

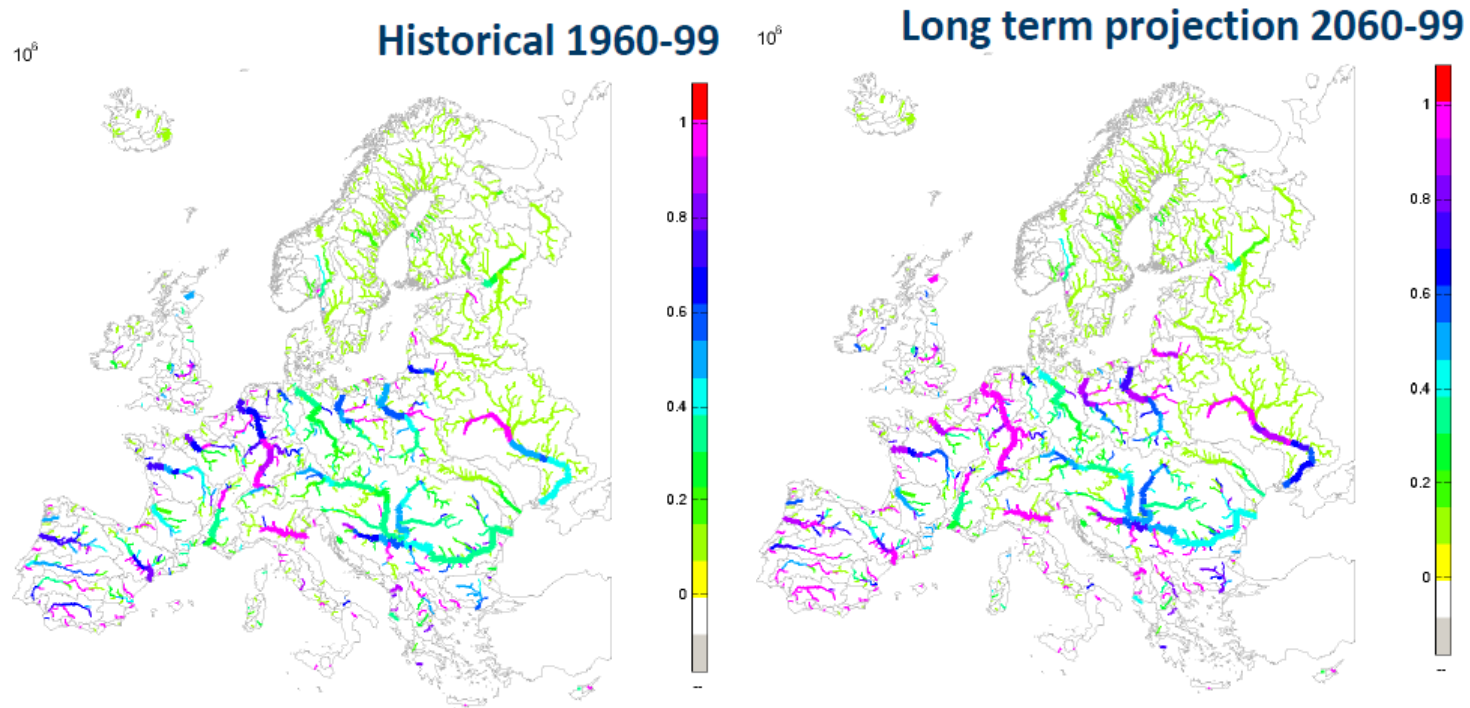
How dams and hydropower can contribute to the future low carbon electricity system?

6th Workshop "Dighe & Territorio" -
Palermo, 10 - 11 Ottobre 2019

The Global Warming issue

WATER DEMAND/ WATER AVAILABILITY

Comparison of historical data and model GFDL projection



From A. Granados, HYDROPOWER EUROPE March 2019

- Dams shall be needed to mitigate the global warming impact in southern and central Europe

