



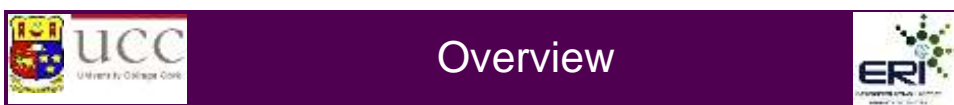
Meeting Ireland's Ambitious GHG 2050 Emissions Target

**UCC IEA-ETSAP Energy Modelling Conference
November 15 2010**

B.P. Ó Gallachóir*, D. Lavigne*, U.K. Rout*, A. Chiodi* &
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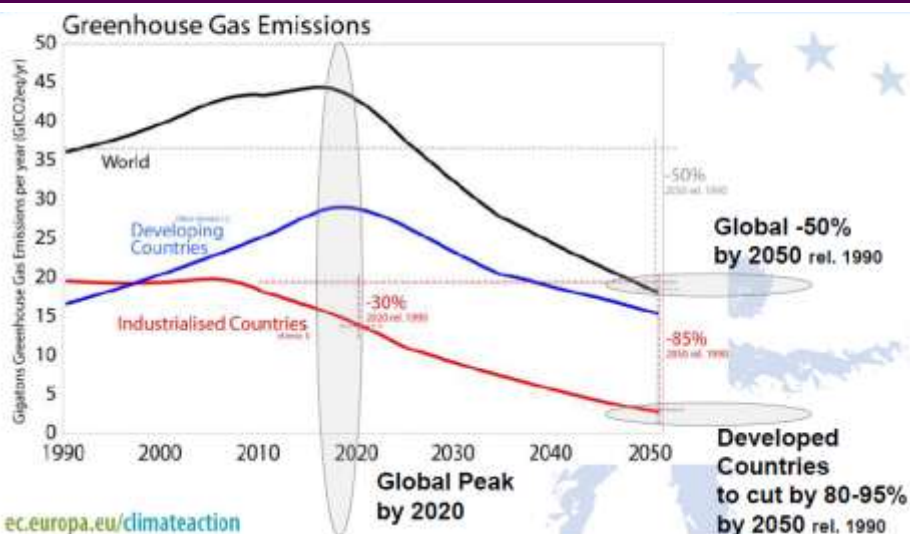


Overview

- Context
- 80% Emissions Reduction Scenario
- Irish TIMES Model
- Results
- Conclusions
- Next Steps



Challenge



Ireland 2009

Total GHG emissions: 62 Mt CO₂e

- Agriculture: 29% (large impact)
- Energy: 65%
 - Power gen + refining 21%
 - Transport 21%
 - Residential 12 %
 - Industry and Services 11%
- Process Emissions (Industry): 4%
- Waste: 2%





Ireland 1990 - 2050



- In Ireland, relative to 1990 ...
 - we are committing to 80% GHG Emissions Reduction by 2050 (F CC Bill 2010)
 - GHG emissions grew by 24% by 2005
- Energy related CO₂ emissions
 - represent 65% of total GHG
 - grew by 50% by 2005
- This research
 - focuses on energy-related CO₂ emissions only.
 - implicitly assumes 80% applied to each sector



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GHG Emissions in Ireland



Year	1990 (Ref)	2005	2009	Units
Total Emissions	55.6	69.0	62.3	MtCO _{2eq}
Increase	-	24%	12%	%
2050 Target	11.1			MtCO _{2eq}
Reduction	80%	84%	82%	%
Energy-related	30.2	45.0	39.4	MtCO _{2eq}
Increase	-	49%	30%	%
2050 Target	6.0			MtCO _{2eq}
Reduction	80%	87%	85%	%



