new achievement as election propaganda.

In contrast, the more moderate groups are in favour of opening up to the outside world, as they believe foreign investment might enable the country to prosper to the extent that it could be the regional power in the zone by 2025. To achieve this Iran would need western technology, so its foreign policy ought to open up to western countries. In such a situation of greater potential for free competition it would be possible to get rid of the inefficient firms associated with the ultraconservative lobbies and the *bonyads*, reducing the protectionist prerogatives of the bazaar economy. Furthermore, if this new achievement were added to the success with the nuclear negotiations, the groups closest to Rohani would have their continuity in the Government guaranteed[95].

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[94] DAVENPORT, Kelsey y KIMBALL, Daryl, "U.S. Officials go to Congress, European Officials to Tehran", Arms Control Association, July 30th, 2015, available at http://www.armscontrol.org/blog/ArmsControlNow/07-30-2015/The-P5-plus-1-and-Iran-Nuclear-Deal-Alert-July-30. Reference date 27.11.2016.

[95] KHAJEHPOUR, Bijan, "Will Iran attract international oil firms in post-sanctions era?", Al Monitor, November 16th, 2016, available at http://www.al-monitor.com/pulse/originals/2016/11/iran-petroleum-contract-ipc-total-cnpc-azadegan.html#ixzz4SBTxtesU. Reference date 27.11.2016.

In the midst of controversies surrounding the Iranian power groups, the first IPC has now been signed by the NIOC and a private Iranian company, linked to the conglomerate controlled by Ali Khamenei. In this new scenario, the Iranian Oil Minister, Bijan Zanganeh, has announced that in the first quarter of 2017 it is expected that foreign companies will be able to enter into similar agreements. The first steps have already been taken, and by the end of 2016 the first preliminary agreement of this nature was signed between the Iranian firm Petropars, the French company Total and the Chinese firm CNPC, to exploit one of the South Pars gas fields[96].

Enjoying domestic support, all Rohani needed was a strong trump to be able to negotiate production with the OPEC countries, at their meeting towards the end of November 2016. Those States plus Russia agreed to reduce their shares to keep up the crude oil market prices. The Iranians arrived at the negotiations arguing that they should increase their production because it had been greatly reduced during the period of sanctions.

Even though the Saudis required a reduction from all the attending countries, the Iranian argument was considered convincing enough to enable them to slightly raise their production quota to almost four million barrels per day. The news was announced in Iran as "the defeat of Riad's oil diplomacy" and a victory for Iran and Russia, because between the two of them they had managed to get Saudi Arabia to accept the logic of Iran and its allies[97].

In this new era opening up for the Iranians, what they want least is to have a Saudi Arabian presence in their sphere of influence and expansion in the Middle East. If the Syrian conflict is viewed from this perspective, it is clear that Saudi Arabia, Turkey and Qatar have a vested interest in al-Assad's Regime collapsing, so that they can lay their own oil pipelines and gas pipelines that on reaching Turkey would join up with the international energy system. This line would avoid the pro-Iranian State of Iraq to steer clear of Iranian influence, run through Jordan and enter Turkey via Aleppo. Hence the strategic importance of this conflict zone[98].

Syrian rebel groups or even Jabhat Fateh al-Sham together with these State stakeholders, are all hoping for a Sunni victory so that they can take part in the new Syrian Regime and thus participate in the new hydrocarbon piping infrastructures.

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[96] TORBATI, Yeganeh, "Iran signs key oil contract with Khamenei-linked firm ue", Reuters, Oct 4th, 2016, available at http://www.reuters.com/article/us-iran-oil-contract-idUSKCN1242BM. Reference date 27.11.2016.

[97] VARZI, Changiz M., "Iranian media praises OPEC deal as victory over Saudi Arabia", Al Monitor, December 1st, 2016, available at: http://www.al-monitor.com/pulse/originals/2016/12/iran-media-reaction-opec-output-deal-victory-saudi-arabia.html#ixzz4SBz2anDq. Reference date 04.12.2016.

[98] TAYLOR, Rob, "You can't understand the conflict without talking about natural gas" Armed Forces Journal, March 21st, 2014 http://armedforcesjournal.com/pipeline-politics-in-syria/ . Reference date 04.12.2016.

