



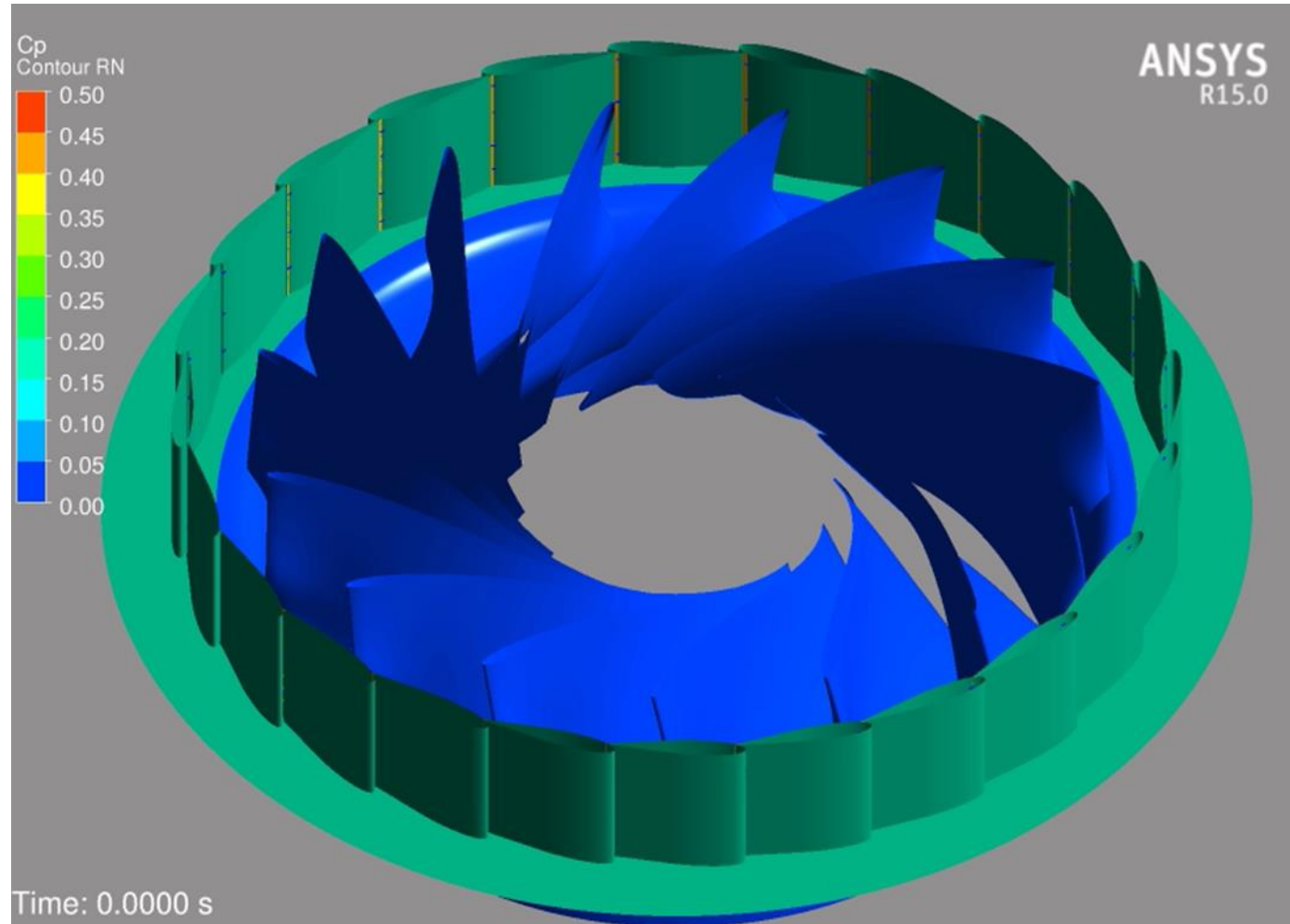
## **Creating data driven business in hydropower**

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# Digitalization in the Hydropower Industry

