Hot Jobs workshop

Jobs associated with technological change in the residential heating sector

Results from the EU heating decarbonisation scenario

Unnada Chewpreecha

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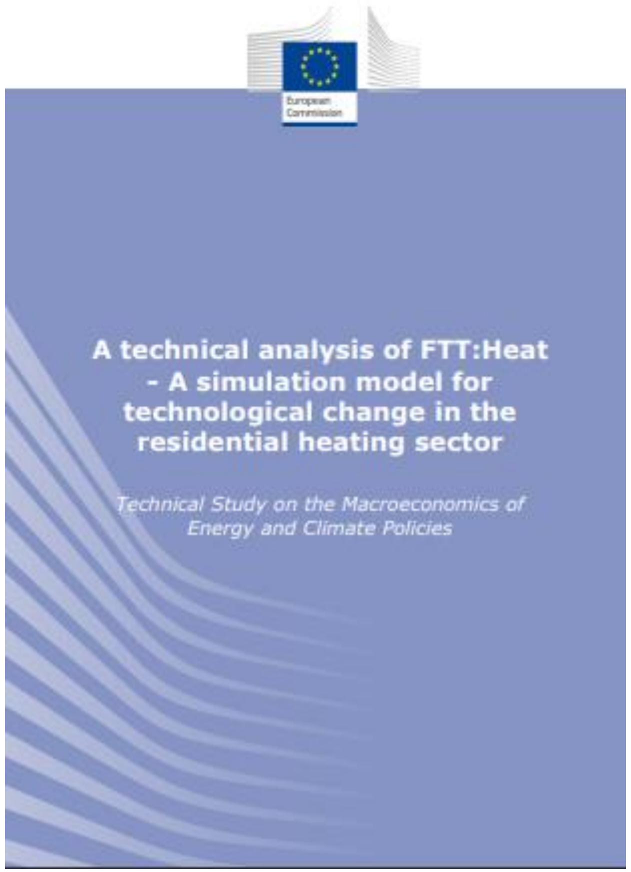
9 May 2019

The study looks at impact of changes in the residential heating sector

- Many studies look at making homes more efficient through better insulations
- This will not eliminate fuel use by households completely
- To decarbonise residential heating, new heating system technologies are needed



https://ec.europa.eu/energy/sites/ener/files/documents/technical_analysis_residential_heat.pdf

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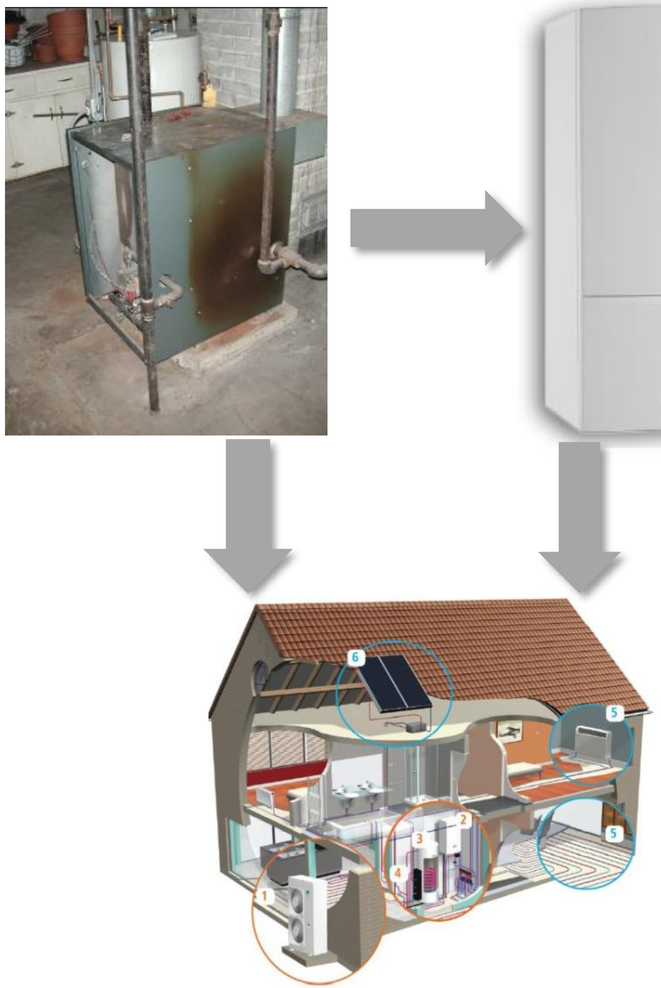
Barriers to technological changes



