



# **CITIES Consortium Meeting, May 2016**

## **Status and Visions**

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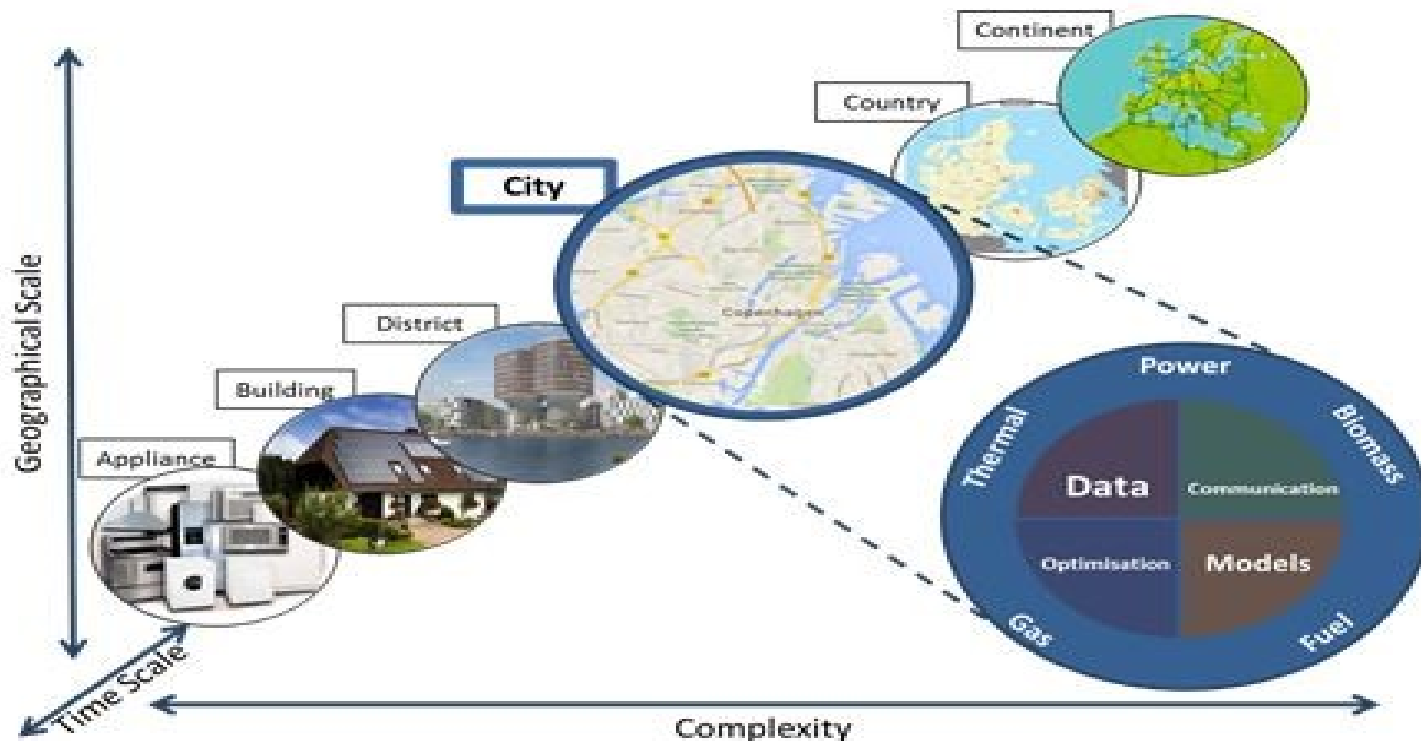


