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ETIP SNET
EUROPEAN TECHNOLOGY AND INNOVATION PLATFORM
SMART NETWORKS FOR ENERGY TRANSITION

Reliable, economic and efficient smart grid system

CATALYST

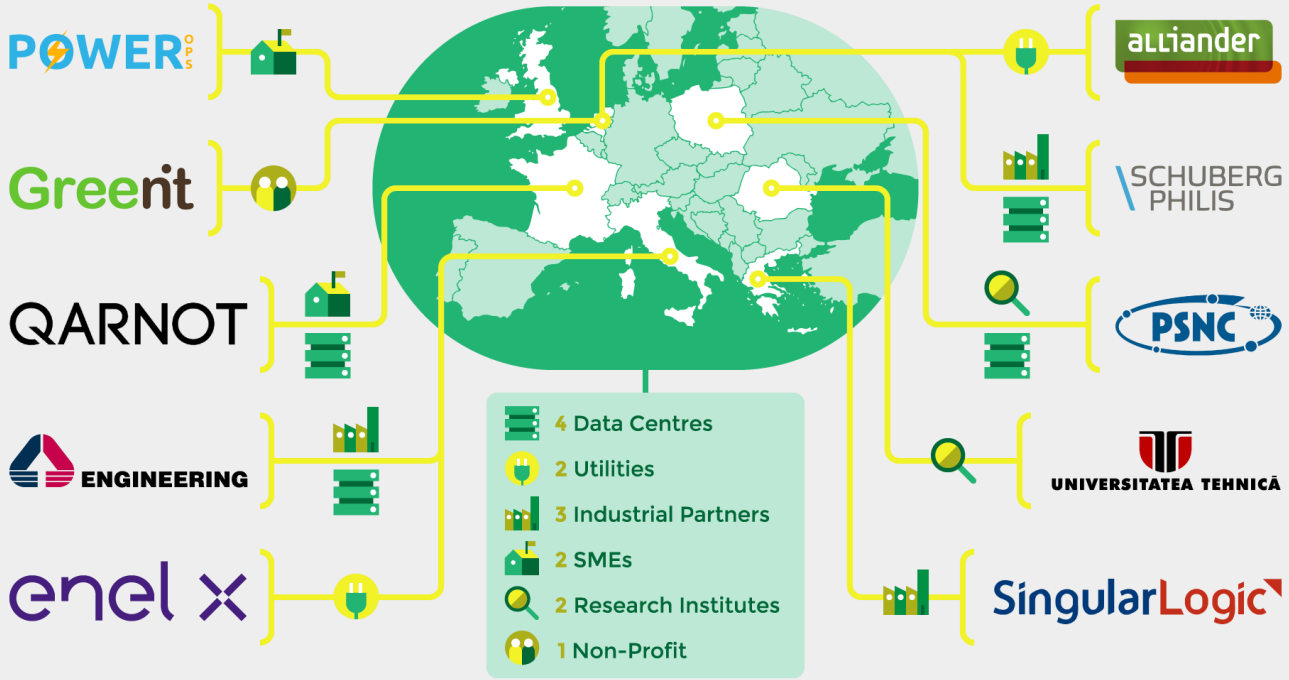
Short presentation of the project

Converting Data Centres (DCs) in Energy Flexibility Ecosystems

H2020-EE-2017-20 Innovation Action

October 2017 – October 2020

2.982.805 Euro (EU 2.299.103,5 Euro)



www.project-catalyst.eu

The context:

- 1.5% of global electricity is used in DCs and wasted as heat
- Energy transition, growing demand for balance services providers

The potential:

