

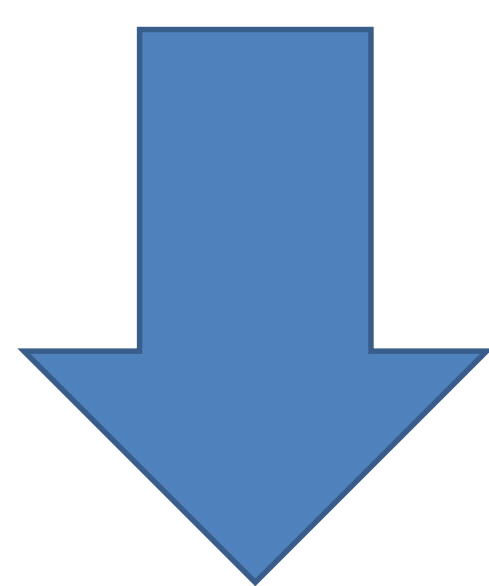
InDeal

An automated Decision Support System to manage District Heating and Cooling Systems



The Problem

To achieve the objective of almost zero carbon energy solutions by 2050, the EU needs to accelerate the development of and focus research efforts on integrated, flexible, highly efficient and environmental friendly solutions. In line with EU political goals and policies, the European objectives are distinguished between short term: towards 2020 and medium term: towards 2030 and remain sustainable and future-proof also in the long term: towards 2050. Unfortunately, the first batch of objectives set for 2020 seem to be very far away from being accomplished due to the limited use of green industry. As of today, the District Heating and Cooling sector is considered as a green industry with ample room to grow.

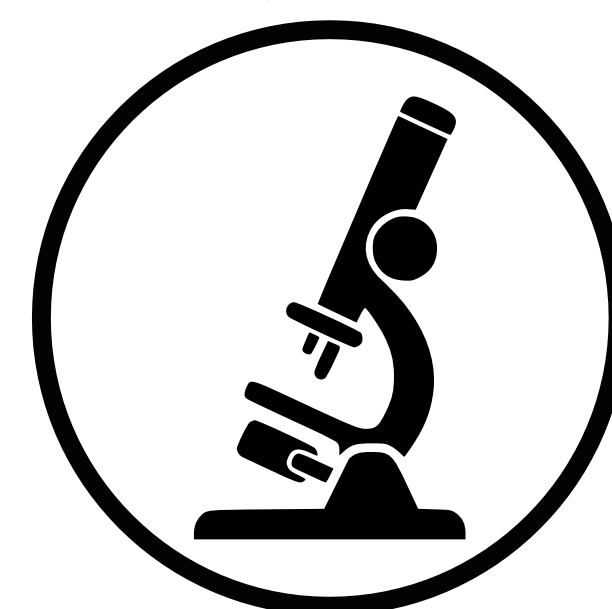


InDeal Overall Objective

By utilizing the untapped potential of District Heating and Cooling Systems, InDeal can contribute the following to EU goals:

By 2020	<ul style="list-style-type: none">Avoidance of 9.3% of all European CO₂ emissions by District HeatingAdditional 40 – 50 million tons of annual CO₂ reductions by District CoolingDecrease of primary energy consumption with 2.14 EJ (595 TWh) per year, corresponding to 2.6% of entire European primary energy demand25% share of renewable energies in District Heating
By 2030	<ul style="list-style-type: none">A smart energy exchange network, allowing for optimal resource allocation between the multiple low carbon energy sources feeding into the system and various temperature demands of customers.
By 2050	Fully carbon neutral energy solutions through regional, integrated networks.

