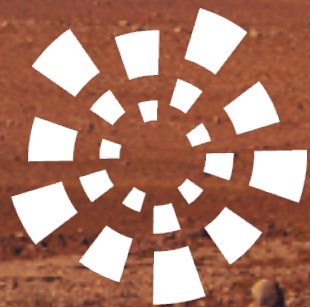




SOLAR ENERGY:

OPPORTUNITIES FOR CSP IN CHILE



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What if Chile
becomes a global
leader in solar energy






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‘A SOLAR SAUDI ARABIA’

While Trump promotes coal, Chile and others are turning to cheap sun power





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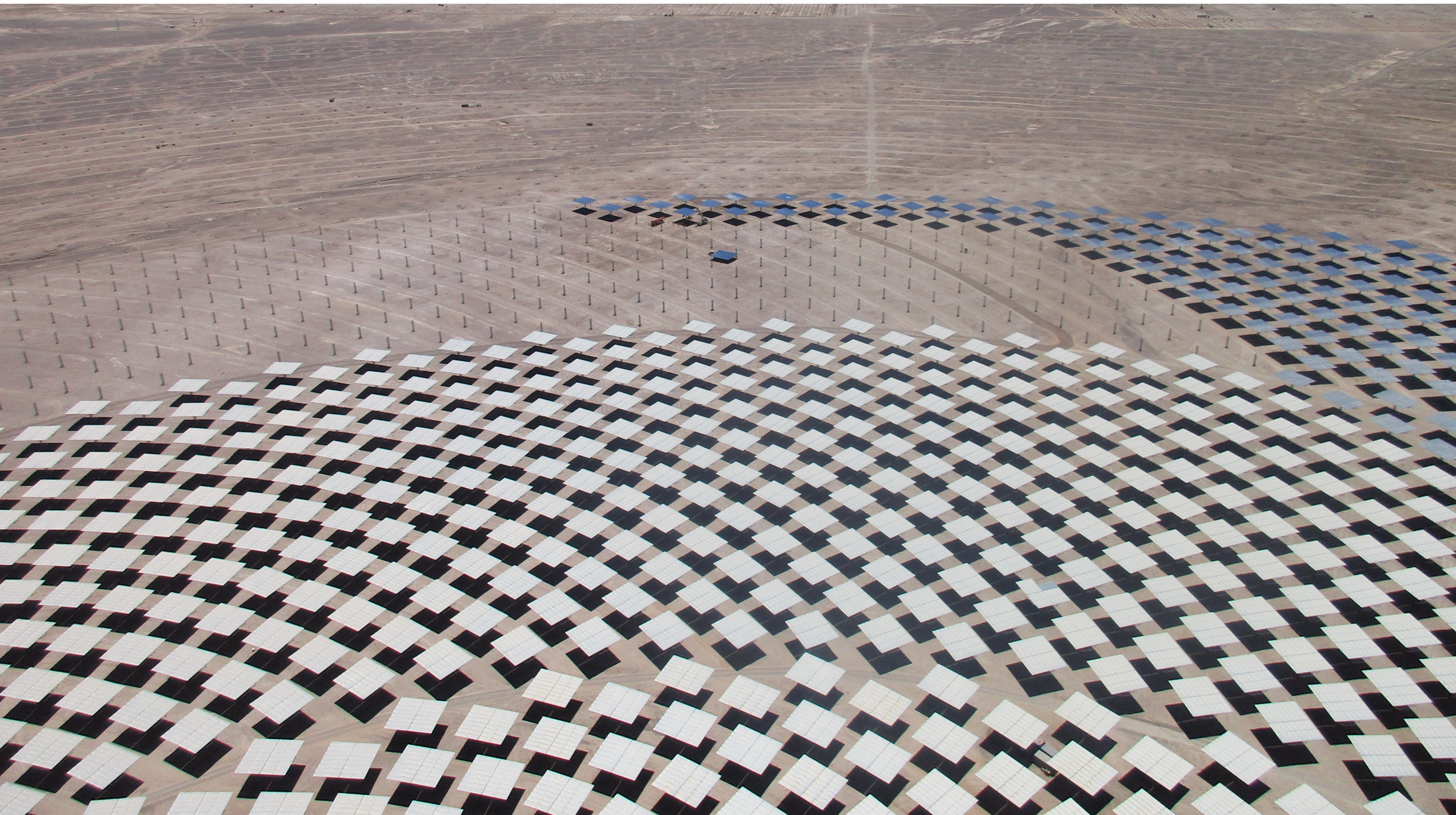




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Chile leverages its lithium with manufacturing incentives

Companies bid on projects tied to the country's vast reserves



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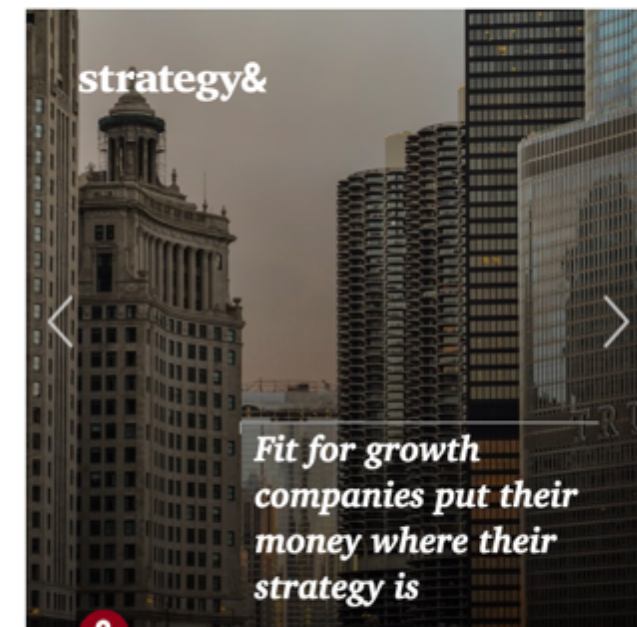
The white gold rush

A battle for supremacy in the lithium triangle

Three South American countries have much of the world's lithium. They take very different approaches to exploiting it



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To keep the rise in global temperature below 2°C,
by 2030 RE's share
should be duplicated

36%

Source: Perspectives for the Energy Transition IEA-IRENA, March 2017



By 2050 should increase
at least up to

65%

Source: Perspectives for the Energy Transition IEA-IRENA, March 2017



In Chile our target by
2050 is

70%

Source: Energy Policy 2050



Globally it will mean a
CSP installed capacity of
720 GW.

