



# GENiC



**GENiC will develop an integrated management and control platform for Data Centre wide optimization of energy consumption by integrating monitoring and control of computation, data storage, cooling, local power generation, energy storage, and waste heat recovery.**

## AT A GLANCE

### Project title

Globally optimized ENergy efficient data Centres – GENiC

### Project number

608826

### Project Coordinator:

Dr Dirk Pesch, Cork Institute of Technology (IE)

### Partners

Cork Institute of Technology (IE)  
United Technologies Research Centre (IE)  
IBM Research GmbH (CH)  
Acciona Infraestructuras (ES)  
ATOS Spain SA (ES)  
Technical University of Eindhoven TUE (NL)  
University College Cork (IE)

### Duration

36 months

### Total cost

€5.41M, €3.275M EC contribution

### Programme

FP7 ICT Call 10 – Objective ICT-2013.6.2:  
Data Centers in an energy-efficient and environmentally friendly Internet

### Website

<http://www.projectGENiC.eu>

## Context of the Project

The primary pillars of modern data center management - computation load, facilities, cooling, and energy generation and storage, typically operate without great coordination or optimization. Data Center (DC) energy consumption has doubled between 2000 and 2005 and grew by 50% from 2005 to 2010 consuming 1.5% of global energy with continued rapid growth. The primary use of energy in DCs is to power computation, cooling and HVAC systems. While server energy management tools can implement energy savings technologies at the CPU, rack, and data center level, the dynamic computation scheduling, local server/rack energy and cooling management and particularly virtualization are not considered in an integrated manner.

Another important aspect is that there is little reuse of the enormous amount of heat generated within DC facilities that can be reused in different ways to reduce the global energy footprint of DCs. However, the integration of renewable energy sources (RES) is confronted with aspects such as lack of interoperability of generation, storage and heat recovery and installation and maintenance cost versus payback.

Therefore, **modern data centers require more sophisticated management tools and a holistic approach to energy management of the entire facility (from design through operation)** to fill the gap between cooling, power, and IT systems

energy management through greater visibility into infrastructure and IT performance, embedded intelligence, and automated response to real-time changes in the environment.

## Objective

The major objective of GENiC is to develop a novel scalable, integrated management and control platform for data center wide optimization of energy consumption by integrating monitoring and control of the primary data center energy producing and consuming components: computation, communication, and data storage, cooling, local power generation, energy storage, and waste heat recovery.

The fundamental premise of GENiC is that the energy consuming equipment in data centers must be supplemented with sustainable energy generation and storage equipment, and operated as a complete system to achieve an optimal energy and emissions outcome.

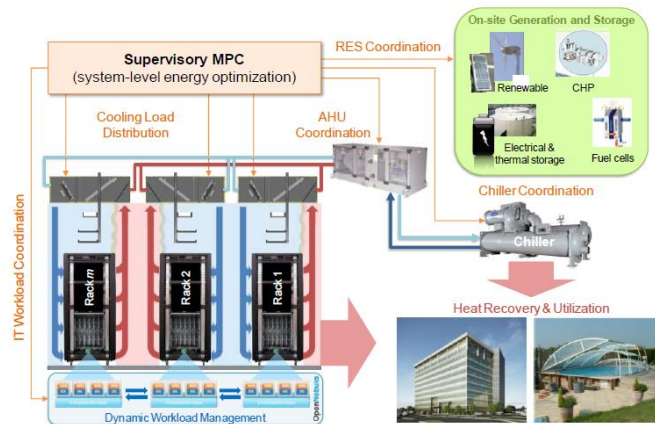
The platform will include open interfaces and a common data format and provide control and optimization functions and decision support tools enabling data center operators to achieve a substantial reduction in energy consumption, PUE and CUE. GENiC will also define a process and develop a tool chain supporting cost-effective integration of renewable energy sources into data center power systems demonstrating renewable energy penetration in excess of 80%.

## Proposed technical solution

The GENiC project plans to make advances to the state of the art in a number of ways:

- Specification and Development of an integrated IT load and energy management platform
- Development of novel thermal forecasting models to accurately capture the temperature distribution in a data center
- Development of adaptive supervisory control algorithms
- Development of IT workload models and energy-aware dynamic computation allocation algorithms
- Development of dynamic energy monitoring, fault detection and decision support capability along with data center holistic monitoring

- Specification and integration of Renewable Energy Sources (RES)



## Impact of the project

GENiC will provide an integrated energy management platform for data centers that will include energy optimization by integrating energy management with IT load, facilities, equipment, RES and reused energy sources. As result, data centers using GENiC management approach will have a quantifiable and significant improvement of the overall efficiency (PUE) and a parallel improvement of their environmental effectiveness (carbon usage effectiveness – CUE; and water usage effectiveness - WUE).

The project will use actual individual and networks of data centers power managed by GENiC at the demonstration stage.