Building Irish TIMES from PET-IE

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Overview

- PET-IE -> Irish TIMES
- PET -> 'Country' TIMES
- Ireland's Energy System
- Irish TIMES development
  - Improving energy system characterisation
    - Residential sector
    - New Industry Sub-sectors
- Scenarios
  - EN1 RES 2020
  - EN2 Non-ETS GHG 2020
  - EN3 GHG 2050

PET-IE

- Pan European TIMES (PET) model developed within NEEDS project www.needs-project.org/
- Energy systems of 30 countries modelled separately.
- PET synthesized by allowing trade between countries.
- Further developed in RES 2020 project www.res2020.eu to analyse EU 20% RES target
- PET-IE from RES 2020 used as starting point for Irish TIMES

PET-IE -> Irish TIMES

- Wanted to avoid ‘multiple’ TIMES models for Ireland
- New approach adopted here to ensure
  - ongoing consistency between PET-IE & Irish TIMES
  - as Irish TIMES improves, this feeds back to PET-IE
- Involves PET-IE ‘dbase’ only extraction from PET
- Irish TIMES is a fully working TIMES model
- Irish TIMES cannot change calibrated base year data

PET-IE -> Irish TIMES

- Scenario files used to amend sectoral data
- SubRES used to add new technologies, commodoties, etc.
- Scenario files and SubRES feed back to PET
- PET recalibrated at intervals with improved energy system characterisation.
- PET currently being recalibrated to 2005 base year (good timing!)

PET -> 'Country' TIMES

- "Extract" country model from PET model
  - a single region is delivered (e.g. Ireland) via VEDA-FE browse database, to country TIMES modelling team
  - this includes data to simulate the Reference case trade environment of the multi-region PET
- Feed-back from country TIMES modelling team
  - periodically information about new inputs, structure updates and assumptions
  - used by the PET core team, to improve the single country region

PET -> 'Country' TIMES

- Browse database in VEDA-FE
  - the simple way to understand an existing model (structure, data by sectors/techs and assumptions)
  - possible to update and review all the technical, economic and environmental input data
  - check and update energy service demand and demand projections
  - build new scenarios
  - add new sectors, commodities and processes

PET -> 'Country' TIMES

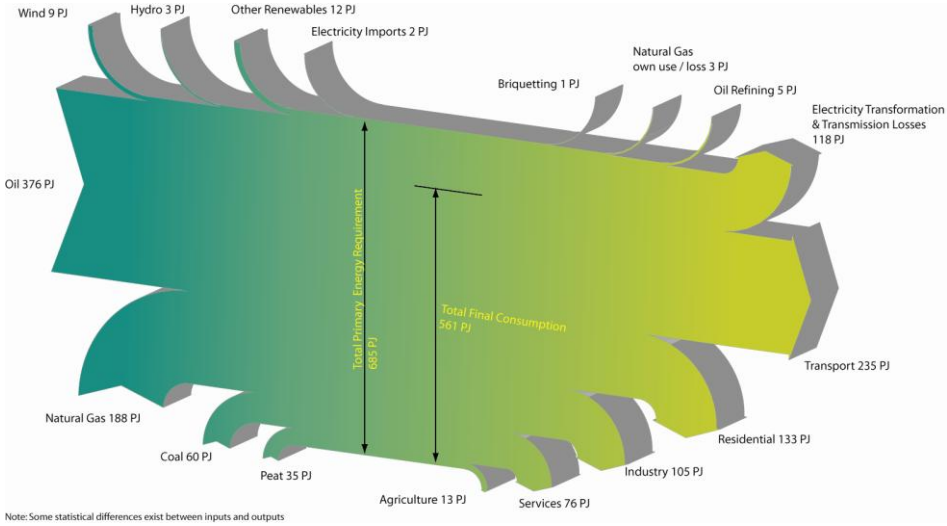
- Browse database in VEDA-FE
  - not possible to update the base year (BY) energy balance, change the BY reference energy system or BY energy service demand
  - to update BY energy balance, RES and demand the modellers need to send data to the PET team
- Why this approach?

