

The Prize and the Quest of Energy Beyond the Oil Paradigm: Renewable energy deployment under the sustainable development agenda

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Since the oil crisis of the 1970s, energy politics have become a key area of international relations studies (Santos, 2018, p. 5; Borovsky and Trachuk, 2015, p. 97; Duffield, 2012, p. 1). However, given the magnitude of these crises and considering their impacts mainly on the net oil importing countries of the period, it is possible to argue that this decade served as an impetus to rethink the excessive dependence on oil, whether for energy purposes or for other uses of its derivatives.

In fact, since the second industrial revolution, oil has been consolidated as a key energy input, having its different uses and applications in distinct sectors of the economy. In line with the growing relevance of oil (and its derivatives), the specialized literature followed this trend, focusing excessively on the industry and the dynamics of the oil sector, sometimes based on the analysis of demand, supply, dependence, market structure, but, most of the time, without highlighting the relevance of alternative sources in this context.

Here, by “alternative sources” we are not (yet) referring to renewables, but to those that, in the post-crisis context of the 1970s, constituted alternatives to oil in different regional and national contexts. The international relations (IR) area is no exception. Despite being an interdisciplinary area by nature that does not just look at the past, the discipline ends up being equally influenced by this (skewed) perception of oil. Thus, different currents and theoretical lenses deal with the energy theme, which, again from the 1970s on, leads to the need to discuss it from the perspective of “energy security” – when the central concern of the period was the reduction of dependence on oil imports, particularly in OECD countries (Vivoda, 2010, p. 5262; Yergin, 2006, p. 69).

“Some of the major approaches of IR discipline like realism, neo-realism, constructivism and neo-liberal institutionalism can be employed to study the epistemology of energy

security. The realism and neorealism perspectives can also be correlated with classical geopolitics (...). Similarly, social constructivism and critical geopolitics can also help in mapping accentuation of 'societal conflict' as well as 'resources distribution' which is taking place mostly in the so-called 'Southern part of the world' (Mohapatra, 2016, p. 683).

Therefore, without making an in-depth analysis of the perception of different IR schools on the energy agenda and on the concept of energy security, this paper is in line with the aforementioned author. In proposing a more general analysis of the topic in question, we not only stress the relevance of OECD countries, but instead consider the global south perspective in different analysis and cases to be made – particularly focused on the case of South America. However, albeit it is not the purpose of this paper to promote an analysis of this theoretical debate on IR, it stands out that:

“the theoretical framework of energy research is still dominated by neorealism, which focuses on the role of state actors and their interests in terms of energy security (...). The neoliberal school, represented by A. Goldthau, J. M. Witte, C. Fettweis and others, looks into the role of institutions, international cooperation and liberal markets” (Borovsky and Trachuk, 2015, p. 97).

Thus, it is clear that the

debate on the subject of IR is broad, although it presents a mainstream more centered on neorealistic lenses, analyzing the geopolitics of oil and the power of nations associated with the ownership of this resource. Indeed, it may be really hard to differentiate between the so-called ‘hard power’ and ‘soft power’ when the question of capturing resources comes into mind (Nye Jr, 1982, p. 126), what poses questions and doubts about these concepts – apparently consolidated in the IR literature.

In the face of this mainstream, the IR fields that generally consider energy issues are geopolitics, foreign policy, the Middle East, interdependence, international conflicts, and resource nationalism. In general, studies end up focusing almost exclusively on state actors, national approaches, suggesting rigid governance. Therefore, the main contribution of this paper is precisely to question this foundation and to problematize this *modus operandi*, proposing a paradigm beyond oil, especially given the need to foster renewable energy under the sustainable development agenda.

To this end, we use two terms that are frequently used in the field of IR to address energy issues, which give the title to two books by the relevant author of the area Daniel Yergin: “the prize” (Yergin, 1991) and “the quest” (Yergin, 2011). Ergo, aware of the limitation of focusing only on oil in international energy studies and analyzes, this paper will be divided as follows:

In the next section, we propose a theoretical contribution by linking the domain-dependency (of the resource) binomial to energy security. Next, section 3 analyzes different levels of energy governance for reaching and/or promoting energy security beyond oil, proposing three analyzes and suggesting some instruments: 3.1. national (different instruments and policies); 3.2. regional (cooperation and integration); and 3.3. international (trade and conflicts). Finally, the main conclusions are presented, as well as references used in the study. Despite the technical nature of some of the discussions carried out, this paper proposes a more general and conceptual analysis from the perspective of international politics.

