



Renewable Energy in Chile



KIT Alumni Expert Seminar, Concepción Matthias Grandel 26.11.2015





German Technical Cooperation in Chile (Energy):

Renewable Energies and Energy Efficiency Program (4e) in Chile

Commissioned by: German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)

Lead executing agency: Ministry of Energy

Objective: Reduction in greenhouse gas emissions

- Cogeneration in public hospitals, industry and commerce (2015-2019)



AChEE
Agencia Chilena de
Eficiencia Energética





- Solar energy for power and heat generation (2013-2016)

Ley 20.571 para la Generación Distribuida

¿Cómo funciona la Ley de Generación Distribuida 20.571? (Impacto de un sistema fotovoltaico residencial)

Para recibir certificaciones sobre materias relacionadas a la ley 20.571 por correo electrónico, envíenos a lay20571@energiamat.cl, utilizando la palabra "Boletín" en el asunto y indicándonos su nombre y organización (opcional).



- Development of large scale solar energy CSP/CST and PV (2014-2019)



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New projects (starting from 2015/2016)

- NAMA- self supply renewable energy systems (2016-2018) - BMUB and DECC
- Promoting energy efficiency in the mining sector (2016-2019)

Complementary projects from the facility "PPP" (BMZ)

- Dissemination of commercial photovoltaic projects sized 1-5 MW in Chile
- Introduction of economic heat pumps in Chile
- Dissemination of solar air collectors for drying agricultural products
- Energy efficiency in industrial refrigeration systems in Chile



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...Chile has huge potential for Renewable Energy...



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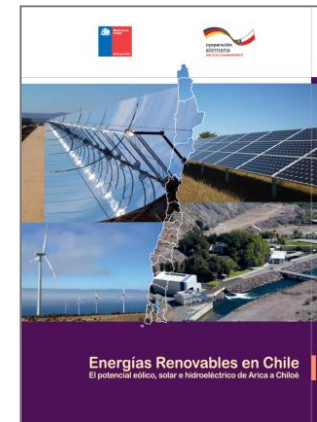
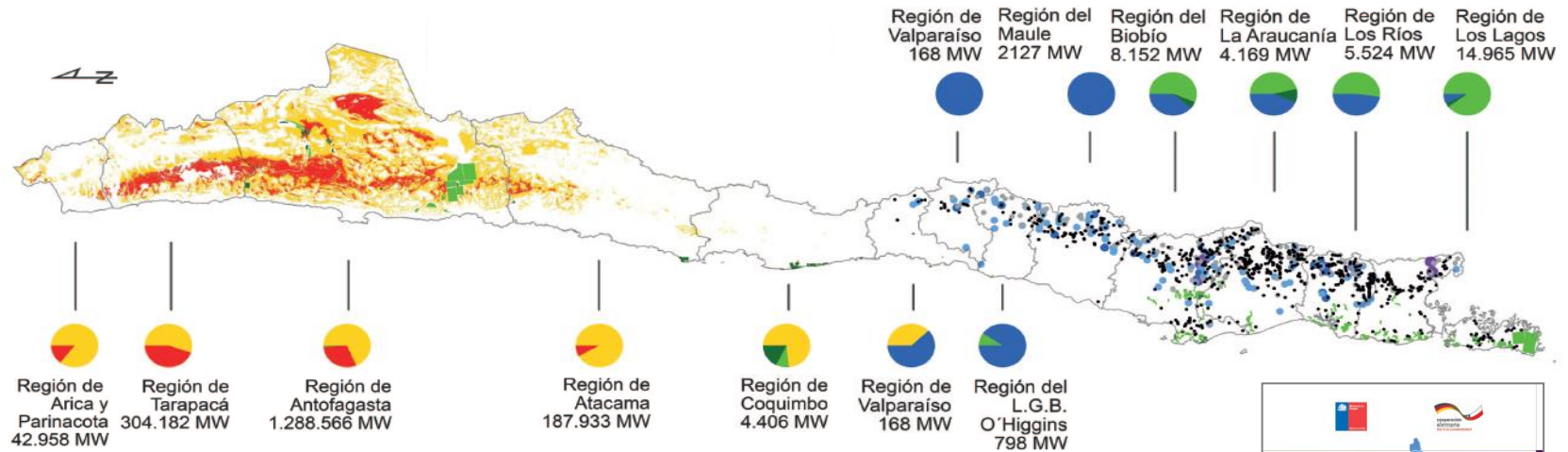
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Total Potential: 1.865 GW RE (solar, wind and hydro)