**CITIES**

Centre for IT Intelligent Energy Systems

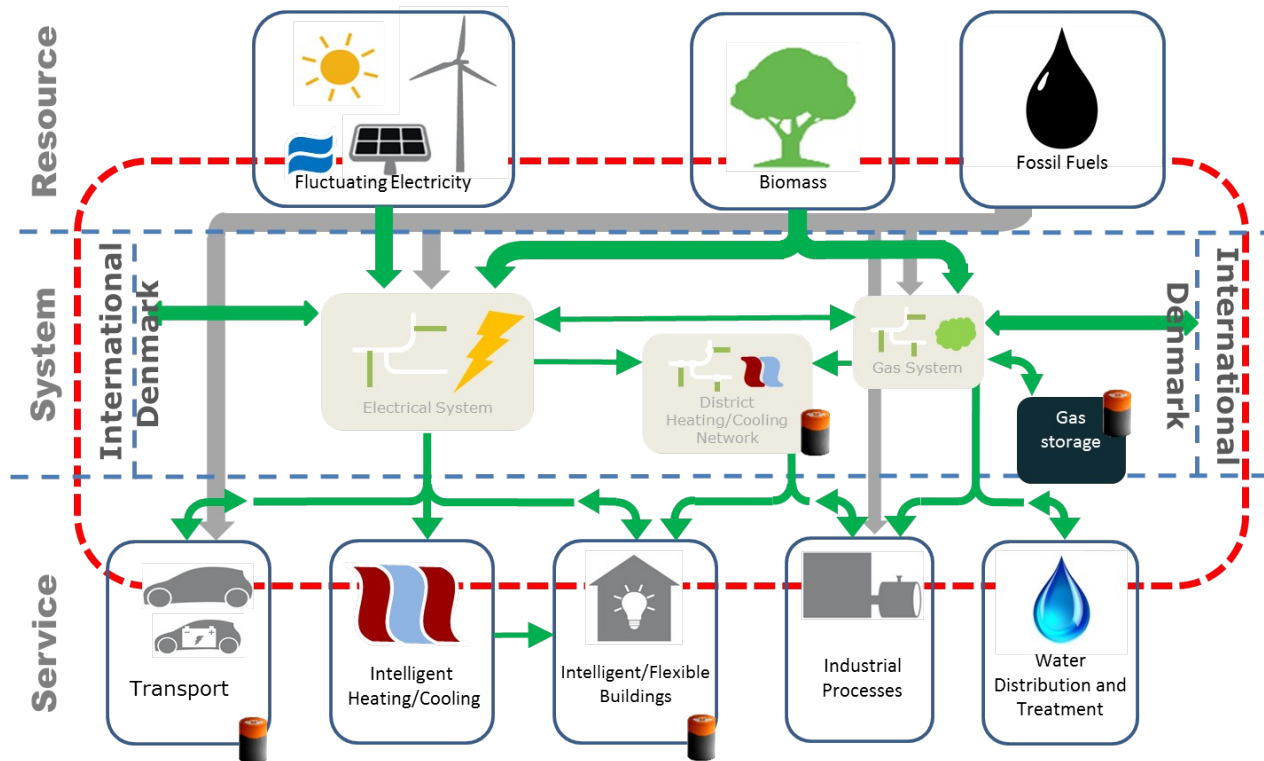
# Scientific Objectives

To establish methodologies and ITC solutions for design/planning and operation of integrated electrical, thermal, fuel pathways at all scales

