How can long–term energy scenarios be more relevant to climate policy making?

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International Forum on Long–term Energy Scenarios for the Clean Energy Transition

Berlin April 10-12 2019

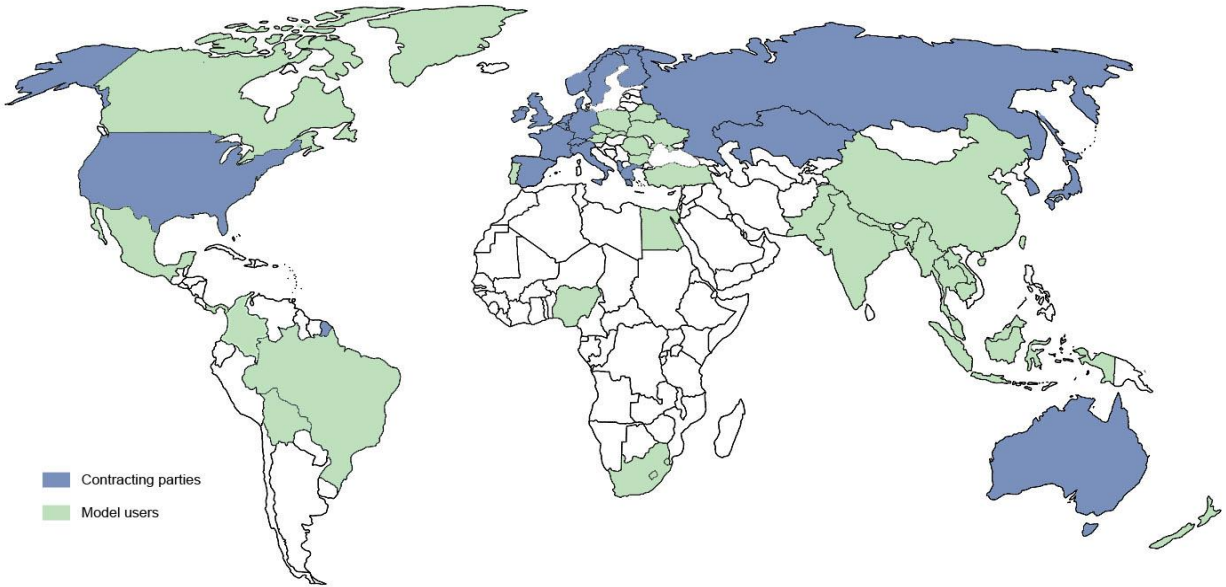
University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

MaREI
Centre for Marine and Renewable Energy

What is IEA-ETSAP?

- One of 39 **IEA Technology Collaboration Programmes** www.iea.org/tcp/
- 41 years international **cooperation** on energy **systems** modelling (since first oil crisis)
- **Develop and maintain** (MARKAL and TIMES) tools
- **Assist policy decisions** to model future **energy pathways**
- Focus on key role of **technology** to meet goals
- Biannual **workshops** and **training**
- **Collaborative research** and **analyses**

Who is IEA-ETSAP?



www.iea-etsap.org

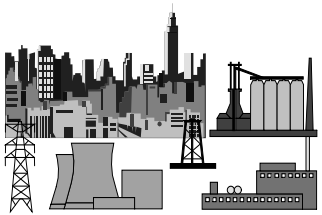
Unique network of **200 Energy Modelling teams** from almost **70 countries** use MARKAL & TIMES models to support decision making in energy and climtate policy.

