The future of energy demand in the North East

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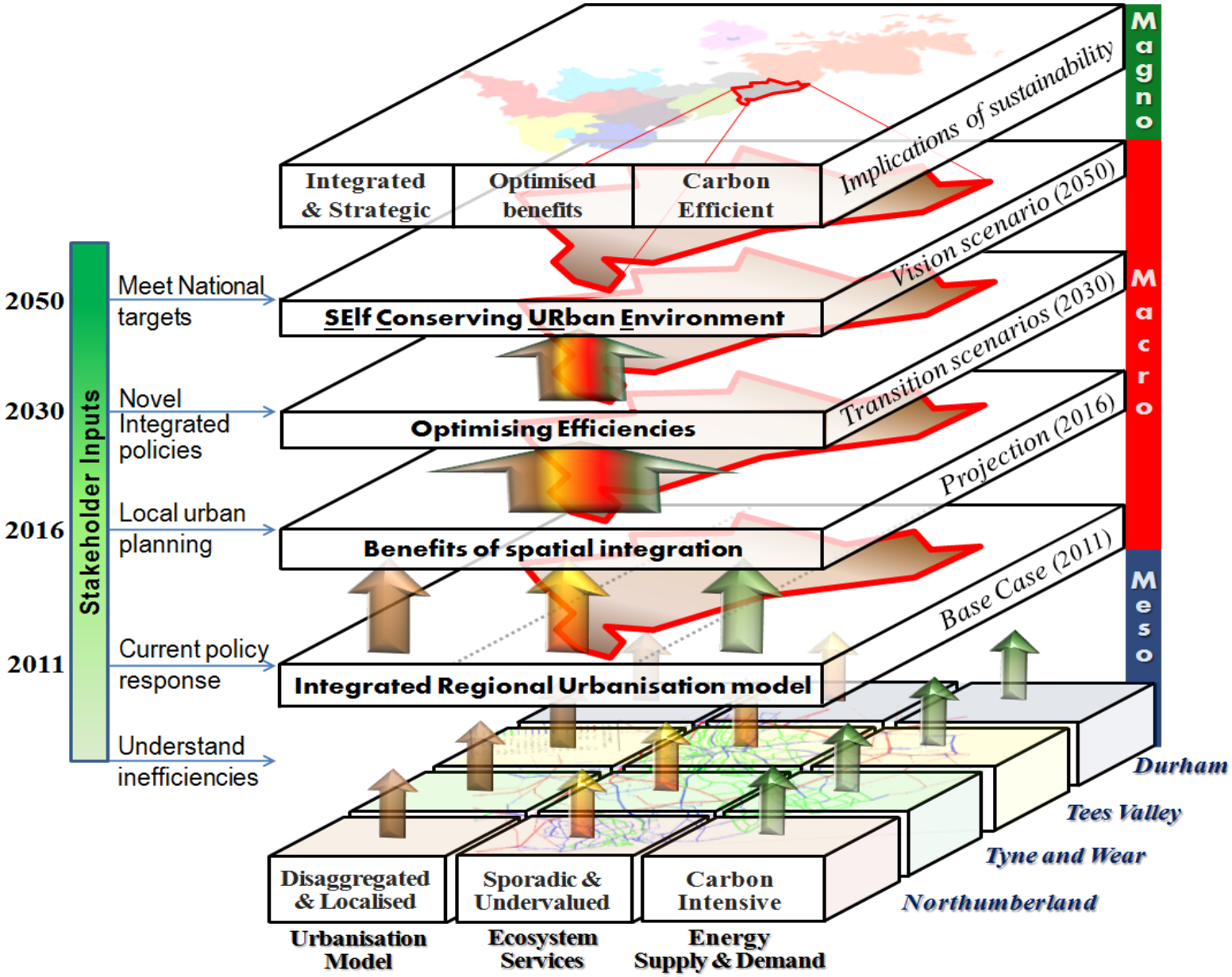
SECURE Overview



Housing Sub-Model

- Represent the space- and time-dependent energy consumption and emissions of housing in the NE region
  - Spatial resolution: LSOA
  - Temporal resolution: hourly
- Current features to take into account:
  - types and distributions of dwellings, heating systems, occupants
- Future changes to take into account:
  - refurbishment
  - renewable energy systems
  - grid decarbonization
  - new housing developments
  - future weather