1. ENSURES COHERENCE BETWEEN THE PET-EU MODEL AND THE SINGLE COUNTRY MODELS AND
2. FACILITATES FEED BACK TO IMPROVE THE WHOLE MODEL

Energy Drivers 1990 - 2007

- Economic growth nearly trebled (6.5% average annual growth)
- Population grew from 3.5 M to 4.3 M (1.3% p.a.)
- Car ownership per 1,000 adults increased from 312 to 545 (EU-15 = 592)
- No. of households increased by 43%
- Energy demand increased by 3.6% per annum (electricity by 4.7%, gas by 6.2%)
- GHG Emissions 24% higher than 1990 (Kyoto target 13% above 1990)

Ireland's Energy Flow 2008



Ireland's Energy Balance 2008

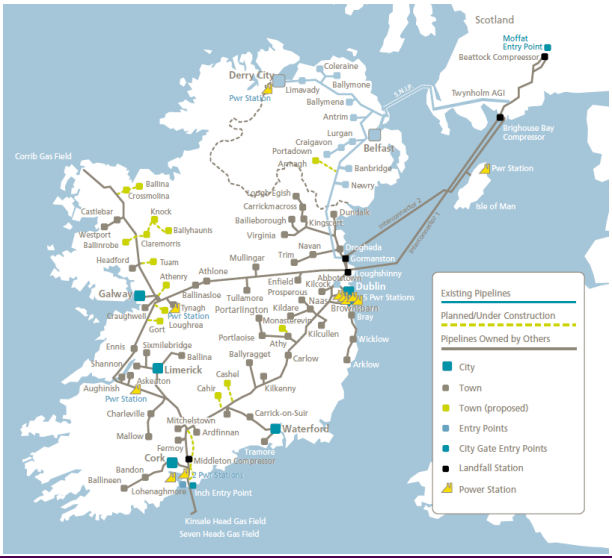
- Final Demand in 2008 - 561 PJ
  - Transport 42%
  - Industry 19%
  - Buildings 37%
  - Agriculture 2%
- Primary Energy in 2008 - 685 PJ
  - Oil 55%
  - Gas 27%
  - RES 4%

Ireland's Gas Supply System

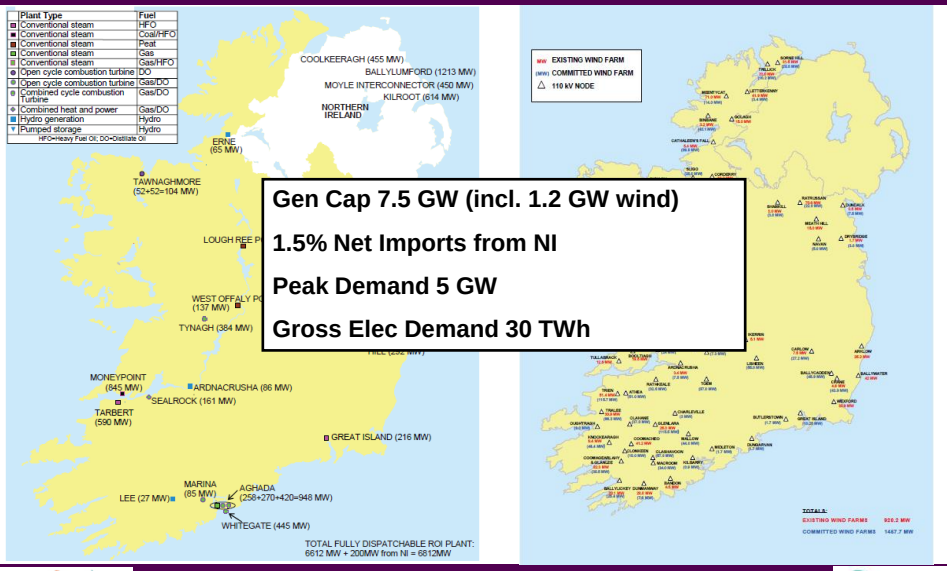
Gas: 27% of primary energy

92% Imported (UK)

