Dissemination strategy on Electricity balancing

DESIRE

large Scale Integration of Renewable Energy

Reporting on dissemination activities carried out within the frame of the DESIRE project (WP8)

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Title of dissemination	Cogeneration of power & heat and cogeneration of power and desalinated water; modelling for optimal system performance
Type of activity	Presentation at conference Article in conference proceedings
Title of forum	PowerGEN Middle East 2007
Language	English
Date of dissemination	22 January 2007
Place of dissemination	Manama, Bahrain
Brief abstract / description of dissemination activity	Cogeneration of heat & power and cogeneration of desalinated water and power have similarities from an energy systems perspective. Both introduce limitations in the freedom of action but also introduce possibilities for integrating fluctuating renewable energy sources. Through energy systems analyses, it was demonstrated how storage tanks desalinated water could introduce a buffer corresponding to heat storages for optimising performance of energy systems with respect to integrating fluctuating energy sources.
Audience impact assessment	POWERGEN Middle East is the largest series of power conferences and trade shows in the Middle East with a high attendance. The idea that CPH plants can be used to integrate fluctuating power sources is a novel idea in the Middle East and did generated some interest in the audience causing feed back after the conference session
Dissemination	Included after this form

PowerGEN Middle East
Manama, Bahrain
January 22nd 2007

Cogeneration of power & heat and Cogeneration of power and desalinated water; *modelling for optimal system performance*

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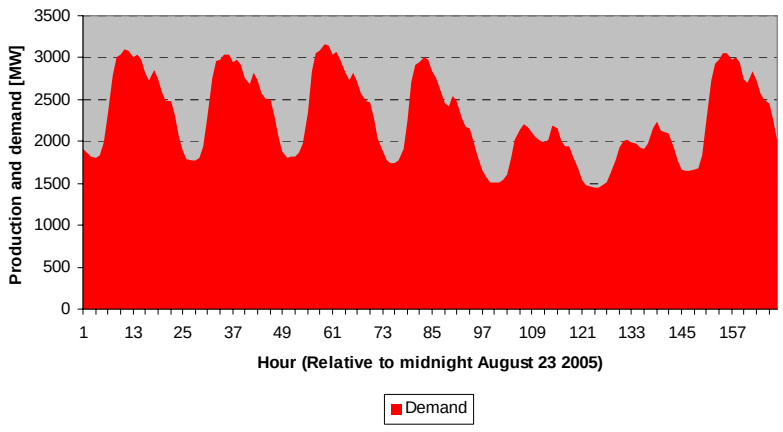
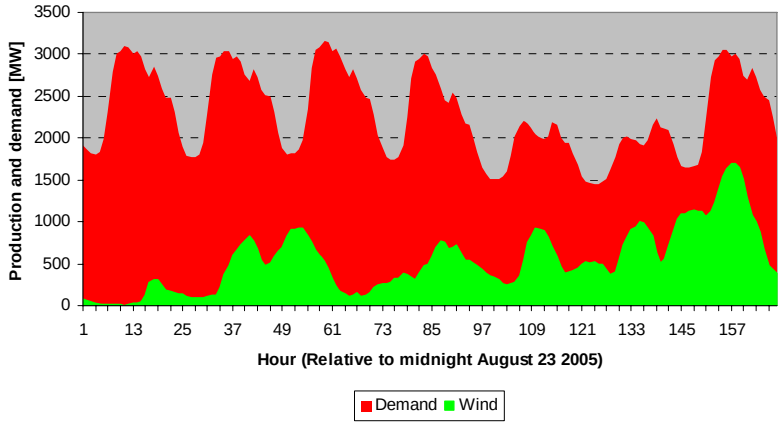
Load curve building in complex energy systems

