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VI STÖDJER FÖRETAG & OFFENTLIGA AKTÖRER I ENERGI- & KLIMATARBETET

Small Scale CHP from Biomass
– a demonstration project in Southeast Sweden

Daniella Johansson, Energy Agency for Southeast Sweden Ltd

Nordic Baltic Bioenergy, April 20, Vilnius

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Partly financed by EU programme Life+ and Swedish Energy Agency

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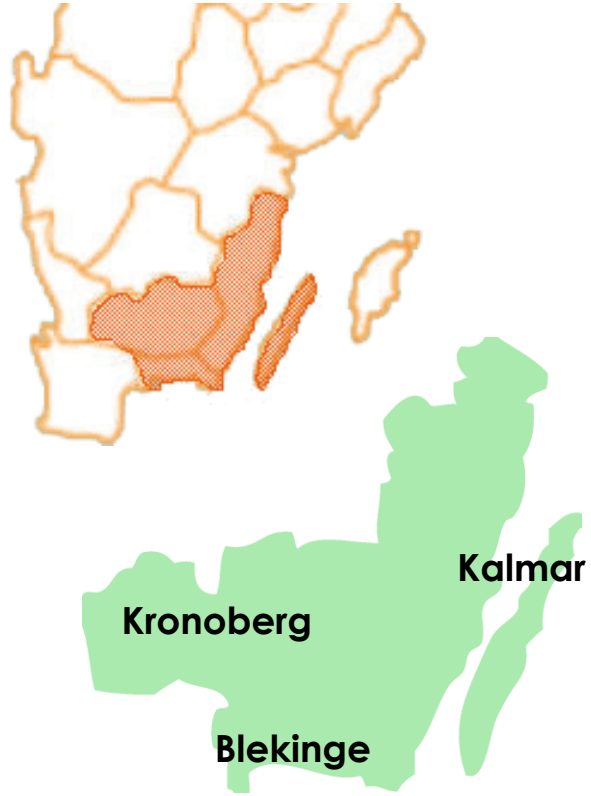
The Energy Agency For Southeast Sweden (ESS)

- ESS started in 1999
- Owned by municipalities, regional councils and county councils in Blekinge, Kalmar & Kronoberg
- 20 employees, head office in Växjö, regional offices in Kalmar, Karlskrona & Oskarshamn
- Experienced project partner
- Striving for a sustainable energy region by carrying out projects and activities within
  - Energy efficiency
  - Renewable energy
  - Mobility
  - Energy in society
- Creating and sustaining networks



