



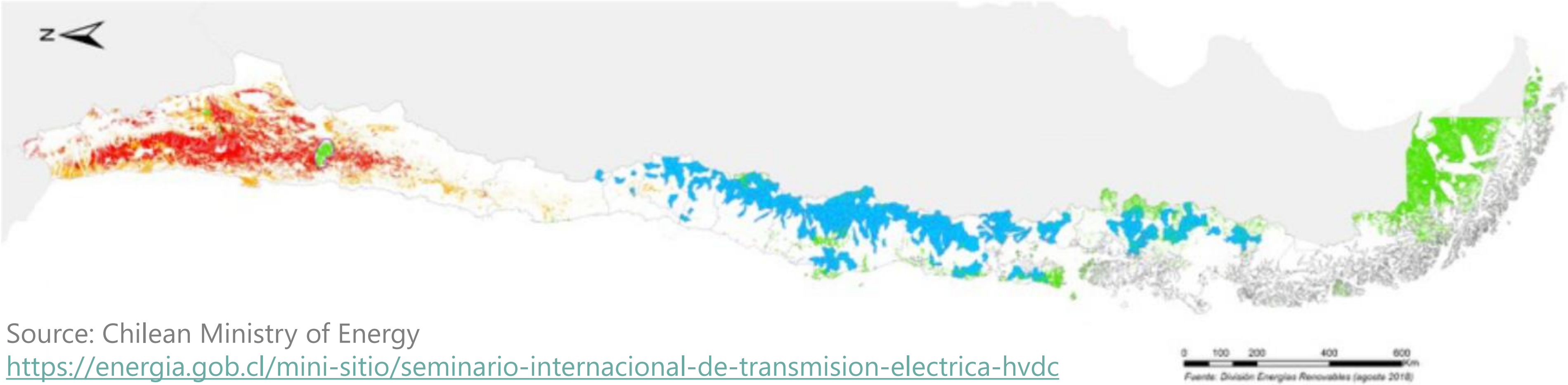
Analysis of potential conversion of coal-fired plants in Chile

Juan Carlos Olmedo
Chairman of the Board

February 24th, 2021

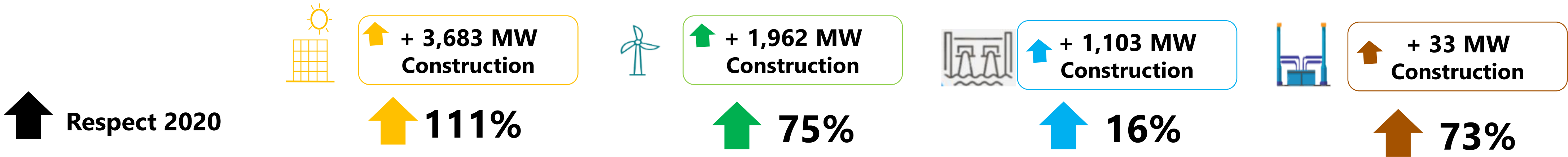
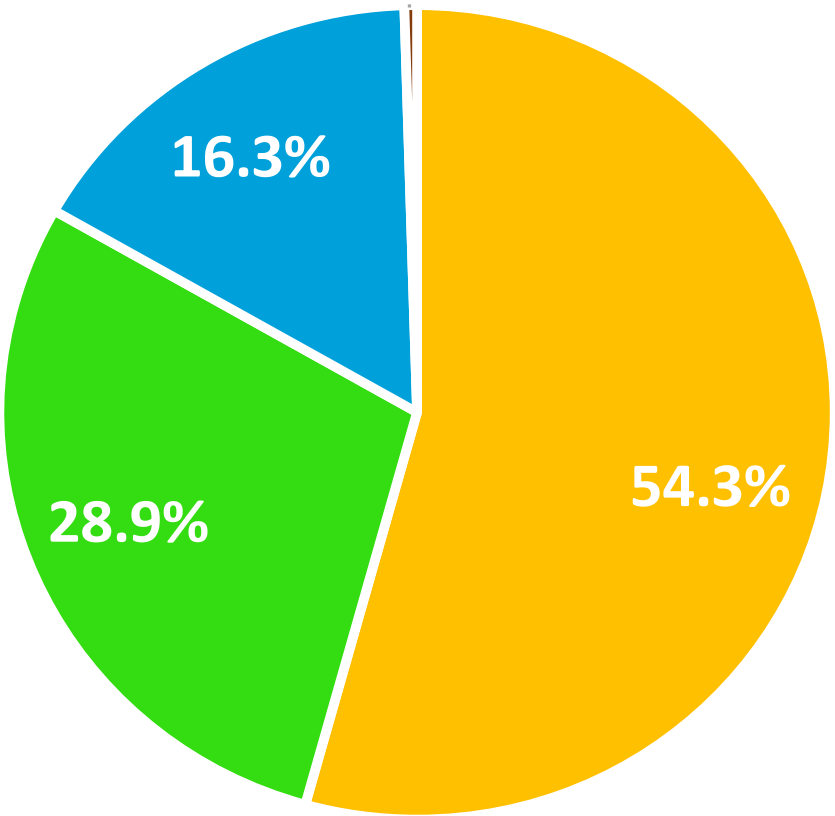
Renewable Resources in Chile