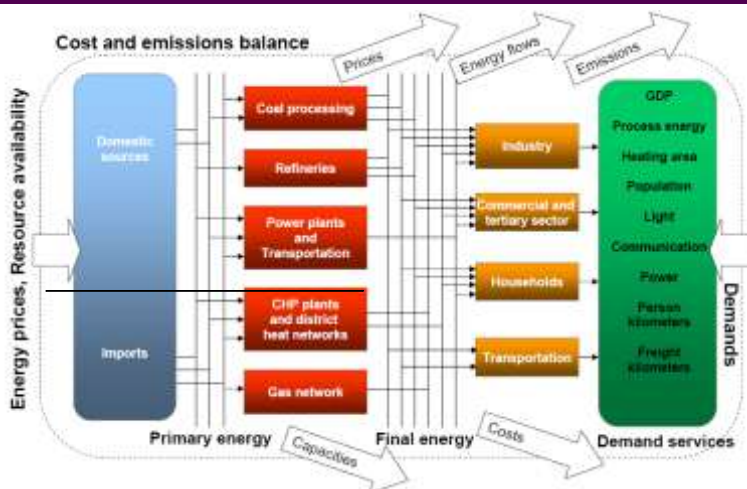
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- Is it technically feasible?
- If so, at what cost?
- How much does energy efficiency do?
- What is the share of renewable energy?
- Will there be significant electrification of transport and heat?
- Can we meet the target with indigenous resources?
- Is our short term pathway aligned?



Remme U. 2007 *Overview of TIMES: Parameters, Primal Variables & Equations*.
 Proc. ETSAP Workshop November 2007 Brazil.



Irish TIMES 2010



- Jan – June 2010
 - EN1 16% RES and 10% RES-T by 2020 ✓
 - EM1 20% lower Non-ETS GHG 2020 ✓
 - Energy service demand to 2050 ✓
- Jul – Dec 2010
 - EM2 GHG 80% decrease by 2050 ✓
 - IEA Workshop Cork November 15 2010 ✓
 - EN2 Energy Security in 2050



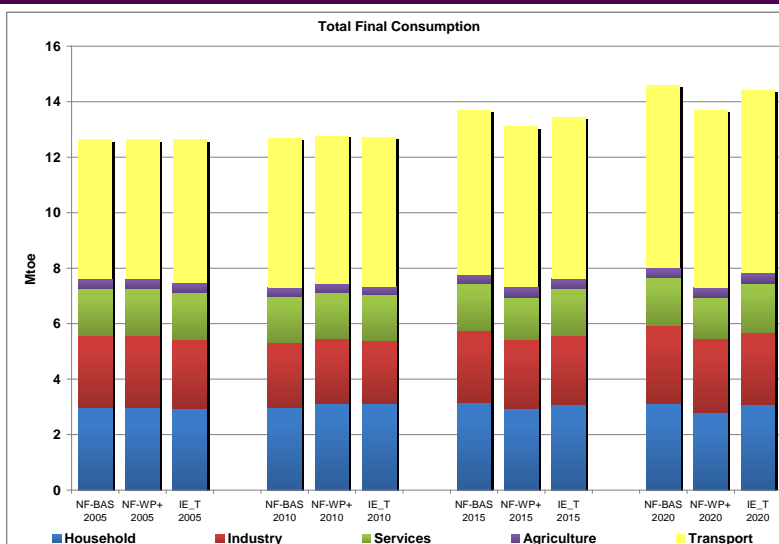
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Reference Energy System - 2020