Annex XIV – *Understanding and facilitating the energy transition to achieve the 'Well Below 2°C' Goal*

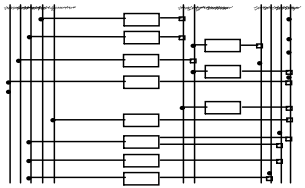
ETSAP will support research and development activities in order to advance the state-of the art of energy systems analysis. A non-exhaustive list of topics includes:

1. Climate **mitigation** responding to the policy ambition aiming for "well below 2° C";
2. Incorporating impacts of R&D in TIMES to capture the **role of innovation**;
3. Exploring the interplay between differences in **long term and short term** policy ambition;
4. Energy Technology Data Source (**E-TechDS**) updates;
5. Improved modelling of **variable renewables** and short term system operational issues in long term energy systems modelling;
6. New approaches for integrating **human behaviour** into energy systems modelling; and
7. Improved modelling of the interactions between the energy system and the **economy**

Building Scenarios



Reality



Model structure

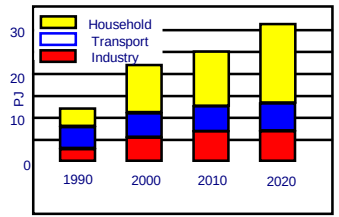
$$P_{BHKW\_S} = \eta_{BHKW} \cdot P_{Coal\_BHKW}$$
$$O_{BHKW\_CO_2} = \varepsilon \cdot P_{Coal\_BHKW}$$
$$Q_{BHKW\_H} = \eta_{2\_BHKW} \cdot P_{Coal\_BHKW}$$

Mathematical description

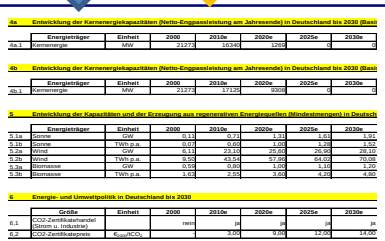
Cross-checking results with reality.

Feedback

Optimiser (CPLEX/MINOS/CONOPT/XPRESS/etc.)