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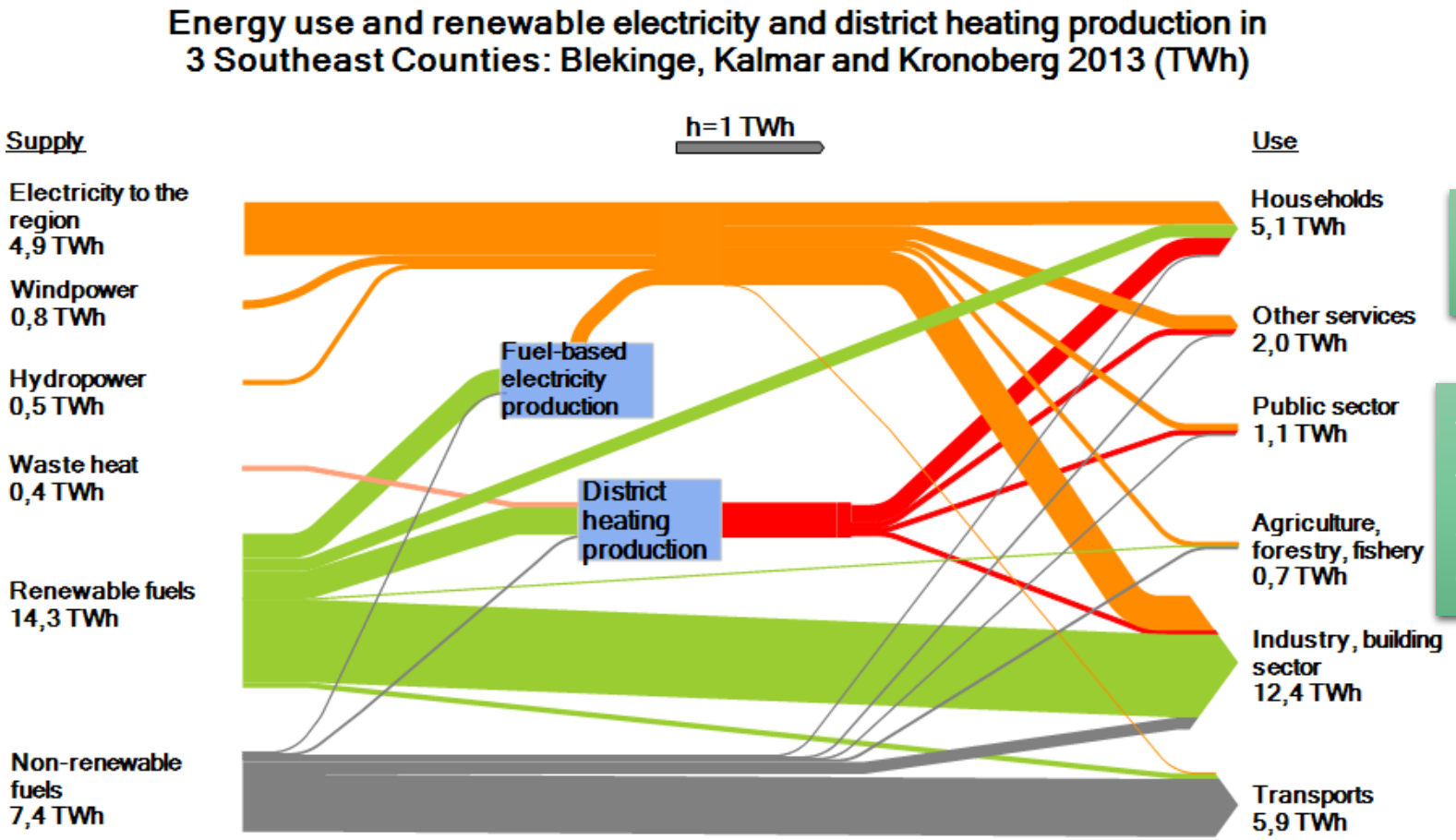
Energy use in Southeast Sweden



Small Scale CHP from biomass is one part of the solution

- 80 potential plants for small scale CHP
- 40-50 plants in the region with a possible average electricity production of 3 GWh/year

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Reasons and opportunities for investing in small scale CHP based on biomass

- Lower costs for imported electricity
- To secure power outage
- Unburden the power grid
- Gives strong environmental profile on the company
- Wish to be part of the leading development
- Decreased tax relief for oil use in Swedish industry
- More reasons to switch to bio based – more products
- Increased locally produced renewable electric power
- Increase use of biomass and decrease fossil CO_2
- Promotes employment in rural areas
- Uses otherwise lost heat for electricity generation (esp. the ORC technology)

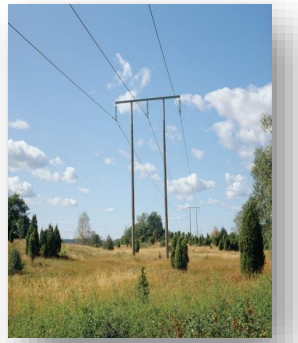

Photo: Bo Dahlin, Svenska kraftnät

Photo: Ronneby Miljö och Teknik AB

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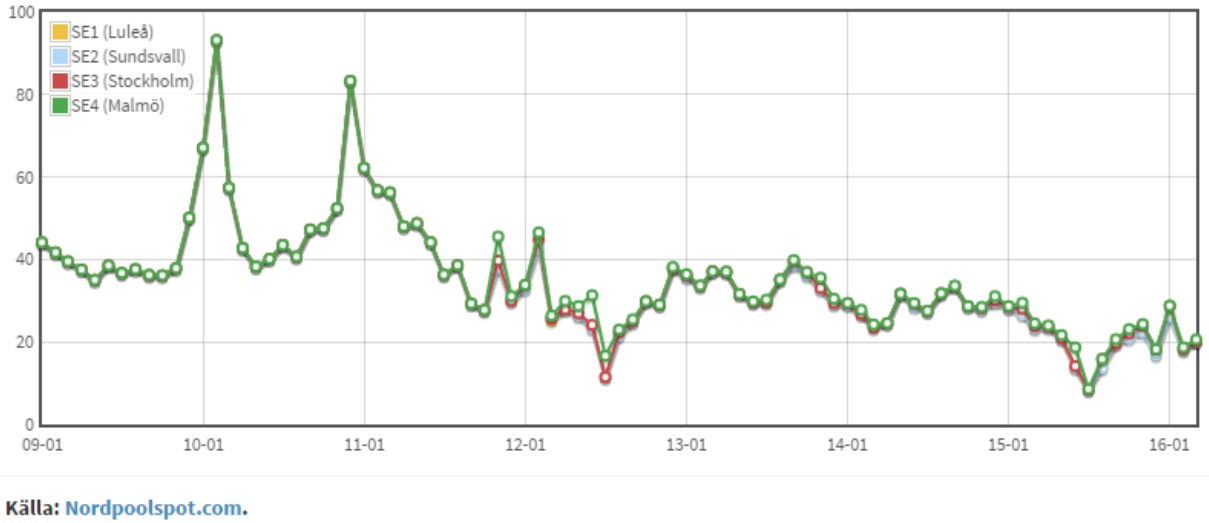
Challenges for investing in small scale CHP based on biomass

