Artelys Crystal Industry

*Increase the value of your investments and operational flexibility*
I. ARTELYS CRYSTAL INDUSTRY

II. EXAMPLE OF STUDIES
   I. Investment study
   II. Operational strategy study
   III. Demo
About Artelys

- Independent company created in 2000
- Innovative company specializing in analytics and energy systems optimization
- Consulting services and software development

Locations
- Paris
- Chicago
- Montréal
Two types of projects:
- Consulting studies
- Functional analysis, development and implementation of operational tools

**Approach**

- Functional analysis
- Specs
- Modeling
- Quantitative analysis
- Protoyping
- Software development
- Implementation
- Training
- Maintenance
- Support

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Artelys carries out consulting studies

- Based on the software **Artelys Crystal Industry**, a powerful techno-economic simulation tool
- Targeting large electricity or heat consumers
  - Industries
  - Heat networks
- Generating savings based on an increased value of
  - Investments
  - Operational flexibility
Demand process modeling

- Model of energy consuming process
- Active demand management: storage, selling of excess energy (market, contracts, FIT)
- Crystal incorporates a demand forecast and analysis tool
- Energy supply contracts

Production facilities modeling

- From an asset library
- Conventional (fuel-oil, gas) and renewable production
- Transmission assets

Operational uncertainties simulation

- Climate uncertainties: $T^\circ$, solar radiation
- Market uncertainties
- Maintenance, failures
Dashboard

- Graphical visualization for operational management
- Costs distribution
- Operational KPIs (startup counts, average/maximum power, etc.)
- Custom KPIs
- Direct export to excel
Customizing

- Artelys Crystal is a generic solution, which can be customized to fit your need
- Artelys Crystal incorporates a scripting tool to customize your KPIs
- Artelys Crystal has a powerful data loading module
What are the opportunities and costs of an investment project?

- **Model**
  - Local energy demand
  - Energy production assets

- **Optimization**
  - Simulation of the existing portfolio with an ideal strategy

- **Scenarios**
  - Design and simulation of investment scenarios

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**PEPS study**

- Assessment of potential for energy storage in France by 2030
- Study funded by ADEME (French environment agency), the French Ministry for Industry and more than ten industrials including power producers, TSOs, DSOs, equipment providers.
- Study of the optimal sizing and of optimal management policies for storage (with careful modeling of technical characteristics of boilers: minimum on-off durations, minimum power etc.)

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STUDY OF OPERATIONAL STRATEGIES
How to modify an operational strategy to improve it in terms of costs or pollution?

- **Model**
  - Local energy demand
  - Energy production assets

- **Historical replay**
  - Integration of historical data
  - Simulation of the current strategy

- **Optimization**
  - Computation of the *ideal* strategy

- **Future strategy**
  - Design of custom operational strategies
  - Simulation and comparison with current/ideal strategies

- **Field application**
  - Implementation within industrial operational management
  - Feedback

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Izmit refinery (Turkey) run by Tüpraş

- Several thousands of GWh of steam & electricity consumption, recent connection to the Turkish electricity grid
- Strategies optimization minimizing costs and pollution
  - Costs and pollution reduction by +10% with no investment
  - Design of custom strategies
  - Simulation and analysis of custom strategies
- Adjustment of strategies to electricity markets
  - Day-ahead, spot...
- Investment strategies studies
  - Gas turbines, CHP with
    - VHP steam
    - HP steam
  - Wind turbines, PV

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DEMO
A refinery produces and consumes its own energy. The plant manager wants to know how profitable it would be to sell to the market and whether this could be accommodated by the plant’s operational practices?

- Crystal Industry is used to answer these questions.
- Three simulations (test cases)
  - Historical replay (=no market operations)
  - Optimization shows more than 10% potential cost savings but leads to unreasonably complex operations (many startups of the condensate steam turbine)
  - A simplified strategy offers similar savings at reduced complexity
Market price threshold strategy

- The optimized operational strategy highlight a price threshold of $108 for turning ON/OFF the condensate steam turbine.
- But, as much as 12 startups/shutdowns of the turbine are executed in just 5 days.
- The proposed custom strategy is based on the definition of 2 different price thresholds:
  - Threshold $115 for starting up the turbine
  - Threshold $100 for shutting down the turbine

![Electricity price chart](chart.png)
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