IMT Atlantique
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Demand Side Management

A model driven approach to promote energy self-consumption

Stakeholders

OKWind
Votre énergie verte
IRISA UMR

Authors

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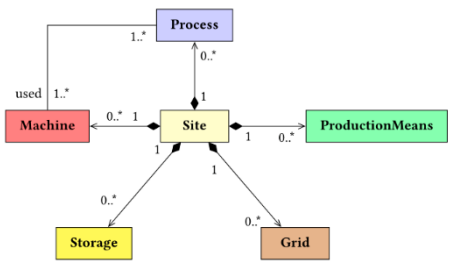
Agricultural exploitation using solar tracker
Credit: GAEC du Faisan

Case study: Industrial site self-consumption

- **Self-consumption** of renewable energies is defined as electricity that is produced from renewable energy sources
- The **autonomy** of sites with micro-generation capabilities is greatly increased by self-consumption of locally produced energy
- One of the keys is thus to **align production and consumption** either by planning processes differently or by relying on storage capabilities.

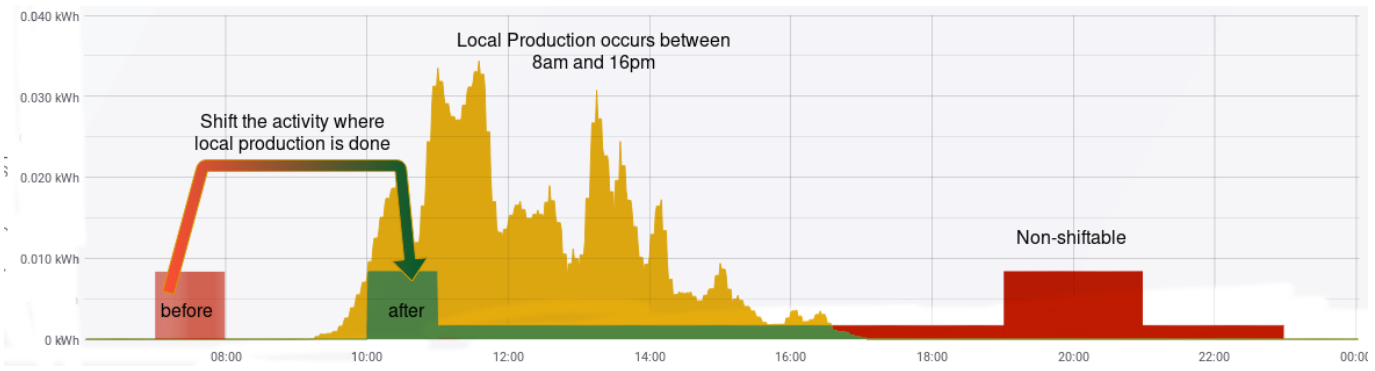
- Help for “What-if“/ “what-for” questions:
  - How to **size** local renewable energy production units or storage to meet a site's energy consumption
  - Which **region** would be the most interesting for the expansion of a business?
  - What **organization of activities** enables the best autonomy and self-consumption?



Simplified version of our metamodel

Proposal: Simulator and Domain Language

- Model Driven Engineering (MDE) approach to address variability
- **Energy Management System** (EMS) in simulation or using real sensors
- Domain Specific Language (DSL) to represent an industrial site
  - Production, consumption, storage
  - Activities and constrains modeling
- Description files are used by a simulator.
- Simulator can be extended by experts, through **plugins**, to model complex devices behavior



Shifting of an activity to increase the autonomy fo the day from 9% to 20%

Experiences

Evaluation: Activity shift recommendations

- Simulator can use third-party prediction to estimate future events: solar production, device usage
- Recommend actions based on context: battery state, user activity to **optimize autonomy** and self-consumption
- Take into account process constrains and flexibility and battery cycle usage
- Improve autonomy from 30% to 50% or 70%

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