

The ESS Energy Recovery System

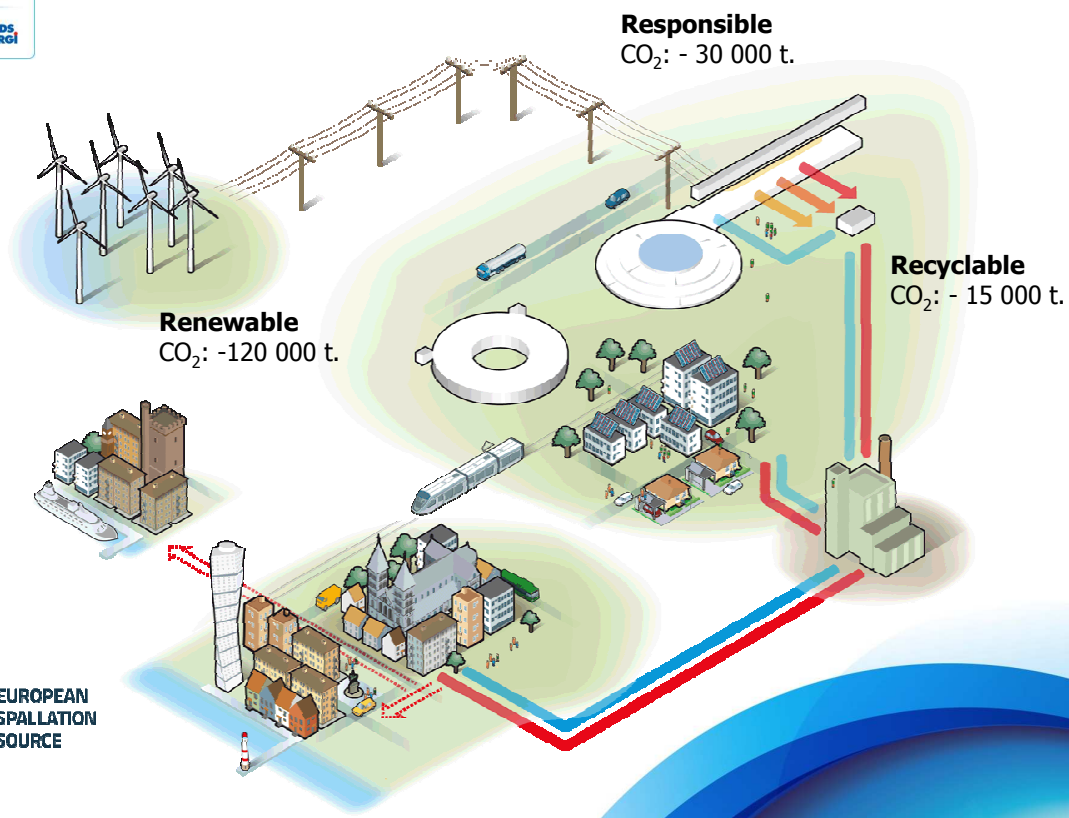


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SOURCE

Thomas Parker
Head of Energy Division



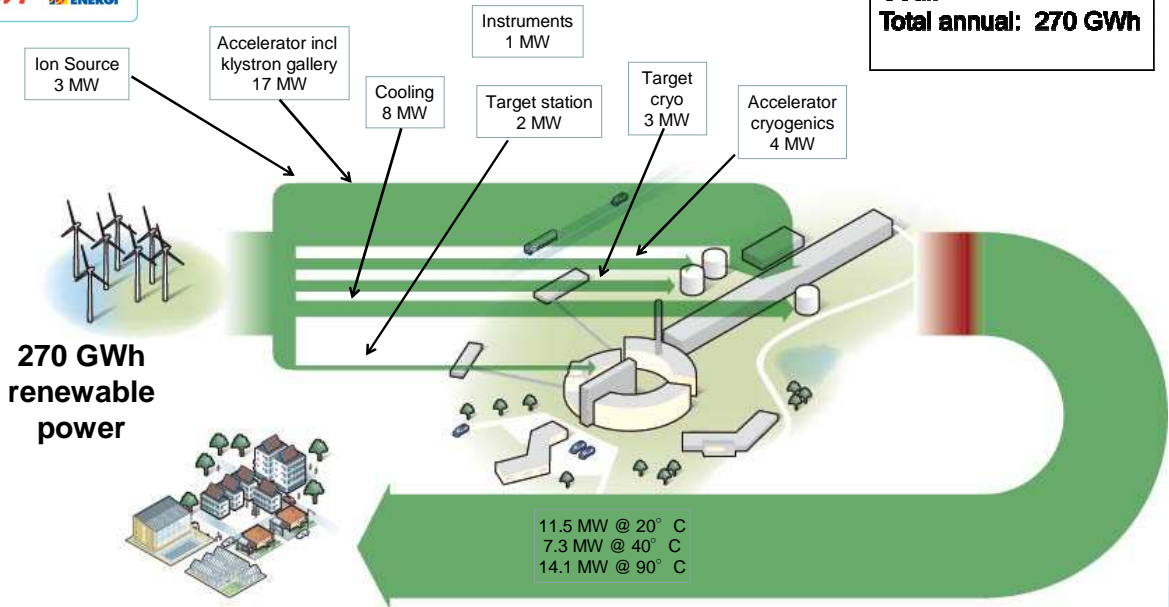
Responsible – Renewable – Recyclable





Energy Inventory ESS 2012

Goal:
Total annual: 270 GWh



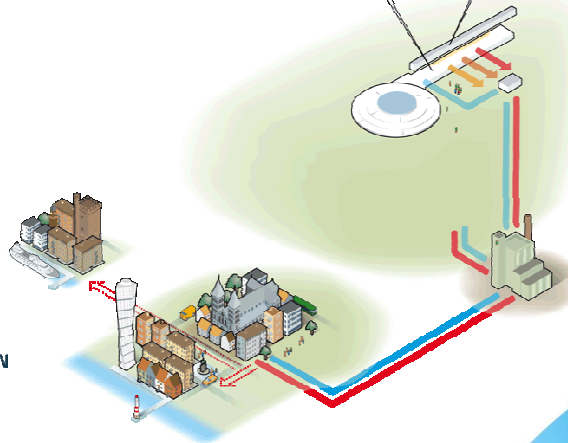
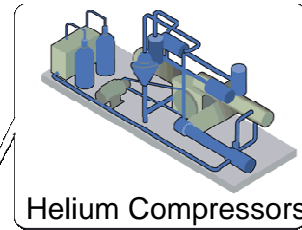
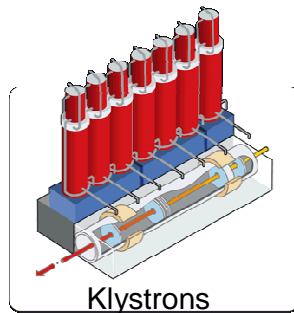


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SUSTAINABILITY PARTNERS



Hot Stuff!



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Warm water 40°

- Physics of heat recycling:
 - 2nd law of thermodynamics
 - Carnot efficiency for conversion to mechanical work
 - Exergy – maximum amount of mechanical work that can be produced
 - Dependency on the available temperature difference
- Conclusion