Source: Perspectives for the Energy Transition IEA-IRENA, March 2017

Today just **5 GW.**

Source: SolarPACES 2017



And a PV installed
capacity of

6.300 GW.

Source: Perspectives for the Energy Transition IEA-IRENA, March 2017



Today a bit more than
400 GW.



Source: IEA PVPS 2017



And an increase of the
stock of electric vehicles
up to

850 Mill.

Source: Perspectives for the Energy Transition IEA-IRENA, March 2017

In 2017 **2 millions**

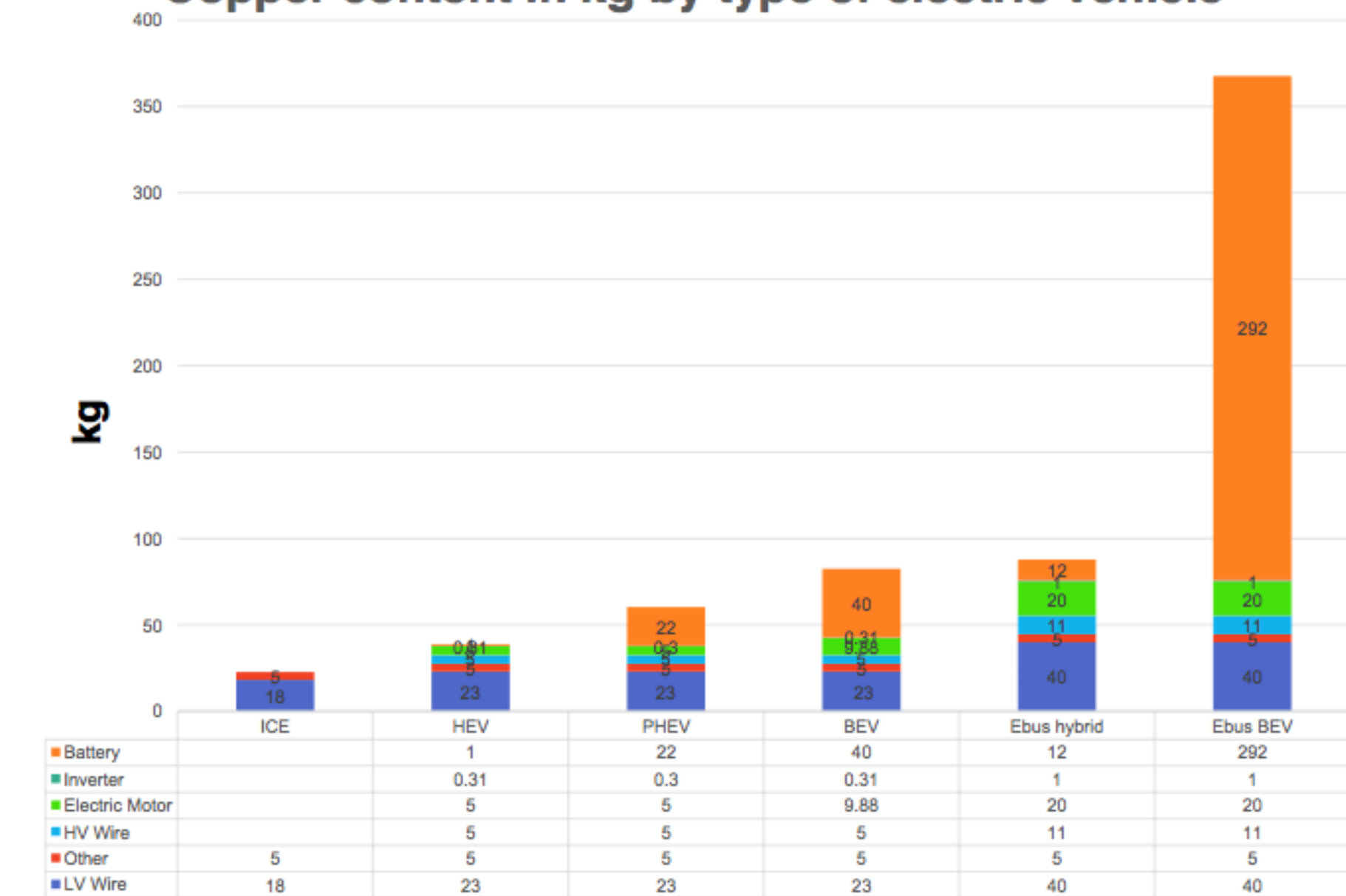