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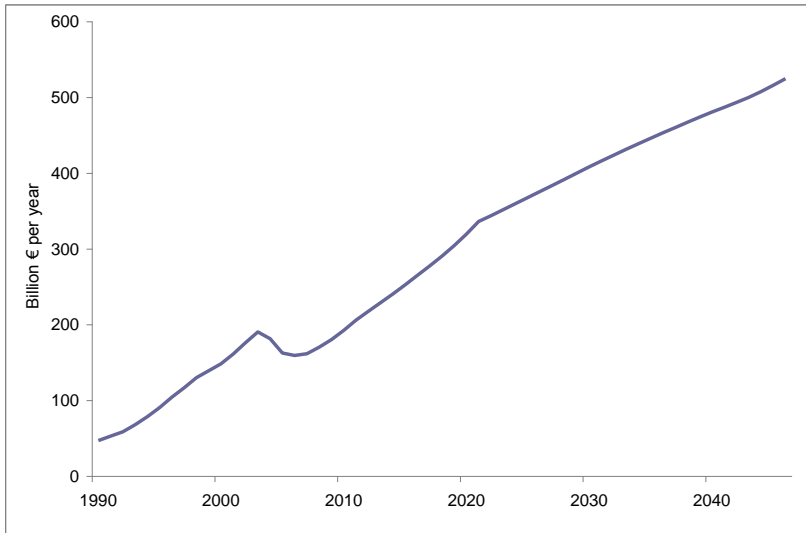
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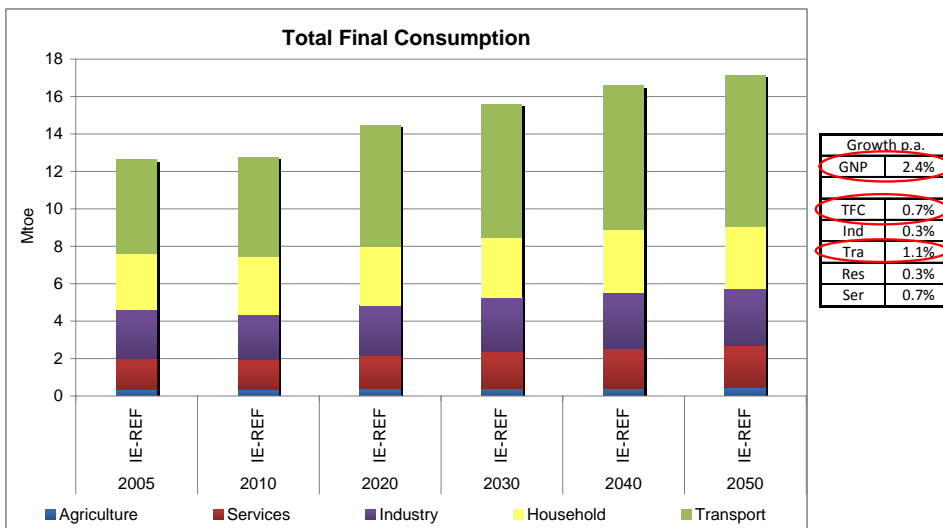
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Ireland in 2050 - Economy

