Workshop: An overview on recent developments on PV research, strengthening strategic alliances

Solar Energy Research Center SERC-Chile

Rodrigo Palma-Behnke

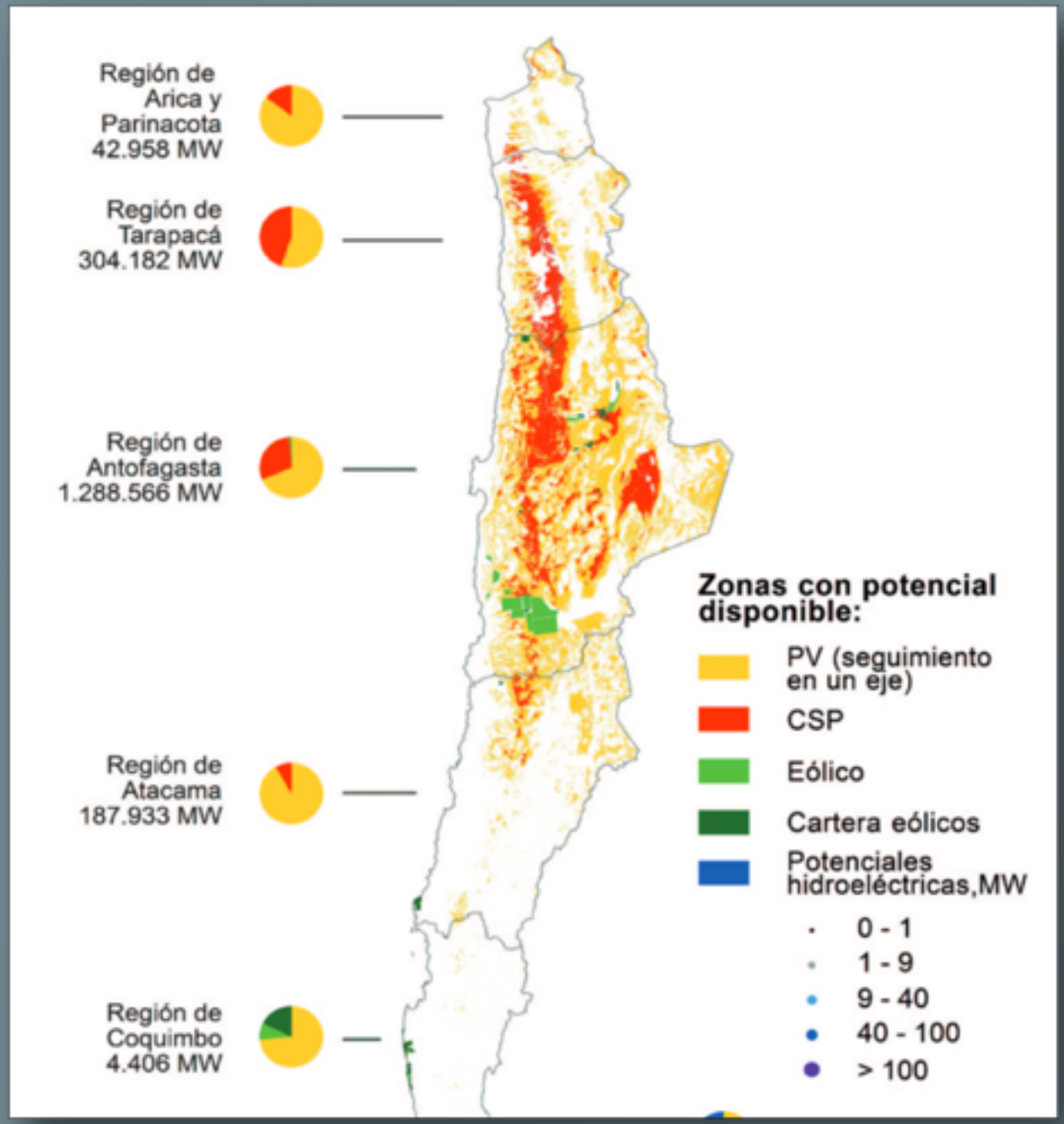
Energy Center – DIE – University of Chile

4th April, 2019, Santiago

OVERVIEW

- **Context: SERC & Energy Centre**
- Examples
- Conclusions

CONTEXT


Región de Arica y Parinacota 42.958 MW
Región de Tarapacá 304.182 MW
Región de Antofagasta 1.288.566 MW
Región de Atacama 187.933 MW
Región de Coquimbo 4.406 MW
Zonas con potencial disponible:
PV (seguimiento en un eje)
CSP
Eólico
Cartera eólicos
Potenciales hidroeléctricas,MW
0 - 1
1 - 9
9 - 40
40 - 100
> 100

SERC **CHILE** 2018 - 2022

SERC CHILE

SOLAR ENERGY RESEARCH CENTER

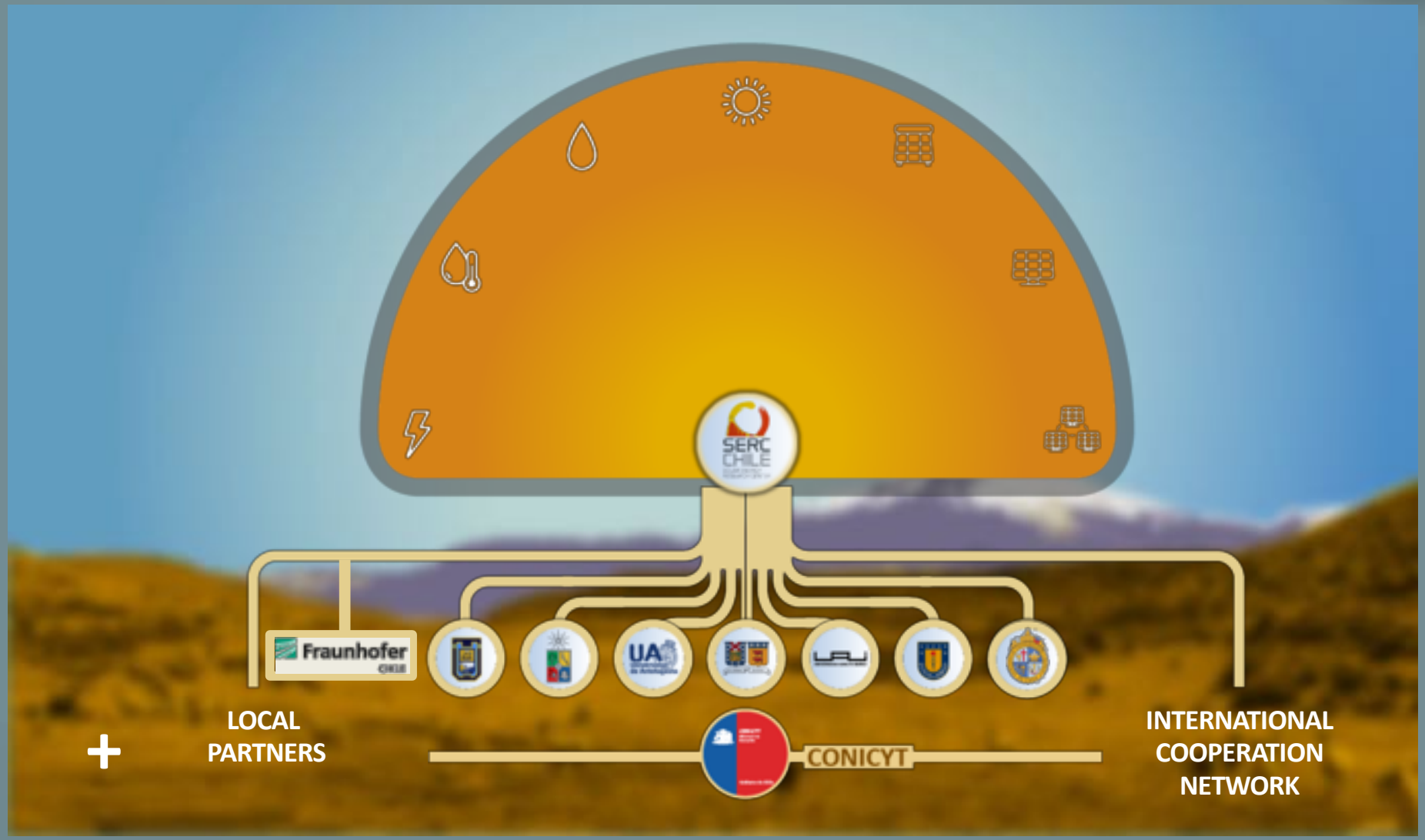
Universidad de Tarapacá · UA Universidad de Antofagasta · Universidad Técnica Federico Santa María · Universidad de Chile · Universidad Adolfo Ibáñez · Pontificia Universidad Católica de Chile · Universidad de Concepción · Fraunhofer · CONICYT Comisión Nacional de Investigación Científica y Tecnológica

