

DE LA RECHERCHE À L'INDUSTRIE

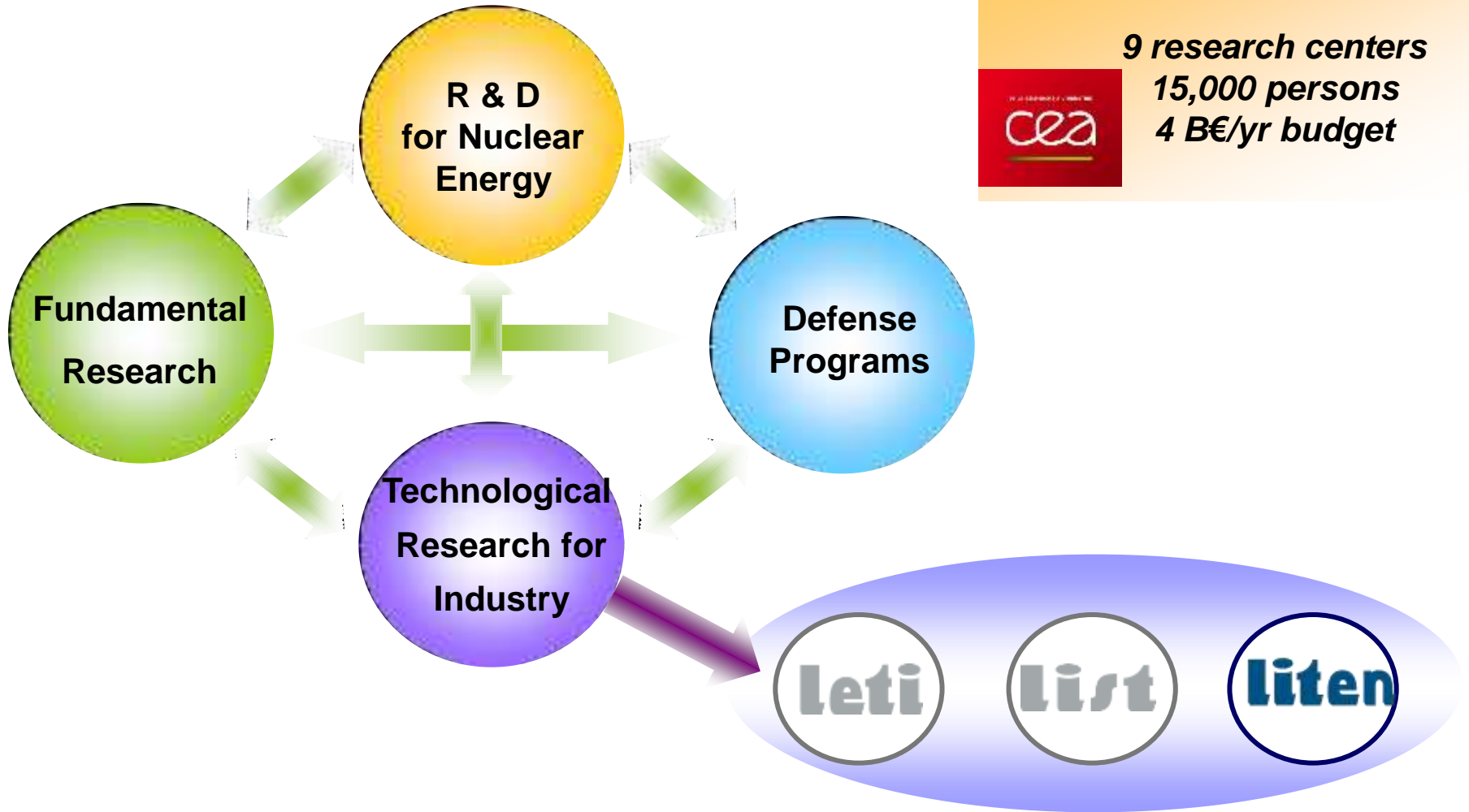


Solar Thermal for Micro Grids



www.cea.fr

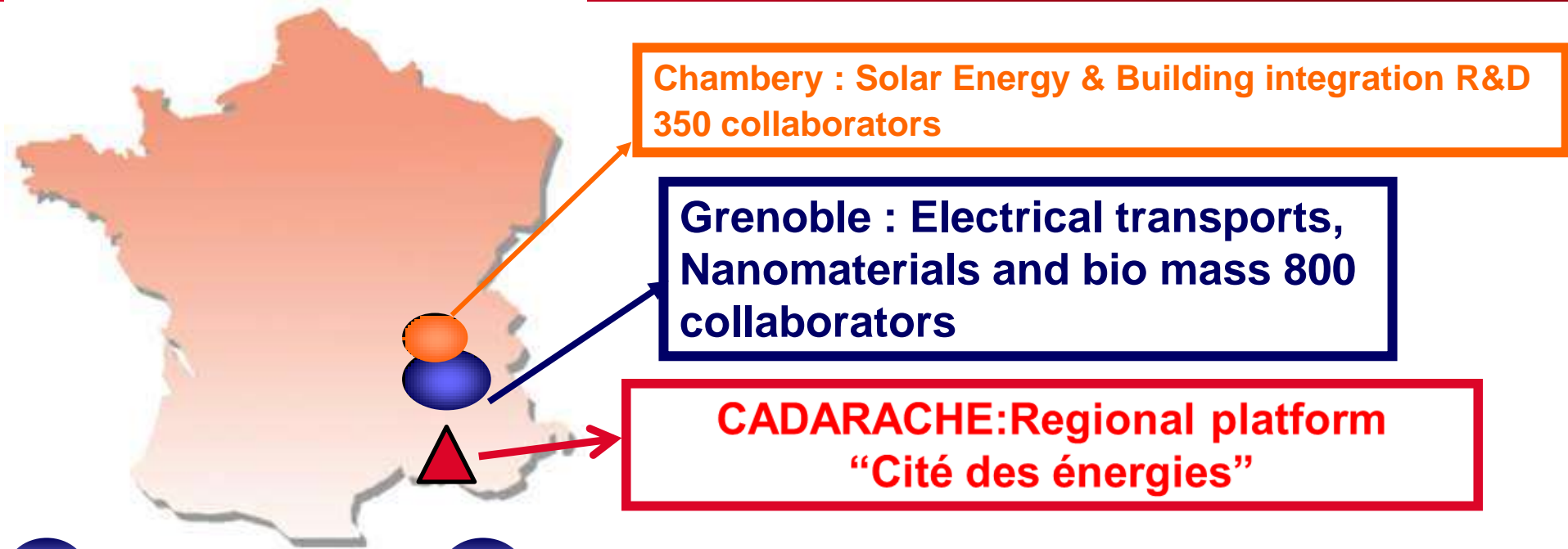
22th January 2015