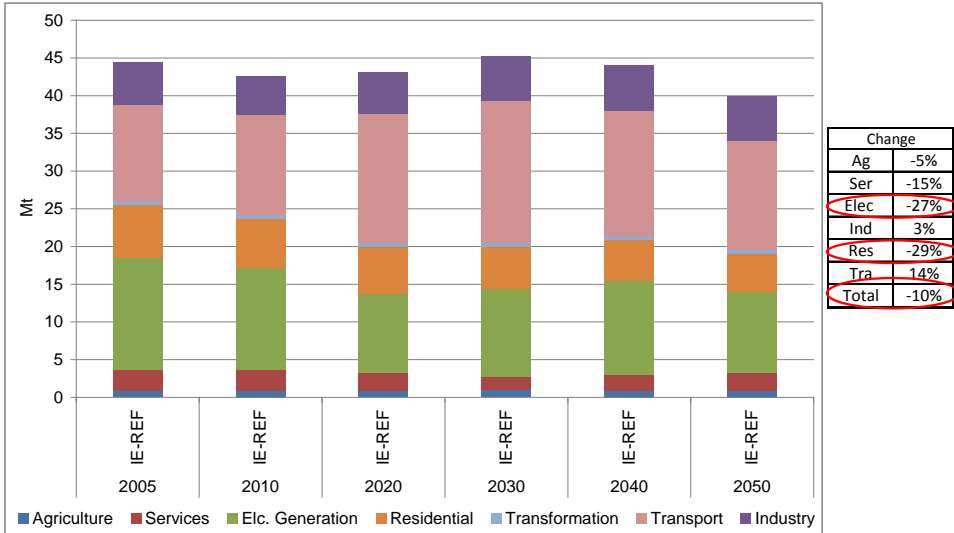


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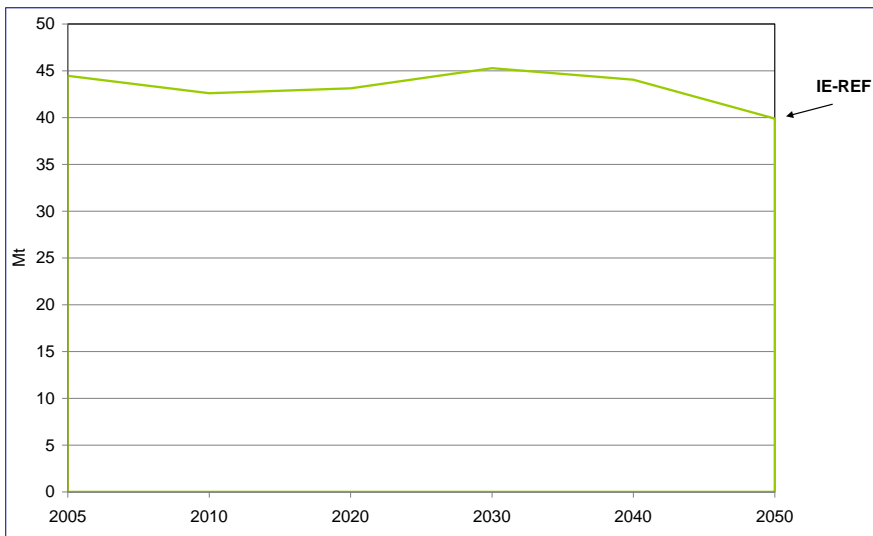
Reference Energy System - 2050



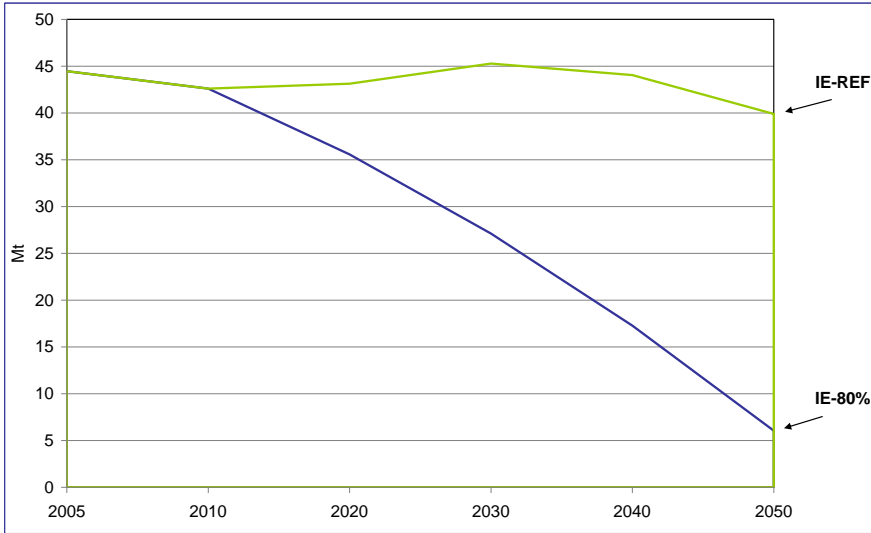
UCC University College Cork Reference Energy System – CO₂ ERI



