GO OPEN SOURCE
WITH THE ADEQUACY SOFTWARE ANTARES AND GET AHEAD OF THE ENERGY TRANSITION

Webinar on Antares simulator, 25th June 2020

Speakers

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Agenda

1. **An accurate and reliable adequacy software**

2. **Reference studies with Antares simulator**

3. **Inputs and outputs**

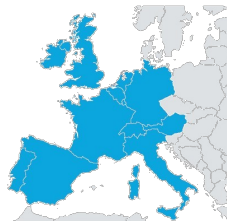4. **Download Antares for free and rely on our services**

antaressimulator

01 | An accurate and reliable adequacy software

A COMPREHENSIVE REPRESENTATION OF AN INTERCONNECTED SYSTEM

Market approach
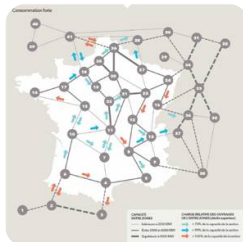
Antares area: One bidding zone

Antares link: Commercial capacities - International Net Transfer Capacity (NTC)

Physical approach

Antares area: One region

Antares link: Inter-regional "equivalent' impedances and grid capacities

Each area is defined by assumptions on…

Its electrical demand and ancillary services (reserve) needs

Its generation fleet with its technical and economic characteristics

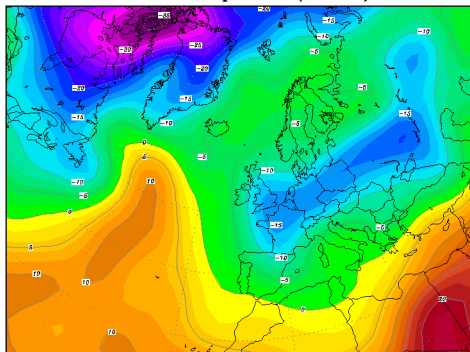*(most input data is yearly time series with a resolution of 1 hour)*

A POWERFUL PROBABILISTIC SOFTWARE

Several thousand possible scenarios are simulated by Antares

Climate scenarios, transformed in **load, wind and solar production**

Maintenance and outages of thermal power plants

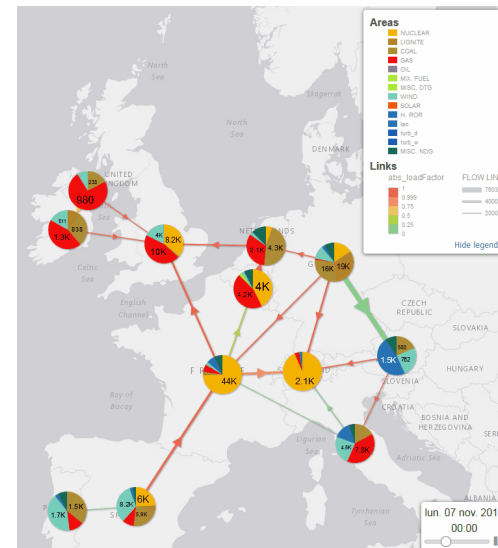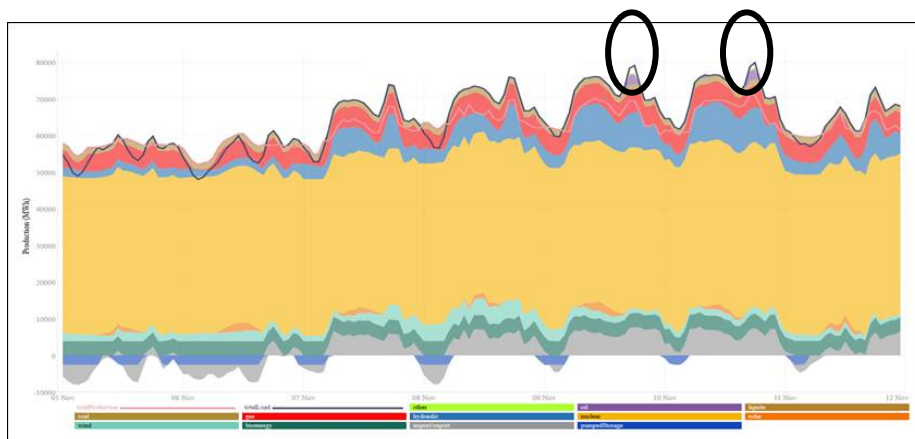Scenarios of **inflows for hydro power plants**