Chile has a large potential renewable resources for power generation: >1,800,000 MW of wind, solar and hydro resources



Projects under construction 2021
6,781 MW

- Solar
- Wind
- Hydro
- Geothermal



Coal Plants decommissioning in Chile

- Coal plants in Chile by 2019: **28 units – 5,500 MW**
- 2020 energy generation from coal plants: **35,2%**
- Current Decommissioned Coal Plants (575 MW):
 - Tocopilla: U12 y U13 - **173 MW**, Iquique: CTTAR - **158 MW**, Puchuncaví: Ventanas 1 - **114 MW and** Coronel: Bocamina 1 - **130 MW**
- First stage of coal decommissioning schedule represent 30% of coal installed capacity
- A Law initiative promoted by Congress has been proposed to accelerate coal decommissioning by 2025.

Iquique 158 MW
Tocopilla 718 MW
Mejillones 2,176 MW

Huasco 760 MW

Puchuncaví 872 MW

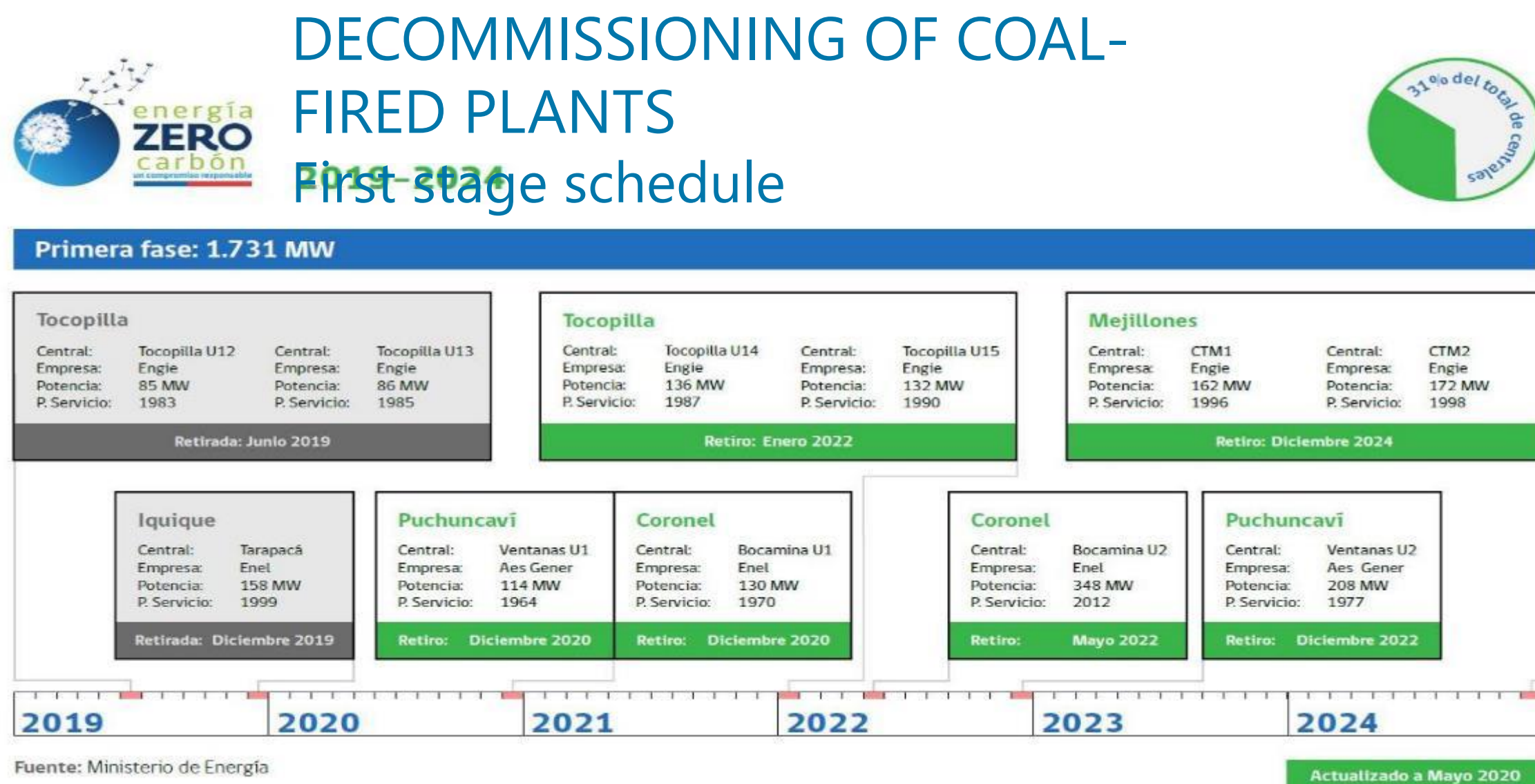
Coronel 850 MW

55%

13%

15%

15%

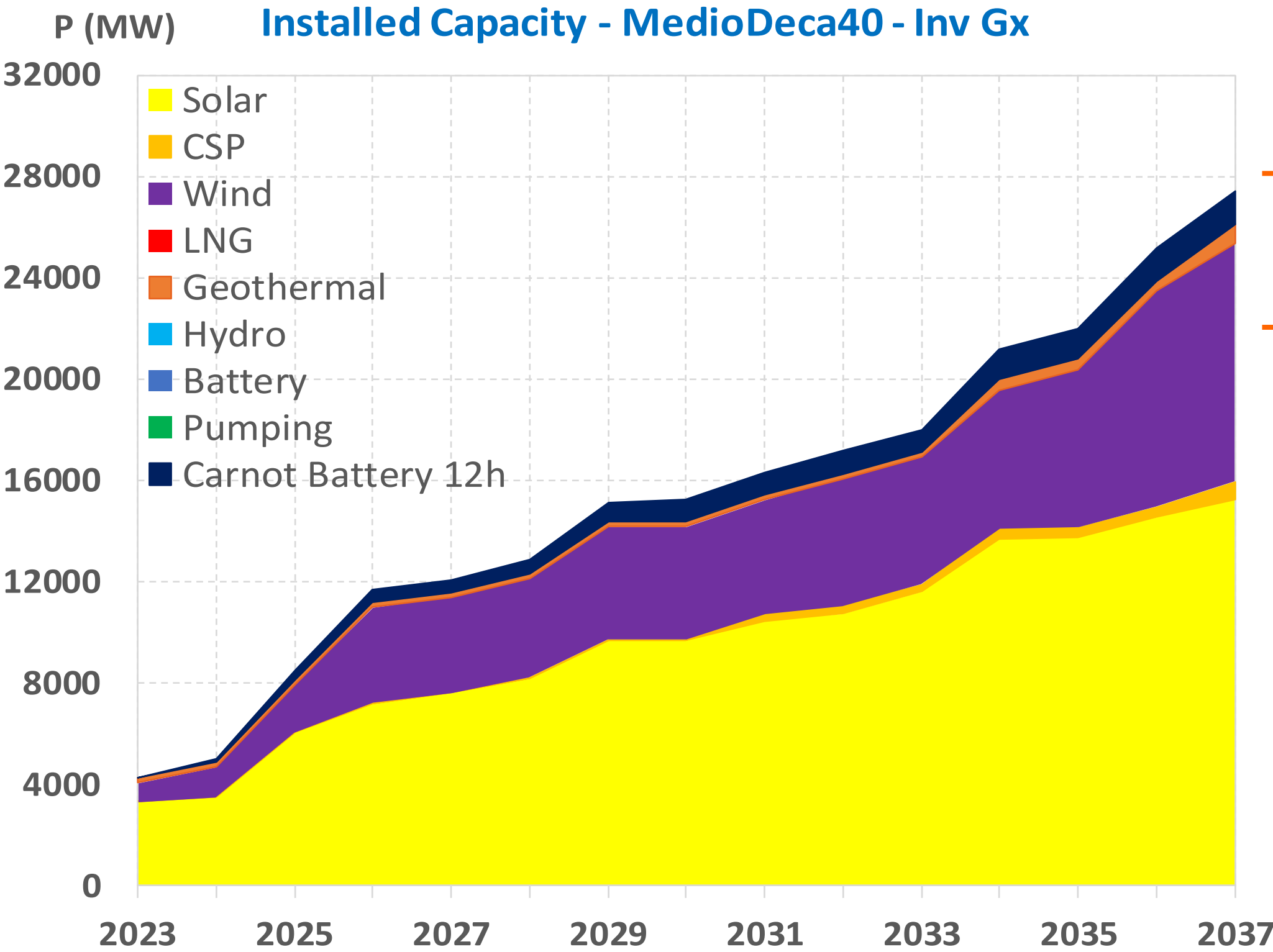


- Investment in renewable generation plants and transmission lines are necessary to **mitigate** impacts of **coal decommission and transport renewable generation**. More than 20,000 Millions USD of additional investments are required in period 2020-2040.
- Project development will need equity, permits and financing.
- Sustainable recovery leveraged by transmission system improvement: upgrade and new transmission facilities.
- Power system needs minimum levels of inertia, short circuit capacity, reactive power support, ramp management
 - Asset recycling of conventional synchronous generation power plants.
 - Additional power storage capacity
 - CSP, CAES, hydro reservoirs, geothermal, pump hydro, electric batteries, Hydrogen, PTx.
 - Emerging technologies (Grid forming inverters)
- **Asset recycling** of existing **coal-fired power plants** into Thermal Storage Plants. Replacing primary energy (**coal**) by renewable energy generation stored in tanks of **molten salts**.