Challenges

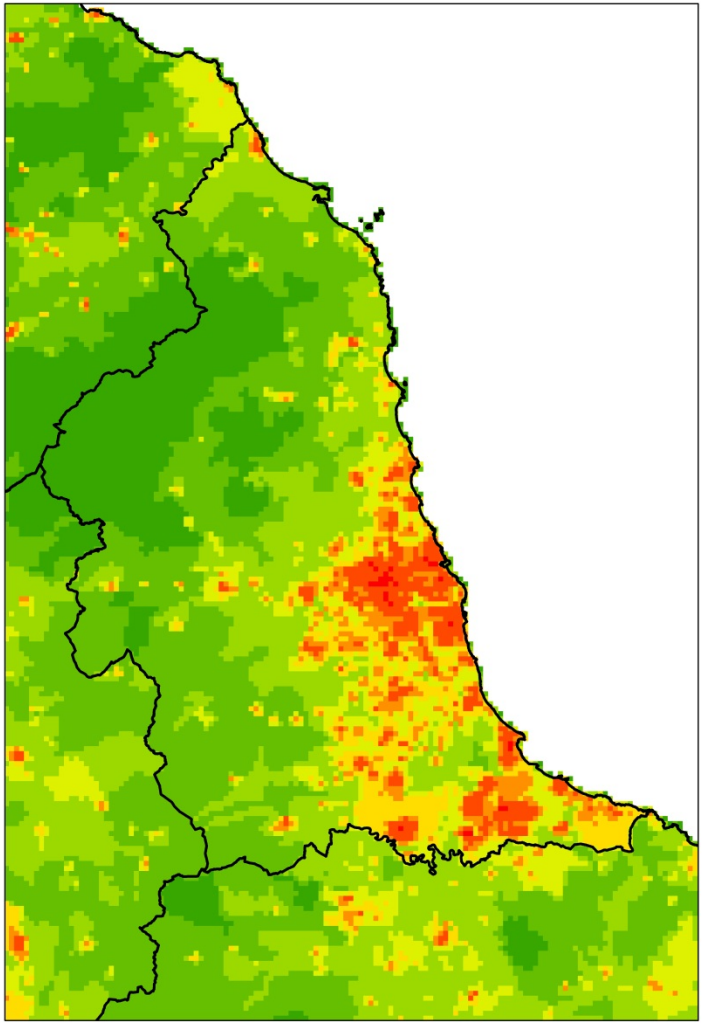
- Adequate representation of heating load
  - usual modelling assumptions bear little relation to reality
  - twin-track approach
    - static modelling with SAP
    - dynamic modelling with EnergyPlus
- Requisite complexity
  - number of zones, features of buildings, refurbishment options
- Representativeness
  - how many homes of what type?
- Modelling of occupants
- Optimization

This will allow us to…

- Predict energy consumption and emissions of domestic building stock
- Investigate spatial and temporal variations
- Predict time-dependent resource flows
- Demonstrate impact of interventions, embedded generation, new housing, weather
- Determine benefits of reducing inefficiencies e.g. energy from waste
- Optimize to determine the best outcomes

