Residential Sector – Technologies and Policies

UCD NESC Workshop on GHG Reductions

16th May 2012

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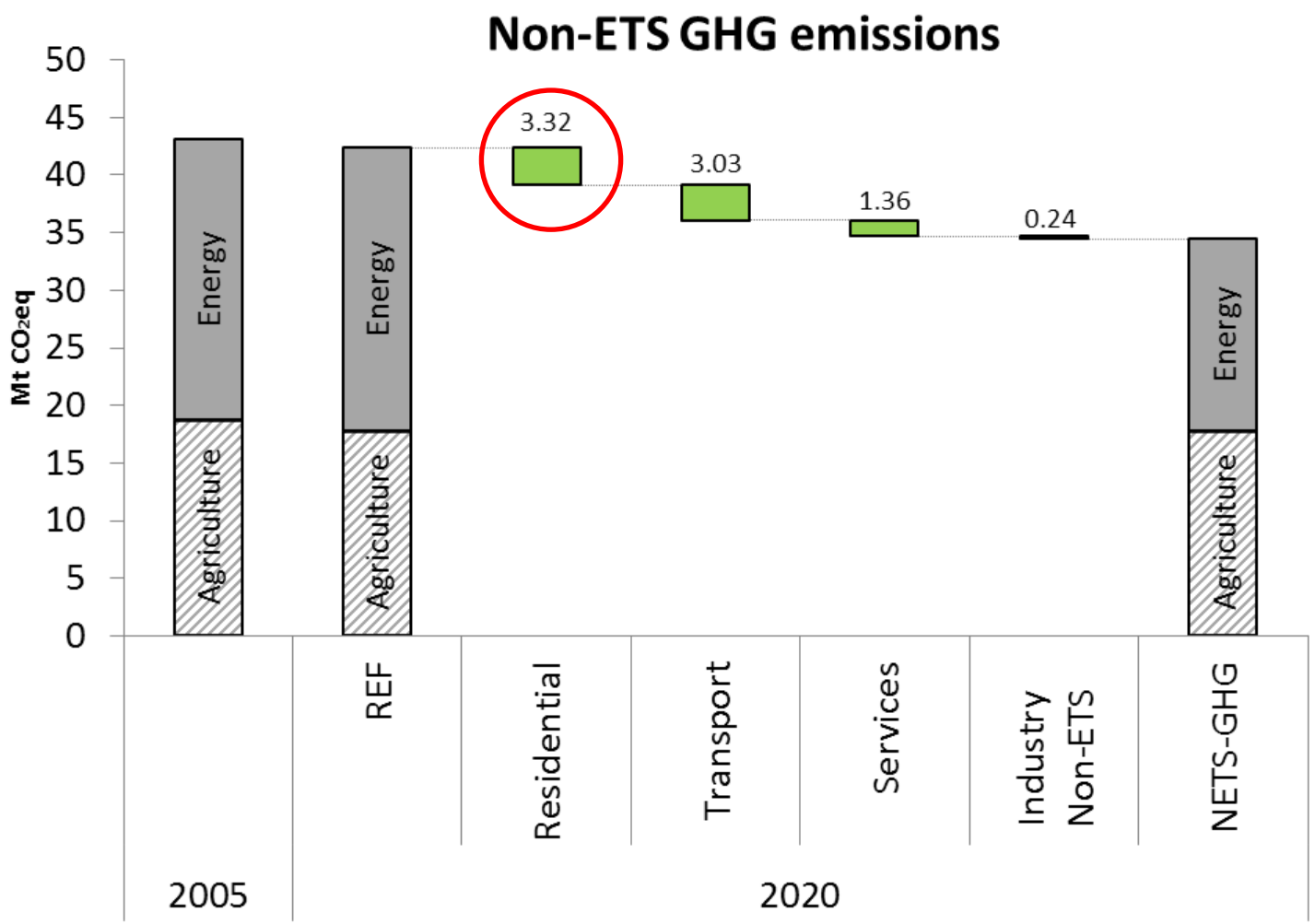
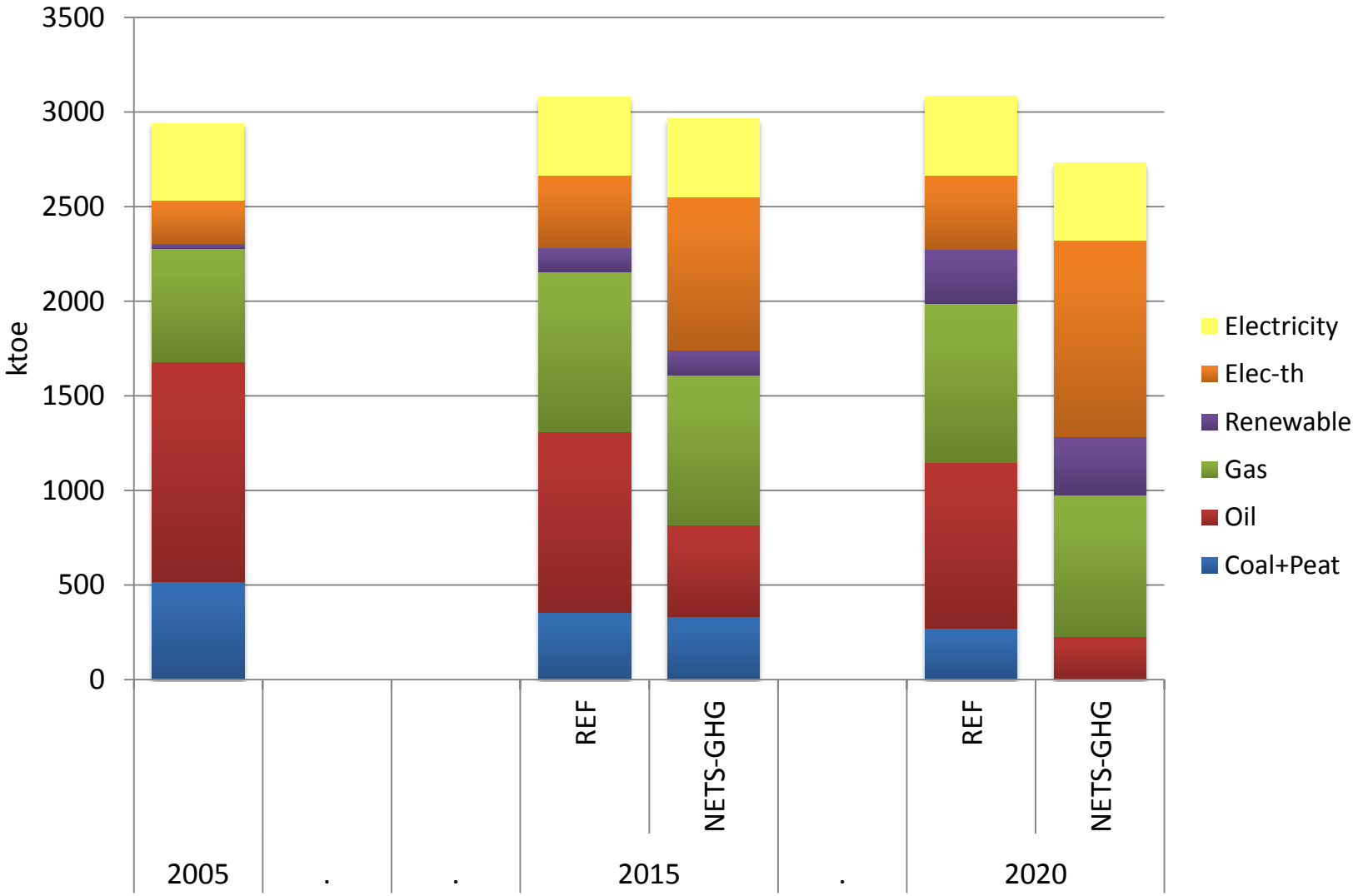
Overview

