

Integrated water and energy management for a better efficiency: the experience of an energy utility (EDF)

7th World Water Forum,
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The experience of an energy utility (EDF) in integrated water and energy governance

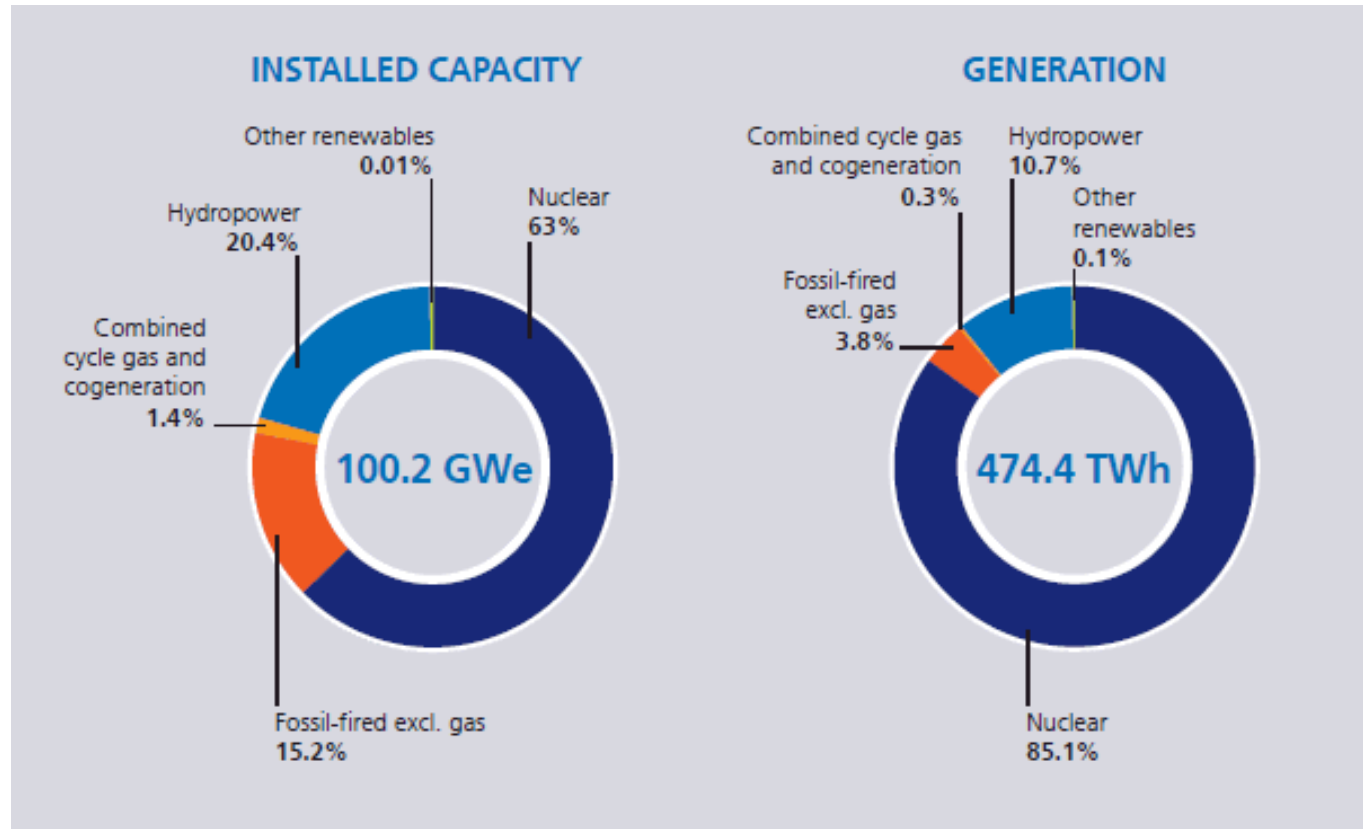
- Water management and electricity production in EDF France
- Regulatory context for water and energy management
- Interaction between water and energy policies (hydroelectricity)
- Concrete examples of EDF water-energy integration
- The future of water-energy integration