ONE OF THE MOST ACCURATE PROGRAMS

To simulate and visualize the balance between supply & demand

For each scenario studied, ANTARES **optimises the unit commitment** in order to meet the demand at the lowest cost.
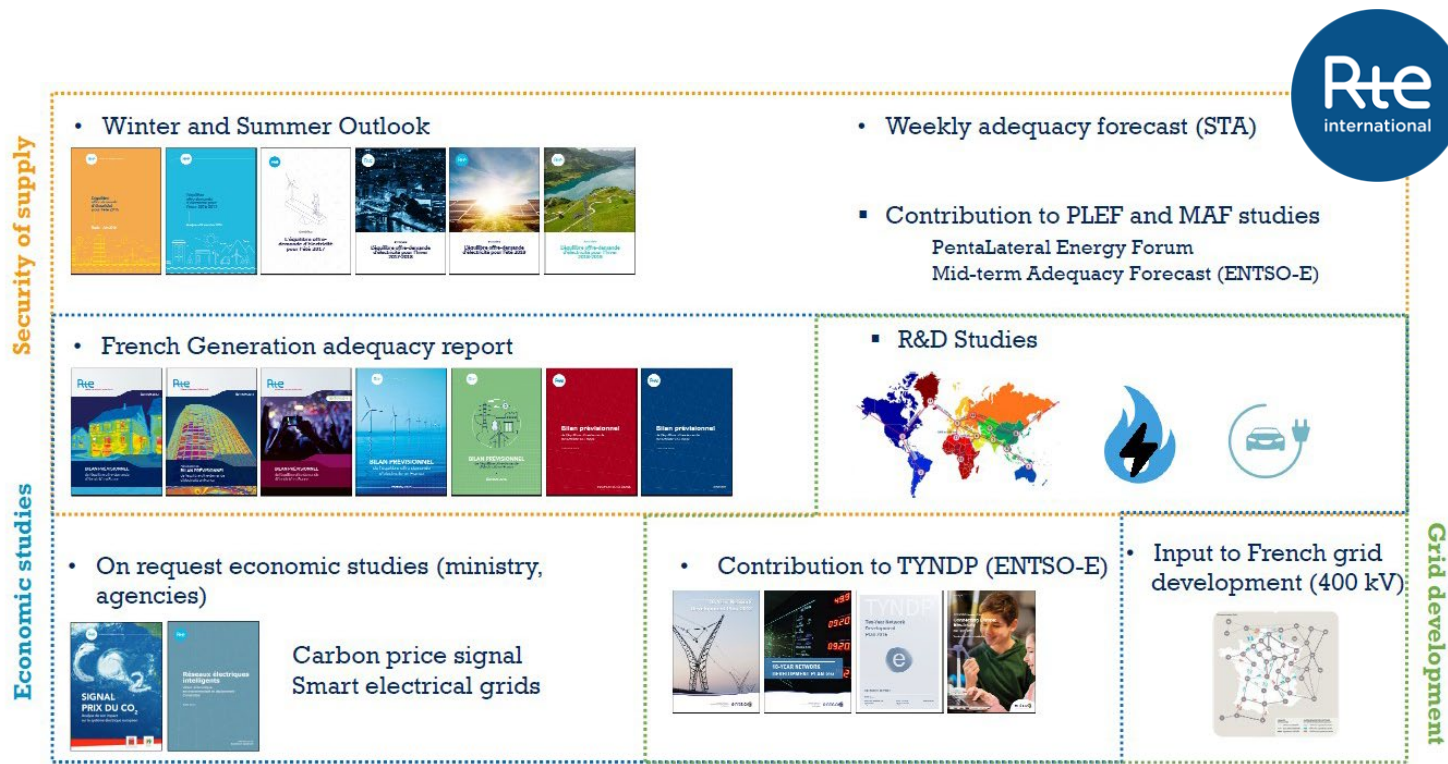
Exchanges between neighbours are possible, within the limits of the **network**.

Loss of load ⚠

02 | **Reference studies with Antares simulator**

ANTARES IS USED FOR REFERENCE PUBLICATIONS IN EUROPE

Security of supply

- Winter and Summer Outlook
- French Generation adequacy report

- Weekly adequacy forecast (STA)
- Contribution to PLEF and MAF studies
  - PentaLateral Energy Forum
  - Mid-term Adequacy Forecast (ENTSO-E)
- R&D Studies

Economic studies

- On request economic studies (ministry, agencies)

  Carbon price signal
  Smart electrical grids

- Contribution to TYNDP (ENTSO-E)
- Input to French grid development (400 kV)

