



Istituto Nazionale di Fisica Nucleare  
LABORATORI NAZIONALI DEL GRAN SASSO

***One-day workshop on underground physics***  
*Gran Sasso National Laboratory*

May 30, 2019

**LNGS technical facilities and safety plants**

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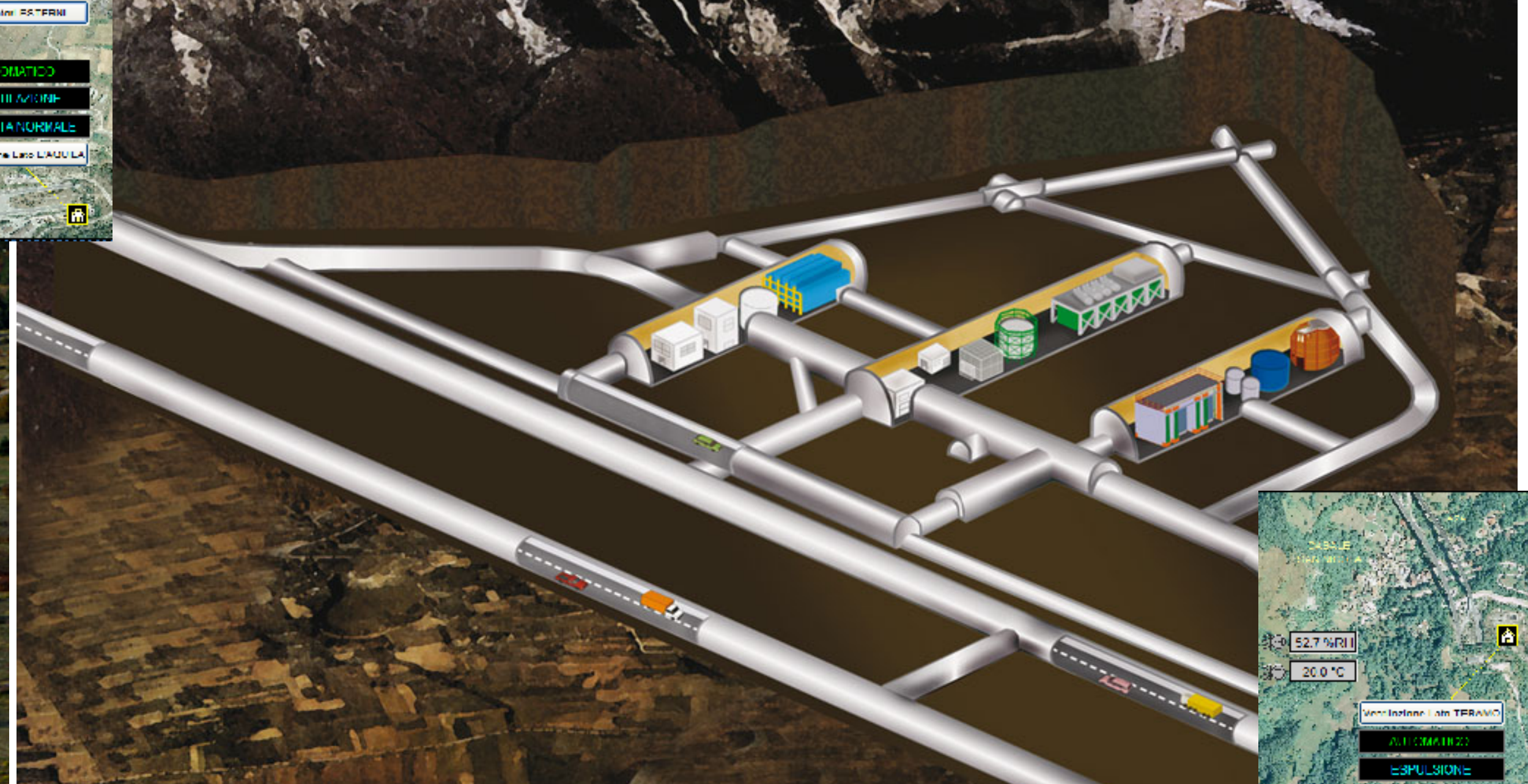
# Technical and General Services Division