Scenario results

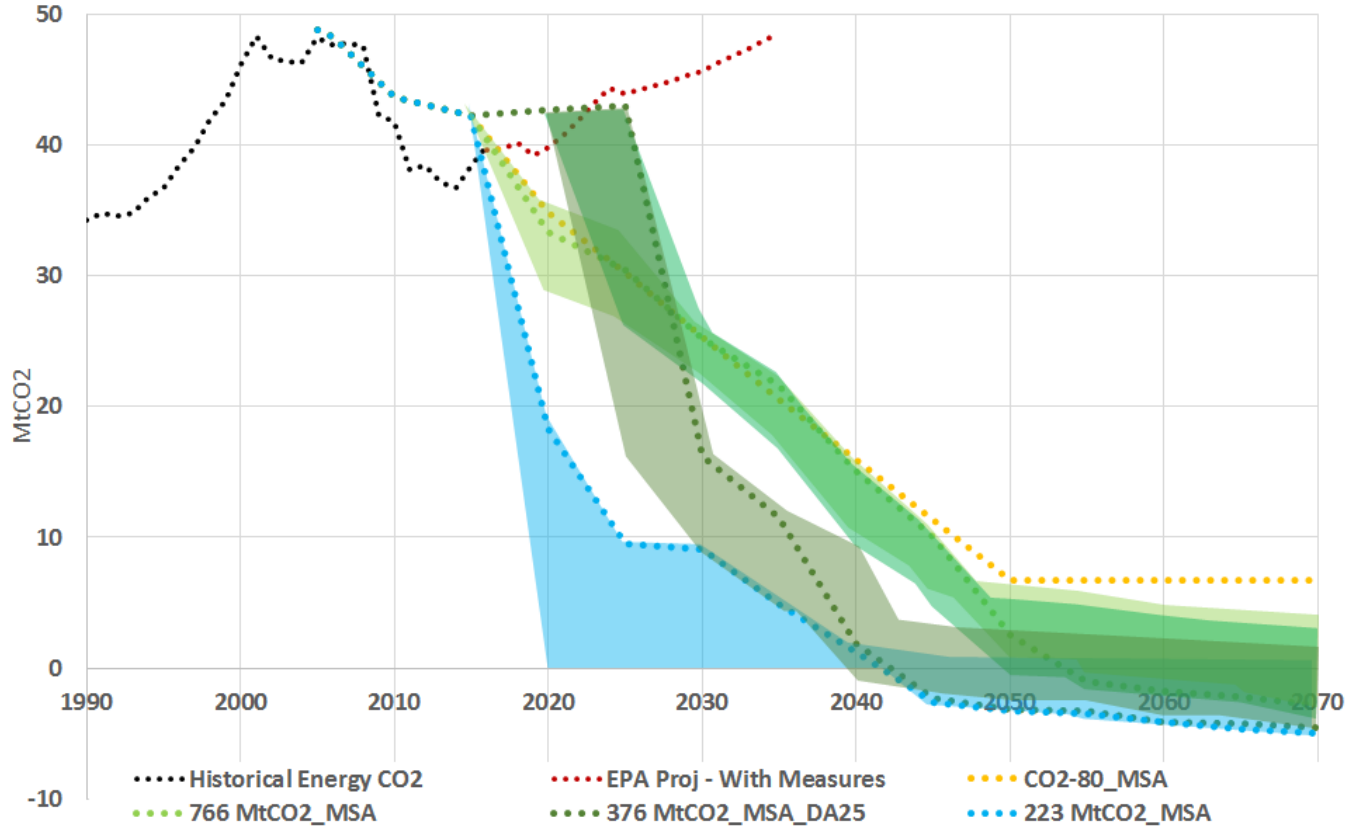


Data

Low Carbon Scenarios

1. **Run** TIMES model without constraints
2. Solution = **least cost energy system to meet service demands**
3. Impose max CO_2 **constraint** and **re-run** TIMEs model
4. Solution = least cost energy system meeting service demands **AND** CO_2 target
5. **Compare scenario results** from 2 and 4
   - can we meet the low carbon target imposed?
   - what are the differences in energy technologies selected?
   - what is the contribution of energy efficiency compared with RE?
   - do we get significant electrification of heat or transport?
   - what is the marginal abatement cost to achieve emissions reduction target?
   - what is the difference in energy system costs?

Ireland's 2050 GHG Emissions Pathways



IEA-ETSAP Book 2015

- methodologies and case studies
- demonstrating use of energy systems models
- supporting energy and climate policy

>22,000 Chapter downloads - one of the **top 25% most downloaded eBooks** in the relevant SpringerLink eBook Collection in 2016

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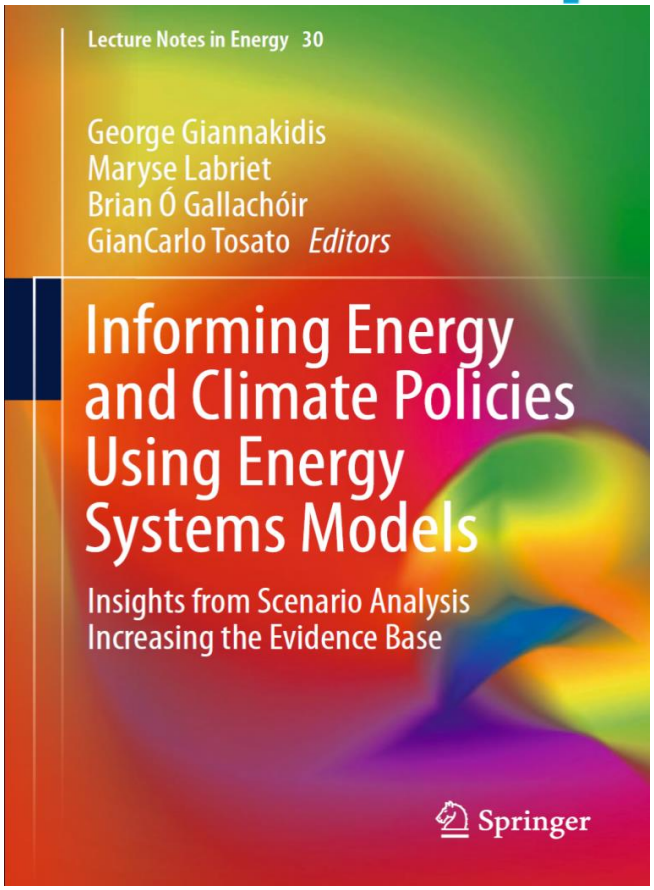

