

Green Hydrogen for Climate Action

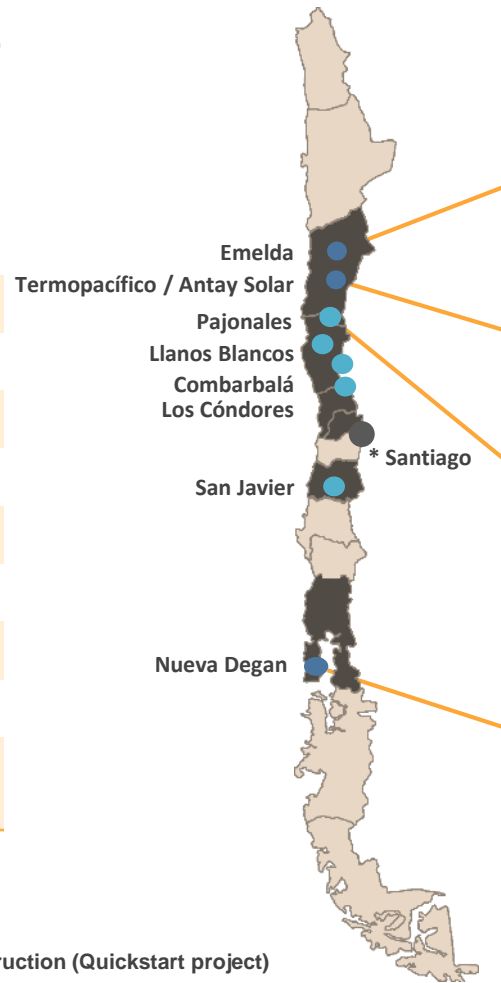


PrimeEnergía

CEO Rodrigo Cienfuegos P.

Prime Energía in Chile

| | |
|-----------------------|---------------|
| Emelda | 72 MW |
| Genpac | 96 MW |
| Antay Solar | 9 MW |
| Pajonales | 100 MW |
| Llanos Blancos | 150 MW |
| Combarbalá | 75 MW |
| Los Cóndores | 100 MW |
| San Javier | 50 MW |
| Nueva Degan | 50 MW |
| Total Capacity | 702 MW |



Backup Power Plants to support renewables



Solar initiative in PRIME Energía Power Plants



- In Chile renewables; solar, wind, already have surpassed 20% share in power generation.
- But thermal (mainly coal, natural gas and diesel) still account for 40%+ of yearly power generation.
- Due to variability of sun and wind, they require flexible support that spans from seconds to days.

FACING CLIMATE CHANGE
IS TASK OF ALL OF US
TIME FOR ACTION

DECEMBER 2 - 13, 2019



Jules Verne

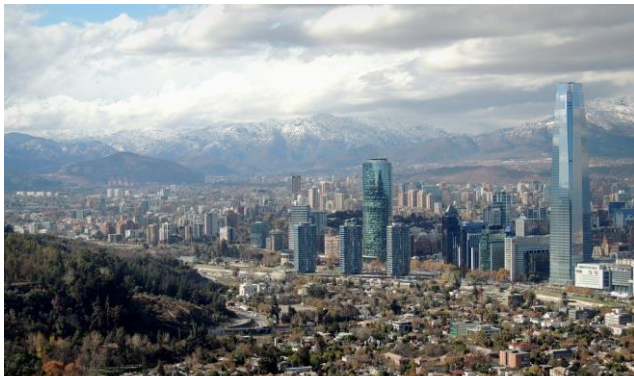


I believe that water will one day be employed as fuel, that hydrogen and oxygen which constitute it, used singly or together, will furnish an inexhaustible source of heat and light, of an intensity of which coal is not capable.

AZ QUOTES

Energy and Environment

¿How do we meet energy needs AND care for the environment?



New Technologies

Market must incorporate different technologies to allow more flexibility



Technological advance is allowing the replacement of existing GHG emitting technologies. There are technologies like additives and emulsions that allow for step improvements with low investment and radical technologies like hydrogen and other not emitting technologies

What is going on in Chile

Government support for non emitting technologies

- Electric and gas driven buses are being promoted
- Supports technological development of local lithium industry.
- Sponsored Hydrogen technologies study (performed by GiZ, Germany).
- Supports development of hydrogen driven vehicles for open pit and underground mining (hydrogen motor drives and fuel cells).





HYDROGEN – Fuel for a sustainable Future

- Coal is being phased out. Chile till 2040, and could be even 2030.
- Hydrogen in diesel engines for electricity generation.
- Decreasing costs of hydrogen from renewables technology could make hydrogen based combustion engines more reliable than diesel ones.
- All or a significant part of existing infrastructure can be used.

Hydrogen facts

Highest energy density
by weight.
120-140Mj / kg (-253 ° C)

Infrastructure
Possible to use existing one:
motors, turbines, boilers.

Emisiones
No CO2 emissions.

Production
Can be mixed with
conventional liquid
fuels lowering
emissions as well as
slight cost reductions.