Source: Bloomberg 2017

Why we talk
about E-Mobility



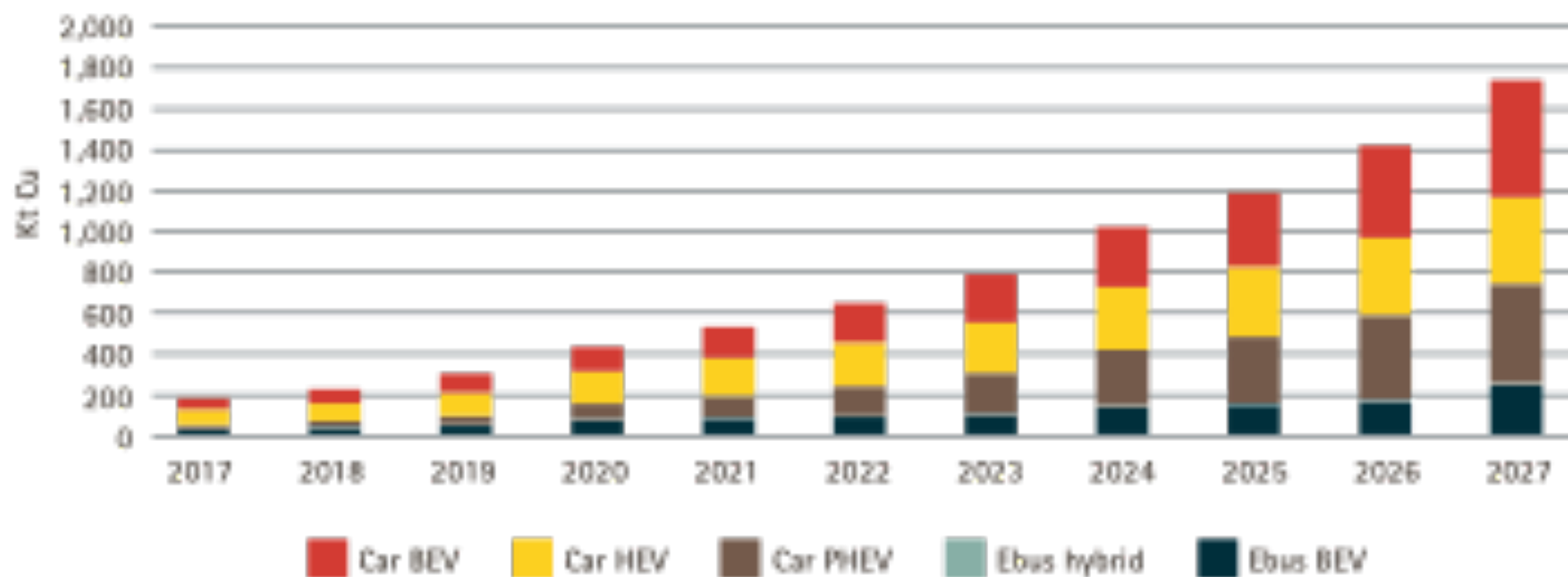
4X

Copper content in kg by type of electric vehicle



Source: IDTechEx 2017, International Copper Alliance

E-Mobility copper demand



Source: IDTechEx 2017, International Copper Alliance



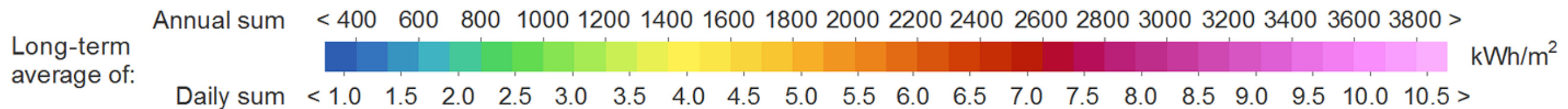
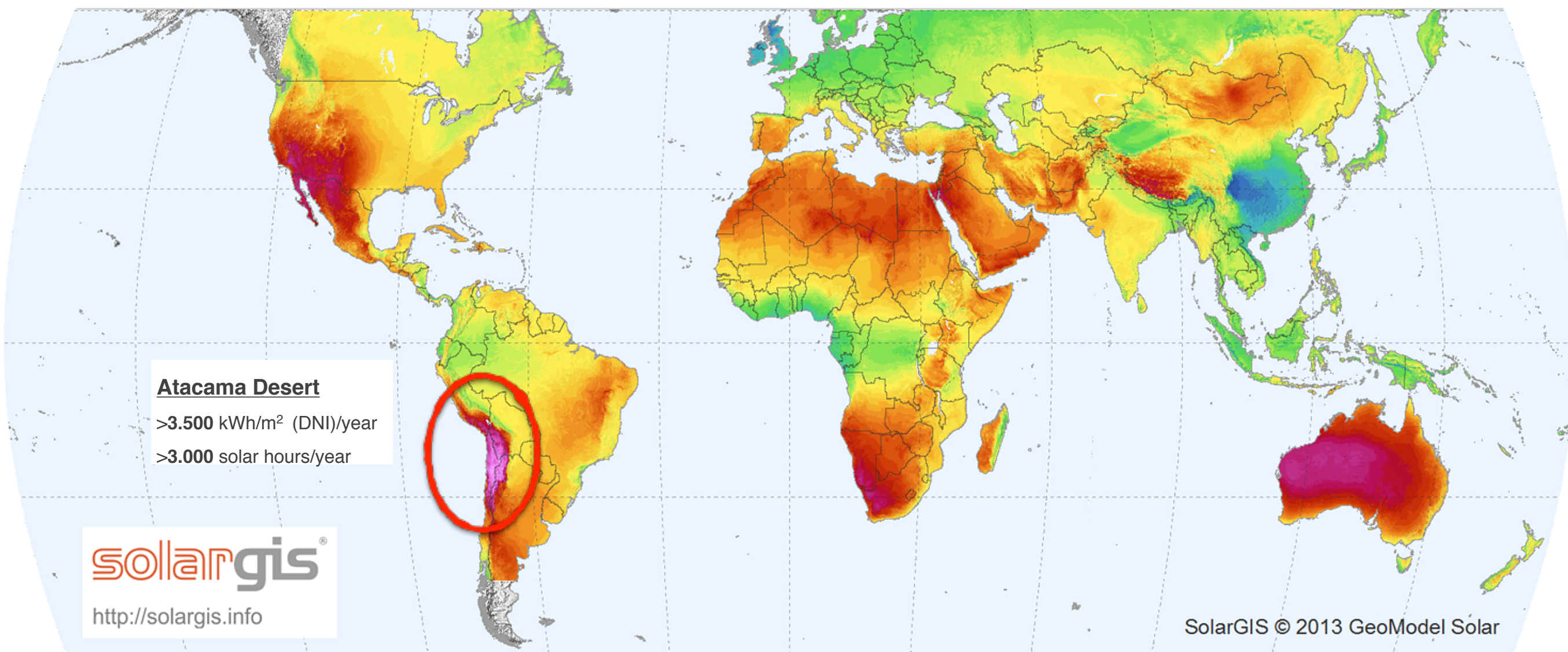
Renewables, energy
efficiency and E-Mobility
will drive the future
demand for copper

Source: BHP Billiton, 2016

! And also for Lithium !