The objectives are organised in three categories:



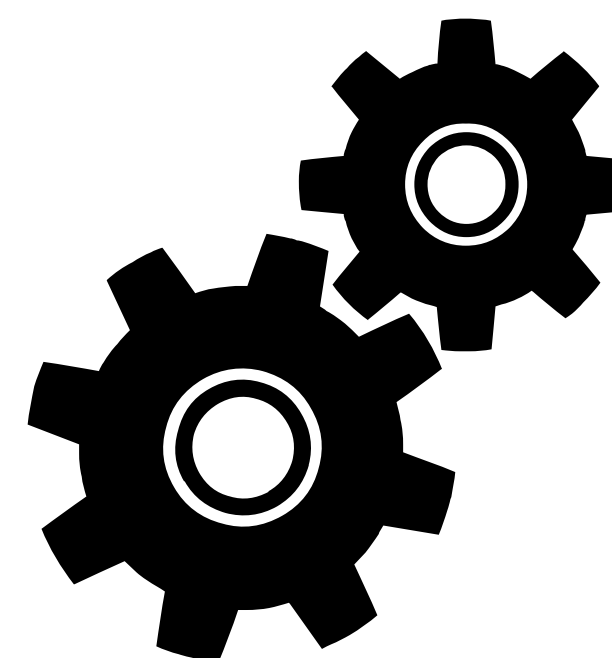
Scientific

- S1 Weather forecasting tool
- S2 Better analysis of heating and cooling demand
- S3 Anticipate the future energy demand
- S4 Innovative insulating materials for pipes of DHCS
- S5 Development of superstructure model for DHCS



Technical

- T1 Develop Storage management tool
- T2 Innovative and intelligent piping system
- T3 Automated decision support system
- T4 Better interaction between thermal production, storage, distribution and consumption
- T5 Central control platform for overall 24/7 monitoring of the DHCS
- T6 Development of intelligent meters for DHCS



