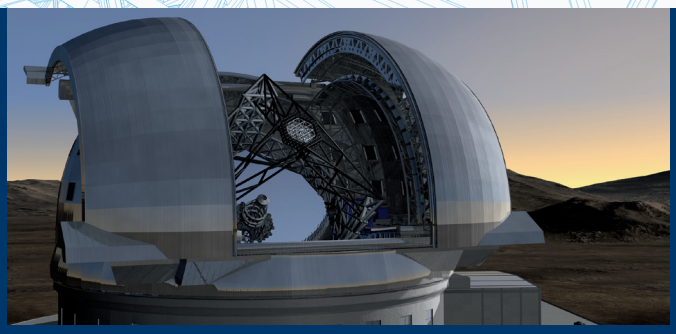


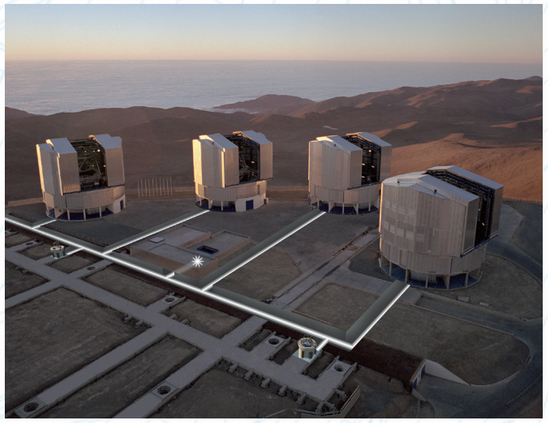
Grid Electricity Supply

Armazones (E-ELT)

Paranal (VLT)

ESO – the European Southern Observatory (formally known as the European Organisation for Astronomical Research in the Southern Hemisphere), is the foremost intergovernmental astronomy organisation in Europe and the world's most productive astronomical observatory. It is supported by 15 countries: Austria, Belgium, Brazil, the Czech Republic, Denmark, France, Finland, Germany, Italy, the Netherlands, Portugal, Spain, Sweden, Switzerland, the United Kingdom and hosted by Chile. ESO carries out an ambitious programme focused on the design, construction and operation of powerful ground-based observing facilities enabling astronomers to make important scientific discoveries. ESO also plays a leading role in promoting and organising cooperation in astronomical research. ESO operates three unique world-class observing sites in Chile: La Silla, Paranal and Chajnantor. At Paranal, ESO operates the Very Large Telescope, the world's most advanced visible-light astronomical observatory and VISTA, the world's largest survey telescope. ESO is the European partner of a revolutionary astronomical telescope ALMA, the largest astronomical project in existence.

ESO Headquarters in Garching, Germany

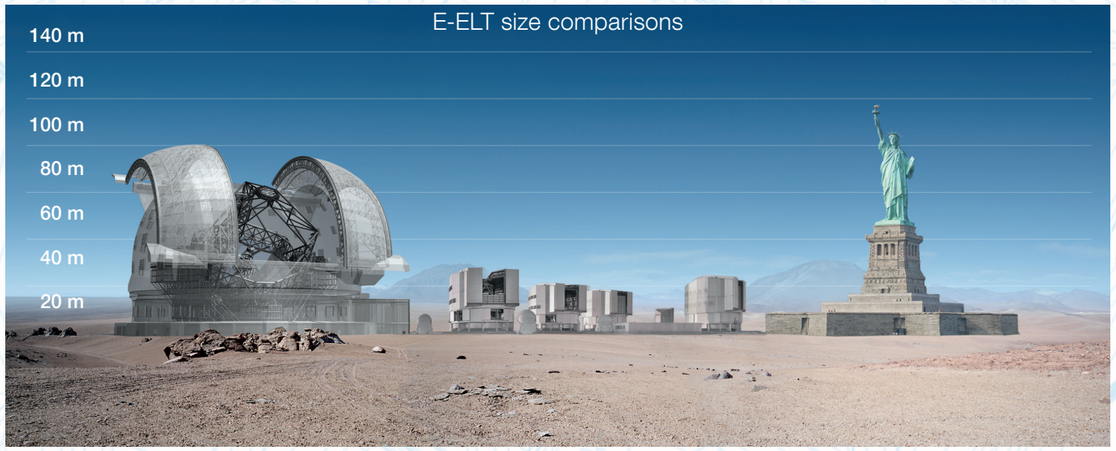


Paranal (VLT)

