

# A new mix of power for the ESO installations in Chile: greener, more reliable, cheaper.

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European Organisation for Astronomical Research in the Southern Hemisphere (ESO)

According to one of the goals set in its green initiatives, namely "<u>To have a strategy that supports reducing costs, lowering complexity, and increasing</u> operating and energy efficiency", ESO is undertaking the following projects:

### LA SILLA PV PLANT

In July 2014 ESO signed an agreement with the Chilean company, Astronomy & Energy (at the time a subsidiary of the Spanish LKS Group, but now part of ENEL Green Power, EGP), to install a solar farm. Construction ended in May 2016 and the plant is planned to be fully operational in July.



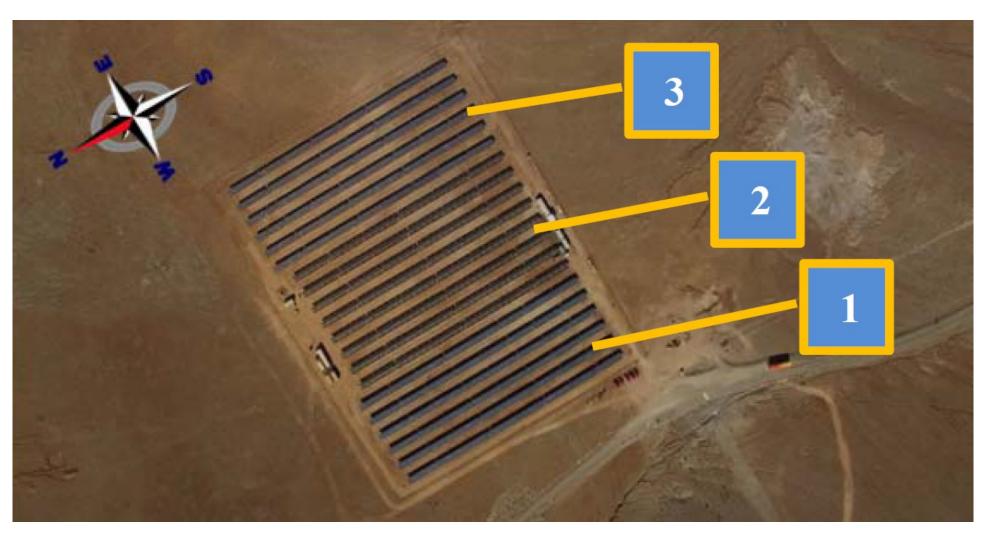
#### PARANAL POWER LINE

In collaboration with the Chilean authorities, in 2013 a study indicated for Paranal and future E-ELT installation that "the development of a transmission line (to the existing grid) would satisfy the primary system goal, which is to facilitate astronomic observation in a more reliable, cost effective, and environmentally friendly manner". The Chilean company SAESA

## ALMA GAS PIPELINE

As neither connection to grid (about 150km away) nor a pure solar installation (without connectivity to grid, the cost for energy storage would be prohibitive) are at present viable solutions, the construction of a gas pipeline to a main Natural Gas (NG) pipeline in San Pedro has been chosen to reduce operational costs, CO2 footprint, and also the negative effects, and

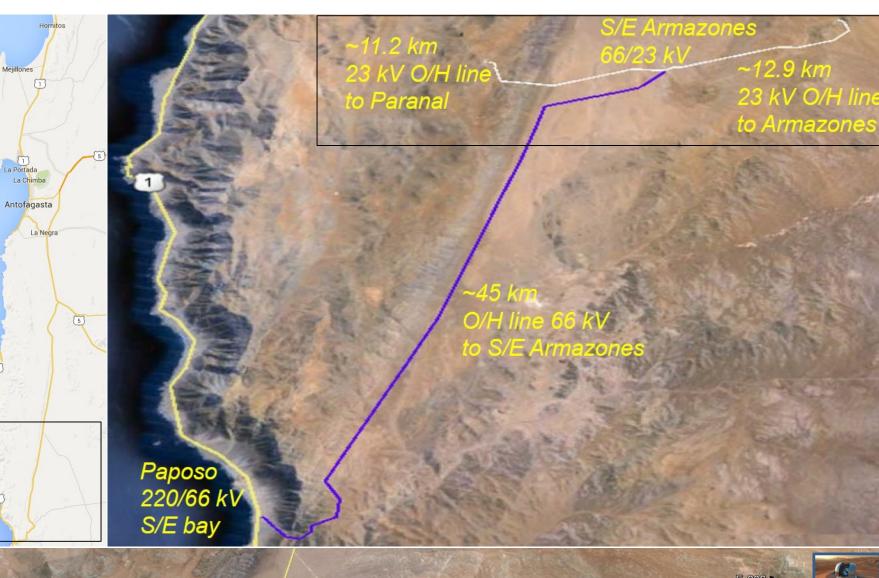
The solar plant, named also La Silla in honor to the nearby observatory, has an installed capacity of 1.7MW covering approximately 100 000 m2, at about 5 km from the Observatory and it is intended not only to produce energy, but also to test new technologies.



