

Posters presented on CITIES consortium meeting 2016 May at
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1 Hidden Markov Models for indirect classification of occupant behaviour

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A huge variability in the energy consumption in residential buildings is due to the different behaviours of the occupants. It is very seldom to find direct observations of occupant presence and behaviour in residential buildings. However, given the increasing use of smart metering, the opportunity and potential for indirect observation and classification of occupants' behaviour is possible. This poster presents the use of Hidden Markov Models (HMMs) for indirect observations and characterisation of occupant behaviour.

2 Using Strategic Energy Planning to develop and implement a 100 % Renewable Smart Energy System

Author: Louise Krog Jensen louise@plan.aau.dk

A short presentation of the research strategy that the PhD study are planned to follow. Fokus in the PhD is to look into the institutional and local barriers in strategic energy planning, in order identify and develop approaches for the municipalities to use in their work with developing and integrating local strategic energy plans that ensure local development and in the same time help reaching the national goals.

3 Price responsive predictive control of a heat pump in a family house

Author: Jacopo Parvizi jacop@dtu.dk

The methods applied in this study show how to reduce the energy costs for the local house demand modeling and controlling a heat pump. Flexible demand side response is set to achieve a balance between energy production and consumption using a market price responsive controller.

4 Optimization under Uncertainty for Managing Heat & Power Systems

Author: Juan Miguel Morales González jmmgo@dtu.dk

We identify strategic investments in fuel mid-term contracts. In this case, we combine biomass contracting for one year in advance with the optimal short-term operation of a CHP system. The model is based on a three-stage stochastic problem that adapts to the heat and electricity systems performance.

5 Flexible Mid-Term Biomass Contract Planning for Combined Heat and Power Plants

Author: Ignacio Blanco igbl@dtu.dk

We identify strategic investments in fuel mid-term contracts. In this case, we combine biomass contracting for one year in advance with the optimal short-term operation of a CHP system. The model is based on a three-stage stochastic problem that adapts to the heat and electricity systems performance.

6 Forecasting of heat load for buildings and refrigeration load for supermarkets

Author: Peder Bacher pbac@dtu.dk

This poster presents models and cases studies for heat load forecasting: in buildings and in supermarkets. The models are data-driven time adaptive and are used for short-term forecasting up to 42 hours ahead. Case studies for 16 single-family houses in Sønderborg and a supermarket on Funen are presented.

7 Data-driven Solar Power Forecasting

Author: Caroline Persson lillepersdatter@gmail.com

This poster presents a non-parametric model for multi-site forecasting of solar power generation and it is based on Gradient Boosted Regression Trees (GBRTs). The model can help improving the integration of solar power into the electricity grid.

8 Limited area forecasting for wind energy scheduling

Author: Martin Haubjerg Rosgaard mhros@dtu.dk

For any energy system relying on wind power detailed knowledge of near-future wind fluctuations is essential for efficient utilisation in the power grid. To this end, accurate weather forecasts constitute vital input and this study concerns assessment of the value added by increasing the resolution of global weather forecasts using a specific configuration of a limited area weather forecast model.

9 Validation of a Gas Network Model through the simulation on the Danish Transmission System

Author: Marco Cavana marcav@dtu.dk

A non-isothermal, multicomponent and steady state fluid-dynamic model of gas networks has been applied to the Danish Transmission System using real data provided by Energinet. The model is able to simulate gas pipeline networks including non-pipeline elements (compressors and MR stations). It has been thought for multi-injection frameworks where the injected gases have different composition.

10 Streamlining smart meter data analytics

Author: Xiufeng Liu xiuli@dtu.dk

Smart electricity meters are replacing conventional meters worldwide and have enabled a new application domain: smart meter data analytics. In this poster, we introduce a hybrid ICT solution for streamlining smart meter analytics. The system offers an information integration pipeline for ingesting data from smart meters, a scalable platform for processing and mining big data sets, and a web portal for visualizing analytics results.