2. Domain-dependency binomial

In his first book, Daniel Yergin (1991) associates in his title “money and power” to “the epic quest for oil” – both as “the prize”. In it, the author deals with the history and personalities of world oil power, from the 19th century to the Gulf War. With the change in the global energy scenario, such as: (i) rising demand in Asia; (ii) greater awareness of global warming; (iii) changing markets and in energy use patterns; (iv) increasing efficiency; and (v) adopting alternative sources; new challenges arise and to face them it is necessary to think beyond the oil paradigm. Looking towards a more sustainable global energy system demands to integrate demand-side and supply-side policies

(Wenger *et al.*, 2009), in addition to rethinking governance strategies at its most diverse levels and, at the same time, associated promotion and incentive instruments.

However, in his second book, Daniel Yergin (2011) expands the perspective already in his title when he associates “the quest” to “secure” and “remaking of the modern world”. Given this broader view, which is no longer limited to the oil industry, the author considers climate change and renewable energies in the scope of his analyzes. It is precisely in this wider line of thought that this paper fits, suggesting a more responsible and aligned approach to the new global trend to narrow the debate on sciences often treated as separate, namely the area of energy and the area of environment (Santos and Santos, 2018, p. xxi).

In this context, the terms “the quest” and “the prize”, associated with the endowment of factors, are directly related to the “domain-dependency binomial”. Therefore, having or not having access to some resources – including energy ones –, the role of nations in terms of the positioning and market structure of that industry is defined.

“It became important to have energy domain, mainly having access to different resources ‘in the backyard’, that is, domestically; however, when this was not possible, different contractual/commercial arrangements,

wars and/or interventions took place in order to dominate it. By dominating energy and basing an entire model of production and patterns of consumption on certain energy sources, dependence started increasing and seemed to have no return. In this sense, the binomial domain-dependency of energy began to control and even determine technological, economic, political, social and undoubtedly environmental relations within and between countries” (Santos, 2018, p. 1).

The aforementioned excerpt presents points that will be analyzed in the following sections and which deserve to be highlighted since now, either because the choice of them arises from this fragment, or because they contribute to the understanding of the research method to be developed in this paper. The energy “domain” can occur domestically and/or internationally, in different ways; there are different strategies, which also apply to the case of promoting energy security, defining “levels of energy governance” (section 3). At the same time, when referring to “dependence started increasing and seemed to have no return”, we point out the technological and institutional difficulty resulting from centuries of oil establishment as an engine of the international economy since the second half of the 19th century, suggesting a trajectory of path-dependence. Finally, the impact of the binomial on relations within and between nations from a social, environmental and political point of view are in line with the beyond the

oil paradigm that emerges, under the sustainable development agenda.

Although closely associated with the provision of non-renewable energy resources, it is worth noting that this binomial seems to be present also in the case of renewable energy resources – such as wind, solar and biomass. The relationships are not exactly the same, either due to the nature of the stock and the storage of resources, or due to seasonality and intermittency, which makes the capacity factor of these alternative sources lower. In any case, in view of the ongoing change in global energy geopolitics, it is possible to keep analyzing the trade-offs of the domain-dependency binomial of the energy sector also for the progressive and systematic advance of renewable energies in the global energy matrix.

Faced with this dilemma, and especially in net energy importing countries during the oil crises of the 1970s, the energy agenda is prioritized and closely associated to national sovereignty itself. Thus, it ends up becoming central and priority on the domestic agenda due to its pressure on the trade balance and on the balance of payments of these countries, since they were under severe pressure with the increase in the price of a barrel of oil. In this regard, monitoring the decisions and the political-economic situation of the countries of the Organization of the Petroleum Exporting Countries (OPEC) became a mandatory task for analysts of international, trade and defense relations at the time.

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Given the growing relevance of the energy industry, the agenda is then securitized (BUZAN *et al.*, 1998; WÆVER, 1995, 2004), since the countries that did not have the “domain” seek at the same time to reduce the “dependency” on oil – making room for a deep theoretical debate in the subject of IR². Nonetheless, unlike what is reproduced in different publications and even in public policies in distinct countries, it is necessary to highlight that the concept of “energy security” is not unique, cohesive, nor immutable. In this way, it can be associated with:

- price and guarantee of demand from primary sources such as oil and gas (IEA, 2013);
- risk management (Chester, 2010, p. 892);
- mitigation of uncertainties (Van der Hoeven, 2011, p. 12);
- 4As approach – availability, accessibility, affordability and acceptability (Cherp and Jewell, 2014, p. 416);
- environmental sustainability (Kruyt *et al.*, 2009, p. 2167);
- sociocultural factors (Von Hippel *et al.*, 2011, p. 6723);
- need for promotion of regional arrangements (Santos, 2018, p. 3);
- long-term prospects for promoting sustainable development (UNDP, 2000, p. 14);
- technology innovation (IRENA, 2017, p. 13);

- indicators and measurement indices (Sovacool, 2011, p. 7473);
- non-state actors (Cherp, 2012, p. 842); and/or
- institutional factors (Tongsopit *et al.*, 2016, p. 61).