Global warming challenges

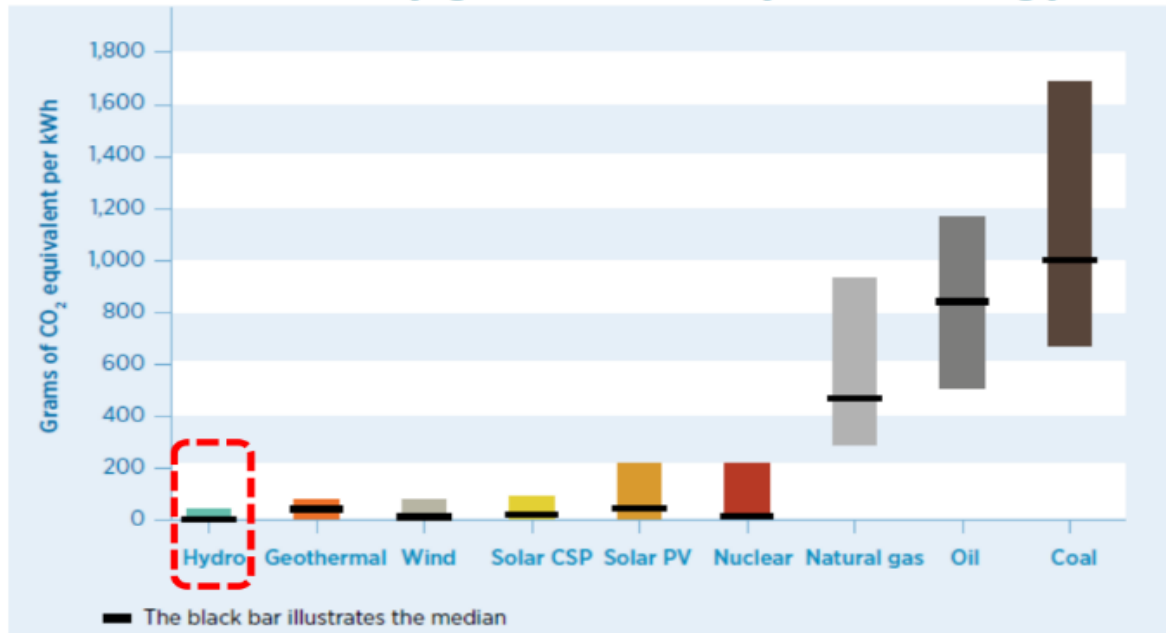


- New dams and *reservoirs* will be required and vital in many regions in order to mitigate climate change by equilibrate the perturbed water resources regimes and to ensure water, energy and food as well as to protect against floods.

Hydropower shall contribute to the required decarbonised energy

CO2 emission in Europe	Today	suggested in 2050
Direct CO2 emission per capita	7t/CO2	2t/CO2
CO2 emission (with importation)	10t/CO2	2t/CO2

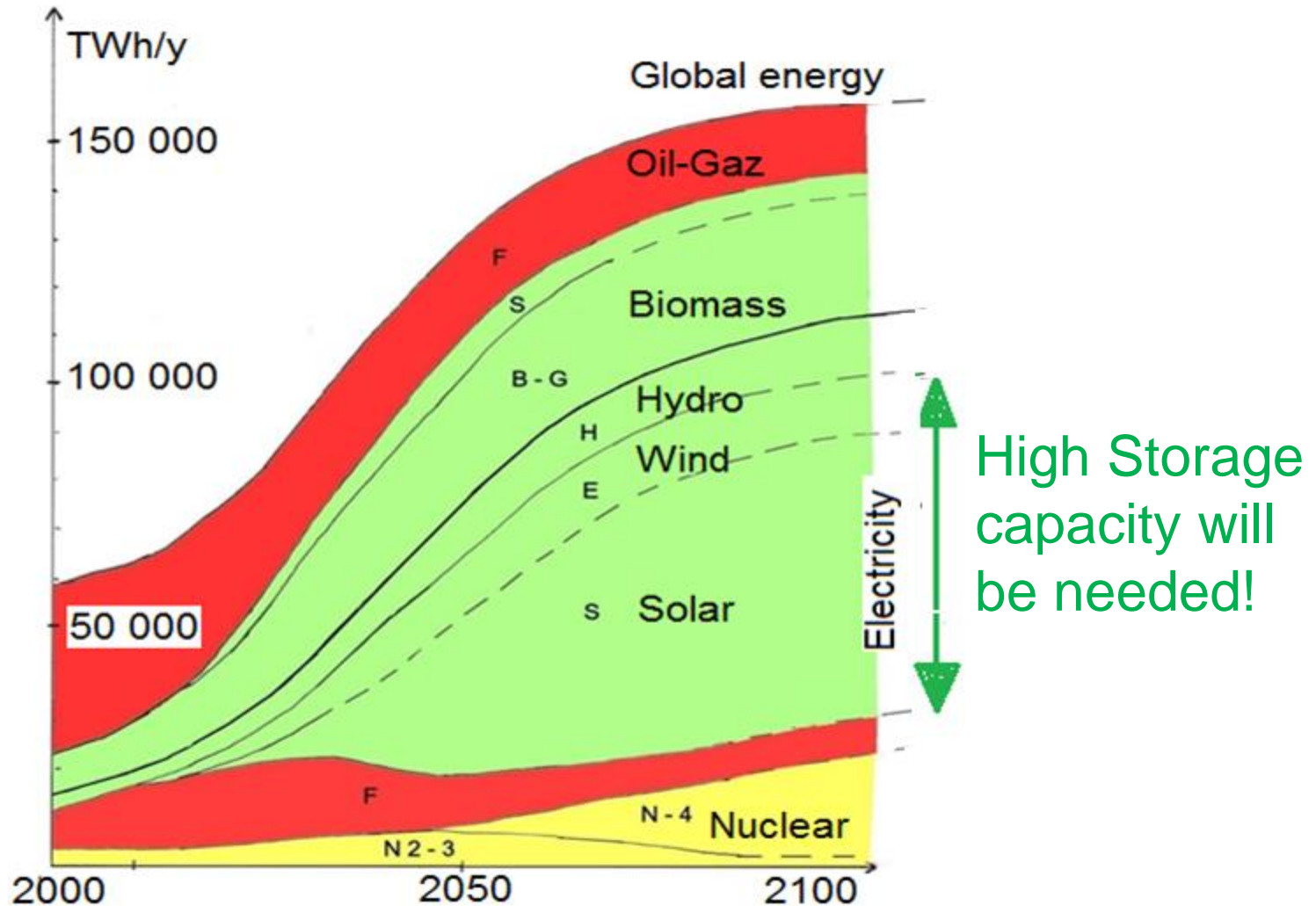
**Life-cycle emission intensity
of electricity generation by technology**