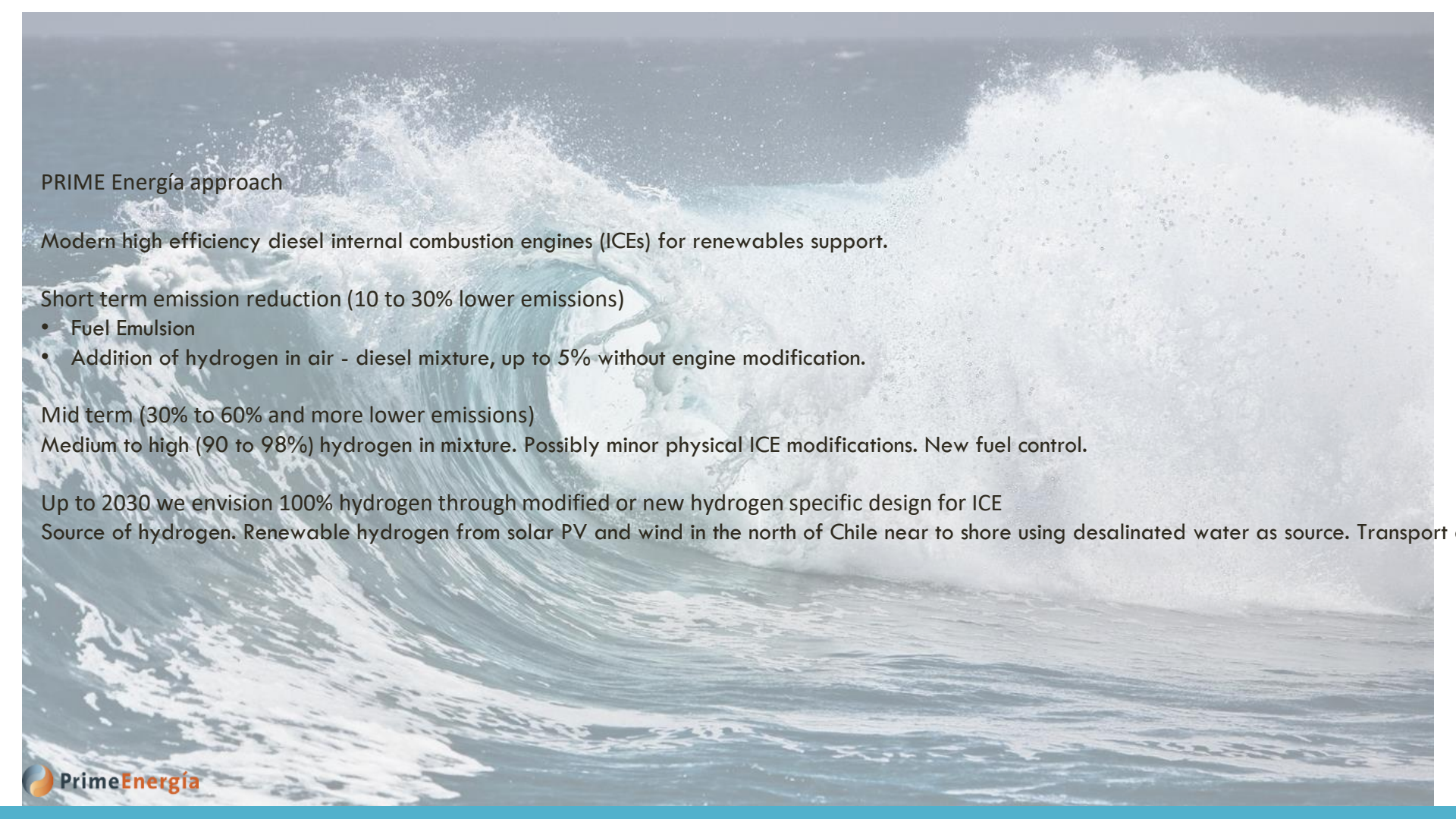
Maintenance
Reduced maintenance due to a
cleaner fuel.

Fuel Emulsion. Till Hydrogen arrives

Reformed (R-Fuel / Hybrid Fuel), reduces emissions dramatically



Innovative technology allows the use of existing motors or combustion equipment without modifications with no loss of power and efficiency. Significant improvement in emissions and costs, using existing infrastructure



PRIME Energía approach

Modern high efficiency diesel internal combustion engines (ICEs) for renewables support.

Short term emission reduction (10 to 30% lower emissions)

- Fuel Emulsion
- Addition of hydrogen in air - diesel mixture, up to 5% without engine modification.

Mid term (30% to 60% and more lower emissions)

Medium to high (90 to 98%) hydrogen in mixture. Possibly minor physical ICE modifications. New fuel control.

Up to 2030 we envision 100% hydrogen through modified or new hydrogen specific design for ICE

Source of hydrogen. Renewable hydrogen from solar PV and wind in the north of Chile near to shore using desalinated water as source. Transport



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CEO Rodrigo Cienfuegos P.

tel. +56 2 3210 5200

mail: rodrigo.cienfuegos@prime-energia.com