8 OTHER USES

Digitalization in the energy sector in Chile

- Market Management & Operation
- Ancilliary Services
- Energy Management
- Operation (Monitoring Control/Reporting)
- Teleworking

Application presence by country

Uses/Applications	Germany	Finland	Japan	China	USA	UK	Sweden	France	South Korea	Singapore
Market Management & Operation	■				■					
Ancilliary Services				■	■	■				
Energy Management	■		■			■	■	■		
Operation (Monitoring/ Control/Reporting)					■	■				
Teleworking	■	■	■	■	■	■	■	■	■	■

Application potential by sector

Uses & Applications	Transportation	Industry	Buildings	Electricity Generation	Finance	Public Sector	Main type of energie
Market M&O				■	■		
Ancilliary Services	■	■	■	■			Electricity
Energy Management	■	■	■	■			Fossil fuels and electricity
Operation				■			Electricity
Teleworking	■	■	■	■		■	Fossil fuels and electricity

Enabling Technologies

Technologies	Load monitor	In home display	Smart thermistat	Smart light	Smart plug/switch	Smart appliance	Hub	Smart meters	AMR/AMI	V2G	EV/PHEV	IED (relays, SCADA...	PMU	WAMS	Smart Sensors	Sensor and actuator	LAN/HAN/NAN/WAN	Cloud	5G	Machine learning	Data mining	Nature inspire	ANN	Multi-agent systems	Clustering	NLP	Digital twin	Autonomous vehicle	Blockhain	Actuators	3D printers
Uses & Applications	Smart home & Smart building							Smart grid							IoT & IoE					Big data, machine learning & AI										Physical action
Market M&O																			■	■								■		
Ancilliary Services	■											■	■	■	■	■	■	■	■											■	
Energy Management	■	■						■	■					■			■	■	■	■										■	
Operation								■	■			■	■	■	■	■	■			■			■						■	■	
Teleworking		■															■	■	■												■

ENERGY PARTNERSHIP CHILE-ALEMANIA

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Digitalization in the energy sector in Chile

8.1 Market management & operation

Market managers include independent system operators (ISOs) for wholesale markets and forward markets in various ISO/regional transmission organizations (RTOs) regions. Market operators help with the smooth functioning of the market, and their functions include price quotation streams, balancing, audit, financial and goods sold clearing, and more.

Common examples

By managing the market it's possible to add new actors in order to have more competition; for example, adding the figure of the retailer, consumers can decide on the option that best suits them, in terms of energy price, power source, DR programs etc.

Opportunities

- It promotes innovation by including different actors into the market.
- Improvement of supply security by the complementary services market.

Information, infrastructure and regulation requirement

- Regulation update needed to allow new actors and new instruments to monitor market.

Barriers

Economic: low or no market incentive for companies to incorporate new technologies and business models or prioritize customer choice; high entry barriers for participation in the wholesale and retail market of DER and third-party energy service providers.

Security: it requires a cybersecurity system to accompany it in order to prevent and better respond to possible attacks and interruptions.

Others: No incentives or requirements for companies to share electricity data.

Regulation: competition at the wholesale level varies from state to state and regions.

Application synergies

- DER (2.4), Energy storage (2.2) and VPP (2.3) could be beneficiated by the digitalization of market management since it could allow their participation in order to massify their uses.
- The digitalization of market management is necessary to make applications like DR (2.1) and P2P (3.1) a reality.

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Market management & operation

International real application

The IDE4L project developed digital tools that allow the flexible demand to be integrated into the market, considering the technical limitations of the network in the market operation.

IDE4L ideal grid for all

Examples of international goals

- No specific targets were found.

National key partners and resources

Ministerio de Energía – Gobierno de Chile; Coordinador Eléctrico Nacional; CNE Comisión Nacional de Energía; Empresas Eléctricas A.G.; SEC Superintendencia de Electricidad y Combustibles; TDLC Tribunal de Defensa de la Libre Competencia

Public policies recommendations to Chile

- Determine strategies to remove barriers and facilitate new markets, allow new transactions and empower consumers.

CURRENT STATUS OF THE APPLICATION IN CHILE

LOW | MEDIUM | HIGH

FORECAST OF FUTURE DEMAND FOR THE APPLICATION

LOW | MEDIUM | HIGH

Digitalization in the energy sector in Chile

8.2 Ancillary services

Enable a market to provide spinning reserve, voltage support, frequency support, and other services. Through these ancillary services, the aim is to give greater stability and robustness to the network.

Common examples

Ancillary services can include:

- Frequency regulation, which is a service that corrects for short-term changes in electrical imbalances that might affect the stability of the power system.
- Contingency reserves, which are used to respond to an unexpected failure or outage of a system component, such as a generator, transmission line, circuit breaker, switch or other electrical element.
- Black-start regulation, which supplies electricity for system restoration in the unlikely event that the entire grid loses power.