Therefore, it is possible to argue that the concept of energy security is slippery, since it is hard to define universally, because it is polysemic, multi-dimensional and context-dependent on the nature of each country/region (Santos, 2018, p. 18)³. In large part, this concept has served to reinforce the national character of the energy agenda, suggesting policies such as self-sufficiency and energy sovereignty.

From the point of view of international policy, more than analyzing “energy security”, there was a need to analyze the impact of energy on international security. “Although these questions are time-honored, systematic inquiry into the causal links between energy and international security remains embryonic” (Stulberg, 2017). In this way, according to the author it is possible to find many mutual areas between energy and international security:

- energy nationalism;
- critics of energy nationalism;
- energy resources and territorial conflict;
- energy and grand strategy;

- energy streams, markets, and conflict;
- energy, the state, and war;
- energy companies and international conflict;
- energy weapons and statecraft;
- pipeline politics;
- transnational energy infrastructure and non-state actor threats; and
- energy securitization and conflict.

Still according to the author, there are two main fields in the survey literature: the first one focus on the history of oil, its politics and diplomacy from its early uses in the 19th century to contemporary episodes of geopolitics (Yergin, 1991, p. 205; Singer, 2008, p. 50; Cooper, 2012, p. 85); in turn, the second one identifies key global issues of energy security, associating it to interdependence, environment and climate change (Santos and Santos, 2018, p. xxi; Luft and Korin, 2009, p. 70; Pascual and Elkind, 2010, p. 38; Kalicki and Goldwyn, 2013, p. 76). Thus, one can see the close relationship of these two main fields proposed by Stulberg (2017) and the analysis made at the beginning of the section based on Yergin's books (1991; 2011).

However, there has been a recent change in the concept of energy security, especially due to factors exogenous to the sector itself. Consequently, the recent debate about the "energy transition" has given space to rethink this oil-based energy paradigm, suggesting that it should be replaced by more cleaner energy

sources that have less impact on the climate. Generally, the passage from the era of fossil fuels to the era of renewable energies is called "energy transition". Although it is not the first energy transition humanity has ever witnessed, the current energy transition from fossil fuels is already ongoing and should not be analyzed from a single lens – since it is not an exclusively technological nor resource endowment issue (Grayson, 2017, p. S113). Therefore, the ongoing concept of "energy transition" usually refers to the shift from fossil fuels to renewable energy sources (IRENA, 2019a, p. 76).

To deal with this new context, different initiatives were adapted and created to carry out a new energy beyond the oil paradigm. This does not mean to argue that oil will not continue to be important, however the idea is to replace it progressively and to advance technologically so that its exploration and use impact less negatively on the environment and emit less greenhouse gases (GHG). In this context, we highlight the signing of the Paris Agreement and the agenda promoted by the United Nations (UN), with the participation of different sectors of society (states, academia, private companies, organized civil society, young people, etc.) that, together with the Climate Conference of the Parties (COP), have sought to address the issue.

From the point of view of global commitments, it can be argued that the Paris Agreement, as a result of the COP 21, and the Sustainable Development

Goals (SDGs) have already put the global mitigation agenda in a new era – making 2015 a milestone for the issue. The Paris Agreement was agreed by virtually every country in the world to reduce GHG in order to limit the average global temperature rise well below 2 degrees Celsius and as close as possible to 1.5 degrees Celsius, thus avoiding the most severe impacts of climate change, such as increased droughts, floods and severe storms. Given the impossibility of reaching consensus on a single universal emission mitigation formula, it was agreed that each country decided its own goals for the period 2020-2030.

Kinley (2016, p. 9) fully believes in the capacity of the Paris Agreement to face the need to mitigate GHG and propose an innovation with regard to climate governance. Although they are optimistic, Höhne *et al.* (2016, p. 27) see a space for potential future gains with the expansion of the ambition of the commitments of the agreement, since large emitters presented very conservative Nationally Determined Contributions (NDCs). “There is some convergence of views, then, that the Paris Agreement has steered the world onto a path that can avoid dangerous climate change, so long as its promise to trigger stronger future action is realized” (Viñuales *et al.*, 2016, p. 3). Analyzing specifically the NDCs of the countries of South America, it is possible to affirm that “what is actually happening in South America is a mere diversification of the sources of power generation rather than a real and

related to clean energy, including renewable sources, energy efficiency and advanced and less polluting fossil fuel technologies, and promote investment in energy infrastructure and clean technologies. It is worth mentioning that, unlike the United Nations Millennium Development Goals (MDGs), which were not specifically dedicated to the energy issue itself, the SDGs are concerned with this agenda and are seeking results to be achieved by 2030.