- Low electricity prices
- Low oil prices
- Unsettled energy and short termed policies
- Not fully commercialized technologies
- Unsettled market for the feedstock
- Lack of knowledge



Source: Elen.nu /Nordpoolspot.com

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Small scale CHP
– a demonstration project in Southeast Sweden

- A project within the EU programe Life+
  - Energy Agency for southeast Sweden (*project manager*)
  - The Emå-dairy
  - The energy company, Ronneby Miljö & Teknik

Objective:

- To demonstrate different technologies for small scale CHP
  - Gasification to power
  - Wet steam turbine
  - Organic Rankine cycle
- Increase the use of small scale CHP
- Establish a platform for small-scale CHP showcases
  - Study visits at the plants
- Decrease emissions of CO_2 and contribute to the EU and national targets
- Increase renewable electricity by increasing local-bio based small-scale electricity production

Photo: Bo Dahlin, Svenska kraftnät

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Gasifier at a local diary, Emåmejeriet

- Small local dairy
- Owned and operated by farmers
- Wood chips fuelled gasification unit
  - 40 kW electricty
  - 100 kW heat
  - Volter OY trough Nordisk bio kraft & värme AB
- Investment ca. 3 million SEK
- A dryer– uses excess heat
- In operation since 28 October 2015
- > 12MWh electricity

Photo: Johanna Wallin, Energikontor Sydost

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EMÅMEJERIET Etabl. 2007

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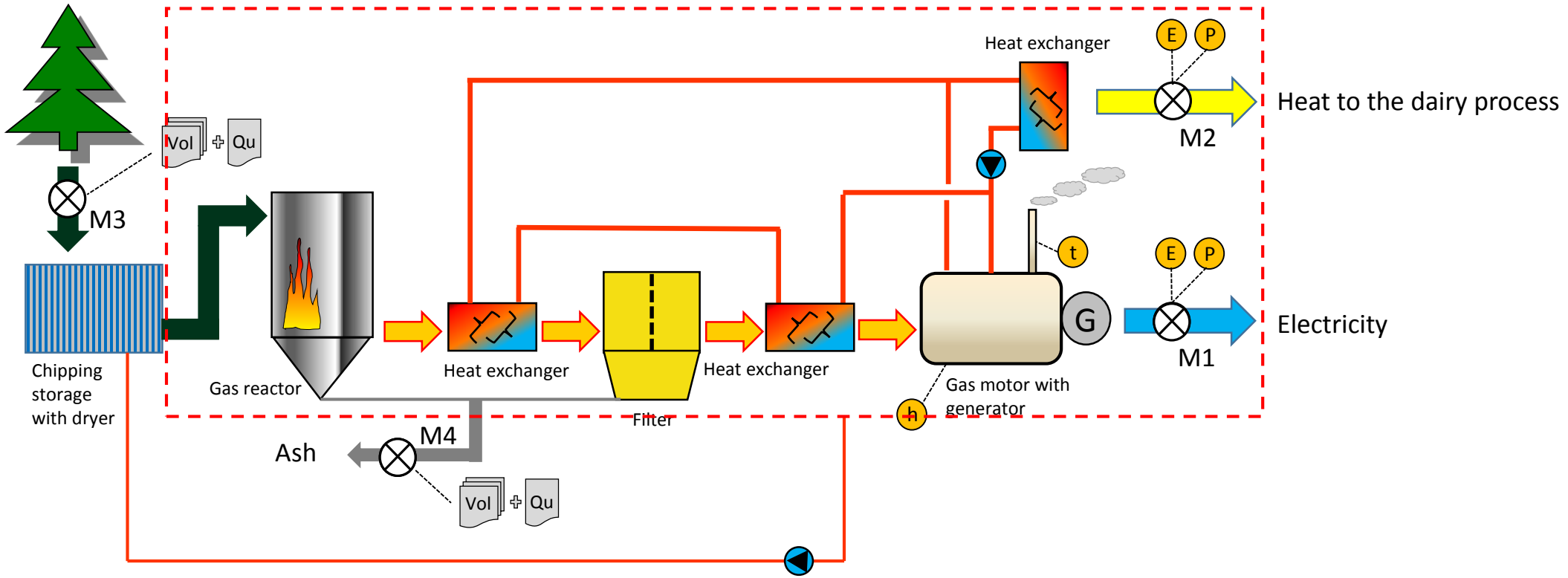
Technology – Gasifier at the dairy



