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en virtud de una decisión del Bundestag alemán

# Main implications of the connection of hydrogen projects in medium systems

*Executive Summary*



## IMPRINT

This study was carried out by OHMIO ENERGÍA on behalf of the Energy Partnership Chile-Alemania.

Leading partners are the German Ministry for Economy and Climate Action (BMWK) and the Chilean Ministry for Energy (ME), together with numerous affiliated institutions. The GIZ is the executive body of this partnership.

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## 1 Background

The Energy Partnership Chile - Alemania is an intergovernmental cooperation and knowledge transfer project between the Federal Ministry of Economy and Climate Protection of Germany and the Ministry of Energy of Chile, with the German Cooperation Agency (GIZ) being the executing organization in charge of materializing this agreement in actions.

Both Chile and Germany have established specific commitments to reduce greenhouse gas emissions. These commitments are part of the Nationally Determined Contributions (NDC) of the Paris Agreement of the United Nations Framework Convention on Climate Change, where the development of green hydrogen plays a key role in meeting the goals established in this mechanism.

In Chile, there are very favourable conditions for the development of the green hydrogen industry, mainly due to the natural resources that the country has. Thus, the southern zone, thanks to the wind resource, represents a comparative advantage in relation to other countries, mainly in the Aysén and Magallanes regions.

This study focuses on evaluating the effects that the development of green hydrogen production projects will have on the electrical systems of the Los Lagos, Aysén and Magallanes regions, called Medium Systems, and seeking regulatory solutions that allow an effective integration of these developments, considering technical, economic, and socio-environmental aspects.

## 2 General objective and specific objectives

The general objective of this study, commissioned by GIZ in coordination with the Ministry of Energy, is to analyze the current regulatory framework of Medium Systems (SSMM) in Chile and propose modifications that allow the integration of green hydrogen production projects. In this regard, three specific objectives are proposed:

1. Analyse the current regulation of the SSMM and propose modifications to the pricing and planning of these to ensure an adequate integration of the green hydrogen production projects to the networks of said systems.
2. Analyse the current regulation of the SSMM with respect to the vertical integration between the segments of generation, transmission, and distribution, and propose regulatory modifications that allow more competitive tariff signals to be given to the developers of green hydrogen production projects.
3. Conduct a conceptual analysis of potential implications resulting from the growth of the SSMM due to the location of large green hydrogen projects. Based on the analysis, propose improvements or new criteria for the definition of SSMM and interconnected systems.

## 3 Introduction

The regulation of the SSMM was introduced in 2004 by Law No. 19,040, where they were defined as electrical systems whose installed generation capacity is less than 200 MW and greater than 1,500 kW, whose planning and pricing is carried out every 4 years through a centralized process where generation and transmission expansion plans are binding. These are vertically integrated systems<sup>1</sup>. The aforementioned regulation was complemented by Supreme Decree No. 229/2005<sup>2</sup>, Decree No. 23/2015<sup>3</sup> and with the Technical Standard for Safety and Service Quality (NTSyCS) for SSMM of the year 2006<sup>4</sup>.

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<sup>1</sup> Law No. 19,940 allowed the same company to carry out generation, transmission and distribution activities. This is established in article 174, second paragraph, of the General Law of Electric Services.

<sup>2</sup> Supreme Decree No. 229/2005 of the Ministry of Economy, Development and Reconstruction, which approves the regulation of valuation and expansion of the SSMM.

<sup>3</sup> Decree No. 23/2015 of the Ministry of Energy, which approves the regulations for the operation and administration of the SSMM established in the General Law of Electric Services.

<sup>4</sup> The NTSyCS for SSMM was updated in 2018 through Exempt Resolution No. 179 of the National Energy Commission.

Currently in Chile there are nine SSMM grouped into three large systems: (i) Los Lagos, which includes Cochamó and Hornopirén; (ii) Aysén, which includes Aysén, General Carrera and Palena; and (iii) Magallanes, which includes Puerto Natales, Punta Arenas, Porvenir and Puerto Williams<sup>5</sup>.

In the areas where the SSMMs are located, mainly in the Aysén and Magallanes regions, there are very favorable conditions for the development of green hydrogen production projects using wind energy.

In this context, it is important to analyze both the implications of the development of green hydrogen projects in the southern part of the country, as well as the barriers to their development, precisely because the geographical characteristics and the isolation of the indicated areas have made the electrical systems that supply these localities to be disconnected from the National Electric System, constituting independent electric systems with a special regulation.

### 3.1 Main regulatory barriers for the development of green hydrogen and renewable energy projects in the SSMM

It is possible to point out that there are barriers because of the current legislation, which refer mainly to the following matters: (i) characterization of the SSMM and the consequences derived from it; (ii) planning of the SSMM; and (iii) lack of certification of green hydrogen projects.