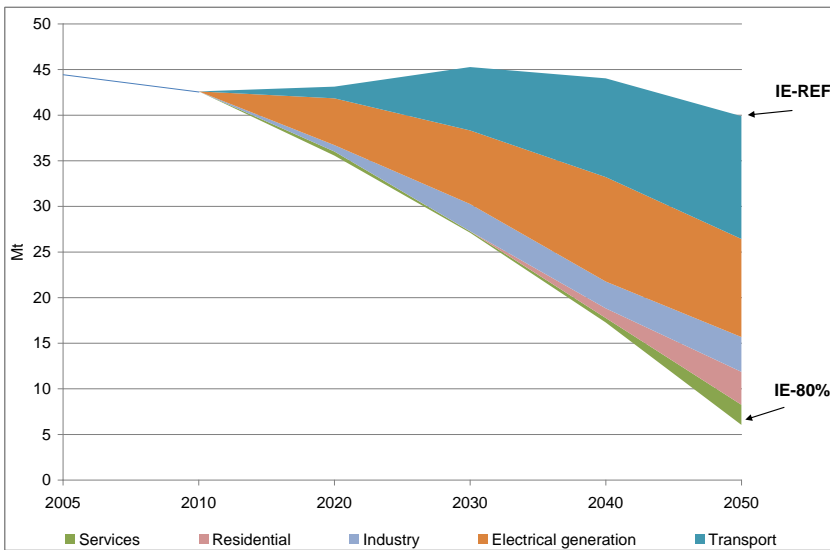
UCC University College Cork Energy CO₂ Emissions - REF ERI



UCC University College Cork **Energy CO₂ Emissions – 80%** ERI

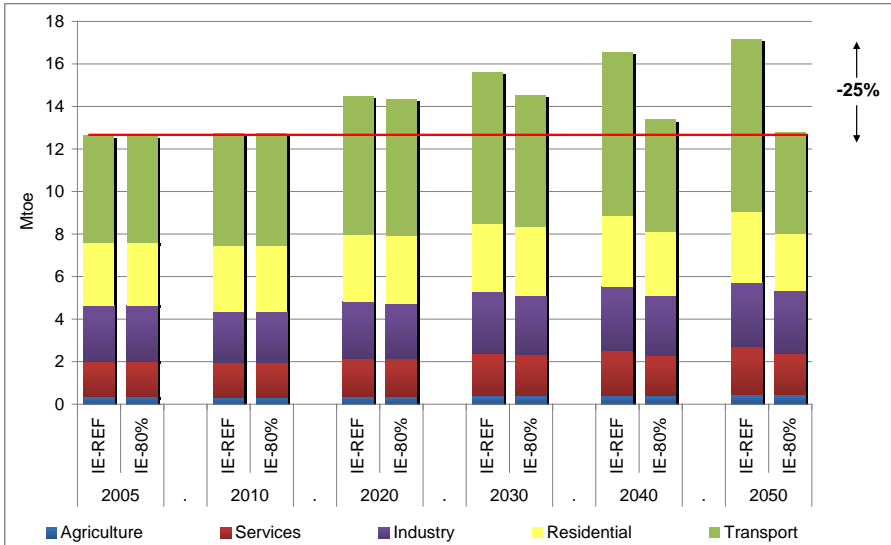


UCC University College Cork **Which Sectors?** ERI



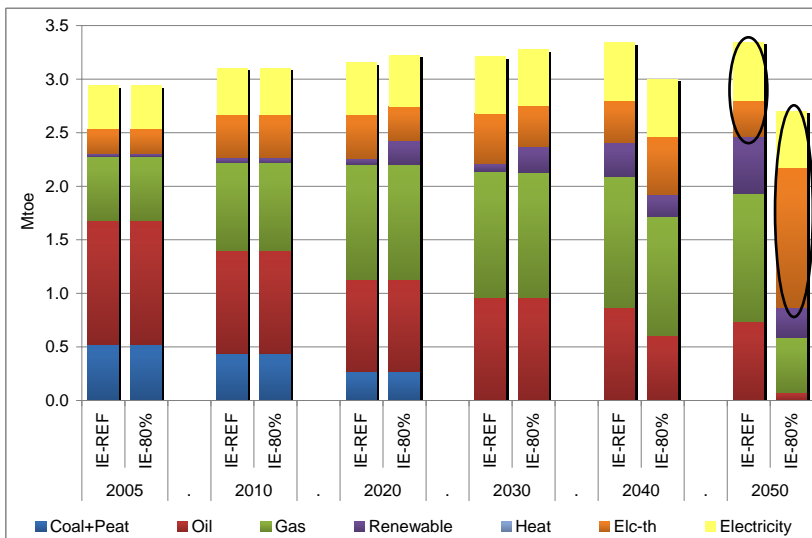
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Total Final Consumption

