LA COCHE HYDROPOWER STATION UPRATING:

A HIGH PRESSURE PUMPED STORAGE PLANT OPTIMIZATION

Xavier Mourrat, Nathalie Lefebvre, Gilles Yahiaoui

SHF - Enhancing Hydropower plants Grenoble, April 9-11, 2014

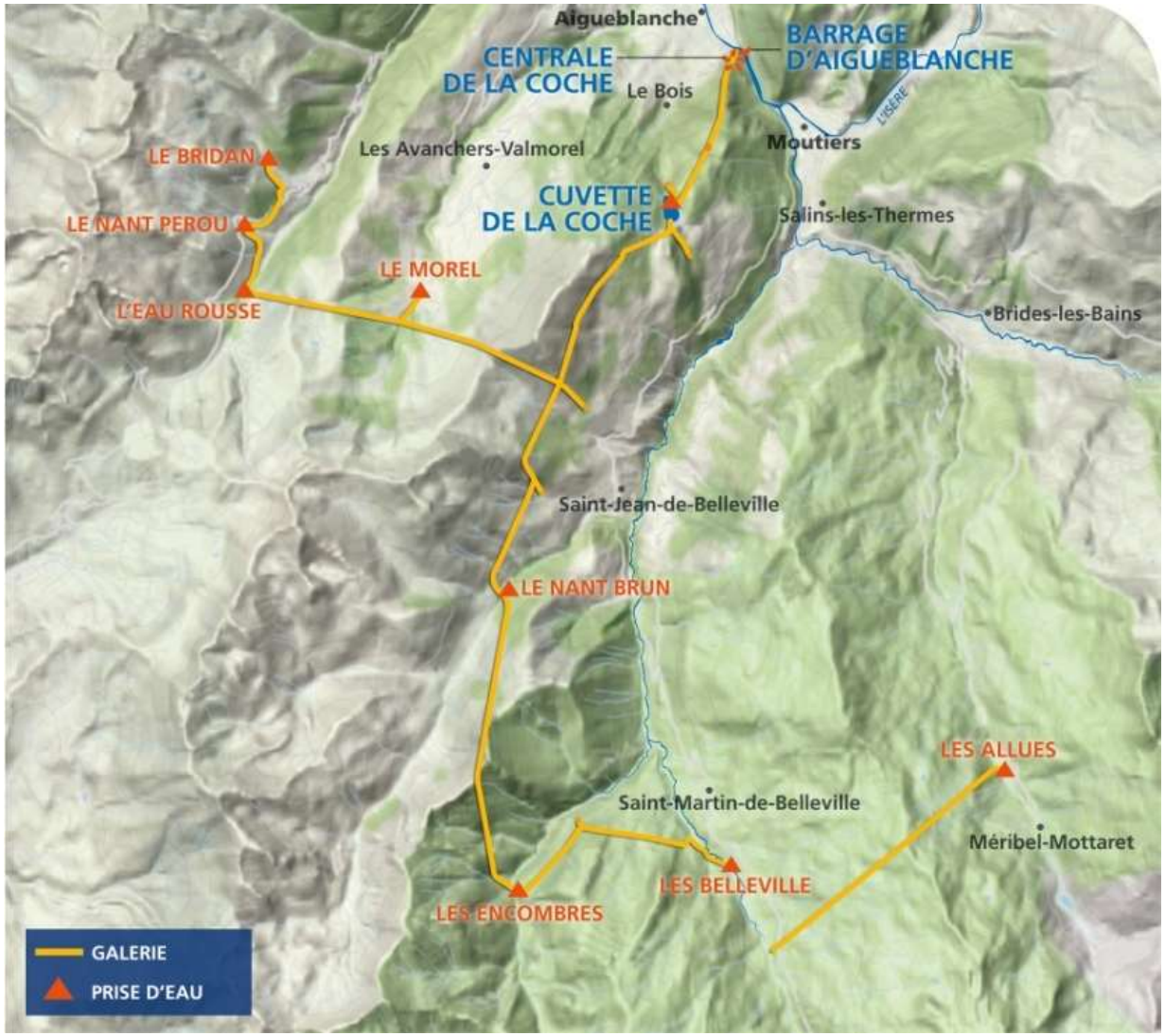
Barrage d'Aigueblanche © EDF – Dominique Guillaudin