 - Re-use of waste heat from Research Infrastructure as mechanical work is generally not viable.
 - Heat recycling can not be solved by physics alone!

Temperature benchmarks

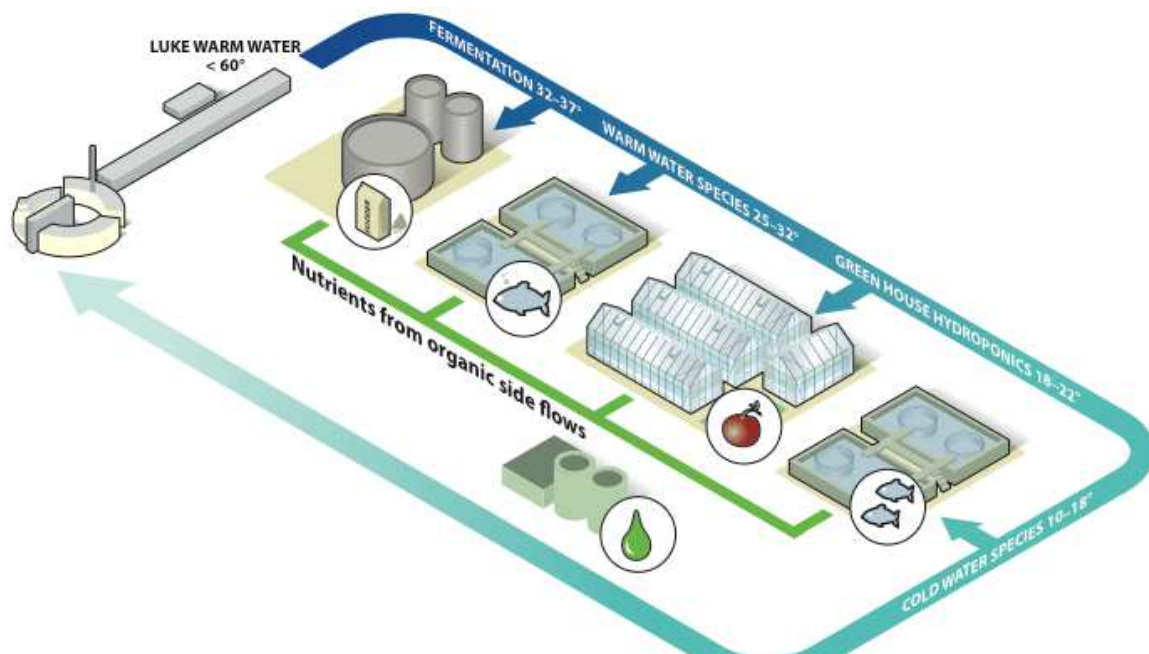
- 80° District heating system
- 70° Tap water
- 40° Space heating

- => not nearly enough demand for 40°

Priorities

- 1.** Energy efficiency
- 2.** High-temperature cooling
- 3.** Find uses for lower grade heat (other than mechanical work)
 - a.** Heating – 40° for space heat
 - b.** Biological systems for food and energy production

The Hybrid Cooling Chain



Open Call

- Within two weeks
- www.esss.se
- Design, build, operate, own
- Heat transfer, heat storage/balancing, land, financing, operations
- Not consulting





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Thank you!

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