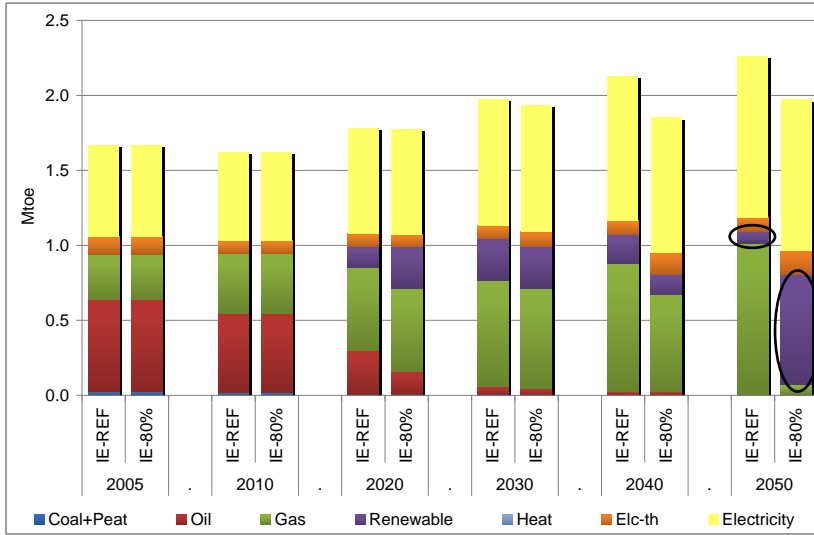


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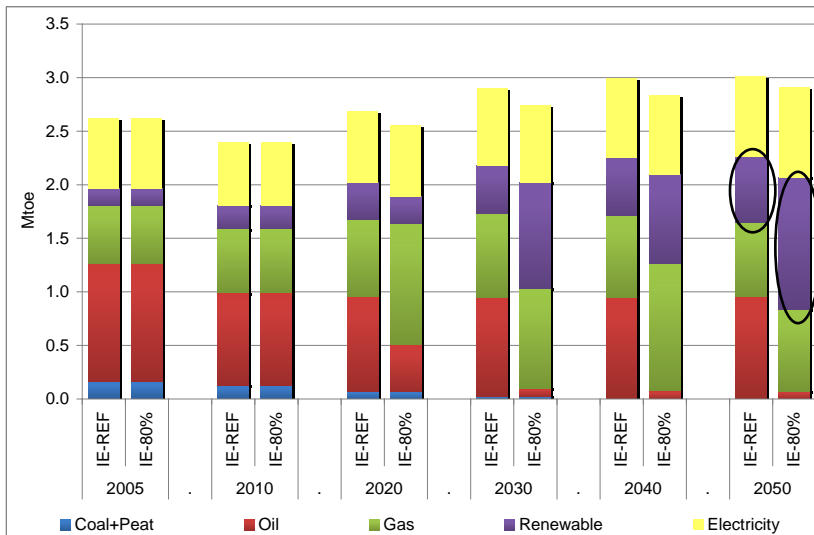
Residential - Electrification




