MULTIPLE ENERGY SYSTEM ANALYSIS OF SMART ENERGY SYSTEMS

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INTRODUCTION

• Transition to future smart energy systems

• Three (four) levels of energy systems
  • City (Local)
  • (Regional)
  • National
  • Transnational

(based on Google Maps)
LINKING LOCAL AND NATIONAL ENERGY SYSTEMS

• Allocation based on national averages
• Upscaling local models
• Transmission between levels and systems

• Developing a tool to handle local <-> national energy systems
  • Country as regions
  • Cities and Municipalities as part of regions and Countries
CURRENT MODELING IN ENERGYPLAN

- One system limitation
  - Municipality
  - Region
  - Country
  - ...

- External electricity market
  - Interconnector Capacity

- Separate analyses of individual regions.

- Creating a tool that can link multiple energy plan models.

(energyplan.eu 2015)
Creating a Model for Analysing Multiple Energy Systems in EnergyPLAN

Transmission

• Model all scales of energy systems

• Difference in linking cities to countries and linking countries to each other

Current Assumptions in EnergyPLAN

• Analytical programming

• Based on technical simulation

  • Fuel based optimisation

  • Most efficient units

  • Utilise ”local” production units
A MULTIPLE EXECUTION TOOL FOR ENERGYPLAN – TWO MAIN APPROACHES

Iterative
• Run each individual system in island mode
• Analyse import/export data and production units and transmission capacity
• Add potential export to the systems
• Run and repeat.

Share based
• Define an overall system
• Define subsystems
• Program calculates the shares of the subsystem in the overall system
• Analyse the overall system, use shares to get subsystem output.
• Assumes copper-plate
EXAMPLE OF CITY TO COUNTY

• Copenhagen and Denmark
  • Larger city with central CHP
  • Iterative

• Sønderborg and Denmark
  • Smaller city with decentral CHP
  • Iterative and share based
RESULTS: ITERATIVE ANALYSIS FOR DK

Analysis based on data from CEESA and PlanEnergi
PERFORMANCE OF LOCAL SYSTEM: COMPARING SHARE BASED ANALYSIS

- Capacity or Production?
- Production strategies
- Production based is more similar to the iterative approach

Analysis based on data from CEESA and PlanEnergi
CONCLUSIONS

• That the iterative process works in terms of reducing fuel consumption
  • However, some import demand might still exist.

• No difference if the share is calculated on production.
QUESTIONS?

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