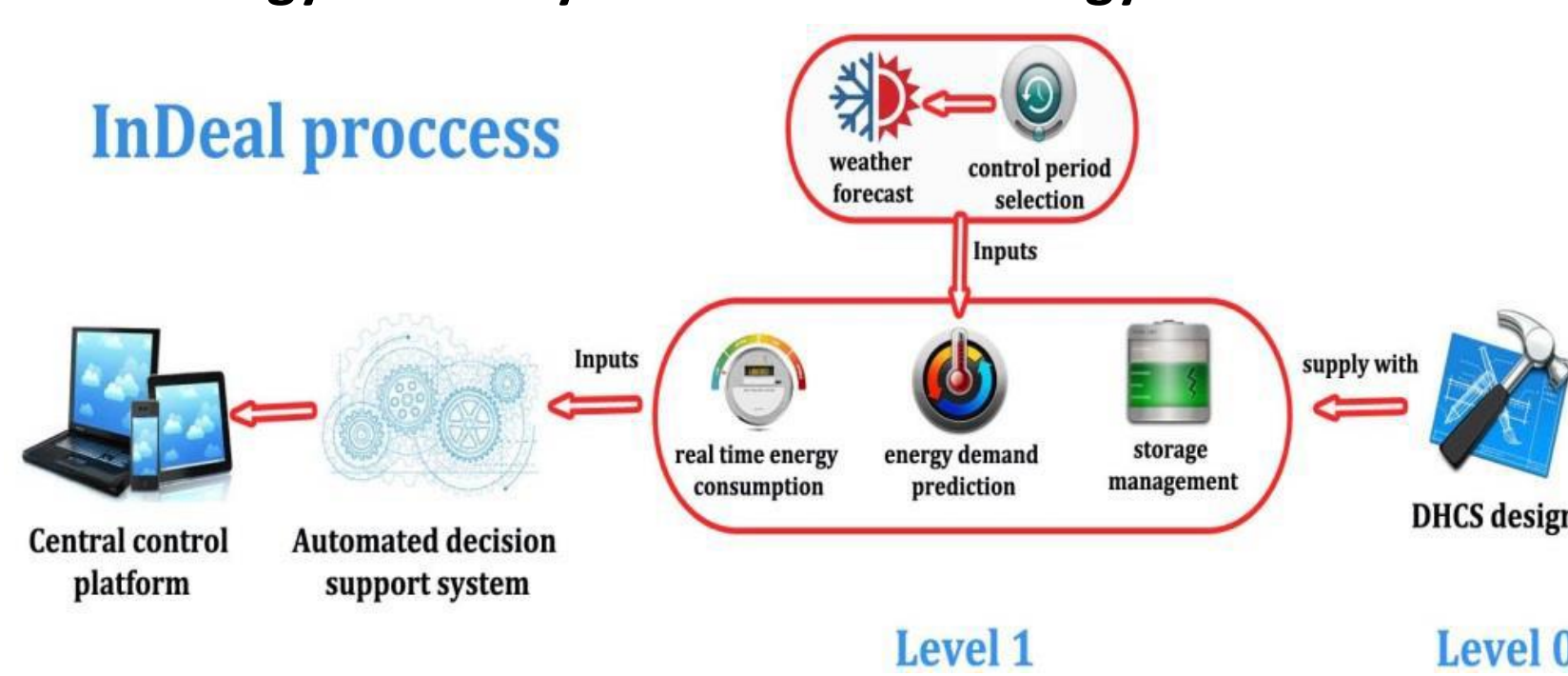
Operational

- O1 Validation and demonstration of insulating materials
- O2 Validation and demonstration of monitoring tool
- O3 Validation and demonstration of prediction tools
- O4 Energy Efficient DHC systems

The Approach

InDeal project will offer an innovative automated Decision Support System (DSS) that will impose a fair distribution of heating and cooling among the network's buildings by: (i) real – time energy consumption data gathering via artificial intelligent meters including autonomous sensing capabilities, (ii) identifying and evaluating the network's buildings' need and demand for heating and cooling depending to their energy efficiency, energy consumption and type of building, (iii) predicting the short-term and long-term weather conditions and forthcoming need for heating and cooling, (iv) monitoring and control the level of energy stored in network's storage stations and substations, (v) 24/7 monitoring of the DHC system by a central control platform and (vi) solutions of minimizing heat losses via pipe design and innovative insulation materials and life cycle assessment. The target of InDeal is to turn the current DHCS into automated DHCS that will guarantee the increase of the overall energy efficiency of the system and a fairly distribution of heating and cooling based on energy demand of each building and their energy efficiency level by prioritizing the distribution of heating or cooling to buildings with low energy efficiency and maximum energy demand.