Given the complexity of agreements and initiatives in a global scale, it is necessary to understand how they have affected and continue to affect policies on a domestic, regional and international levels. Thus, it is up to the next section to analyze the different levels of energy governance, particularly identifying how they collaborate to promote energy security, understanding the concept beyond its traditional approach of the 1970s and considering especially the sustainable development agenda.

3. Levels of energy governance

According to Zaman and Bruderermann (2018, p. 444), “energy governance” is a concept that “is [also] highly context-dependent (...) [and] a process of coordination in which institutional properties (system of rules, policies) and interdependent (public-private) actor constellations interact to decide how to provide energy services”. Particularly analyzing the governance of the

the governance of the electricity sector in developing countries, the authors state that the regulatory issue is affected by weak institutional capacity, political instability, poor technical and financial performance, state budgetary constraints, and donor-driven lending mechanisms.

From a more global analysis of the concept, Van de Graaf and Colgan (2016, p. 1) argue that:

“over the past few years, global energy governance (GEG) has emerged as a major new field of enquiry in international studies. (...) By focusing on governance, they [scholars] broaden and enrich the geopolitical and hard-nosed security perspectives that have long been, and still are, the dominant perspectives through which energy is analysed”.

In this paper, we will not only consider formal, interstate forms of energy cooperation and specific multilateral organizations, but will also take into account informal norms and practices in GEG. According to the authors (p. 6), “fewer scholars have ventured to examine the role of transnational or subnational players in GEG (...) [, what] is especially important with regard to issues such as mitigating the resource curse or expanding energy access in the global South”.

Aware of the different existing levels of energy governance, the following subsections will briefly present how initiatives conducted in each of

them can affect (positively and/or negatively) the energy security. It is noteworthy that there are interactions between the different levels, which can be positive (re-feed policies) or negative (institutional inflexibility). In addition, it should be noted that this section also presents some instruments for this, since they “have a crucial role in deploying innovation and cost reduction in renewable energy production” (Shokri and Heo, 2012, p. 1). However, it is noteworthy that the same instrument can be used at different levels of energy governance.

Domestic investments

From a national point of view, countries can seek to promote energy security in different ways and through different instruments (El-Ashry, 2012, p. 105) and, as already mentioned, they can be used and stimulated at other levels of governance. Each country can independently promote and/or stimulate the beyond the oil paradigm in different ways, for example, through subsidies, financing, fiscal and tax incentives, adaptations in regulatory frameworks, carbon rates, investments in research and development (R&D), public-private partnerships (PPP). In this way, they would be promoting energy efficiency and reducing the costs of production and operation of renewables, increasing their competition compared to the already established sources, through “policy mix covers policies related to education and

training, industry, labour, investment promotion and R&D, among others” (IRENA; IEA; REN21, 2018, p. 99).

Generally, “domestic policies are necessary to overcome the barriers specific to the investments in RE [renewable energy] capacity in order to meet the targets set by international agreements. These policies are typically divided into two main categories: adaptation and mitigation” (Bento *et al.*, 2020, p. 7). Mitigation measures can be divided into technology-push (grants, subsidies, and government funded R&D) and market-pull policies (1. tariff-based instruments: Feed-in Tariffs (FiTs) and carbon tax; 2. hybrid instruments: tendering; and 3. quantity-based instruments: renewable portfolio standards or obligations (RPS or RPO) and cap and trade systems (CaT) (p. 8-10).

Analyzing the cases of South Korea, China, Germany and UK, Shokri and Heo (2012, p. 7) argue that “all of these countries started supporting renewable energy markets by capital subsidizing in early stages and feed in tariffs and renewable portfolio standards in later stages”. Through an algebraic model, Newbery (2018) concludes that mainly solar PV (and, in some cases, wind onshore) creates external benefits of learning-by-doing that drive down costs and reduce CO₂ emissions, what justifies subsidy, justifying the need to quantify it and evaluate its social profitability. Seeking to evaluate the effectiveness of renewable energy development in

Sixteen East Asia Summit countries (Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam, Australia, China, India, Japan, South Korea and New Zealand), Chang *et al.* (2016, p. 427) “build an index to assess respectively if such policies have helped create a market for renewable energy, maximize potential profits, reduce risks relating to the investment, develop and adopt new technologies, and improve the access to financial resources”. To do so, they consider the following five criteria: (i) market (renewable portfolio standards, renewable energy certificate, and net metering); (ii) profitability (feed-in-tariff, power purchase agreement, and tax incentives); (iii) uncertainty (renewable energy target, no expiring policies, and renewable energy act); (iv) technology (R&D grant, smart grid, and data reliability); and (v) finance resources (capital subsidy, public investment and loans, and venture capital).

“Public energy R&D is recognized as a key policy tool for transforming the world’s energy system in a cost-effective way (...). However, managing the uncertainty surrounding technological change is a critical challenge for designing robust and cost-effective energy policies” (Anadón et al., 2017, p. 1).