CONTEXT

Created in year 2012 by CONICYT

The objective of this center is to become a leader of scientific research in solar energy, especially developing the potential of the Atacama Desert in Chile.

- First association of institutions devoted to the development of solar energy in Chile!
- 80 researchers, 300 students
- Non profit
  Inclusive spirit




SERC CHILE
SOLAR ENERGY RESEARCH CENTER

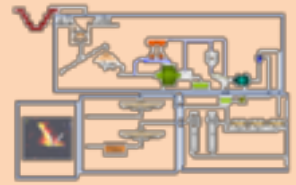
CONTEXT

Four strategic focuses

I. Massive integration of large-scale solar energy to the electric interconnected system



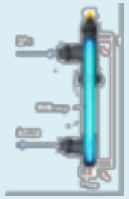
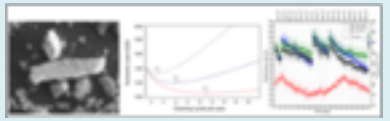
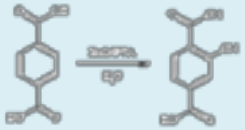
II. Solar energy based mining in Chile

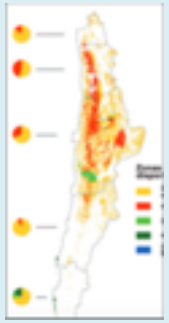




III. Development and widespread adoption of small-scale solar solutions



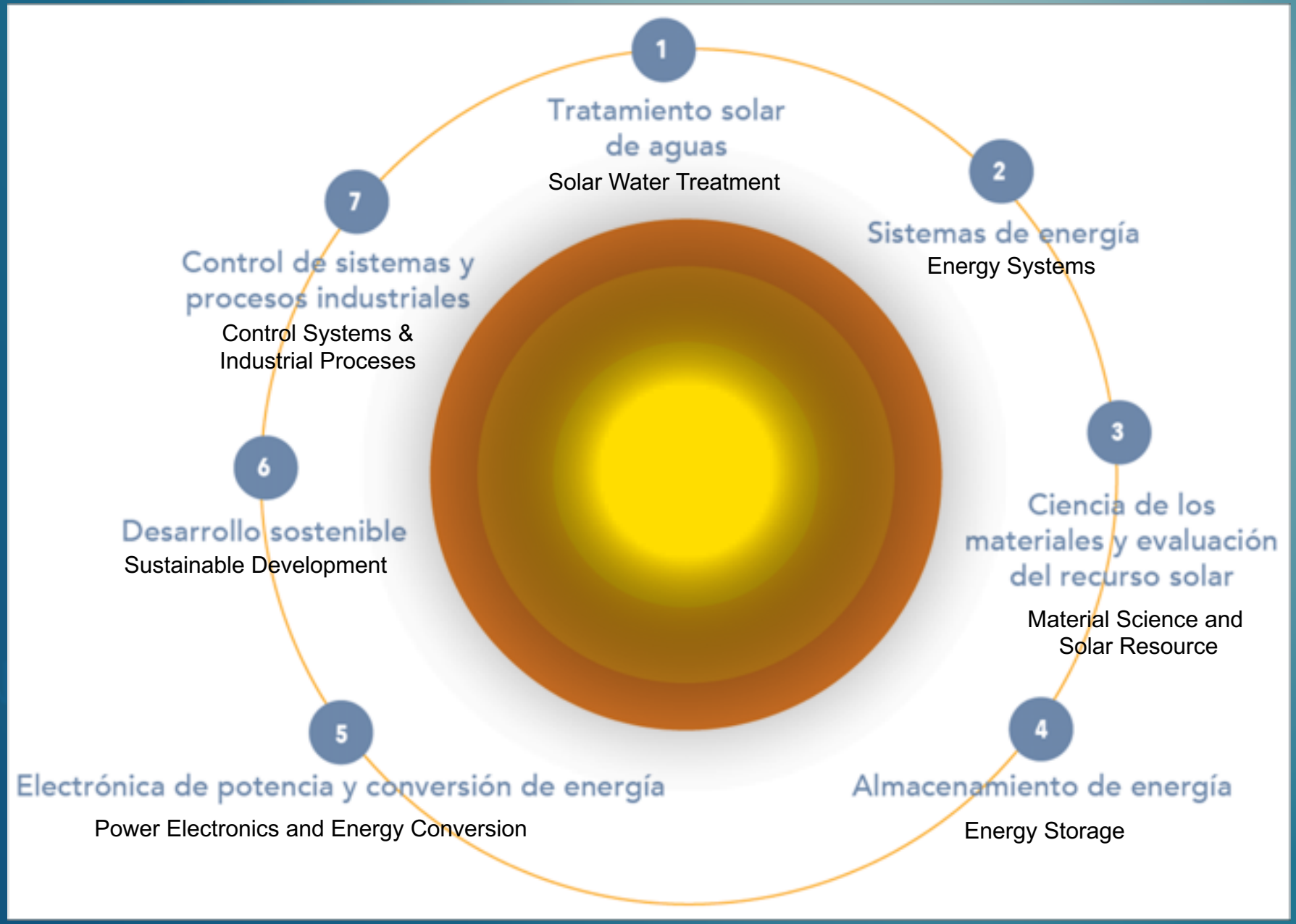

IV. Optimization and characterization of materials and solar resource under local conditions



CONTEXT

SERC CHILE
SOLAR ENERGY RESEARCH CENTER



SERC **CHILE** 2013 - 2017

Figure 1: Distribution of the number of citations of articles published by SERC researchers.

