

# *Institutional Factors for the Energy Transition: the Case of Chile*

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## Introduction

The world is undergoing an energy transition where different transformational forces are impacting the way energy is produced and used. It is generally recognized that decarbonization through the replacement of fossil fuels with renewables, digitalization that enables progress in smarter systems, and decentralization that facilitates the use of local energy sources, correspond to the predominant characteristics or trends of this new energy transition.

Under the framework of such trends, Chile, as well as other developing countries, has proposed to advance in the search for an economically, socially, and environmentally sustainable energy sector. At the same time, since the Paris Agreement, climate change commitments have grown in importance. In January 2020, the Chilean government committed to achieving carbon neutrality by 2050. Consequently, the current energy policy includes different measures that try to achieve a variety of goals in terms of emissions reduction, access to clean energy, use of distributed resources, among others.

It is worth asking whether the institutional framework in the energy sector is in line with the challenges presented by this transition, given that their original design was conceived in the 1980s for an energy sector based on the use of fossil fuels, with centralized and integrated energy production to reduce costs, and users as passive consumers. It should also be added that the challenge of the energy institutional framework should not only be understood in the technical scope of the aforementioned trends, but particularly from the social consequences they imply, given that today's society demands new standards of transparency, access, diversity and participation in decision making.

The institutional design is relevant, beyond the technical quality of standards and public programs, becoming relevant how they are developed, what incentives and balances exist in view of the weight of different actors and accountability mechanisms, as well as whether energy users finally accept them or not. Thus, it is possible that objectives, for example, of decarbonization, are not achieved, not because they are not proposed, or because regulations are not imposed or actions and roadmaps are not established for their achievement, but because the existing institutional design and governance in the sector are not providing the appropriate framework for this to occur.

Thus, the energy sector may end up in a case of failed energy transition, where opportunities are not taken advantage of, where energy policy objectives are not met or where the new socio-technical paradigm to be implemented is not socially validated.

## What should we understand by “institutions” in the energy sector?

At this point it is convenient to define what we mean by “institutions” applied to the energy sector.

Following the approach from institutional economics (North, 1990; Williamson, 1985; Ostrom, 2005), institutions are understood as rules, norms, and conventions - formal and informal - that frame the incentives that organizations have and on which they act. Organizations include both private actors and public bodies, which are subject to institutional norms, both formal and informal, incentives and sanctions. Therefore, understanding the effect that an energy transition can have requires consideration of the institutional environment in which it takes place.

The energy sector can be understood as a type of socio-technical regime (Smith et al, 2005), where markets and regulations coexist with the expectations, beliefs and values of the actors in the sector. Thus, the incentives and behavior of the actors will be conditioned by the socio-technical regime. In short, the objective of the energy transition is to “dislodge” the current socio-technical regime to make room for new configurations.

To understand how the new energy regime in transition and the previous regime differ and what they share, I will now describe the principles and bases of each.

### *a. Fossil-centralized energy regime*

The current regime in the Chilean energy sector is based on the reforms implemented in the 1980s. The principles of this regime can be summarized in three: economic efficiency, energy security and subsidiarity of the State. Under these principles, the country seeks to develop those energy resources that have a lower total cost. The objective is that any technological change that reduces the costs of a technology could be quickly reflected in the cost of supply to consumers. Given the technological development prevailing in the 1980s and 1990s, this meant that fossil resources were used primarily, but also hydroelectric resources that the country still possessed in abundance. In any case, this regime also favored the importation of natural gas from Argentina in the 1990s. In short, this is how technological neutrality is enshrined as the basis of the fossil-centralized energy regime: it does not matter what the technology is if its use is cost-efficient.

Thus, because of the efficiency principle, the development of energy infrastructure was designed to take advantage of economies of scale and density, both in electricity generation and in its transportation and distribution. The same applies to the transportation of

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fuels, either by importing Argentine natural gas or LNG through port terminals.

The second principle established that energy supply must have adequate availability and security, balancing the costs of supply restrictions with the investment and operating costs required to reduce such restrictions. Thus, it is not efficient to avoid system failure at any cost. Given the lack of abundant fossil resources in Chile and the need to import them, ensuring energy independence understood as autarky was never a policy objective in this regime. On the contrary, what was relevant became the provision of a reasonable energy independence for the country, promoting the diversification of supply sources, both local and international.

For technological cost reductions to be translated into lower prices for end customers, it was essential to have competitive and transparent markets with low barriers to entry. To this end, Chile was inclined to liberalize the sector, establishing the subsidiarity of the State as a guiding principle. In the specific case of the energy sector, subsidiarity means that the State does not exercise business activities in this sector, to the extent that these are or can be exercised by private entities. To this end, the role of the State is to provide an eminently technical regulatory body that defines the boundary conditions for interaction between private agents. The active role of the State was reserved, for example, for the provision of energy access to remote locations.

Finally, one of the characteristics of the old regime is the passivity of the energy user or customer, who simply makes her consumption decisions based on price signals. She does not participate in the production chain nor is she considered to be able to contribute to demand management. Thus, the infrastructure is thought of in a unidirectional way, from production to consumption only. Thus, the user is also not conceived to participate in the technical or regulatory discussion of the sector. The regulator was there to protect their interests.

