AMANAC CLUSTER

# AMANAC WORKSHOP

BRUSSELS,BELGIUM | 03.07.2019

## WHAT KIND OF BUILT ENVIRONMENT FOR FUTURE GENERATIONS?

# The perspective of end users: applications of UHDC in an industrial context

Sandra Scalari
*Enel Green Power spa*

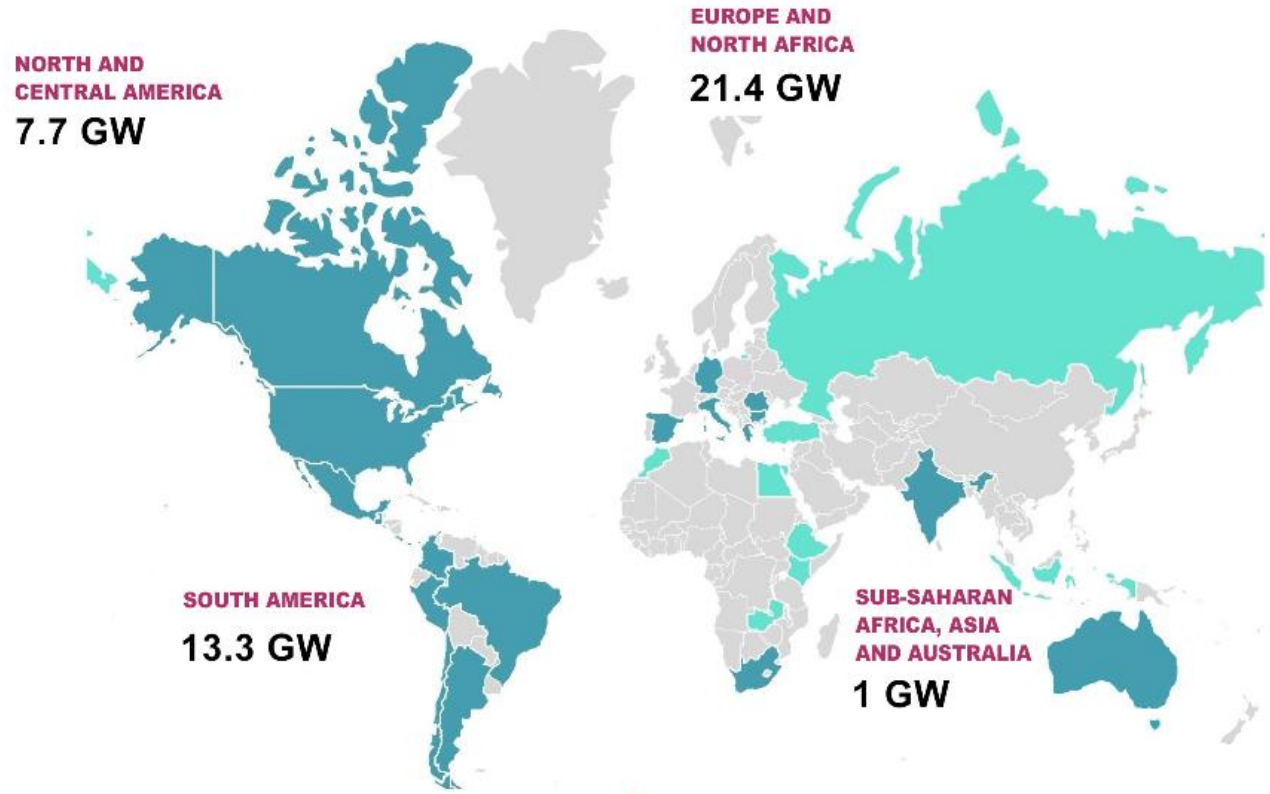
endurcrete

DACOMAT

RESHEALIENCE
Ultra High Durability Concrete

The projects have received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 760639 (EnDurCrete), 760824 (ReSHEALience) and 761072 (DACOMAT)

# Enel Green Power




**29**
COUNTRIES

**> 43 GW**
MANAGED CAPACITY

**More than 1200**
OPERATIVE PLANTS

Countries with assets in operations and under construction

Countries in development phase

**28.1 GW** HYDRO

**0.9 GW** GEOTHERMAL

**10.6 GW** WIND

**3.7 GW** SOLAR

**0.1 GW** BIOMASS

AMANAC CLUSTER

endurcrete

DACOMAT

RESHEALIENCE

The projects have received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement Nº760639, 760824 and 761072