- Least-cost pathway for Irish energy system
  - IrishTIMES
- Simulating policies
  - Bottom up Modelling

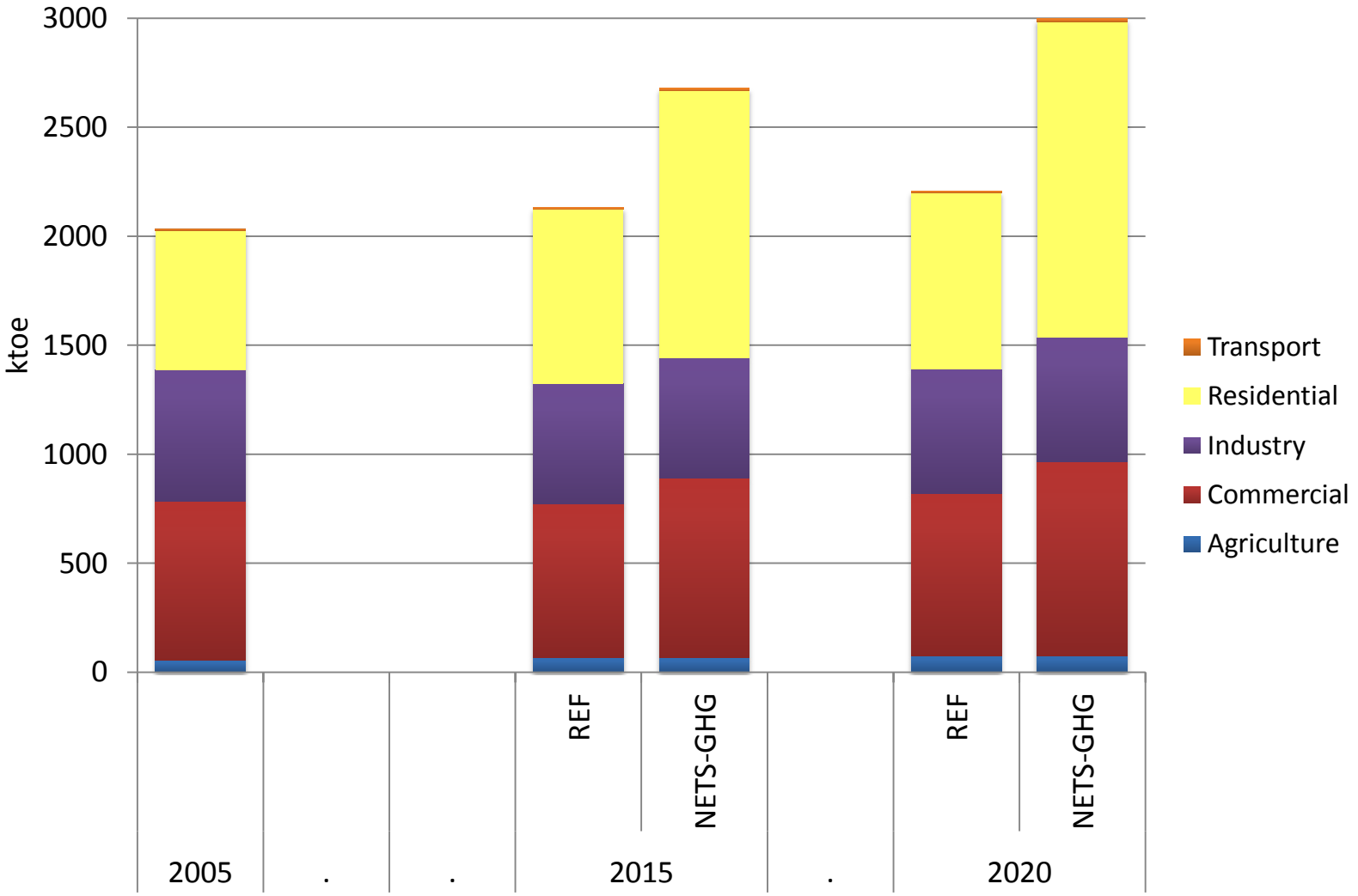
Achieving the Target at Least Cost



Residential Energy Changes



Impact of Electrification



Policy Analysis: Residential Retrofit

- National Energy Retrofit Programme
- 1 million buildings
- Target savings: 8,000 GWh total; 6,000 GWh residential
- Quantifying potential energy savings in the residential sector
- LEAP_Ireland model.

Model Assumptions

- Numbers of dwellings

	Thousand dwellings retrofitted												
Scenario	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**Total**
100k	0	0	50	70	100	100	100	100	100	100	50	30	800
50k	0	0	25	35	50	50	50	50	50	50	25	15	400

Model Assumptions

- Depth of retrofit

Label	kWh/m^2/yr
A1	<25
A2	>25
A3	>50
B1	>75
B2	>100
B3	>125
C1	>150
C2	>175
C3	>200
D1	>225
D2	>260
E1	>300
E2	>340
F	>380
G	>450

Model Assumptions

- Depth of Retrofit:
- “In line with current trends” scenario