**3.1.1. Characterization:** Defining a SSMM as an electrical system with installed generation capacity equal to or greater than 200 MW without establishing standards to transition to a system that exceeds the limit has important consequences, since the regulation applicable to SSMMs differs substantially from the regulation of Systems with installed generation capacity equal to or greater than 200 MW. Thus, in case of exceeding the established limit, the generation, transmission, and distribution companies of a SSMM must abruptly adjust to a totally different regulatory framework. The mere connection of an NCRE generation project to a SSMM to produce green hydrogen could trigger the regulatory change or it could be the case of a green hydrogen production plant that is using the SSMM as backup for its production that is seen affected by the connection of any other generation project that implies that the limit is exceeded. The absence of regulation on the matter generates uncertainty and inhibits investment.

Some of the changes they should make are: having to disintegrate vertically; move from centralized and binding planning and pricing (in the generation and transmission segments) to a regulation where generation is a segment where there is competition, and transmission, in addition to being planned annually, is subject to a qualification and valuation process, being remunerated by end customers through a transmission charge; finally, they should move from a pricing at average cost to another at marginal cost and contracts. In addition to the non-existence of a procedure with stages and deadlines to move from one system to another, the regulation is unclear and susceptible of being interpreted, for example, those SSMMs that exceed the threshold of 200 MW, do they form a new National Electric System? ("SEN")? Are they part of a single SEN? Are they a new category of electrical system? The answer to these questions has practical and regulatory effects, especially regarding the role of the National Electricity Coordinator.

**3.1.2. SSMM Planification:** Another barrier detected was in terms of planning of the SSMM, where the objectives of this do not consider variables intended to promote renewable energy and therefore the development of green hydrogen projects. In this sense, the law is mandatory in that the expansion of the system must be at a minimum cost, thereby introducing a restriction that makes it very difficult for renewable technologies with high levels of investment to compete with traditional energies, particularly because the planning/pricing process is carried out every 4 years, which creates uncertainty for projects with high investment costs. Likewise, if planning does not include aspects that allow the planner to introduce renewable energies and new technologies within its objectives, it is impossible to encourage competition and promote the diversification of the energy matrix. On the other hand, the current regulation does not contemplate the interconnection between SSMM nor the international

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<sup>5</sup> In the current SSMM tariff process, a new system was incorporated, Puerto Cisnes, which will be formalized once the corresponding tariff decree is published in the Official Gazette.

interconnection. This type of interconnection would make it possible to strengthen and generate better supply and demand conditions in the SSMMs.

**3.1.3. Lack of certification of green hydrogen projects:** The issue of renewable certification constitutes a new difficulty, since today the matrices of the SSMM are mostly thermal, which would have a negative impact on the certification of hydrogen as green.

## 4 Main conclusions and regulatory proposals

Based on the objectives and the analysis carried out, this study concludes with a series of proposals for regulatory changes considering mainly the case of the connection of renewable generation plants for the production of green hydrogen in SSMM and that of the connection of an electrolysis for the production of green hydrogen that is supplied with energy from the electrical system, using the corresponding SSMM as a backup of the supply or to be supplied permanently.

Notwithstanding the foregoing, it is necessary to keep in mind that the vast majority of the hydrogen projects announced in the extreme south of Chile have an installed capacity that far exceeds 200 MW<sup>6</sup>, therefore, in addition to their connection to a SSMM, it is technically impossible given the size of the system, the lack of regulatory clarity discourages the connection of projects.

The regulatory changes that may be made, per se, will not imply that large hydrogen projects are connected to the SSMM, but they could give investors clarity regarding the regulations applicable to this type of project and clear-up doubts in the absence of regulation in certain cases.

Of all the aspects analysed in this study, it is possible to point out that there are regulatory barriers in the current legislation for the entry of green hydrogen and renewable energy projects to the SSMM that allow progress towards a more renewable matrix. The main barriers detected, as indicated above, are related to the characterization of the SSMM, their planning and the lack of certification of green hydrogen projects. The following numerals 4.1, 4.2 and 4.3 indicate the main regulatory proposals to overcome the barriers.

Within the analysis conducted, special attention was paid to whether the vertical integration of the SSMM constitutes a barrier to the development of green hydrogen projects. In this sense, it should be noted that at the international level there has been a strong debate about the advisability of disintegrating all or some segments of the energy supply chain. This debate has not been easy to settle, as it is not clear that the potential benefits of increased competition from unbundling outweigh the eventual higher costs of production from lost efficiency by removing economies of scale and scope. The same debate exists at the national level, where it is not possible to affirm that a measure such as disintegration would obtain lower or more beneficial rates for end customers.

In accordance with the foregoing, the consulting team concluded that it is not possible to establish that the legally permitted vertical integration for SSMM is an entry barrier per se that threatens competition. Nor could it be said that a measure such as disintegration would obtain lower or more beneficial rates for end customers. To promote disintegration, it should be shown, beyond mere speculation, that the cost of vertically integrated structures is substantially higher than that of separate ones. Therefore, it is necessary to consider the need to disintegrate in each situation and analyse each case in particular. It is not possible to apply the same evaluation to all SSMMs, especially considering their size.

Consistent with what has been indicated, it is possible to improve the regulation of the SSMM without forcing a disintegration, enabling in the regulation spaces of competition in the generation segment as proposed in the following numeral 4.4.