Source: Bloomberg, 2016

OUR PERFECT STORM?: THE CHILEAN SINGULARITY

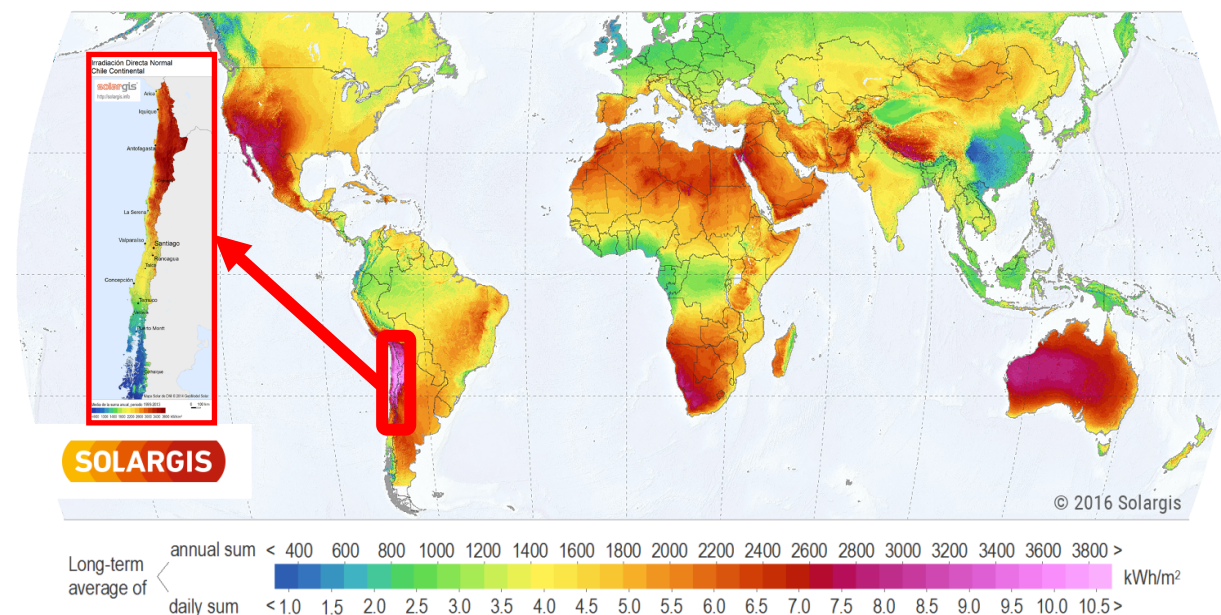


CHILE: THE BEST SOLAR RESOURCE IN THE WORLD

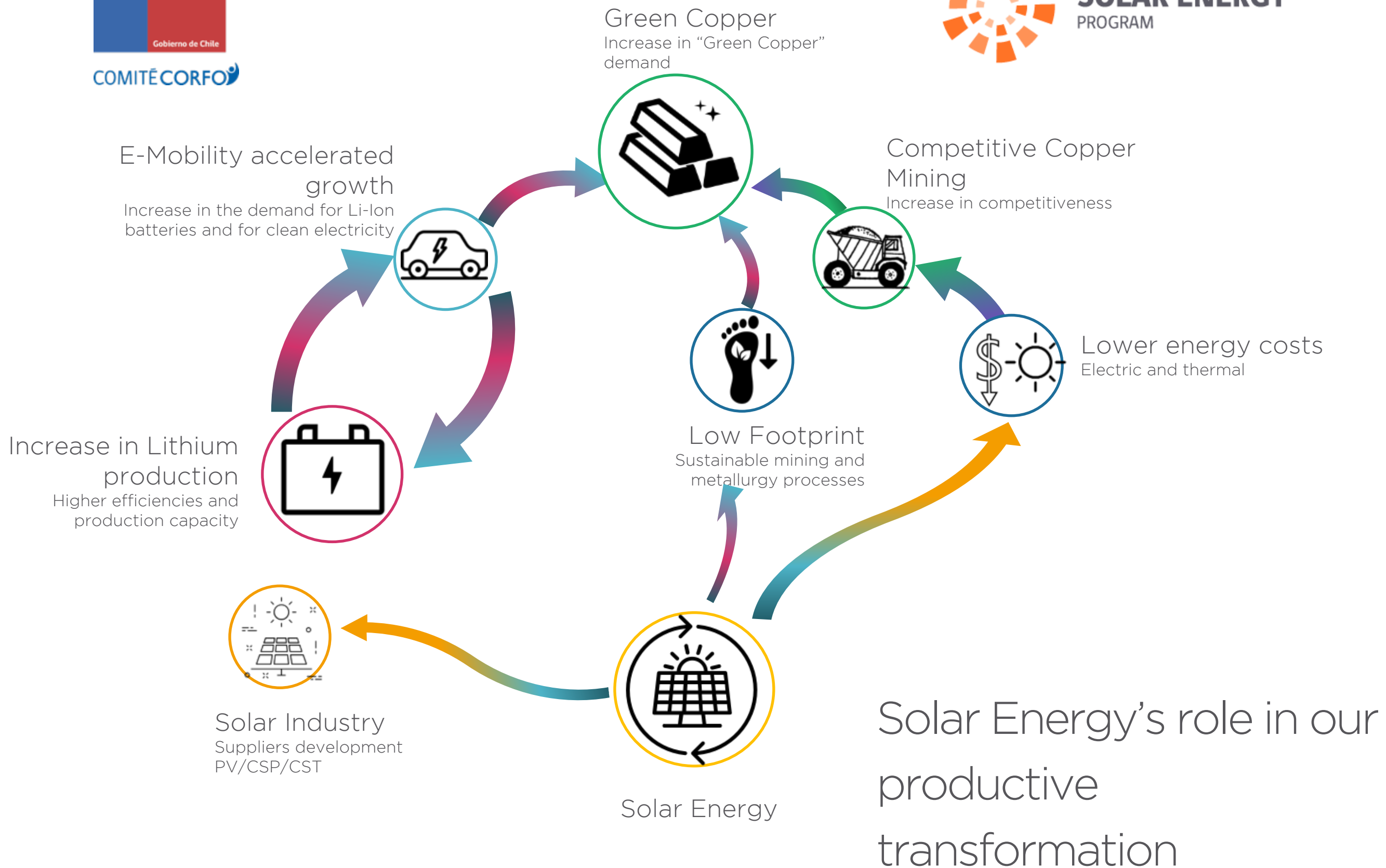
Chile receives the highest solar irradiation in the Atacama desert.

DNI María Elena, Chile ~	3700 kWh/m ² /y
DNI Northern Cape, South Africa ~	3044 kWh/m ² /y
DNI Nevada, USA ~	2730 kWh/m ² /y
DNI Ouarzazate, Morocco ~	2490 kWh/m ² /y
DNI Almeria, Spain ~	2130 kWh/m ² /y

DIRECT NORMAL IRRADIATION



We are in the best place to
be a leader in the
development and
deployment of Solar Energy
technologies to support our
copper, lithium and fuel
industries (H₂, NH₃, etc).