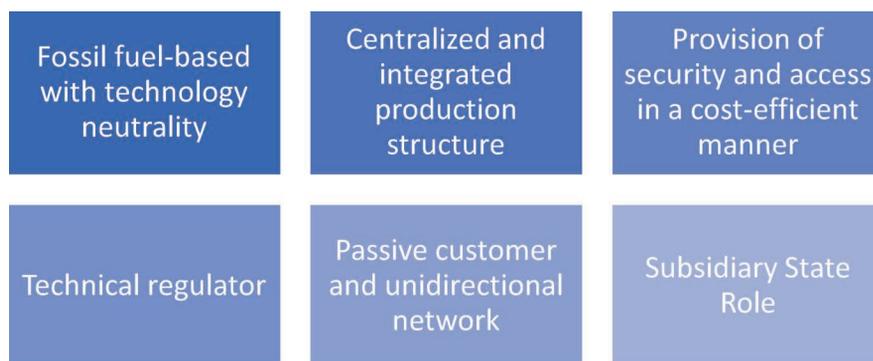


Figure 1: Characteristics of the fossil-centralized energy regime in Chile

### b. New energy regime

It should be noted that the foundations of the new energy regime do not imply disregarding the forces that shaped the old regime. Indeed, cost-efficiency is a

principle that is still present. However, the new regime is more complex because of energy transition trends. Thus, for example, it is no longer possible to speak only of energy security, but the new regime broadens the concept to include resilience, through adaptation to climate change. Also, access to energy remains important, but the demand for quality of service becomes more relevant.

Some of the characteristics of the new regime are evident because of the transition from fossil fuels to renewables. However, this is the result of forces that already existed, such as cost-efficiency, given that technological change has made them as or more competitive than traditional technologies, as well as new forces such as the need to decarbonize to reduce GHG emissions or the social pressure to reduce local pollution. The same happens with the development of distributed generation and storage as alternatives for the development of an equally or more efficient electric system, which reduces the impact of the energy infrastructure in the territory.

Other characteristics of the new regime are the result of forces that were not present in the old regime and are not part of the energy transition, although they are facilitated by the trend towards digitalization: the demand for citizen participation. Unlike what could be observed in the old paradigm, where the citizenry was conceptualized as a mere recipient user, in the new regime the user is not only active in terms of production considerations or efficient management of their energy consumption, but at the same time demands to participate in the definition of objectives and actions of public policy in this area.

The complexity of an energy system that is moving towards decentralization, with complex public policy objectives (for example, mitigation and adaptation to climate change) has redefined the bases of State action. Without abandoning its strictly subsidiary role (the State continues not to get involved where other actors can do so), it has come to take actions and define instruments to achieve energy policy objectives that go beyond the merely technical sphere. For this very reason, the governance of public agencies in energy matters has become more complex. It is no longer sufficient to have a technical regulator that defines tariffs, rules and regulations that provide a framework for the interaction of private agents. On the contrary, it has been necessary to advance in a sectoral political authority with the creation of the Ministry of Energy in 2010, to define energy policy objectives in 2015 and design concrete actions to achieve them. Likewise, the complexity of the sector's interaction has increased, requiring progress in new bodies, some of them independent, such as the independent system operator in 2017 to ensure adequate interaction between the different agents, both public and private.

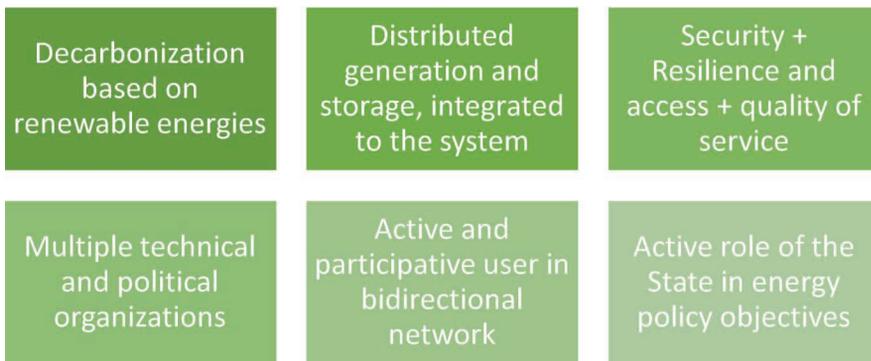


Figure 2: Characteristics of the new energy regime

### How the institutional design can shape energy transition's success

According to the IEA, Chile has emerged as a world-class destination for solar and wind energy developers with legislation that encourages investment in generating capacity across the electricity sector. By July 2021, 28% of installed capacity corresponds to non-conventional renewables, which represents more than 7,3 GW, and there are 5 GW under construction.

The institutional drivers that allowed this renewable boom that started several years ago are credible commitment from the government, formal rules that contribute to complying with international climate change commitments and collective choice rules leading to monitoring.

