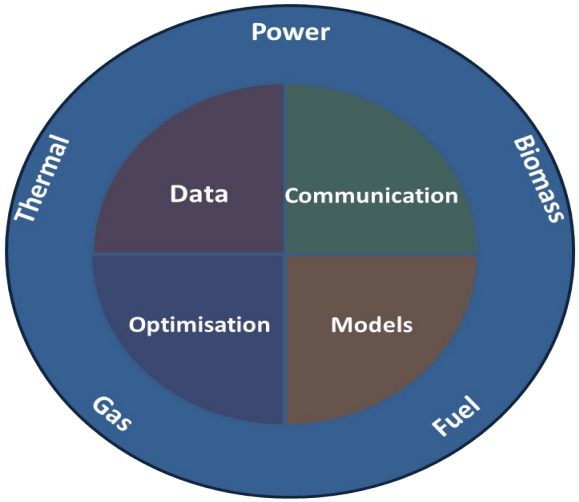
ESI - Why?



Henrik Madsen, DTU Compute

http://www.henrikmadsen.org

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Quote by B. Obama at the Climate Summit in New York:

(a couple of weeks ago)

*We are the **first generation** affected by climate changes,*

*and we are the **last generation** able to do something about it!*

Potentials for renewable energy

- **Scenario**: We want to cover the worlds entire need for power using wind power.
- How large an area should be covered by wind turbines?

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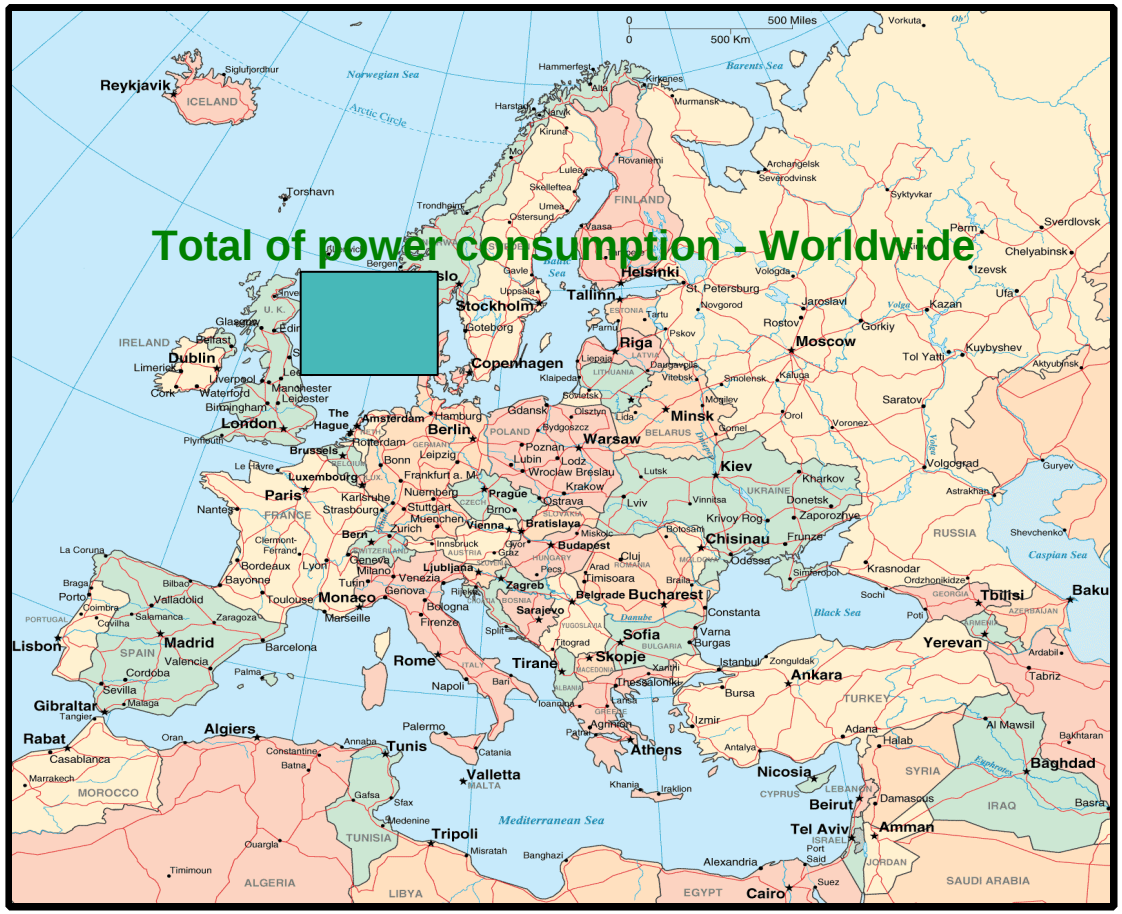
Potentials for renewable energy