Network coverage limited



Ireland's Electricity System



Gen Cap 7.5 GW (incl. 1.2 GW wind)

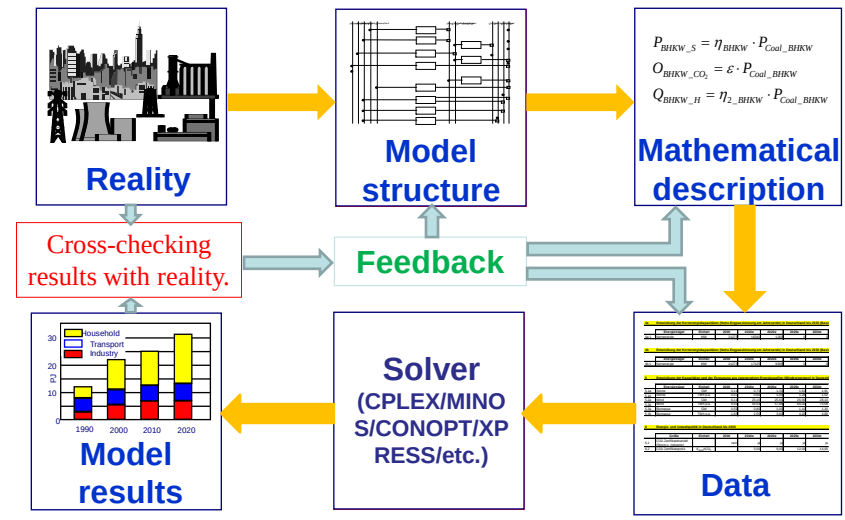
1.5% Net Imports from NI

Peak Demand 5 GW

Gross Elec Demand 30 TWh

TIMES Overview

Depicting reality inside an energy systems model



Irish TIMES (2009 - 2011)

- Provide new capacity to answer policy questions
- Focus on 2020 but extend to 2050
- Provide insights into technology options
- Build energy systems modelling capacity at UCC
- Complement existing Irish modelling research
- Contribute to the significant international TIMES research effort through IEA ETSAP
- Disseminate the results of the project.

Irish TIMES Development

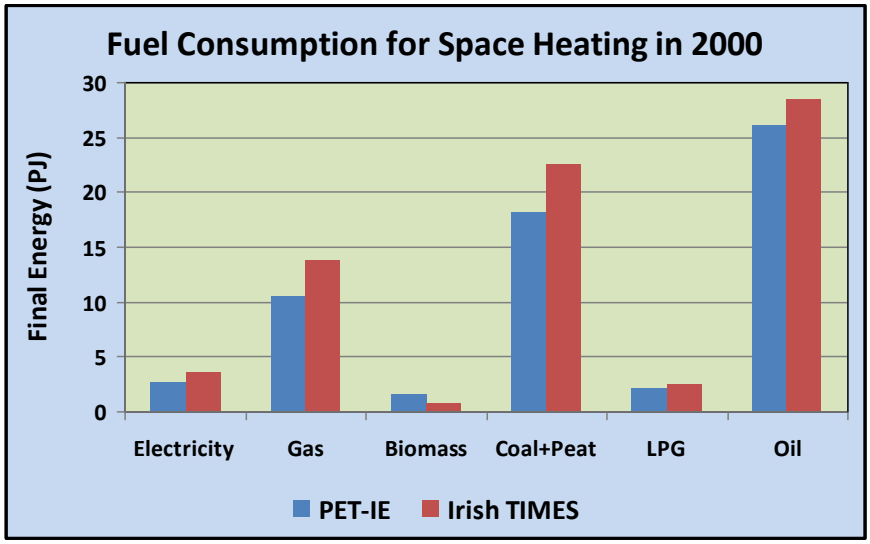
- Initial energy system update complete for
  - Residential
  - Electricity Generation
  - Transport
  - Industry
- Planned work 2010
  - further detailing for industry
  - Scenarios to 2020 (RES and GHG)
  - Demand drivers to 2050
  - Scenarios to 2050