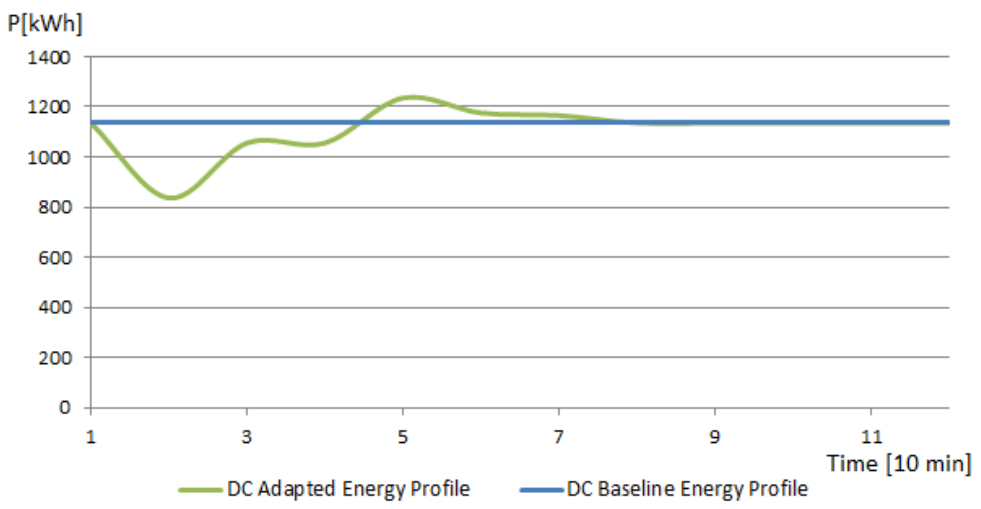
- DCs has several redundancy systems, (backup generators and cooling systems, batteries, UPS) that could be exploited to enhance the reliability of the grid

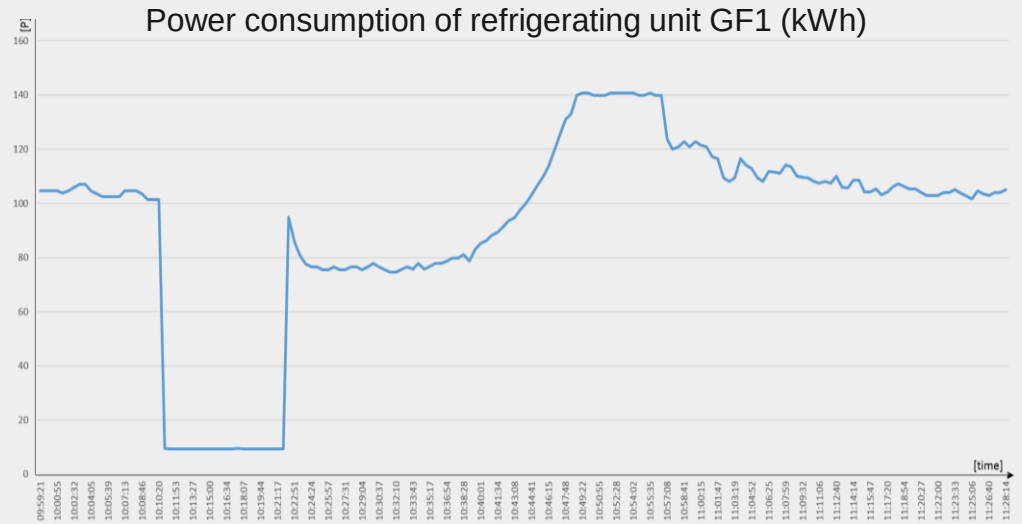
Overarching objectives:

- Demonstrate DCs can and should offer flexibility services to the grid and are suitable hubs coupling the grid with heat network
- Develop a set of tools for DCs assets optimization and flexibility forecasting
- Validate and disseminate an innovative business framework for multi-carrier flexibility service offering

Key exploitable results addressing energy system integration

Evidences from the Italian test: cooling system inertia used as flexibility asset





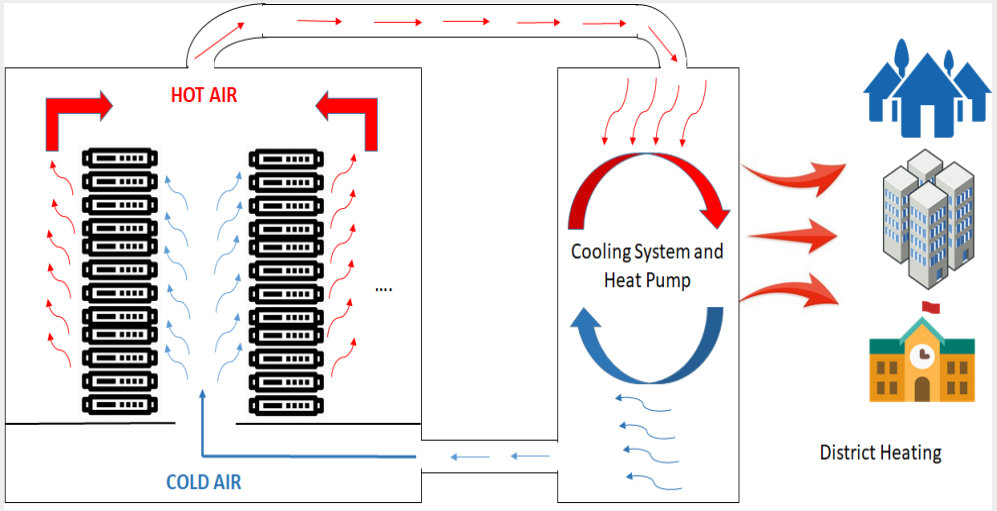
- Refrigerant units are switched off decreasing the overall energy demand of the DC by 300kW
- When regrigerants are restarted additional power is necessary to bring the system back to steady state