- **Scenario:** We want to cover the worlds entire need for power using wind power
- How large an area should be covered by wind turbines?
- **Conclusion**: Use intelligence ....
- Calls for **IT / Big Data / Smart Energy Solutions/ Energy Systems Integration**



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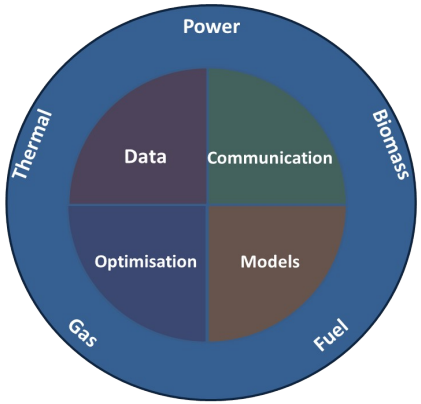
ESI – Hypothesis

The **central hypothesis of ESI** is that by **intelligently integrating** currently distinct energy flows (heat, power, gas and biomass) in we can enable very large shares of renewables, and consequently obtain substantial reductions in CO2 emissions.

Intelligent integration will (for instance) enable lossless ‘virtual’ storage on a number of different time scales.



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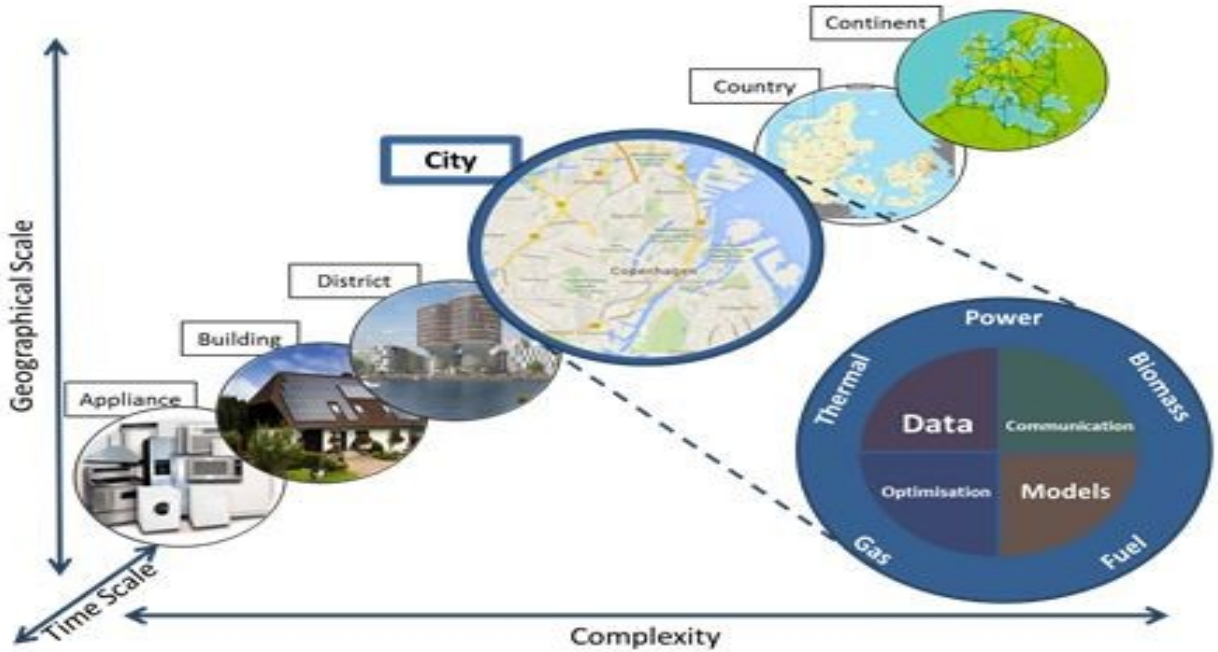
ESI - Scientific Objective

To establish methodologies and solutions for design and operation of integrated electrical, thermal, fuel pathways at all scales