## Services

- Electrical
- Fluid Systems
- Fire Protection and Safety
- Building maintenance and General Services
- Mechanical
- Underground Structure

## Four different locations

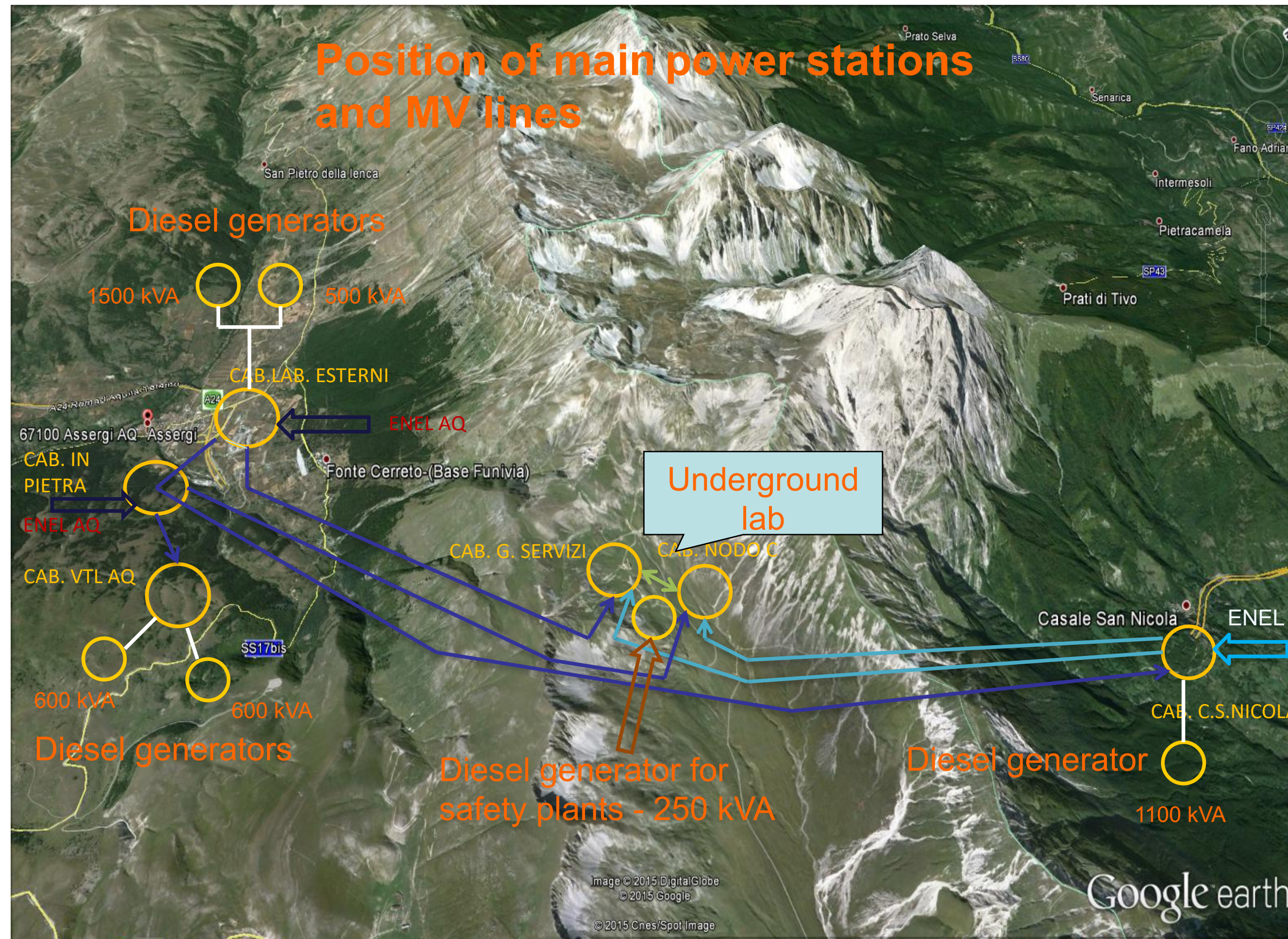
- External Laboratories
- Underground Laboratories
- Ventilation Plant (Casale San Nicola)
- Ventilation Plant (Assergi)