Energy demand in 2009

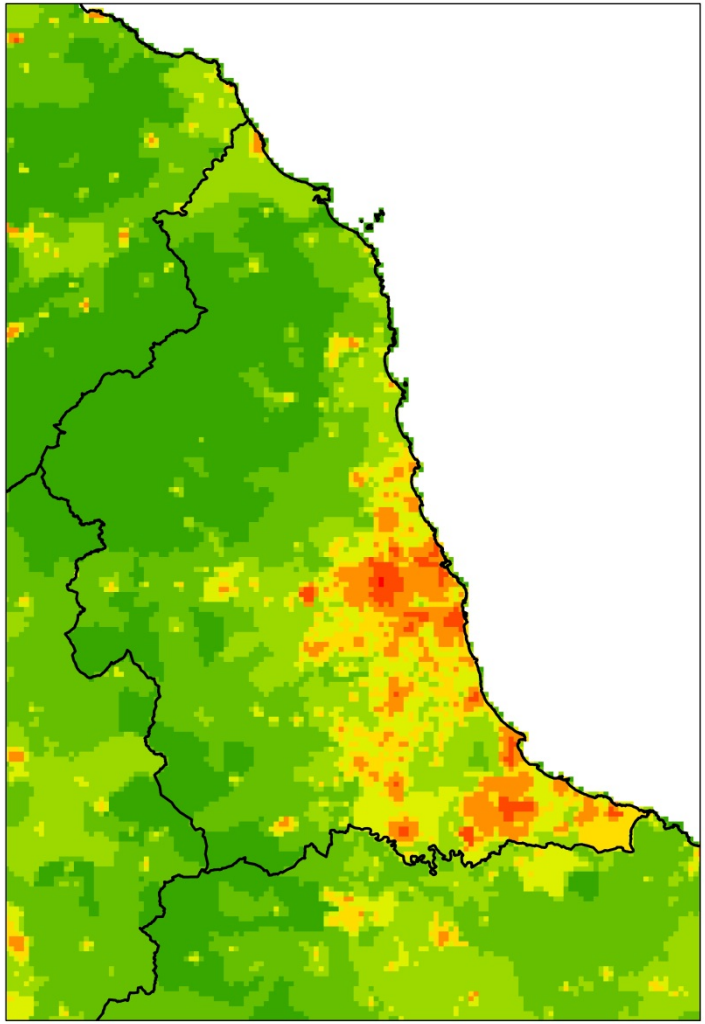
Heat



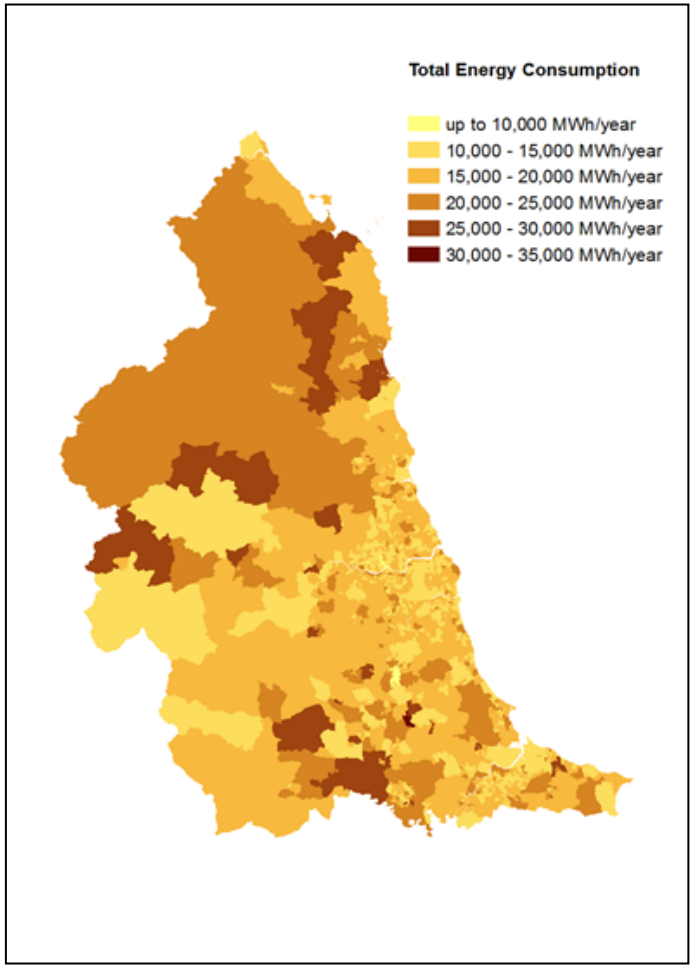
Annual energy demand kWh/m^2

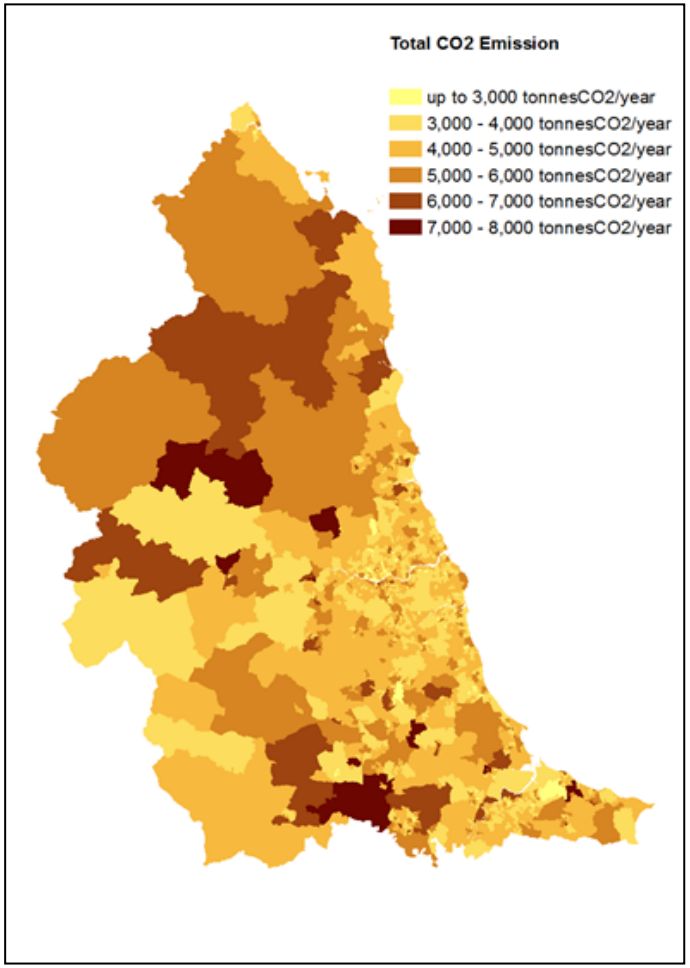
- Below .01
- .01 to .03
- .03 to .1
- .1 - .3
- .3 - 1
- 1 - 3
- 3 - 10
- 10 - 30
- Above 30

