Source : Médiathèque EDF

WATER & ENERGY SECURITY

reduce and reuse

Sustainable Development Division

29/08/2017

Laurent BELLET - Water & Energy Advisor

WATER & ENERGY NEXUS

Almost all forms of electricity generation require water

Energy production is in most cases impossible without water. The Energy sector accounts for 600 billion m3 freshwater withdrawal per year (75% of the industrial sector use) and 66 billion m3 freshwater consumption per year (IEA).

Hydropower

Geothermal

Pulverized Coal

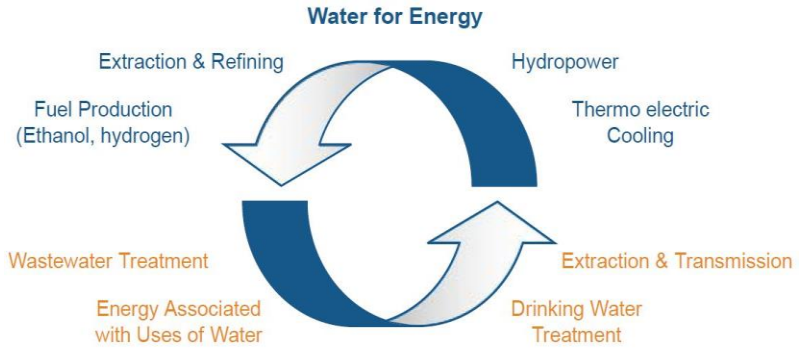
CSP (Tower)

NGCC

Nuclear

CSP (Parabolic Trough)

Only **Wind** and **Solar PV** have a negligible impact on water resources



Thirsty Initiative – WORLD BANK

cooling systems

The type of **cooling system** used will determine the amount of water required by the thermal power plant.

Water is also needed in smaller quantities for other processes, generating waste water streams that can have a negative impact on the environment.

Each drop = 1m3/Mwh

main types of cooling systems	use	water withdrawal	water consumption	efficiency	cost	environmental impact
once through 	water				$ small	 bad
cooling towers 	water				$$ medium	 moderate
dry cooling 	air	0	0		$$$ high	 none

Note on water withdrawal and consumption: this is an approximate representation to show the difference in magnitude for types of cooling systems. The exact amount of water will vary depending on the efficiency of the power plant, but the ratios will remain constant. This table shows an approximate calculation for a power plant with an efficiency of ~35%, and each drop ~ 100 liters/MWh

WATER REDUCE (1) AND REUSE (2)

1- Water savings from Agriculture in DURANCE VALLEY (FRANCE): 21 hydro power plants (2000MW), 2 reservoirs (1.5 bm3), 250km of canal, multi-purpose uses of water

- Irrigation rights: total annual withdrawal of about 1800 Mm3 for 150 000 ha of irrigated lands
- Water Saving Convention (2000): between EDF and 2 main irrigators / 6-yrs period
- **Remuneration to the irrigators by EDF** for the saved water with incentives to outreach the targets.
- Agricultural water consumption decreased from 310Mm3 in 1997 to 201Mm3 in 2006.
- New convention signed in 2014 for 9 years: 20 to 25 Mm3 of additional water saving.
- 84% of the saving water is not turbined (flow release constraints): the third winner is ecosystems.

2- Heat for flowers from CANDELLA CCGT gas-fired power station (ITALY – EDF Edison)

- 90 hectares of greenhouses owned by Ciccolella (world's largest grower of the flower Anthurium).
- The hot water produced by the power station is used to heat the greenhouses
- The flower producer receives the 20,000m3 of water heated to 37°C that it needs every hour to run the heating system
- Edison, in return, receives water cooled to 30°C to re-inject into its steam production system
- The total investment for Ciccolella: €200m
- Preferential rate for buying heat which helped minimize the risk of investments on the long-term

WATER REDUCE, RECYCLE, REUSE, RECOVER

3- MOBILE PURIFICATION STATION (FRANCE): developed by EDF for its nuclear fleet

- Maintenance of the secondary water circuit (steam) every 12-18 months.
- Before: full change of the water in the circuit, now recycle and reuse thanks to the purification system
- 400 to 2500m3 of water saved per operation

4- Rain water harvesting system in MACAE CCGT power station (Brazil – EDF Norte Fluminense)

- Reduction of leaks and purges -> covers 30% of the water needs
- Reuse of rain water 100-130 000m3/year -> Reduce the withdrawal of water from the river by 2%
- Investment cost: 800k€.

5- TIRU waste-to-energy plant (Saint Barts - Caribbean – EDF Tiru)

- Modernization of a waste-to-energy plant + construction of a sorting plant and a composting plateform
- The plant supplies heat to the desalination plant -> ¾ of the island's drinking water from green energy
- 100% of the island's waste is recovered