# Main Underground Technical Infrastructures

- Electrical Power
- Ventilation
- Cooling system
  
- Oxygen sensors
- Fire detection systems
- Fire fighting systems

# Electrical power - Medium voltage (20 kV)



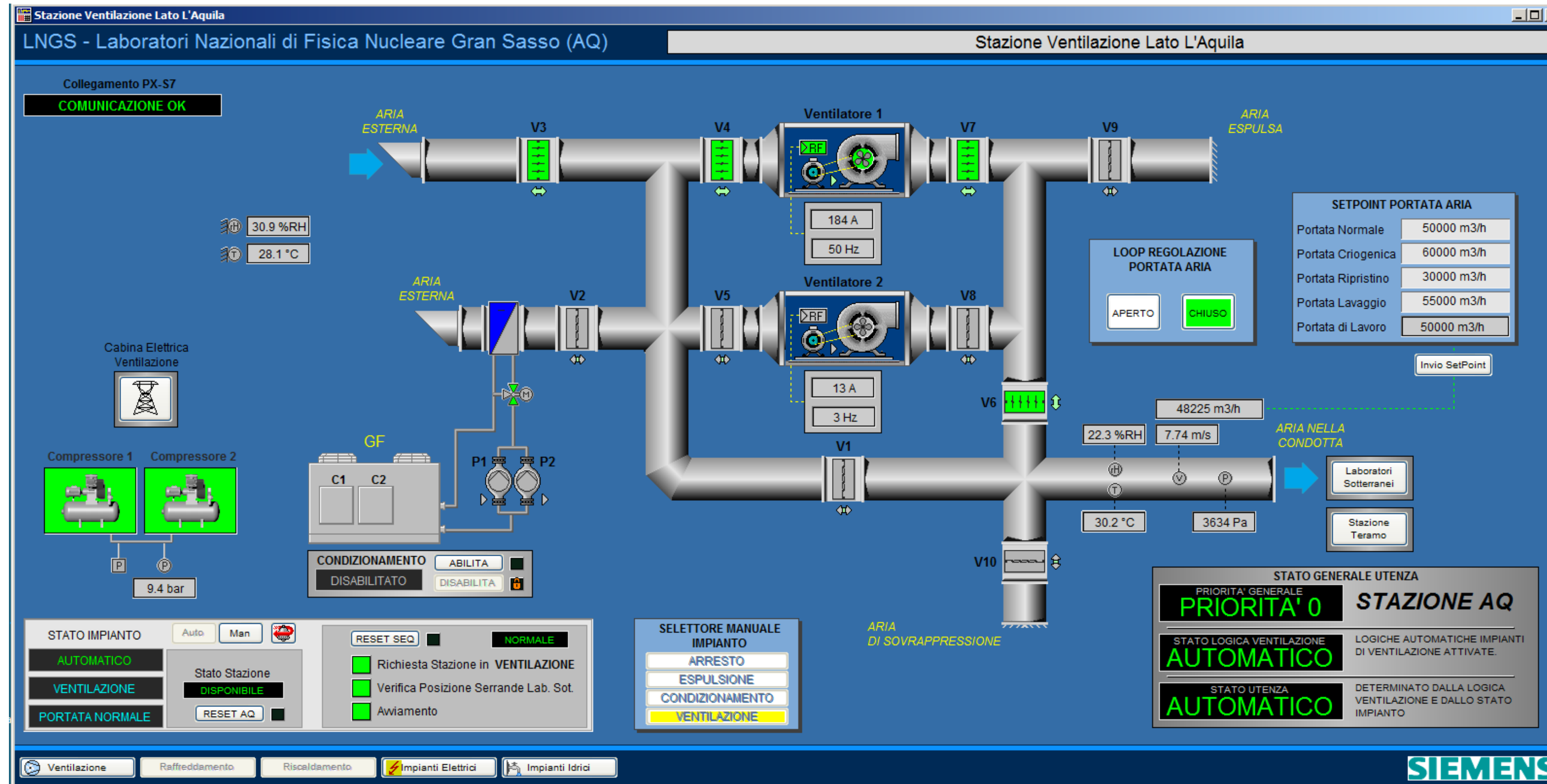
- Installed power 2,15 MW
- Redundancy of delivery point (L'Aquila, Teramo)
- Automatic switching system from one to other line in case of power absence in one of the lines for both underground power stations
- Diesel Generators for both external supply station
- LV Diesel Generator for direct power of emergency plants underground (hall C fire fighting plant)
- L'Aquila ventilation station with redundant (2) Diesel Generators
- Casale S. Nicola Ventilation station only 1 Diesel Generator but power from L'Aquila station