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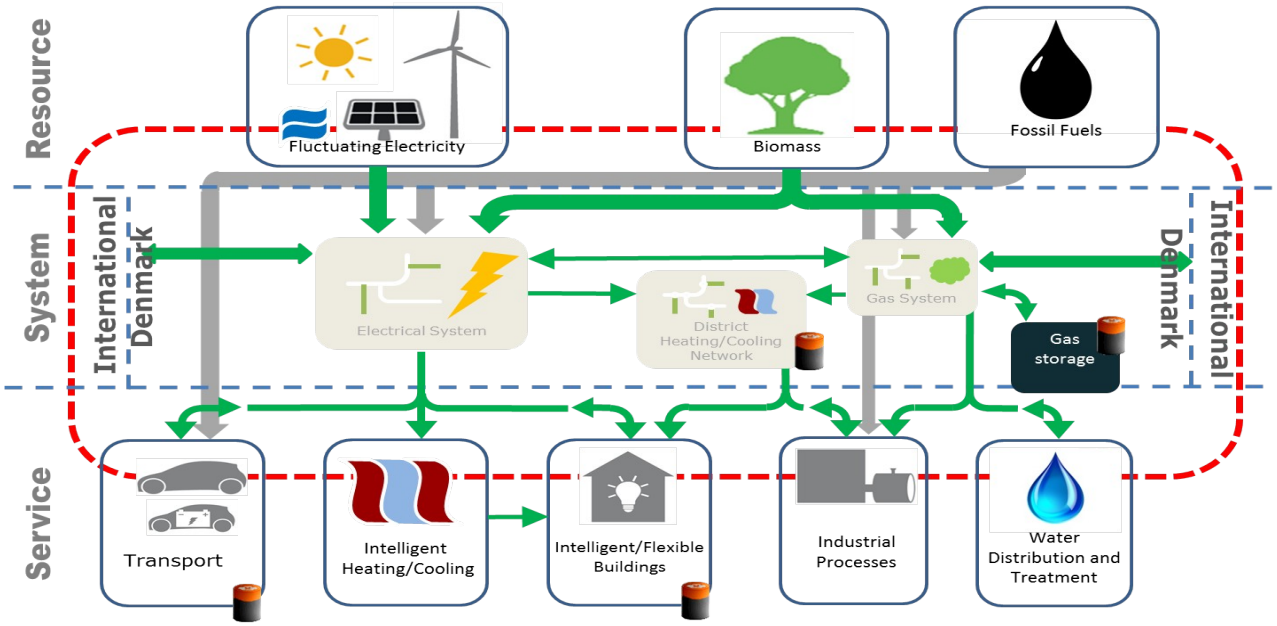
ESI - Concepts

Energy Systems Integration using data and IT solutions leading to **models and methods for planning and operation of future electric energy systems.**