  - Roof insulation and cavity wall insulation where possible.

Archetype model retrofit profile					
	OneStDet	TwoStDet	TwoStSem	Terraced	Apartment
Before	After "In line with current trends" retrofit works				
C	C	C	C	C	C
D	D	C	C	C	C
E	D	D	D	D	D
F	E	E	E	E	E
G	F	F	E	F	G

Model Assumptions

- Depth of Retrofit:
- “Deeper retrofit” scenario
  - Roof insulation, cavity wall insulation where possible, upgrade of heating controls, boiler upgrade

Archetype model retrofit profile					
	OneStDet	TwoStDet	TwoStSem	Terraced	Apartment
Before	After "Deeper retrofit" works				
C	C	B	B	C	C
D	C	C	C	C	C
E	D	C	C	D	D
F	D	E	D	D	E
G	E	F	E	E	G

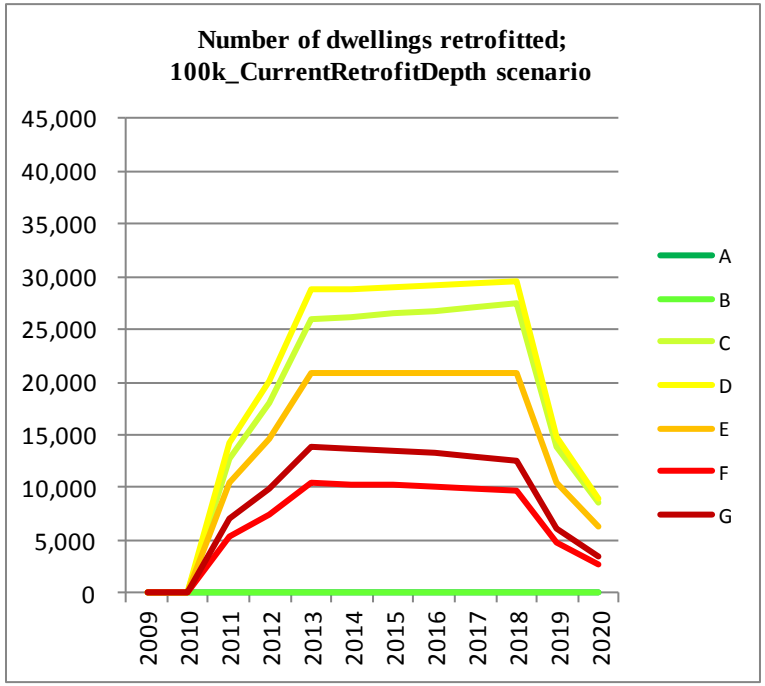
Model Assumptions

- Depth of Retrofit:
- “Full retrofit” scenario
  - Roof Insulation, cavity wall where possible, heating controls, boiler upgrade, external wall insulation

Archetype model retrofit profile					
	OneStDet	TwoStDet	TwoStSem	Terraced	Apartment
Before	After "Full retrofit" works				
C	B	B	B	B	B
D	C	B	B	C	C
E	C	C	C	C	D
F	C	C	C	C	E
G	D	D	C	D	G