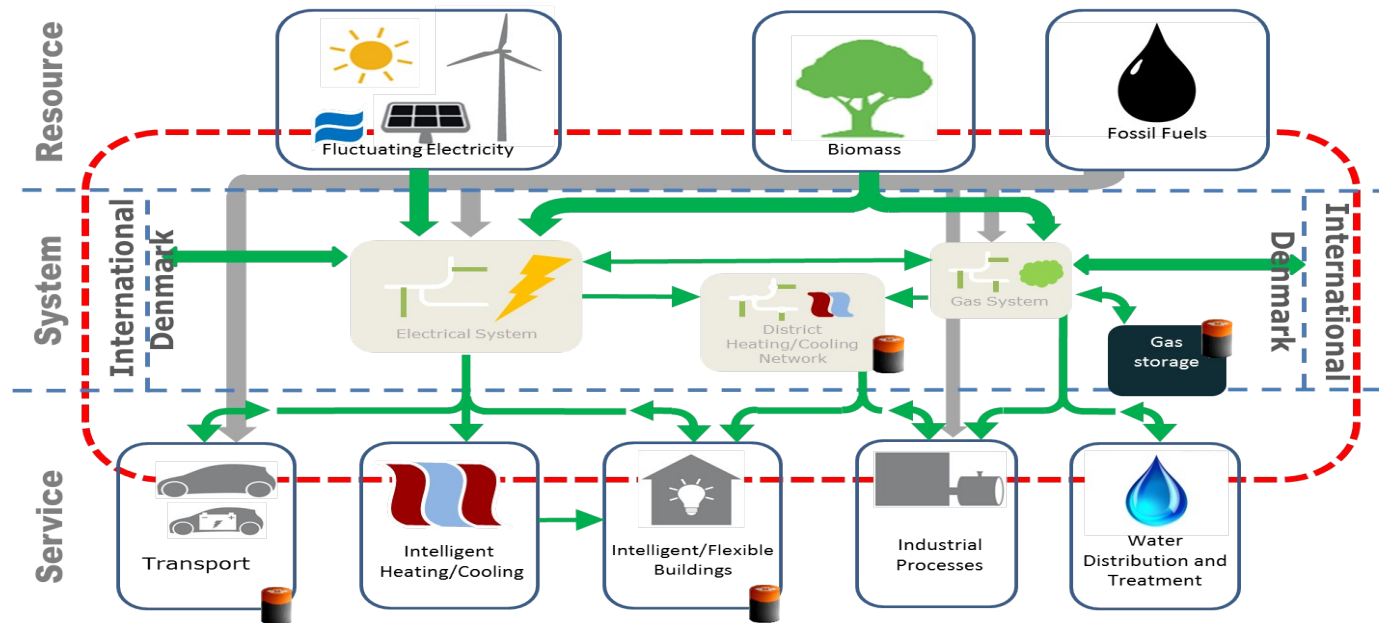


# Concepts

Integration based on *IT solutions* leading to methods for *operation* and *planning* for future energy systems