9 research centers
15,000 persons
4 B€/yr budget



The key points of LITEN



2012 Manpower

1200 collaborators

Patents: 600 in portfolio

200 new patents in 2011

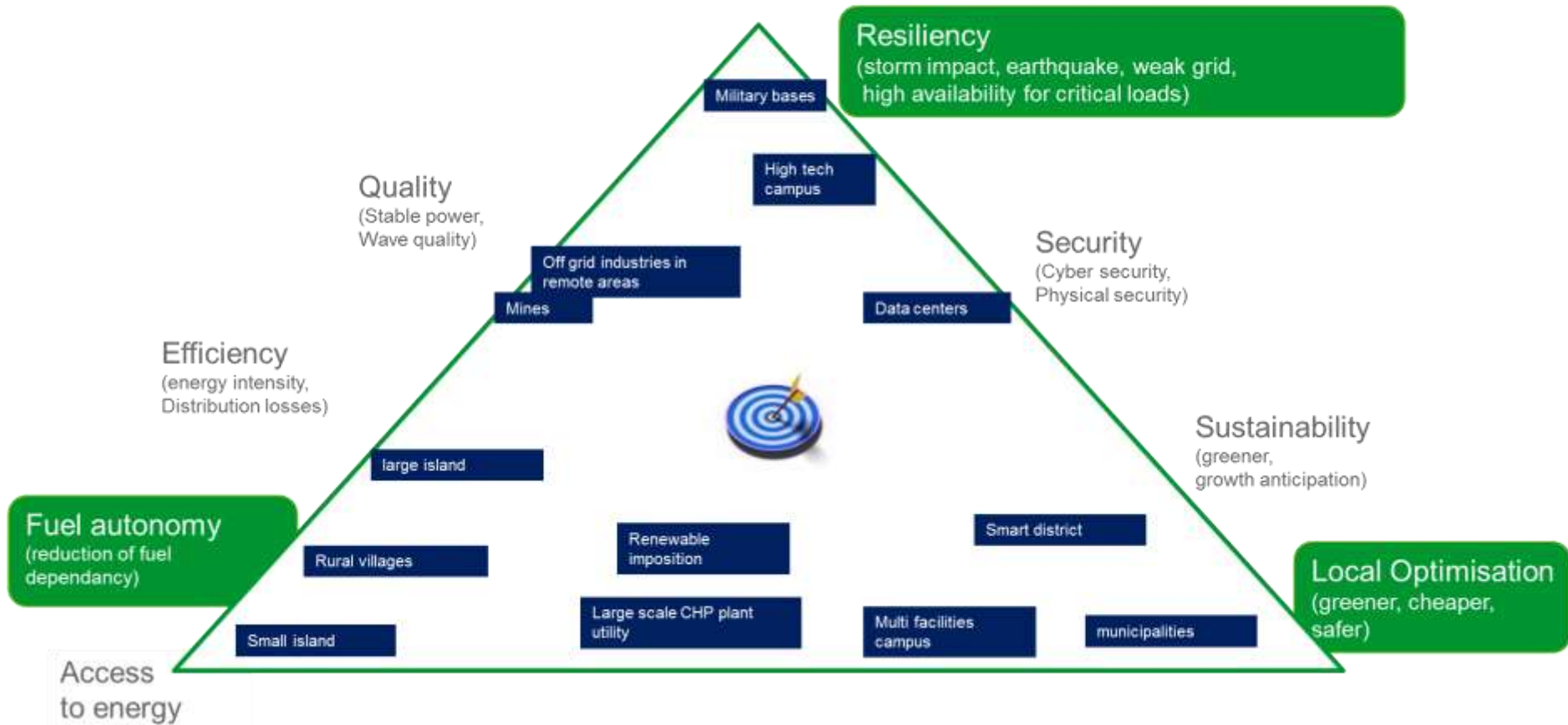
2012 Budget

150 M€

120 M€ turnover

30 M€ of CEA funding

Three main drivers for a microgrid need



THE SOLAR PLATFORM (THERMAL ZONE)