# Electrical power - Main data



- Installed power 2,15 MW
- N. 5 MT/bt transformer substations
- 9 Resin transformers 20/0,4 kV from 630 to 1600 kVA
- N. 28 UPS ( from 10 to 300 kVA);
- 6 Diesel Generators from 250 to 1500 kVA

# Ventilation



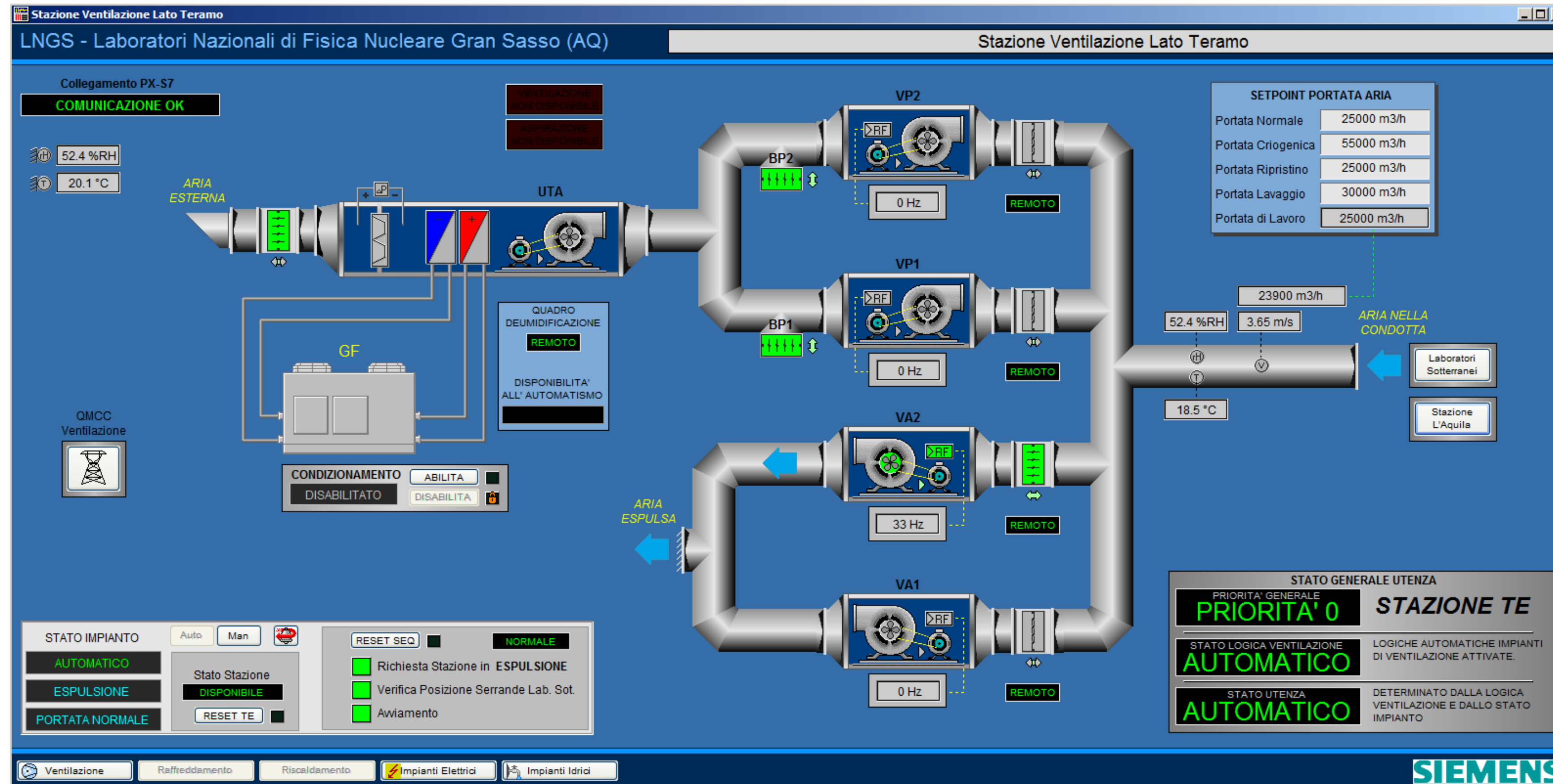
## L'Aquila Station:

Maximum flow: 60.000 m<sup>3</sup>/h;

Two electric fans (one backup);

Two diesel generators for electrical backup one redundant;

# Ventilation



## Teramo Station:

Maximum flow: 50.000 m<sup>3</sup>/h;

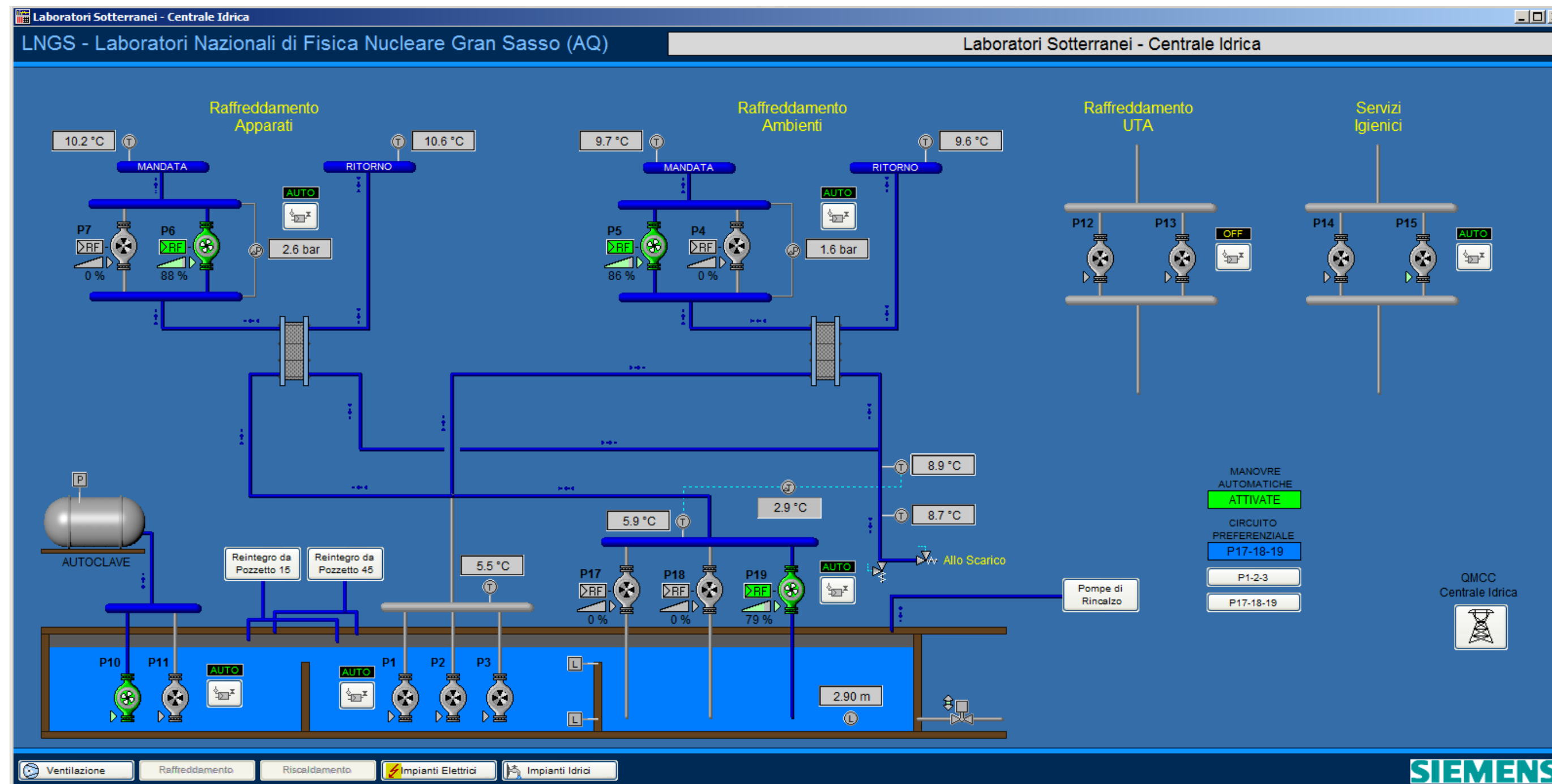
Two electric fans (one backup) for air inlet;

Two electric fans (one backup) for air extraction;

One diesel motor for electrical backup, in addition Teramo power station could be fed by L'Aquila power station;



# Cooling system



- Maximum power 1,1 MW
  - Maximum water flow rate 90 l/s
  - Water temperature between 9°C - 12°C
  - 6 pumps for the primary circuit (3 of which for backup);
  - 3 exchangers (one for backup);
  - 2 pumps for experimental apparatuses cooling - secondary circuit (one for backup);
  - 2 pumps for fan coils (environment cooling) - secondary circuit (one for backup);
  - various pumps for other services
- Automatic regulations

# Oxygen and gas sensors



**CO, CO<sub>2</sub>, NO<sub>x</sub>**

- Car tunnel
- Tir tunnel
- Halls A,B,C



**LeI detector**

- Borexino
- LVD



**VOC detector**

- Borexino

**O<sub>2</sub> sensors**

- Cryogenic areas



**Portable sensors**



Local Alarm Panel

Loop interface box

Draeger O<sub>2</sub> sensor

# Fire detection systems



## Laser scanner (Vesda)

- Hall A
- Hall B
- Hall C



## Laser scanner (Quadra)

- Car tunnel
- Tir tunnel



## Smoke detector

- Boxes
- Offices

## Other systems

- Thermostick
- Flame detector (UV)
- Temperature

# Fire fighting systems

## Water mist

- LVD
- Borexino
- Hall A
- Car tunnel
- Tir tunnel



## Foam

- Borexino
- Hall C



## Red Devil

- Hall B

## Niagara

- Main doors



## Other systems

- Fire hoses
- Inergen
- 190 Fire extinguishers of different types