# MODELS AND DATA
STATUS AND CHALLENGES OF THE GREATER COPENHAGEN UTILITY

CITIES Kick-off   29 January 2014

The district heating system in Copenhagen

- **Integrated district heating system**
- **35 PJ/year**
- **20 % of heat demand in DK**
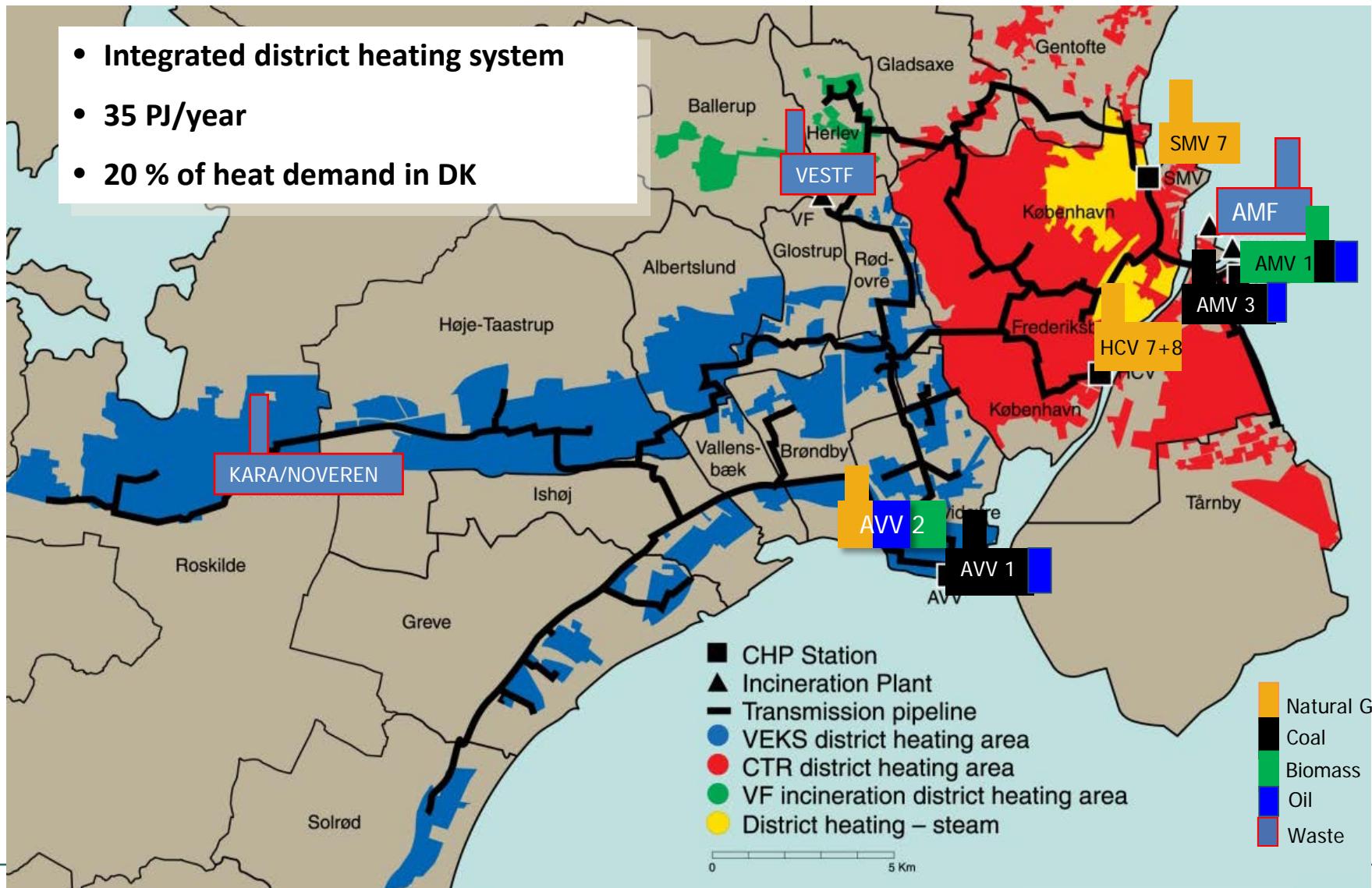
MAIN TOOLS IN HOFOR'S ENERGY PLANNING AND OPERATION

1. BALMOREL: Supply model for medium- and long-term planning for Greater Copenhagen. *Slide #4.*

2. TERMIS: Real-time monitoring and automatic control of the district heating grid (water flows and temperatures). Also planning of grid improvements and extensions. 420.000 pipes, 210.000 level points, 32.000 valves.

3. PRESS: Same thing, steam grid.

4. Dispatchment of district heating; Varmelast.dk. *Slide #5.*

5. Remote readers (heating, cooling, gas, electricity, and more). Almost all buildings. Considerable potential for energy savings.