Chile's first renewable legislation was enacted in 2008, first to reach 10% of the wholesale market and then the goal was level up to 20% in 2013. Also, electricity auctions for long-term contracts were enhanced in 2014 to foster competition in the generation market, increasing the participation of renewable generation. All these policies and a long-term goal of reaching 70% of renewables by 2050 create a credible commitment for the decarbonization process.

Complying with international commitments on climate change also contributed to renewable growth. Not only the Paris agreement but the more recent 2020's NDC where Chile committed to carbon neutrality by 2050. Perhaps one of the most important instruments to reach that goal started in 2019 with the public and private agreement on coal phase-out by 2040.

To achieve renewable energy targets, countries need formal and informal institutions to monitor compliance. Formal institutions include fines and other disincentives for non-compliance that discourage future non-compliance. In Chile, regulatory mandates were included in the legislation, but they were never used, since renewable growth outperformed the original projections of the regulator. Informal institutions, on the other hand, worked well in different communities where renewables were perceived, at least at the beginning, as less invasive and more environmentally friendly.

However, there are other situations where the current institutional framework did not work as well. As it was mentioned, energy development has historically taken the energy user only in his role as a customer, re-

ceiving prices that give her the right signals for her consumption. Under this paradigm, a smart meter policy was implemented in 2017. The idea was to deploy 6,5 million smart meters by 2025, reaching full coverage in distribution networks. The deployment was mandated to distribution companies, the cost of it was calculated by the regulator and paid by the consumers as an additional monthly charge in their bills. This is a good case of fossil-centralized perspective, even when the final goal was to contribute to a smarter

network that could foster distributed generation and renewable use. First, the decision and estimation of the cost was made by the technical regulator through a regulatory process with the participation of only distributors, suppliers, and sectorial experts, but without any role for customer's organizations and other stakeholders. Second, the role of the customer was entirely passive since he could not decide anything about the process. Third, considering the subsidiary role of the state, the deployment must be made entirely by private distribution companies without any participation of public organizations, not even communication campaigns to explain the process. Finally, since the distribution company oversaw the deployment, all the process was vertically integrated and centralized at the natural monopoly.

When smart meters cost was included in electric bills by 2019, public debate on the benefits and costs for the consumers was very algid. There was a collision between an energy public policy, perhaps well-design according to a different socio-technical regime, with the energy transition regime. Customers demanded participation in the decision to change their meters, transparency in the process of cost determination and a guarantee of a better quality of service. A centralized regulator was blamed for implementing policies considering only the perspective of the utilities. By mid-2019, the Ministry of Energy and the regulator decided to modify the policy and make voluntary for the customer the decision to change the meter. Currently, there is no certainty of reaching a full coverage of smart meters in the following years due to a policy that was thought for a different paradigm and without considering the current institutional setting.

If Chile in some moment decides to discuss again about smart meters deployment, there are a couple of key institutional drivers to take into consideration. First, stakeholder participation where customers feel that their interest are consider in the process and decision are not taken arbitrarily by a centralized authority. Second, rules that facilitate innovation. Given the challenge of technological change in the energy infrastructure, it is important to have pilot programs and measures to facilitate innovation in the sector, considering that it is necessary to advance in a trial-and-error process. Third, there should be rules to promote transparency. In general, good information is required for decision

making in any market. Information asymmetries generate widely known inefficiencies. Therefore, information transparency, facilitated by stakeholder participation, is very important in an energy transition process. Making information available to the public can generate public support, providing confidence and predictability about new technologies deployment.

### What kind of institutions do we need for a successful energy transition?

As Koster and Anderies (2013) show, there are several key institutional drivers that enable a successful energy transition, in terms of renewable generation. To expand the perspective to an energy transition that includes decentralization and digitalization as well, it is necessary to define a concept of “socially accepted energy transition”. For example, the centralized renewable development model that requires extensive transmission lines and extensive land use may not be socially validated and may end up being unsustainable. Or it may also be the case where the digitalization and decentralization of the sector occurs incompletely, due to the perception that new technologies are invasive or that they only benefit incumbent actors, resulting in a segmentation of the energy market between users with access to renewable energies - typically high-income - and other users with lower resources who must make do with fossil fuels and pollutants.

Also, public policies that facilitate energy transitions must be conceptualized as integrated plans that combine policy with practical physical considerations. In the case of energy, the public policy cannot simply focus on making rules and expecting compliance. Public policies must consider the existing energy system and the possible trajectories of change given it. For example, the inertia of the existing system is very important for the implementation of renewable energies. To integrate renewables into the grid it is necessary to modernize

existing grids or create new systems. Therefore, it is important how the rules that do or do not facilitate new renewable technology being able to “retrofit” into existing infrastructure work.

Finally, it is important to recognize that we are transiting from a centralized regulatory governance to a polycentric governance. It would be very important to balance an increasing diversity of organizations and the required coordination among them. The resulting governance it is expected to be very country specific, depending, at least, on historic and geographic considerations.

In sum, the Chilean experience is a good example of how the energy transition is impacting on the institutional design of the energy sector and how relevant institutions are to have a successful transition, where costs and benefits are well-distributed, and the paradigm shift is socially accepted.

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