Hydropower helps to decarbonize the electricity system and to mitigate climate change.

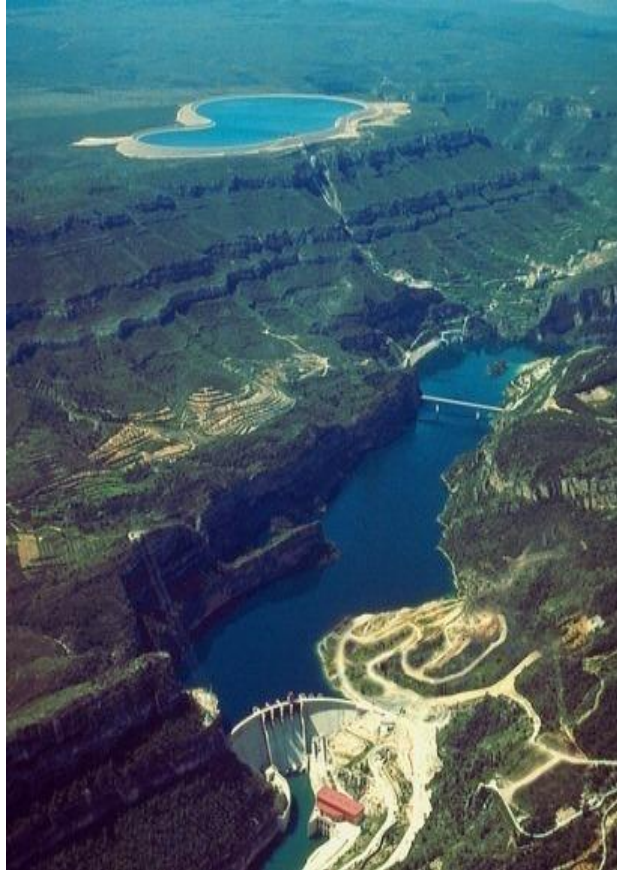
The role of hydropower in reducing GHG emission will become more and more evident with high levels of variable RES penetration.

