A low energy demand pathway for Ireland

Ankita Singh Gaur, Hannah Daly
Energy Policy and Modelling Group, University College Cork

Summer 2021 semi-annual ETSAP meeting
Introduction

- Energy use caused about 59% of the GHG emissions in Ireland (SEAI, 2020)
- Economic growth and energy use are strongly coupled (GNI*- Modified Gross National Income)

[Historical energy consumption and GNI*- Ireland graph]

Source: Central Statistics Office, Ireland
Introduction

• If current correlation between energy use and economic growth continues, meeting climate goals will become increasingly difficult

• Hence exploring alternate energy demand growth patterns is important
Mitigation pathways describe future emissions that keep global warming below specific temperature limits.

Current mitigation scenarios are biased towards growth and technology fixes.

IPCC’s 2018 report highlights:
- Annual Carbon dioxide emissions to reach net zero by 2050
- Use of Carbon Dioxide Removal (CDR)
  - Risks of using CDR include:
    - adverse impacts on the ecosystem
    - feasibility in terms of cost
    - land use, availability and competition for food production
    - social acceptance and safety

Mitigation scenarios focus on supply side.

Demand side measures not well-represented in energy system models due to their complex nature.
Rationale for Low Energy Demand Pathway

• Most mitigation pathways depend on novel fuels and technologies
  • Dependency can be reduced with lower energy service demands
  • Deployment of CDR and Biofuels can be limited
    • Biodiversity loss, soil degradation and adverse impacts on ecosystem can be reduced

• Efficiency improvements can have an economy-wide rebound effect
  • Buffer can be available to absorb some efficiency rebound effect if demand is reduced

• Demand side determines the size of the entire energy system
  • Reducing energy demand services implies down sizing of entire energy system, making it easier to decarbonise supply side
Rationale for Low Energy Demand Pathway

• Ireland has significantly increased its climate mitigation ambition
  • Reduce greenhouse-gases by an average of 7% per year till 2030
  • “Net-zero” target for 2050

• Ireland faces a number of challenges in meeting these objectives
  • Very high share of GHG emissions from agricultural sector
  • Transport and heating are heavily dependent on fossil fuels
  • Relatively electricity grid make it very challenging to integrate high shares of renewable electricity
Low-Energy demand scenario for Ireland

- Revolves around the idea of reducing energy consumption through
  - changes in behaviour and lifestyle
  - increasing end-use efficiency
  - denser urban development
  - economic restructuring
  - changing social infrastructure

- Proposes a reduction in energy demand without any compromise in the quality of life or end-user satisfaction

- Does not include any novel fuels or technologies that may have adverse impacts
Low-Energy demand scenario for Ireland

**Transport**

- **Freight**: Activity level to go back to the 1995 level by 2050
  - Better logistics and efficiency improvements,
  - Reviving local economy
  - Taxes on foreign imports

- **Passenger kilometres**: pkms/capita decrease to 12000 by 2050
  - Shorter travel distances and higher occupancy in vehicles
  - Work from home
  - Modal shift- more public transport, increase in active modes of travel (walking & cycling)
Low-Energy demand scenario for Ireland

Residential

- **Area** per person by 2050 - **42.5 sq. metres**
  - About 70% of the Irish population lives in under occupied dwellings
- **Old** housing stock- at least **B2 rated** (100 kWh/m²)
  - Retrofits and renovations
- **New** housing- at least **A2 rated** (50 kWh/m²)

<table>
<thead>
<tr>
<th>Residential demand</th>
<th>(%) share</th>
<th>2018</th>
<th>2050 LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space Heating</td>
<td></td>
<td>73%</td>
<td>56%</td>
</tr>
<tr>
<td>Water Heating</td>
<td></td>
<td>24%</td>
<td>30%</td>
</tr>
<tr>
<td>Lighting</td>
<td></td>
<td>2%</td>
<td>5%</td>
</tr>
<tr>
<td>Pumps &amp; Fans</td>
<td></td>
<td>1%</td>
<td>8%</td>
</tr>
<tr>
<td>Space cooling</td>
<td></td>
<td>0%</td>
<td>1%</td>
</tr>
</tbody>
</table>

Industry

- **45%** decrease in **energy intensity** by 2050 from current level
  - Increasing production efficiency
  - Better usage of materials: e.g., recycling, circular economy
- **50%** reduction in energy demand from **cement** industry by 2050
  - Replaced by other building materials such as timber
Low-Energy demand scenario for Ireland

Services

• Space constraint: **Commercial** buildings-5.3 m²/capita; **Public** buildings-10.7 m²/capita
• Public lighting units are assumed to remain constant at 2040 level
• Final energy demand determines the size of the entire energy system
• Marginal emissions price is lower in the LED scenario—cheaper to decarbonize smaller system
• Investments in energy system are lower in LED scenario
Results

- CO₂ emissions are lower in the LED scenario in 2050

- Reliance on negative emission technologies (in this case BECSS) is also lower in the LED scenario
• LED pathway explores the possibility of reducing emissions without relying on technological transformation but by reducing end-use demand for energy

• Lower demand provides opportunities to decarbonize the supply end more effectively

• The transformation to a lower energy demand cannot be achieved only through expected rational consumer behaviour and needs specific policies for its implementation

• Investments will be needed in order to enable the transition to LED e.g. public infrastructure
Co-benefits of LED Scenario

- Easier to meet climate goals
- Reduced air pollution
- Decent standard of living for all
- Healthier lifestyle
- Better indoor air quality
- Biodiversity loss minimised
Thank you

agaur@ucc.ie

@ankita_gaur3