# Example: Storage by Energy Systems Integration



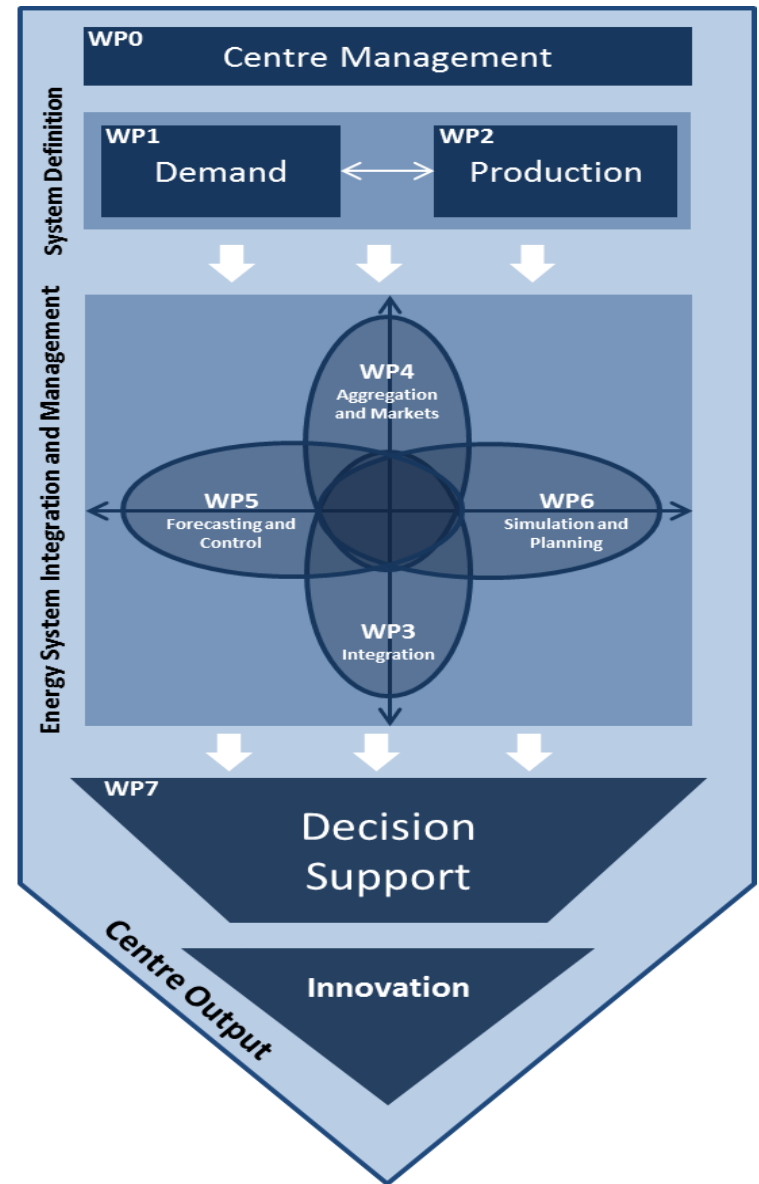
- Operational (simplified) models for optimization and control
- (Virtual) storage principles:
  - Buildings provide storage up to, say, 5-10 hours ahead
  - District heating systems can provide storage up to 1-2 days ahead
  - Gas systems can provide seasonal storage

# Goals (from the application)

- **To educate 11 Phd's and 4.5 PostDocs**
- **30-40 journal papers**
- **6 PhD summerschool events**
- **Dissemination through media and broad-audience events**
- **A dynamic and public website**
- **Models and strategies for integrated energy systems**
- **CITIES Innovation Centre (in parallel to CITIES)**
- **Support activities related to green/smart cities projects**
- **Establish international networks**

# Methodology

Research and work flow arranged into **work packages**.



**Status (1. April 2016)**

# Status (1. April 2016)

## Some statistics (1/1 2015 - 1/4 2016):

- Many invited presentations
- 6+ times in the media
- 70 scientific oriented presentations
- 24 conference papers
- 2 Book chapter (Wiley, Springer)
- 44 journal papers (33 pub/accep., 11 subm.)
- 8 Workshops
- 4 PhD summer/winter-schools
- 2-3 extra PhD's (Indonesia, Malaysia, DSOs, ...)
- 2-3 extra PD's (China, DSOs, ...)
- Several successful H2020, EUDP, ... applications related to CITIES



# Workshops

# CITIES Workshops

- Ensure **cross WP interaction**
- Ensure deeper discussions on specific issues
- External experts will be invited from time to time
- Often arranged in collaboration with other groups / research organizations / companies / city projects / .....
- Examples of workshops:
  - ***Workshop on Energy Systems Integration***
  - ***Flexibility and Buildings (jointly with TotalFlex and READY projects)***
  - ***Nordic Smart Cities Workshop***
  - ***Smart Meter Workshop at Danish District Heating Assoc.***
  - ***Model Predictive Control***
  - ***INNO-SE, 4DH and CITIES Workshop at Grøn Energi***
  - ***CITIES Korean International Workshop***
- See [www.smart-cities-centre.org](http://www.smart-cities-centre.org)

