KEY FACTS & FIGURES

- Wien Energie is the largest ESCO in Austria
- Sales revenues of approx. €1.94bn
- Investments: approx. €152m
- Headcount: ~ 2,500
• Heating network 1,212,5 km
• Customers 353,860
• Hotwater & Heat 88%
1969 – 1971: construction of Spittelau district heat plant with integrated waste incinerator to ensure heat supply of Vienna General Hospital

1987: major fire – plant almost completely destroyed

1989 – 1992: re-commissioned and facade re-designed by the artist Friedensreich Hundertwasser
SIGNIFICANCE OF SPITTELAU WTE

- Thermal recovery of approx. one third of residual waste in Vienna

- Central location:
  - Short transport routes for waste lorries
  - Optimum integration into district heat network and district cooling network operated by Wien Energie

- World-famous facade design by Friedensreich Hundertwasser
TECHNICAL DATA – STATUS PRE REFURBISHMENT

• **Capacity (design):**
  - 2 incinerations lines 2x31.25 MWth
  - Waste throughput 2x15 t/h, heating value 7,5 MJ/kg
  - Actual capacity: ca. 250,000 t/a residual waste at 9 MJ/kg

• **Equipment:**
  - Boiler 33 bara, 240°C (saturated steam) – DOM 1969
  - Flue gas cleaning by 2 electrostatic precipitators, 2-stage flue gas scrubbing, electrodynamic venturi system, catalytic DeNOx facility (DOM 1987 – 1989)

*Date of manufacture
TECHNICAL DATA – PRE REFURBISHMENT

• **Energy generation:**
  - Saturated steam back pressure turbine (DOM 1989): power output (ca. 5 MW) for own use and grid feed-in
  - All-year feed-in of district heat into the district heat network of Wien Energie (ca. 60 MW)
OBJECTIVES OF ENERGY OPTIMISATION

- Refurbishing required after 40 years of operation
- Efficiency increase – savings of 5 million m³ natural gas per year
- Tripling el. power output to ca. 13 MW
- Unchanged emissions levels – unchanged capacity of 250,000 tonnes of waste annually
- Famous Hundertwasser design will be preserved
REFURBISHING MEASURES - OVERVIEW

• **Grate/boiler:**
  - Installation of wider grates
  - Unchanged capacity of ca. 250,000 t/a; design heating value 10 MJ/kg
  - Installation of modern vertical pass boilers (40bar, 400°C)
  - Renewal of slag conveyor system

• **Energy utilisation:**
  - Extraction back-pressure turbine to replace saturated-steam turbine
  - 2-stage district-heat converter
REFURBISHING MEASURES - OVERVIEW

- **Flue gas cleaning:**
  - Existing electrostatic precipitator replaced by fabric filter, optional addition of activated carbon
  - Dismantling of electrodynamic venturi scrubbers
  - Existing SCR unit (op. temp. 280°C) replaced by a low-temperature catalytic DeNox unit (op. temp. 190°C)
  - Using heat shifting systems (flue gas scrubbing, SCR unit) instead of gas burners to heat the flue gas upstream of SCR
LONGITUDINAL SECTION OF EXISTING PLANT
LONGITUDINAL SECTION OF NEW INCINERATION PLANT
PARTICULAR CHALLENGES

- Refurbishment during ongoing operation
- Site constraints – site equipment, pre-assembly areas
- Central urban location
- Adjacent to underground line
- Preservation of artistic design by Friedensreich Hundertwasser
REFURBISHING PROJECT ORGANISATION

- Owned and operated by: Wien Energie GmbH
  - Principal
  - Construction management
  - Site supervision

- Feasibility Study: Rambøll Danmark A/S mbH
  - Feasibility Study
  - First concept

- Planned by: Wiener Kommunal-Umweltschutzprojekt-gesellschaft mbH
  - Overall project coordination
  - General planning
  - Project management
## IMPACT ON ENERGY EFFICIENCY