The global new energy system



➤ Hydropower is needed to secure the new power system

Storage with Pumped Storage Plants

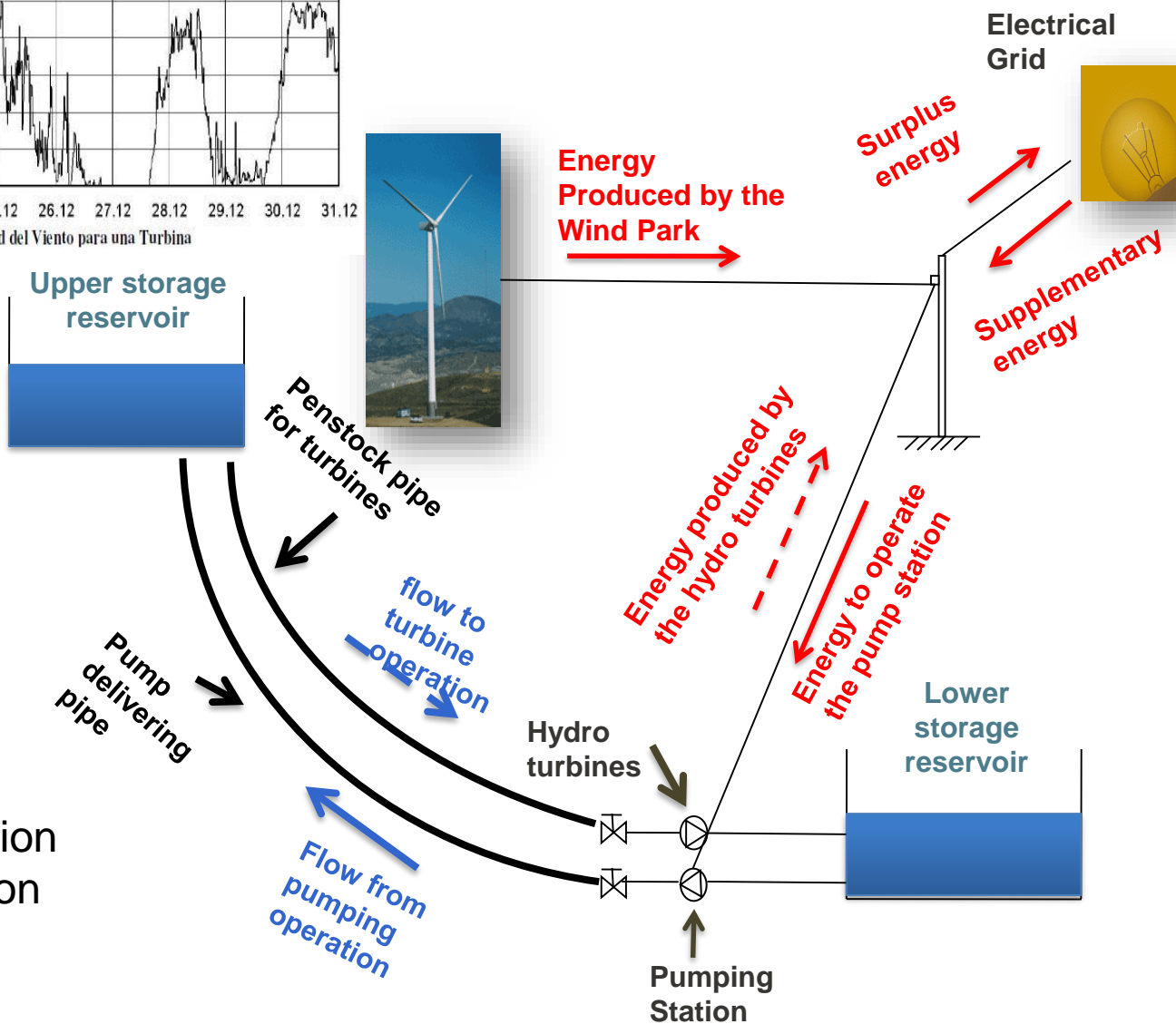
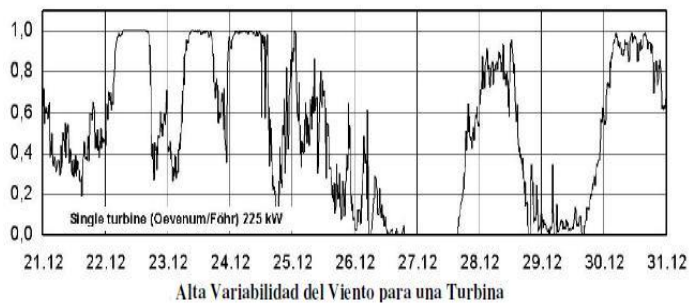


La Muela largest PSP
in Europe (1700 Mw Spain)



Potential pump-storage sites (>5000)