Residential Sector

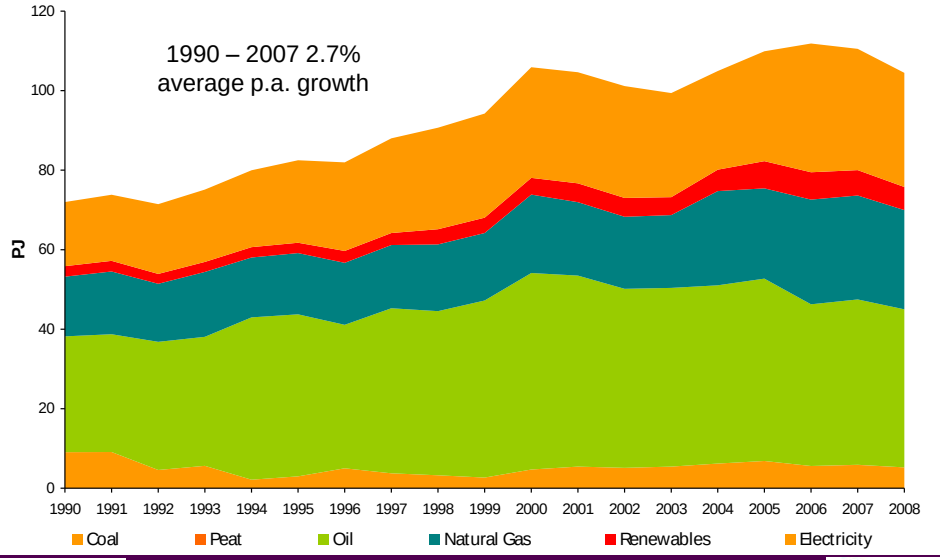
Improved characterisation of energy end use

	Final Energy Demands (PJ)					Final Electricity Demands (PJ)			
	PET-IE		Irish TIMES			PET-IE		Irish TIMES	
	2000	2001	2000	2001		2000	2001	2000	2001
Space Heating	60.9	64.7	71.6	74.4		2.6	2.7	3.6	3.4
Water Heating	13.1	16.3	17.5	18.2		4.9	5.1	5.8	5.8
Cooking	16.1	16.1	3.9	4.0		4.7	4.6	2.9	2.9
Lighting, Appliances & Other	12.3	12.1	10.7	12.1		12.3	12.1	10.7	12.1
Residential	102.4	109.2	103.7	108.8		24.5	24.4	23.0	24.2