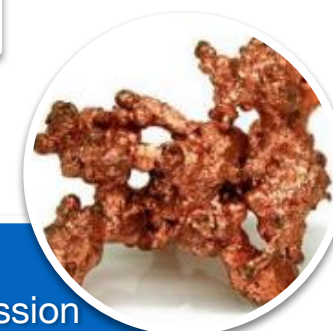


INNOVATION STRATEGY: VISION 2025

Chile: leading supplier of lithium and low-emission copper for the electric car industry



World's leading lithium producer



World's largest low emission copper producer

Long term supply of lithium carbonate/hydroxide (battery grade)

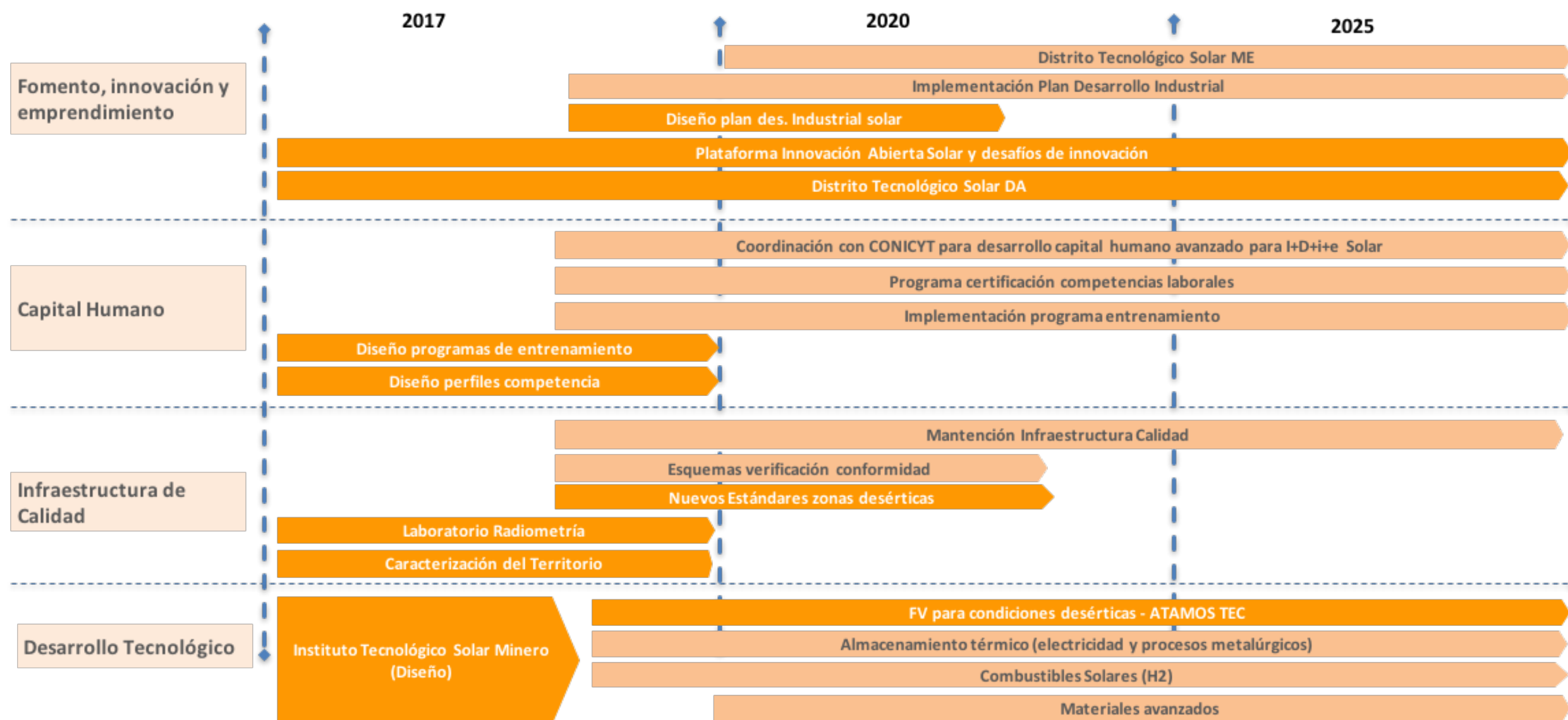
Lithium added value products (cathodes, others)

Solar energy for continuous electricity supply (mix PV/CSP) at average cost of 50 USD/MWh

Fossil fuels substitution
Hydrogen and Synthetic fuels based on circular economy approach



