CHP/DHC Strategic Workshop
Linking heat and electricity systems
Paris, 27-28 May 2014
Linking heat and electricity systems: Methodology

- Develop a compendium of case studies: industrial CHP and integrated approaches of CHP with DHC
- Distil lessons learned to assess impact on project development and operation
- Policy measures and market mechanisms to overcome existing barriers to further deployment
## Compendium of CHP/DHC case studies

<table>
<thead>
<tr>
<th>Project name</th>
<th>Type of application</th>
<th>Location</th>
<th>Capacity (MW)</th>
<th>Energy input</th>
<th>CO₂ savings compared to conventional generation technologies (kt/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Markinch project</td>
<td>Industrial CHP - Paper sector</td>
<td>UK</td>
<td>127</td>
<td>Biomass</td>
<td>250</td>
</tr>
<tr>
<td>Eresma project</td>
<td>Industrial CHP - Beverage sector</td>
<td>Spain</td>
<td>23</td>
<td>Gas</td>
<td>16</td>
</tr>
<tr>
<td>Nuevo Pemex project</td>
<td>Industrial CHP - Gas processing and Refining sector</td>
<td>Mexico</td>
<td>730</td>
<td>Gas</td>
<td>430</td>
</tr>
<tr>
<td>Marstal project</td>
<td>Biomass CHP and solar thermal DH with storage and heat pump</td>
<td>Denmark</td>
<td>6</td>
<td>100% renewable</td>
<td>11</td>
</tr>
<tr>
<td>Bercy project</td>
<td>DC network – assisted with natural cooling</td>
<td>France</td>
<td>44</td>
<td>Natural cooling assisted</td>
<td>7</td>
</tr>
<tr>
<td>PNUW project</td>
<td>DH network – solar thermal with storage</td>
<td>Saudi Arabia</td>
<td>25</td>
<td>Solar, diesel (aux. boilers)</td>
<td>5</td>
</tr>
</tbody>
</table>
Markinch Project – Industrial CHP: Paper

Sources: CHPA representatives (2013), Personal communication; RWE Innogy representatives (2013), Personal communication.
Eresma Project – Industrial CHP: Beverage

Nuevo Pemex Project – Industrial CHP: Gas processing

Marstal Project – Flexible and renewable DH system

Bercy Project – DC assisted with natural cooling

PNUW Project – DH with solar thermal and storage

Key factors impacting CHP/DHC projects’ development & operation

Technology selection:
- Energy efficiency
- Technology flexibility
- Energy prices and availability
- Thermal/electricity loads
- Existing local infrastructure
- Grid interconnection possibilities

Financing mechanisms:
- Company self-financed
- Loans
- Third party
- Joint venture
- Publicly financed
- Any combination of these

Business structure:
- Generator / end-user
- Generator/ market operator
- End-user/distribution

PROJECT DEVELOPMENT

SYSTEM OPERATION
What matters at the technology selection phase?

- End-use efficiency goes first: get the right generation capacity size
- Temperature is important: compatibility of local heat sources and sinks, and minimise return temperature on DH systems
- Heat / electricity ratio: assess heat / electricity demand patterns over time
- Existing possibilities to locally bridge energy demand with generation
- Value flexibility
How to make energy efficiency and flexibility economically visible?

- CHP technologies typically require higher upfront investments
- DHC networks infrastructure are high capital intensive
- A detailed economic feasibility assessment is key...
  - Environmental and flexibility benefits in economics terms
  - Maximum integration of heat/electricity users and producers to be analyzed
  - Long-term view of energy market conditions
Business structure to cope with a deep level of integration

How can policy and market conditions help CHP/DHC projects?

<table>
<thead>
<tr>
<th>TECHNOLOGY SELECTION INCENTIVES</th>
<th>FINANCIAL AND FISCAL INCENTIVES</th>
<th>SMART BUSINESS MODELS SUPPORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>–Energy efficiency rewarding policies</td>
<td>–Low interest loans</td>
<td>–Support related R&amp;D and international collaboration</td>
</tr>
<tr>
<td>–Complementary policies rewarding efficient use of renewable energy sources</td>
<td>–Capacity grants</td>
<td>–Promote pilot models</td>
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<tr>
<td>–Interconnection measures</td>
<td>–Feed-in tariffs</td>
<td>–Integrate lessons learned from pilots and existing models into infrastructure development plans</td>
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<tr>
<td>–Local infrastructure and heating/cooling planning</td>
<td>–Fiscal incentives</td>
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</tbody>
</table>

Can help mitigate markets failing to effectively reward energy efficiency
Thanks

Don’t miss: http://www.iea.org/chp/