Grid development

A WIDE COMMUNITY OF USERS

entso e

- Ten-year Network Development Plan (TYNDP)
- Mid-term Adequacy Forecast (MAF)
- Short Term Adequacy (STA)
- Seasonal Outlook

elia

MAVIR

Rte

ULB UNIVERSITÉ LIBRE DE BRUXELLES

amprion

GRTgaz

APG AUSTRIAN POWER GRID

mtaEK

MINES ParisTech

EMC

ekc

University of Strathclyde Glasgow

med-TSO MEDITERRANEAN TRANSMISSION SYSTEM OPERATORS
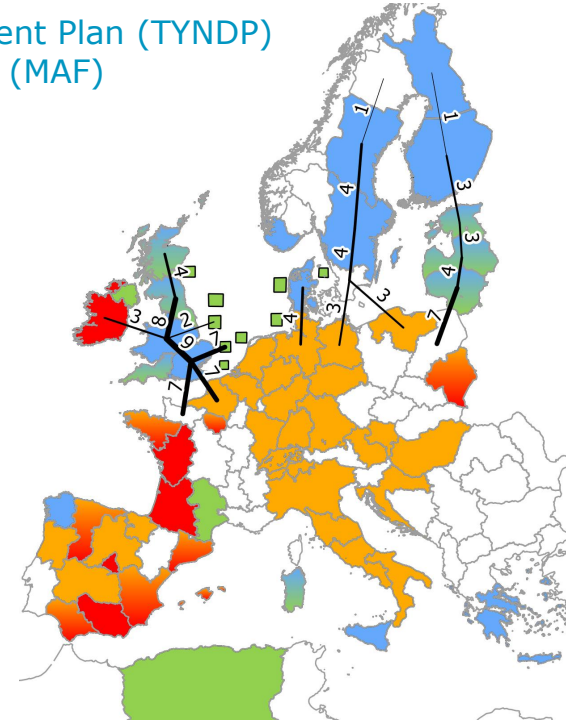
RTE international STUDIES WITH ANTARES

Islanded System

- High development of RES capacities in the coming years
- Thermal power plants to decommission or commission

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Study

1. Economic interest in Energy Storage System
2. Security of supply
3. Increase in RES curtailment

Ukraine

- Strong development of RES capacities
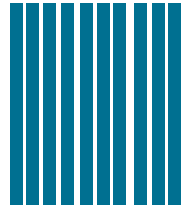- Old and inflexible thermal fleet
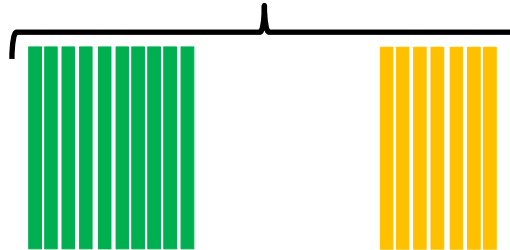
УКРЕНЕРГО

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Study

1. Increase in RES curtailment
2. Impact of the reserve's distribution among the thermal fleet on the cost of production
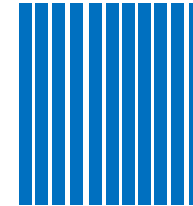
03 | Inputs and outputs

MAIN INPUTS

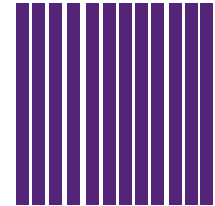**Load
Hour by hour**

**Wind generation
Hour by hour**

**Solar generation
Hour by hour**

**Hydro power
Generation (or
inflows)**

**Thermal availability
Hour by hour**

Monte-Carlo draw
of N years

Year 1   Year 2   Year …   Year N

MAIN OUTPUTS

Security of supply

- LOLE (h)= Loss of Load Expectation
- Unsupplied energy (MWh)
- Current margin

Economic results

- Cost of production
- System costs
- Marginal costs
- Cost of curtailment
- Cost of unsupplied energy
- Exchange between areas

Environmental

- Co2 emissions
- Renewable production
- Spilled energy
- Generation plan

COMPLEMENTARY R PACKAGES

Meet your own needs with scripts in R

AntaresRead
Read the results of your study and select the kind of output, the area(s) and the link(s) you want to focus on

AntaresEditObject
Edit your study and launch consecutive simulations

AntaresViz
Display your results through various type of graphics

AntaresProcessing
Set of functions to post the process your study's results

fbClust / fbAntares
Select typical Flow-Based domains from historical data and translate them into Antares constraints

AntaresXpansion*
*Optimise the investment strategy on a long-term scenario (*Should be released in the coming months)*