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WATER MANAGEMENT AND ELECTRICITY PRODUCTION IN EDF FRANCE

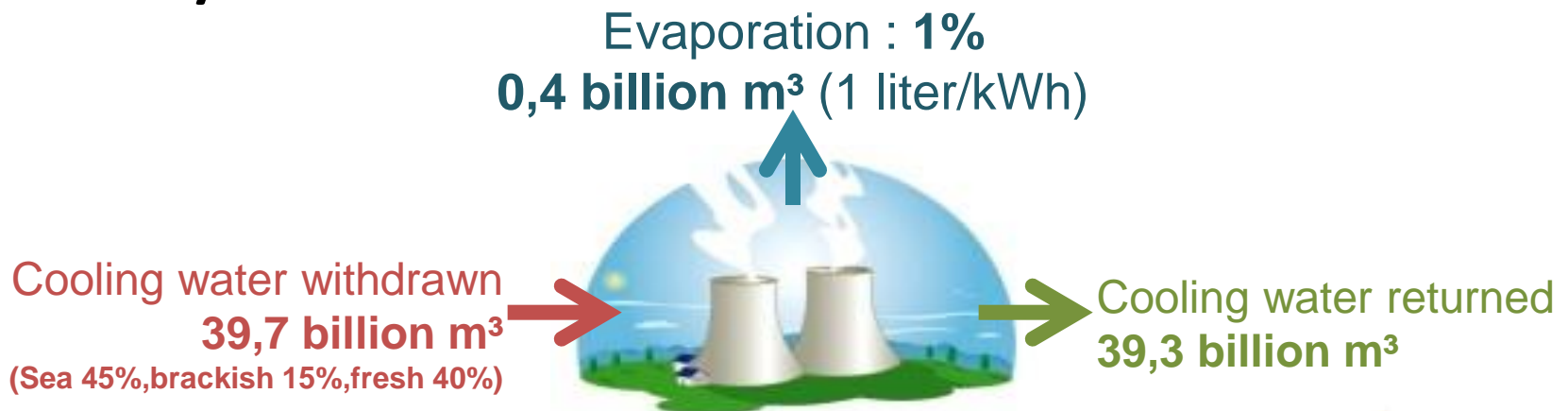
EDF electricity production in France



- Major role of EDF hydro reservoirs in the management of water resources : **75% of the total French storage capacity of surface water.**

Water consumption due to EDF electricity production

- **Strong link** between water and electricity production
- **Hydroelectric powerplants** : water, fuel of the turbines, **completely restored in the river**
- **Nuclear and thermal power plants** : gross consumption (evaporation) 0,4 billion m³ , about **1 liter/kWh**





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REGULATORY CONTEXT FOR WATER AND ENERGY MANAGEMENT

Water Management in France

French regulations and adapted European regulations

- The **1964 French law** implemented **water management by catchment area** in France :
 - The **Basin Committees** bring together all parties
 - The **Water Agencies** collect royalties and redistribute subsidies
- The **EU Water Framework Directive of 2000** for a **Community policy** on water :
 - **Good Ecological Status (GES)** of all aquatic environments by 2027
 - development and implementation of forward **planning documents** by river basin
- **2006 French Water Law** guiding the implementation and achievement of GES,
 - Classifies waterways as **List 1** (authorisation may be given to build new infrastructure but very rarely) or **List 2** (it is necessary to ensure sufficient sediment transfer and fish migration.)

Electricity Production in France

French regulations and adapted European regulations

- **European key objectives** for an integrated climate and energy policy (European Council)
- In France, renewable energy development plan : **23% consumed energy has to be renewable by 2020**
- Multi-year investment plan (PPI) : **for hydroelectricity, increase in production of 3TWh/yr and increase in peak capacity of 3000 MW by 2020**
- 2015: new french “energy transition law” will be adopted by National Assembly in June: **32% consumed energy has to be renewable by 2030, new Pluriannual Energy Plan.**



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INTERACTION BETWEEN WATER AND ENERGY POLICIES (HYDROELECTRICITY)

Hydroelectricity and aquatic environment

- Limiting hydroelectric power plant's impacts on the aquatic environment has consequences on hydroelectric production potential :
 - **Minimum flows** : across France 10% of the annual average flow (5% for rivers that have a medium annual flow above 80 m³/s); annual loss of production 1,8TWh.
 - **Ecological continuity** : for eels, interruption of turbine production ; estimated loss 0,5TWh per year.
 - **Variations of flow** : flow variations attenuation downstream of hydroelectric power plants; loss of peak production.