SOLAR ENERGY ROADMAP: VISION 2025



What about CSP market in Chile

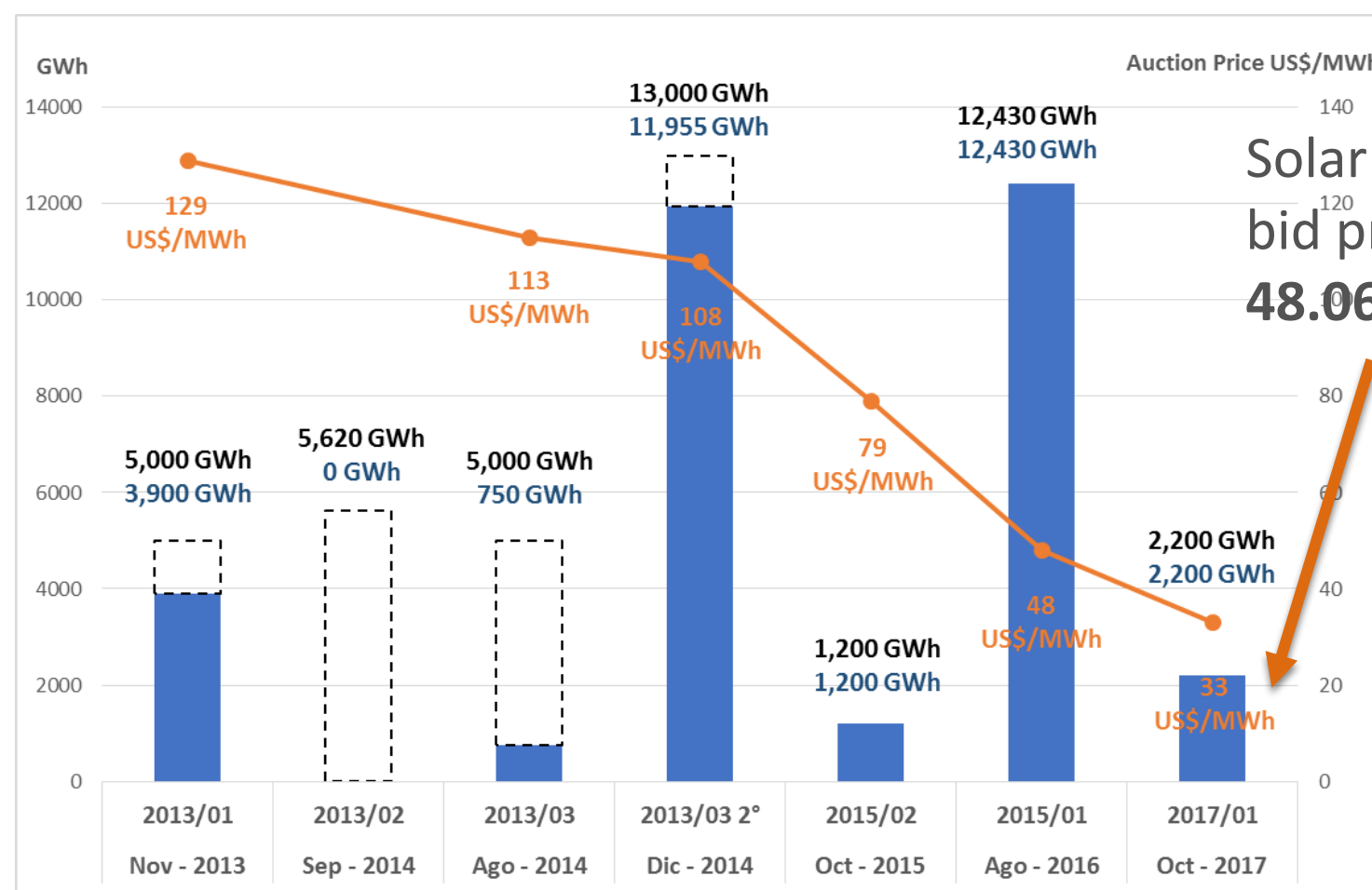


STATUS OF CSP IN CHILE

Proyecto	Inversión MMUS\$	Propietario	Ubicación	Tipo	Potencia MW	Almacenamiento	Helióstatos & Parabólicos	Estado DIA
Planta María Elena	3.300	Ibereólica Solar Atacama S.A.	María Elena	Torre	400	13 horas	35.200	Aprobada
Planta Camarones	800	Elecnor Chile S.A.	Camarones	Torre	105	14 horas	7.000	Aprobada
Planta Copiapó Solar	1.300 ^e	SolarReserve	Copiapó	Torre	240	14 horas	24.000	Aprobada
Planta Tamarugal Solar	2.400 ^e	SolarReserve	Pozo Almonte	Torre	450	11 horas	40.000	Aprobada
Planta Likana Solar	2.400	SolarReserve	Calama	Torre	450	11 horas	40.000	Aprobada
Planta Pedro de Valdivia	2.600	Ibereólica Solar Atacama S.A.	María Elena	CCP	360	10 horas	5.680	Aprobada
Planta CEME 1	500 ^e	Enerstar América	María Elena	CCP	70	14 horas	1.400	Aprobada
Proyecto El Loa	2.100 ^e	Andes G Energy	Calama	CCP	300	S/I	4.800	Calificación
Proyecto Tamarugal	2.100 ^e	Andes G Energy	Pozo Almonte	CCP	300	S/I	4.800	Calificación

ELECTRICITY TENDERS

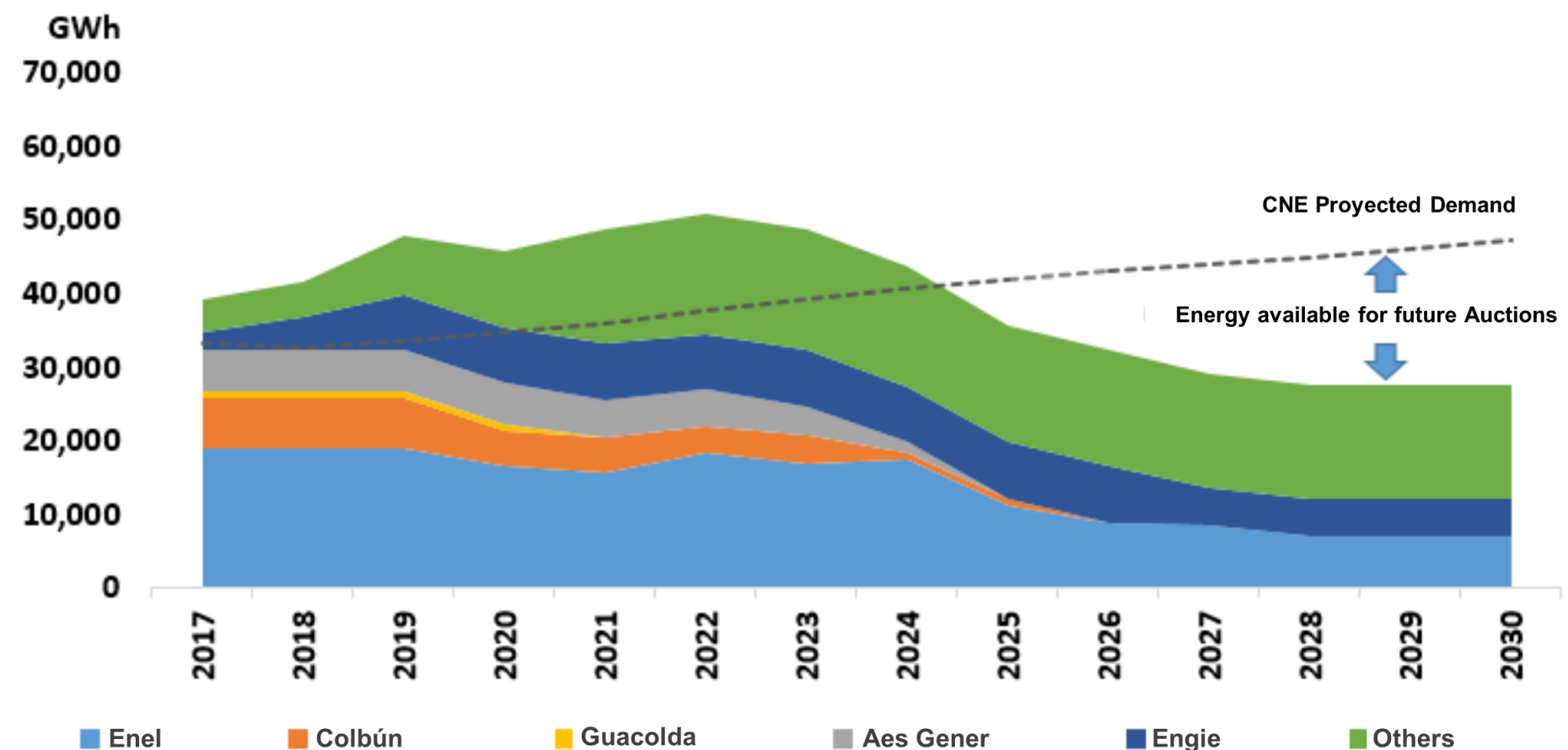
Energy auctioned	2,200 GWh
Offers	24
Companies	24
Reserved price	81.5 USD/MWh
Average price	33 USD/MWh