NHE

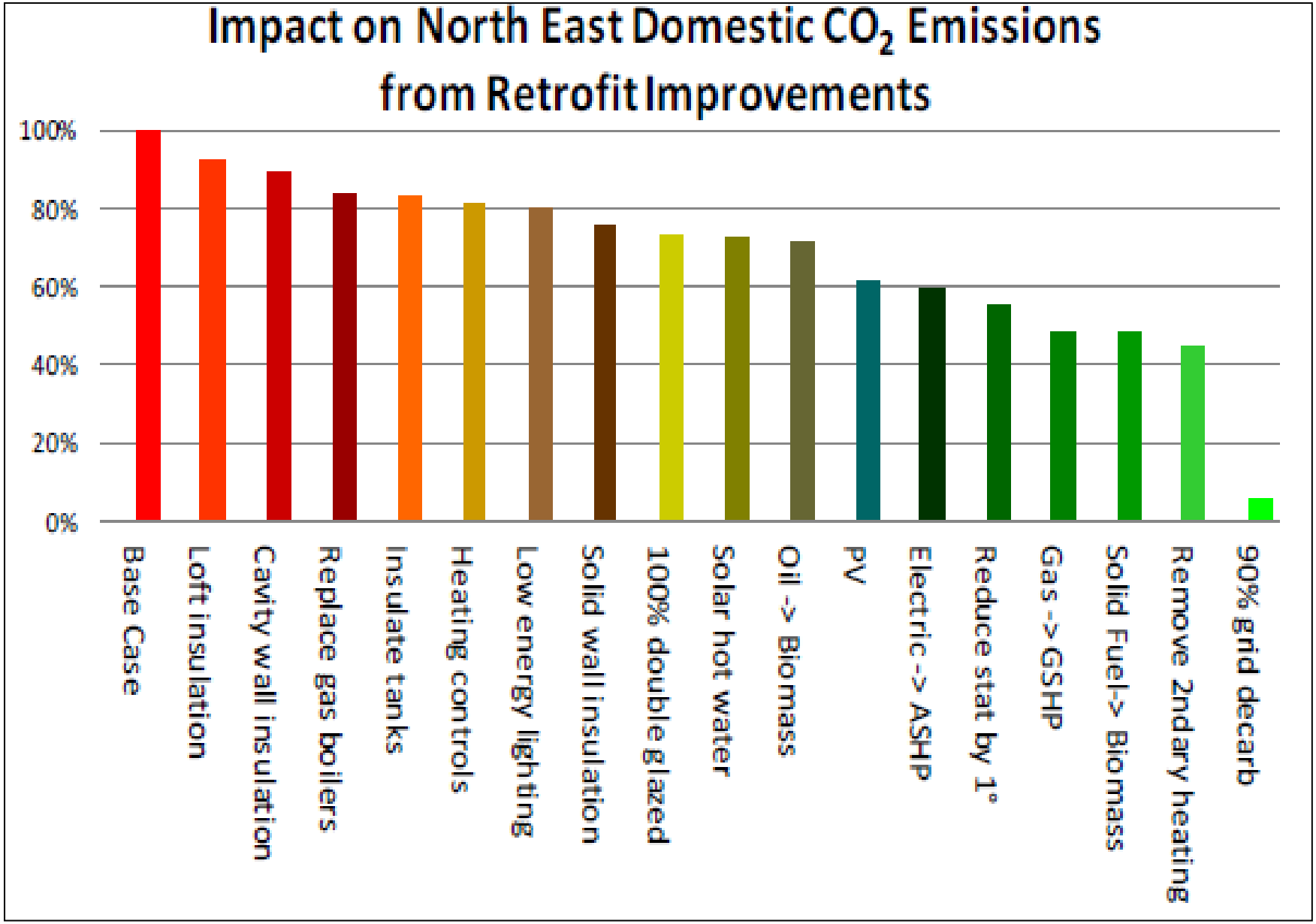


Energy and emissions over NE

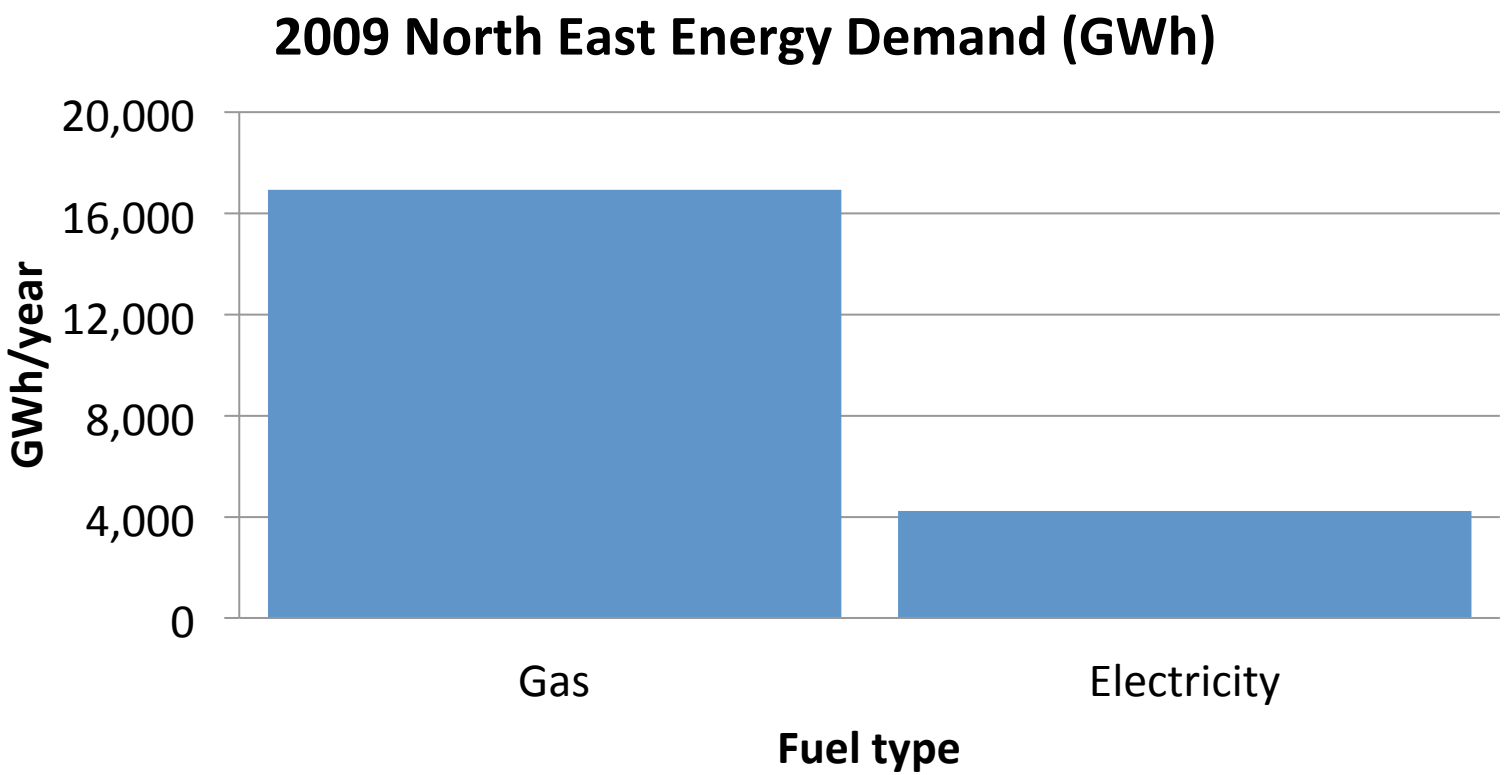




Inefficiency of current stock