**Prohytec
Desalination/
Multitherm
2013/2014**

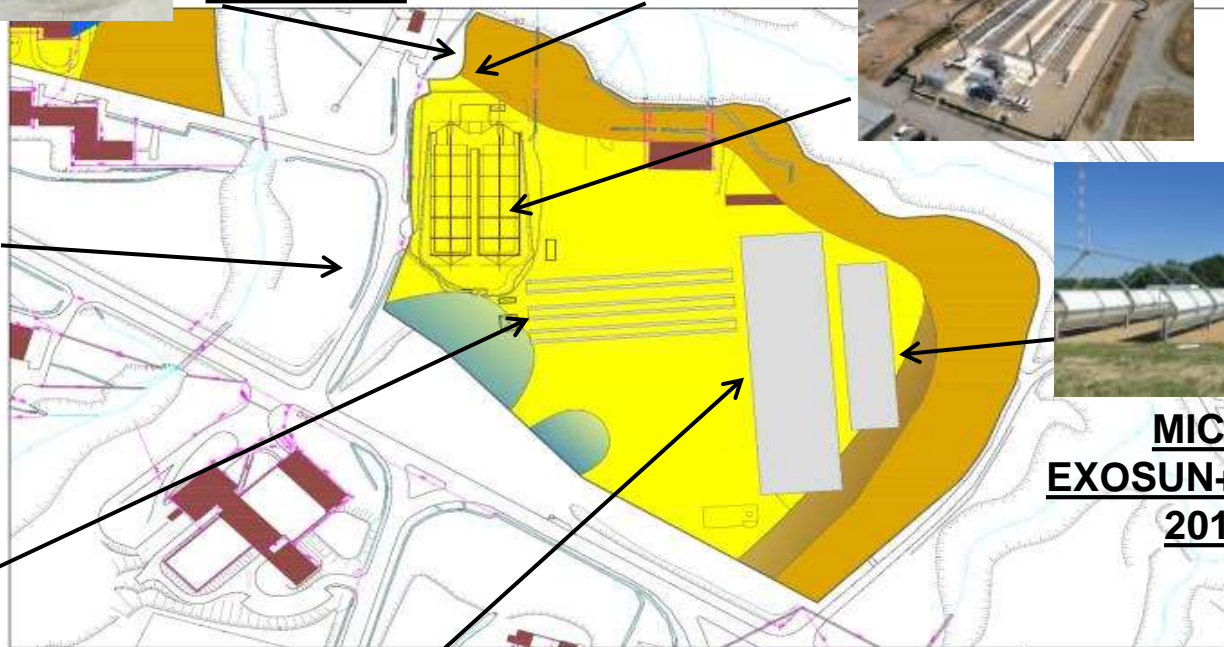


**ATOLL
ENERGY 2014**



**ALSOLEN
2010**

**Prohytec H2
2013/2014**



**MICROSOL
EXOSUN+SCHNEIDER
2012/2013**



**SAED
(WIESSMAN)
2010**

LEGENDRE		IMPLANTATION PLATEFORME SOLAIRE		Registre entreprise		Implantation plateforme solaire	
Eau Potable	• Réaménage	BO	Direction de l'énergie nucléaire	Date d'édition	25/05/2012	Nom de l'opérateur	MEKARSEL - CRT / PAT
E11a		CADRACHES	Direction de l'Énergie Nucléaire	Echelle	1/2000	Nom de l'opérateur	MEKARSEL - CRT / PAT
E11b			Direction de l'Énergie Nucléaire				
E2a			Direction de l'Énergie Nucléaire				
E2b			Direction de l'Énergie Nucléaire				
E2c			Direction de l'Énergie Nucléaire				
E2d			Direction de l'Énergie Nucléaire				
E2e			Direction de l'Énergie Nucléaire				



**ALSOLEN SUP
2014/2015**

CONCENTRATED SOLAR POWER PLANT HIGH TEMPERATURE (ALSOLEN)



Concentrated Solar Power plant (Fresnel mirrors) :

- Heat transfer medium : Therminol (oil)
- Temperature range: 250°C - 300°C
- Output power: 450 kWth
- Electrical Output: 50 kWel
- Storage Capacity: 1500 kWh