The virtual power plant in engineering and design

## Simulation of turbine flow: start-up sequence



# New Focus: Services in Operation and Maintenance of Hydropower Plants

Digitally optimized operation and predictive maintenance – three examples

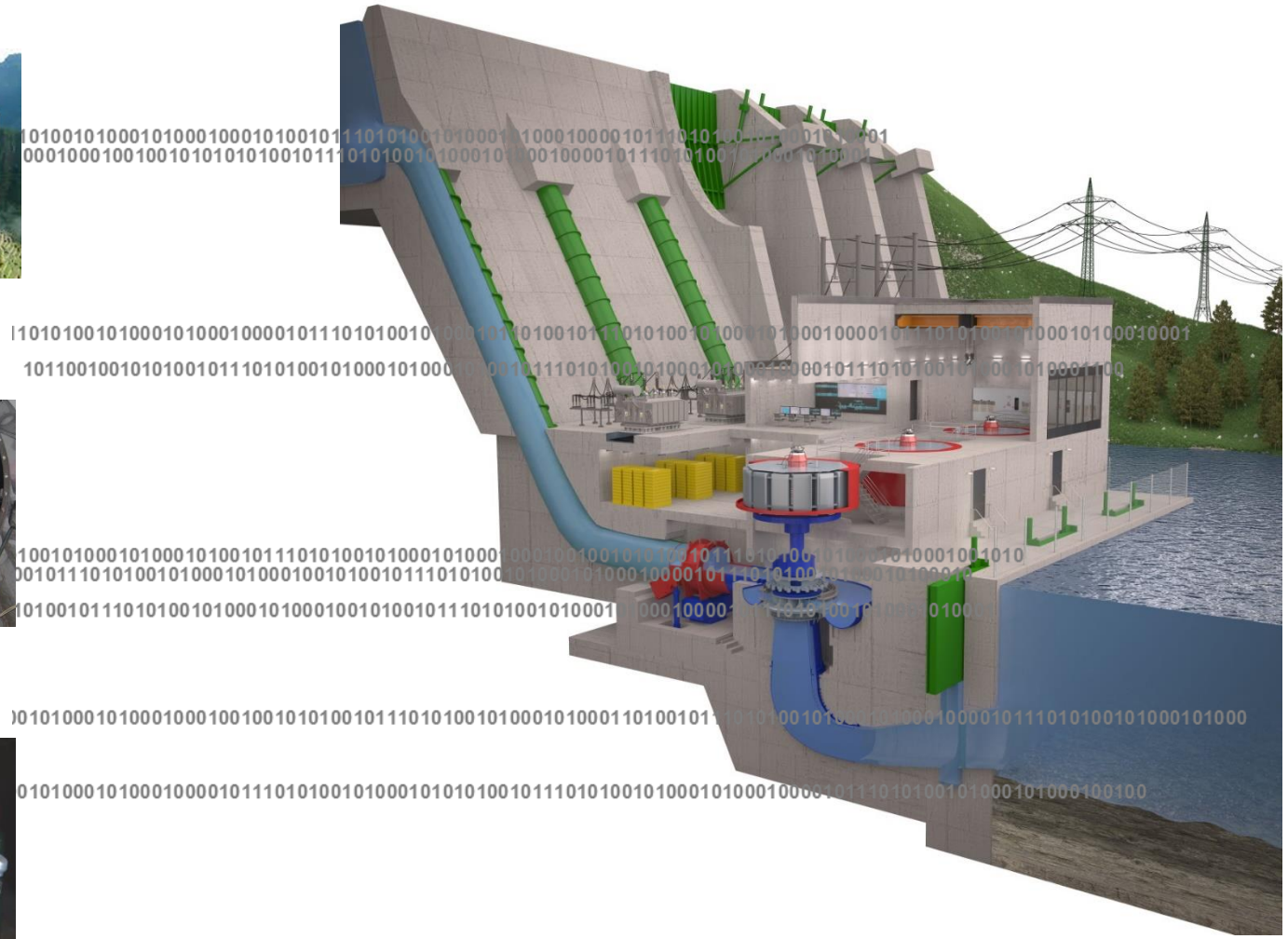
## ▪ Sediment Monitoring



## ▪ Vibration Monitoring of Bearings



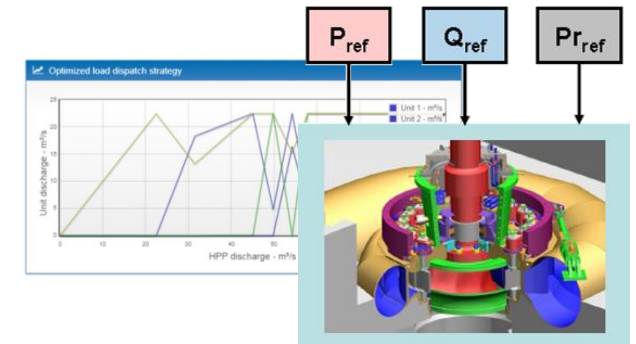
## ▪ Partial Discharge and Ozone Generator



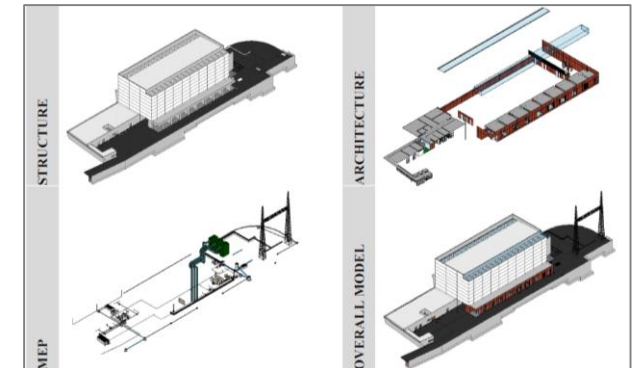
# Data driven processes and business

## Changes in the Hydro Industry

- **Hydropower plant is part of larger ecosystems**
  - Electrical grid: grid stability
  - Energy market: electricity price
  - Natural environment: weather and water
- **Data based engineering processes**
  - Building Industry Modelling BIM becomes a driver
  - Systematic use of engineering data in all stages of the product life cycle
    - Model information, Documentation
    - Communication, Collaboration
- **From product to services: Diverse market structure**
  - HPP ownership
  - Operation
  - Maintenance
  - Refurbishment



**Optimization of plant operation:  
Domain knowledge & data analytics**



Ferreira et al: The role of BIM during the tender phase ..., HYDRO 2017

**Data based engineering process:  
Collaboration & model information**