# Demo Projects

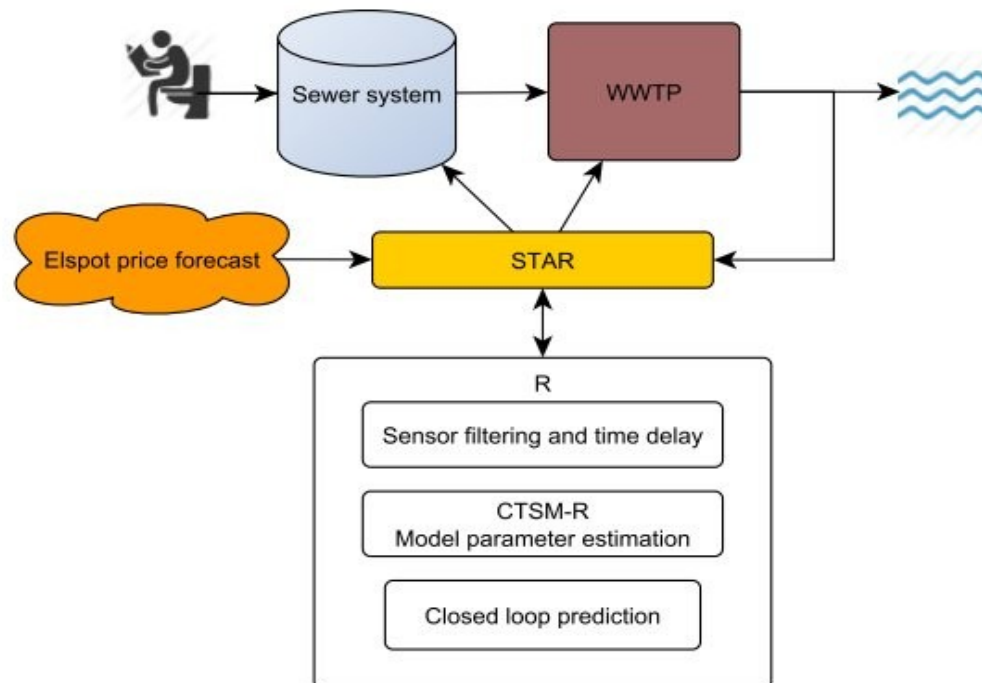
# CITIES – Demo Project

- **Purpose: To ensure an efficient and fruitful collaboration between smart cities projects (Sønderborg, Tjæreborg, Frederikssund, Odense, Aarhus, Copenhagen,..), companies, research organisations, and universities.**
- Use test facilities (eg at Grundfos, Danfoss, PowerLab.dk, TI, Tecnia (Kubik), ...)
- At least two Work Packages must participate
- Linked to new partner projects (EUDP, Innovation Centre, H2020, etc.)
- Linked to external existing and planned Smart Cities projects
- Use of high performance computing facilities (eg NREL-ESIF and DTU-HPC)
- Described on our homepage.



# Results – some examples (cont.)

- Sønderborg demo project (2029 scenarios for energy balance in Sønderborg Municipality)
- Energy flexibility in wastewater treatment:



# **Results**

## **A few examples**

# Results – some examples

- Software:
  - DMS: A Scalable Data Transformation and Analysis System
  - HPMPC: A toolbox for High-Performance MPC
  - MPC-R: A toolbox for MPC in R
  - CTSM-R: A toolbox for semi-physical modelling in R
  - Modelling tools for aggregated loads
  - Multiple Execution Tool for EnergyPLAN
  - Sifre (Energinet.dk) - tests in Sønderborg
  - Cloud service for forecasting (load, wind, solar,...)
- Cloud data hosting – data.deic.dk
- Smart-Energy Operating-Systems (SE-OS)
- CITIES Asian Workshop (October 2015)
- Nordic Smart Cities Workshop (September 2015)
- EERA JP ESI (now in operation)