1. **Slow turnover**
   - only 5% of stock need to be replaced within each year
2. **Diverse preference**
   - May not always prefer one technology even if it is made cheaper
3. **Inertia**
   - even if all households prefer new technologies, not all households would immediately adopt new technologies
     - ➢ lack of information
     - ➢ lack of access to finance
     - ➢ Industry constraints

Policy intervention is needed to encourage take up of new heating technologies

Gas boilers will be banned in new homes from 2025

Apprentices learning how to fit boilers. A union representing engineers has condemned the chancellor's announcement

ALAMY

THE TIMES

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Tools used for the analysis

- Bottom up technologies model of residential heating (FTT-Heat) with a global macroeconomic model (E3ME)
- Both models are simulation models meaning
  - based on decision making rather than social planning (optimisation)
  - imperfect decision making due to lack of information and other barriers
  - decision makings can be affected by policies
  - learning by doing, costs come down over time and technologies are path dependent
- Detailed coverage and complete energy-environment-economy
  - 59 world regions, each with 69 sectors, 13 heating technologies
  - annual projections to 2050
  - all impacts are captured in one single framework

www.e3me.com

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Policies inputs

Policies introduced to address new technologies barriers

Market based	Regulations	Information
Carbon tax	Phase out in sales	Labelling (proxy by lower discount rate)
Fuel tax	Phase-out in stock	
Fuel rebate	Regulated market share	
Purchase tax	Procurement/ Kick Start	
Purchase subsidies		
Feed-in-tariff		
Low-interest loan		

Scenarios are based on policies mix

- Scenario 1: Share of renewables increase by +10pp until 2030
- **Scenario 2: Deep decarbonisation by 2050**
- Scenario 3: EU wide carbon tax

Table 11: Overview of scenarios 1-3 and simulated policies by group of Member States, from 2018-30 and 2030-50. Green indicates that a policy is implemented for a group of Member States in the given period, red indicates that a policy is not implemented.

	Time period:	**2018-2030**				**2030-2050**			
	Member States:	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**
Scenario 1	Carbon tax		X	X	X				
	Upfront subsidy			X	X				
	'Kick start' policies				X				
Scenario 2	Carbon tax		X	X	X	X	X	X	X
	Upfront subsidy			X	X	X	X	X	X
	'Kick start' policies				X				
Scenario 3	Carbon tax	X	X	X	X	X	X	X	X
	Upfront subsidy								
	'Kick start' policies								