<table>
<thead>
<tr>
<th>Energy generation</th>
<th>pre-refurbishing (operating data)</th>
<th>post-refurbishing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Thermal input of fuel</strong></td>
<td>MW</td>
<td>2 * 42,6</td>
</tr>
<tr>
<td><strong>Steam generation</strong></td>
<td>t/h</td>
<td>2 * 45</td>
</tr>
<tr>
<td><strong>Steam parameters</strong></td>
<td>bara / °C</td>
<td>33 / 240</td>
</tr>
<tr>
<td><strong>Boiler outlet temperature</strong></td>
<td>°C</td>
<td>180</td>
</tr>
<tr>
<td><strong>O2 content of flue gas</strong></td>
<td>Vol.% tr.</td>
<td>9,2</td>
</tr>
<tr>
<td><strong>SCR gas Consumption</strong></td>
<td>Nm3/h / MW</td>
<td>650 / 6,5</td>
</tr>
</tbody>
</table>
### IMPACT ON ENERGY EFFICIENCY

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<tbody>
<tr>
<td>Energy generation</td>
<td>MW</td>
<td>5,0</td>
</tr>
<tr>
<td>Power grid feed-in</td>
<td>MW</td>
<td>1,0</td>
</tr>
<tr>
<td>District heat generation</td>
<td>MW</td>
<td>60,0</td>
</tr>
</tbody>
</table>
# IMPACT ON ENERGY EFFICIENCY

<table>
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<tr>
<th>Energy efficiency (grid feed-in energy / thermal input of fuel*)</th>
<th>pre-refurbishing (operating data)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Total efficiency</td>
<td>%</td>
<td>66,5%</td>
</tr>
<tr>
<td>Electric power efficiency (grid feed-in)</td>
<td>%</td>
<td>1,1%</td>
</tr>
<tr>
<td>Heat efficiency (grid-feed in)</td>
<td>%</td>
<td>65,4%</td>
</tr>
</tbody>
</table>

*incl. natural gas
OVERVIEW OF MAIN CONTRACTORS

- **Furnace**
  Mitsubishi Hitachi Power Systems Europe Service GmbH (formerly: Hitachi Power Europe Service GmbH, XERVON Energy GmbH….)

- **Water-steam-system**
  Integral Engineering GmbH – Integral Montage GmbH

- **Turbine**
  Integral Montage GmbH, Sub-contractor: MAN Turbo AG

- **SCR**
  Strabag AG
OVERVIEW OF MAIN CONTRACTORS

- **EMSR technology**
  Cegelec GmbH

- **Instrumentation and control technology**
  Siemens AG

- **Construction engineering**
  Züblin Baugesellschaft mbH – Porr Technobau und Umwelt GmbH

- **Dismantling**
  IMB Industriemontagen Berger GmbH
REFURBISHING SCHEDULE

- Winter 2011/2012: preparatory construction work
- As of Feb. 2012: dismantling and construction boiler 2
- July 2013: Turbine/Generator delivered
- March 2014: boiler 2 commissioned
- May 2014: electricity production resumed
- May/June 2015: boiler 1 commissioned
- Oct. 2015: formal handing over of plant
INITIAL STATE (2011)
PREPARATORY WORK
(01/2012)
SLAG BUNKER SUPERSTRUCTURE (03/2012)
DISMANTLING OF LINE 2 (02 – 06/2012)
LOGISTICS, DELIVERIES AT NIGHT
THE NEW FEEDWATER TANK (07 – 08/2012)
ENLARGEMENT OF BOILER HOUSE (02/2013)
CONSTRUCTION OF BOILER 2 (10/2012)
THE NEW BOILER LINE NO. 2
TURBINE AND DISTRICT HEAT CONVERSION (07/2013)
CONSTRUCTION WORKS IN THE WASTE BUNKER
3RD MARCH 2014 – FIRST WASTE FIRE IN LINE NO.2
CURRENT STATE OF CONSTRUCTION
THE COMPLETED WTE SPITTELAU (2015)
THANK YOU FOR YOUR ATTENTION