Opportunities

- It reduces the time without supply.
- It leads to new business models.

Information, infrastructure and regulation requirement

- It's necessary to update the existing infrastructure to increase its computational capacity for its correct implementation in the market.

Barriers

- **Others:** It's necessary to have generation forecast information or the response on demand suggest that the ancillary services should be able to work in conjunction with these applications.
- **Regulatory:** changes should be considered to make it easier for new agents to enter the complementary services market.
- **Economic:** It's required to correctly define the associated payments, so that there is a correct remuneration associated with the provision of these services.

Application synergies

- The integration of DER (2.4) requires ancillary services, considering the variability of renewable energies, in addition to the versatility provided by Energy storage (2.2) and EVs (5.1).
- A Microgrid (1.3) or a VPP (2.3) could participate in ancillary service markets, such as frequency and voltage regulation.

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Ancillary services

International real application

NEMOCS, by the company Next Kraftwerke is a VPP software that allows to connect, monitor and control decentralized power producers, consumers and storage systems. It allows prosumers to participate in ancillary services by adjusting power production, consumption and storage systems depending on grid requirements. In addition to this, the control system displays external data like grid frequency or market prices and their respective market value.

Examples of international goals

The "Smart Grid Vision and Routemap" intends to establish a framework of standards that form the basis of an intelligent network for all residential homes, industrial warehouses and associated buildings; within this framework of regulations this use should be considered.

In the Chinese case, the modernization of the network aims to facilitate the incorporation of NCRE. For this purpose, the ancillary services become relevant thanks to the robustness they give to the network. In "Regulatory pathways for smart grid development in China" gaps are mentioned, being the one that best fits to this use the development of technologies for updating the distribution network and a greater insertion of energy storage (as an ancillary service).

National key partners and resources

Public policies recommendations to Chile

- Promote the adoption of a common data architecture, tools, and standards to reduce bugs and raise the quality, reliability, and security of devices and services, and that facilitates economies of scale and data sharing across different institutions.

CURRENT STATUS OF THE APPLICATION IN CHILE

LOW | MEDIUM | HIGH

FORECAST OF FUTURE DEMAND FOR THE APPLICATION

LOW | MEDIUM | HIGH

Digitalization in the energy sector in Chile

8.3 Energy management

Energy management functions may be inclueded in IHDs (In Home Displays) to, among others, inform the consumer about energy cost and usage, and responsiveness to price signals on the basis of consumer-entered preferences. It includes the connection of thermostats in buildings or sophisticated heating, ventilation and air conditioning (HVAC) management systems in homes, offices, public buildings and shopping centers.

Common examples

The revenue in the South Korean Smart Home Energy Management segment reached US$170 Million in 2018. Energy management is one of the key factors driving the Smart Home industry.

Opportunities

- Greater savings in energy consumption.
- Reduction of the price of energy.
- It implies a promotion of innovation.

Information, infrastructure and regulation requirement

- Efficient system needed to have an effective energy management.
- Regulation about data privacy required.

Barriers

- **Economic:** reduction in energy bills needs to meet users' expectations.
- **Human capital:** users need to learn about the management system, which represents a one-time investment.
- **Security:** users could be subtracted from this application due to suspicions about the use that could be given to their information.

Application synergies

- The IoT and the growing number of products and services offered by private companies associated with Smart homes (7.3) (Amazon, Apple, Microsoft, etc.) bring opportunities for the energy management system, providing it with a greater number of devices to control and extract information.
- Electrification of heat and applications such as Smart lighting (7.1) complement energy management in order to facilitate the entry of this use.

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International real application

EcoFactor is a cloud-based home energy management platform providing services to utilities and home service providers. It has 3 principal services: Proactive energy efficiency, that uses data collected from Internet-connected thermostats to run energy algorithms, and automatically minimizes consumer energy consumption; Optimized demand response, that based on consumption patterns gives the best DR program; HVAC performance monitoring, that with analytics algorithms and pattern recognition can be used to identify lapses in HVAC performance and notify consumers early.

Examples of international goals

- No specific targets were found.

National key partners and resources

Public policies recommendations to Chile

- Increase the public investments in digital infrastructure, build a large-sale ICT infrastructure, including massification of 5G and AI technology.

CURRENT STATUS OF THE APPLICATION IN CHILE

LOW | MEDIUM | HIGH

FORECAST OF FUTURE DEMAND FOR THE APPLICATION

LOW | MEDIUM | HIGH

Digitalization in the energy sector in Chile

8.4 Operation (monitoring/control/reporting)

Monitoring: Supervises network topology, connectivity and loading conditions, including breaker and switch states, as well as control equipment status. Control: Supervise wide area, substation and local; carry out automatic or manual control. Reporting: Operational statistics and reporting roles, archive online data, and perform feedback analysis about system efficiency and reliability.