### 4.1 New characterization of the electrical systems

The main barrier detected, considering the impact and consequences, is the one referred to the characterization and definition of SSMM.

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<sup>6</sup> <https://h2chile.cl/proyectos/>

In general terms, the proposal considers the existence of a SEN that constitutes the country's main electrical system and a five-year qualification process for electrical systems not connected to the SEN, to categorize them as SSMM, Isolated System for small consumers or Isolated System for Productive processes. In other words, there would only be one SEN, which is expanding, and the rest of the country's systems should be classified in one of the indicated categories.

In this way, the SSMM would no longer be defined by a single variable referring to the installed generation capacity, but rather these would be characterized as systems destined to supply energy to free and regulated customers in towns whose size, geographical location and other particular characteristics justify the need to establish specific regulatory and normative standards. The Isolated Systems for small consumers would be intended to supply electricity for commercial and residential activities; while the Isolated Systems for production processes would not have the purpose of supplying final customers, but rather the production of goods or products, such as a large hydrogen project, operating in isolation from existing electrical systems.

Regarding coordination and operation, the National Electric System would continue to be overseen by the National Electric Coordinator. In the SSMM, the person in charge would be the Coordinating Committee, with some legal exceptions in that certain tasks could be assumed by the National Electricity Coordinator (operation programming, certification, open access, competition monitoring or another to be defined). For their part, isolated systems, whether for production processes or intended to supply electricity for commercial and residential activities, would not be subject to coordination.

The new proposal for the characterization of the SSMM solves several of the problems raised, mainly the following:

- the abrupt transition from one type of system to another;
- the non-existence of transitoriness; and
- allowing stakeholders to adjust in a clear and orderly manner to the new regulation.

The foregoing, because it is a flexible proposal that allows the regulator to determine the rating of an electrical system, and if a rating change is deemed necessary, it allows it to establish a mechanism so that the technical and regulatory change is carried out gradually as determined by the National Energy Commission.

## **4.2 SSMM Planification**

### **4.2.1 Planning objectives, investment recognition and pilot project**

Regarding the barrier associated with planning, to allow the transformation of the matrix to a more renewable one, it is suggested to modify the planning objectives of the SSMM and match them to those of the SEN where it is expressly indicated within the objectives of diversification of power generation.

Likewise, the National Energy Commission is expressly authorized to consider in planning investments that allow transforming thermal generation into generation based on zero emission fuels, and the incorporation of pilot projects that develop new technologies to be financed through the public service charge.

### **4.2.2 Interconnection between SSMM and international public service interconnection systems**

It is proposed to incorporate into the planning process the interconnection of two or more SSMMs as a faculty of the National Energy Commission or as an initiative of a company. Regarding international public service interconnections, it is proposed to clarify who are the ones that are obliged to pay for it, establishing that it will be remunerated by the final customers of the SEN based on the transmission charge and a new transmission charge applied to the corresponding Medium System.

## **4.3 Certification of green hydrogen projects**

On the other hand, in terms of certification, it is proposed that the operator of each SSMM develop the necessary traceability systems, whose investments must be recognized in the corresponding tariff process, and the National Electricity Coordinator or the National Energy Commission be informed for the granting of the corresponding certificate.

#### 4.4 Proposals to promote competition

In particular, and as a way of promoting competition in the generation segment, a flexible regulation is proposed that allows the National Energy Commission to make the best decisions according to the circumstances and the SSMM in question. To this end, a tender mechanism for renewable energy and storage compatible with the current planning and pricing mechanism is proposed. The proposed mechanism introduces competition under a scheme like that of the sole buyer<sup>7</sup> and has the advantage that long-term contracts would be triggered, allowing the financing of intensive initial capital investment projects and at the same time defossilizing the SSMMs by receiving their remuneration based on energy injected.

Enabling both mechanisms (centralized planning and some competition mechanism), would allow that as the SSMMs grow and technologies are developed, they can move towards competition (in which each SSMM will have a different temporality), without abruptly losing the economies recognized today among generation, transmission, and distribution. This would allow not only for the prices obtained because of the competition to reflect the real market conditions and those projected by the agents, but also for all the technologies to compete equally.

All the above allows that, ignoring eventual technical restrictions, if hypothetically a green hydrogen project had the intention of connecting to a SSMMs, this type of tender could be triggered to supply the eventual new block of energy and power required. Likewise, the same hydrogen project, if it requires injecting energy to the SSMM, could also participate as a bidder in the tenders. It should be noted that, as of today, such a situation does not exist since the large green hydrogen projects do not plan to connect to the grid as customers of the same<sup>8</sup>, and it is not seen that the growth in demand for the SSMM by itself will allow trigger this type of mechanism.

It should be noted that the proposal considers establishing the mechanism as optional and not mandatory. For those cases in which it is estimated that it is not convenient to conduct supply tenders, it is established that the investments are recognized during the following two tariff processes to solve one of the main barriers for investors to develop renewable projects.

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<sup>7</sup> This model is based on the creation of a single buyer that centralizes the generation requirements.

<sup>8</sup> According to the interviews carried out with project developers in the month of September of 2022.



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