Sandra Scalari
*Enel Green Power*

# Enel Green Power: Italian geothermal focus

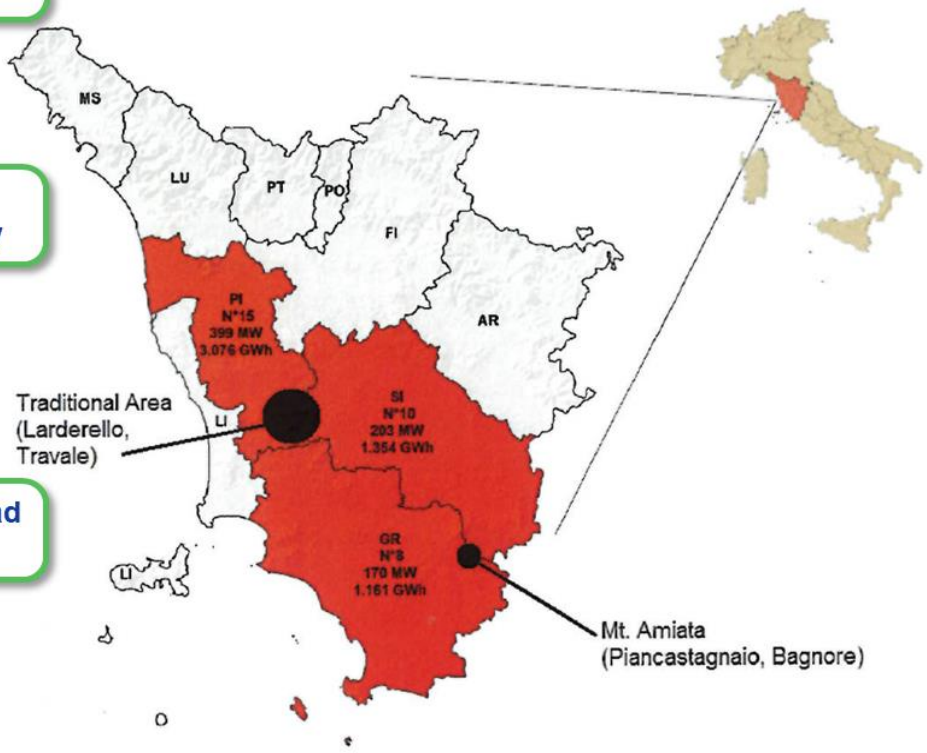
More than 500 wells

570 km pipelines

37 generating units

916 MW net installed capacity

87,3% average load factor




AMANAC CLUSTER

endurcrete

DACOMAT

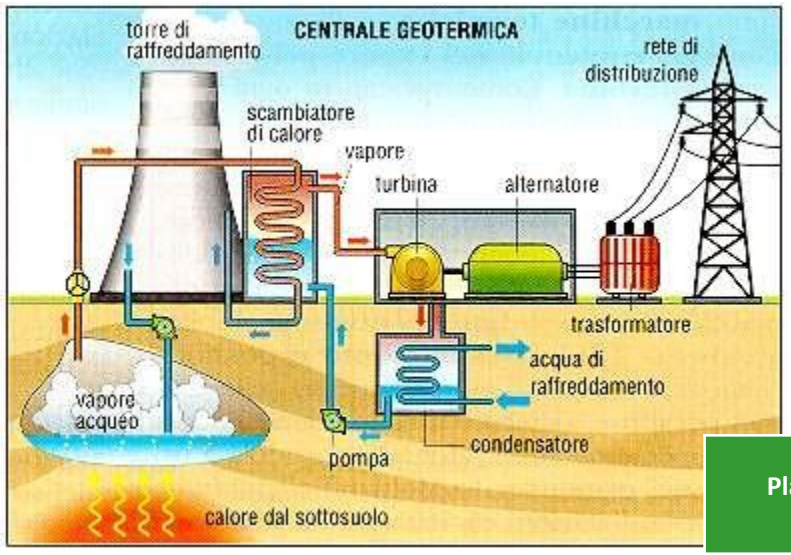
RESHEALIENCE

The projects have received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement Nº760639, 760824 and 761072

Sandra Scalari
*Enel Green Power*

# Why Ultra High Durability Concrete in geothermal plants?

Geothermal energy comes from the heat contained within the earth which, in some areas of the earth's crust, rises to the surface in the form of very hot steam: heat and mechanical strength which can feed a thermoelectric power station to move the turbines. After use, the steam is condensed back into the water in the cooling tower and injected back into the subsoil to supply the groundwater and maintain pressure.