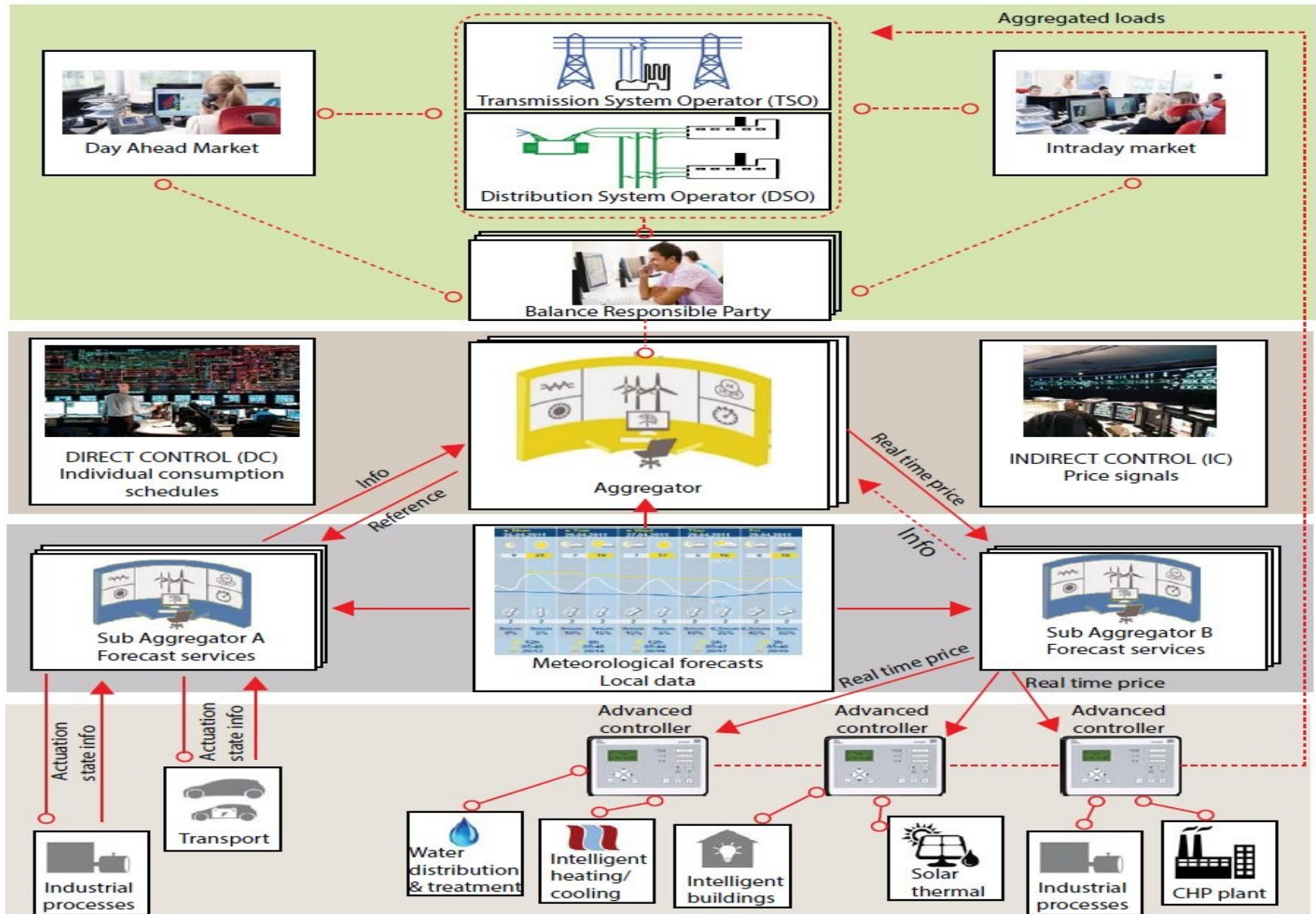
# **Plans and Visions**



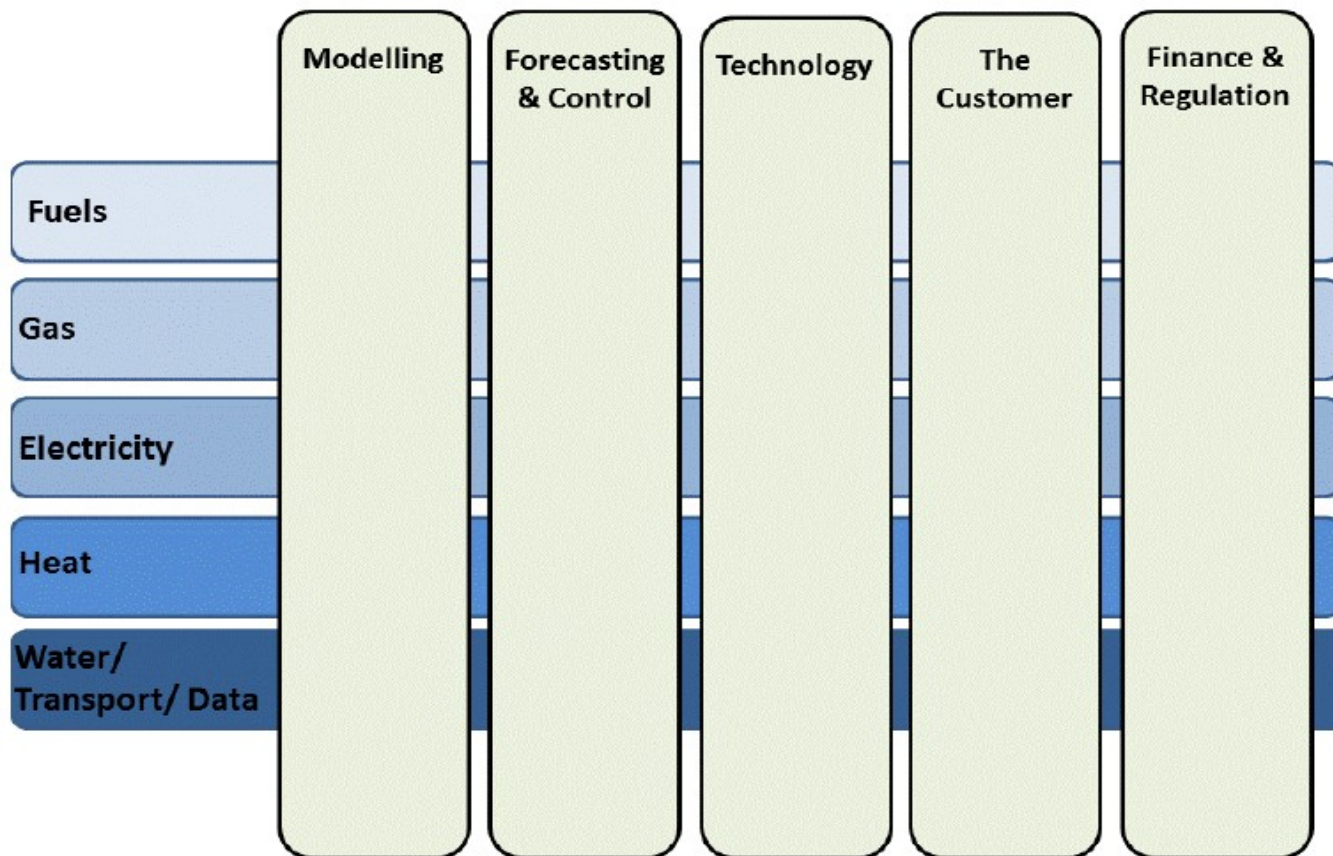
# Plan for 2016

- **Focus on planning (tools, markets, methodologies, ..) (WP4, WP6, WP7)**
- **Focus on interaction with gas systems (WP1, WP2, WP5)**
- **Definition and initialization of (more) Demo Projects**
- **New (extra) PhDs and Post Docs**
- **Establish a final set of KPI – and implement the KPIs**
- **Establish *CITIES Innovation Center***
- **Solution/Library for Model Predictive Control**
- **International Advisory Board at this Consortium Meeting**
- **Interaction with the Commission**
- **Interaction with EERA JP ESI and iiESI**
- **Data ownership and security**
- **Standards for intelligent and integrated energy systems**