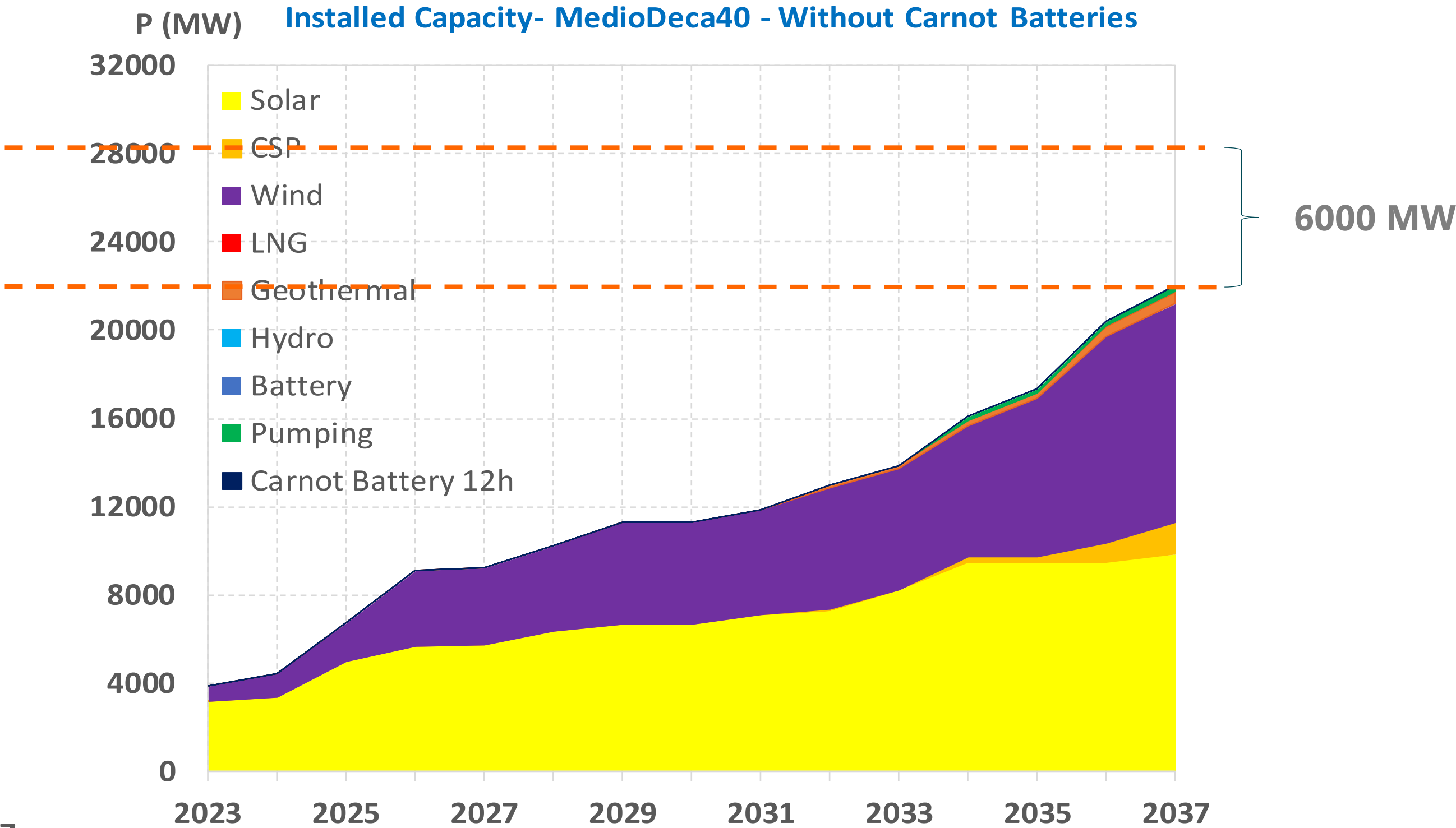
Asset recycling based on Carnot Batteries make feasible a higher RE share