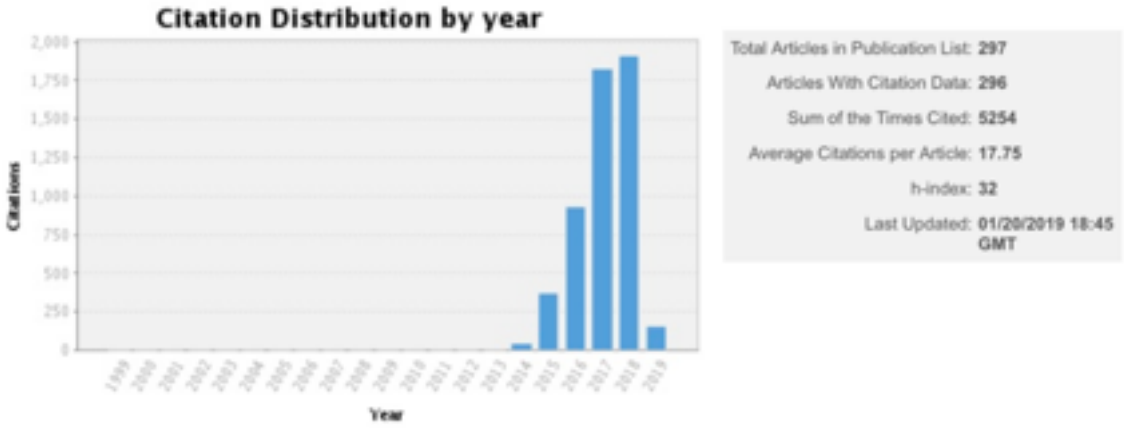
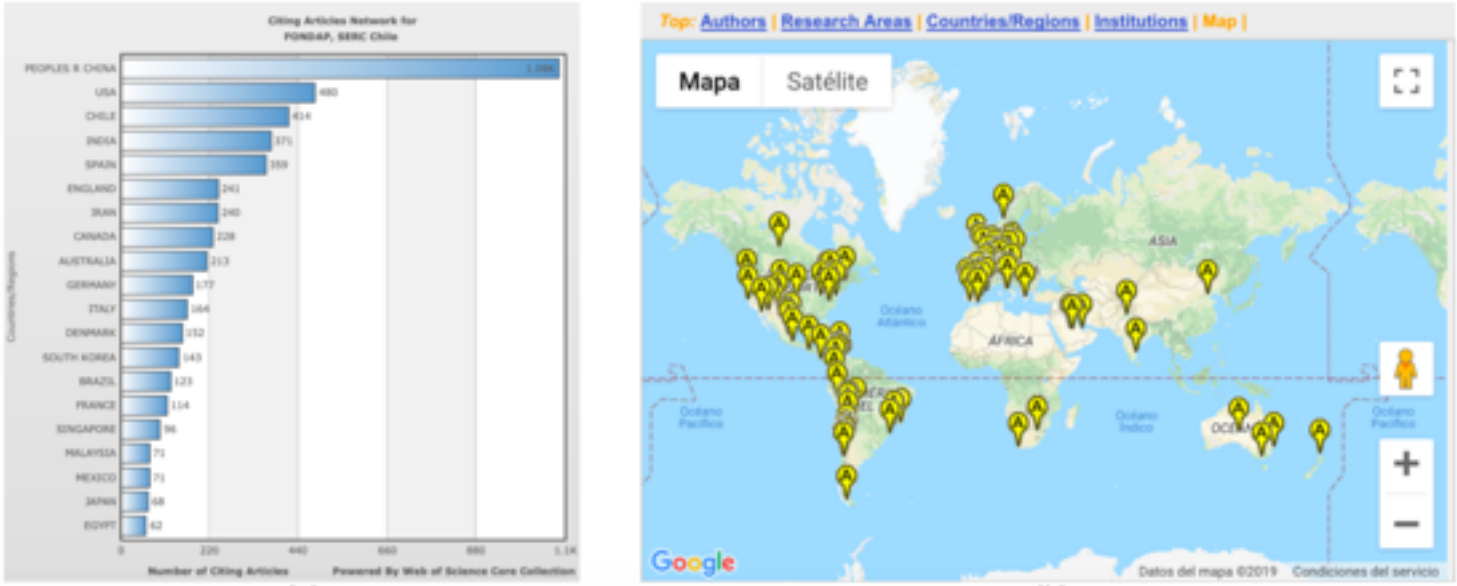
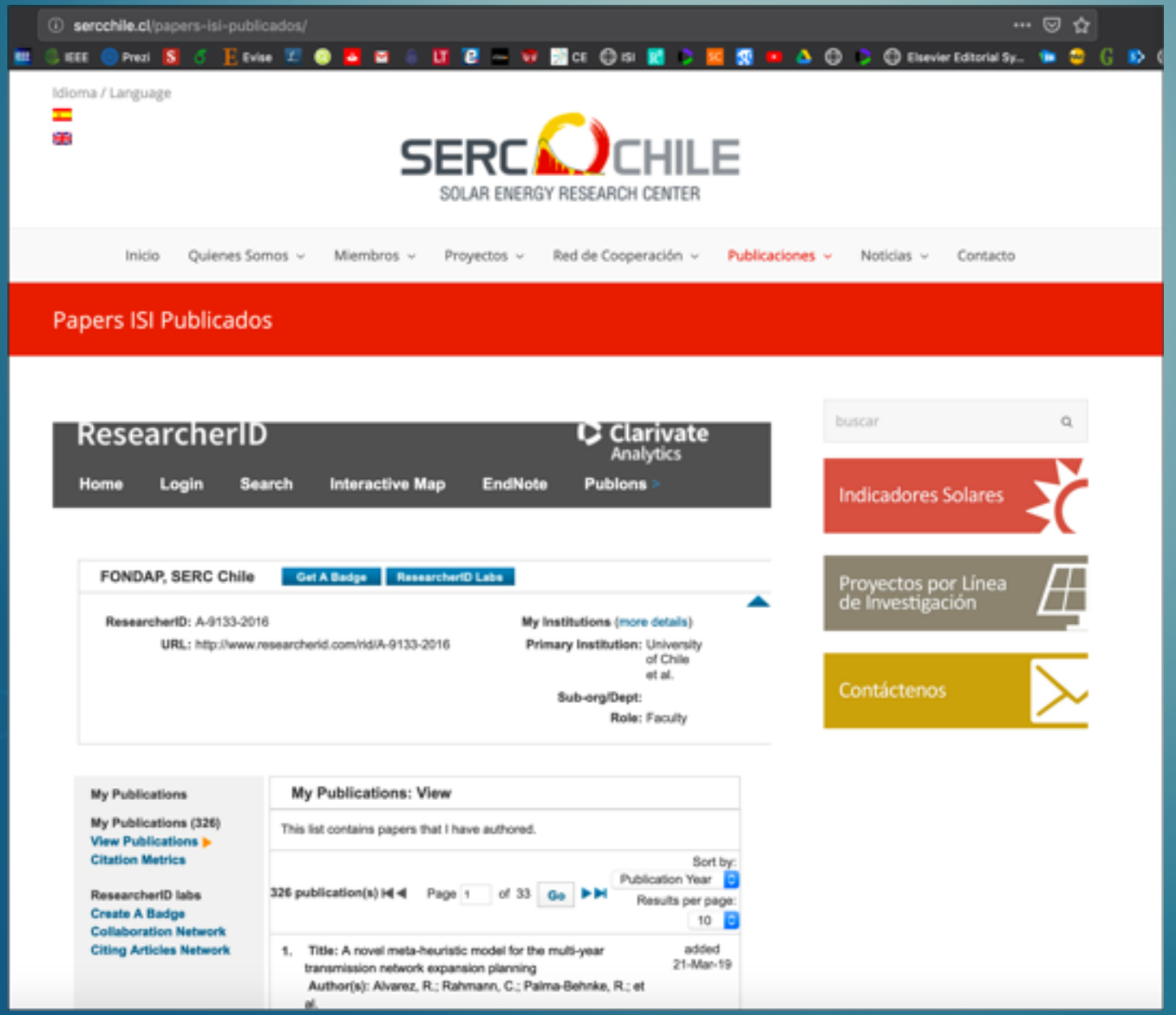