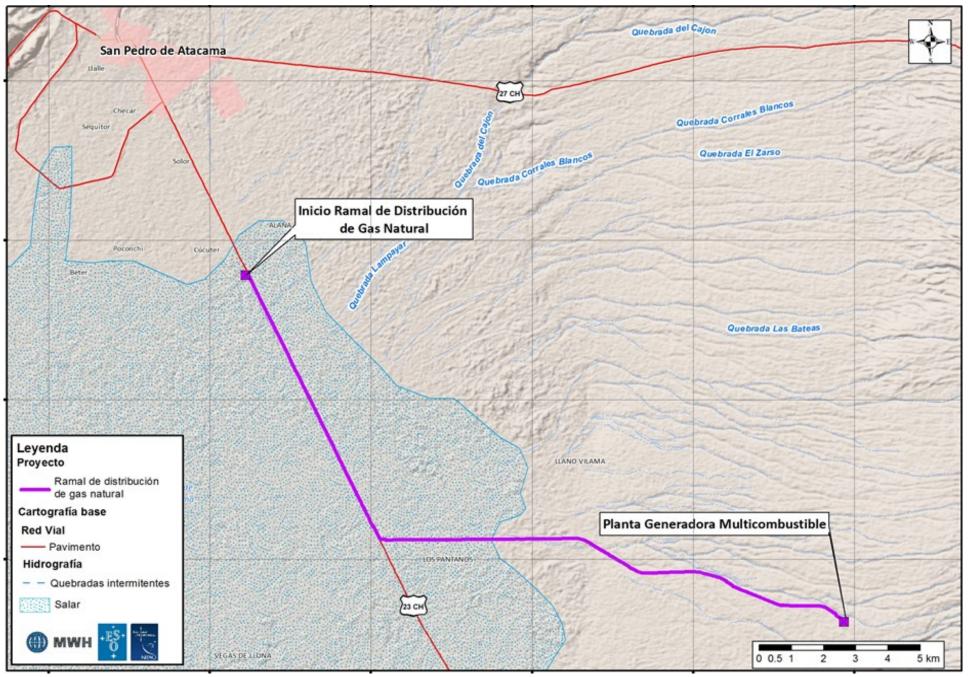
<u>Standard</u> poly crystalline modules.
<u>Bifacial</u> monocrystalline N-type photovoltaic

expressed their interest in extending the grid line and to supply ESO. Construction started in May 2016 and it is due to completion by mid 2017. Key Elements:

- 220/66 kV substation to connect to the existing SIC transmission system in Paposo.
- 66kV line (~45km) from Paposo to ESO area.
- 66/23 kV "Armazones" substation.
- 23kV line (~11km) to Paranal (VLT, VLTI, VISTA).
- 23 kV line (~13km) to Cerro Armazones (E-ELT).