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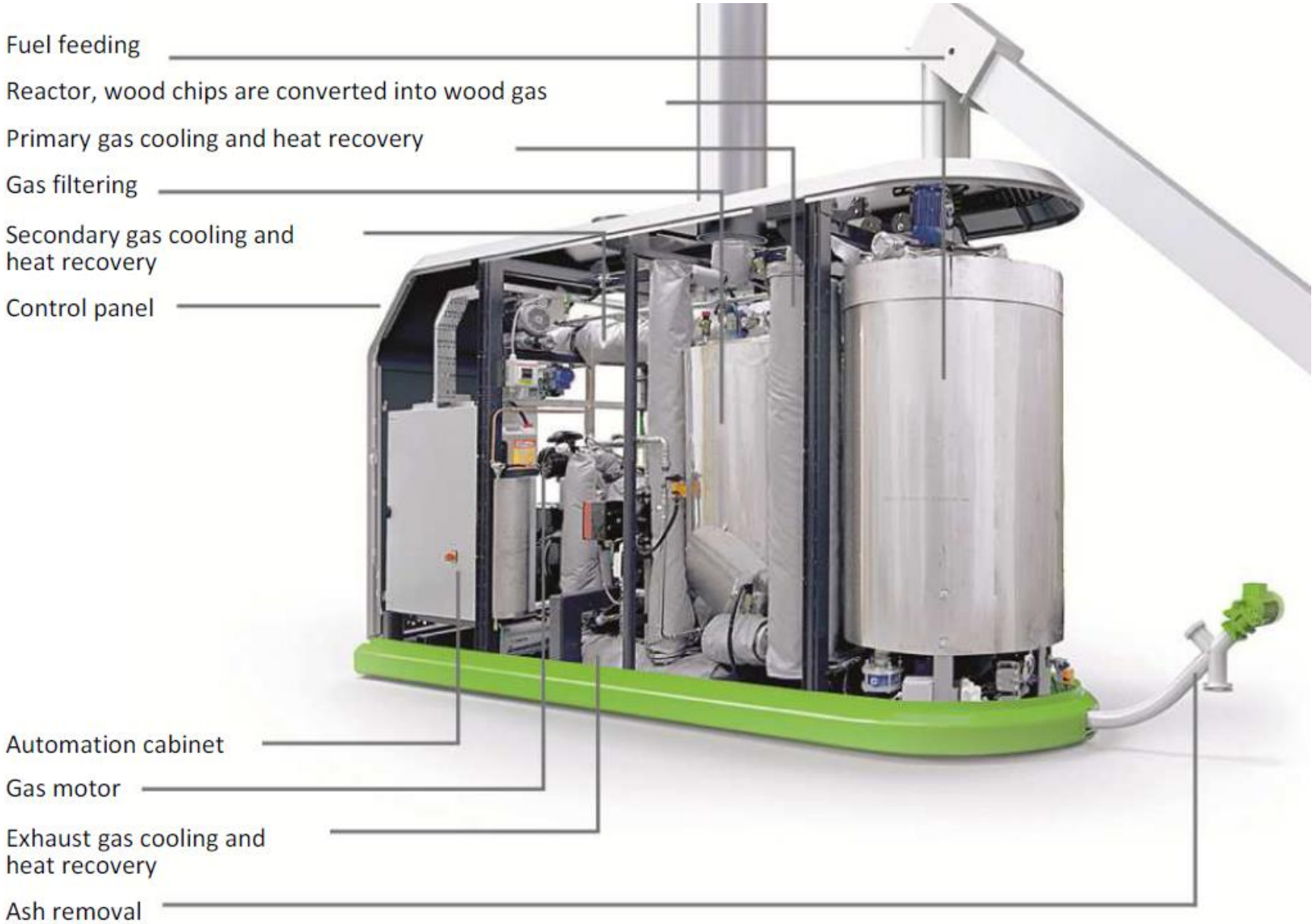