Using policies, we can decarbonise households heating

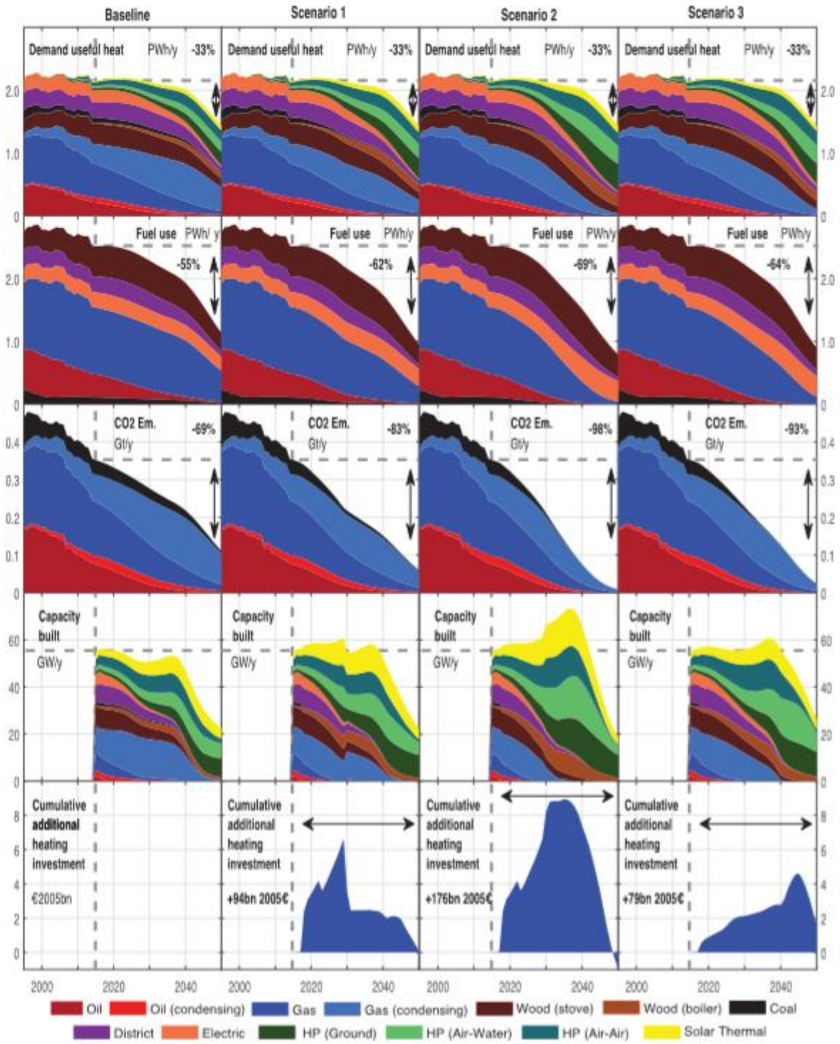

Figure 7: EU wide annual heat generation by technology, fuel use, CO_2 emissions, added heating capacity, and additional heating investments. Model results for baseline and scenarios 1-3. Values from 2015 onwards are projections by FTT:Heat. Bold numbers indicate changes in 2050, relative to 2014 (the last historical data point). Projections for useful energy demand for heating are taken from the EUCO30 scenario.

Table 15: Technology group market shares in EU wide residential heat demand, in baseline and scenarios 1-3. 2014 shares are calculated from historical data, 2030 and 2050 shares are model projections by FTT:Heat.

	Start	Baseline		Scenario 1		Scenario 2		Scenario 3	
	2014	2030	2050	2030	2050	2030	2050	2030	2050
Oil	13%	6%	1%	5%	1%	4%	0%	5%	0%
Gas	40%	40%	30%	34%	17%	33%	2%	36%	7%
Biomass	16%	17%	15%	20%	18%	20%	20%	19%	19%
Coal	4%	3%	1%	1%	0%	1%	0%	1%	0%
District heat	11%	13%	6%	13%	5%	13%	4%	14%	6%
Electric	9%	7%	2%	7%	1%	7%	1%	8%	3%
Heat pumps	6%	13%	39%	18%	52%	19%	65%	15%	59%
Solar	1%	2%	5%	3%	7%	3%	8%	2%	6%

Scenario 2 shows 98% reduction in CO_2 emissions from residential heating

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Macroeconomic impacts are small