Key exploitable results addressing energy system integration

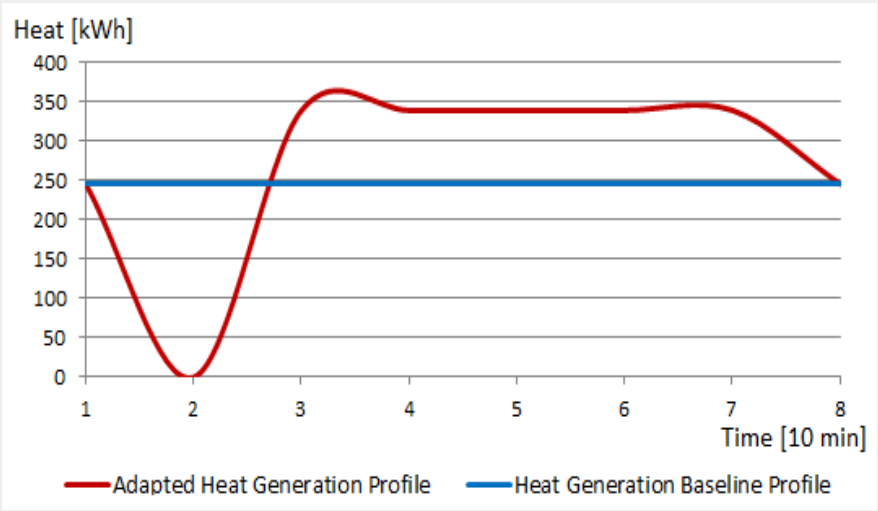
CATALYST most «ready to the market» tools: **prediction engine** and **optimizer**

The **prediction engine** is a modelling tool that can be integrated in the DC management system to quantify how much flexibility or heat can be exploited from the DC while the **optimizer** provides the best strategies configuration (e.g.: hosting external IT load, scheduling IT load in time, etc.) to match the DC's energy consumption with external drivers such as renewable production, heat demand or flexibility request.

Simulation of heat recovery by heat pump



The refrigerant unit switch off generates extra 40 kWh of heat when restarted



Key exploitable results addressing energy system integration

Key results from the projects:

DCs can provide congestion management services (upward/downward)

The exploitation of thermal inertia is the least intrusive solution to exploit flexibility

At design stage it make sense to locate DCs near the heating network

Quantifiable benefits

improvement of grid reliability, enhancement of the circularity of the DC operation