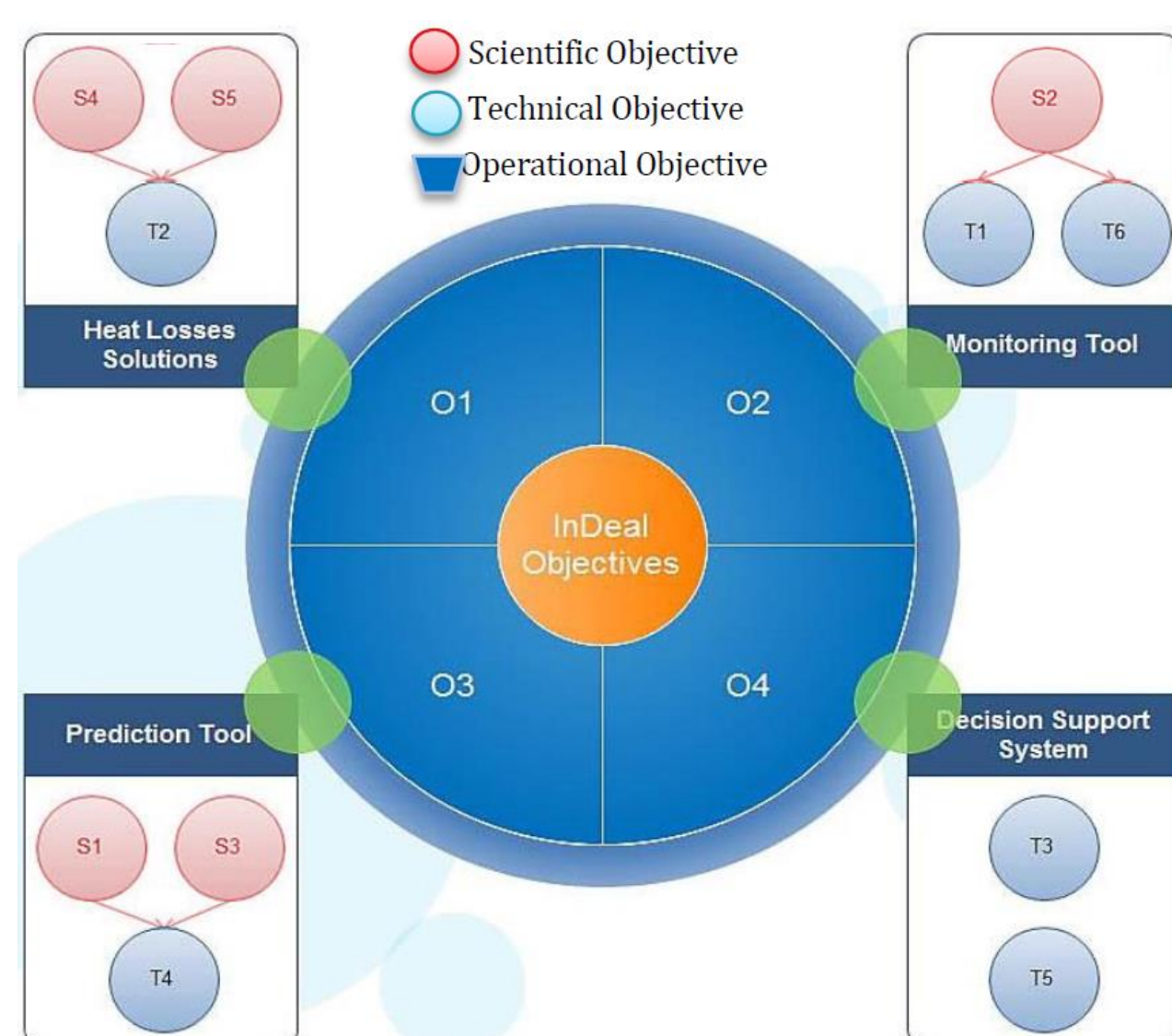
InDeal process



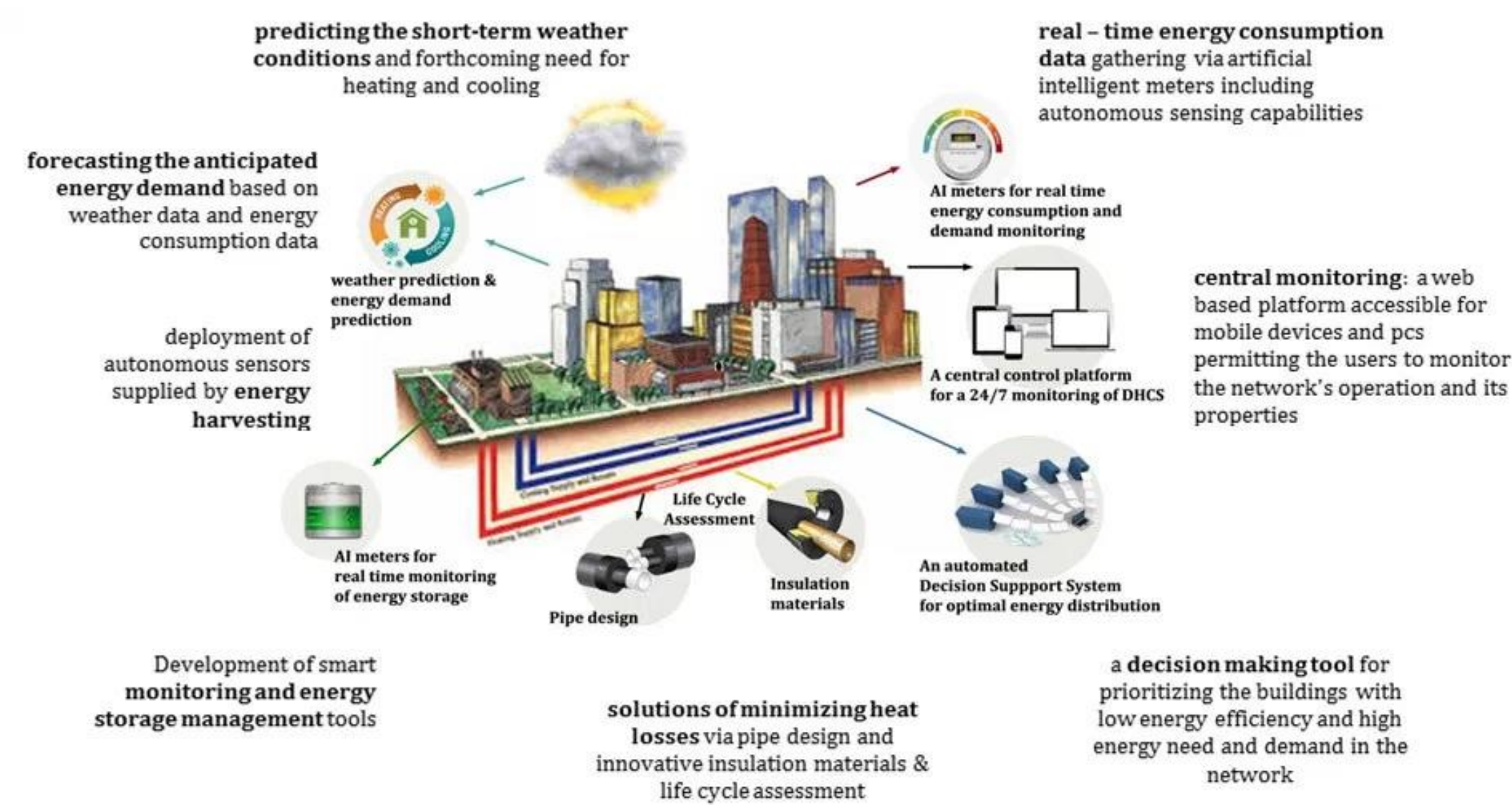
InDeal process for automated operation of DHCS

Technology and Innovation Potential

DHCS have evolved from 1G (1st generation) systems of coal powered heat-steam systems to 4G green systems with renewable energy resources and cooling grids. InDeal consortium has identified the need and proposes an automated Decision Support System that will manage the DHCS. Supporting tools will communicate with the DSS and provide significant information as real time weather forecast, real time energy demand, stored energy monitoring and control and real time energy consumption. A central web-based platform will provide all the information to end-users as a map of DHCS. The platform will be accessible from mobile devices and pcs. Furthermore, in order to create a solid and complete solution to this problem, InDeal process is divided in two steps. The first step permits the optimum design and selection of innovative InDeal insulating materials. This intelligent piping system will be equipped with autonomous sensors supplied by flow and heat energy harvesters and artificial intelligent meters. The second step is proposed for existing DHCSs in order to transform them in automated DHCSs and be able to manage the heating and cooling distribution efficiently.