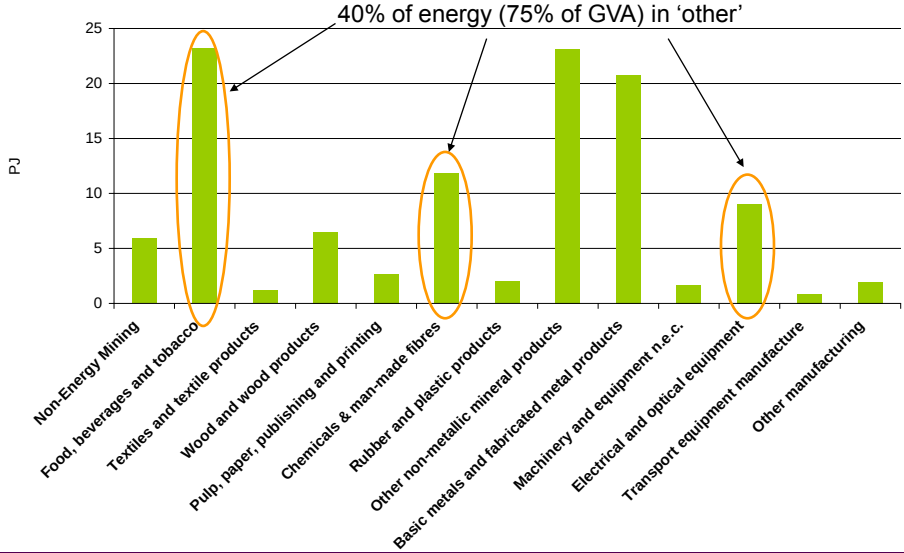
Improved Fuel Split



Energy in Industry



Energy in Industry 2005



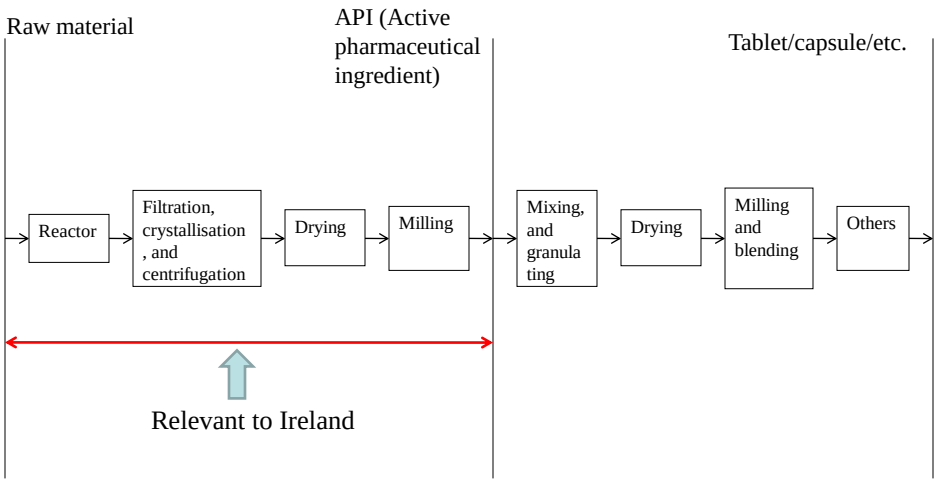
Industry in PET-IE

Produced commodity	Symbol	Energy (% 2005)
Aluminium Demand	IAL	13.5
Ammonia Demand	IAM	0
Cement Demand	ICM	14
Chlorine Demand	ICL	0
Copper Demand	ICU	0
Glass Flat Demand	IGF	0
Glass Hollow Demand	IGH	0
High Quality Paper Demand	IPH	0
Iron and Steel Demand	IIS	0
Lime Demand	ILM	1.4
Low Quality Paper Demand	IPL	0
Non Energy Consumption - Chemicals	NEC	0
Non Energy Consumption - Others	NEO	6.6
Other Non Ferrous Metals Demand	INF	7.7
Other Non Metallic Minerals Demand	INM	5.8
Other Chemicals Demand	ICH	11.3
Other Industries	IOI	39.7

Industry in Irish TIMES

Produced commodity	Symbol	Energy (%, 2005)
Aluminium Demand	IAL	13.5
Ammonia Demand	IAM	0
Cement Demand	ICM	14
Chlorine Demand	ICL	0
Copper Demand	ICU	0
Glass Flat Demand	IGF	0
Glass Hollow Demand	IGH	0
High Quality Paper Demand	IPH	0
Iron and Steel Demand	IIS	0
Lime Demand	ILM	1.4
Low Quality Paper Demand	IPL	0
Non Energy Consumption - Chemicals	NEC	0
Non Energy Consumption - Others	NEO	6.6
Other Non Ferrous Metals Demand	INF	7.7
Other Non Metallic Minerals Demand	INM	5.8
Other Chemicals Demand	ICH	2.3
Chemicals and Pharmaceuticals	*IPH*	9
Other Industries	IOI	9.6
ICT and Electronics sector	*ICT*	7.2
Food, beverages and tobacco	*IFB*	22.9