Particularly evaluating negative emissions technologies (NETs),

especially how bioenergy with carbon capture and storage (CCS) and direct air capture (DAC) contribute to mitigation, Honegger and Reiner (2018, p. 306) see “market mechanism under Article 6.4 of the Paris Agreement – colloquially called ‘Sustainable Development Mechanism’ – as a possible cornerstone of such a policy instrument”.

Among the regulatory possibilities, we highlight: (i) power regulations (feed-in tariff/premium payment, tendering, net metering; and renewable portfolio standard); (ii) heating and cooling regulations (solar heat obligation, technology-neutral heat obligation); and (iii) transport regulations (biodiesel obligation/mandate, ethanol obligation/mandate, non-blend mandate (IRENA; IEA; REN21, 2018, p. 12. According to this report, between 2014 and 2016 the growth rate of the number of countries that implemented power regulations, heating and cooling regulations, and transport regulations was, respectively, +7.7%, +6.3% e 0.0%. The report also suggests policies for system integration and policies for energy access, arguing that “despite the significant progress made over the past decade and the growth in policy support, renewables have yet to reach their full potential and key barriers still inhibit further development” (p. 15).

Table 1 sums up main drivers, key players and remaining barriers of renewable energy deployment. Although the perspective is mostly national, the weight of subnational level

highly competitive development costs (onshore wind, and more recently, solar PV). From the point of view of policy instruments, auctions to solar thermal requirements and biofuel blending mandates stand out in the region, leading to significant drop in costs.

Regional arrangements

From a regional point of view, two main tools stand out to promote the paradigm beyond oil through the promotion of renewable energies: cooperation and regional integration. Although they are often treated as synonymous concepts and therefore interchangeable, the first may have a more technical, punctual and short-term character, while the second tends to require greater political will to be carried out, being a broader and more long-term process.

In both cases, and regardless of the region analyzed, it is necessary to adapt the national electricity markets, what may reshape cross-border electricity flows, as well as the promotion of harmonization of markets and regulatory frameworks. After the 1970s, Duffield (2012, p. 1) argues that recently we have seen energy cooperation initiatives specially within the International Energy Agency (IEA), the North Atlantic Treaty Organization (NATO) and the European Union (EU). Notwithstanding, it is worth noting the efforts made in Asian and South American countries.

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In the particular case of the European Single Market in Electricity, large rise in subsidized renewable generation driven by the decarbonization agenda made it hard to measure and identify the benefits of energy integration in the region (Pollitt, 2019). This shows the trade-offs associated with the difficulty of measuring the impact of a given measure when, in practice, many of them are being carried out at the same time to achieve a common goal.

Considering the South America case, it is possible to consider energy integration (specifically electrical integration) in the region beyond the energy cooperation that already exists between Venezuela and some Caribbean countries – limited to easier and cheaper access to Venezuelan oil. There is a relevant possibility of exploring synergies in the regional derived from hydrological complementarity, as well as different sources (Paredes *et al.*, 2017, p. 22; Moura, 2017, p. 44; Ramos, 2016, p. 81). This complementarity suggests the joint planning of the dispatch of hydroelectric dams, construction of new ventures and joint management of decision-making.

Santos (2018, p. 181) creates and analyzes four modeling scenarios for the integration of the power sector in the South America region, considering the expansion and (i) new international interconnection lines; (ii) new bi-national hydroelectric plants; (iii) new contractual arrangements (swaps); and

(iv) regulatory harmonization:

- reference integration scenario (RIS);
- weak integration scenario (WIS);
- moderate integration scenario (MIS); and
- strong integration scenario (SIS).

“Undoubtedly, it will require political will and ‘diplomatic engineering’ to carry out the measures of each scenario in the face of such adverse political-economic context (...), but the modeling exercise ratified the argument that greater electricity integration in Mercosur (and in South America as a whole) leads to a reduction in the need to increase installed capacity, as well as to lower geographic and socio-environmental impacts” (Santos, 2018, p. 222).

Analyzing official documents from Southern Common Market (Mercosur), Andean Community (CAN) and Union of South American Nations (UNASUR), the author concludes that the regional bodies dedicated to the energy and climate issues have contributed little either because of its institutional nature or because of the recent events of regional political economy. In this way, there has been some normative and institutional development in the field of energy integration in South America in the last decade; however, it ended up being incapable of translating into practical results. “Itaipu Binacional” and the “Bolivia-Brazil Gas Pipeline” (GASBOL)

are the bolder cases and have binational nature, both experiences dating back to the 1970s and late 1990s, respectively.