Services - Renewables

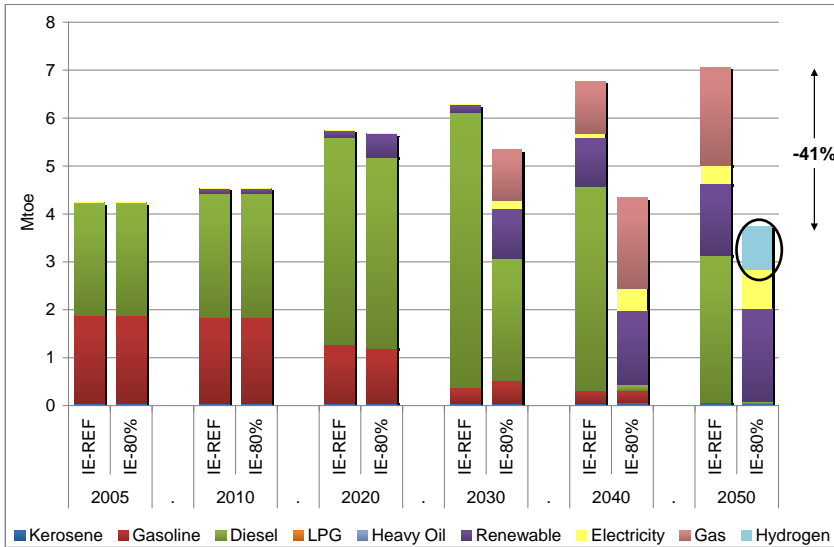




Industry – Renewables

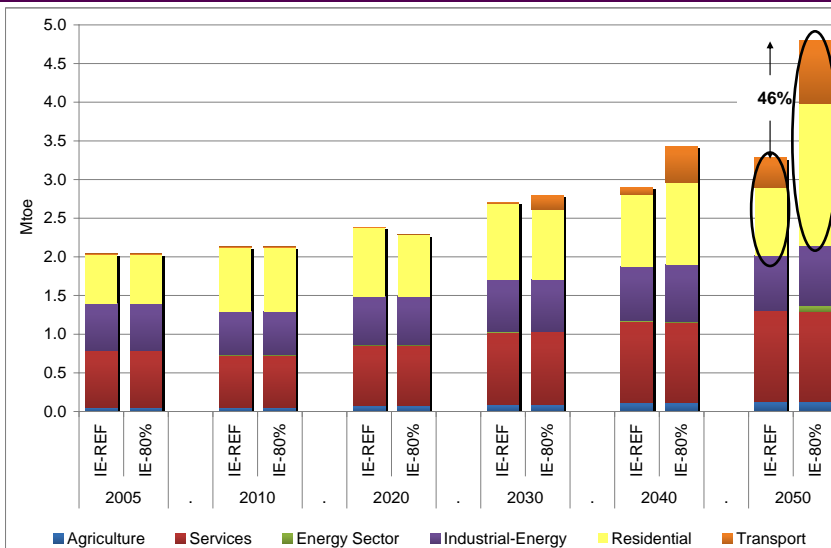
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Transport – Biofuels, Elec & H₂



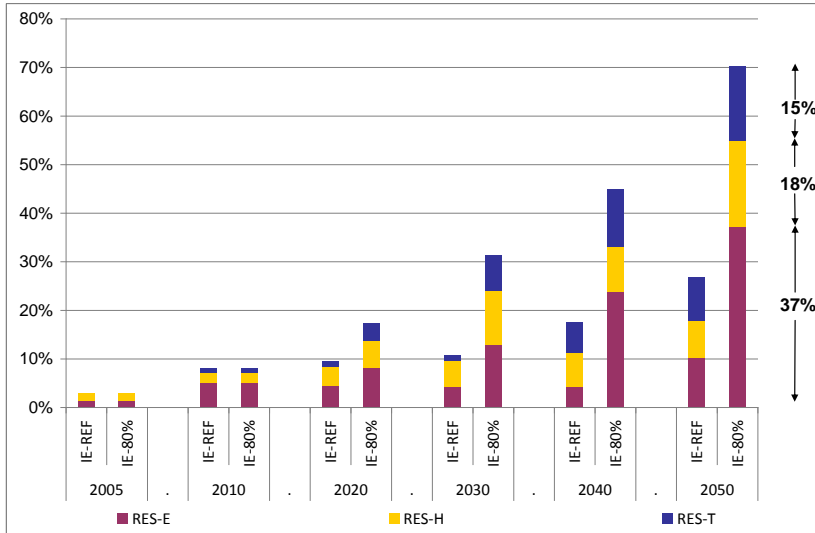
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Electrification