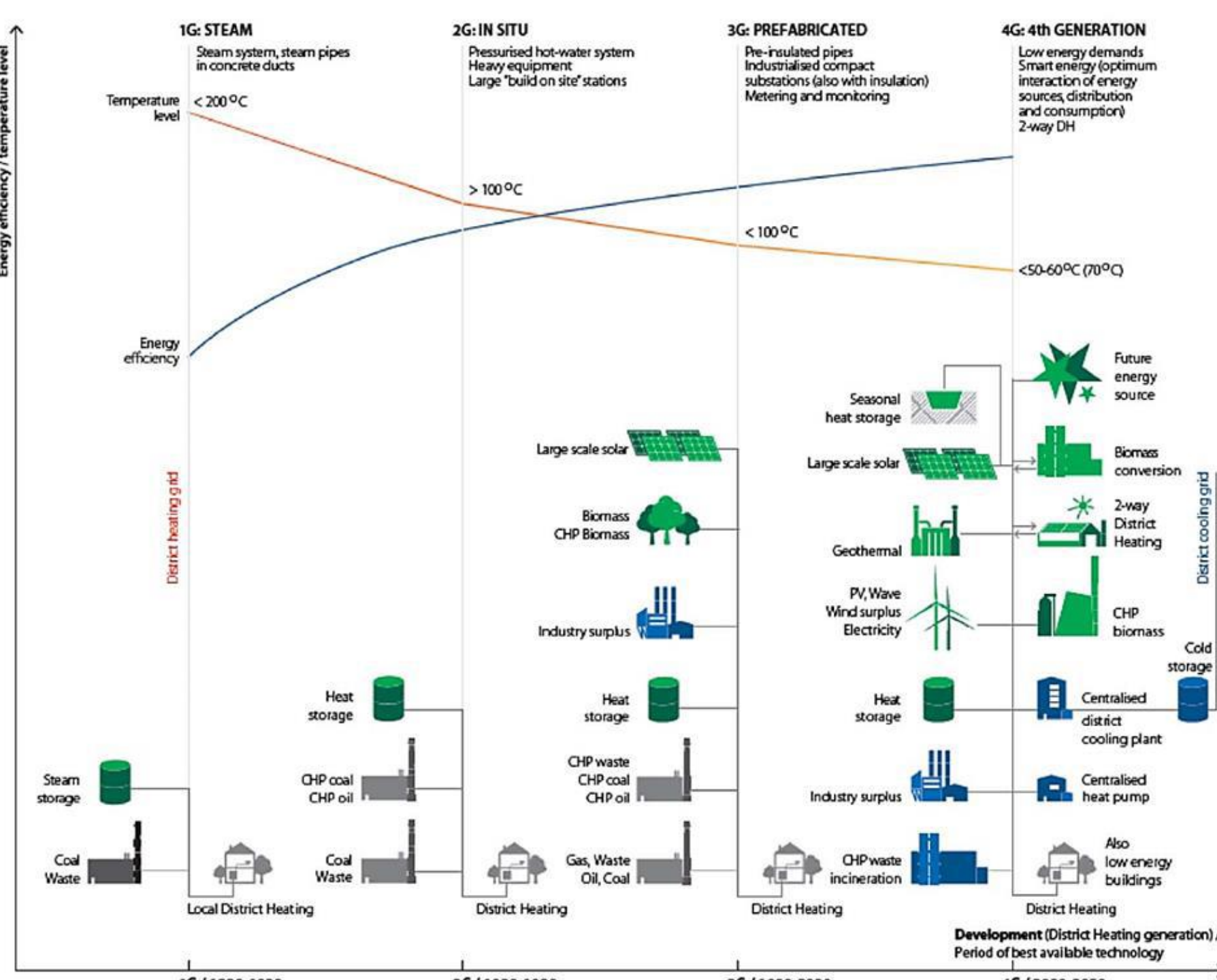
InDeal objectives



InDeal concept overview

The Process

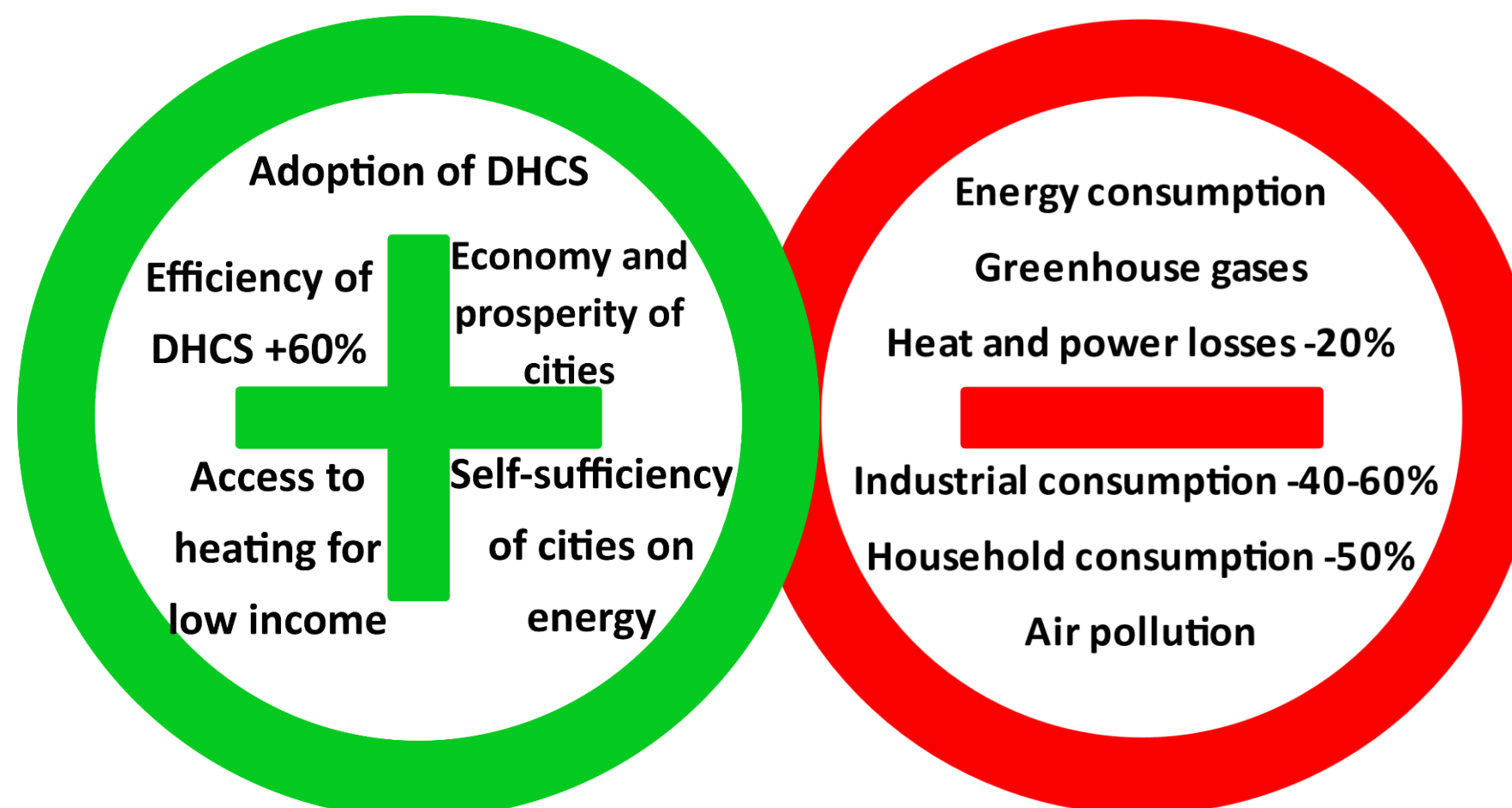
The InDeal concept can easily be applied to existing DHC systems in retrofit applications (Level 1) for increasing the energy efficiency of the system and as well as in manufacturing procedures of DHC systems (Level 0) for decreasing the heat losses of the system via an optimum design of DHCS with innovative pipes and insulation materials.



DHCSs comparison

The Impact

The InDeal project is expected to contribute to the key objectives of the European energy research policy by promoting sustainable development, ensuring security and diversity of energy supply, improving energy efficiency and increasing industrial competitiveness. Alignment with European Commission target for reduction of greenhouse gases..



Project Partners



Contact:

Prof. Dionysis Bochtis

Director

d.bochtis@certh.gr

+30 2311 257651 | +30 2311 257650



CERTH
CENTRE FOR
RESEARCH & TECHNOLOGY
HELLAS



Institute for Bio-economy & Agri-technology

iBO | CERTH

6th km CharilaouThermi Rd.

57001 | Thermi | Thessaloniki | Greece

www.ibo.certh.gr | www.certh.gr