Iran would likewise lose its ability to control the Saudi energy products passing through the Strait of Hormuz, if Saudi Arabia were to construct oil and gas pipelines running from the latter through Yemen to unload in some port in the Gulf of Aden. This could happen if the Saudis reached an agreement to cross the Yemeni territory of Hadramawt as far as the Port of al-Mukalla[99].

In view of this it is understandable that the Iranian position is to support the Houthi Movement, which in keeping with its interests would guarantee instability in Yemen. At the same time, energy products from the Arabian Peninsula countries could not be sent directly to the Gulf of Aden, it would control the Strait of Bab el Mandeb and would give strength to Iranian control over the Strait of Hormuz.

Although Qatar and Saudi Arabia have their disagreements, they do see relatively eye to eye where the energy sector is concerned, and thus they view the Iraq and Syria conflict in the same light, supporting the Sunni group against Iran's interests.

What is more, the Iranian authorities estimate that the disturbances in Iran's Kurdish province are being induced by Saudi Arabia. For the first time in twenty years the Democratic Party of Iranian Kurdistan (DPKI) recently clashed with Iranian forces, causing Iran to retaliate by attacking Kurdish bases on the other side of the Iraqi frontier[100]. The reason for this war by "proxy" seems to be that both Iran and Saudi Arabia are trying to limit the power of their respective rival, they being unable to solve their problems by establishing communication channels.

Conclusions

It can be seen from all the above-mentioned factors that there is a real struggle for power and hegemony between Iran and Saudi Arabia, and that this fight extends out of the energy field.

The geopolitical foundation on which the relations between these two stakeholders is based is very important, because both countries overlie a physical substratum that contains the most extensive hydrocarbon deposits on the planet.

For Saudi Arabia, the conditions are based upon the huge oil and gas reserves that it possesses under a desertic land. The country has about 30,000,000 inhabitants, who are excessively dependent on the capacity to produce water resources from their massive energy reserves. The population is not homogeneous, given that apart from a Sunni majority, there is an important Shiite community living precisely in the region where the main oil deposits are.

[99] LIN, Christina, "Saudi Arabia's and Turkey's Pipeline Wars in Yemen and Syria", Institut für Strategie- Politik- Sicherheits- und Wirtschaftsberatung ISPSW, Issue No. 429, Berlin, 2016.

[100] Reuters, "To Iranian eyes, Kurdish unrest spells Saudi incitement", Sep 4th, 2016, available at http://www.reuters.com/article/us-iran-politics-kurds-idUSKCN11A0BD. Reference date 04.12.2016.

The Saudi deposits and refineries are not in a secure location, given that they are concentrated in the east of the country and territorial waters make them highly exposed to any aggression from Iran. That is why Saudi Arabia´s defence expenditure is the highest of all the States in the region. The country has a formidable air force and anti-aircraft and anti-missile defence system, basically provided by the USA.

The situation affecting the other Shiite communities on the Arabian Peninsula is a destabilising factor, Yemen being the biggest cause for Saudi concern, because the Houthi Movement is a real problem for the country's physical and energy security.

As most of the maritime energy transport routes stem from the Persian Gulf, the Saudis are very dependent on their products passing through the Strait of Hormuz, which is geographically controlled by Iran. One possible alternative would be to transport part of their production via oil pipelines, the infrastructures currently in service already enabling them to transfer the oil to the ports in the east, where the resources arriving would be faced with a dual problem. On the one hand, most of the hydrocarbons leaving from the Persian Gulf are heading for the Asian market, so not only would conveying them by pipeline and ship be more expensive, but arrival at their destination ports would also be delayed by several days. On the other hand, Saudi oil would also have to cross the Strait of Bab el Mandeb, whose eastern coastline belongs to Yemen, currently occupied by the Houthi Movement, posing a threat to maritime traffic.

The Saudis need to extract their oil safely, so they have several projects for doing so via oil pipelines, clashing with Iranian interests though. The possibility for constructing an oil pipeline across Yemen, would take Saudi oil to the Gulf of Aden without having to pass through either of the straits. To do this, the Saudis would have to negotiate with the tribal factions that control the zone, in order to guarantee the continuity of land communications. Another option would be to build a diversion of the old Trans-Arabian Pipeline, which passing through Jordan runs as far as the Lebanese port of Sidon. However, the presence of the pro-Iranian group Hezbollah in Lebanon means that this line would have to be diverted through Syria, so it would be necessary to overthrow Al Assad's pro-Iranian regime.