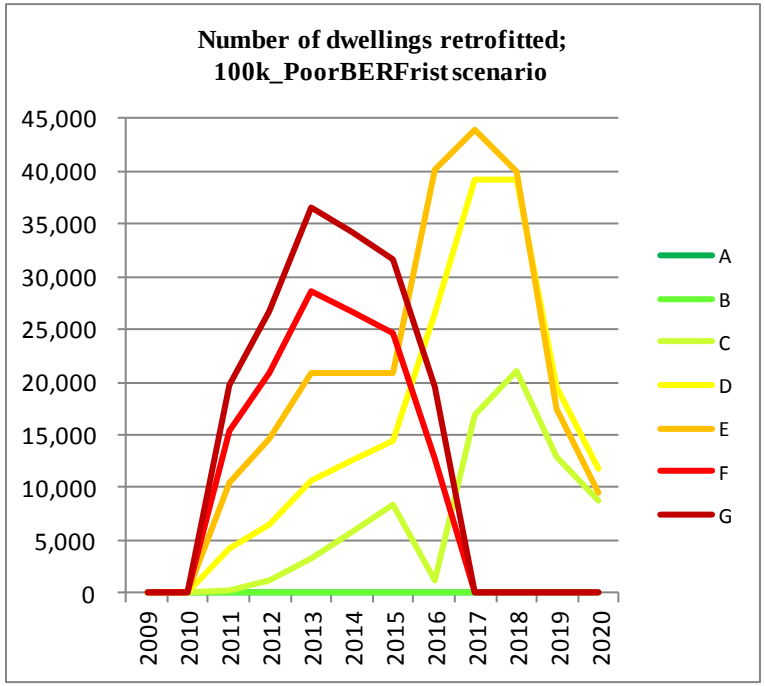
Model Assumptions

- Initial BER profile of dwellings retrofitted:
- “Reference” scenario



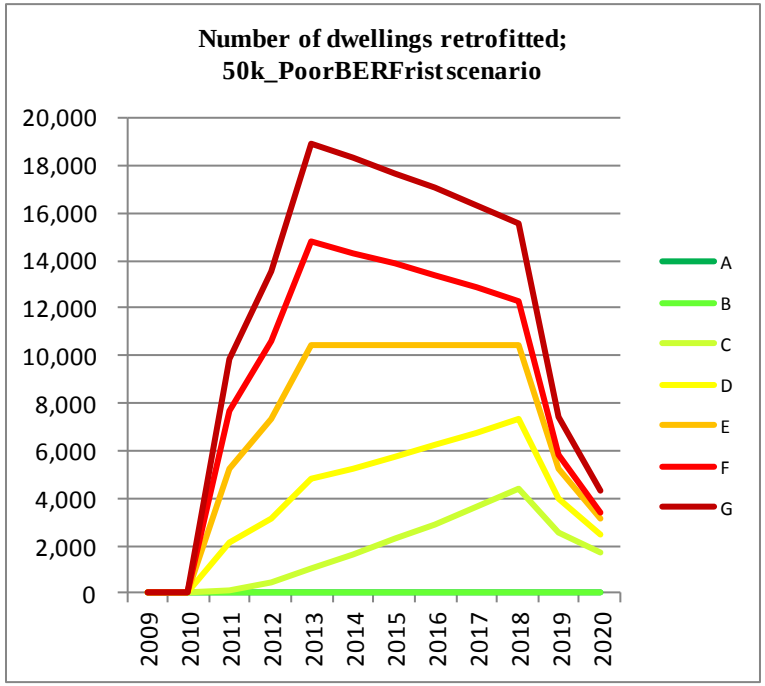
Model Assumptions

- Initial BER profile of dwellings retrofitted:
- “Poor BER first” scenario



Model Assumptions

- Initial BER profile of dwellings retrofitted:
- “Poor BER first” scenario

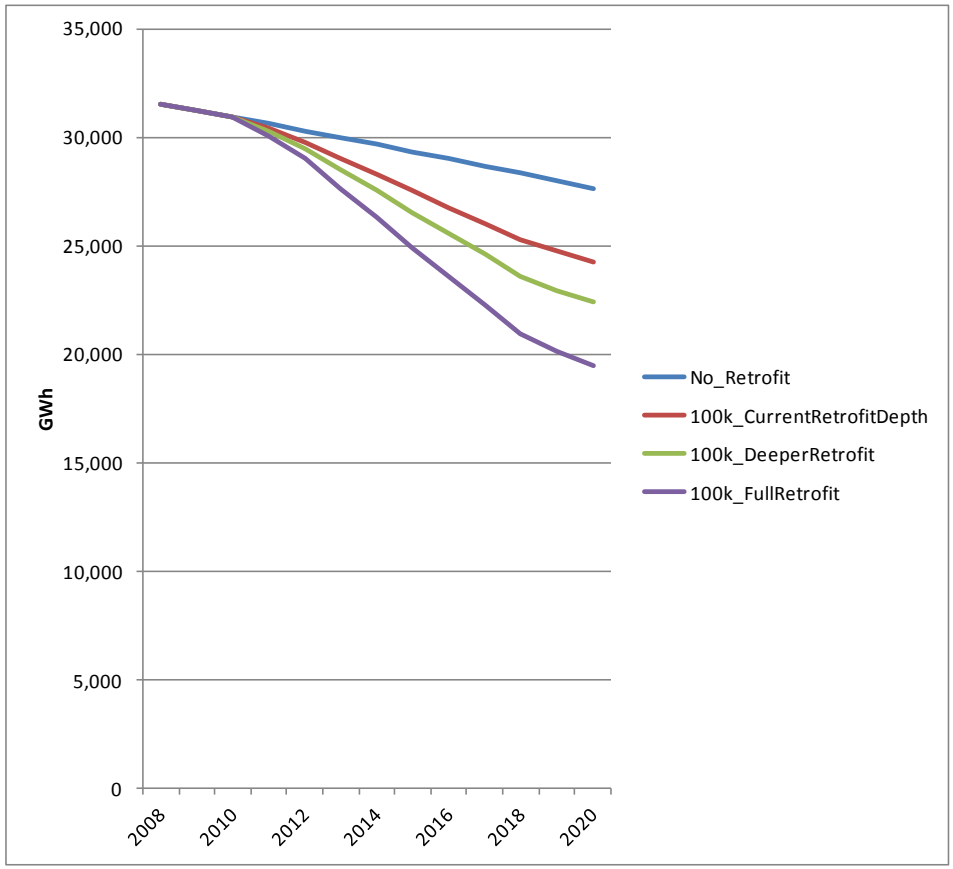


Model Results

- Savings estimates represent upper bound
- Rebound Effect
- Free riders
- Baseline definition