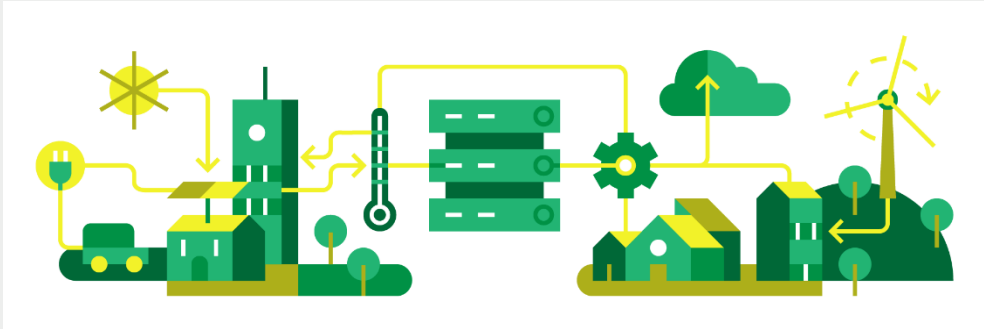
Final beneficiary of the results

DCs, district heating operators, smart grid operators, ESCO, aggregators

Lessons learned and barriers to innovation deployment

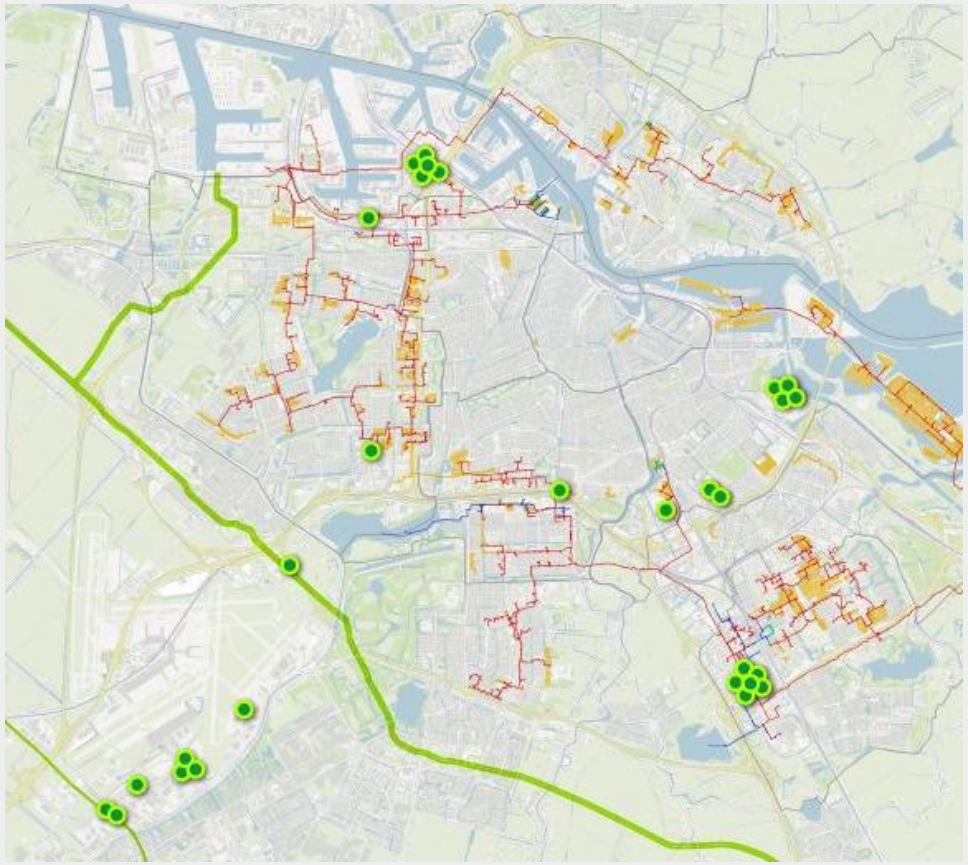
Lessons learned from the project and Barriers

- The integration of DCs in the energy market as prosumers is also a matter of education. DC operators should be "educated" in implementing proposed solutions mainly because DCs are designed to operate independently and without integration with external systems.
- Uncertainty on who should invest for district heating connection



Deployment prospects of the most promising solutions

Market potential



distribution of Data Centres (green dots) near the Amsterdam district heating network (red lines)

ESCO 2.0 business model

Key Partners

CATALYST developers

Local Heat Broker

Aggregator

Key Activities

Equipment deployment

Advisory for incentives application

Key Resources

CATALYST control, monitoring and optimization tools

Value Propositions

Flexibility Performance Contract (FPC):

