



#### **CITIES Consortium Meeting, May 2014**

### Main ideas, methods, WPs and planned workshops

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### 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





### **Scientific Objectives**

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



### Research Structure Work Packages



### Methodology

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







# **Aim:** Efficient and effective communication and management to ensure the success of CITIES.

**WP:** Will be covered by Fred in the next presentation.







Rules to ensure collaboration between WPs and between Departments/Universities – in an interaction with the **companies** and **smart cities projects**.

- PostDocs rules: Focusing on a single WP while their research managment tasks will involve arrangement of workshops, seminars, summer schools, PhD supervision, etc.
- PhD rules: Supervisors from two departments, allocated to a primary and a secondary WP.



- Interaction with International partners ensured using IT-tools, Workshops and Consortium Meetings
- Interaction with EERA activities (Smart Cities, Smart Grid, Wind, .....)
- Interaction with relevant COST activities (eg. COST0902, COST1207, ...)
- Interaction with relevant IEA activities (Annex ..., 58, 60, 63, 66, ....)
- Strong interaction with Smart Cities projects (Sønderborg, Tjæreborg, Odense, Aarhus, Horsens, Copenhagen, ...)
- Synergies with new parallel activities focusing on innovation and development (EUDP, PSO, INNO+, H2020, Climate-KIC, Innovation Network, Industrial post docs, etc.)





- **WP-leaders:** Organize and track (using green, yellow, red) the research tasks within his/her WP. WP-leader is also responsible for milestones and reporting.
- CMT: Organize cross-WP workshops, seminars, summer schools, etc. Use of PD in this work.
- IAB: Will comment on research results presented at consortium meetings, and provide advises – often presented in a talk.



### CITIES Seminars and 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 upcoming workshops:
  - Workshop on Energy Systems Integration

     (with iiESI main responsible Prof. Mark O'Malley, UCD/ERC)
  - Weather Intelligence for Renewable Urban Areas (with COST WIRE)
  - CITIES and Big Data

(with IBM, Simcorp, Accenture, ....) (August 2014)

- District Heating and Integration of Fluctuating Renewables (with 4DH, Danish District Heating Assoc) (Nov. 2014)
- See www.smart-cities-centre.org



- Develop and maintain www.smart-cities-centre.org
- Announce our workshops, talks, etc.
- Use of Google+, Twitter, and Linkedin
- Participate in external meetings (12 invited talks about CITIES since February 2014)





### **CITIES – Demonstrations**

- Use our test facilities
- Linked to our partners (District heating systems, Companies, Smart City Projects, ...)
- Linked to new partner projects (EUDP, Innovation Centre, etc.)
- Linked to external existing and planned Smart Cities projects
- Use of high performance computing NREL and DTU HPC





- \*\* Kubic (Tecnalia)
- \*\* Ireland



- \*\* PowerLab.dk (SYSLAB/Bornholm)
- \*\* Grundfos' test buildings
- \*\* Danfoss' test fac. for supermarket cooling
- **\*\*** DTU's test houses (eg Sissimiut)
- \*\* ESIF (NREL)
- **\*\*** Samsung Test Buildings in Seoul
- + A number of Smart Cities projects



### WP1: Energy Services and Demand



**Aim:** Characterize and model energy services and demand in cities, and their geographical and temporal variations

### WP2: Energy Supply, Transmission, Storage and Conversion



**Aim:** Characterize energy supply, transmission, storage and conversion possibilities and identify opportunities for increased efficiency and flexibility.



### WP7: Decision Making Models and Support Systems



**Aim:** Methods and tools to assist private and public agents in making "good" decisions to fully benefit from Smart Cities and guarantee a proper city development





### **CITIES output**

**Decision Support Tools** 



### **Key Outcomes**





- Operational methods and scenarios for energy systems integration and management, paving scenarios towards a fossil free future
- Component level, modular and aggregate models of energy supply, consumption, and transmission, suitable for simulation, control and optimisation frameworks
- Market structures that support energy systems integration
- Aggregation, optimization and control principles for energy systems integration
- Modular forecasting and control models for a variety of energy system components, including their interactions
- Integration of short-term operational models in models for long-term planning.
- Models of energy consumption and production accounting for their stochastic and dynamic features.
- Methods for controlling energy consumption and demand side management.
- CITIES is aiming at being a leading knowledge centre for Smart Cities development and operational tools.

Tools will be announced/described on www.smart-cities-centre.org.

Synergies with existing and new smart cities development projects

## Innovation and Commercial Platform



## Innovation Centre - some first ideas:

Development of ideas for business opportunities in partnership with the energy sector, business partners and decision makers.

Development of new methods for aggregation, forecasting and control for future energy systems (eg. low temp. district heating)

Development of methods related to Energy Informatics (Eg. use of Smart Meter data for identifying potentials for energy savings)

Development of products such as apps and other software tools to suit niche applications revealed through CITIES research

**Key partners:** Dansk Industri, Lean Energy Cluster (now: CLEAN), VE-net (TI)











### **International Partners**



TOMORROW TODAY