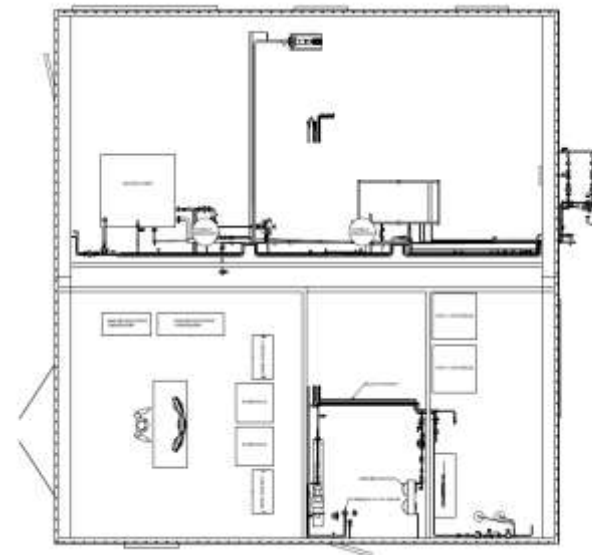


Process Skid

Electrolyzer



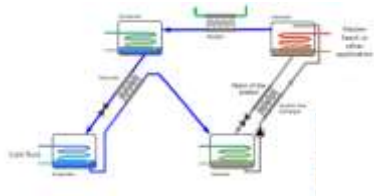
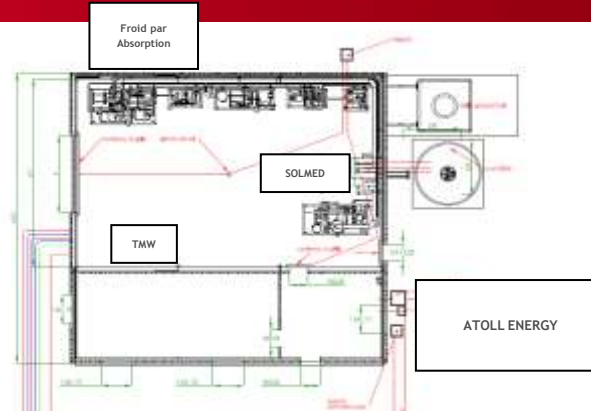
Hydrogen Purification



Objectives:

- To have a benchmark platform for different kinds of electrolyzer (alkalin, PEM, high temperature)
- Production capacity: 20 Nm³ / jour

ALSOLEN MULTITHERM / PROHYTEC DESSALINATION



Experiment Hall using wide range temperature with different sources for different using:

- dessalination prototype (SOLMED)
- dessalination machine (ALFA LAVAL)
- thermally driven chiller (absorption NH₃/H₂O)

**Thermally driven
chiller 100 kWf**



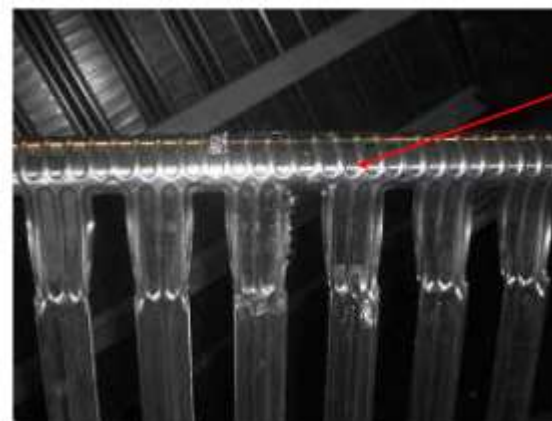


Genset energy optimisation and cascade thermal recovery :

- Electricity and, from waste-heat recovery:
- Air-conditioning with absorption chiller
- Hot water generation and desalination from absorption cooling

A test bench for machines and storages optimization





Heat pipes

Low Concentrated Solar Power plant (Glass tube and heat pipes) :

- Heat transfer medium : water
- Temperature range : 80 – 120 °C
- Thermal Capacity: 100 kWth

**To be linked with
Atoll Energy
QuadriTherm
Platform**



Concentrated Solar Power plant (cylindro-parabolic mirrors) :

- Heat transfer medium: water
- Temperature range : 140°C - 180°C
- Thermal capacity: 300 kWth
- Electrical output power: 15 kWel
- Dessalination: 2 m³/j
- Operating : 24h/24h 355 days/year