ESO premises in Vitacura Santiago, Chile

La Silla Observatory

Chajnantor (ALMA)



E-ELT VLT Statue of Liberty

The European Extremely Large Telescope

ESO is currently planning to construct an optical/near-infrared telescope, known as the European Extremely Large Telescope (E-ELT), at Cerro Armazones, 20 km east from Paranal, which will become "the world's biggest eye on the sky". This project has the potential to become a powerhouse for economic development, offering contractors an opportunity to lead projects not only at an intergovernmental level, but also internationally.
The E-ELT will revolutionise our understanding of the Universe, much as the first telescopes did 400 years ago, when Galileo first pointed one to the sky. The E-ELT will tackle the biggest scientific challenges of our time, and aim for a number of notable firsts, including tracking down Earth-like planets around other stars in the habitable zones where life could exist. Although 20 km away from Paranal, the E-ELT will share the infrastructure with the VLT.

Grid electricity supply

The electric power requirements of the ESO's VLT and E-ELT Observatory warrant a grid connection. The estimated total power demands are:

	Paranal (VLT)	Armazones (E-ELT)	Total
Instantaneous peak power[1]	2 500 kVA	10 000 kVA	12 500 kVA
Maximum power demand[2]	1 800 kVA	6 000 kVA	7 800 kVA
Yearly energy consumption	10 GWh/y	30 GWh/y[3]	40 GWh/y[3]
Internal ESO distr. voltage	10 kV	15 kV[4]	

Notes
[1] IEV 726-06-03 instantaneous peak power (in a transmission line): the maximum instantaneous power passing through a given transverse cross-section of a transmission line during the interval of interest.
[2] IEV 691-02-02 demand: the power delivered by an electricity supply, expressed in kilowatts or kilovolt-amperes
[3] Estimated demand. Significantly lower power demand is expected during construction.
[4] 15 kV is the preferred value. Other values can be accepted if they provide technical or standardisation advantages.

The Project

Construction of the Paranal substation (S/S): This shall include one incoming high voltage (HV) line bay, one HV/15 kV power transformer bay, one HV/15 kV, 12.5 MVA transformer, 15 kV busbars, two 15/10 kV transformer bays, two 15/10 kV, 5 MVA transformers and two 15 kV underground cable line bays to transfer power to Armazones.

The nominal voltage U_n = 15 kV is to be confirmed, whereas U_n = 10 kV is the nominal voltage of Paranal's medium-voltage (MV) power system. The bays shall be complete, and include all civil and electrical infrastructure, required isolators, circuit-breakers, current transformers (CTs), voltage transformers (VTs), surge arresters and earth electrodes.

The substation capacity shall be able to fulfil all the power needs at Armazones from the Paranal standby generation facility in the event of grid failure, after the isolation of the Grid-to-Paranal line. Indoor MV switchgear may be used, instead of MV busbars and bays. All the required measuring, control and protection equipment for the S/S shall be included in the contractor's scope of supply. The substation shall include all civil and electrical infrastructure (such as area, fencing, foundations, ducting, oil catch basins and earthing, etc.) to make a future extension possible — including a second overhead line from the Grid and a second HV/MV power transformer bay with the same characteristics as above.

