Circular economy in practice

Per Langer, EVP – City Solutions
13 November 2018
Fortum – leading player in heating, circular economy and solar

### Sales split (MEUR, LTM Q3/18)

<table>
<thead>
<tr>
<th>Category</th>
<th>MEUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>603</td>
</tr>
<tr>
<td>Heat</td>
<td>208</td>
</tr>
<tr>
<td>Waste treatment</td>
<td>103</td>
</tr>
<tr>
<td>Other</td>
<td>161</td>
</tr>
<tr>
<td>Total</td>
<td>1,077</td>
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**Total MEUR 1,077**

1) Financials do not include Solar which will be a part of CiS division from the beginning of 2019
2) Consumers Solutions excluded from financials for better comparability
3) Fortum Oslo Varme consolidated from August 2017 onwards

### EBITDA development (MEUR)

- 2016: 186
- 2017: 262
- LTM Q3/18: 281

1) Established solar offering in India
2) Strong foothold in the Baltic Rim
3) District heat supply/networks w/o own production

- **Associated companies’ CHP**
- **Fortum CHP**
- **Other waste management locations**
Operating environment – highlights by business

**Heating and cooling**
- Relatively stable business environment
- Heat storage and cooling solutions increasingly important
- District heating flexibility and complements renewables with growing focus on environmental impacts

**Circular economy**
- Waste and recycling: small players and consolidation opportunities
- Waste-to-energy highly relevant and growing globally, complements recycling
- High demand for recycled and bio-based raw materials
- Strong drive for sustainable bio materials

**Solar**
- Strong growth in solar PV power production
- Continuing cost decline driven by higher efficiency
- Large-scale solar still contract based
- Emphasis on combining solar with battery storage
## Operational excellence and increased flexibility for City Solutions

<table>
<thead>
<tr>
<th>Executing fuel conversions</th>
<th>Extracting synergies from acquisitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Increasing flexibility in the fuel mix for CHP plants: more bio, waste, and excess heat through large-scale heat pumps</td>
<td>• Hafslund / Fortum Oslo Varme integration progressing as planned. Expected synergies of EUR 5-10 million in 2019-2020</td>
</tr>
<tr>
<td>• E.g. Zabrze, Järvenpää, Pärnu, Jelgava, Czestochowa</td>
<td>• Ekokem integration completed in 2017. Platform for growth and bolt-on acquisitions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>District heating providing flexibility to power market</th>
<th>Asset performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>• District heating provides flexibility (alternative fuels, power-to-heat etc.) and short-term storage possibilities to balance intermittent power production</td>
<td>• Introduction of more advanced predictive maintenance tools for decreasing unavailability costs at power plants</td>
</tr>
<tr>
<td>• District heating helps to balance the seasonal energy demand variation</td>
<td>• Using digital tools for total district heat systems optimisation – from individual plants all the way to demand side response at customer end</td>
</tr>
</tbody>
</table>

**CHP** = combined heat and power
The role of future utility expands – clear link with our current competences and assets

**FUTURE UTILITY**

- **Power-to-Gas**
  - First trials under evaluation
  - Link to district heat for heat recovery from electrolysis process

- **CO₂-sink**
  - Selected by the Norwegian state to develop a full-scale carbon capture project in Oslo

**CO₂**

**FUTURE UTILITY**

- Hydrogen and methane for traffic and industrial use

**UTILITY TODAY**

- District heating as thermal storage and source of flexibility
- More waste-to-energy, in current and new markets
- Excess heat recovery, e.g. data centers
- More solar

**Sustainable materials**

- Focus on value-adding recycling (e.g. plastics, high-value metals, ash)
- Several active projects to grow presence in Nordics and beyond

**Bio economy**

- Resource efficient use of bio, focus on fractioning and pyrolysis
- Demonstration plant in Joensuu, participation in a pilot project in India

**Raw material**
Waste-to-energy is the enabler for starting sustainable material production

**Revenue streams**

- Selling waste management services
  - Gate fee
- Selling environmental engineering services
  - Gate fee, project income
- Customers
- Waste-to-energy / other treatment
- Rejects
- Recycled raw materials and products
  - Product sales (e.g. plastic granulates, recycled oil, metals sorted from ash)
- Energy
  - Heat and electricity sales
- Final disposal
  - Fees from landfilling
- Customers
City Solutions

- Continue fuel conversions in heat production
- Extract value from district heating’s role as a provider of flexibility
- Grow solar in selected markets, continue capital recycling
- Grow waste-to-energy in selected markets and focus on value-adding recycling
- Develop competences in advanced bio-material processing