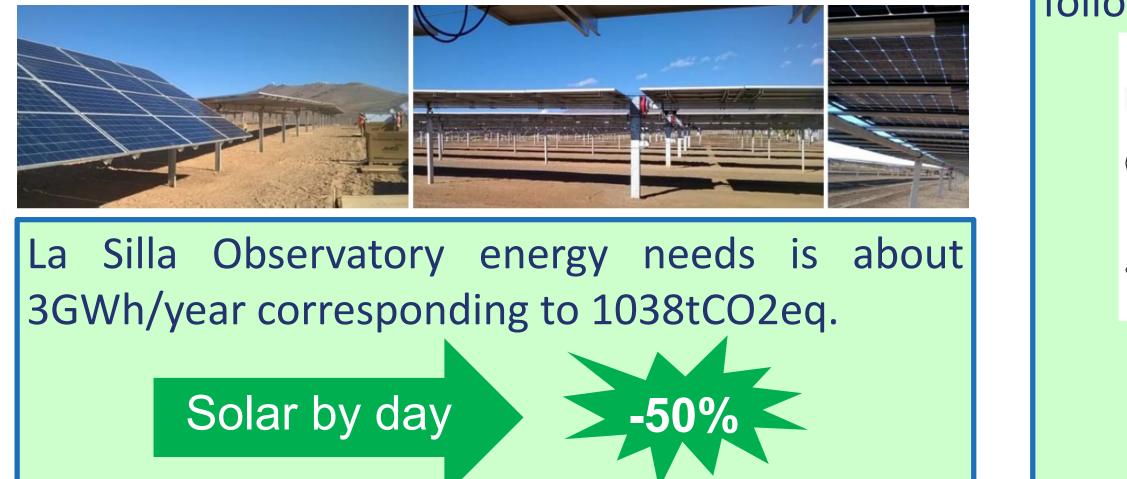
accident risks, caused by the LPG trucks traffic. The layout of the pipeline was selected to minimize the environmental impact by closely following existing roads for a total of 25km.



The project will also use an innovative reinforced polymeric pipe that offers faster installation and flexibility to better adapt to natural constrains.

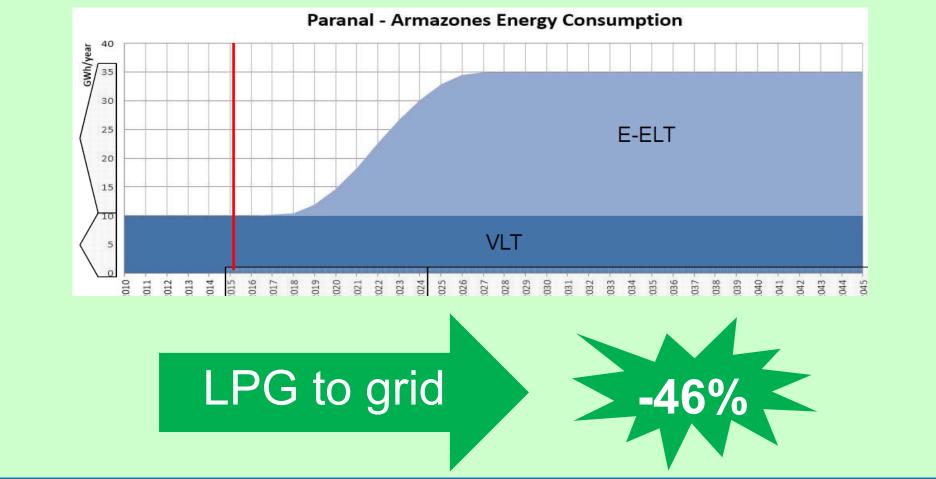


- modules with active surface on both sides. As also the radiation reflected from the ground is used to produce energy, they are expected to have 15 to 30% more production.
- 3) <u>SMART</u> panels with advanced electronics that manage the loss of power due to mismatch in the level of generation of a single panel or among various panels due to shading, soiling, aging, temperature gradients. Expected increase of productivity up to 20%.





Paranal Observatory energy needs is about 10GWh/year covered by local generation with LPG turbines producing 7,450tCO2eq. In April 2016, the Chilean grid was 44% renewable (Hydro and NCRE). Energy needs will ramp up with the E-ELT construction and operations as in the following picture.



In May 2016, the required Environmental Impact Study has been submitted to the Chilean authorities, and according to the current plan, construction completion is expected during 2018. Below, two moments of the preparation of the environmental impact study: meeting with the local communities and census of the fauna (a bat)



ALMA Observatory energy needs is about 22GWh/year corresponding to 16,398tCO2eq.

LPG to NG



#### **EXPECTED/ACHIEVED ENVIRONMENTAL BENEFITS**

#### **Expected CO2 reduction in t/year as consequence of the implementation of the planned projects**

**Other benefits:** 

In the case of PAO and ALMA: the benefits both in terms of lower emissions and less overall risks that one can achieve by avoiding the LPG delivery by trucks.

In the case of PAO: the creation of the transmission line could foster ESO to install new NCRE facilities improving the overall energy mix.

For all cases: a reduction in CO2 means also reductions in other greenhouse gasses.