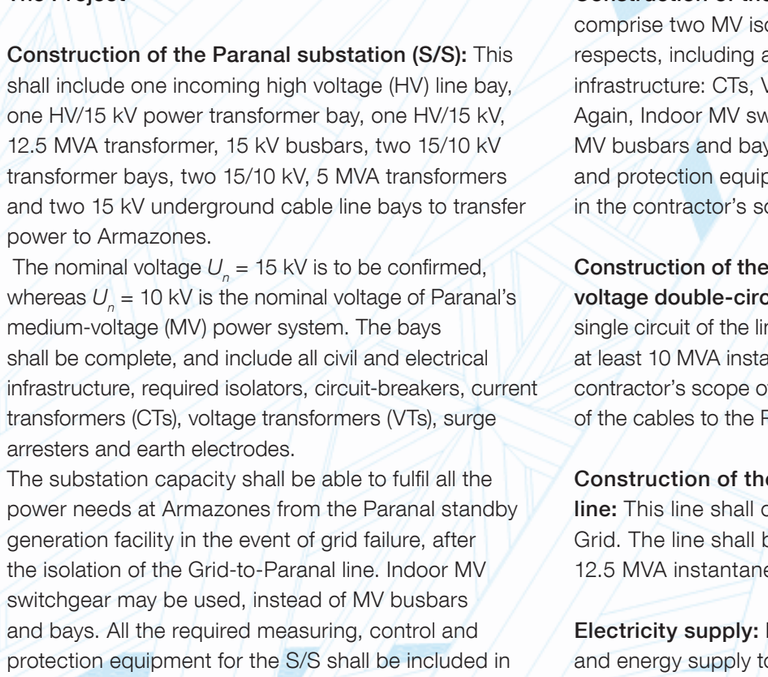
Construction of the Armazones S/S: This shall comprise two MV isolator bays, complete in all respects, including all required civil and electrical infrastructure: CTs, VTs, surge arresters, earthing etc. Again, Indoor MV switchgear may be used, instead of MV busbars and bays. All required measuring, control and protection equipment for the S/S shall be included in the contractor's scope of supply.

Construction of the Paranal-to-Armazones medium-voltage double-circuit underground cable line: Each single circuit of the line shall be capable of transmitting at least 10 MVA instantaneous peak power. The contractor's scope of supply shall include the connection of the cables to the Paranal and Armazones S/S.

Construction of the Grid-to-Paranal HV overhead line: This line shall connect the Paranal S/S to the Grid. The line shall be capable of transmitting at least 12.5 MVA instantaneous peak power.

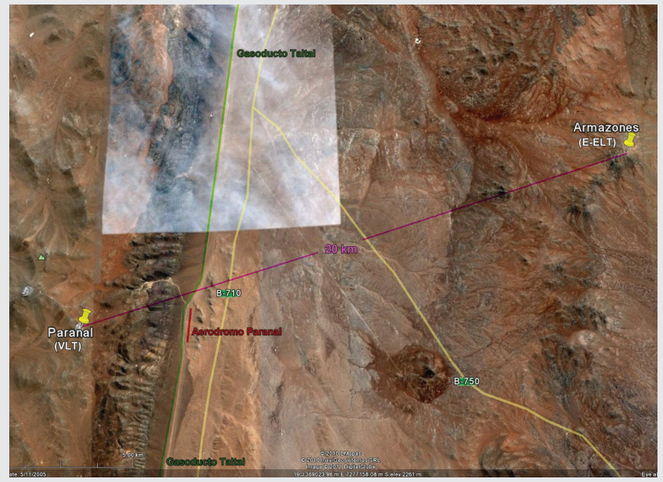
Electricity supply: ESO asks that the electric power and energy supply to the Observatory shall last for at least 30 years.

Maintenance: Provision for corrective and programmed regular preventive maintenance to the entire power supply system (i.e., the Grid-to-Paranal overhead line, the Paranal-to-Armazones cable line, the Paranal S/S and the Armazones S/S), shall be made to minimise power outages and their effects.



Timelines

ESO astronomers and astrophysicists have been working since 2005 to refine the design for the E-ELT. Performance, cost, schedule and risks have been carefully evaluated. The go-ahead for E-ELT construction is expected in 2011, with the start of operations planned for the end of the decade.