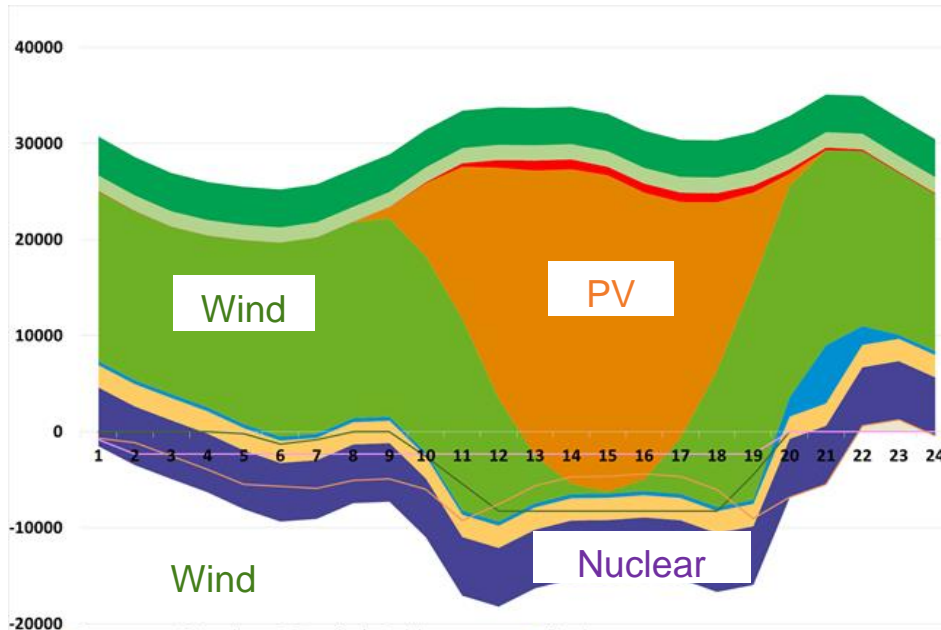
Example of in Grece: Marathon PSP



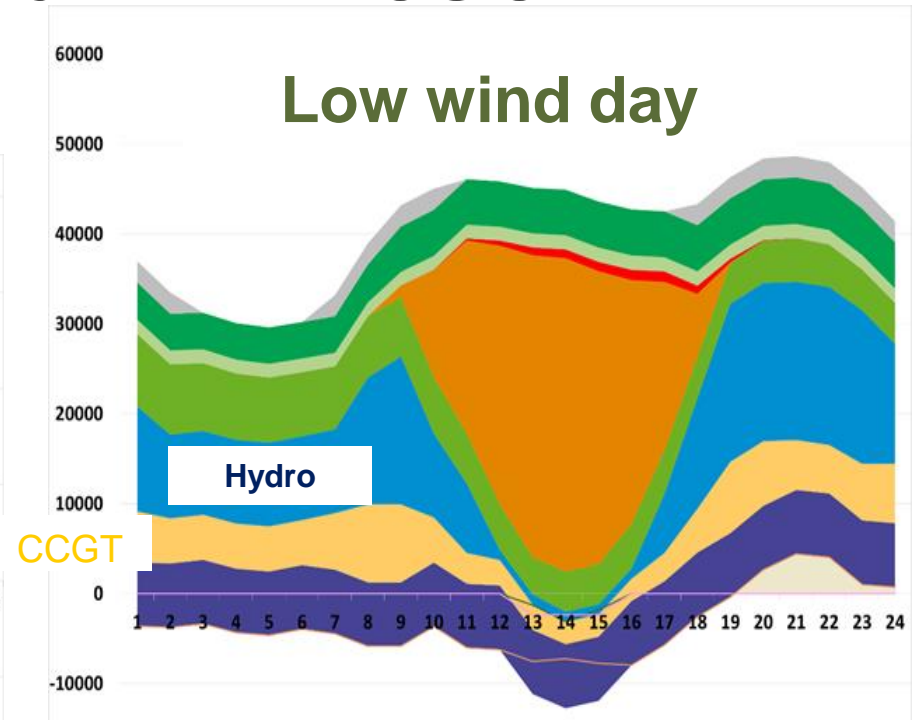
Best solution
at Marathon
site:
60€/MWh

Example: Spain in 2030

High wind day



Low wind day

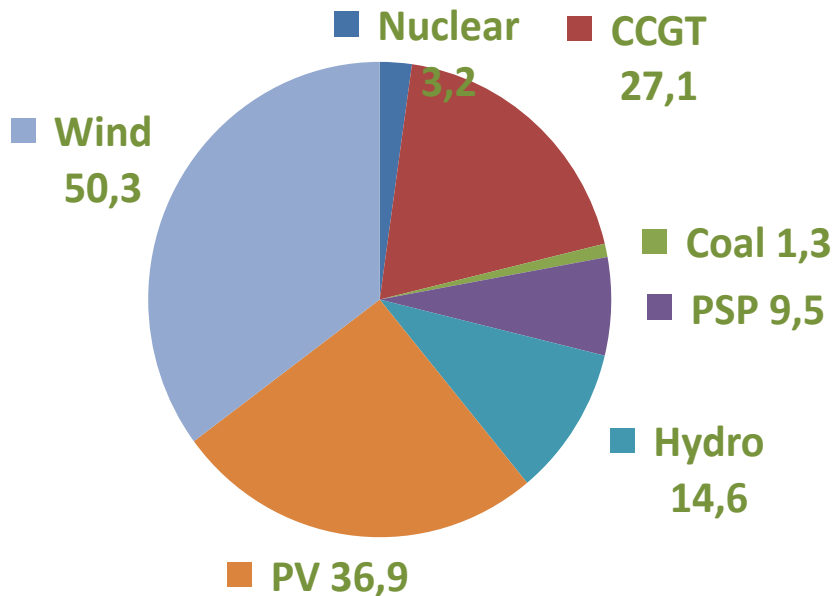


- Intermittent generation from PV and wind is very high
- During day, most of the power is based on power electronics with no inertia
- In addition to the contribution of CCGT, Hydro shall balance the network