Saudi Arabia is aware that its energy resources will not be an infinite source of income, so the new Government team, supported by the succession to the throne, has embarked on an ambitious plan to branch out into different industrial sectors and to implement new energie sources, mainly nuclear, but also renewable sources.

This new Saudi vision will have to be the one that consolidates its monarchy, because an atmosphere of economic prosperity will enable its subjects to find jobs and social welfare. This is one of the main challenges faced by the Saudi regime, because its mixed population needs a stable environment to prevent the

internal order from becoming upset. Once again, the shadow of Iran cast itself over Saudi security, given that social unrest could turn the Shiite communities into a factor that could bring down the Sunni monarchies on the Arabian Peninsula.

The US military presence in the zone is a balancing element, where the US Administration's expenditure is made up for by the purchase of arms and the shipments of oil from the countries on the Arabian Peninsula. Saudi Arabia and the rest of the Gulf monarchies will have to determine the extent to which altering this situation would be in their interests, since at present the US presence is a guarantee of security.

Iran appears as a territorial fortress straddling the two most important gas and oil basins in the world, as a result of which not only its own hydrocarbon trade but also that of the States bordering on the country depend to a greater or lesser extent on Iran's geographical position. The simple shape of its coastline gives Iran the capacity to control the Strait of Hormuz, an essential value in the energy debate.

Iran's position also enables it to access the Caspian Sea, and set itself up as the "stopcock" for the flows from Central Asia to the Indian Ocean. What is more, the variety of bordering states will enable the country to send its energy resources through them.

Apart from its valuable territory and wealth, Iran has more than 80,000,000 inhabitants, what makes it the only nation-state in the Middle East with a latent power based on these three parameters. Furthermore, it must be borne in mind that although the population is heterogeneous, the Shiite branch of Islam is a binding factor, albeit with certain exceptions, such as the Kurds, whose dissidence the Iranian authorities have attributed to Saudi backing.

The presence of large numbers of Shiites in the Middle East has been used by Iran to project its power. The most important case is with neighbouring Iraq, although this influence is also felt strongly in Lebanon and Yemen, not to mention Syria, whose Government relies heavily on Iranian support to survive. As all these areas are closely associated with energy supply, either because of their production or their geographical location, it is easy to understand why Iran's projection as a regional leader would constitute an element for its global control over fossil fuel sources.

The Iranian regime considers this regional expansion to be an imperative, as iran feels of itself to be the bastion of Shiism, its vision of a new regional and world order being drawn back from the Iranian Revolution and the planning to achieve this going back to 2005, long before its Saudi rivals drafted their new project for the future.

The Iranians have a very high level of training when compared to the surrounding States, which has allowed the country to diversify its industry and enabled it to carry on with its domestic production in spite of the sanctions.

Iran has also managed to survive in a relatively stable way despite the complex environment surrounding it. However, to do so it has had to seek such allies as Russia and China, what has led to a twofold dependence, on nuclear-electric power and on weapons.

The lifting of the nuclear sanctions amounts to a triumph for Iranian foreign policy, because it has retained its uranium enrichment capacity at the expense of delaying its nuclear program. Now that the sanctions have been lifted it will once again play a role in the free hydrocarbons market and a wide range of possibilities for foreign investment, which will undoubtedly improve Iran's economic situation. The increase in the country's oil production share, in spite of the reduction that affects the rest of the oil exporters, is another triumph that the Iranian Authorities have utilised against the Saudis.

In this improved frame, it is likely that Iran's status as a power and its social acceptance will increase and this will probably have a positive effect on its image abroad, where it is attempting to weaken potential Saudi influence. Nevertheless, the strong Iranian power groups could prove to be an obstruction to the country's economic growth, so it is a question of waiting to see how the internal struggle for power will be settled, in a context where there will likely appear a new Iranian Supreme Leader in the coming years, given Khamenei´s currentelderness.

These two stakeholders, at State level, would appear to be emerging as the energy giants of the future, using their oil and gas, among other resources, to increase their regional and global influence in a zero-sum game. The outcome in the long term could well be decided by which of the two can carry out its strategic objectives, in an environment of relatively competitive energy prices.

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