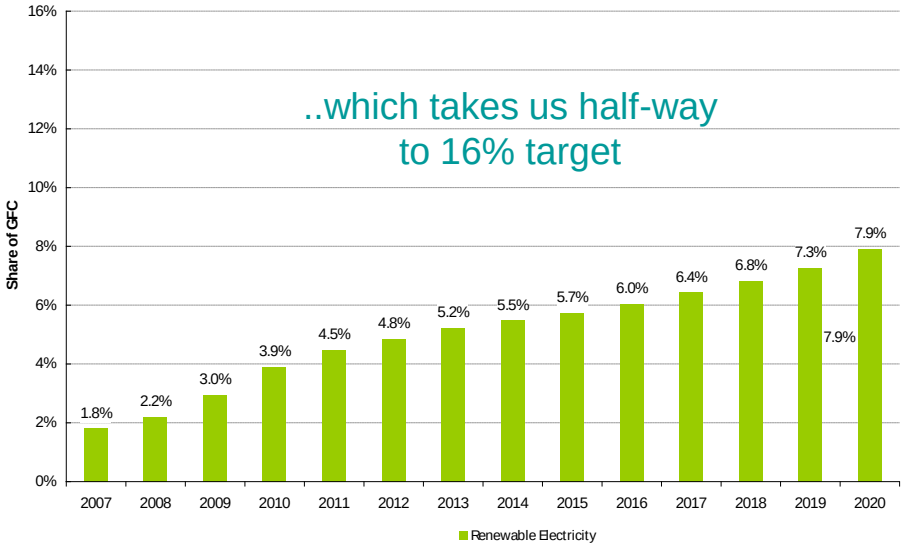
e.g. Pharmaceuticals



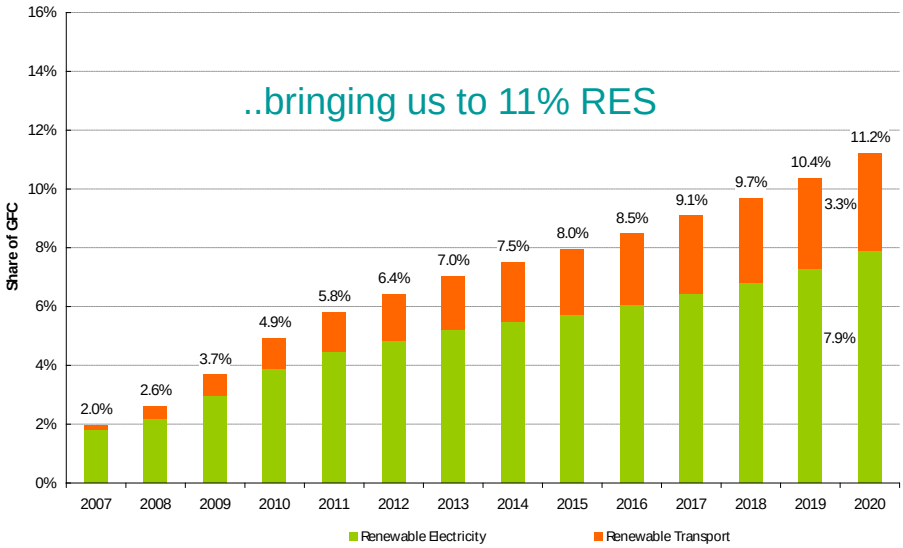
Scenario I - RES Targets for 2020

- Directive 2009/28/EC mandatory targets for Ireland
  - 16% RES by 2020
  - also 10% RES-T
- But Ireland has national targets
  - 40% RES-E by 2020 (7.9% RES) going well
  - 10% RES-T by 2020 (3.3% RES) late starting
  - 12% RES-H (4.2% RES) no movement
  - Is this the optimal mix???
  - Scenario ENI *Assess mix that gives 16% RES plus 10% RES-T and compare with national targets*