- Tool for monitoring optimization and control

- Possibility to trade flexibility and recovered heat

- Possibility to move/accomodate IT load

Customer Relationships

Periodic reports with results achieved

Channels

Participation at trade associations events

Direct sale

Customer Segments

DC operators

Cost Structure

Training for DC operators

CATALYST Licensing cost

Marketing cost

O&M

CAPEX for equipment

Revenue Streams

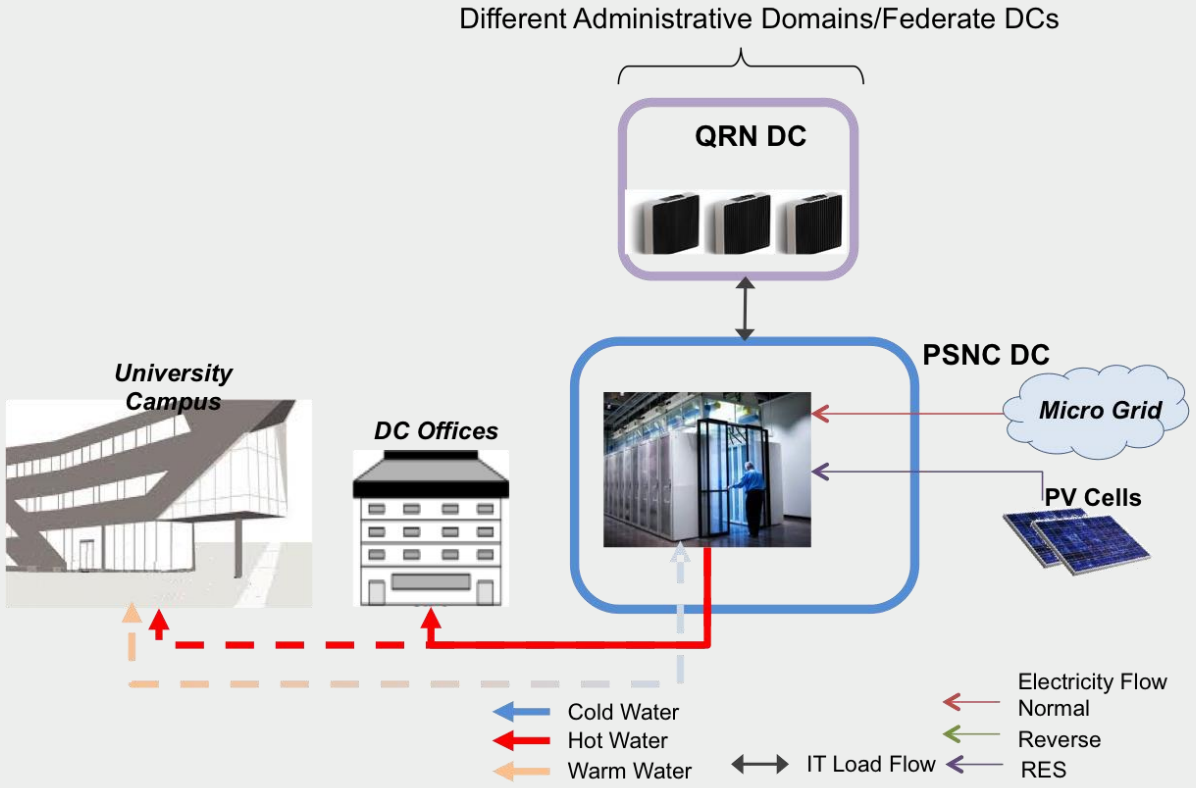
Profit sharing from flexibility and recovered heat trading

Profit sharing from energy savings and incentives

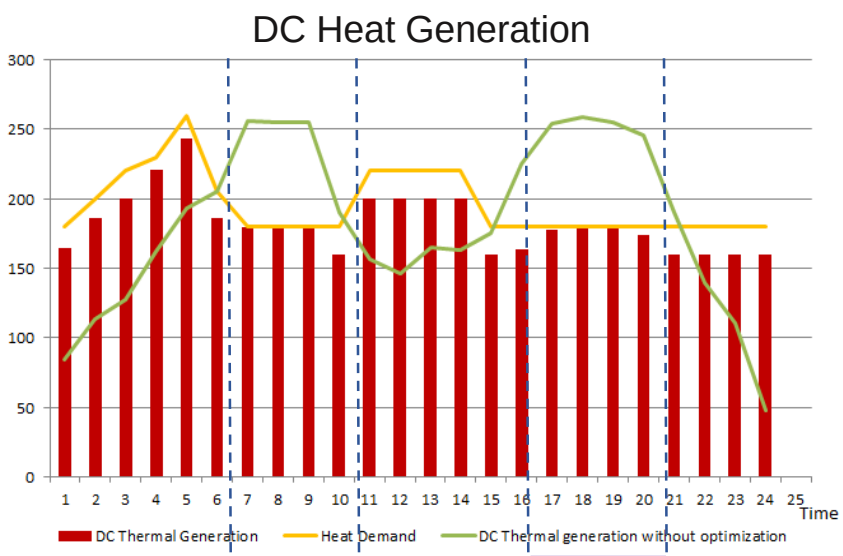
Needs for future R&I activities coming out of the project