Hydroelectricity and society

- **Electricity producers are actors in regional development**

- **Power services :**

- guaranteed provision of electricity
 - payment of license-fees to the communities

- **Non-power services :**

- drinking water supply
 - environmental services
 - irrigation, tourism
 - navigation
 - information sharing
 - flood and drought protection



- **Non-power services offer many opportunities to contribute to regional development and are often based on water management**

Policies integration: Multipurpose uses of hydroelectric reservoirs project

To optimize the **multipurpose uses of hydroelectric reservoirs** :

- The World Water Council and EDF collaborate on “the multipurpose water uses of hydropower reservoirs”.
- This project presented in Daegu addresses 2 key questions :
 - How to set an appropriate governance to allow coordinated/integrated water uses management (in terms of strategy, planning, decision making and operation);
 - How to minimize contradictions/competition among multipurpose water uses of hydropower reservoirs”;

Policies integration: EDF Value creation project

- **Identification of socio-economic and environmental values** created by hydropower
- **Evaluation in qualitative, quantitative and, if possible, monetary terms** of the created values
- **Analysis of the role of the operator** in the regional economic development
- **Visual presentation** of results

Originally a 6th World Water Forum Commitment



EDF Value Creation Project - 5 dimensions



Electricity Services:

- Electricity, tax payments, system services, etc....



Socio-Economic Values

- Drinking water, employment, tourism, irrigation, etc....



Societal Values

- Health services, education, social cohesion, etc....



Environmental Values

- Biodiversity protection, rehabilitation of aquatic or terrestrial environments, etc....



Risk Management

- Flood and drought protection, etc....

Policies integration: Water for Energy Framework (W4EF)

- The **Water for Energy Framework** is an international and ambitious initiative led by EDF with WWC and WEC, the **W4EF** initiative.
- The W4EF intends to provide **all energy actors** with a **common evaluation** frame to assess the different ways their facilities interact locally with water.
- Three kinds of indicators:
 - **Water Use indicators** (withdrawal, quality requirement, consumption, net discharge quality).
 - **Water Interaction indicators** relate the uses to the water body's use capacity
 - **Water Situation indicators** estimate the local stress affecting the water body with and without the activity.
- Indicators are calculated for one site, one water body. They may then be aggregated over any production boundary to produce global

Other tools promoting policies integration

- **Discussion forums:**
 - The **Basin Committee** brings together shareholders (elected representatives, users and administrations) to deliberate and take decisions in the interest of all in water resource matters,
 - the EPTB (**basin territorial public institution**): regions, departments and areas bordering a common waterway ; logic upstream-downstream reasoning; arbitration and processing of the various requests on a hierarchical basis.
- **Tools :**
 - The **River Basin Management Plans** (SDAGE) and the associated **Programmes of Measures** (PdM) : prioritised objectives and measures at catchment level ,
 - Adapted to the sub-basin level to **Development and Water Management Plans** (SAGE)
 - Other types of forward planning documents : **river contracts** (drinking water, water treatment, environment), **management plan of low water levels** (resources/needs balance), **territorial project** for the creation of new dams, etc.