| Plant | Location | Date | Typology | T | pH | Cond | Alk | Alk rit | $O_2$ dissolved | $H_2S$ | $SO_4^{2-}$ | $SO_3^{2-}$ | $S_2O_3^{2-}$ | $Cl^-$ | $Na^+$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Plant Fluid | °C | -log [$H^+$] | µS/cm | meq/L HCl | meq/L HCl | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| Nuova San Martino | LAGO | 06-mar-18 | Blown down water | n.d. | 7,07 | 4.430 | 3 | 1,8 | 0,1 | 0,4 | 1.223 | 77 | 26 | 213 | n.d. |
| Le Prata | LAGO | 12-gen-17 | column C2 water inlet | 19,3 | 7,08 | 6.460 | 11 | n.d. | n.d. | 0,2 | 2.292 | 980 | 229 | 1,1 | 1.352 |
| Bagnore 4 | PIANCASTAGNAIO | 26-gen-17 | Injection water | 19,9 | 6,49 | 24.200 | 3,1 | n.d. | 1,1 | 0,3 | 10.020 | 505 | 11,2 | 2,8 | 0,9 |
| Chiusdino | RADICONDOLI | 07-lug-17 | cooling tower water inlet | n.d. | 6,9 | 7.870 | n.d. | n.d. | n.d. | 1,5 | 5.119 | 325 | 46 | 1 | n.d. |

AMANAC CLUSTER endurcrete DACOMAT RESHEALIENCE

The projects have received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement Nº760639, 760824 and 761072

Sandra Scalari
*Enel Green Power*

# Why Ultra High Durability Concrete in geothermal plants?


AMANAC CLUSTER

endurcrete

DACOMAT

RESHEALIENCE

The projects have received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement Nº760639, 760824 and 761072

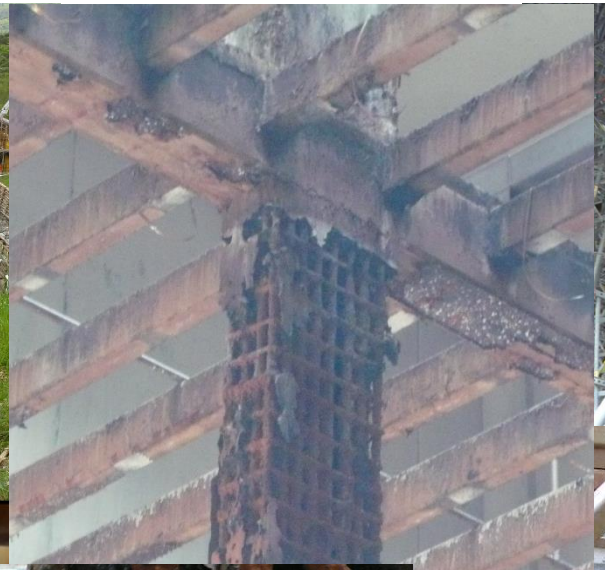
Sandra Scalari
*Enel Green Power*

# Why Ultra High Durability Concrete in geothermal plants?

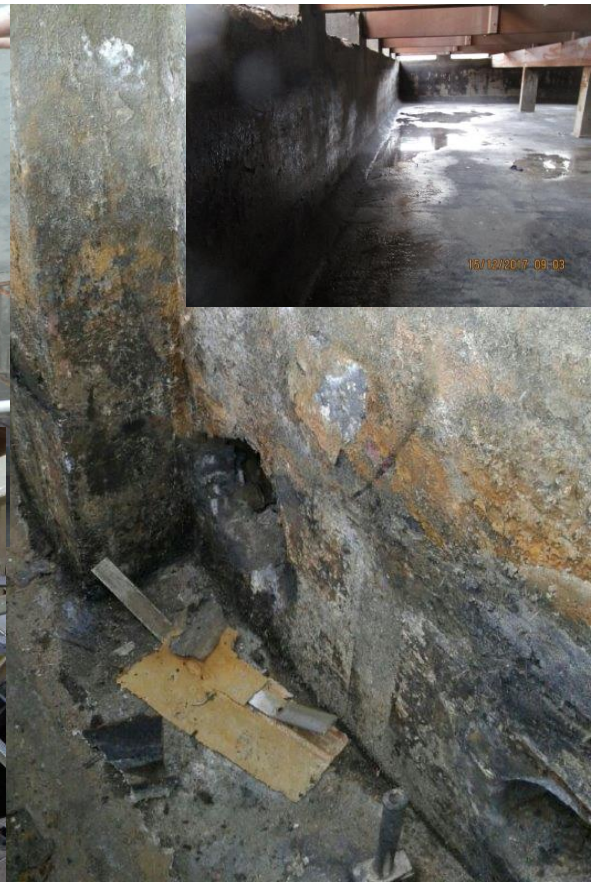
Walls and columns damage and restoration