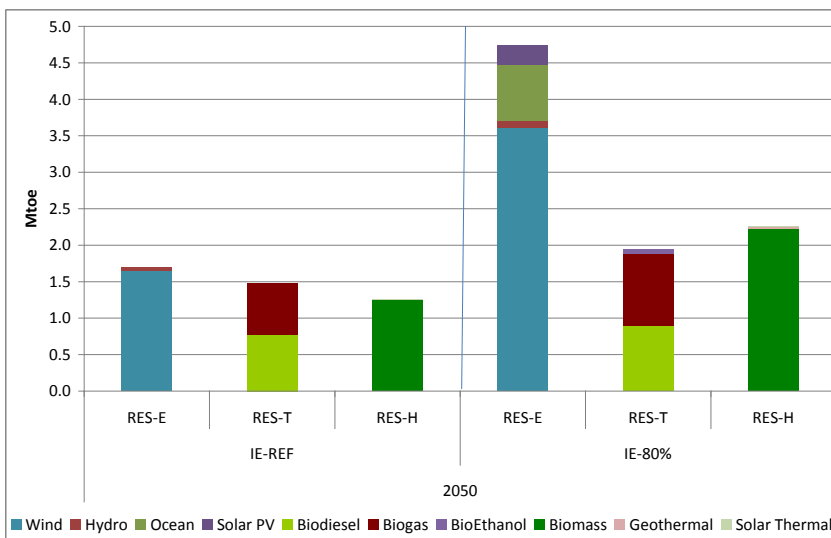
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Renewable Energy – 70%



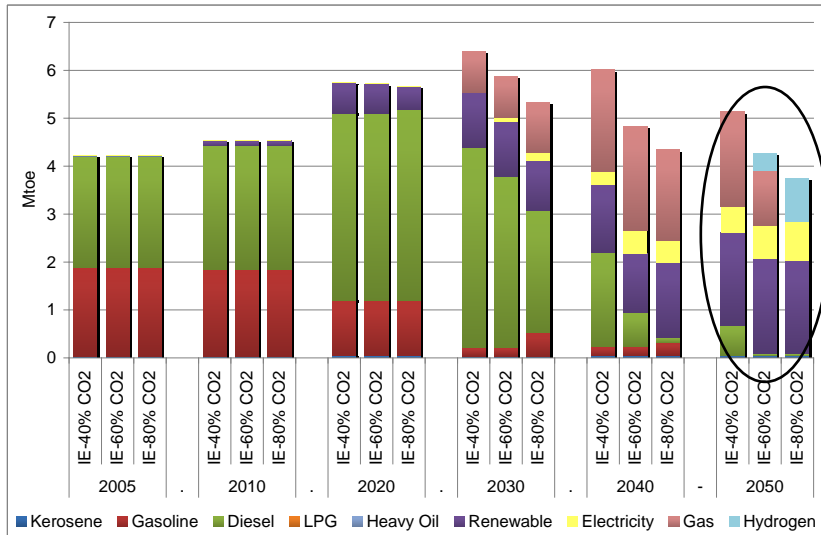
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Renewable Energy – 70%



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Comparing Targets - Transport



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At What Cost?

Scenario	€ / tonne CO2					
	2020	2025	2030	2035	2040	2050
-40% Emissions by 2050	43.79	58.79	78.02	73.17	74.69	52.89
-60% Emissions by 2050	42.91	78.57	82.80	77.33	67.24	195.37
-80% Emissions by 2050	42.31	88.29	85.58	82.83	128.25	438.71



Interim Conclusions

- Technology can deliver 80% reduction energy-related CO₂ emissions by 2050
- 25% reduction in Energy Demand
- Electrification => 2.4-fold increase on 2005
- Elec = 38% of TFC (18% currently)
- RE = 70% of Energy Use (47% non elec)
- Marginal CO₂ cost €42 - €439 per tCO₂



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Next Steps

- Scrutinise resource and sectoral results
- Validate electricity results using PLEXOS
- Check imports versus indigenous
- Develop energy security scenario
- Examine 'interim' 2020 scenarios (30%)
- Explore regional UK-IE TIMES?
- Consider impact of non-energy emissions



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