Figure 2: Origin of articles citations published by SERC researchers. (a) Countries that have cited SERC articles. (b) Collaboration Network of SERC in ISI papers.



SERC **CHILE** 2013 - 2017



OVERVIEW

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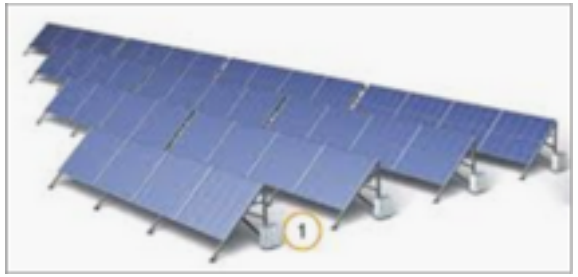
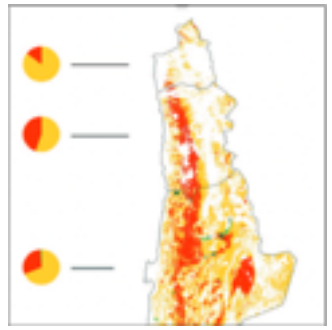
PV added value chain



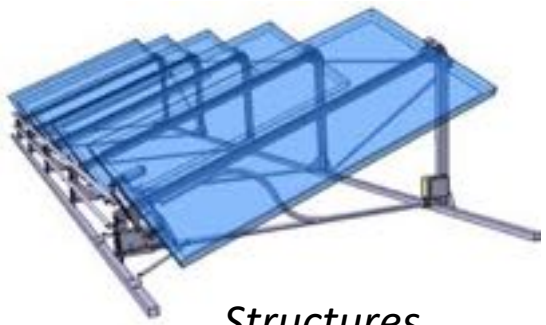
BoS O&M

Converters



Characterization

PV solutions

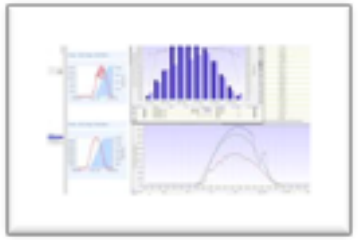


Structures

Modules

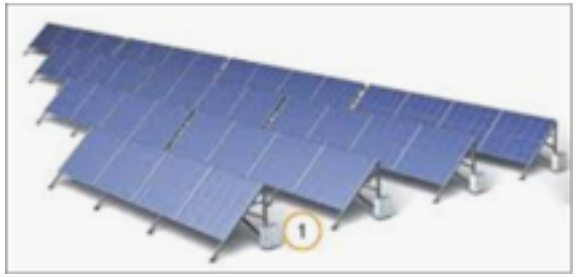
Cells

Materials



Monitoring / planning

System integration
Market



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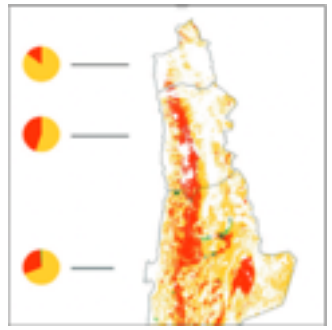

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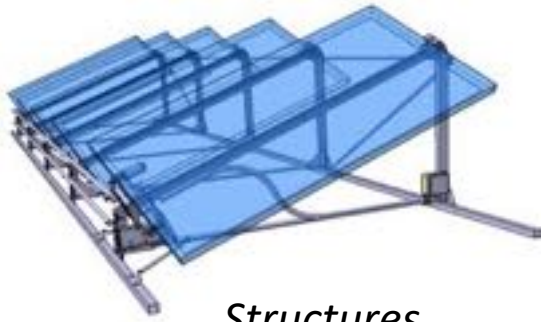


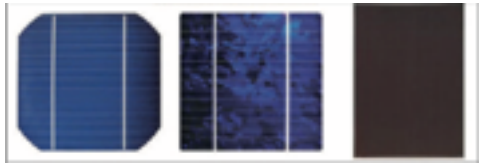
Structures

Modules

PV solutions

137/ 326

42%



Cells

System integration
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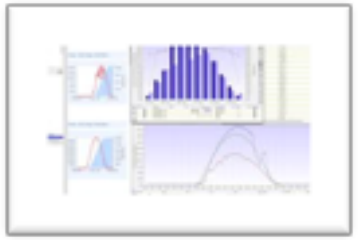
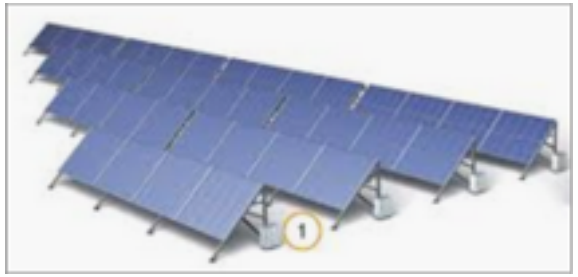