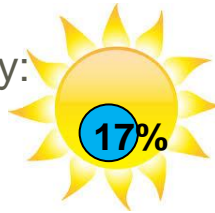


Source: GIZ/MinEnergía, 2014: “Energías Renovables en Chile – El Potencial eólico, solar e hidroeléctrico de Arica a Chiloé.”



PV/CSP Potential vs installed capacity

Germany



PV potential in Germany:
224 GW

PV installed capacity:
38 GW

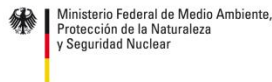
CSP potential in
Germany:
0 MW

CSP installed capacity:
1,5 MW (scientific pilot)

Source Chile: Potenciales ERNC Chile, Ministerio Energía;
CIFES, CDEC SIC-SING
Source Germany: ISE Fraunhofer, www.foederal-erneuerbar.de

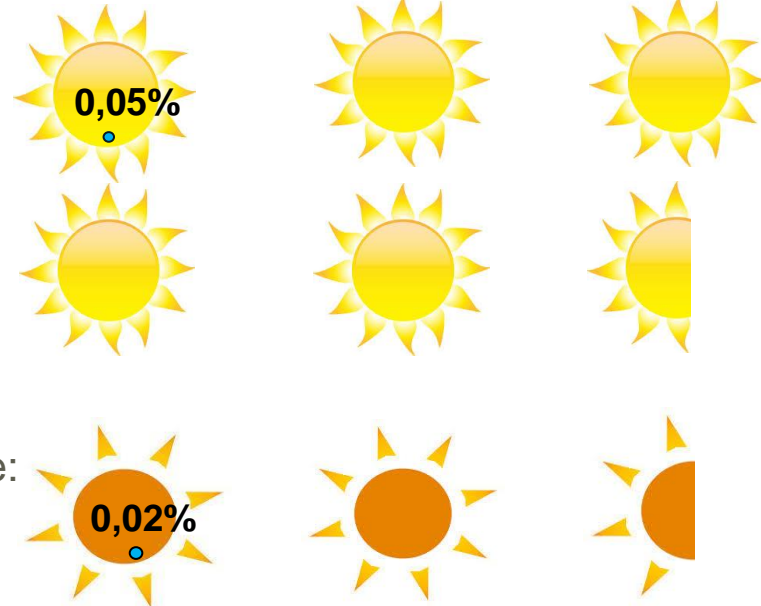


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Chile



PV potential in Chile:
1.263 GW

PV installed capacity:
0,741 GW

CSP potential in Chile:
548 GW

CSP installed
capacity:
0,110 GW
(under construction)



* Potential considered only in the territories that are supplied through the SIC and SING systems. The potential in the south of Chiloé was not considered.