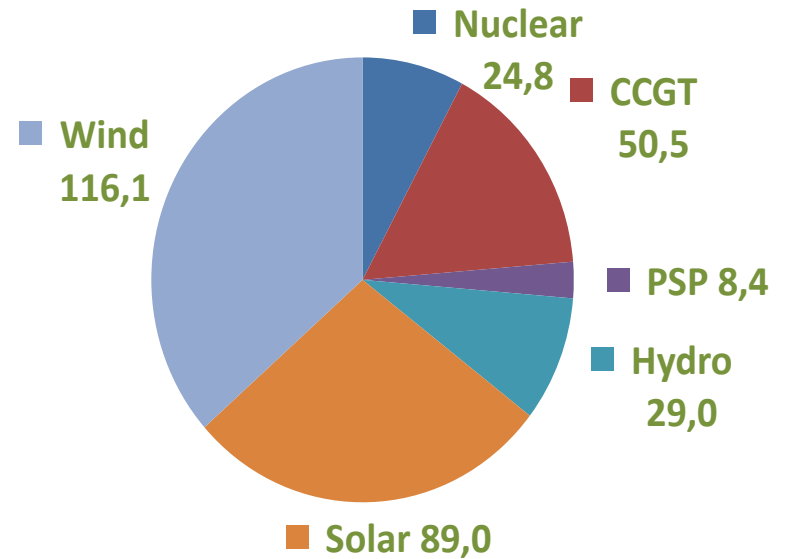
Example: Spain in 2030

2030 Installed capacity GW

- From 2020 to 2030 will be installed:
- 22.3 GW of wind
- 28.5 GW of PV
- 3,5 GW of PSP