Common examples

In the document "Cyber Physical System for the Energy Transition" it is said that digitalization will enable the development of a new set of tools in control rooms that can offer the operator a whole new level of hyper-vision and automation, from two days ahead up to real time, to face a context of an increasing number of uncertainties and interlinkages.

Opportunities

- Cost reductions.
- Reduction of times without energy supply.
- Increase supply security.

Information, infrastructure and regulation requirement

- Measurement and control infrastructure needed.

Barriers

- **Security:** reports could generate conflicts in users if they include information from users who use distributed resources.
- **Regulatory:** delay in its implementation due to the legislative processes or the creation of necessary regulations in each country.

Application synergies

- The increase in DER (2.4) in the network gives coherence and support to the inclusion of these technologies, in addition to ad-hoc networks and the IoT can facilitate the use of these technologies
- Advances in Predictive maintenance (6.1) in conjunction with this use will allow significant cost reductions, and reduction of times without energy supply, and increased supply security.

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Operation (monitoring/control/reporting)

International real application

The Catapult report sponsored by the Department for Business, Energy & Industrial Strategy, Ofgem and Innovate UK, provides a series of recommendations on how to harness the power of data in the British energy system. The document recognizes the operational benefits of the digitization of the energy system, referring to solutions that combine strategic monitoring with data science, analysis and modeling to maximize the value of the investment, instead of relying solely on the massive deployment of equipment. The report repeatedly recommends that in addition to regulatory interventions there should be long-term data strategies on the part of organizations.

Examples of international goals

In the "Cyber Physical System for the Energy Transition" document, "System operation" is one of the five layers in the digital grid concept. The policy objectives highlighted in this document that analyze more than 100 projects in the ENTSO-S domain are: 1) At least 40% cuts in greenhouse gas emissions (from 1990 levels), 2) A 32% share for renewable energy, and 3) 32.5% improvement in energy efficiency.

National key partners and resources

Public policies recommendations to Chile

- Increase the public investments in digital infrastructure, build a large-sale ICT infrastructure, including massification of 5G and AI technology.

CURRENT STATUS OF THE APPLICATION IN CHILE

LOW | MEDIUM | HIGH

FORECAST OF FUTURE DEMAND FOR THE APPLICATION

LOW | MEDIUM | HIGH

Digitalization in the energy sector in Chile

8.5 Teleworking

Teleworking means that employees use information and communication technologies (ICTs) to work from home, in telecentres or in other places.

Common examples

The Singapore Computer Emergency Response Team, seeks to make teleworking safer, which is why it promotes and is expected to implement telework policies at the corporate level.

Opportunities

- Reduction of greenhouse gas emissions due to the decrease in the need to mobilize employees to their jobs.
- It implies a reduction in expenses and time for employees, and also entails greater time flexibility.
- For employers, office maintenance costs are reduced.

Information, infrastructure and regulation requirement

- Equipment needed so that the worker can carry out his work from home.
- It's required to establish a legal maximum working hour in order to not expose teleworkers to longer workdays.

Barriers

- **Infrastructure:** need for connectivity improvements at residential level.
- **Human capital:** lack of employee training.
- **Security:** personnel information may be targeted by cyber-attacks.
- **Others:** ambiguity between personal space and workspace; unavailability of digital data; some tasks are not possible to carry out in teleworking mode

Application synergies

- If more workers engage in teleworking, the use of Personal and Public transport (5.1-5.2) will decrease, then less emissions are generated and costs are reduced.

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Operation (monitoring/control/reporting)

International real application

In a European Commission investigation, teleworking in the EU was analyzed, both before and after the COVID-19. The study shows that the sectors that most switched to teleworking are education, ICT, administrative and and commerce. However, there are others that are difficult or impossible to perform away from the standard worksite, like sales, electric/electronic and personal service[12].

European Commission

12 "Telework in the EU before and after the COVID-19: where we were, where we head to". European Commission, 2020.

Examples of international goals

With the Korean New Deal, up to 40 percent of the work is expected to be done remotely.

The cybersecurity and infrastructure security agency hopes to increase cybersecurity in telecommuting through improvements in related infrastructure.

National key partners and resources

Ministerio de Energía – Gobierno de Chile

Ministerio del Trabajo y Previsión Social – Gobierno de Chile

DT Dirección del Trabajo

Public policies recommendations to Chile

▷ In order to reach the desired state where teleworking is mature in Chile, training of the workers is needed.

CURRENT STATUS OF THE APPLICATION IN CHILE

LOW | MEDIUM | HIGH

FORECAST OF FUTURE DEMAND FOR THE APPLICATION

LOW | MEDIUM | HIGH