Therefore, it is possible to argue that in practice the normative effort of Mercosur, CAN and UNASUR was not able to overcome political, technical, economic and regulatory barriers that prevent the advance of energy integration in the region. Due to its intergovernmental nature, the three institutions present limitations to their performance. Trying to map out other regional movements beyond South America, there were also considered the Forum of the Countries of Latin America and the Caribbean on Sustainable Development and the Energy and Climate Partnership of the Americas (ECPA) – which have recently narrowed the Latin American dialogue with the sustainable development and climate change issues.

It is then clear that, especially from the overflow of policies carried out at the national to the regional level, it is possible to create a context of promoting regional energy security through the progressive replacement of oil in the energy matrix from regional arrangements. The challenge is certainly on a different scale, since regionally there will be a greater number of state and non-state actors, as well as different interests to take into account.

International flows/conflicts

After analyzing the levels of national and regional energy governance, this

subsection focuses on the international level. Here, we consider “international” more than just relations between states; in fact, the distances between the countries involved are specifically considered, gaining global coverage.

Trade flows and potential conflicts stand out. Without focusing on the case of trade, since much of the international transit of oil barrels is known to be made by sea, this subsection proposes a critique of the search for energy security (in its broad concept). This is because in some cases the search for energy security may lead to the energy insecurity itself, negatively impacting prices and quantities offered. In fact, there may be different energy conflict nature (e.g., hot wars, coercion, and attacks on infrastructure) waged between and among supplier-, transit-, and consumer-states (Stulberg, 2017), so here we explicitly address the nexus between energy (in)security and international conflicts.

Among the main features of energy system that is more able to impact risk of conflicts, stand out “geographical concentration of primary resources, the number and diversity of exporters on the international energy market, vulnerability of infrastructure to attacks, vulnerability of users to disruptions and externalities related to interconnections with other systems” (Månsson, 2014, p. 106). According to the author, energy can be (i) objective; (ii) mean; or (iii) cause in a conflict. In the first case, by secure and control system structure; or compete for resources. In the second

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In the second case, due to deliberate reduction of flow by supplier or user; or disturbance induced by a third party; finally, the third case may be because of the resource curse/local abundance; environmental degradation/local scarcity; reduced security of supply; or interactions with food prices (p. 114).

Bashirov (2019, p. 5) analyzes the case of Azerbaijan and argues that “until 1997, US democracy promotion policy was largely ineffective and weak”. Having his foreign policy without focusing on the struggle against international terrorism, characteristic of the first decade of the 21st century, President Trump does not consider democracy promotion by reducing his political and military capital in some countries, differing from the Obama Administration period (p. 22). Therefore, this “flag” has no longer been used to attack regions that, coincidentally, are rich in oil.

Regardless of the nature of the conflict, they have the ability to affect the region politically, socially and economically. In some cases, they can also impact prices and quantities offered for a given energy source – historically, there are different cases in which these conflicts have influenced the value of price of a barrel of oil. Thus,

“a fall in oil prices lowers interest rates and inflation in most countries (...). The effects on real output are positive, although they take longer to materialize (...). On the supply side, the effects of lower oil prices differ widely across the

alternative sources – which are not necessarily unconventional renewable energies. This is the case, for example, with the technical and economic feasibility of shale gas and shale oil, which are already widely used in the US and other countries, such as Argentina, which led to a drop in the price of a barrel of oil in recent years.

“The “shale revolution” evolving in the US since the late 2000s features the use of shale resources thereby increasing the country’s production of oil and natural gas significantly and correspondingly reducing its imports and contributing to oversupply in global markets and decreasing prices” (Aalto *et al.*, 2017, p. 1). The basis of the shale revolution was two significant technological innovations: horizontal drilling and hydraulic fracturing.

At the same time as this trend of relative weight loss in oil is taking place – which still does not mean that it is not relevant in the global scenario –, some international policy analysts have perceived a risk associated with the advance of renewables in the global energy mix. Although it seems to be an initial nonsense, the increase in the share of renewables, especially unconventional ones can add a risk factor associated with their seasonality and intermittency. Precisely for this reason, they are often associated with complementarity with another source already established and conventional or, as a consequence, they need some energy source to serve as a backup for the energy supply.

In this sense, natural gas has been suggested as this backup source, being often associated with the source responsible for the current energy transition. In this scenario, the global gas market is also evolving due to two revolutions: the US shale revolution and the LNG revolution (Sabbatella and Santos, 2020). Thus, because natural gas is:

“one of the few energy resources that can provide effective and reasonably priced backup power when needed, and indeed natural gas is one of the few fossil fuel sources for electric power that is tolerable to the general public in a green sense (...). The net result is that the world’s energy portfolio is ever more dependent on natural gas which has international relations implications almost as powerful as oil has had in the past” (Reynolds, 2018, p. 7).