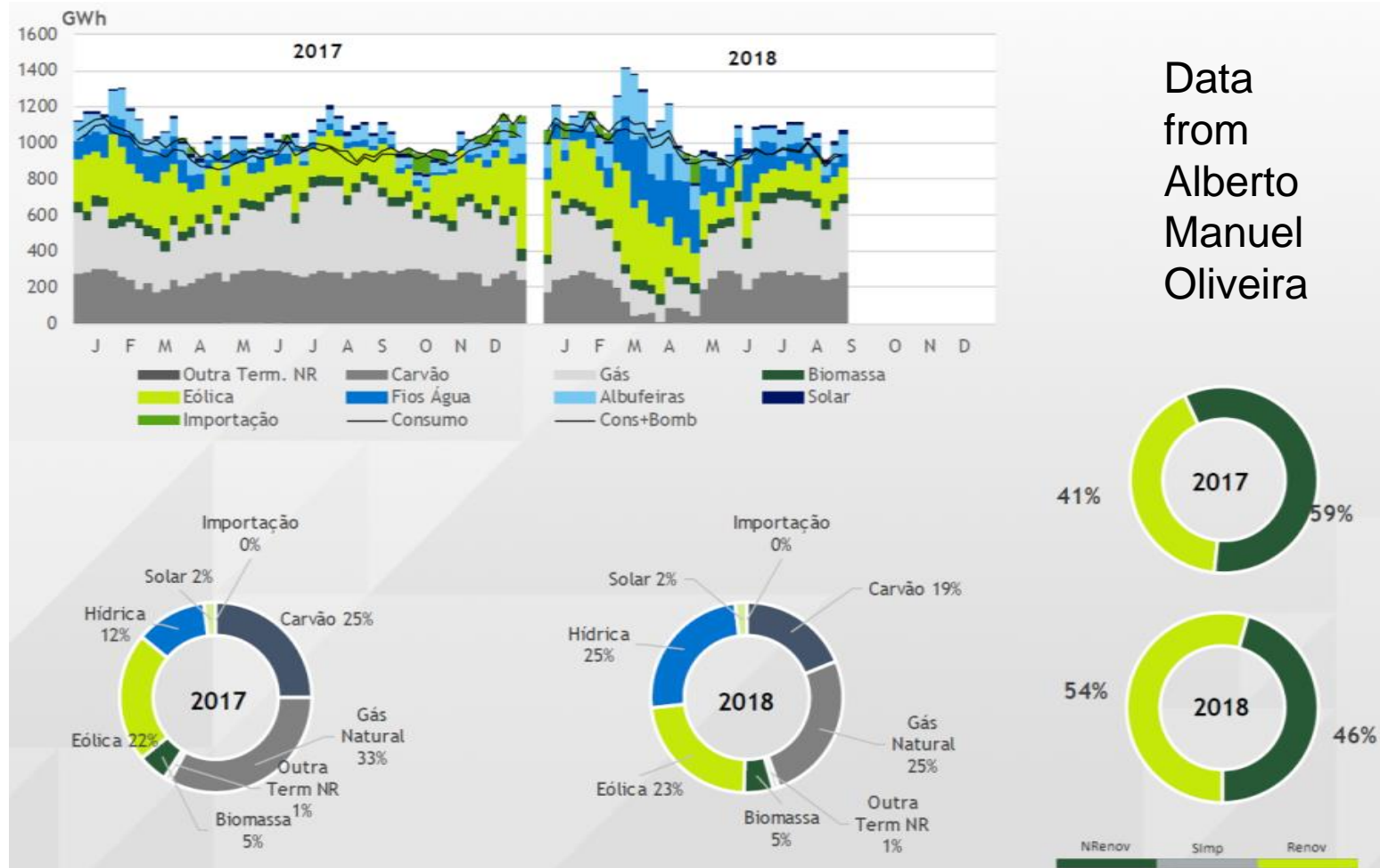
2030 Energy Balance TWh



Data from
Fernando
Perán
Montero

- Solar and wind will cover around 60 % of the electricity consumption
- CCGT : back-up technology for periods of low wind and solar resources
- Hydro: +0.5 TWh
- PSP : + 3.7 TWh

Example : Portugal in 2018



Data
from
Alberto
Manuel
Oliveira

2018: Electricity consumption was fully covered by wind, solar and hydropower for 3 days in March and 4 days in May

The needs of dams in Europe

❑ Power supply:

a sharp increase of
Pumped Storage Plants
shall be required in 2050
(50 GW to 200 GW!?).

PS-HEPP Sfikias
Installed Capacity 315MW



❑ **Seasonal Water Storage**: the need of seasonal water storage will keep much increasing for possibly 500 km³ more in 2050.

❑ **Floods mitigation**: the need will increase and especially in flat areas.

Dams deployment in Europe

Main solutions for increasing storage and flexibility with hydropower in Europe:

1. New power plant associated to new upper reservoir
2. New power plant on existing reservoirs
3. Transformation of turbine plant in pump-storage plant
4. New construction techniques to decrease dam cost
5. Digitalization program (predictive maintenance)
6. Efficiency programs (variable speed turbine, increase runner diameter, runner design)
7. Hybridization opportunities (Hydro+PV+battery)

The challenges for dams

- ❑ Most of the **best sites have been used**
- ❑ Cost of **wind and PV** more and more competitive
- ❑ **Reduction of social and environmental impact**



A BRAIN TRUST is required to find innovative concepts (not only technical, but environmental and social friendly as well)



Improvement of dam sustainability



Water resources strategy-
Strategic Directions for WB
Engagement

World Bank

2004

Hydropower sustainability
assessment protocol

International
Hydropower
Association (IHA)

2010

**Sustainability assessment
protocol for dam projects
at river basin level**

International
Commission on
Large Dams
(ICOLD)

2018



Specially focused on:

- Social issues as a key of sustainability
- Social Issues / Indigenous people
- Benefit sharing / win-win policies
- Water Rights Framework and Governance
- Sedimentation at basin level
- Fish paths

Data from Enrique Cifres

Lessons learn on sustainability

- **Participation** leads to better decision-making (involvement of all actors is required for environmentally sustainable development)
- **Credibility** from stakeholders by playing the role of a fair **referee** between confronted positions.
- **Transparency** (well defined rules and calendars, knowledge “a priori” of the range of possibilities, boundary conditions and the scope of the discussion)
- **Information** does not belong to agencies but to citizens
- **Capacity building** of stakeholders must be enhanced.
- **Equity in costs and benefits** means to calculate **gained value** of **externalities** that need very complex and not agreed procedures (WIN-WIN concept)

HYDROPOWER EUROPE a project led by ICOLD is appointed by EU from 1 Nov 2018 to 31 Oct 2021