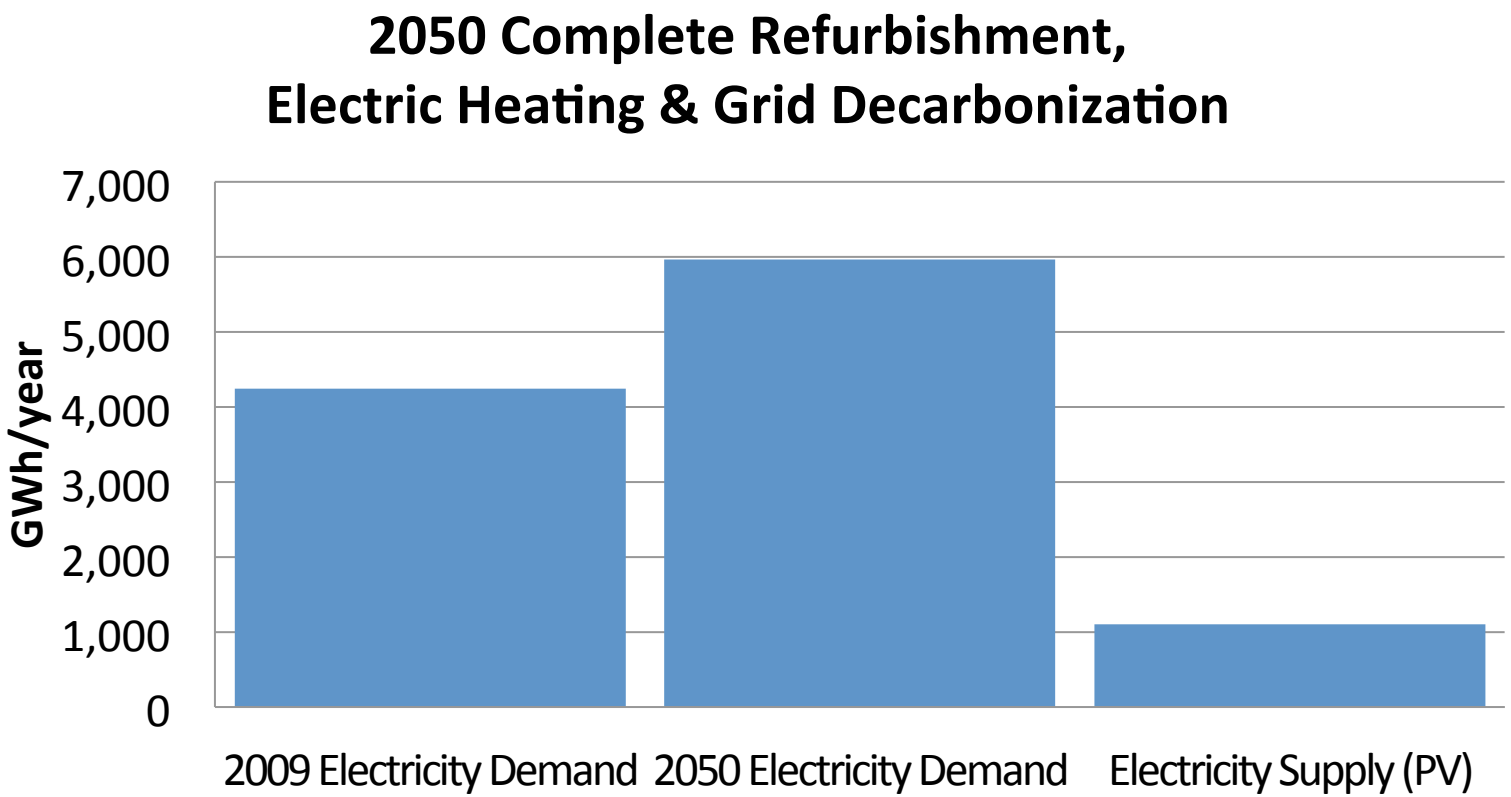
Changes in Energy Demand



Changes in Energy Demand

2009 North East Energy Demand (GWh)	
Gas	Electricity
16,918	4,241

Changes in Energy Demand



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30% of Households with 1 Electric Vehicle by 2050 – Charging at home (GWh)
Electricity Demand
1,000