Lining maintenance










AMANAC CLUSTER

endurcrete

DACOMAT

RESHEALIENCE Ultra High Durability Concrete

The projects have received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement Nº760639, 760824 and 761072

Sandra Scalari
*Enel Green Power*

# Expected advantages from Ultra High Durability Concrete

**IMPROVED PRODUCTIVITY**

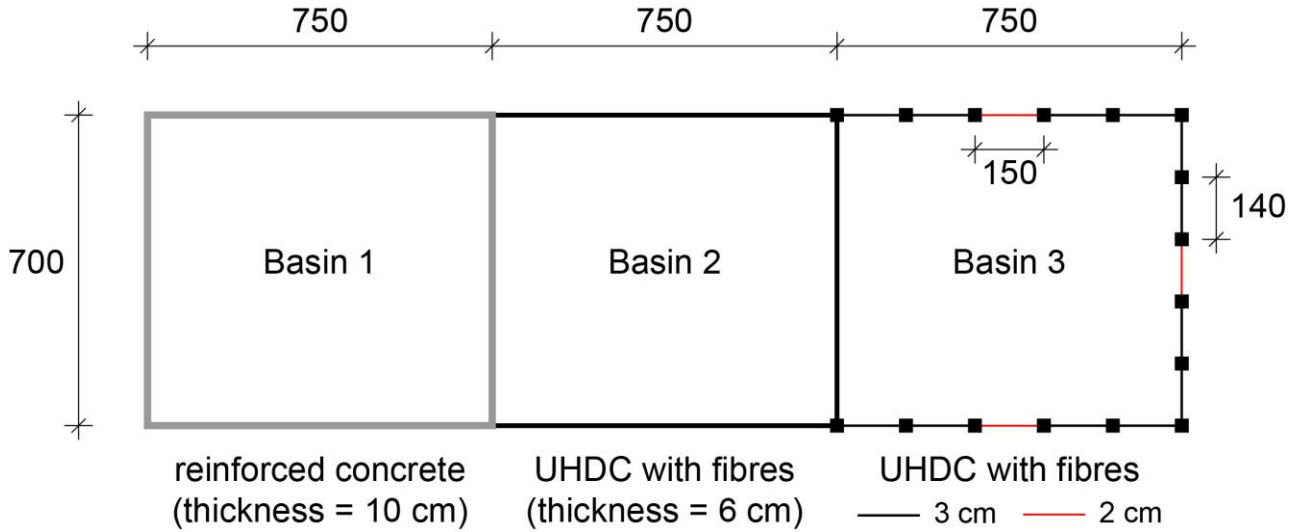
- reducing the stops and times associated with the maintenance of the basins.

**EASIER MAINTENANCE**

- Longer lasting materials
- Elimination of additional protections

**ENVIRONMENTAL BENEFITS**

- Better “sealing” performance




**SUSTAINABILITY**

- reduced use of materials in construction (also less incidence of steel because of fibers)
- in the decommissioning phase, reduce the quantity of materials to be disposed of, both in terms of volume and because, for the new materials, direct reuse on site is envisaged.

AMANAC CLUSTER endurcrete DACOMAT RESHEALIENCE

The projects have received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement Nº760639, 760824 and 761072

Sandra Scalari
*Enel Green Power*

# EGP exploitation strategy for UHDC

- EGP has the role of **end-user of the advanced materials technologies**: applications for geothermal and biomass plants for which buried basins made of concrete are usually used as tanks for the water treatment, drilling mud, and tanks for firefighting water.
- Used both for the **construction of new** tanks and for the **maintenance of the existing** tanks already built which are currently in operation.
- In **Italy** EGP has about 34 geothermal plants on working, about 50 existing well pads For the future, EGP is trying to apply the technology of geothermal and biomass plants abroad. Presently are under construction two geothermal plants one in **Chile** and the other one in **Germany** while a new geothermal plant under development in **Indonesia**.
- EGP expects to:
  - explore new business opportunities, and developing **new competitive design concepts** with the partners.
  - introduce the technology in the tenders for structure construction, providing more value, and **reducing the maintenance** costs during the concession.