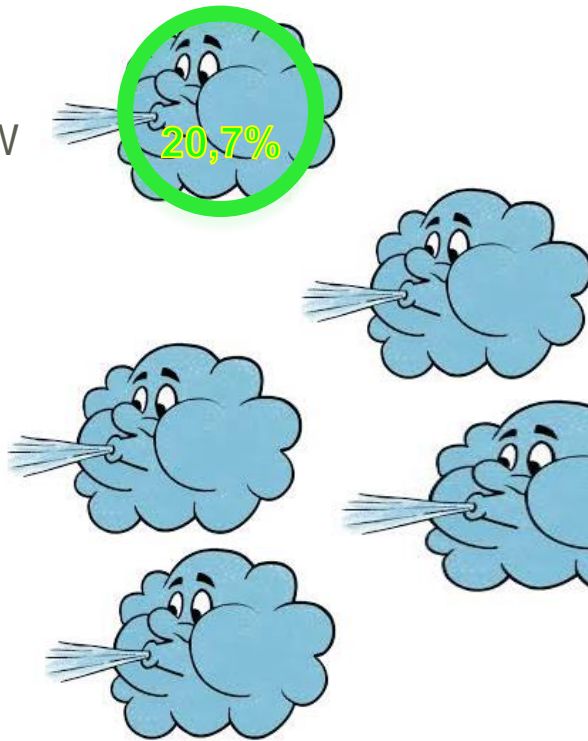


Wind “onshore” Potential vs installed capacity

Germany

Wind potential
Germany: 189 GW

Installed capacity:
39 GW



Chile*

Wind potential
Chile:
40 GW

Installed capacity:
0,904 GW



Source Chile: Potenciales ERNC Chile, Ministerio Energía;
Source Germany: ISE Fraunhofer, www.foederal-erneuerbar.de

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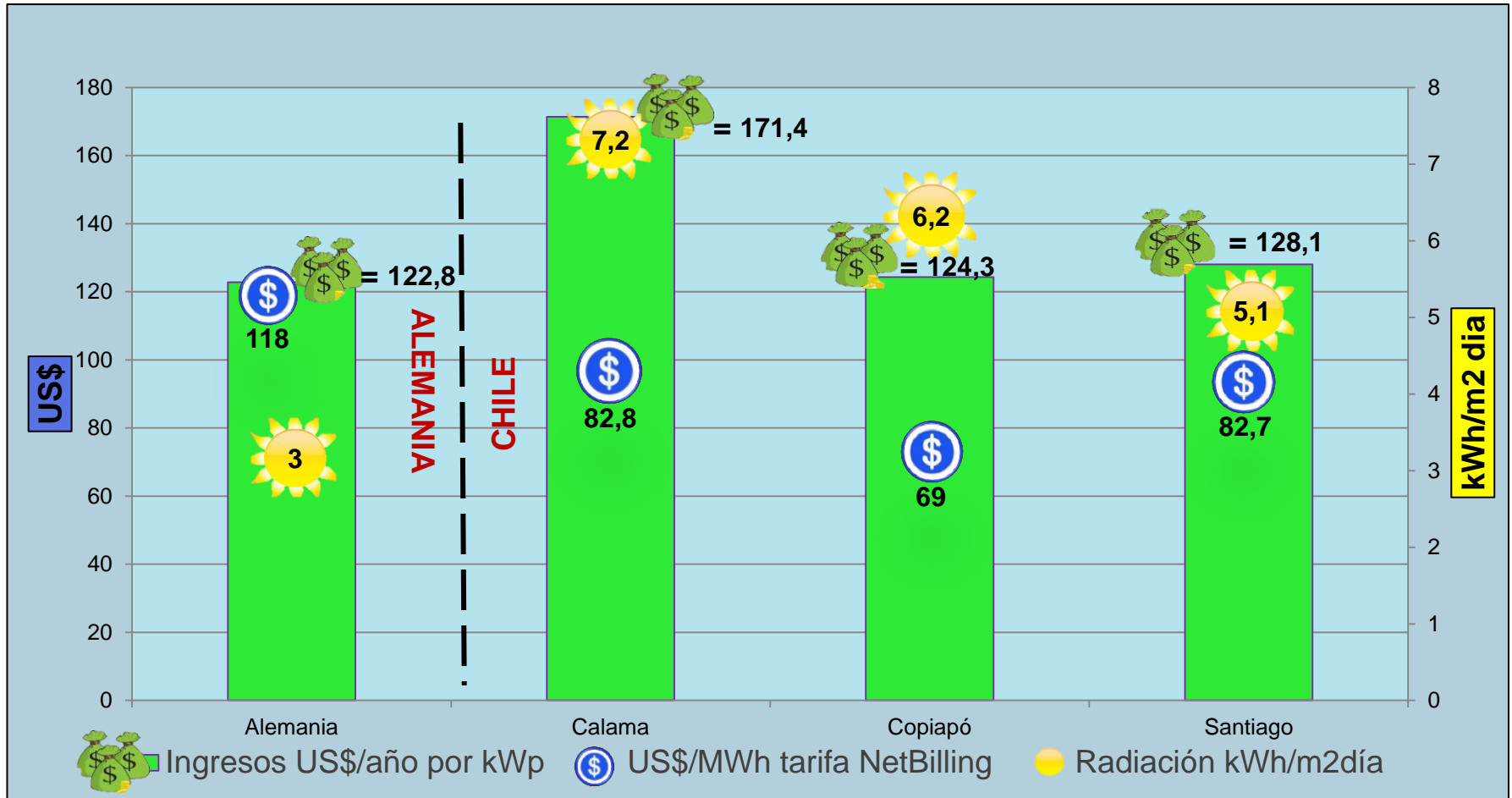