Source: Volter

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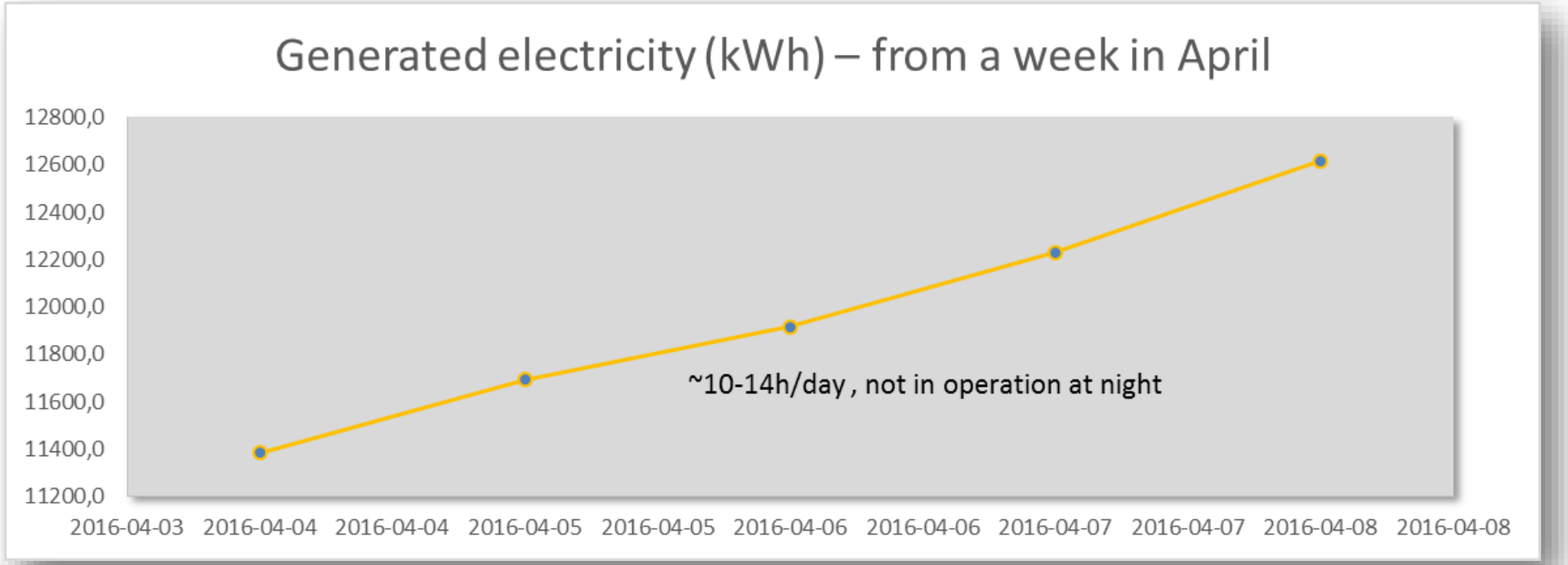
Electricity from the gasifier – an example



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Lessoned learned so far?

- Few suppliers that can offer gasification technologies for high flow temperature
- The better pre-study – the better pricing
- No environmental permissions needed < 500 kW
- Building permits needed for storage and dryer
- Difficult to buy dried steam wood chips (transportation and pricing) - the system needs a dryer
- Initial problems due to dryer – not the gasifier
- More complex to connect the gasifier with a dairy process with large fluctuations in heat demand than expected – solved by an accumulator tank
- The gasifier has been running as expected

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Wet steam turbine at the municipality owned energy company, Ronneby Miljöteknik

- Supply service within i.e heat, sanitary and water
- Wet steam turbine (WST)
  - 500 kW electricity
- Making the district heating plant self-sufficient in electricity
- Investment ca. 15 million SEK
- Inline with the strategic plan: ”*to combine environmental responsibilities with economic effectivity*”
- Procurement process ready, M+M Turbinen technik
- Delivery in Sept/Okt 2016
- Modification of existing boiler - implemented