# Smart-Energy Operating-System



# ESI Joint Program in EERA

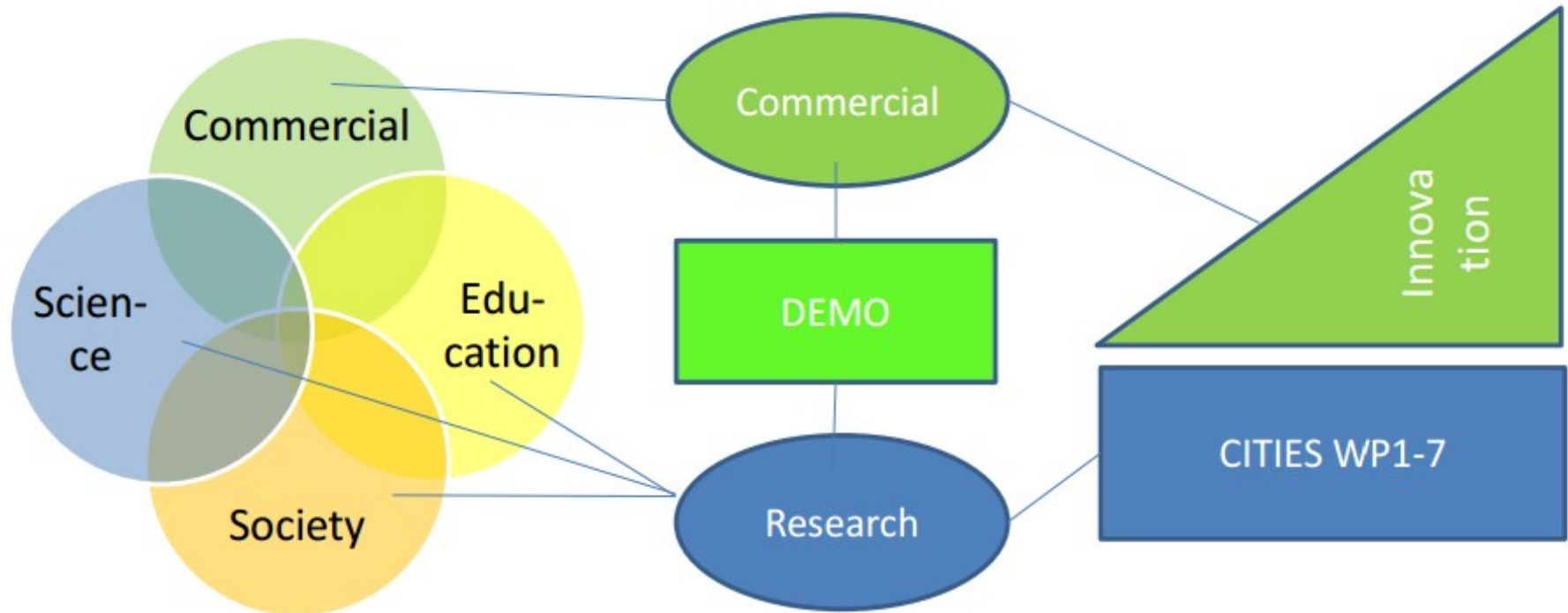


# **CITIES Innovation Center**



# CITIES Innovation Center

CITIES  
Objectives



# **This Consortium Meeting**

# Consortium Meeting

- **CITIES results presented in poster sessions**
- **High-level keynote presentations**
- **Planning and design of future smart and integrated energy systems**
- **Water – Energy - Gas synergies**
- **Panel Sessions / Discussion**
- **Discuss *CITIES Innovation Center***