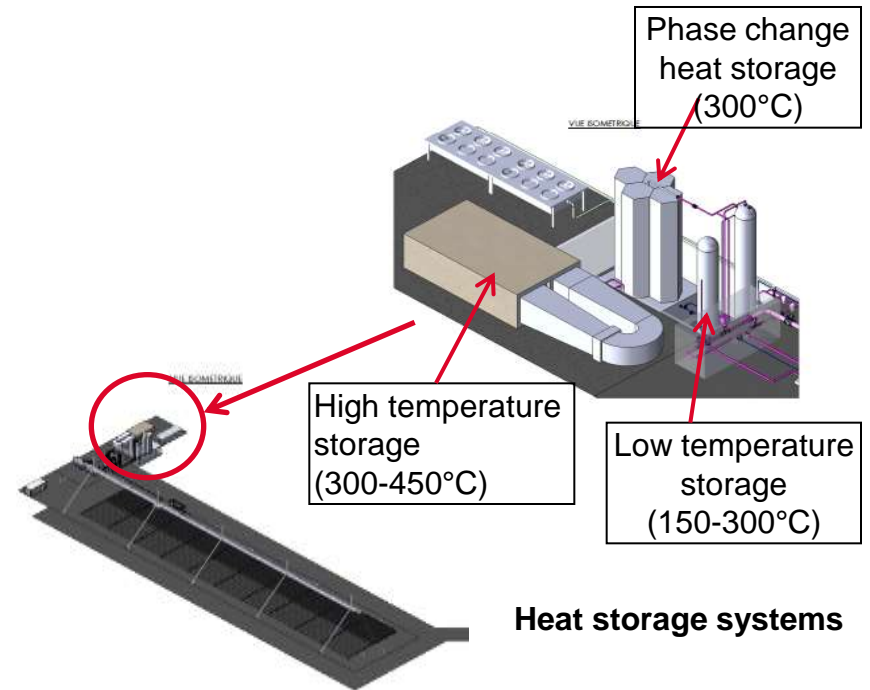


CONCENTRATED SOLAR POWER PLANT VERY HIGH TEMPERATURE (ALSOLEN SUP)



Concentrated Solar Power plant (Fresnel mirrors) :

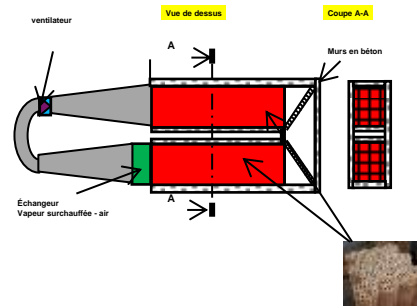
- Heat transfer medium : superheated steam
- Temperature range: 400°C - 450°C
- Output power: 1 MWth



Development of a heat storage system for solar power plants with direct steam generation. Three stages system (sensible-latent-sensible):

- Temperature range: 160°C - 450°C
- Prototype capacity: 1,6MWh
- Commissioning: june 2015

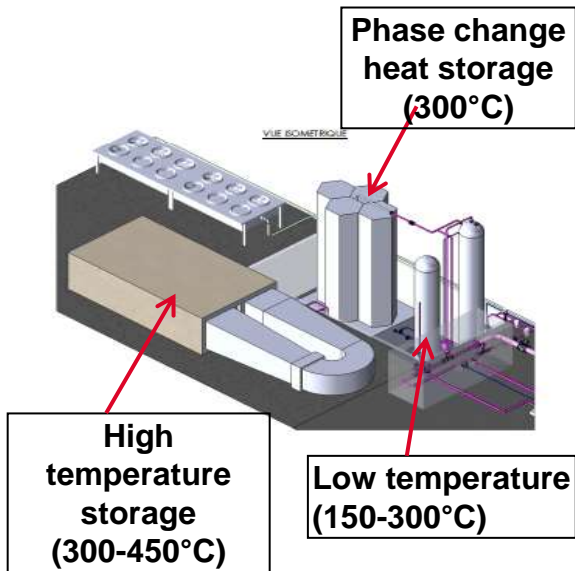
Storage T : 300°C – 450°C
Capacity : 280 kWh (air)



Storage T = 300 °C : Phase change heat storage (NaNo3)
Capacity: 850 kWh



Storage T < 300 °C :
Sensible heat storage (Water)
Capacity: 480 kWh



Heat storage systems
General view