Considering the RRR Waste to Energy plant interface to a District Heating system

Riverside Resource Recovery Ltd

The Riverside Energy from Waste facility at Belvedere in the London Borough of Bexley, is Cory Environmental's single most significant development project. With an average annual capacity of 585,000 tonnes, it will be an important strategic river-served waste management facility for London, helping the capital to manage its own waste, keeping over 100,000 HGVs off the capital's congested roads each year and making a real contribution to London's ability to meet its landfill diversion targets.

Site Development

Detailed site investigation started in spring 2007, followed by archaeological work in summer 2007 and site remediation work later that year. Essential ecological mitigation measures were also carried out during this period.

With the appointment of Breheny as contractor for the Norman Road improvements, work commenced at the beginning of 2008 on the complete reconstruction of the main highway to the main development area. This work was completed in July 2008, enabling work to start on the construction of the RRR facility including piling of the jetty.

Construction and commissioning of the plant is expected to be complete by mid 2011.

Energy Recovery

Heat energy will be recovered from the flue gases through specialist, high efficiency boilers. A turbine has the capability to supply up to 30MW of steam/heat and up to 72MW of electricity. Approximately 6MW of this will be used in the plant with the remainder generating at 11kV and transforming on site up to 132kV for export to the grid.

Exhaust steam from the turbine will be condensed by a bank of air-cooled condensers.

Comments

The information in previous sections is directly from www.coryenvironmental.co.uk. It seems that the design and procurement of the plant is at quite an advanced stage already. It should be checked with Cory whether they are in a position to consider any CHP/DH modifications to process or lay-out anymore.

Typical CHP/District Heating interface

The main components in the steam Combined Heat and Power to District Heating interface are the following:

1. Steam extraction and steam/water heat exchangers

   The steam is extracted from the turbine and its condensing heat is recovered to the DH water through a steam/water heat exchanger. Typically, several stages (extraction points) are used to achieve the optimum situation. Adequate temperature level must be achieved in the DH water but on the other hand, steam should be

extracted at the lowest possible pressure levels in order to lose as little as possible from the electricity yield.

2. Circulation pumps

The circulation pumps maintain continuous flow in the DH network, circulating the water through the steam/water heat exchangers and boilers in one hand and through the distribution network and the consumer substations in the other hand. The flow shall be varied to ensure adequate pressure difference to each customer.

3. Water treatment and pressurization system

DH circulation water needs to be treated to avoid corrosion and scaling; softened water with oxygen removal and pH adjustment. The pressurization and expansion system maintains adequate static pressure in the network by feeding in additional water or letting the expanding water volume out to the expansion tank.

4. Control and automation

The main function of control and automation system is to continuously adjust the heat supply from the energy station to meet the momentary heat load by the consumers. In practice, this is achieved by varying both the flow temperature and the DH water flow.

Preliminary considerations on the RRR CHP DH interface

- ✓ The power/heat ratio 72MW_e and 30MW_{dh} indicates that the option for CHP-heat generation would not be fully utilized. In a steam cycle, a typical power/heat-ratio would be 1:2. If there would be heat load available and the financial incentives in place, the RRR plant could be designed to supply some 100MW heat. This would result in losing some 10MW of electricity yield at full heat load.
- ✓ In a fully optimized steam CHP/DH plant, the steam extraction points (2) are typically at a pressure level of 0.8-1.0 bar. This will ensure the highest possible z-factor. The RRR steam turbine is probably specifically designed and extraction points and capacities could be freely chosen, but it may be too late now for any further optimization.
- ✓ Other than the turbine, the future proofing for DH interface and operation mainly requires space reservation and lay-out considerations. The rather bulky heat exchangers should locate in the immediate vicinity of the turbine. Further space is needed for circulation pumps, pressurization etc but the location of these is more flexible.
- ✓ In site lay-out, space could be allocated also for a possible heat accumulator (to facilitate optimum electricity generation, a.o.) and for peak and reserve boilers.
- ✓ Please find enclosed an example of a typical CHP/DH plant lay-out.

Attachments:

1. Salmi Voima main data
2. Salmi Voima lay-out

Selected references

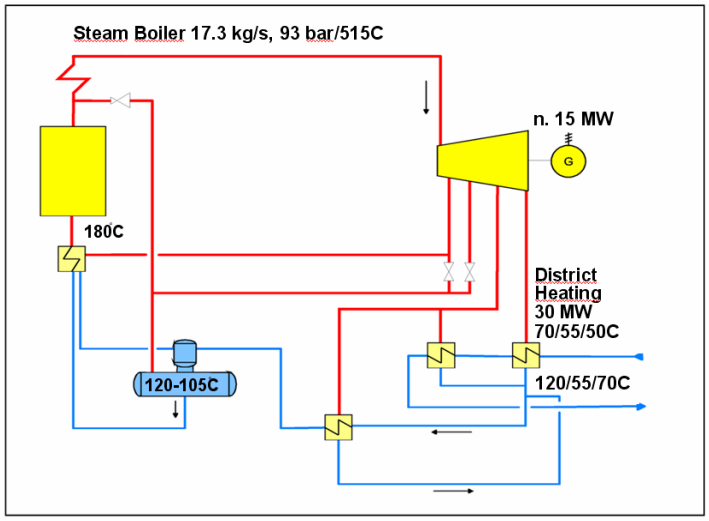
Savon Voima Oy's (former Salmi Voima Oy)
District Heating Power Plant in Iisalmi (Fin)