AMANAC CLUSTER endurcrete DACOMAT RESHEALIENCE

The projects have received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement Nº760639, 760824 and 761072

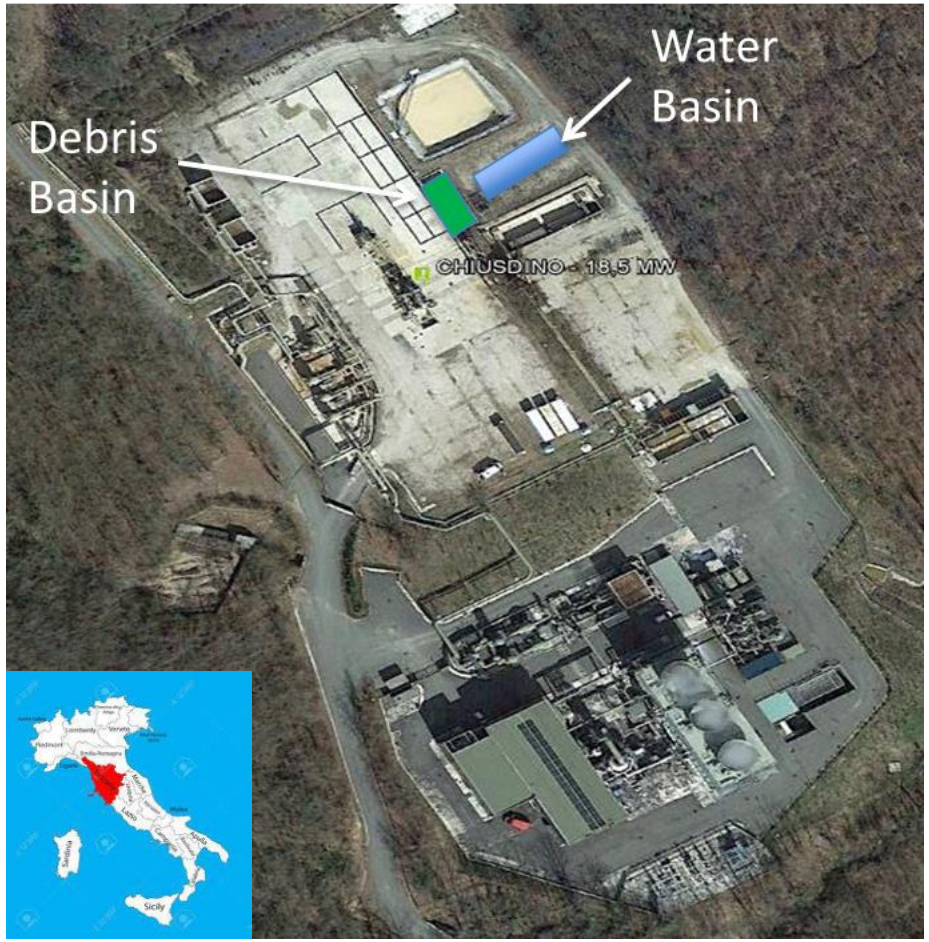
Sandra Scalari
*Enel Green Power*

# EGP exploitation strategy for UHDC: pilot demonstrators

As end user EGP will build and operate 2 pilots in Tuscany (Italy):

- a reduced-scale water tank (about 1:2) connected to the tank of a power plant in order to derive a stream of geothermal water
  - test several structural design concepts
  - test different UHDC mixes with different functionalizing constituents
- a mud debris tanks, built near a drilling station and used during the phases of execution of a new production well, reproducing the same operating conditions.

The two pilots will be monitored for more than 2 years: site visit organized in June 2021 in conjunction with International Conference on Self-Healing Materials




The projects have received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement Nº760639, 760824 and 761072

Sandra Scalari
*Enel Green Power*

AMANAC CLUSTER

# AMANAC WORKSHOP

BRUSSELS,BELGIUM | 03.07.2019

## WHAT KIND OF BUILT ENVIRONMENT FOR FUTURE GENERATIONS?

***Thank you for your attention***


Sandra Scalari

*Enel Green Power*

sandra.scalar@egp.it


endurcrete

DACOMAT

RESHEALIENCE
Ultra High Durability Concrete


The projects have received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 760639 (EnDurCrete), 760824 (ReSHEALience) and 761072 (DACOMAT)