Without aiming to splurge or to provide a futurology exercise, what we point out here is the risk that natural gas will replace the role that oil currently plays, since an increase in its demand is expected to serve as a backup for electrical systems highly dependent on non-conventional renewable sources. Consequently, it would be possible to imagine a significant change in foreign policy and energy geopolitics, with countries like Russia, Iran, Canada, Qatar and China gaining relevance in the global energy scenario. **Table 2** lists the top 10 producers, consumers and net importers of oil, natural gas and

renewable energy.

As shown, the US currently leads both production and consumption of oil and natural gas. However, specifically with regard to natural gas, it is highlighted that the list of consumers can be strongly affected by the scenario that is presented. When it comes to renewable energies, the participation of countries in the global south already stands out at the top of the main producers and, in particular, the participation of BRICS countries, such as China, India and Brazil.

Conclusions

This paper aimed to discuss the way in which the energy industry is analyzed in the IR, particularly due to its excessive focus on oil industry. We highlight the influence of the second industrial revolution on the emergence of oil, either as a resource for energy purposes, or with its derivatives having different industrial uses.

Offering a broader view beyond the mainstream of IR, our argument is in line with international perceptions that energy geopolitics and foreign oil policy are no longer enough to fully understand the global energy industry of the 21st century. In this sense, it follows the expansion of perception Daniel Yergin, which starts to consider “the prize” and “the quest” beyond the oil paradigm in his last published book.

The oil crises of the 1970s meant that oil importing countries needed to rethink their external

dependence, consolidating the concept of energy security as a state strategy to be pursued. Although it seems consolidated, the concept of “energy security” is slippery, hard to define universally, polysemic, multi-dimensional and context-dependent on the nature of each country/region. However, it is a concept that has been adapted over the past five decades and has consequently appeared in the current debate on promoting the participation of renewable energies (including unconventional ones) in the global energy mix. The same occurs with the domain-dependency binomial, which also reproduces and adapts itself to the energy sources to which it refers.

Seeking the renewable energy deployment within the scope of the sustainable development agenda, we stressed the role of the Paris Agreement, the SDGs and the NDCs in terms of narrowing the link between energy, environment and climate issues. In view of this new paradigm, we analyzed policies and instruments to promote energy security at different levels of governance, namely national, regional and international, reinforcing that some can be applied at different levels. We emphasized not only the role of trade, cooperation and energy integration, but even of conflicts and wars; in these last two cases, we pointed out that the search for energy security ends up having side effects on its own reach.

Finally, by analyzing the progress of share of renewable energies

in the global mix, we showed the need to have an energy source backup. For different reasons, natural gas has been identified as a solution, playing a key role in the current energy transition. Nonetheless, for the sake of reflection and without doing a futurology exercise, a possible new energy geopolitics was pointed out, now anchored in the countries that own and produce natural gas. Given this “new” agenda, the weight of some countries in the global south became quite evident, what is case of the BRICS countries – what may correspond to a new chapter in global energy geopolitics, with dimensions and impacts not yet foreseen.

Notes

2- Generally, in these theoretical debates, energy is assumed as a strategic raw material, being understood as a source of power. Although not necessarily and often central in the analyzes, the role of energy appears in texts by classical (Morgenthau, 1948) even more contemporary realists (Gilpin, 1981), by authors of liberal institutionalism and the theory of interdependence (Keohane and Nye, 1997), as well as by authors of conflicts over resources (Klare, 2001). However, other perspectives have drawn the attention of studies of international energy politics more recently, highlighting gender issues, as well as the relevance of local approaches and sustainability.

3- Despite the growing relevance of the social and environmental dimensions of energy security (Santos, Marques de Souza and Bessa, 2020), the weight of its economic dimension stands out, both for importing countries (adding pressure on the balance of payments) and for exporting countries (whose dependence on its exports represents a possible external restriction) both cases being strongly affected by the international crude oil price.

4- It is also worth mentioning the U.S. position, especially because it is the country with the highest GHG emissions.