SOMMAIRE

Retenue de la Coche © EDF – Dominique Guillaudin

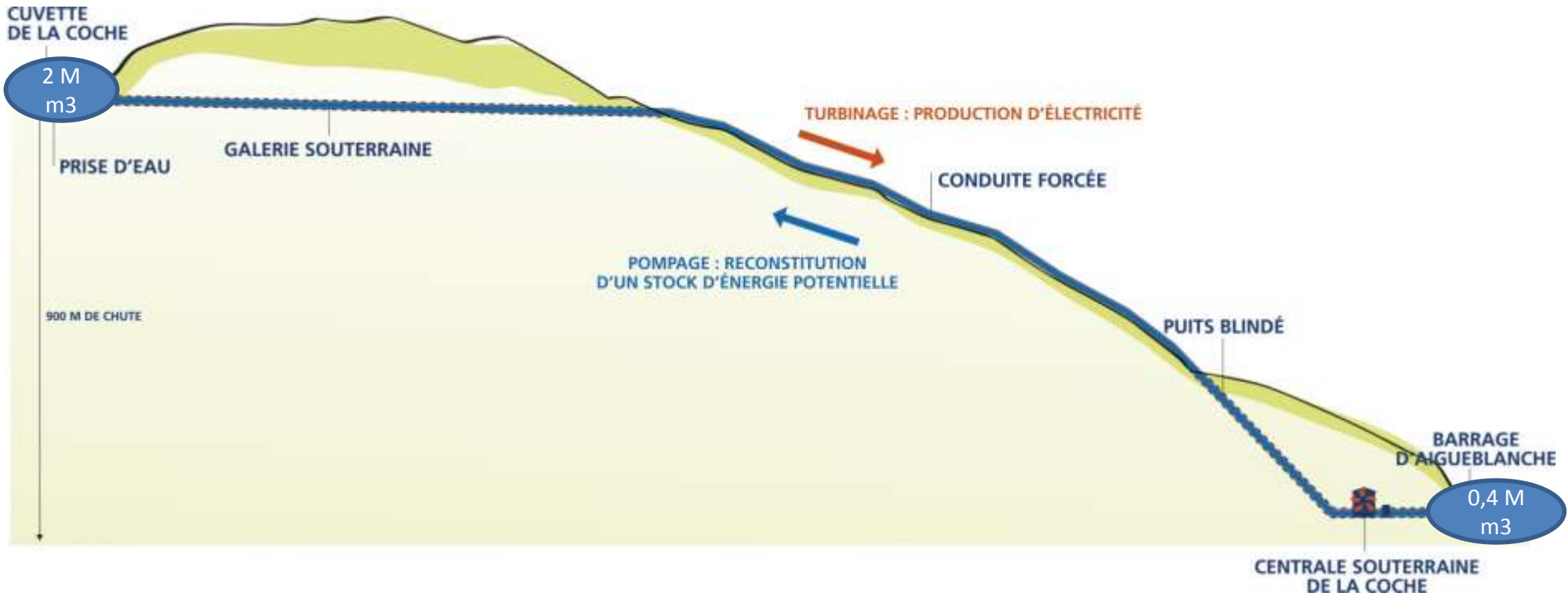
1. EXISTING POWER STATION

- **Savoie [France]**



1. EXISTING POWER STATION

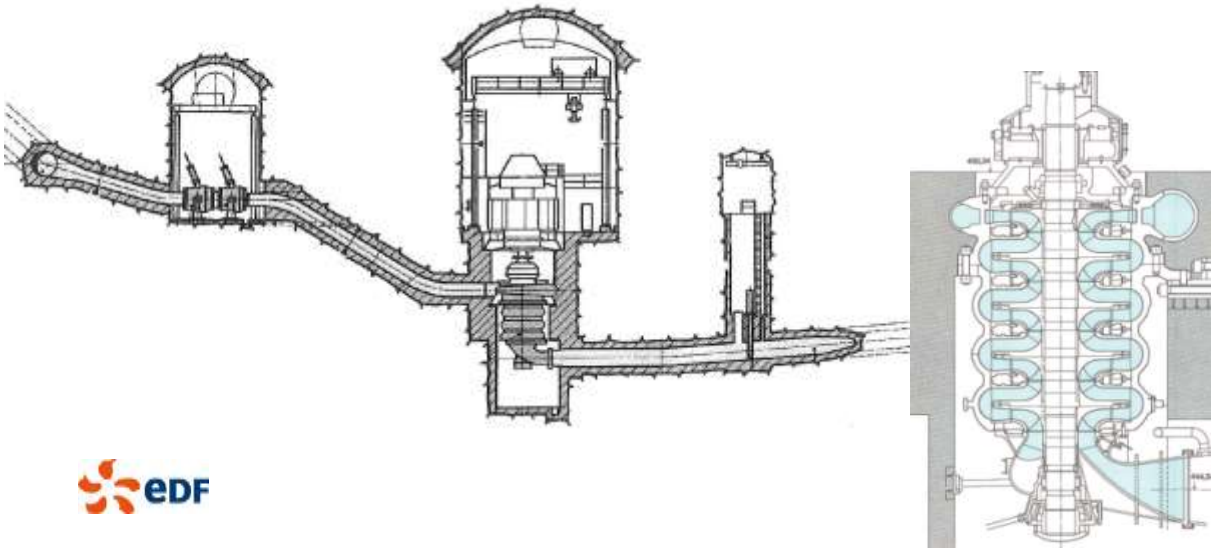
- **Pumping storage power station** built during the **70's**, with a production of **600 GWh [70% of standard gravity energy – 30% of pumped/stored energy]**



