Comprehensive Assessment for Efficiency in Heating and Cooling under the Energy Efficiency Directive:
- Heat Planning Experience from Denmark

Bjarne Juul-Kristensen,
Danish Energy Agency,
25 June 2014
Content

- Factors of importance for Danish results in heat planning
- Two Danish examples - from the 80’ies and from the 90’ies
- New national analyses (comprehensive assessments) in the planning of the transition towards 2030, 2035 and 2050
Factors of importance for Danish results in heat planning (1)

A. A planning system, which ensures investigations and planning - when needed
   1) Clear policy direction and broad national consensus about the direction
   2) Central provision of assumptions (fuel price projections, technology data etc.) for the analyses and guidance to the sector in, how to prepare heat plans
   3) Co-operation between authorities, energy supply companies and industries
Factors of importance for Danish results in heat planning (2)

B. A well functioning decision making system
4) Clear definition of roles and responsibilities between national and local authorities and supply companies / industries
5) Well defined decision criteria according to:
   - Zoning of heat markets between different heat supply infrastructure (DH, NG, individual heat supply)
   - Choice of heat production form and fuel-mix in CHP/HOB

B. Well established implementation model
6) Attractive financial incentives and/or necessary instruments ("carrots and/or whips")
7) Attractive contractual arrangements to promote co-generation
8) "Entrepreneurs" in place in the market to secure implementation, i.e. private/prumatic supply companies
Example no. 1: Development of DH / CHP in the 80’ies

✓ Policy direction clear: substitution of oil through domestic nature gas market and large district heating systems on CHP around coal fired power stations

✓ Several “comprehensive assessments” (national and regional), mandatory nationwide municipal heat planning, guidance documents in heat planning, common assumptions (fuel price projections, technology data etc.)

✓ Regional co-operation groups in order to support the heat planning process, exchange of experience etc.
Example no. 1 (cont):
Development of DH / CHP in the 80′ies

✓ Decision criteria: economic feasibility and oil substitution

✓ Attractive contractual arrangements: Only the additional costs by establishing CHP are covered by the DH-consumers. The electricity consumers obtains same electricity prices with CHP-production as with separate power production, until the CHP-investments are paid back.

✓ Instruments for municipalities: Authorisation to project approval; provisions for securing high connection to network
Results, example 1: Development of heating systems – 1981-2011

- Oil substitution:
  Individual oil boilers reduced since the 80’ies
- Individual natural gas boilers “phased in” from zero since the 80’ies
- The share of DH doubled from 1980. Today 1.7 mio. households supplied with DH.
Results, example 1: CHP proportion of DH-production and of el. prod.
Example no. 2: Development of local CHP in the 90′ies

- National/regional comprehensive assessments and municipal heat planning completed. Clear policy direction and decision criteria.
- Municipal planning followed by project specific (installation specific) planning.
- New favourable incentives for promotion of DH and local CHP: Feed in premium, investment subsidies to network and to CHP-plants.
- Approx. 670 decentralised CHP stations based on natural gas, biomass, waste and biogas were established in the 1990s, in total 1500 MW-el.
- Entrepreneurs in place: local DH companies, municipalities, electricity companies and industry.
Results, example 2: Development of local CHP’s 1985-2000

Centralized production in the mid 80’s

Decentralized production in 2000

Legend:
- Decentralized CHP
- Centralized CHP
- Wind mill park
New challenges: Milestones up to 2050

The government’s energy policy milestones up to 2050

In order to secure 100 pct. renewable energy in 2050 the government has several energy policy milestones in the years 2020, 2030 and 2035. These milestones are each a step in the right direction, securing progress towards 2050.

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>Half of the traditional consumptions of electricity is covered by wind power</td>
</tr>
<tr>
<td>2030</td>
<td>Coal is phased out from Danish power plants</td>
</tr>
<tr>
<td>2035</td>
<td>The electricity and heat supply covered by renewable energy</td>
</tr>
<tr>
<td>2050</td>
<td>All energy supply – electricity, heat, industry and transport – is covered by renewable energy</td>
</tr>
</tbody>
</table>

The initiatives up to 2020 will result in a greenhouse gas reduction by 35 pct. in relation to 1990.
Main elements in the Energy Agreement, March 2012

1. A more energy efficient society
2. Wind power and new RES-technologies
3. RES in industry, buildings and transport
4. Bioenergy in Danish energy supply
5. Smart grids
6. Financing the initiatives

+ several national analyses (a kind of “comprehensive assessments”) of the energy system decided as part of the Energy Agreement in Parliament
National analyses (comprehensive assessments), 2013-14

- Biomass
- Biogas
- Geothermal, large heatpumps, heat storage
- District heating
- Waste heat from industry
- District cooling (acc. to article 14)
- Electricity infrastructure
- Transport technologies
- Gas infrastructure
- Energy eff. (households, industry, transp.)
- ”Back casting” scenarios for entire energy system
DH-analysis: Economic optimal development of DH-production

- Reduction of demand for CHP with increasing amount of wind energy
- Coal and natural gas to be phased out quickly
- Large heat markets: Conversion on short term to biomass and on long term to heat pumps and waste heat
- Small heat markets: Conversion to heat pumps and solar heating
District cooling analyses

- Today district cooling is covering 2% of cooling demand.
- The economic and financial viable potential for district cooling is estimated to be 40%.
- Considerable synergies by combining district heating and district cooling (through compression heat pumps) in stead of separate production of individual cooling and district heating.
Next steps in completing the comprehensive assessment acc. to art. 14 in EED

- Policy decisions on the basis of the analyses decided in the Energy Agreement and other analyses – autumn 2014
- Completion of the analytical part of comprehensive assessment acc. to Article 14.1 and annex XIII – spring 2015
- Completion of an ongoing analyses of the the Danish energy tax system and the Danish subsidy systems – spring 2015
- Possible policy decisions and submission to Commission – autumn 2015