Monitoring / planning



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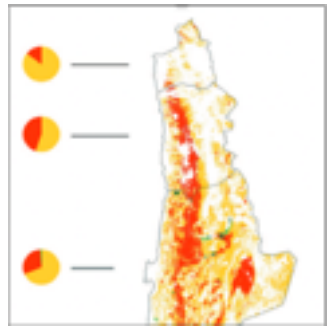
Converters



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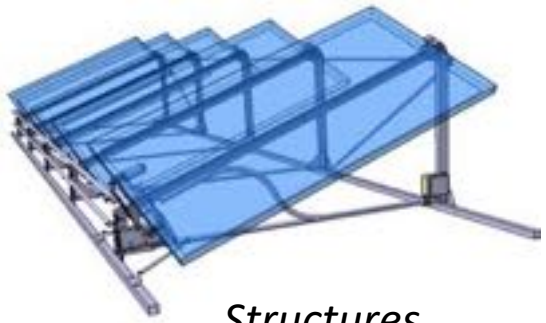

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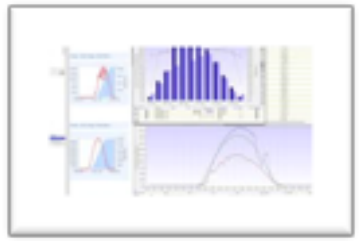


Monitoring

10%

30%

0%

15%

5%

10%

5%

25%

0%

0%

Examples

I. Massive integration of large-scale solar energy to the electric interconnected system

To supply 30% of the electricity consumption in Southamerica

200.000 MW

~ 6.000 km^2 (3ha/MW)

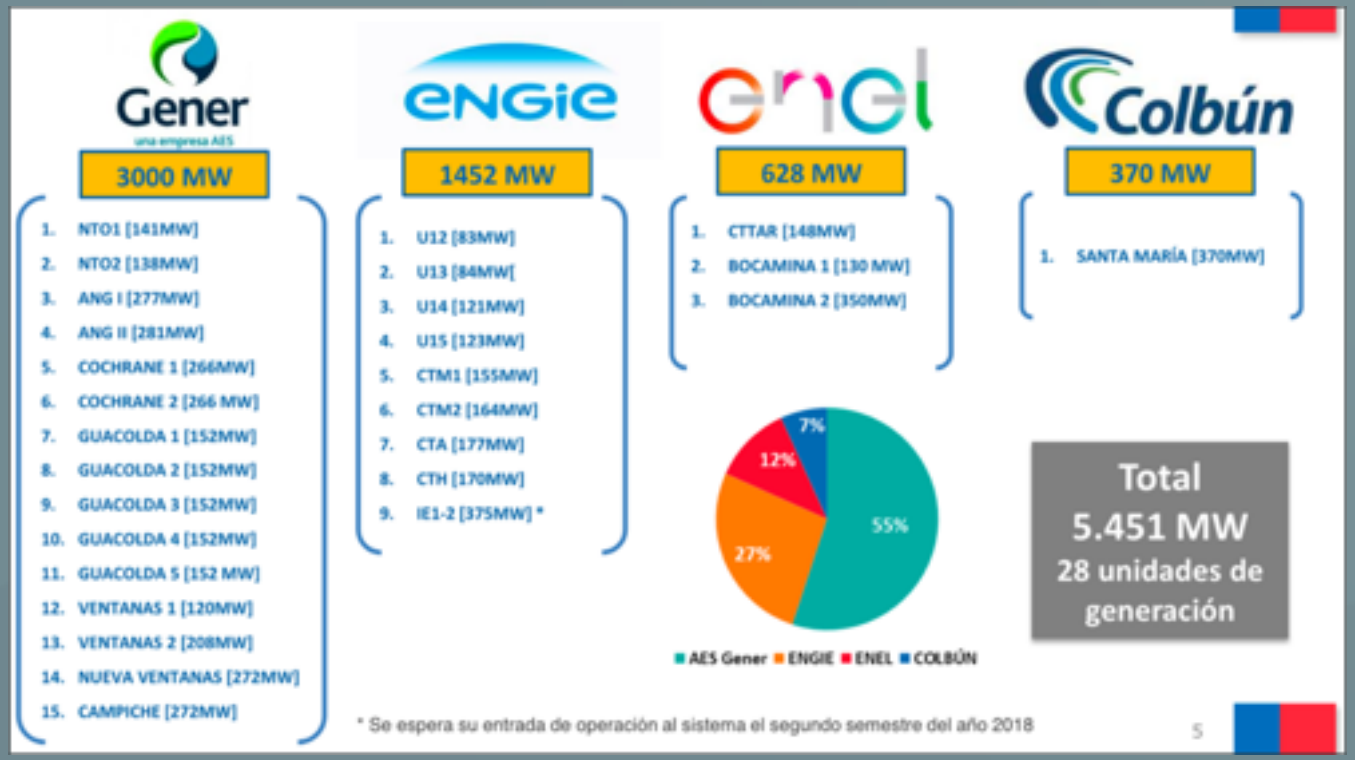
0.8% of the Chilean surface

5% of the Desierto de Atacama

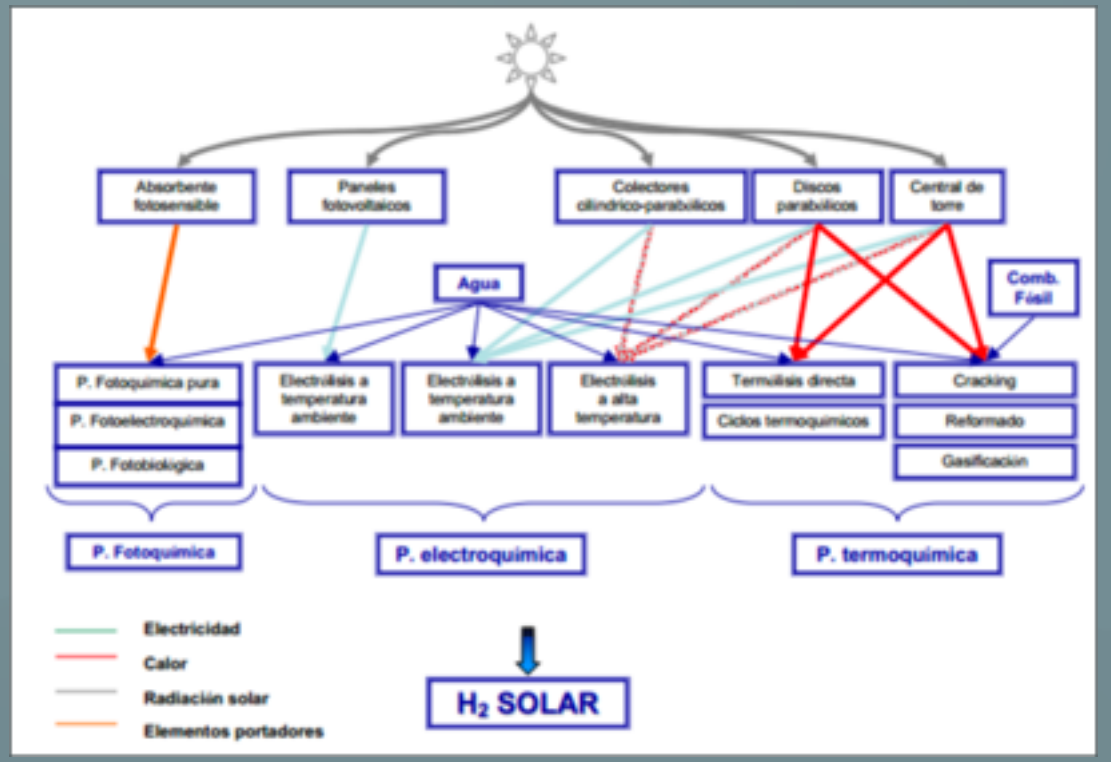
6 times the current Chilean consumption

Examples: Other Options of Massive Integration

- Solar Fuels → H_2
- Attraction of industry → Sustainable energy pole
- Decarbonization of Chile → decommissioning of existing fossil fuel power plants.