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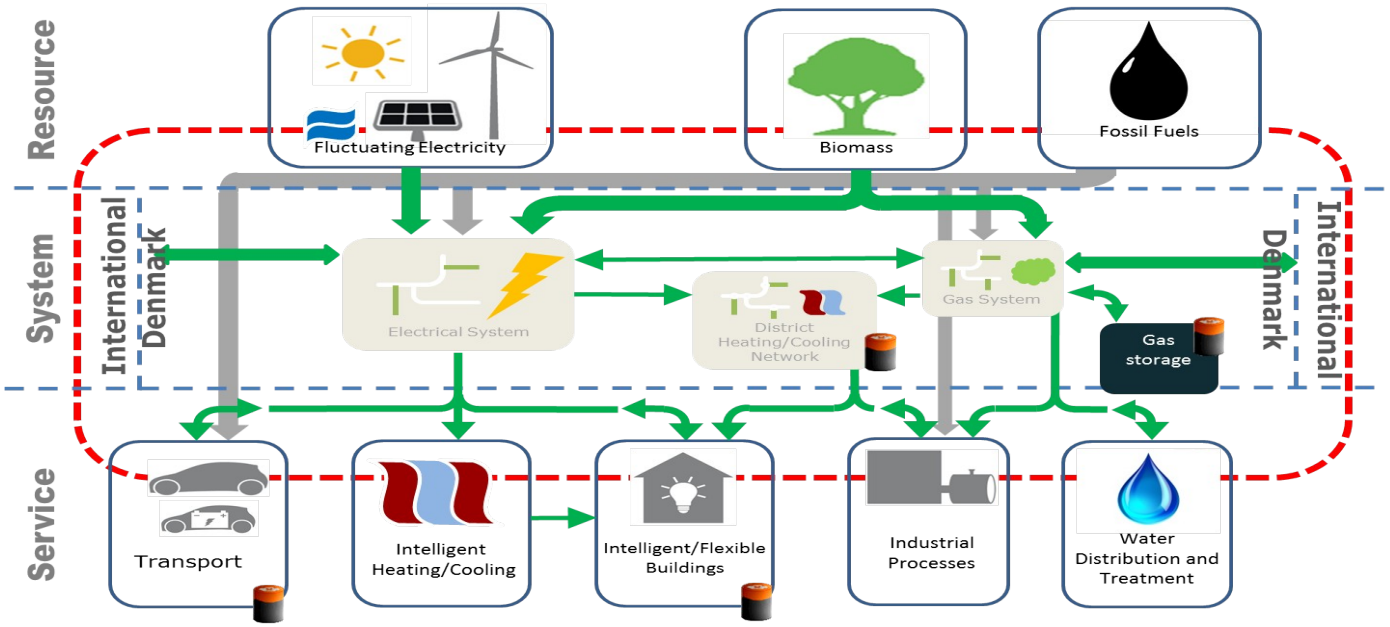
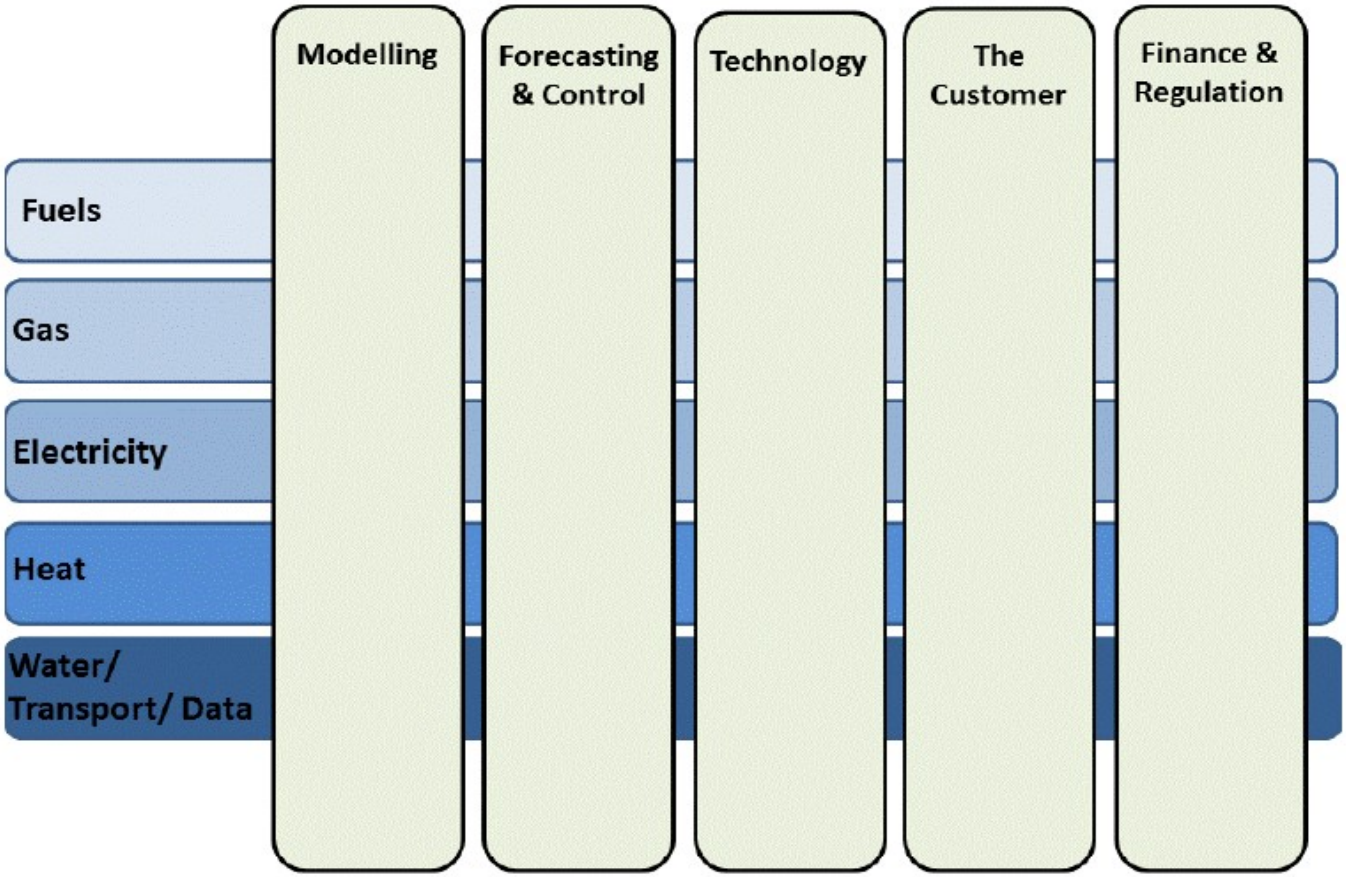
Example: Storage by Energy Systems Integration



- Denmark (2014) : 48 pct of power load by renewables (> 100 pct at some days in January)
- (Virtual) storage principles:
  - _ Buildings can provide storage up to, say, 5-12 hours ahead
  - _ District heating systems can provide storage up to 1-2 days ahead
  - _ Gas systems can provide seasonal storage

Proposal (UCD, DTU, KU Leuven):

ESI Joint Program as a part of European Research (EERA)



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