SolarReserve
bid price:
48.064 US\$/MWh

REGULATED CUSTOMERS

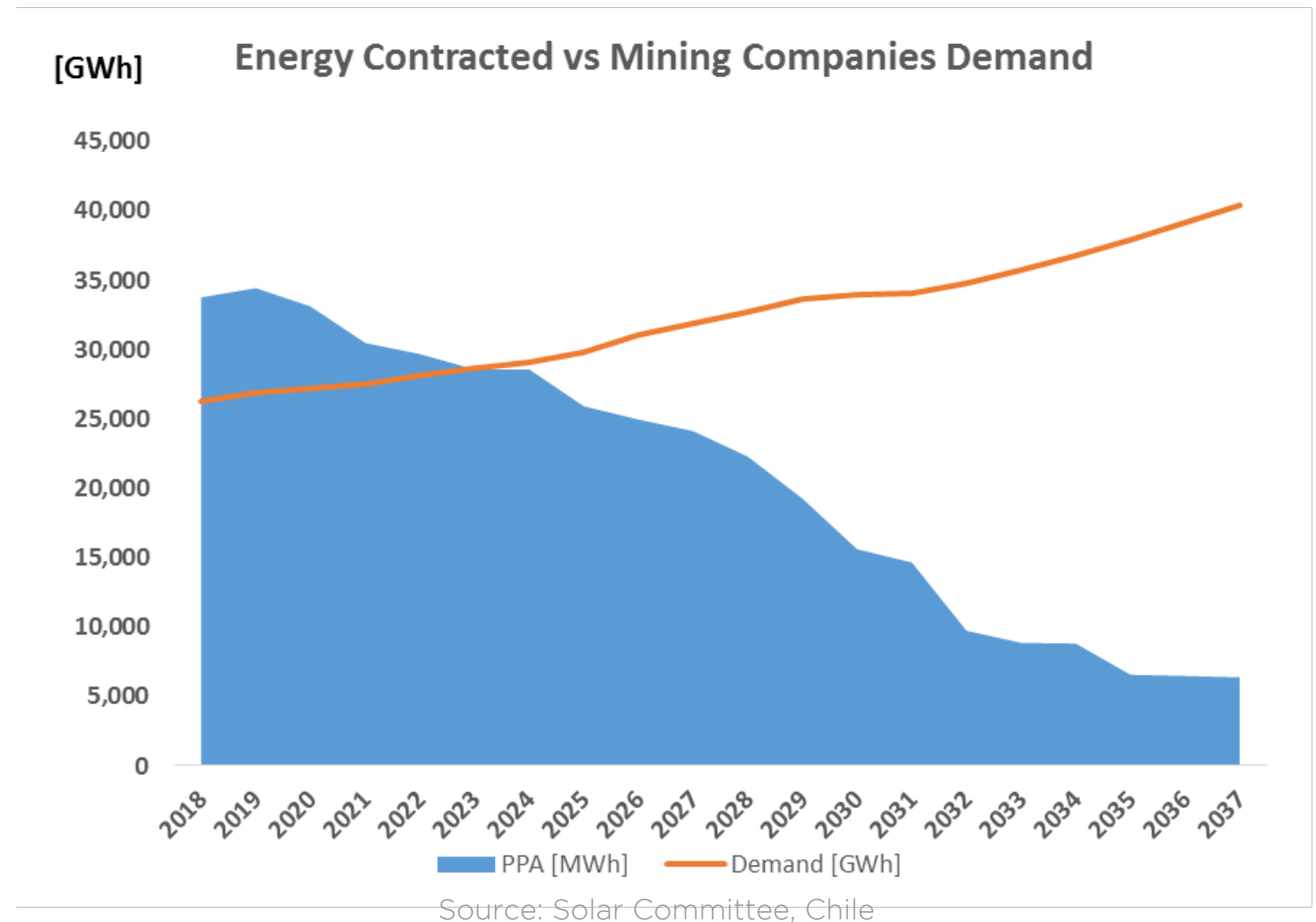
- From the year 2025, a gap for new regulated customers auction appears
- In year 2025 the gap is around 5,000 GWh and it grows up to 15,000 GWh in 2030



Source: CNE

NON-REGULATED CUSTOMERS

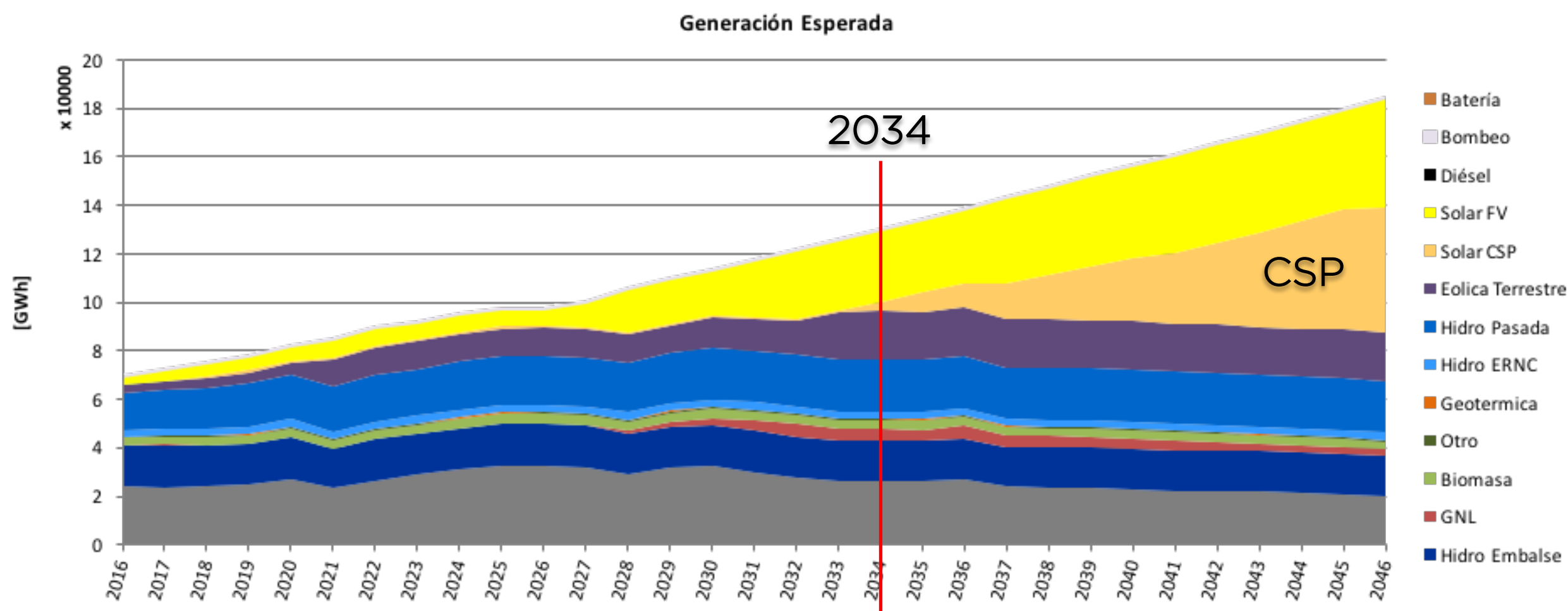
- From the year 2023, the PPA contracts of the mining companies start to expire
- In year 2025 the gap is around 4,000 GWh and it grows up to 34,000 GWh in 2037