...Sun is the only subsidy for Renewable Energy...





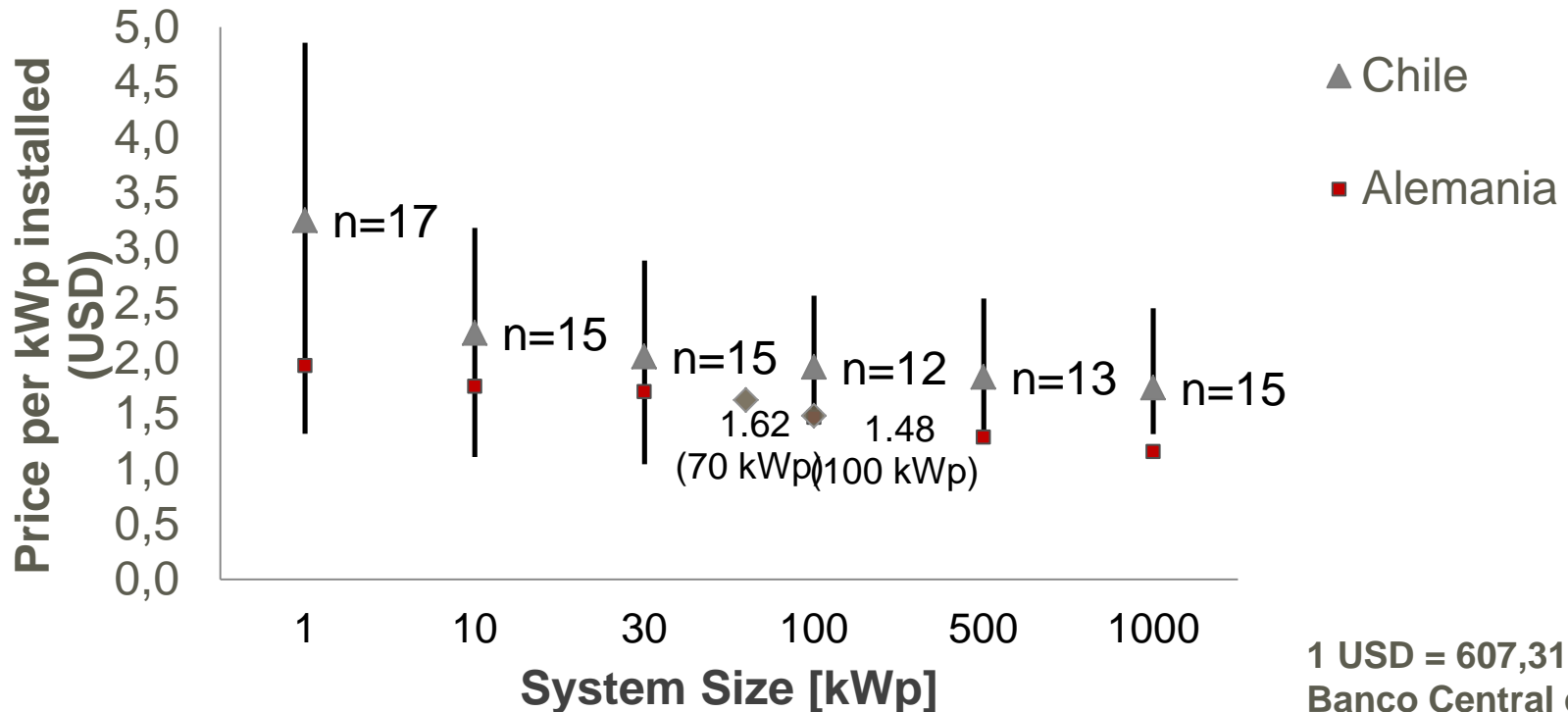
Income from PV – Germany vs. Chile





Prices in Chile still higher than the international price

Comparison of net cost of PV systems by Wp (May 2015)



1 USD = 607,31 CLP
 Banco Central de Chile
 (13 May, 2015)

Source: GIZ Chile, Mercado Público Chile



...strong commitment for Renewable Energy...



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Política Energética de Chile

METAS ENERGÍA 2050