1. EXISTING POWER STATION
KEY FIGURES

- **900 m** head - **40m3/s**
- **Underground power station** commissioned in **1976**
- **4 reversible units** [5 stages] for a total installed power capacity of **320 MW**
- Production : **600 GWh** per year

Centrale de la Coche - © EDF – Lionel Astruc



1. EXISTING POWER STATION
PATHOLOGIES

- Existing units affected by sediments in turbined water

→ Availability < 60%

- **Several solutions studied – the selected solution is the addition of a PELTON unit (2014 – 2018)**

2. THE ADDITIONAL PELTON UNIT
CONTEXT

Existing power station:

Production
4*80MW = **320 MW**

Pumping storage
4*80MW = **320 MW**

LOI POPE
POSSIBILITY TO INCEASE BY 20% THE INSTALLED CAPACITY

Future power stations:

Production
2*80MW + 240MW = **400 MW**

Pumping storage
4*80MW = **320 MW**

Bureaux de la centrale actuelle de la Coche - © EDF – Lionel Astruc

2. THE ADDITIONAL PELTON UNIT
MAIN CHARACTERISTICS AND FIGURES

- Construction **close to existing power station** of a **outdoor power station**
- Available capacity **240 MW –** Discharge capacity **28 m3/s**
- Global cost : **150 millions €uros**

Bureaux de la centrale actuelle de la Coche - © EDF – Lionel Astruc

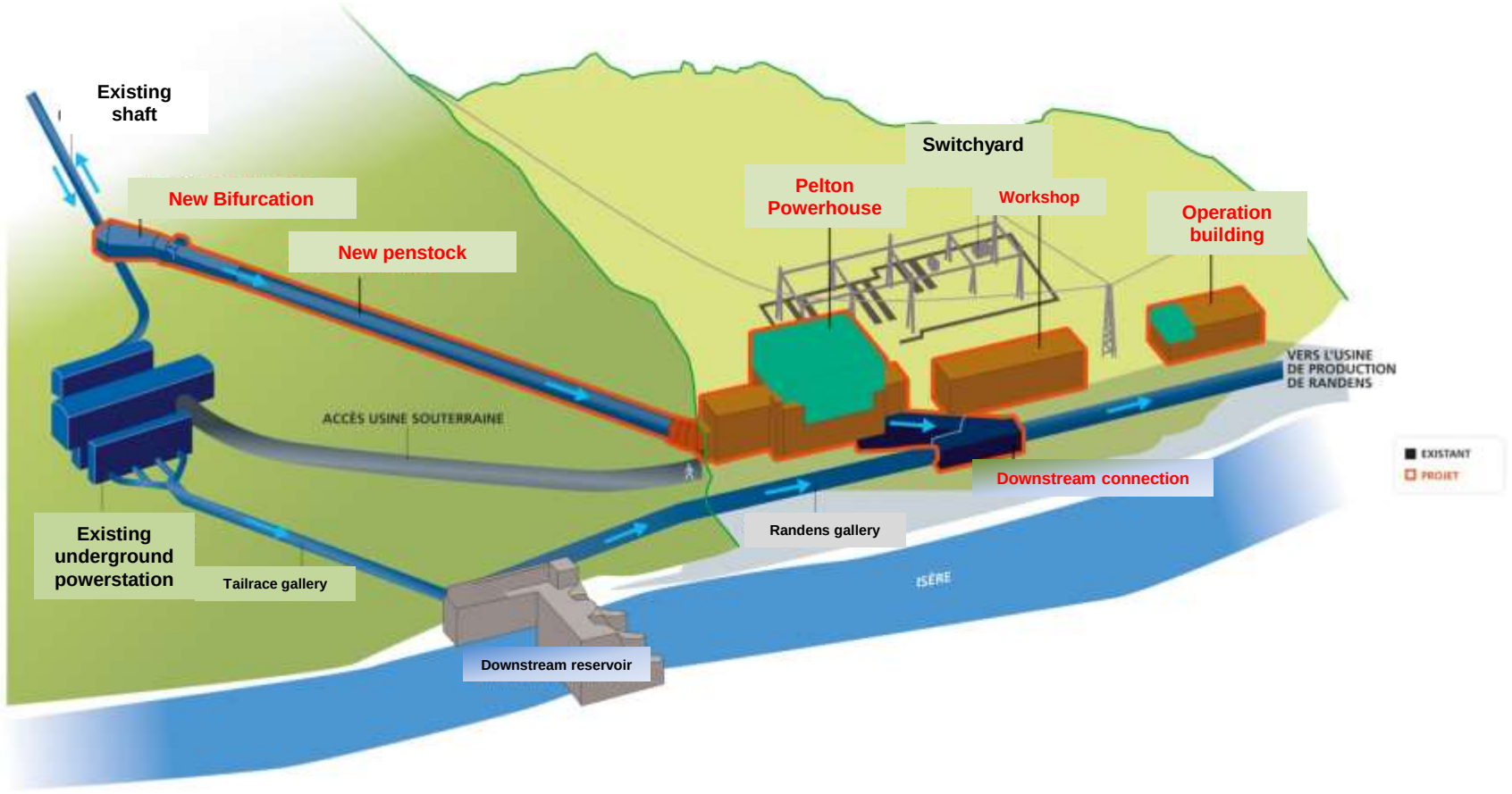
2. THE ADDITIONAL PELTON UNIT
STAKES AND BENEFITS