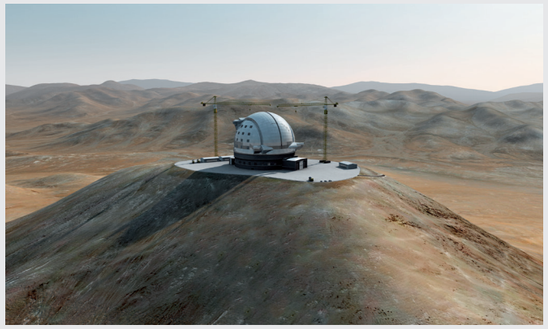


2011

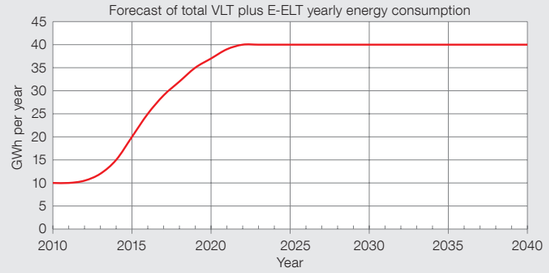
2012

2014

2016

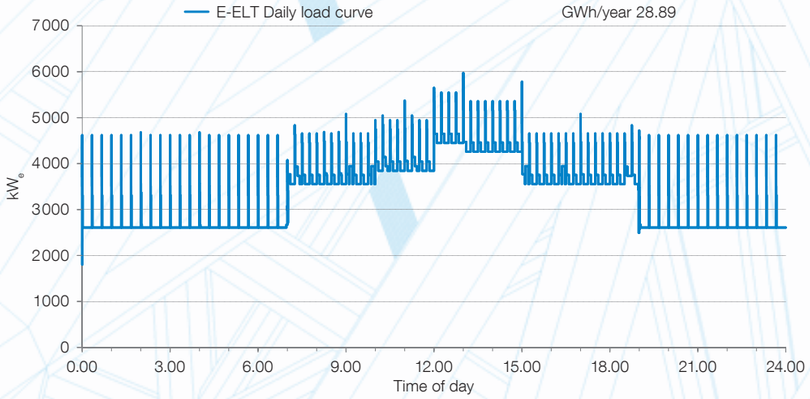


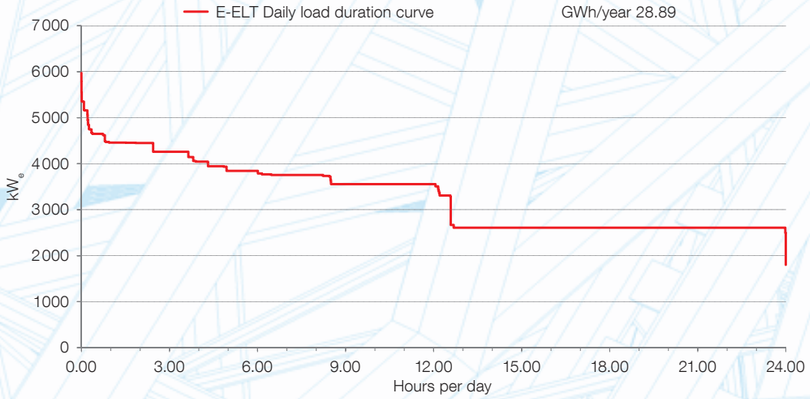
2020

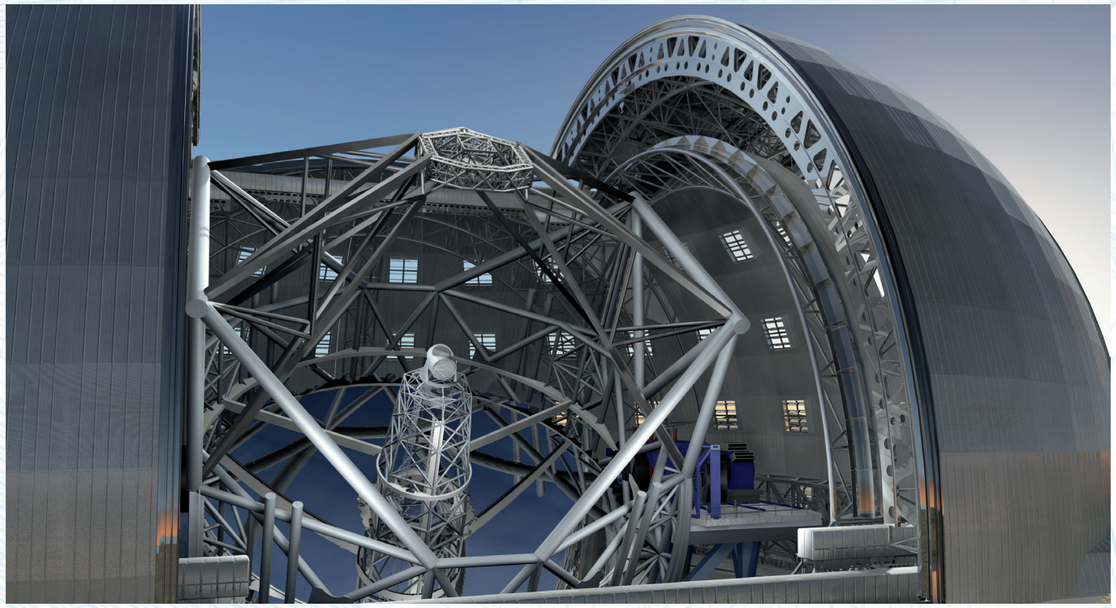


Electric load characteristics

Paranal (VLT) loads are established, well-known and smooth, but estimated Armazones (E-ELT) loads are peculiar, with high active five second load peaks. The local use of flywheels or static synchronous compensators (STATCOMs) might be necessary to smooth out the power demand at Armazones.





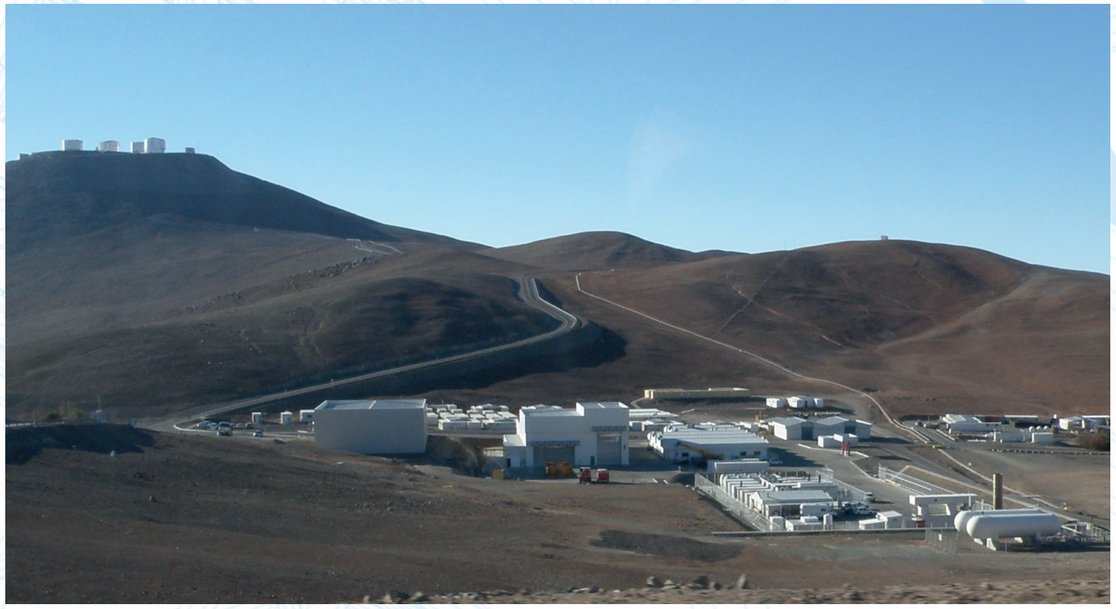


Standby power system

There is an existing power generating station at Paranal that supplies power to the Paranal area.
This power station comprises:
– one multi-fuel turbine generator set (rated 2.6 MWe at the site);
– three diesel generator sets (3×856 kW_e).

All generators are directly connected to the 10 kV distribution network at Paranal.

The facility can be upgraded if necessary and will be used as a standby power generation system for both VLT and E-ELT after the Observatory has been connected to the Grid.



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