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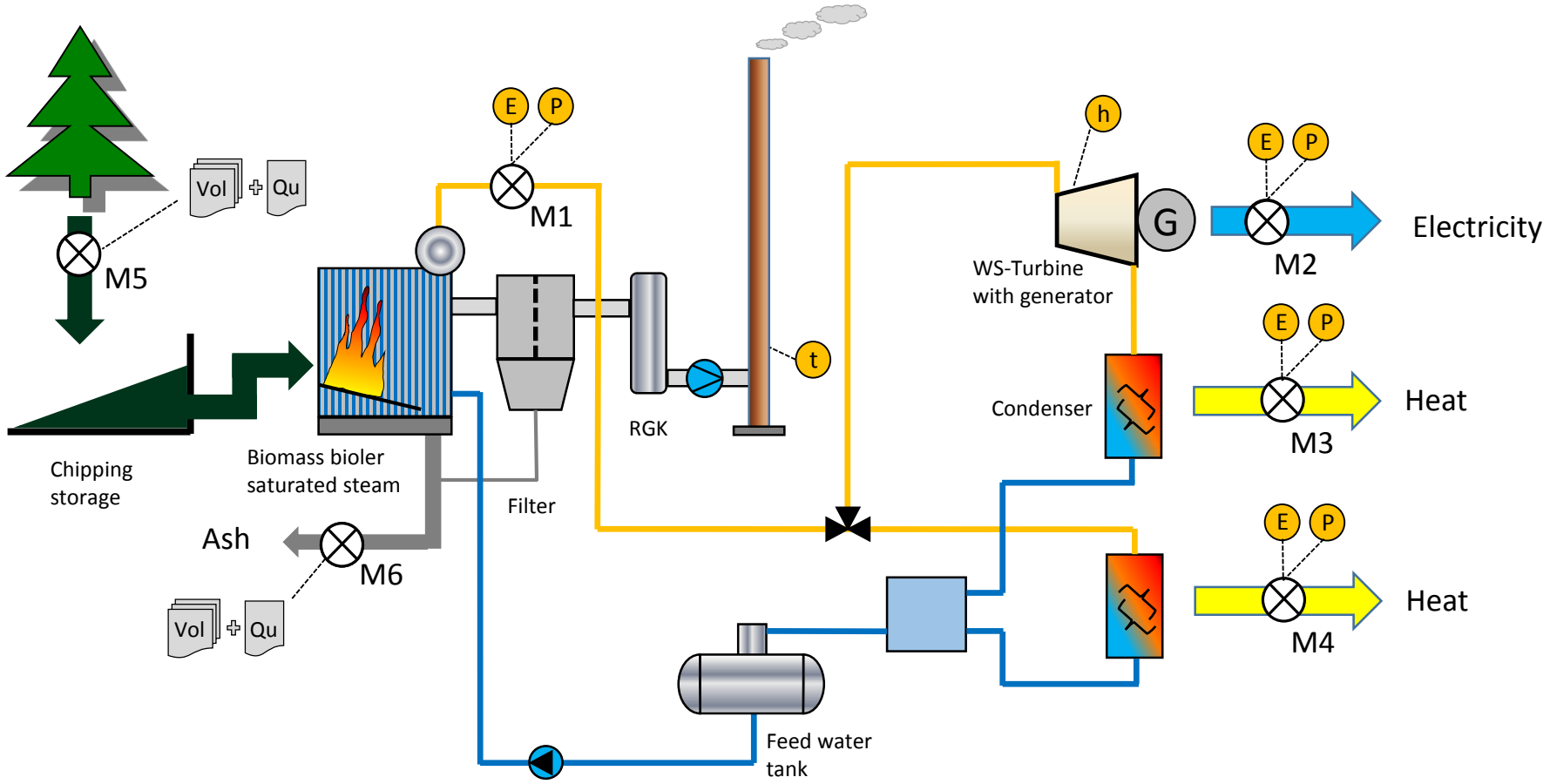
Technology – Wet steam turbine at the energy company