Possibility to write scripts in R and to use specific R packages for Antares, for input preparation or output processing.
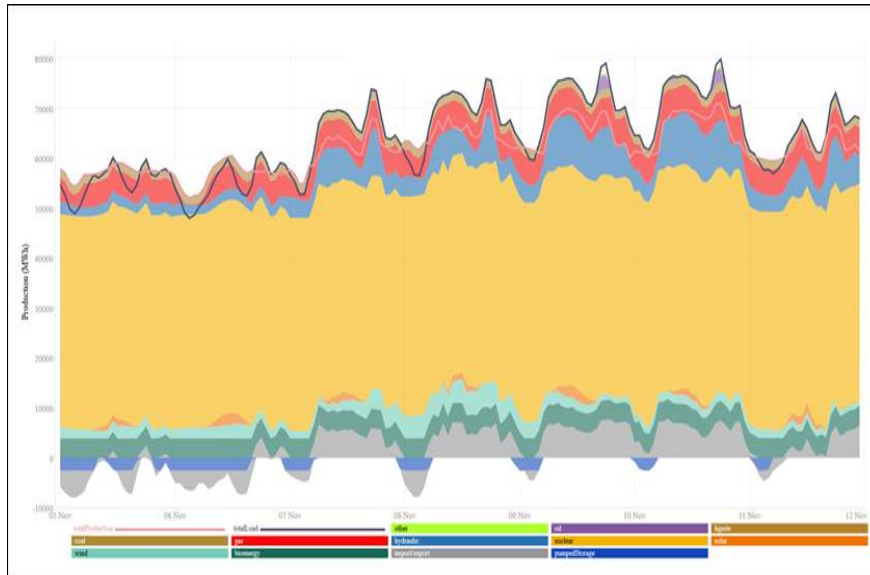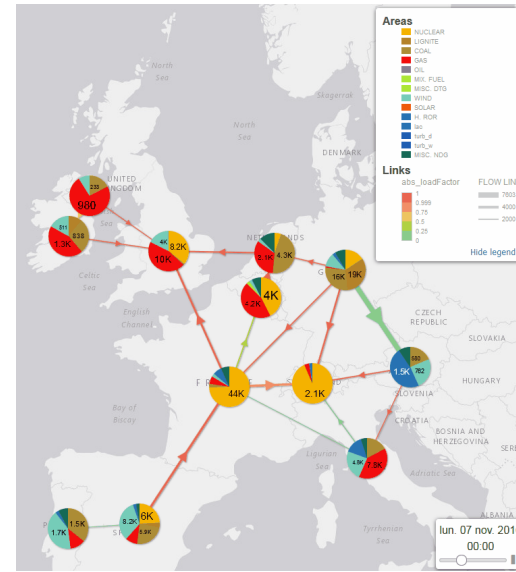
The packages developed by RTE are available on github