by 2050: at least 70% of national electricity production from renewable energies.

METAS ENERGÍA 2035



by 2035: at least 60% of national electricity production from renewable energies.



ENERGÍA 2050
POLÍTICA ENERGÉTICA DE CHILE

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Programa de Energías Renovables y Eficiencia Energética en Chile



Ministerio Federal de Medio Ambiente, Protección de la Naturaleza y Seguridad Nuclear

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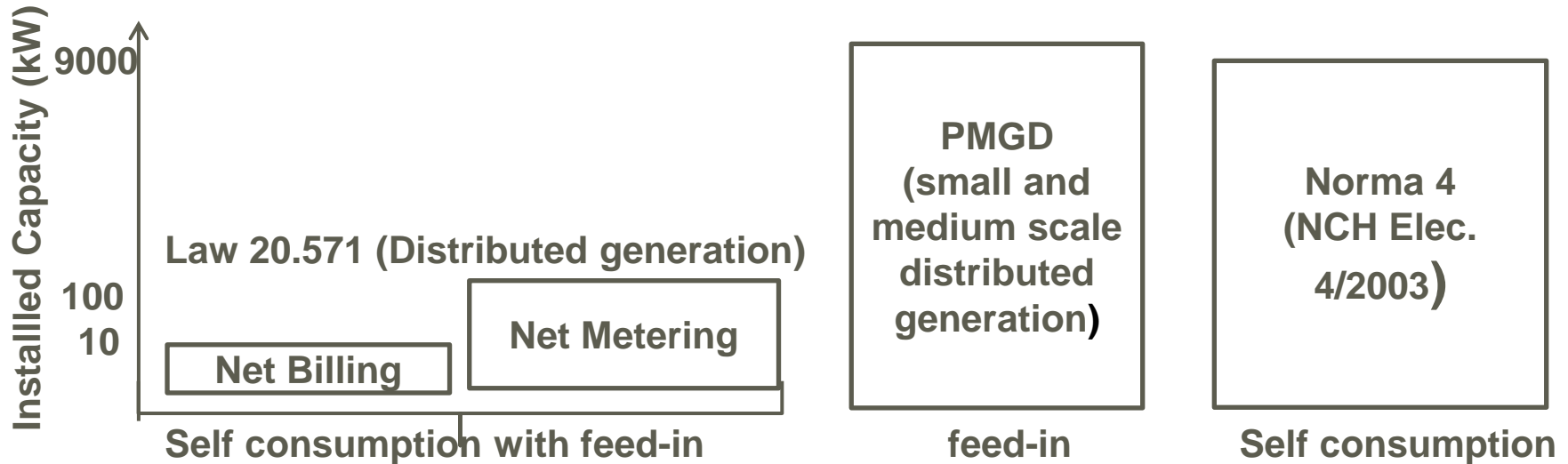