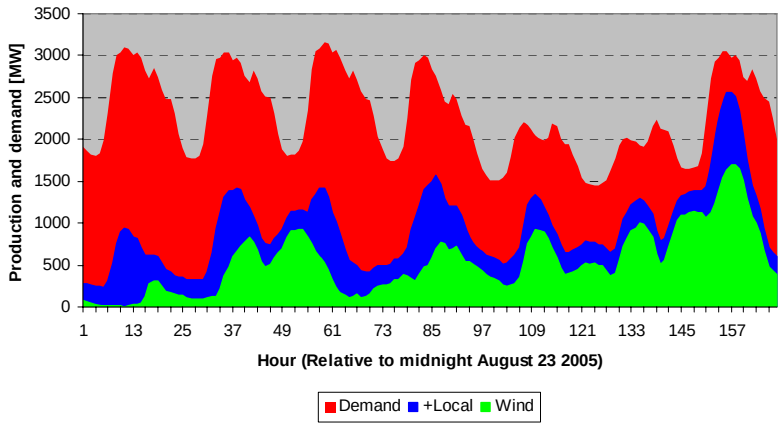


Load curve building in complex energy systems

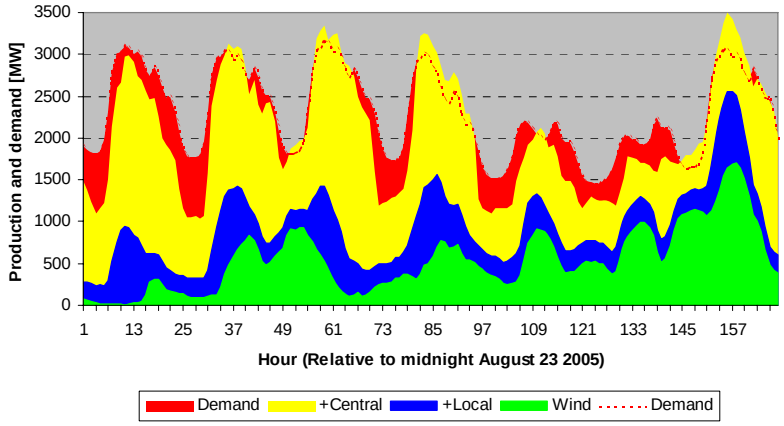


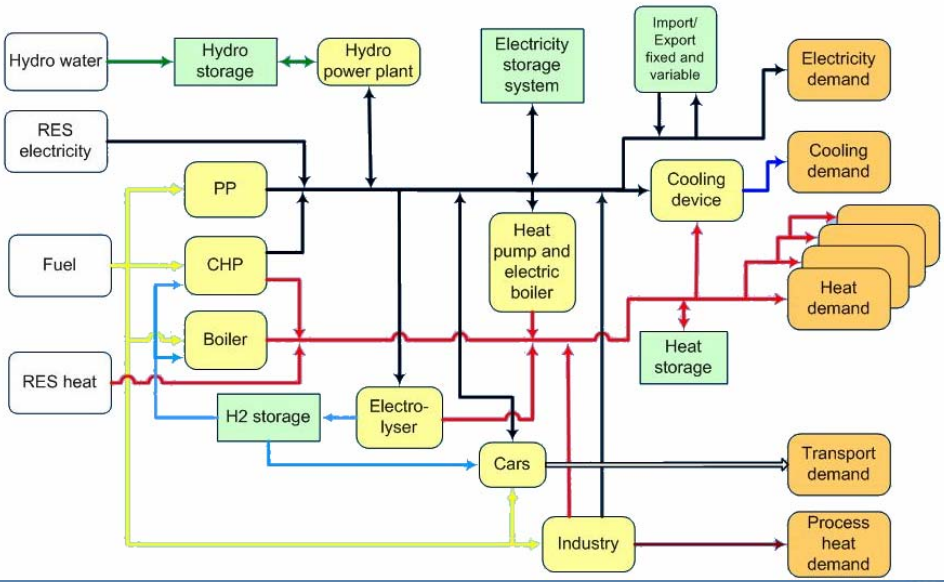
Sustainable Energy Planning
Aalborg University

Load curve building in complex energy systems



Load curve building in complex energy systems





Energy units and TSO control

Units typically outside the control of the TSO	Units typically under the control of the TSO
Photo-voltaic cells	CHP
Wind power	Condensing mode power plants
Solar collectors	Hydro electricity with reservoir (including pumped storage and control of reservoir contents & precipitation)
Run-of-river hydroelectricity	Boilers at centrally dispatchable power plants
Wave power	Heat pumps
Geothermal	Compressed air storages
Nuclear	Reversible fuel-cell storages
CHP	Heat storages
Boilers	
Heat pumps	
Heat storages	

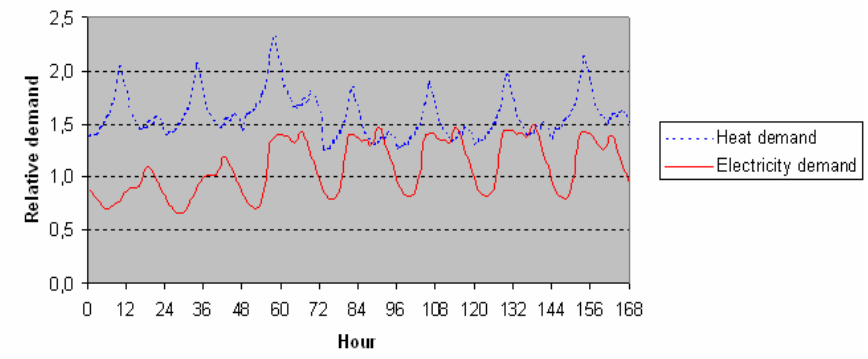
Demands

Electricity demand
Flexible electricity demand
Electricity demand for transportation
Heat demand – areas with dispatchable CHP plants
Heat demand – areas with non-dispatchable CHP plants

Energy system scenario

Consumption [TWh]	Generating capacity [MW]
24.87 Electricity 20.00 District heat	2750 Cogeneration of heat and power (CHP) 5000 Central stations – Condensing operation 2400 Wind (inland and off-shore)

Electricity and heat demand variation over a week



Conclusions

- energy models aimed at analysing energy systems with heat demands and complex interdependencies may be applied to analyse energy systems with desalination plants
- a high degree of wind power has been modelled in order to give an uncontrollable element of production. The analyses demonstrate how the integration of this is improved with storage capacity for desalinated water which enables a time-shift between electricity and water generation and the actual demand of water