- Increase in availability (from 60% to 90%) by improving maintenance and operation
- Increase in peak power production +20%
- Increase in power production +100 GWh/year, and increase in ancillary services

2. THE ADDITIONAL PELTON UNIT
TECHNICAL CHOICES

- Outdoor building
- Underground connection to the existing penstock (underground shaft)
- Replacement of existing operation buildings
- Simple grid connection through an extension of existing switchyard

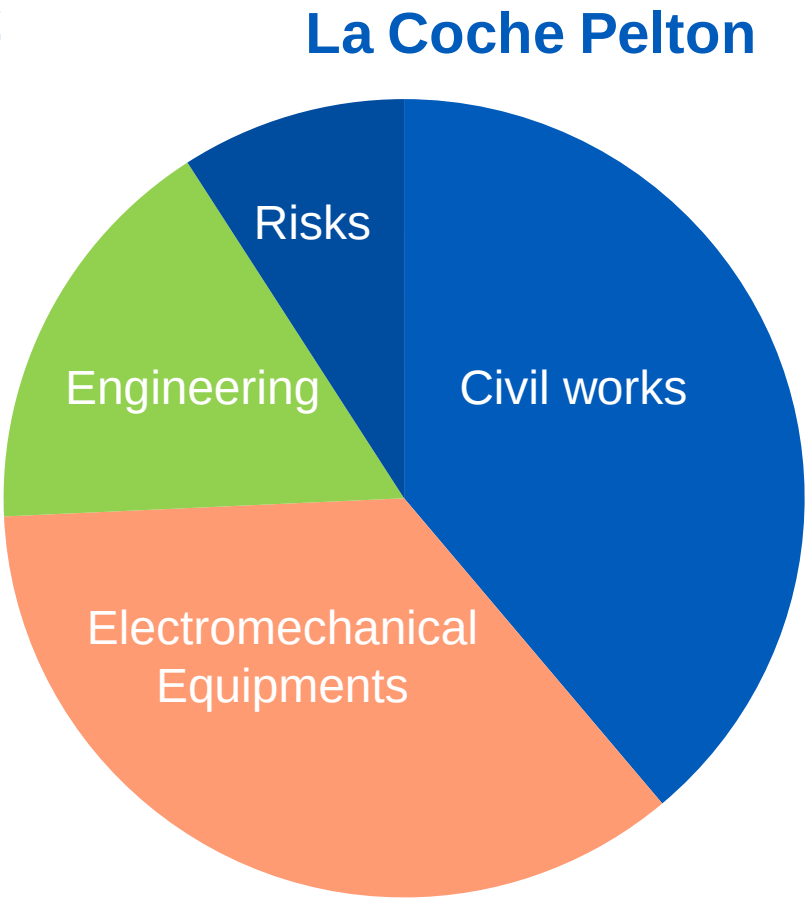
2. THE ADDITIONAL PELTON UNIT
MAIN SCHEDULE



2. THE ADDITIONAL PELTON UNIT

BUDGET

- **Approx. 150M€**



2. THE ADDITIONAL PELTON UNIT

MAIN RISK

- **Stability of the powerhouse is a sensible issue requiring a 3D-model (foundations / structures) to achieve a design able to absorb variable strength, vibration, settlements…**

- **Main technical consequences which could result from the 3D model:**
  - Adjustment of the heavy foundation treatment (bored piles)
  - Preloading (by filling the tailrace concrete channel with water) during the construction phase
  - A specific mechanical component to release the axial thrust resulting from hydraulic pressure on Pelton manifold: The compensation joint;
  - Possible design modification to limit building height: reversed generator
  - Possible adjustment in unit location to connect rocky foundations

THANK YOU FOR YOUR ATTENTION