LONG TERM ENERGY PLANNING - SCENARIO B VERSION FEB 2018

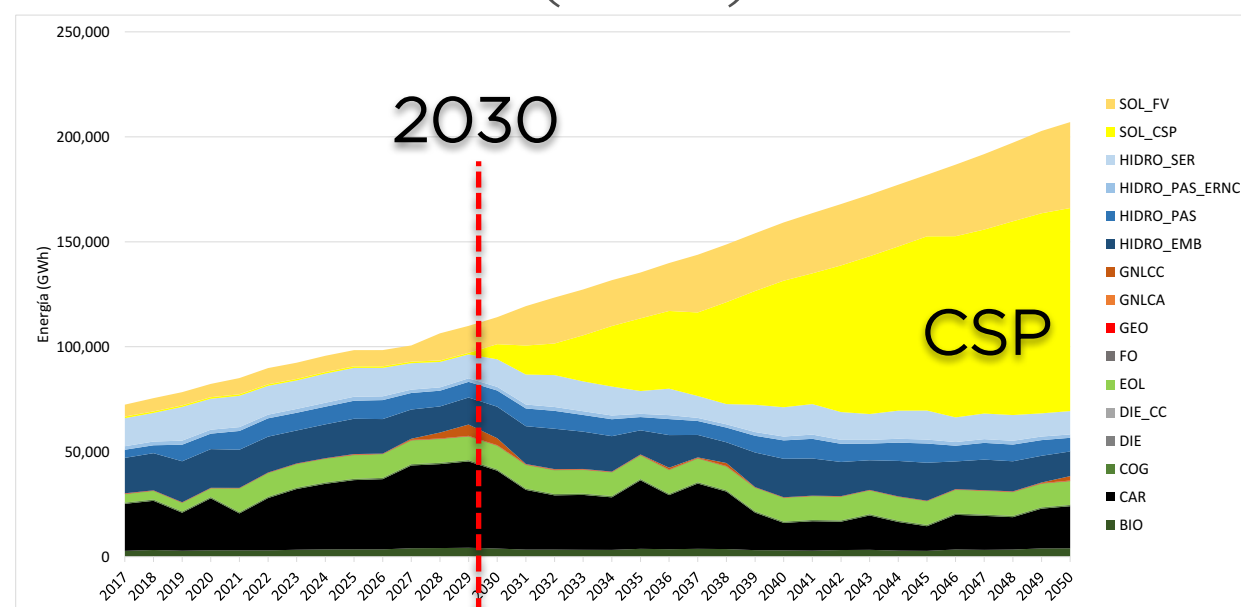
Scenario B Long Term Energy Planning

CSP - 2034 Available at <http://pelp.minenergia.cl/informacion-del-proceso/resultados>



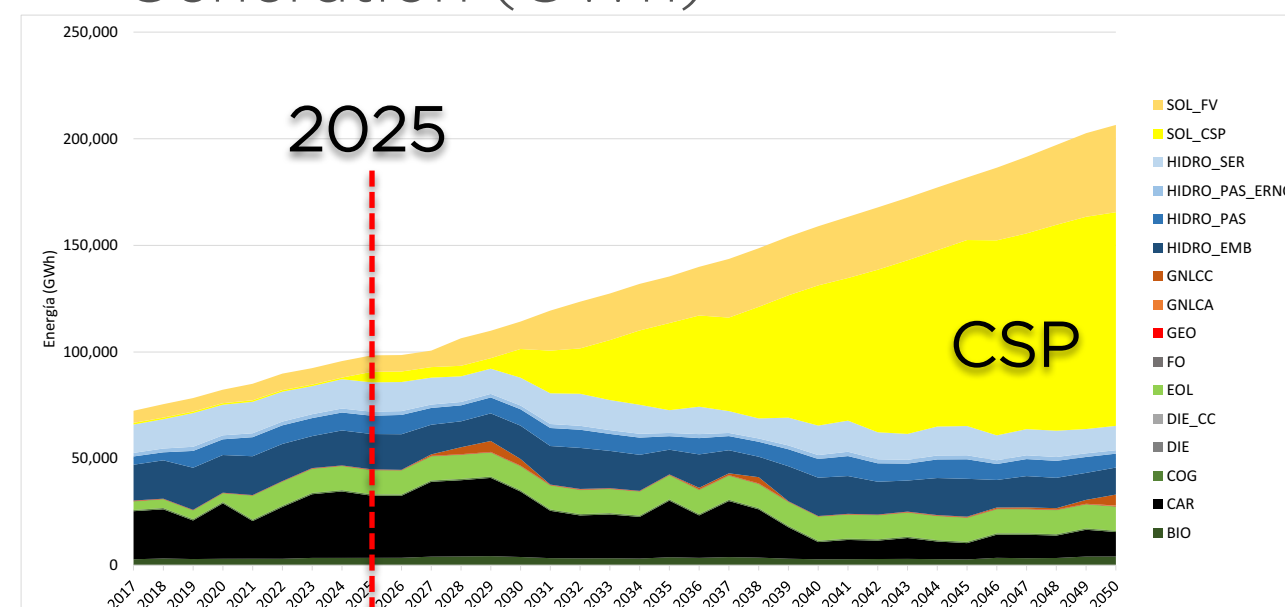
SENSITIVITY ANALYSIS PELP

Generation (GWh)



Assumptions:
LCOE 50 USD/MWh 2025

Generation (GWh)

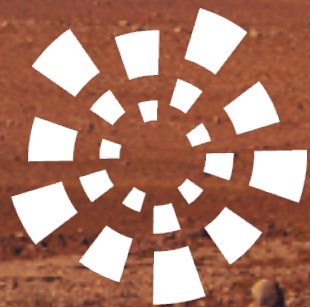


Assumptions:
LCOE 50 USD/MWh 2025
Phasing out Coal Plants > 40 years



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