**Anton J. SCHLEISS,
Jean-Jacques FRY**

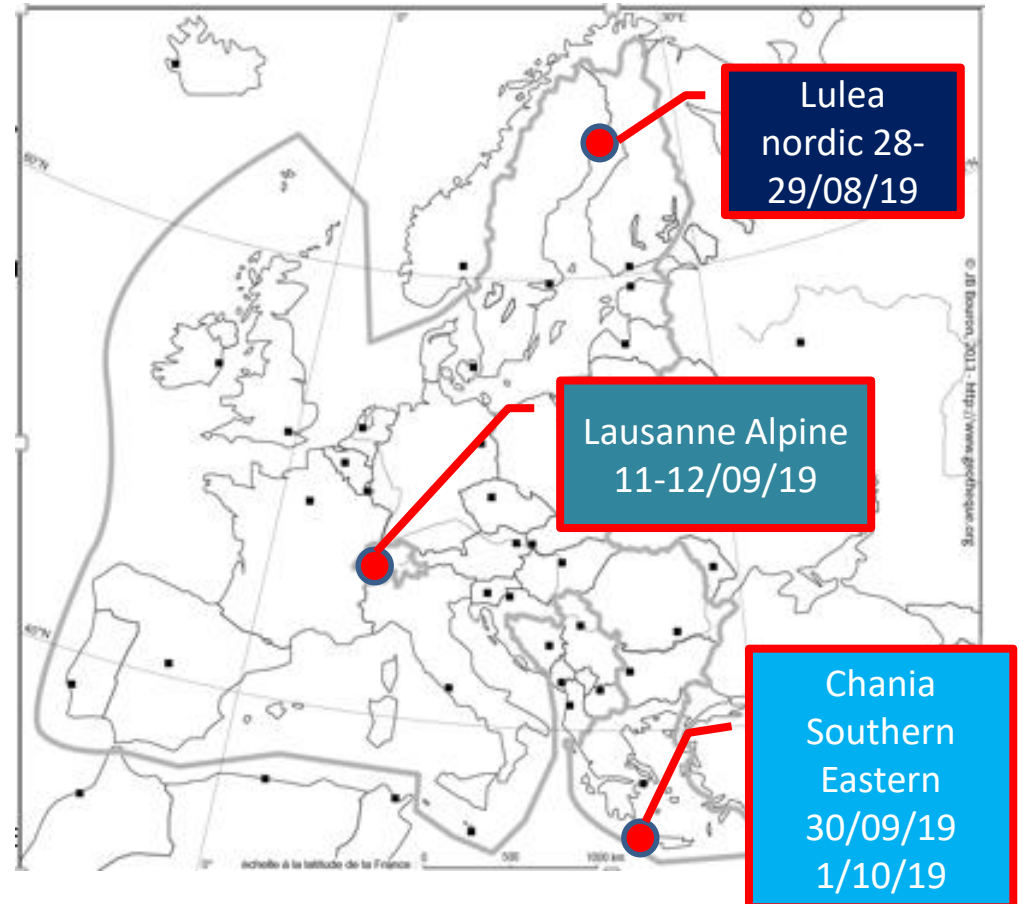
The stakeholders consultation

- The ambition of the project is to bring together all relevant stakeholders across the entire value chain in an European forum.
- The consultation process is essential to identify, prioritise and find solutions to address the current challenges that the different actors of the hydropower value chain are facing.



The consultation : the 3 regional workshops

Dialogue and engagement of all relevant stakeholders
Specific regional issues addressed through high level lectures;
Discussions on future actions;
8 focus groups contribute to Research & Innovation Agenda;
5 focus groups contribute to the Strategic Industry Roadmap providing SWOT analysis of related regional challenges that Hydropower sector is facing.



Register your R&I project!

consultation.hydropower-europe.eu

Participant Area

https://consultation.hydropower-europe.eu/participant-area/

Les plus visités Débuter avec Firefox Boîte de réception - m... Comité Français des B... DeepL

Consultant Area

Registration

HPE Stake

REGISTER

What is the level of budget needed to achieve the results mentioned above?
Indicate the level of financial resource needed

According to which timeline results can be achieved?
Indicate the timeline for the R&I activities and the associate Technology Readiness Level

Supporting Documents
Please provide any supporting documentation for your answers. Please upload a zip file for multiple files.

Current Upload:

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RIA Research & Innovations Agenda

SIR Strategic Industry Roadmap



are unique opportunities for dams

Dam representation in EU

The Hydropower-Europe forum shall represent dams in the European Union in 2022 after the project completion either as a forum or as an ETIP.

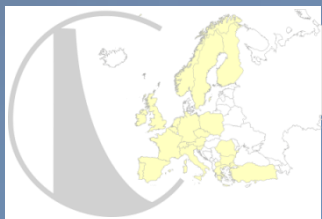
Forum or
association

(No subsidy)



European
Technology
&
Innovation
Platform

(Funded by EU)



**Grazie per l'attenzione e che la
Sicilia è ben preparata per il suo
futuro sostenibile.**