Model Results

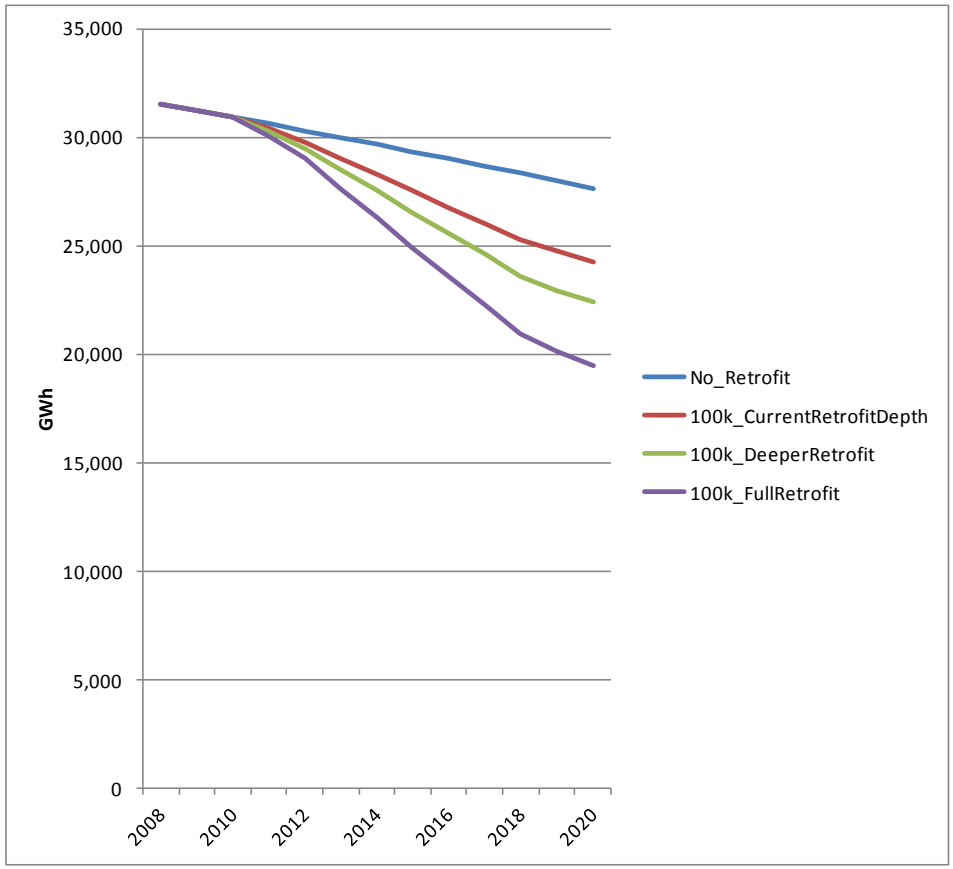
- Effect of depth of retrofit for 800,000 retrofits



GWh	Total in 2020
No_Retrofit	27,635
100k_CurrentRetrofitDepth	24,255
100k_DeeperRetrofit	22,421
100k_FullRetrofit	19,467

Model Results

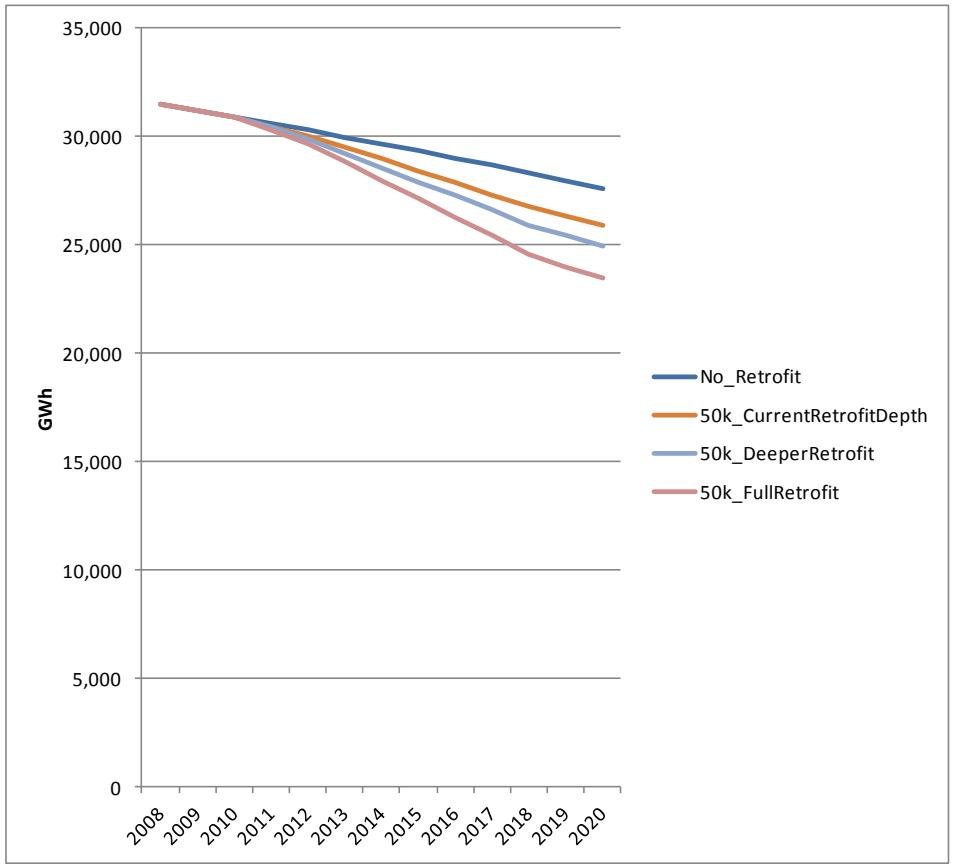
- Effect of depth of retrofit for 800,000 retrofits