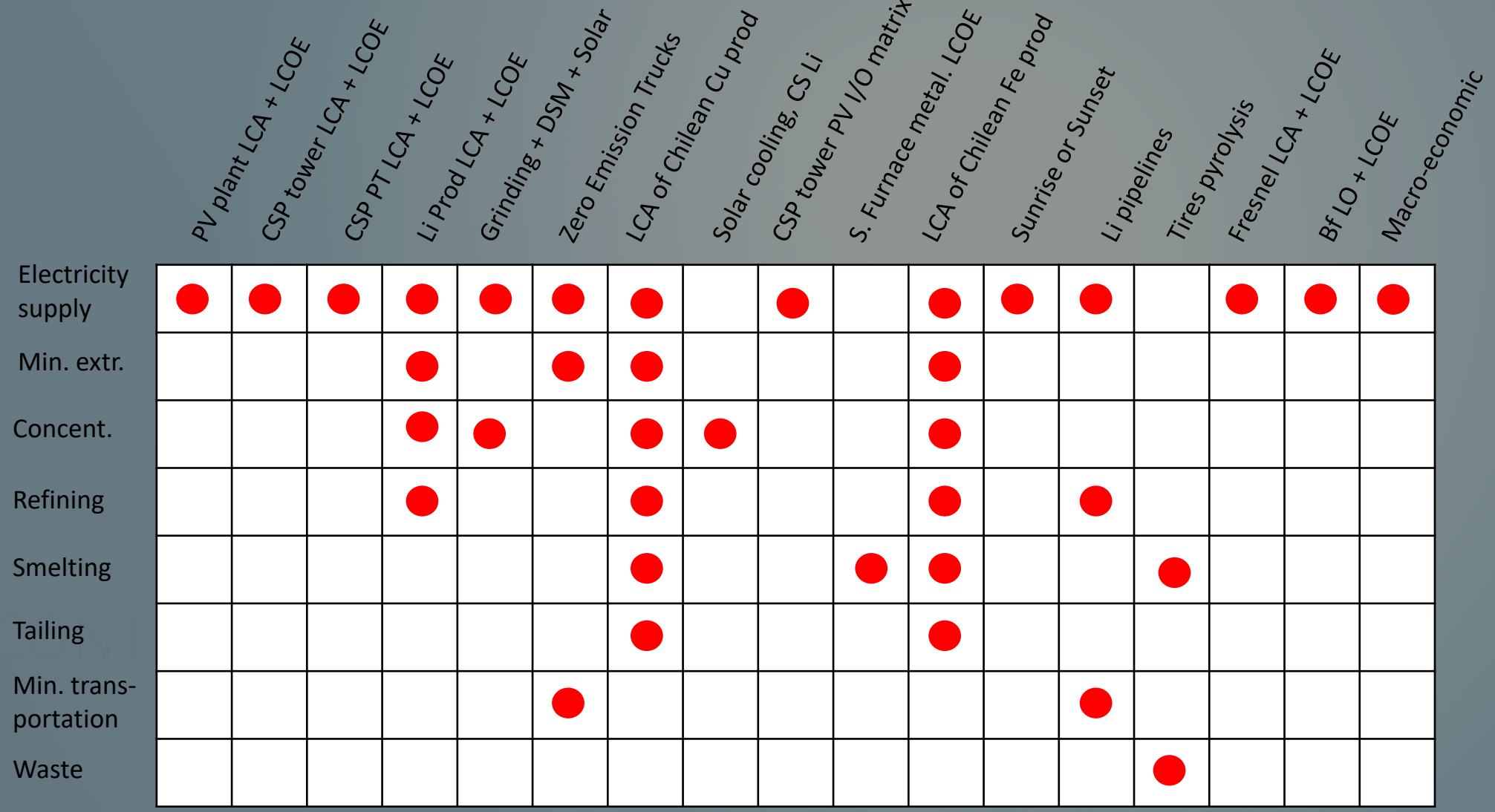


Ref: Ministerio de Energía



Ref: Producción de hidrógeno, empleando energía solar, Revista Elementos, 5, junio, 2015.

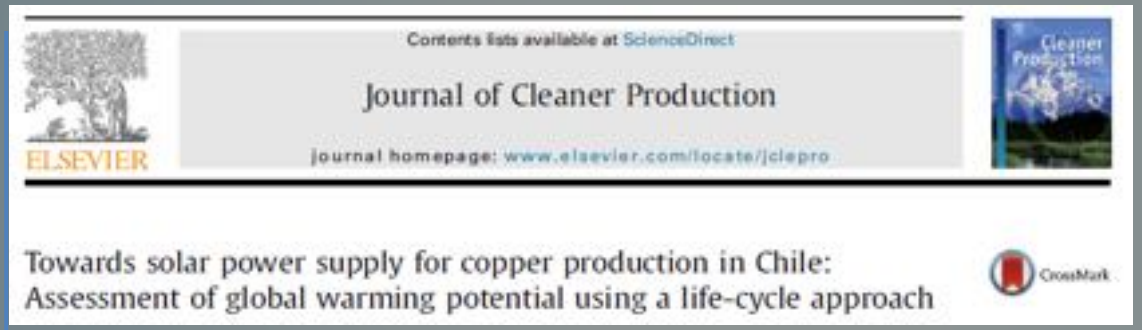
SolarMining research activities related to mining processes



SolarMining scientific contributions

Journal publications

1


Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Towards solar power supply for copper production in Chile: Assessment of global warming potential using a life-cycle approach