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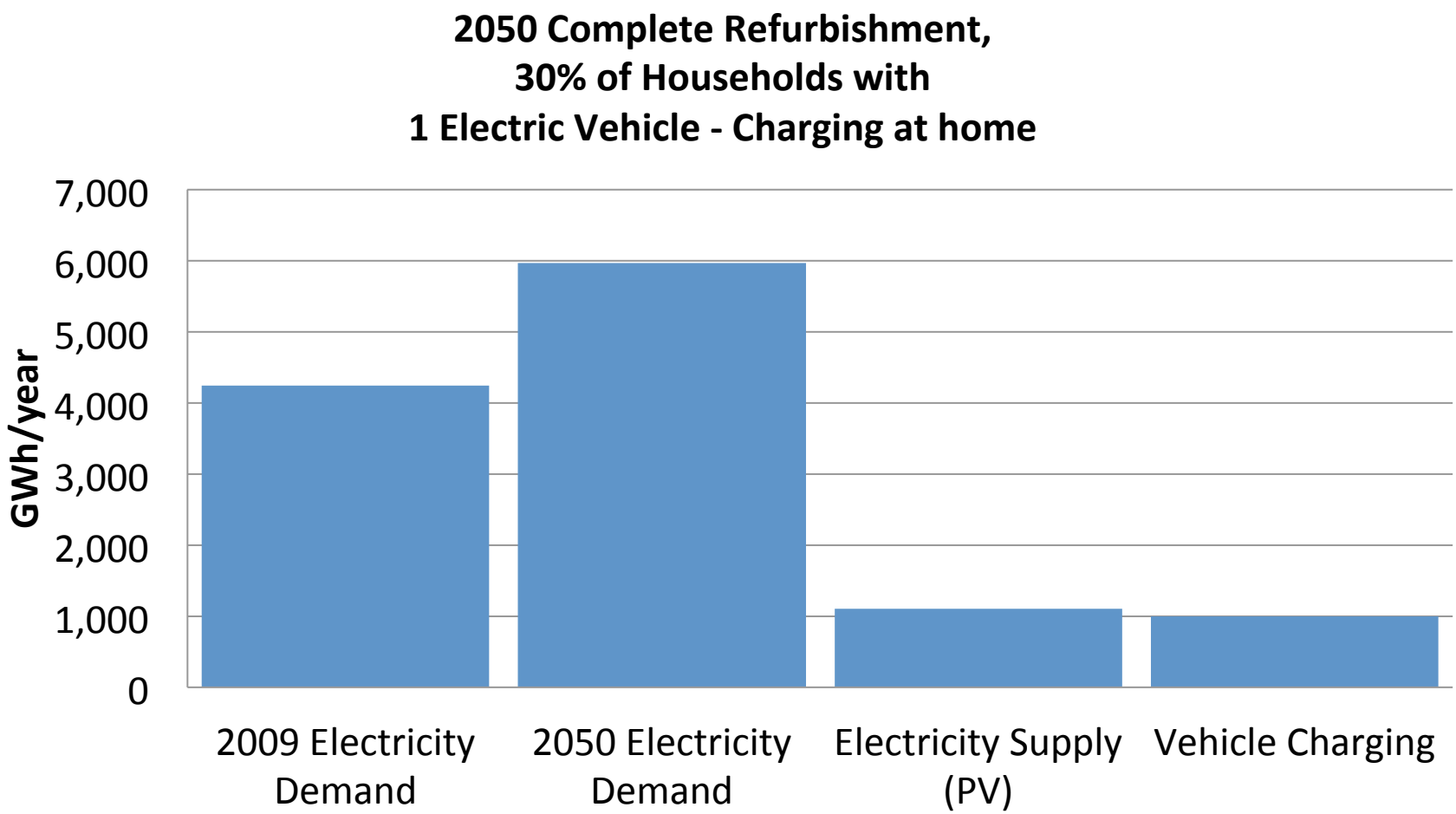

Next steps

- Dynamic modelling to identify temporal load variation
- Geographic modelling to identify the areas most susceptible to load changes

- Integration with the other SECURE sub-models
- Scenario development and analysis