GWh		Savings WRT No_Retrofit
No_Retrofit		
100k_CurrentRetrofitDepth	3,380	12%
100k_DeeperRetrofit	5,214	19%
100k_FullRetrofit	8,167	30%

Model Results

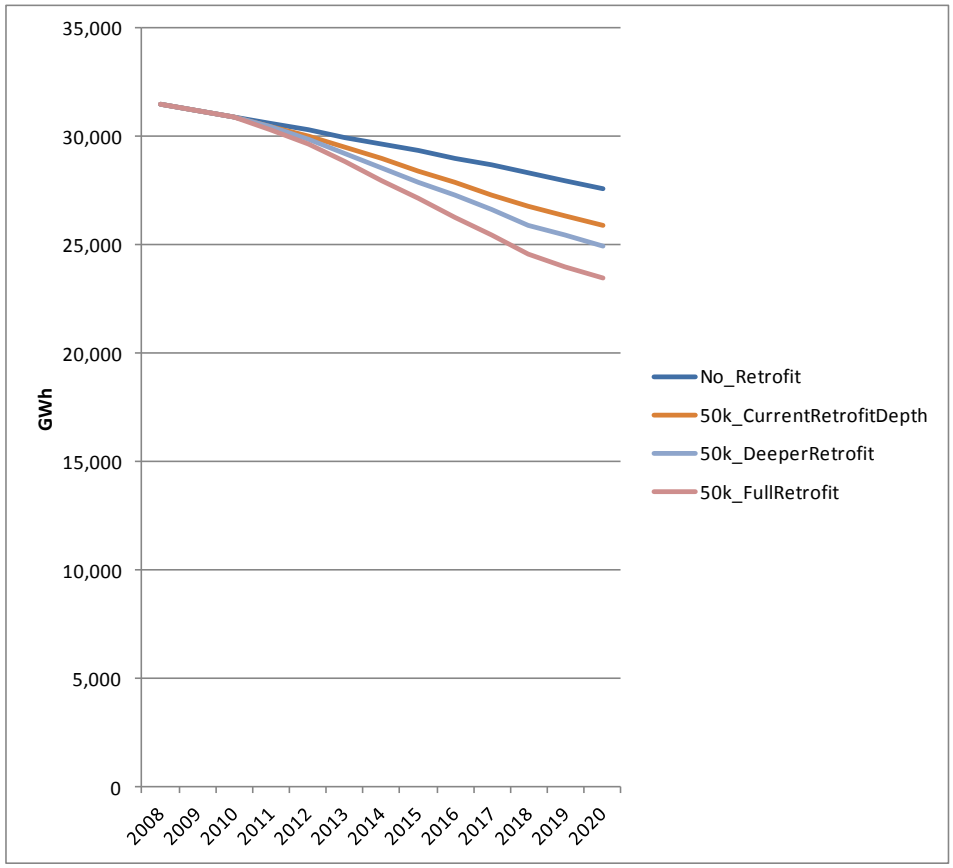
- Effect of depth of retrofit for 400,000 retrofits



GWh	Total in 2020
No_Retrofit	27,635
50k_CurrentRetrofitDepth	25,915
50k_DeeperRetrofit	24,984
50k_FullRetrofit	23,481

Model Results

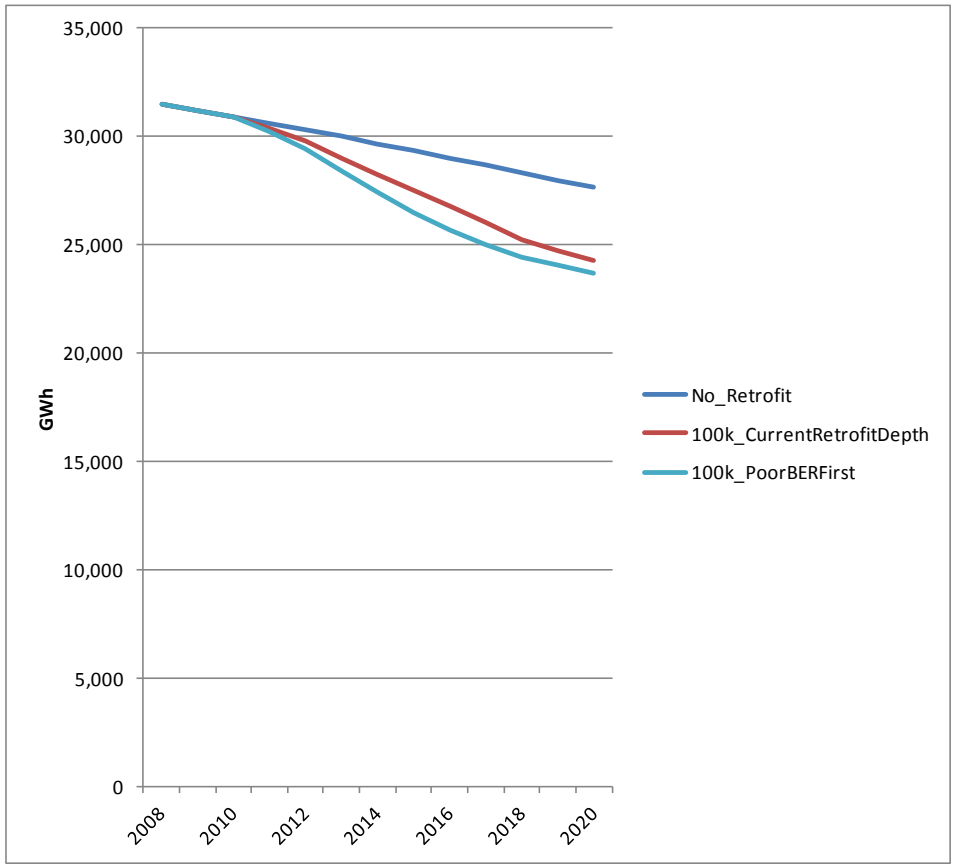
- Effect of depth of retrofit for 400,000 retrofits