2

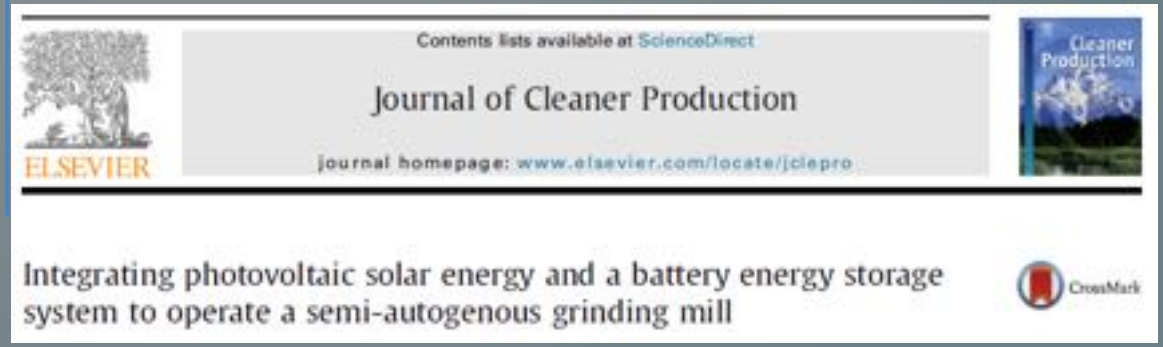

Contents lists available at ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

Sunset or sunrise? Understanding the barriers and options for the massive deployment of solar technologies in Chile

3


Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Integrating photovoltaic solar energy and a battery energy storage system to operate a semi-autogenous grinding mill