11 Towards cloud-based data management for smart cities

Author: Xiufeng Liu xiuli@dtu.dk

This poster presents a data framework for managing smart cities data. The proposed framework takes research data as the example, which focuses on data privacy protection and data quality management in data publishing and sharing in smart cities. The data are discriminated into sensitive data, quasi-sensitive and public data according to three-level sensitivity model, then published by using different strategies. In addition, the poster will present a regression-based data quality checking method, and demonstrate data management system that smooths the whole process of smart city data management.

12 Danish Act on Processing of Personal Data, in a Smart Cities Research Perspective

Author: Alexander Martin Tureczek atur@dtu.dk

The Danish act on processing of personal data influences what data can be processed for. Data has been collected with consent from the data subject for a specific purpose. Any other use of the data violates the purpose and requires new consent from each data subject. But the law does include some areas which are favorable for some position, science is one. This poster explains what the law says about processing data from a research point of view.

13 Stochastic integrated market for electric power and natural gas systems

Author: Christos Ordoudis chror@elektro.dtu.dk

In this work, we present alternative market-clearing approaches of electric power and natural gas systems under wind power uncertainty. Three different market-clearing approaches are examined based on stochastic and sequential market-clearing of either integrated or decoupled energy systems. Application results on a test case are presented and discussed leading to concluding remarks and future work.

14 Smart-Energy Operating-System

Author: Jacopo Parvizi and Henrik Madsen

This poster describes a framework for implementing smart and flexible energy solutions for future electrical energy systems. The method is formulated as a hierarchy of nested stochastic optimization problems connected via a family of aggregators operating at various spatial and temporal levels. At lower levels the optimization problem is formulated as stochastic model predictive control.

15 Aggregated Building Energy Modelling and Parametric Variability Study

Author: Panagiota Gianniou pagian@byg.dtu.dk

This poster includes the findings from three different studies I did this year concerning the aggregation of building energy demands based on typologies. The importance of using simplified models and tools at aggregate level was first outlined, but was further investigated. So a comparison was carried out between advanced building models and simplified ones and the results are presented in the poster. Finally, in the case of district-level energy systems, the variability of building energy use makes it difficult to estimate the aggregate demand and then, dimension the systems accordingly. Thus, the findings from a study are presented which help determine the parameters that affect the variability of building energy use focusing on Danish residential districts, as well as estimate the changes in heating demand that the variations of these parameters lead to.

16 Zero carbon energy system of South East Europe in 2050

Author: Dominik Franjo Dominkovic dodo@dtu.dk

The poster deals with the transition of the very large geographic area into 100% renewable energy system by using smart energy systems approach, augmented with the geographical integration of the region. By using the approach of smart energy systems, authors were able to model the energy system of the year 2050 that is significantly cheaper in terms of socio-economic costs compared to the energy system existing today (2012 was set as the reference year). Further research will focus on the role of cities in transitions like this one and will focus more on the bottom-up approach.

17 Demand Response Opportunities in Wastewater Treatment

Author: Rasmus Halvgaard rhal@dtu.dk

In the transition to a green energy system a Smart Grid with flexible consumers is required in order to balance the fluctuating power production. The energy-heavy processes for wastewater transport and treatment can potentially provide a flexible operation with storage capabilities and be a valuable asset to a Smart Grid. In this poster opportunities for demand flexible wastewater treatment are presented.

18 MPC for Energy Systems

Author: John Bagterp Jorgensen jbj@dtu.dk

In this poster, we describe model predictive control (MPC) in embedded energy applications for control of individual energy units, and economic MPC for integration of control and scheduling of large systems of distributed energy units. We describe the key numerical methods and principles used for software that can be used for real-time optimization of large systems of energy components. Such a system can be used to operate integrated energy systems more efficiently and thereby include more renewable energy such as wind and solar power in the energy system.