ANTARES VIZ

Example

Generation stacking over one week

Dynamic Map with flow and generation mix

ANTARES VIZ

Example

Load Duration Curve
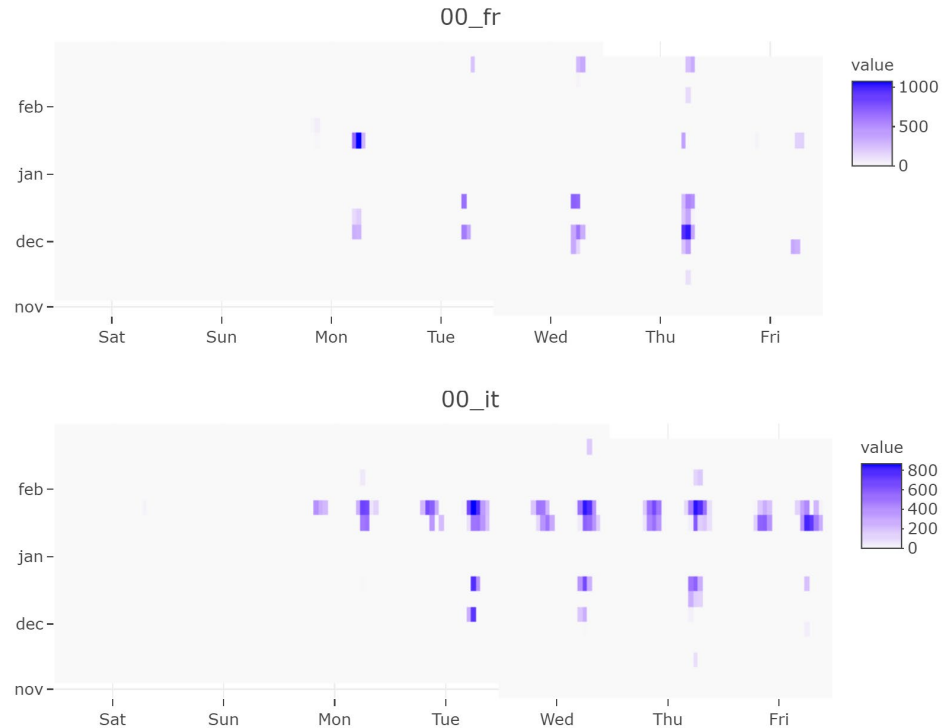

Monotone of FLOW LIN.
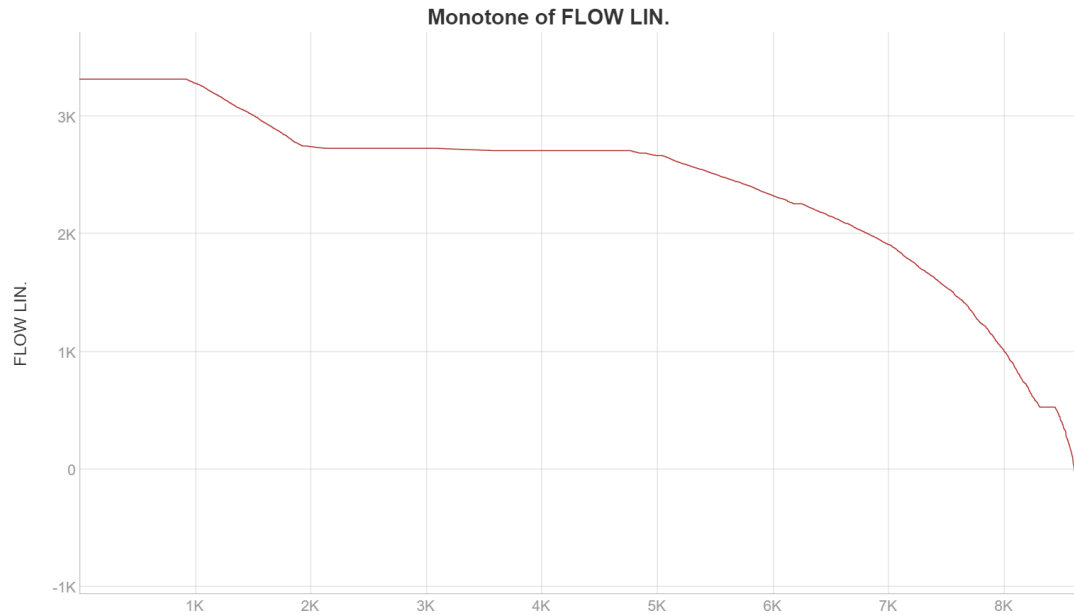
ANTARES VIZ

Example

Heat Map

Display the occurence of an output (Curtailment, Unsupplied Energy, …) according to the days (X-axis) and months (Y-axis) of the year

04 | Download Antares for free and rely on our services

antaressimulator

AN OPEN SOURCE SOFTWARE
Model your first scenarios today

Antares is a complete tool that does not require any other license, thanks to a linear solver developed in-house that will also switch into open source

Antares software installer can be downloaded free of charge

An opportunity to continue the development of a community through the creation of a user club

For consultancy purposes, it allows the model to be provided to your client

RELY ON OUR SERVICES

A service for every need

Training sessions

User club

Support service

GET INTENSIVE TRAINING

Quickly master the simulator thanks to our regular training sessions

Beginner training session

- <u>Duration</u>: 3 days
- <u>Next session</u>: **16th, 17th, 18th September, in Paris**
- <u>Target</u>: beginners or users who need to strengthen their skills
- 2 training sessions scheduled per year

Advanced training session

- <u>Duration</u>: 2 days
- <u>Next session</u>: **7th, 8th July (sold out)**
- <u>Target</u>: experienced users who want to learn advanced methods of modeling
- 2 training sessions scheduled per year

GET IN TOUCH WITH THE WIDE COMMUNITY OF USERS

Take part in the development of the software by joining the user club

Basic User Club Membership

- Participation in the user club meeting to share knowledge and advanced use of the tool (2 times a year)

Advanced User Club Membership

- Participation in the user club meeting to share knowledge and advanced use of the tool (2 times a year)

- Expert support and documentation

- Ability to select the developments of new features via a voting process

GET ANTARES SUPPORT SERVICE

Fine-tune your models

Correction of identified errors in software operation
Analysis, support and correction of Antares, based on feedback from customers for all types of issues encountered in the use of Antares.

Responses to questions relating to software operations
RTEi experts will provide support for questions related to the normal and expected software use. RTEi experts will also provide support to users for the creation and the implementation of their models and the integration of Antares in their business processes.

Support with new software versions
When a new version is released, a notification will be sent to the customer along with a description of the new version.

Questions & Answers