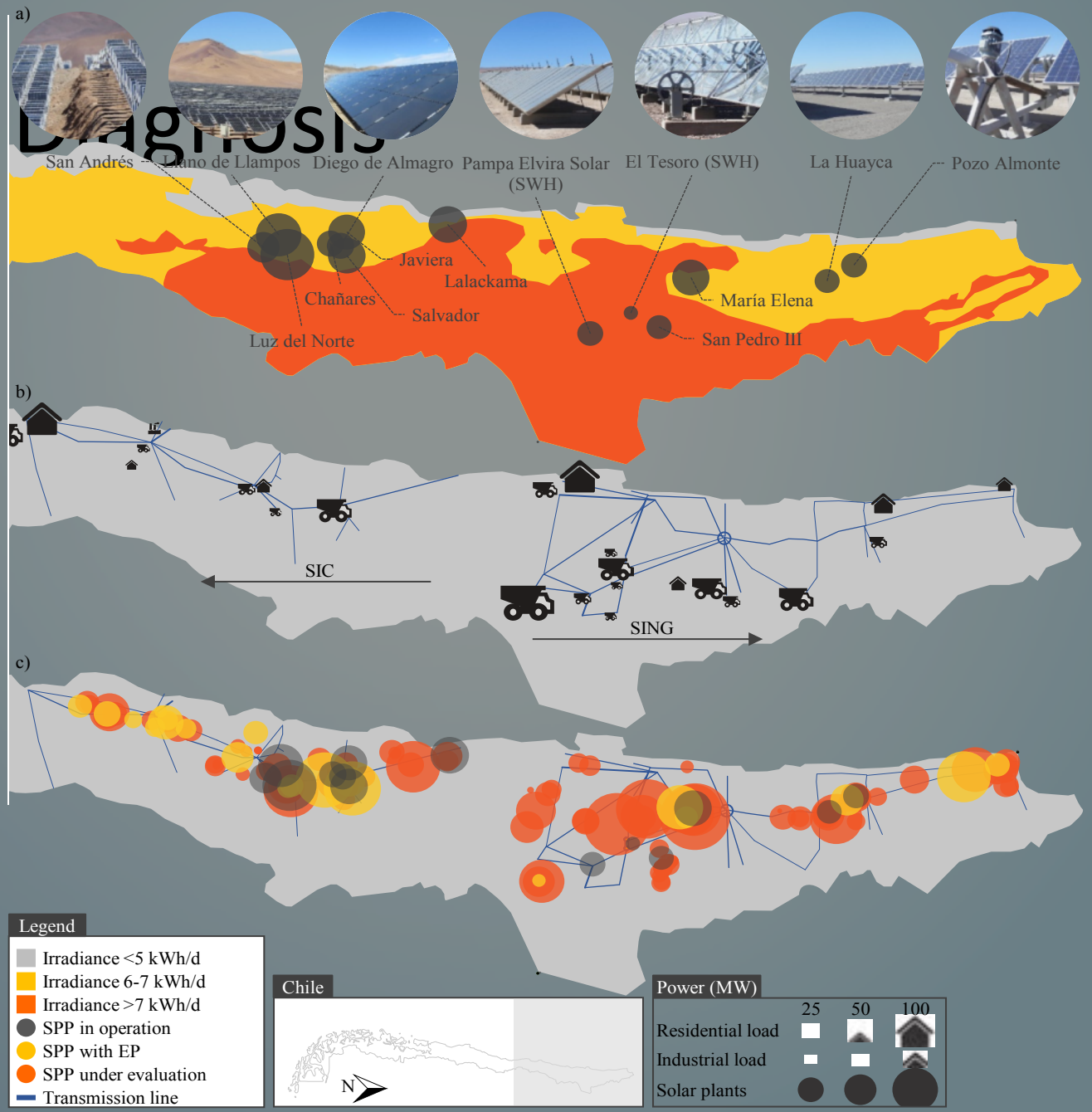
SolarMining scientific contributions

1

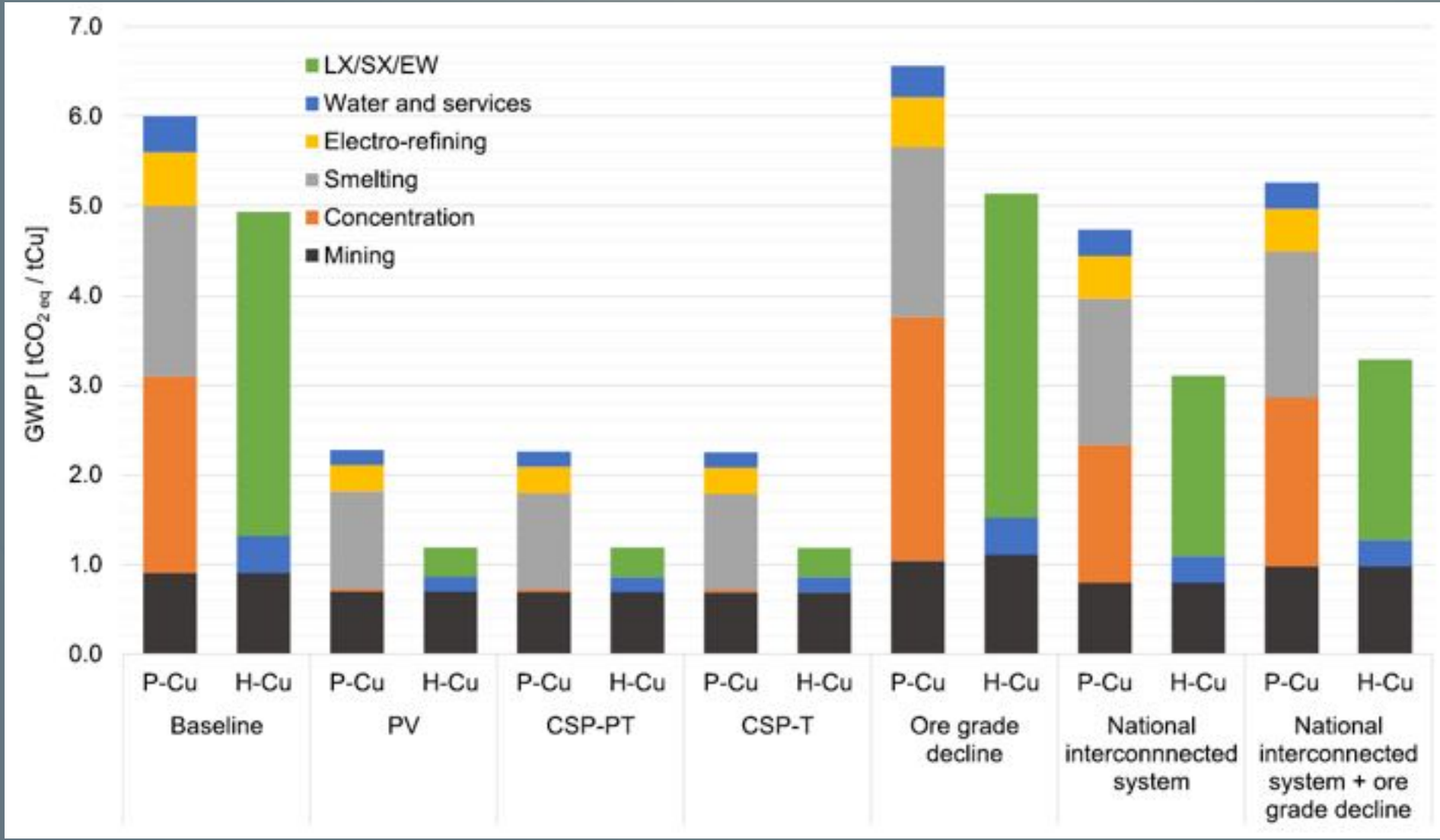
Diagnosis

Solar relation with mines

- HIGH POTENTIAL SINERGY between mining activities and solar plants
- LATENT BARRIERS to reach a higher use of the huge solar energy resource
- POTENTIAL SOLUTIONS to achieve a massive deployment of solar technologies in Chile

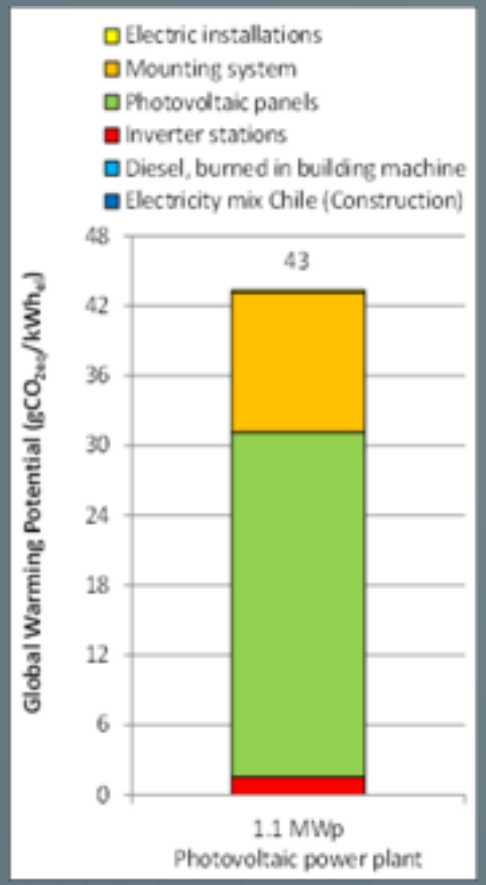


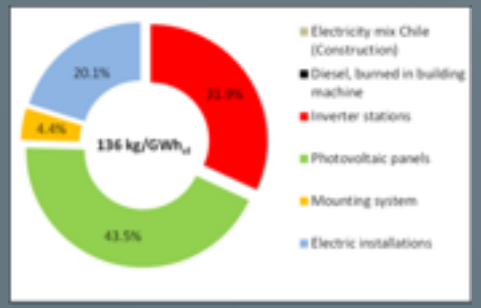
Huge potential for environmental-impacts reduction through solar energy



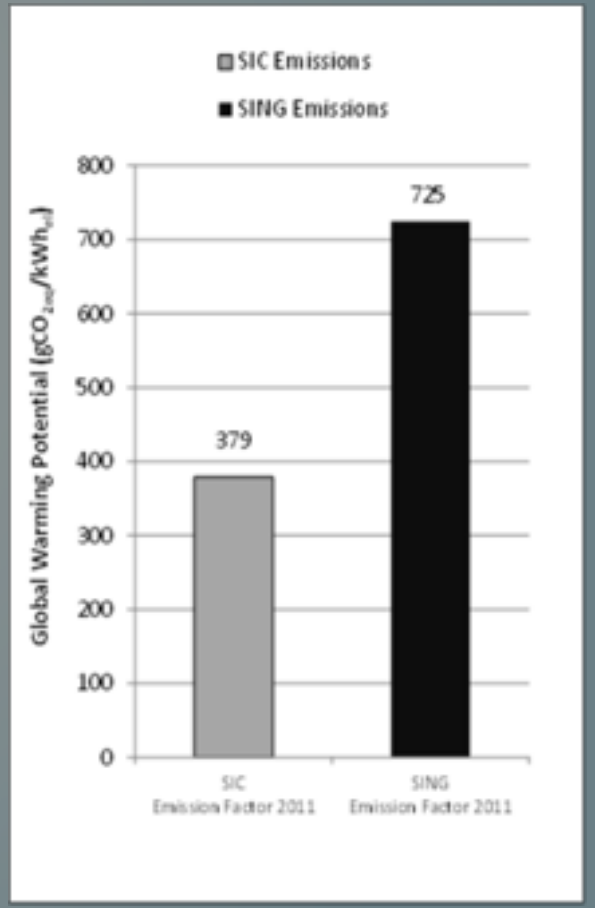
SolarMining technology briefs

LCA on solar technologies





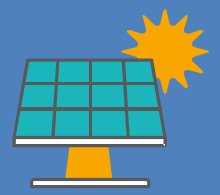
Technology briefs available at: serc.cl/solar-mining



SolarMining set of proposals

Final Document

Ore concentration	Tailings	Smelting and refining	Mine operation and planning	Hydro-metallurgy
2+	3+	2+	6+	2+





INSTITUCIONES SERC CHILE EJECUTORAS:

SOCIOS ESTRATÉGICOS:

ayllu solar

ayllu solar

Región de **ARICA Y PARINACOTA**

The main objective of this project is to **create human capital** in order to promote and reinforce the **sustainable development** of urban and rural communities through the use of **solar energy**, in accordance to the needs of each area.

SERC CHILE

SOLAR ENERGY RESEARCH CENTER

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