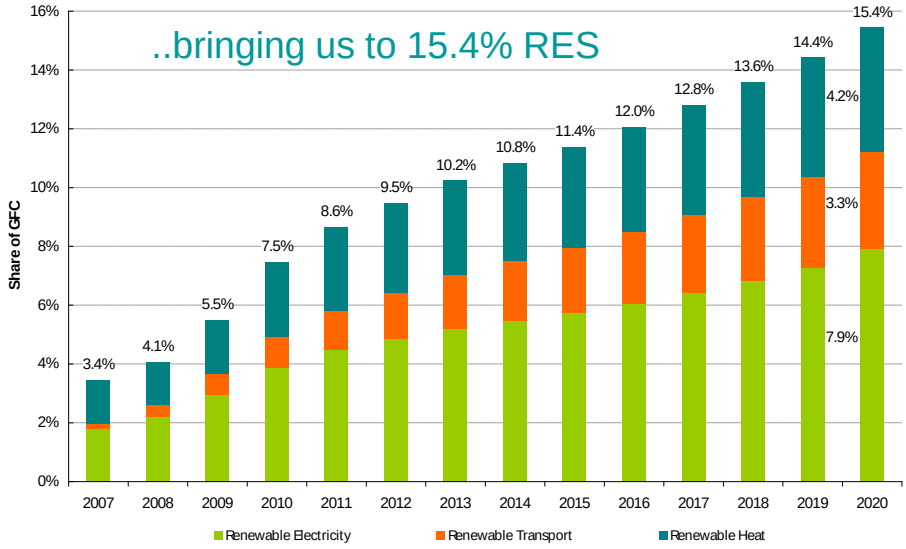
40% RES-E



…. 10% RES-T



and 12% RES-H



Scenario II Non-ETS Emissions

- EU GHG Targets

GHG 20% below 1990 by 2020	=	ETS GHG 21% below 2005 by 2020	+	Non-ETS GHG 10% below 2005 by 2020

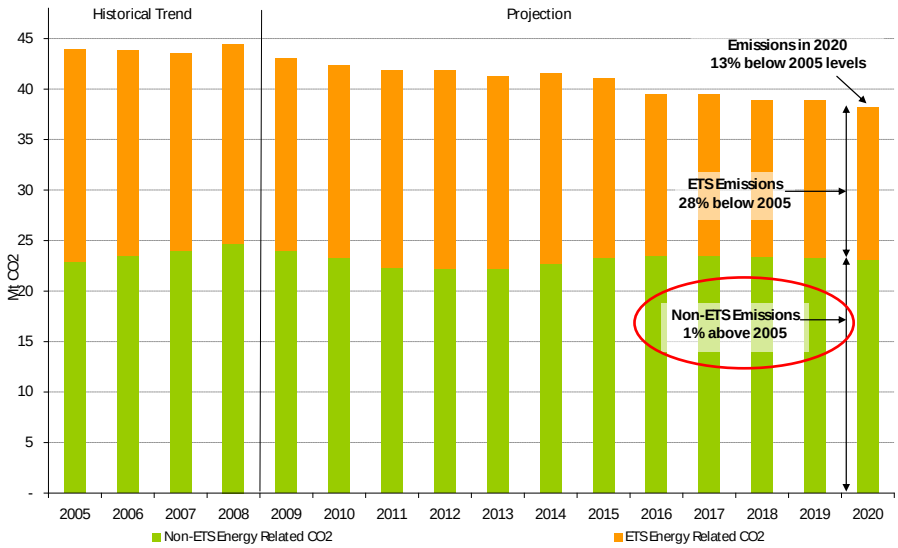
- EU Mandatory Target for Ireland
  - Decision 406/2009/EC
  - Non-ETS GHG 20% less than 2005 by 2020

GHG Emissions in 2007

- Total emissions: 69 Mt CO2e (~ 35% ETS)
  - Agriculture: 27% (large impact)
  - Energy: 65%
    - Power gen + refining 22%
    - Transport 21%
    - Residential 10 %
    - Industry and Services 12%
  - Process Emissions (Industry): 5%
  - Waste: 3%

65% Non-ETS

What if we meet our energy targets?



Irish TIMES Next Steps

- Jan – June 2010
  - Improve industry representation
  - Improve residential electricity end use
  - ENI *16% RES and 10% RES-T by 2020*
  - EM1 *20% decrease in Non-ETS GHG 2020*
  - Service demand to 2050
- Jul – Dec 2010
  - EM2 *GHG 80% decrease by 2050*

From PET-IE to Irish TIMES

www.ucc.ie/en/serg/energypolicy/projects/irishtimes/

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