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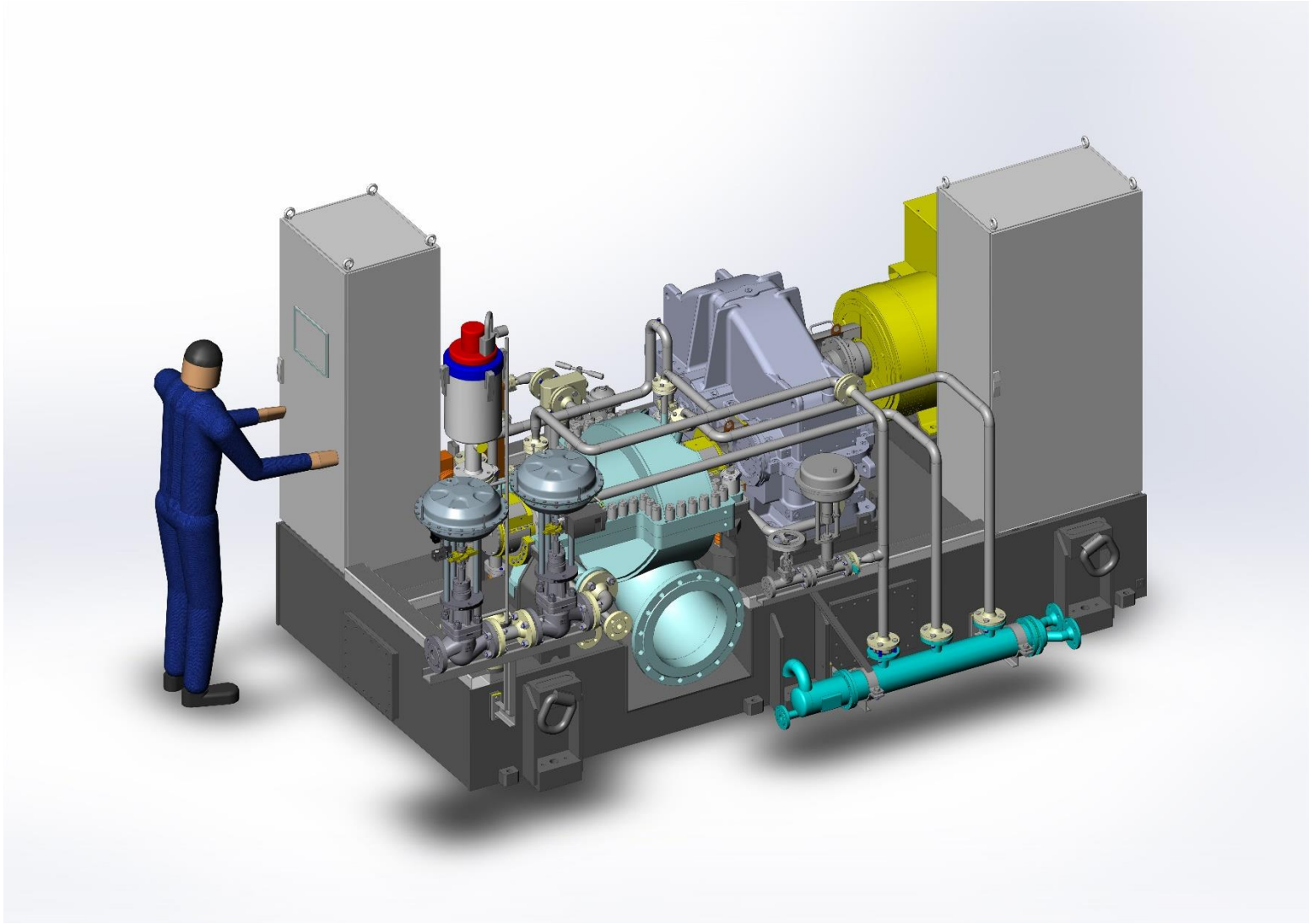

Source: Weckman AB

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Lessoned learned so far?

- Creation of subsidiary company – companies that owns the electricity grid are not allowed to produce electricity
- Lengthy political process
- Few suppliers that can offer turbines in the size of ~0,5-1 MW
- The turbine fits within existing environmental permission for the plant
- Steam dome gives advantages
- To connect the turbine with the existing boiler – more complex than expected