BALMOREL

- Medium- and long-term equilibrium (demand-supply) model
- Focus on electricity and district heating
- Minimization of costs by linear programming (GAMS); perfect market (all players act economically rational)
- Comprises the entire Nordic electricity system, with a higher level of detail for Danish power plants, in particular the Greater Copenhagen district heating and electricity systems
- Hour-by-hour simulations (8760 time steps per year) or more aggregate (11 time steps per week; 572 time steps per year)
- Hydraulic bottle necks in heat distribution network represented by maximum capacity (MJ/s)

www.balmorel.com

HEAT DISPATCHING FOR GREATER COPENHAGEN

DONG Energy

Vattenfall

BOFIT
Supply model
Only major hydraulic bottlenecks
(exit AVV and steam from SMV)

DUF
Overall supply dispatch (water and steam)

VAB
Supply model
Only major hydraulic bottlenecks
(steam tunnel)

Heat forecast models

KATJA
Hydraulic model determines dispatch for the next day

DONG
Submits bids to Nordpool

Vattenfall
Submits bids to Nordpool
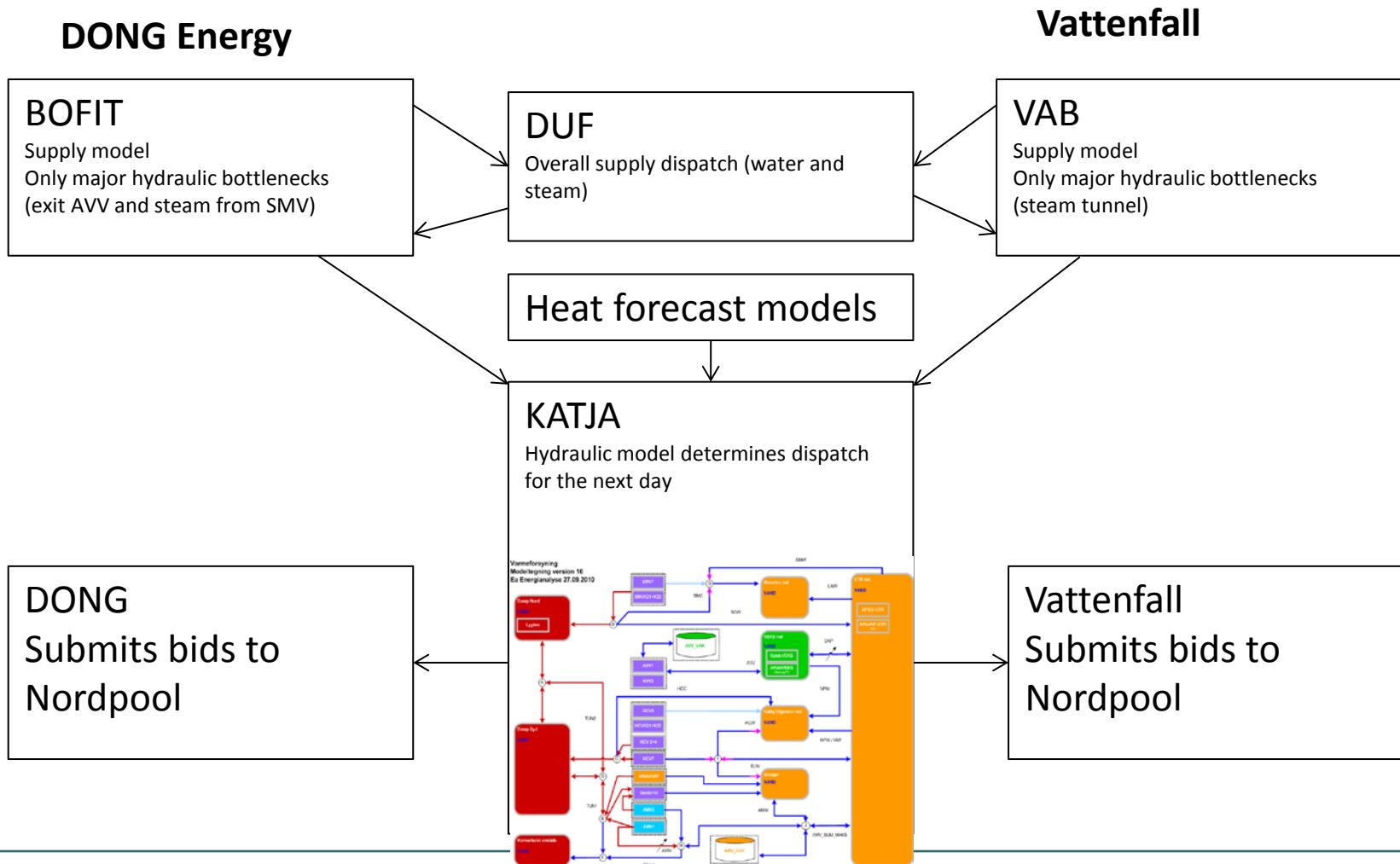
CHALLENGES

1. How can we increase economic gains from participating in two dynamic marketplaces (heat and electricity)?
2. Will more data give us more efficient supply systems, without compromising security of supply and consumer costs?
3. How can we best contribute to the development of smart energy buildings?
4. How can we share customer and commercial-value data with third parties?

Thank you for your attention

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