Ministerio de Energía

Gobierno de Chile



Roof-top PV – The new market



- Distribution company remunerates regulated energy price (59,2 CLP/KWh (8,6 ct US\$) in Santiago)
- Customers with power connection < 10 kW pay integrated price per energy and grid fee (102,3 CLP/kWh (14,8 ct US\$) in Santiago => Net Billing
- Customers with power connections > 10 kW pay for energy and grid separately
-> Net Metering



Roof-top PV – Legal Framework

<http://www.minenergia.cl/ley20571/>

Inicio Preguntas frecuentes Clientes Residenciales y Pymes Otros Clientes Regulados Información Empresas Instaladoras

¿Cómo funciona la Ley de Generación Distribuida 20.571?

Ejemplo de un Sistema Domiciliario Fotovoltaico



Proceso de solicitud de conexión



Ley 20.571



Reglamentos y Normativas

Ley 20.571 para la Generación Distribuida

¿Cuál es el objetivo de la Ley 20.571 para la Generación Distribuida?

✉ **Máximo Pacheco M.**
MINISTRO DE ENERGÍA



“La ley de generación distribuida es el primer paso para la democratización de la energía: garantiza el derecho de los clientes de las empresas distribuidoras a generar su propia energía eléctrica, autoconsumirla y vender sus excedentes energéticos. Además, promueve el uso de las energías renovables no convencionales y los sistemas de cogeneración eficiente, lo que está en línea con nuestro objetivo como país de avanzar hacia una matriz energética más sustentable y diversificada”

22 de octubre de 2014

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Roof-top PV – Market Stimulation

“Programa Techos Solares Públicos”

- 13 Mio. USD until 2018 for PV-Systems in public buildings
- Open public tender for national and international PV enterprises.
- Size of installations between 5 – 100 kWp.
- Main Objective:
 - Mature the PV-rooftop market by public demand
 - Provide information on costs and conditions
 - Try and improve the legal framework
 - Lower costs of energy in public buildings