Photo: Daniella Johansson, Energikontor Sydost

Photo: Ronneby Miljö och Teknik

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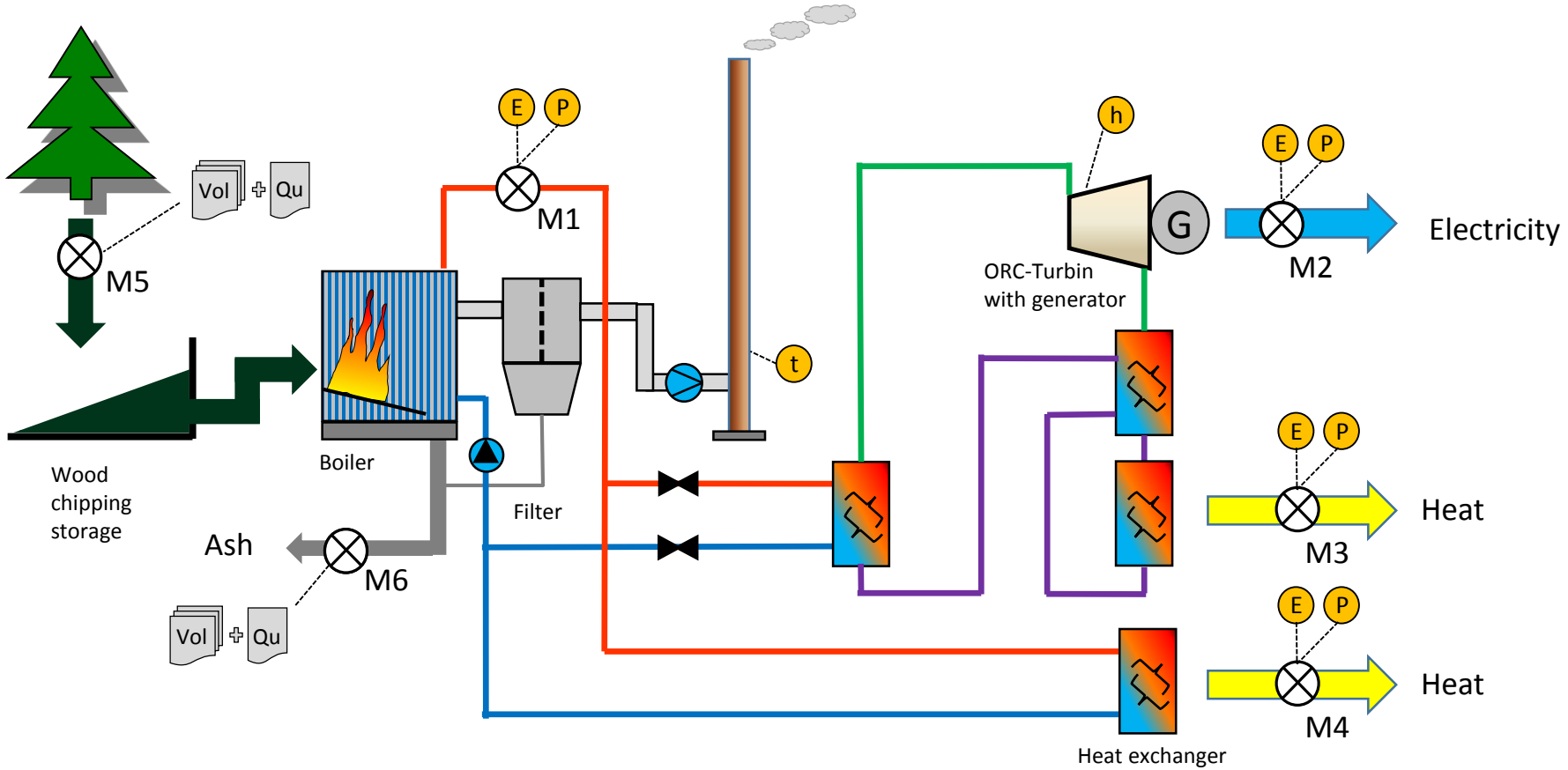
ORC- technology

- Withdrawal of partner due to decreased steam demand
- Difficulties to find replacement due to:
  - Unsettled energy and short termed policies
  - Low electricity price
  - Low oil price
  - The project time frame
- Hope to be able to demonstration at a local district heating plant
  - Delivery of steam to sawmill – gives high availability
  - Contribute to lower the return temperature – higher boiler efficiency

Technology - ORC



Upcoming actions

- Monitoring and evaluation of data:
  - Efficiency
  - Accessibility
  - Running costs
  - Maintenance costs
  - Ev. Process failures
  - Electricity and heat production (alfa-value)
  - Fuel (wood chips) consumption

Disseminate experience from the whole process – from pre-study/procurement process to continuously operation

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Great potential for the technologies!
Welcome to visit the demonstrations!

Interested?

Contact me or visit our home-page!
http://energikontorsydost.se/smaskaligkraftvarme

Thanks for listening!

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