Steam boiler 17.3 kg/s, 93 bar/515oC

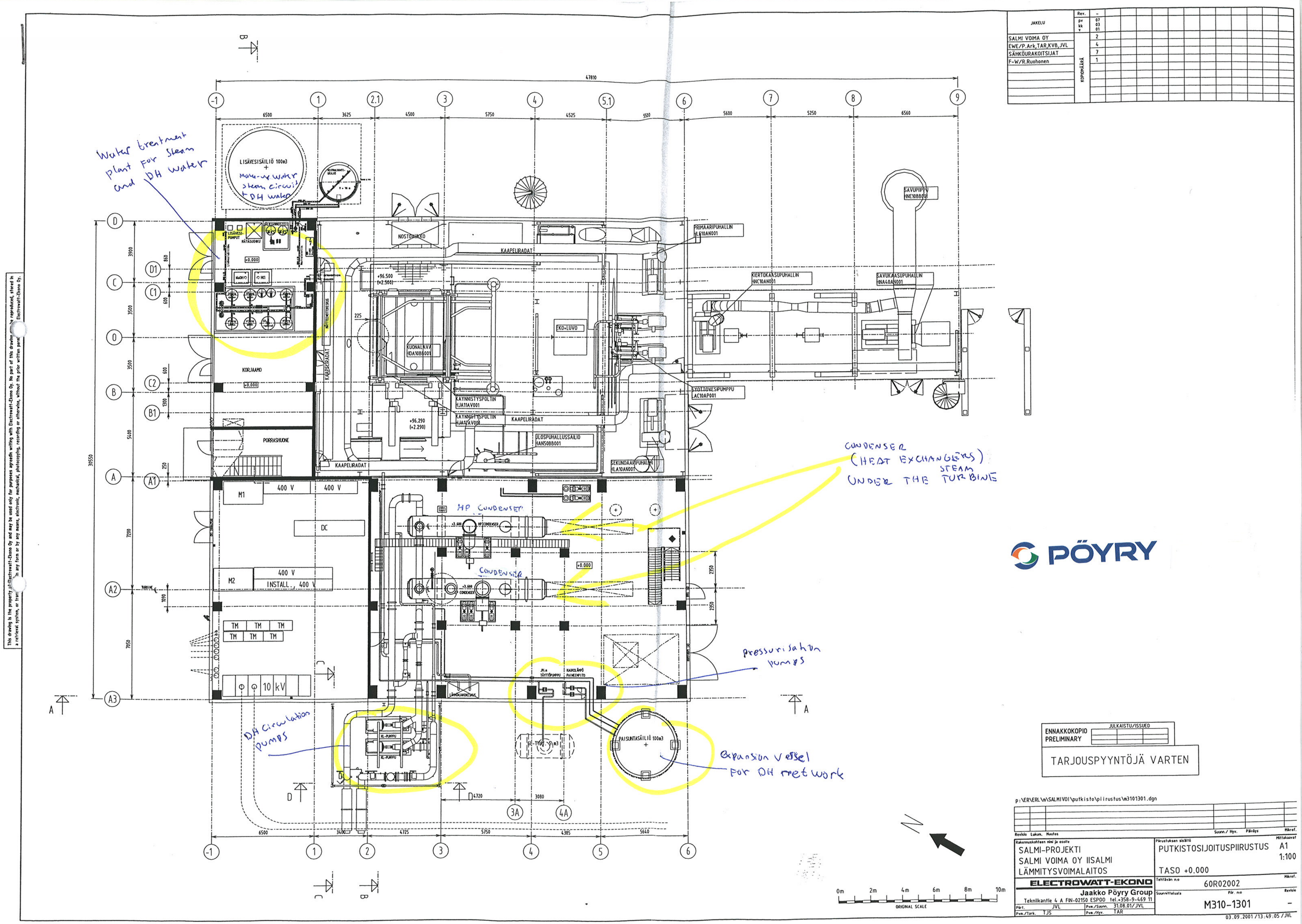
- Foster Wheeler Energia Oy, Finland
- bubbling fluidised bed, natural circulation
- fuel capacity 48 MW
- milled peat, sawdust, waste
- wood, bark, REF

District heating steam turbine

- 15 MWe/30 MWth Blohm+Voss Industrietechnik GmbH
- 2-stage turbine with double flow district heating tail
- LP preheater, feed water tank extraction and HP preheater



- Pöyry's services
  - EPCM
    - Engineering
    - Procurement
    - Construction Management


Water treatment plant for steam and DH water
LISÄVESISÄILIÖ 100m3
Make-up water steam circuit + DH water
SAVUPIIPPU HNE10BB001
PRIMAARIPUHALLIN HLB10AN001
KIERTOKAASUPUHALLIN HNC10AN001
SAVUKAASUPUHALLIN HNA40AN001
NOSTOAUKKO
KAAPELIRADAT
EKO+LUVO
KUONALAVA HDA10BB001
KORJAAMO
SYÖTTÖVESIPUMPPU LAC10AP001
KÄYNNISTYSPOLTIN HJA11AV001
KÄYNNISTYSPOLTIN HJA12AV001
ULOSPUHALLUSSÄILIÖ HAN50BB001
SEKUNDAARIPUHALLIN HLA10AN001
PORRASHUONE
CONDENSER (HEAT EXCHANGERS) UNDER THE STEAM TURBINE
HP CONDENSER
CONDENSER
M1
400 V
DC
M2
INSTALL. 400 V
TM
10 kV
pressurisation pumps
DH circulation pumps
PAISUNTASÄILIÖ 100m3
expansion vessel for DH network
47810
ENNAKKOKOPIO PRELIMINARY
JULKAISTU/ISSUED
TARJOUSPYYNTÖJÄ VARTEN
JAKELU
SALMI VOIMA OY
EWE/P.Ark,TAR,KVB,JVL
SÄHKÖURAKOITSIJAT
F-W/R.Ruohonen
PÖYRY
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Suunn./ Hyv.
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03.09.2001 /13:49:05 /JVL