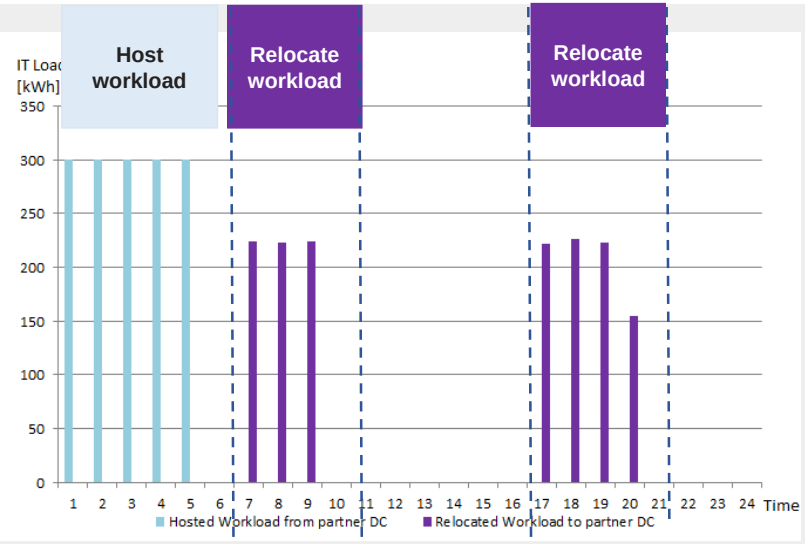
Further tests will be performed to quantify pilots' flexibility and validate CATALYST tools

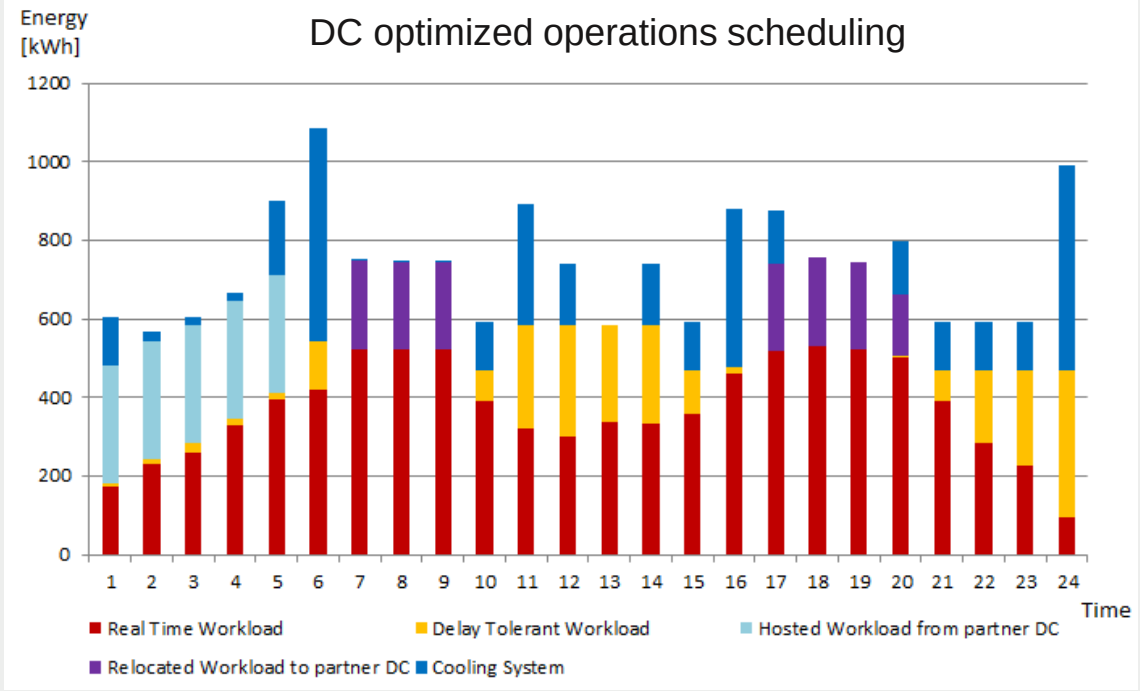
Example: evaluation of the DC flexibility given an external heat demand



Needs for future R&I activities coming out of the project







CATALYST **optimizer** at work:
adapting DC operation to follow external heat demand

- Hosting/relocating IT workload from/to external DC
- Scheduling the delay tolerant workload
- Exploiting thermal flexibility of the cooling system