Coal Decommissioning by 2040

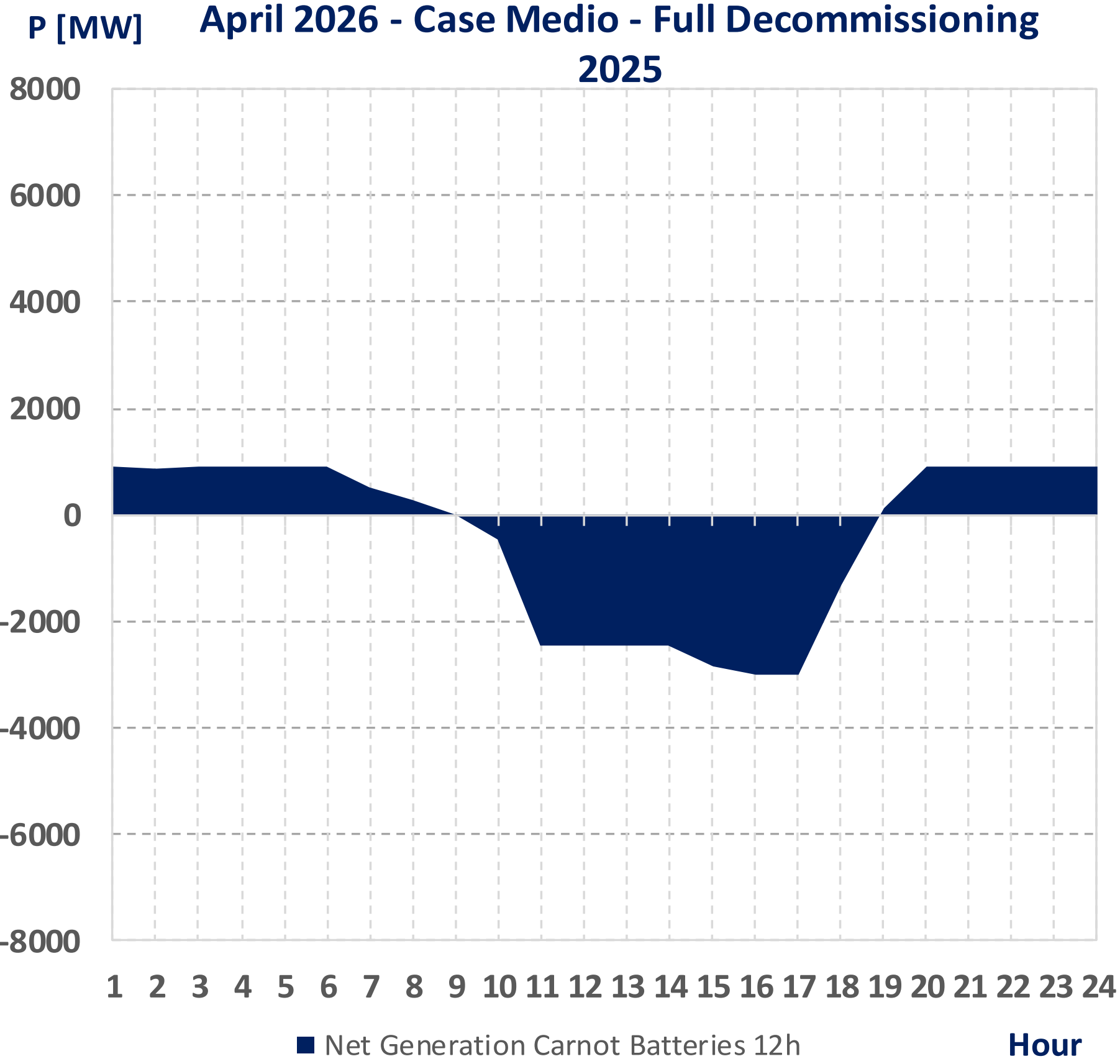
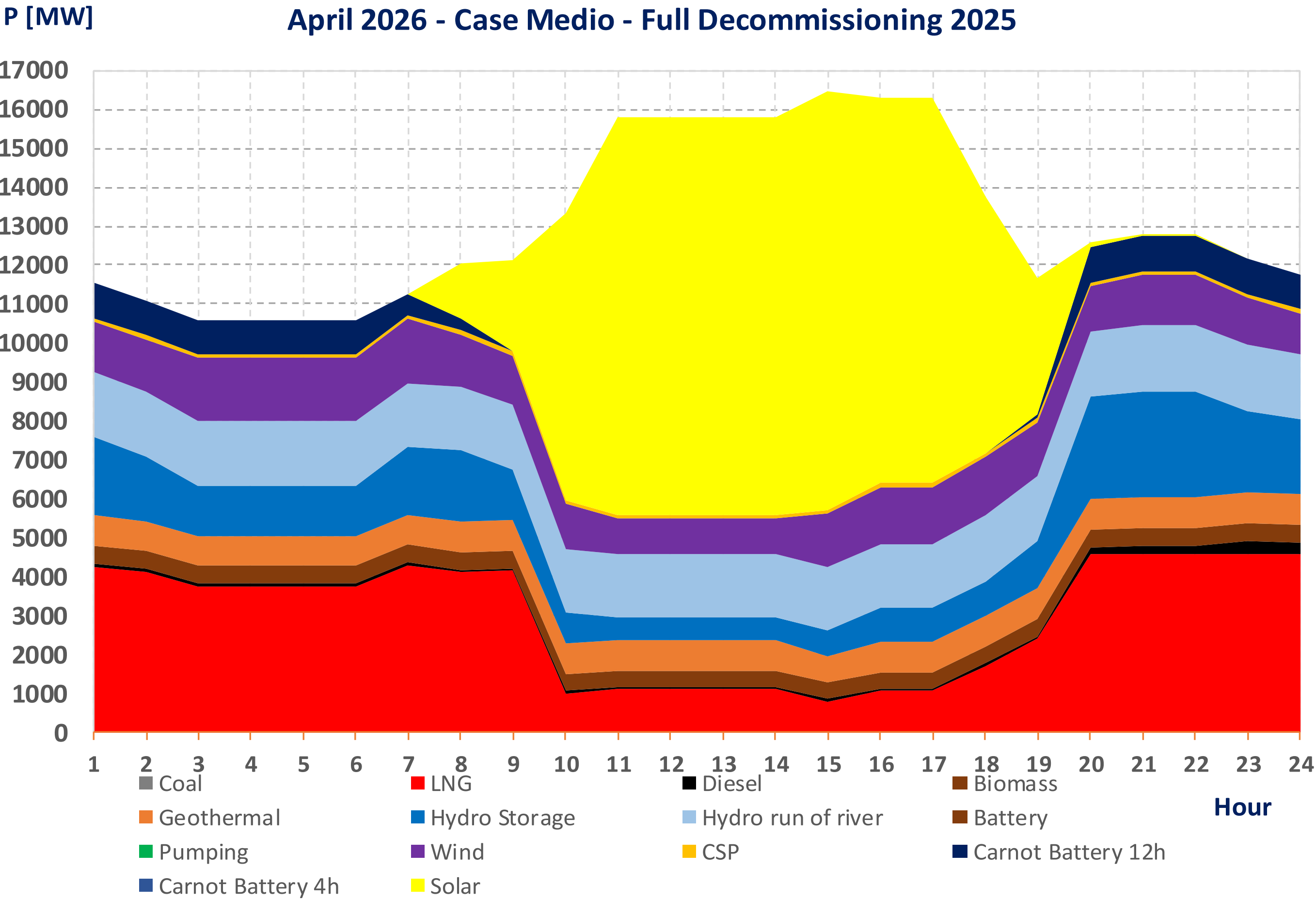
w/ Carnot Batteries



No Carnot Batteries



Study Case : Full Decommissioning 2025



- Increase generation levels of Solar PV as a source to charge Carnot Batteries. Charge in hours of maximum solar generation and discharge at night blocks.
- Discharge of Carnot Batteries during nights reduce LNG dispatch at hours in which solar generation is zero.

- Energy transition needs a focus on reliability and quality of service of power system.
- Accelerating decarbonization process requires smart and cost-effective solutions.
- Asset recycling appears an attractive solution to accelerate decarbonization:
 - Efficient levels of coal-fired plants conversion are between 30% and 70% of existing capacity.
 - Feasible coal plants conversion in short term: 1,640 MW.
 - High complementarity between Carnot batteries and solar PV technology.
 - Reduction in needs of new transmission capacity.
 - Carnot batteries alternative provide inertia, short circuit capacity and reserves.
 - Minimum environmental impact.
 - Allow acceleration of generation matrix decarbonization process and emission reduction.
- Innovative financing resources for asset recycling is needed.