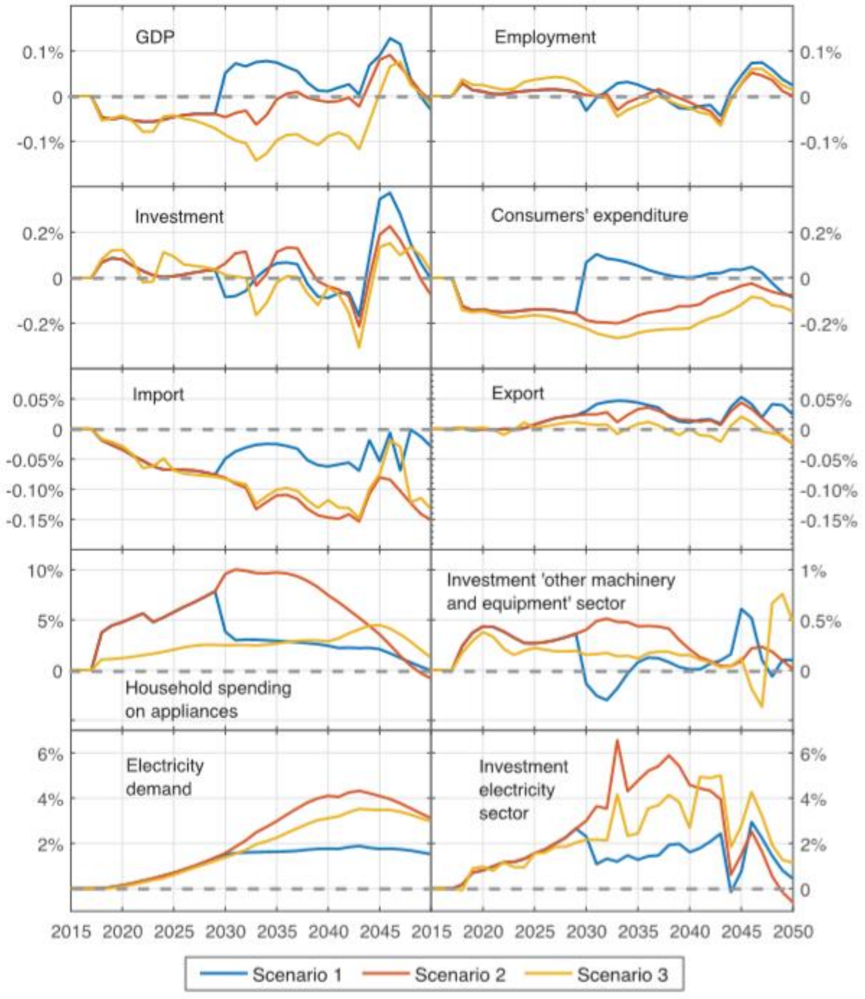

Figure 13: EU wide relative changes in macroeconomic indicators in scenarios 1-3, compared to baseline projections (which already include some degree of decarbonisation, see Figure 7).

- Overall, impact on GDP and employment are small
- Consumer expenditure falls
  - carbon tax reduces disposable income
  - higher spending on expensive heating appliances cause other spending to fall
- Boost to investment from higher electricity demand
- Reduction in fossil fuel imports

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Households heating related expenditure