GWh	Savings WRT No_Retrofit	
No_Retrofit		
50k_CurrentRetrofitDepth	1,720	6%
50k_DeeperRetrofit	2,651	10%
50k_FullRetrofit	4,153	15%

Model Results

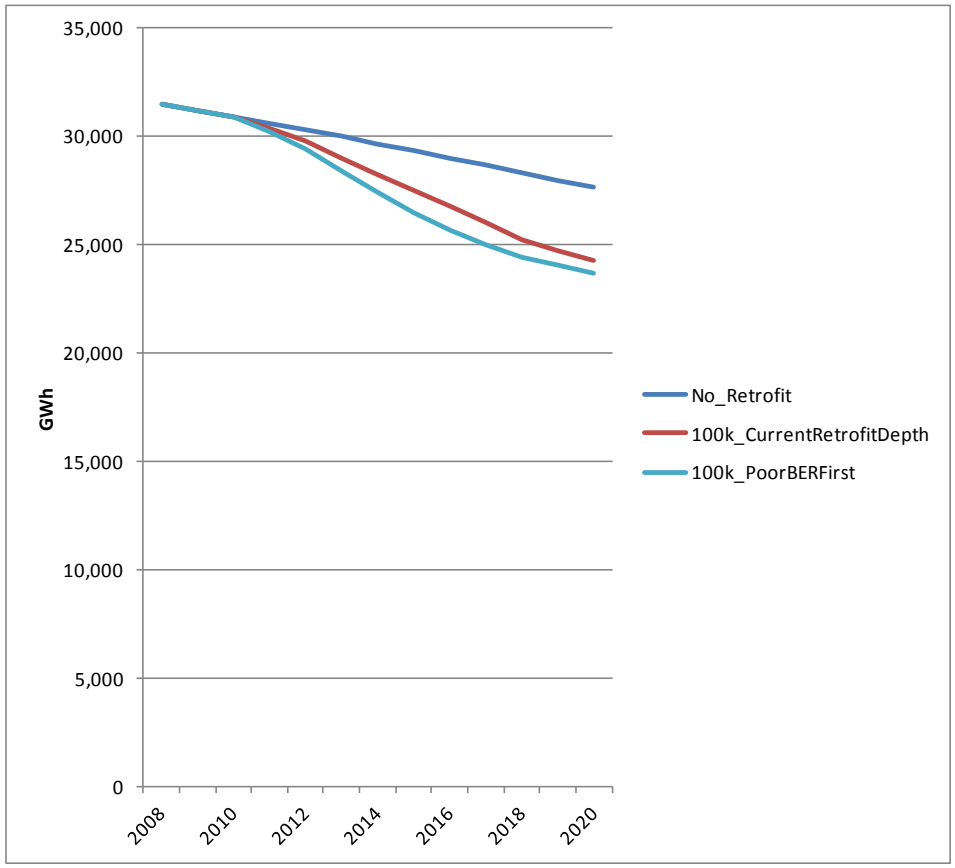
- Effect of targeting poor BER dwellings first for 800,000 retrofits



GWh	Total in 2020
No_Retrofit	27,635
100k_CurrentRetrofitDepth	24,255
100k_PoorBERFirst	23,699