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Tables

Table 1. Drivers, players and barriers of renewable energy deployment

Issue area	What to promote?	Why/How to do so?
Main drivers	Climate change mitigation	improving the share of renewables in the energy mix
	local air pollution	with its associated costs and effects on health
	increased energy security	by decreasing reliance on energy imports
	resilience of the energy system	by predicting climate change-related events and natural disasters
	expanded energy access	by developing off-grid renewable energy markets
	increased access to clean cooking and heating	through the use of distributed renewable energy
	higher revenues than other fuels	due to cost-competitiveness of renewables
Key players and emerging game-changers	local economic value and job creation	as it offers the potential to lower energy spending, increase incomes, and enhance welfare and industrial development
	national and subnational governments	since subnational governments can enact more ambitious policies and targets
	cities and local governments	because cities account for 65% of global energy demand and 70% of anthropogenic carbon emissions
	companies and corporations	by taking advantage of tax incentives or other available renewables policies in their jurisdictions
	utilities	due to their central position, they can influence energy production and use
	regulatory bodies	by shaping needed energy market reforms
	individuals and communities	by making decisions about their own consumption and becoming "prosumers"
Remaining barriers	new players	through digitalization and demand shaping
	awareness and capacity barriers	due to lack of enough information, lack of skilled personnel and training programmes about renewables and their performance
	cost barriers	Specially if compared with competing technologies
	financial barriers	because of the lack of adequate funding opportunities and financing products for renewables
	infrastructure barriers	due to the availability of needed infrastructure to incorporate renewable energy into the energy system
	institutional and administrative barriers	by the lack of institutions and authorities dedicated to renewables
	market barriers	because of inconsistent pricing structures
	public acceptance and environmental barriers	by making renewable energy projects unsuitable for a specific location
regulatory and policy barriers	due to policy design, discontinuity of policies, perverse or split incentives, unfavorable or inconsistent policies, unclear agreements and a lack of transparency.	

Source: own elaboration based in IRENA; IEA; REN21 (2018, p. 19-21).

Table 2. Top 10 producers and consumers of crude oil, natural gas and renewable energy (2017, in Mtoe)

Rank	Crude oil						Natural gas						Renewable energy	
	Production	Value	Consumption	Value	Net imports	Value	Production	Value	Consumption	Value	Net imports	Value	Production	Value
1	US	590.9	US	800.8	China	420.2	US	641.7	US	639.0	Japan	98.2	China	277.9
2	Saudi Arabia	568.7	China	568.2	US	228.1	Russia	581.0	Russia	387.1	China	71.3	India	206.5
3	Russia	549.0	India	214.3	India	187.7	Iran	182.5	China	197.0	Germany	68.8	US	163.9
4	Canada	249.2	Japan	171.4	Japan	185.8	Canada	153.4	Iran	174.7	Italy	56.8	Brazil	122.9
5	Iran	235.5	Russia	149.9	Korea	124.1	Qatar	149.8	Japan	99.9	Turkey	45.0	Nigeria	117.4
6	Iraq	231.5	Saudi Arabia	140.5	Germany	110.5	China	123.9	Canada	96.1	Korea	43.6	Indonesia	82.0
7	China	191.7	Korea	112.0	Singapore	83.4	Norway	108.7	Saudi Arabia	78.0	France	37.7	Canada	49.9
8	UAE	179.0	Brazil	110.4	France	80.1	Australia	87.8	Germany	75.0	Mexico	35.7	Germany	41.6
9	Kuwait	148.2	Canada	102.9	Spain	63.2	Algeria	81.8	UK	67.5	UK	30.9	Ethiopia	38.4
10	Brazil	140.4	Germany	88.1	Italy	52.8	Saudi Arabia	78.0	Mexico	64.3	Spain	27.6	Pakistan	37.2

Source: own elaboration based on IEA Atlas of Energy Database; renewable energies consider conventional and non-conventional sources; 2017 is the last year available in the database.

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Resumo

Esse artigo tem como principal objetivo analisar a segurança energética para além do paradigma do petróleo, dada a agenda de desenvolvimento sustentável. Para tal, parte dos termos chave “the prize” e “the quest” dos livros de Daniel Yergin para evidenciar como a segunda revolução industrial e as crises do petróleo dos anos 1970 reforçaram o papel do petróleo na geopolítica mundial. A partir de 2015, com o Acordo de Paris, os ODS e as NDCs, argumentamos que binômio domínio-dependência e o conceito de segurança energética têm se moldado e sobrevivido à nova conjuntura. Logo, analisamos como diferentes níveis de governança energética (doméstico, regional e internacional) podem contribuir (positiva e negativamente) para o aumento da participação das renováveis na matriz energética global, indicando a possibilidade de o gás natural substituir o papel do petróleo nos próximos anos.

Palavras-chave: energia; segurança energética; petróleo; energias renováveis; desenvolvimento sustentável.

Abstract

This paper aims to analyze energy security beyond the oil paradigm, given the sustainable development agenda. To this end, we start from the

key terms “the prize” and “the quest” in Daniel Yergin’s books to show how the second industrial revolution and the oil crises of the 1970s reinforced the role of oil in world geopolitics. From 2015, with the Paris Agreement, the SDGs and the NDCs, we argue that the domain-dependency binomial and the concept of energy security have been shaped and survived the new conjuncture. Therefore, we analyze how different levels of energy governance (domestic, regional and international) can (positively and negatively) contribute to the increase in the share of renewables in the global energy mix, indicating the possibility of natural gas replacing the role of oil in the next years.

Keywords: energy; energy security; oil; renewable energies; sustainable development.