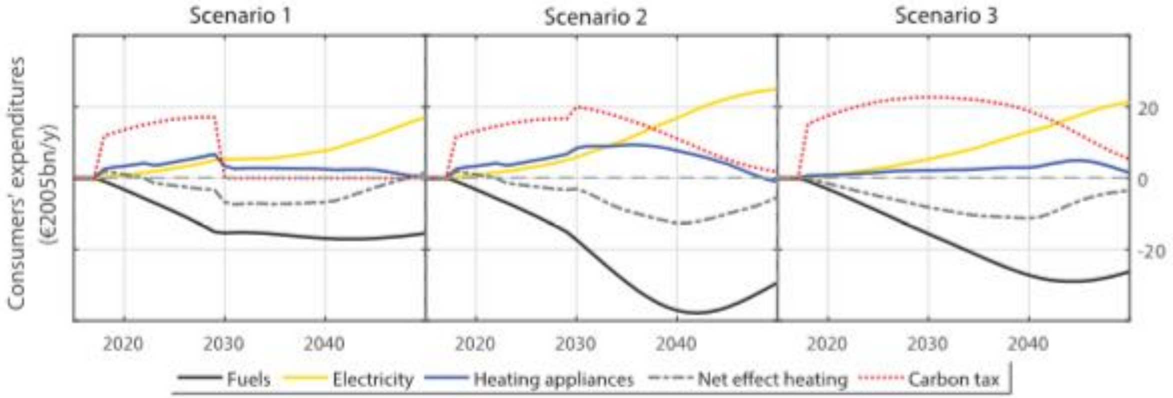

Figure 11: EU wide changes in consumers' expenditures (in €2005bn), scenarios 1-3, relative to baseline. Solid lines represent heating related expenditure changes, the dashed line the net change in heating related expenditures. The dotted red line shows the carbon tax payments in comparison.

- Higher spending on carbon tax and appliances while the transition takes place
- In the long run, higher spending on electricity but will be compensated by savings on fossil fuels

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Heating related jobs- there will be losers and winners

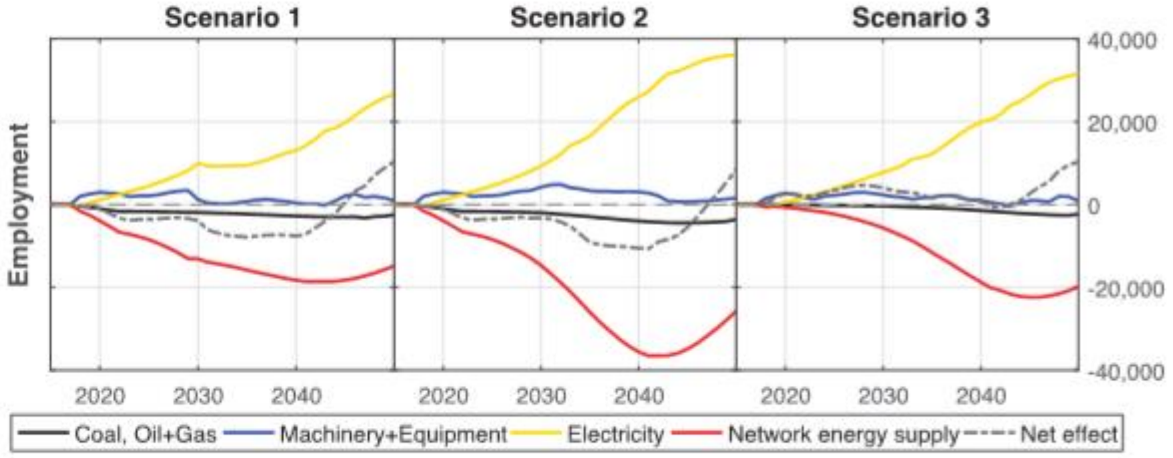

Figure 12: EU wide employment changes in energy and heating related economic sectors, in scenarios 1-3, relative to baseline. Solid lines represent heating related sectors, the dashed line the net change in heating related employment.

- Network energy supply (e.g. gas networks) jobs are at stake
- But it may well be different if the existing networks are used for the provision of renewable energy, such as biogas (which was not considered within this analysis)

Jobs impacts – minimising loss & promote opportunities

- Jobs impacts from heating decarbonisation would have been worse without using carbon tax revenues to lower other tax
  - example: use tax revenues to reduce employers' social security contribution
- Retrained/repurpose fossil fuels-related jobs
- Carefully manage the transition for affected workers and communities
- Encourage domestic industry to become world leader in renewable heating providers
- Ensure necessary skills are available to support the transition
  - engineers, plumbers, etc

Further readings

- Our recent blog on the 2025 ban on gas and oil heating system

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Home | News | Analysis of UK's 2025 ban on gas and oil heating systems highlights the need for additional policy intervention

Analysis of UK's 2025 ban on gas and oil heating systems highlights the need for additional policy intervention

21st March 2019

The ban on fossil-fuel based heating systems in new homes, announced by UK Chancellor Philip Hammond last week, is a positive step towards decarbonising the UK's households. Our analysis suggests it could lead to annual carbon emissions savings of around 13 mtCO2 by 2050.