Model Results

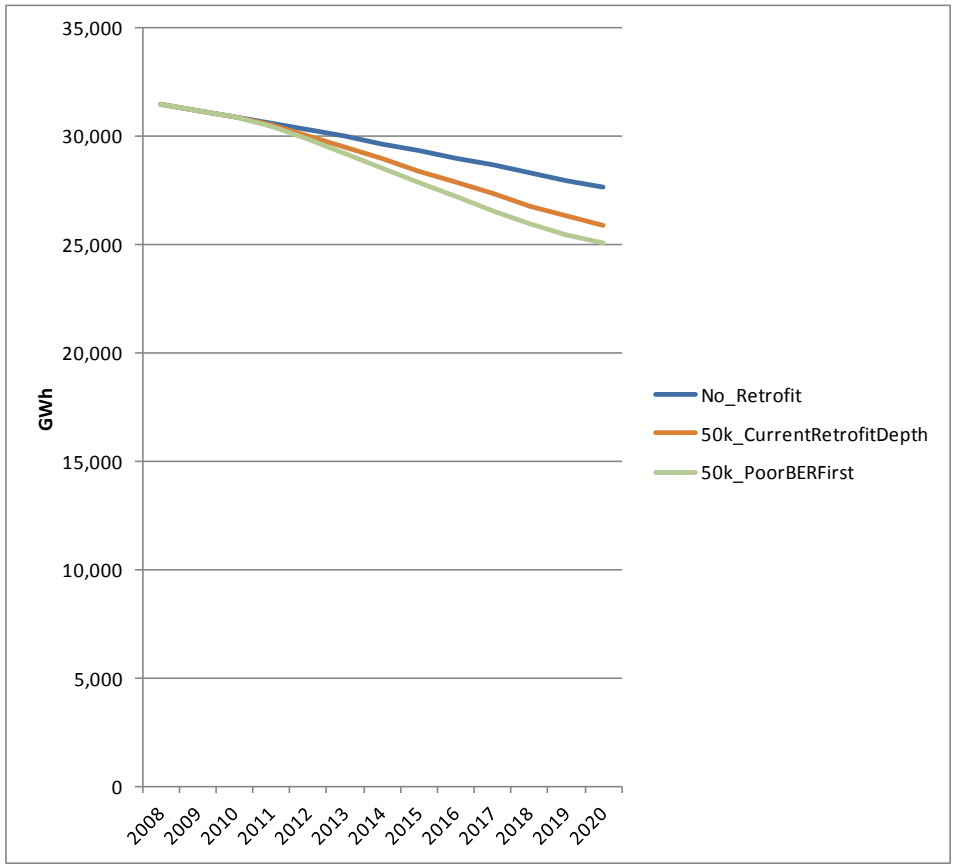
- Effect of targeting poor BER dwellings first for 800,000 retrofits



GWh		Savings WRT 100k_CurrentRetrofitDepth
No_Retrofit		
100k_CurrentRetrofitDepth		
100k_PoorBERFirst	556	2%

Model Results

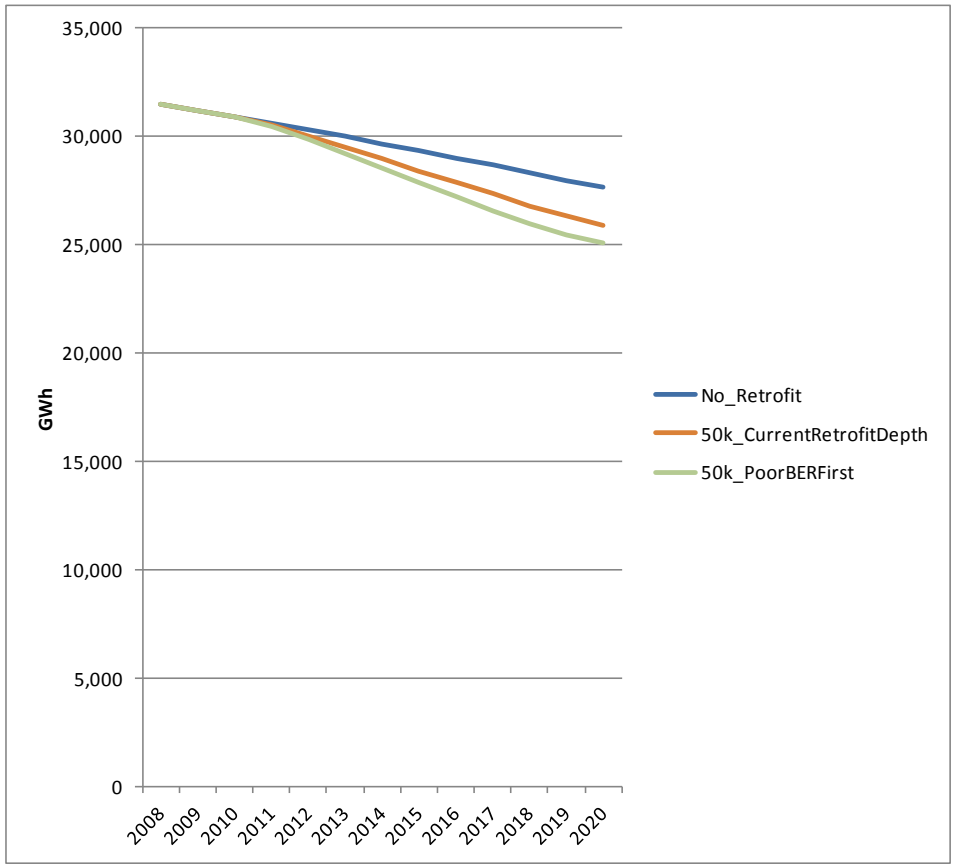
- Effect of targeting poor BER dwellings first for 400,000 retrofits



GWh	Total in 2020
No_Retrofit	27,635
50k_CurrentRetrofitDepth	25,915
50k_PoorBERFirst	25,058

Model Results

- Effect of targeting poor BER dwellings first for 400,000 retrofits



GWh		Savings WRT 50k_CurrentRetrofitDepth
No_Retrofit		
50k_CurrentRetrofitDepth		
50k_PoorBERFirst	857	3%

Model Results

- CO_2 Savings
- Target 6,000 GWh ~ 1.60 $MtCO_2$
- Lower estimate of 1,720 GWh ~ 0.46 $MtCO_2$
- Upper estimate of 8,167 GWh ~ 2.17 $MtCO_2$

Conclusions

- Residential Retrofit:
- Can reach energy efficiency target BUT...
- Need to improve depth of retrofit achieved
- Improved financing options has been identified as a key facilitator for this

Conclusions

- Policy:

- So far focused on:
  - Efficient construction; Building regulations and retrofitting
  - Efficient behaviour ; power of one campaign

- Future potential:
  - Fuel switching
  - TIMES suggests electrification of residential space heating is cost effective method of reducing non-ETS emissions.

Thank You

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