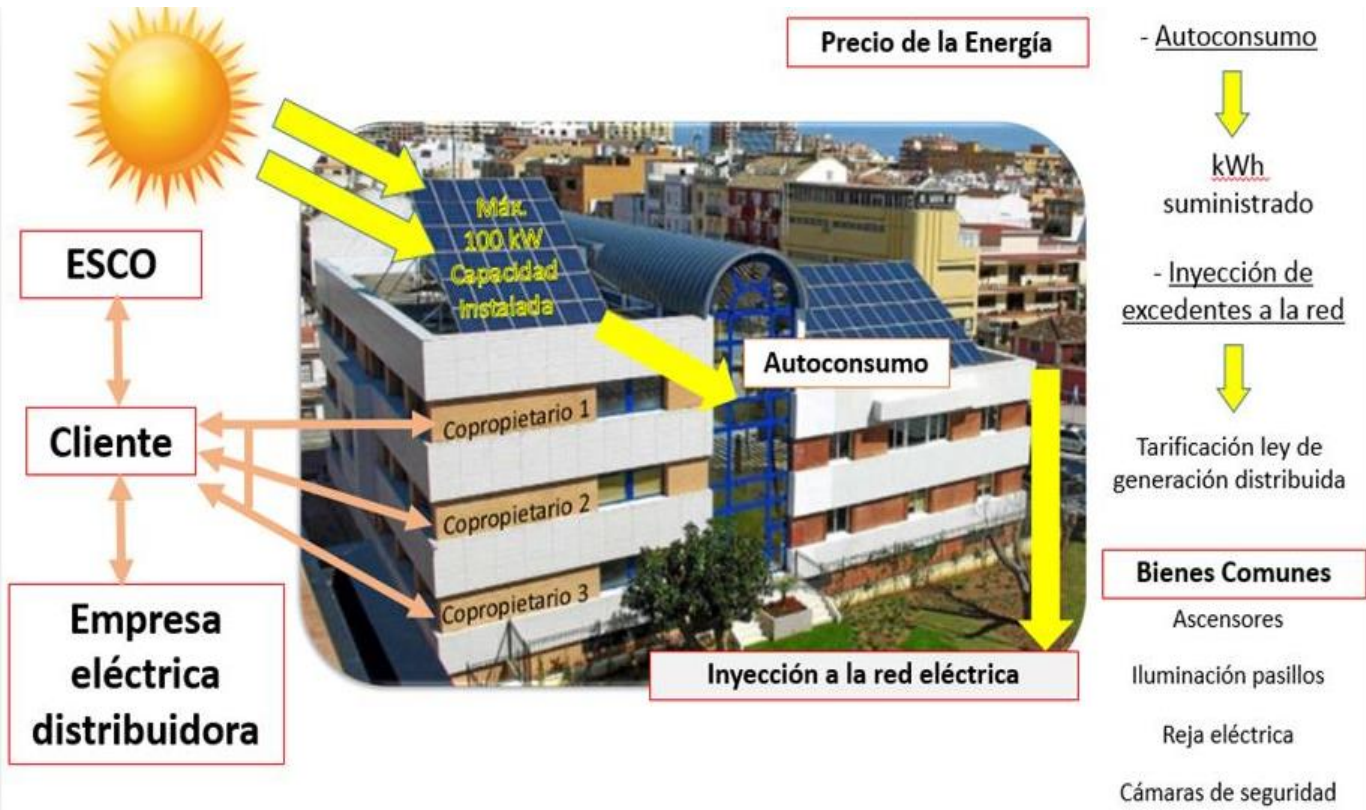
www.minenergia.cl/techossolares



Roof-top PV – Market Stimulation

Legal and fiscal Analysis of PV-contracting/ESCO business model for PV self-supply:

- The ESCO is owner and responsible for the equipment and the electricity production
- Customers buy the generated electricity





Roof-top PV - some barriers still exist

Market starts very slowly – statistics of Net-Metering/Billing (30.9.):

- Number of “solicitudes de conexión”: 366
- Number of connections “TE4” : 41 in process (674 kW), 15 inscribed (225 kW)
- Conclusions from feasibility studies:
- High profitability expectation of Chilean clients
 - payback < 5 years and very high discount rate (10 – 20%)
 - > Need for new business models ,e.g. ESCO, Leasing
- Lack of experience and confidence in purchasing PV-Systems or services
 - Insecurity regarding technical requirements
 - Long decision process
 - > Need for information and patience



Conclusion- Positive:

- Huge RE potential: water (large and small scale), wind, solar (PV, thermal, CSP), geothermic (low and high enthalpy), biomass (gas and solid) and tidal energy;
- Political agenda in favor of RE;
- Regulatory framework becoming more clear and adequate;;
- Possibilities for direct PPA (Power purchase agreements (mining and other large consumers) and the possibility of public tenders (captives clients);





Conclusion - Challenges:

- Electrical system and transmission lines capacity;
- Current economic situation in the mining sector;
- Variable renewable energy dispatch vs flexibility of conventional generation park;
- Regulatory framework for the reserve/backup power;
- Training of local technicians and engineers;
- Deficiencies of the law (net billing);
- High IRR expectation of investors;
- Etc.....





Matthias Grandel

Asesor Principal

Proyecto Energía Solar para la Generación de Electricidad y Calor

matthias.grandel@giz.de

https://energypedia.info/wiki/Solar_Energy_for_Electricity_and_Heat_in_Chile

www.4echile.cl

www.giz.de



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Chile Installed Capacity (MW)

Renewable energy:
42% (12% NCRE)