However, our analysis also highlights the importance of ensuring that both low-carbon development and affordable heating are delivered in conjunction with the ban to avoid higher household heating costs.

Cambridge Econometrics and Radboud University assessed the impact of the policy announcement by looking at the diffusion rates of different technologies in household heating:

Key points to note:
•Gas will still be around for a long time, even with the ban, due to the long lifetime of existing systems.
•Displaced gas is replaced mainly with standard electric systems, i.e. panel and storage heaters. The share of heat pumps in the overall mix changes only slightly.
•The ban may discourage existing home owners from shifting to more efficient condensing gas boilers if they are gradually being phased out.
•The six-year lead time on the announcement is sensible. This gives companies the chance to become familiar with and develop new technologies to meet demand.
•The electricity grid in its present form would struggle to cope with such an outcome; more investment would be needed to cover peak-time demand.

https://www.camecon.com/news/analysis-of-uks-2025-ban-on-gas-and-oil-heating-systems-highlights-the-need-for-additional-policy-intervention/

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Further readings (continue)

- Globally: simulating the deep decarbonisation of residential heating for limiting global warming to 1.5 °C
  - https://link.springer.com/article/10.1007/s12053-018-9710-0
- Globally: decarbonisation in all sectors
  - https://www.camecon.com/blog/estimate-global-value-stranded-fossil-fuel-assets/
  - https://www.camecon.com/what/our-work/world-resources-institute-new-climate-economy-unlocking-inclusive-growth-story-21st-century/

Estimating the global value of stranded fossil fuel assets – technological change and GDP impact

Posted by: Hector Pollitt
Publish date: 25th June, 2018 | 3:46pm

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Our attempt to estimate the value of stranded fossil fuel assets (SFFA), recently published in Nature Climate Change, was widely covered in the press and picked up on-line*.

After all, $4 trillion is an attention-grabbing figure.

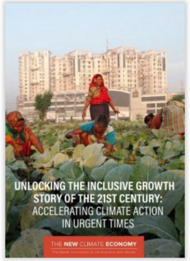
The findings suggest that the momentum behind technological change in the global power and transportation sectors is overwhelming. It will lead to a dramatic decline in demand for fossil fuels in the near future, whether more stringent climate policies are adopted, or not.

But how did we model this technological change and the impact that stranded fossil fuel assets will have on individual countries?

Technology diffusion and how to model it

The analysis focused in particular on the role of technology diffusion (how new technology spreads) in determining the extent to which fossil fuel assets become redundant. For this we used the Future Technology Transformations (FTT) technology diffusion models, which are integrated to Cambridge Econometrics' global macroeconomic model E3ME.

To fully understand the paper's findings, you need to understand FTT.



New Climate Economy: unlocking the inclusive growth story of the 21st Century

October 2018

We provided empirical inputs to the New Climate Economy 2018 Global Commission Report "Unlocking the Inclusive Growth Story of the 21st Century".

The aim of the modelling exercise was to illustrate examples of policies that can simultaneously promote economic growth and reduce the risks of climate change.

Various policies were assessed during the project using Cambridge Econometrics' macroeconomic modelling approach that identifies both potential emission reductions and impacts on the wider economy.

Aside from levels of GDP and CO_2 emissions, key outputs from the analysis include labour market impacts, distributional impacts (for some regions where data are available), and other environmental impacts such as changes in air quality and health impacts.

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Get in touch!

Unnada Chewpreecha

Principal Economic Modeller

Cambridge Econometrics
uc@camecon.com
+44 (0) 1223 533100

www.camecon.com
www.e3me.com

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