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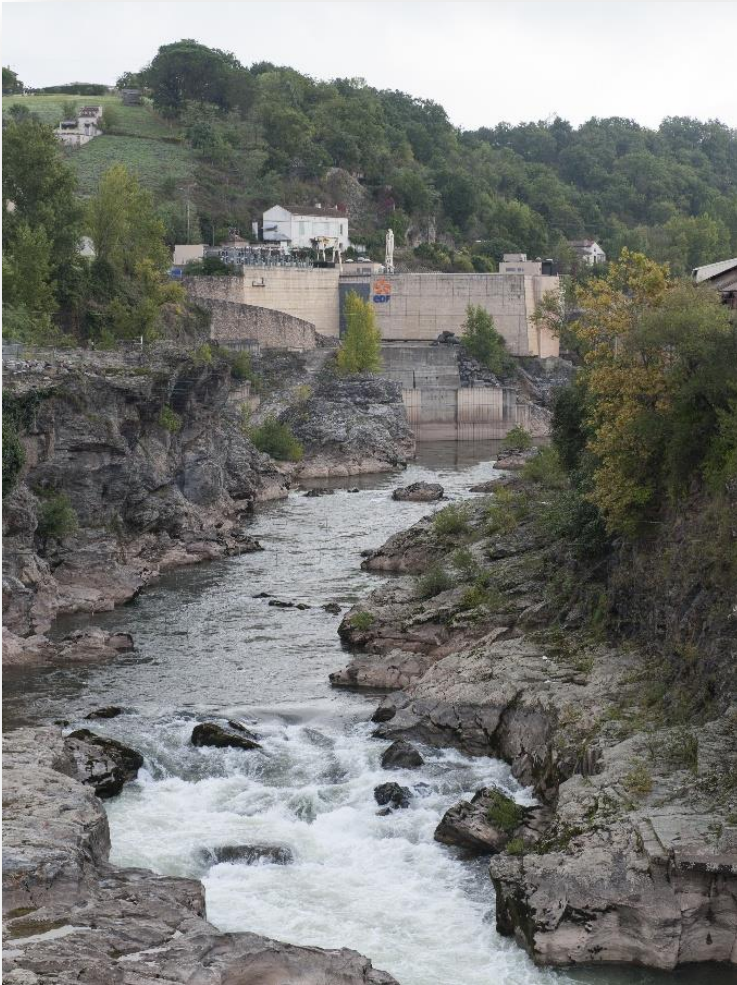
CONCRETE EXAMPLES OF EDF WATER-ENERGY INTEGRATION

The classification of the waterways



- **Direct impact on the hydroelectric potential** : on waterways classified in List 1 the construction of new dams is prohibited .
- **Methodology for reconciling** renewable energy development and the quality of aquatic environments.
- Implementation of hydroelectric projects on rivers sections where the environmental stakes are not preeminent.
EDF has abandoned projects with too much impact on the environment

Providing minimum water levels in Adour-Garonne rivers from EDF hydroelectric reservoirs



- **150 Mm³ from the EDF hydroelectric reservoirs to provide minimum flow** for the benefit of aquatic environments and for the purpose of consuming uses, mainly irrigation
- **Compensation for lost or shifted energy production :** method of evaluating loss of revenue due to the transformation of a winter peak production into summer off-peak production

Dordogne flow variations agreement



- **Impact of variations of flow** on the Dordogne river salmon population.
- The agreement made it possible to improve **knowledge on the behavior** and reproduction of these migrating fish, to **consequently adjust flows** during the most significant periods and to **create site refuges** away from greatest variations.
- Loss of peak production



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THE FUTURE OF WATER-ENERGY INTEGRATION

Future working areas

- To develop **discussions with the stakeholders** : for new hydroelectric power plants (Nam Theun example) and during operation period of existing hydropower plants (new governance for hydroelectric valleys)
- To optimize the **multipurpose uses of hydroelectric reservoirs**
- To improve the methodology for the estimation of the societal **value created by hydroelectric projects**
- To improve the **Water for Energy Framework**

To sum up

- To develop common **water-energy policies**,
- To develop **estimation tools to be used in arbitrating** water and energy policies,
- To develop **discussion forums**, governance between water-energy stakeholders.

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THANK YOU



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APPENDICES

Basin Committee

Basin Committee

135 members

54 members

Body of local authorities

Representatives of the basin
regional councils
(Régions,
Conseils Généraux,
Communes...)

54 members

Body of users representatives

Agriculture, industry
hydropower,
water providers, fishing,
Nature conservation associations,
consumers' associations,
Qualified personalities

...

27 members

Body of State and Public institutions representatives

Basin authorities