Climate Policies Influenced

2014 National Action Plan on Climate Action

2014 Negotiation with EU on 2030 Targets

2003 Energy White Paper

2007 Energy White Paper

2008 Climate Change Act

2015 Climate Action & Low Carbon Development Act

2014 Negotiation with EU on 2030 Targets

2006 St. Petersburg G8

2011 US DoE Critical Materials Strategy

2012 UK DoE Innovation Strategy

IEA-ETSAP Book 2018

- explores feasibility of a well-below-2°C world
- energy system pathways and technology innovations
- behaviour change and the macro-economic impacts
- chapters directly related to the NDCs

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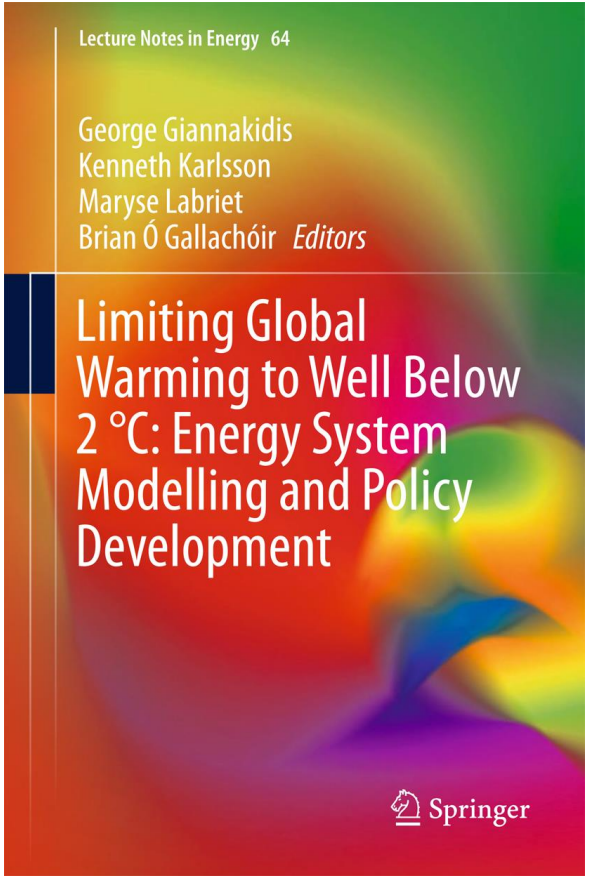

Informing Delivery of Paris

CLIMATE POLICY
2019, VOL. 19, NO. 1, 30–42
https://doi.org/10.1080/14693062.2018.1464893

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RESEARCH ARTICLE

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Zero carbon energy system pathways for Ireland consistent with the Paris Agreement

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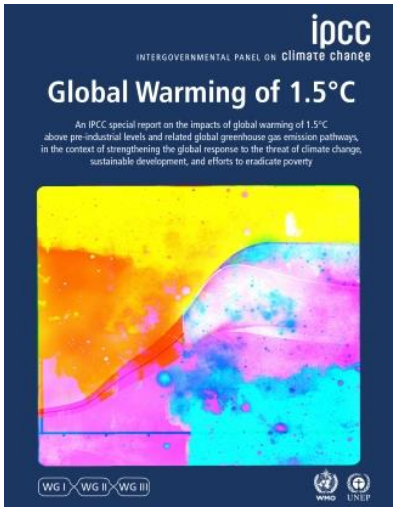

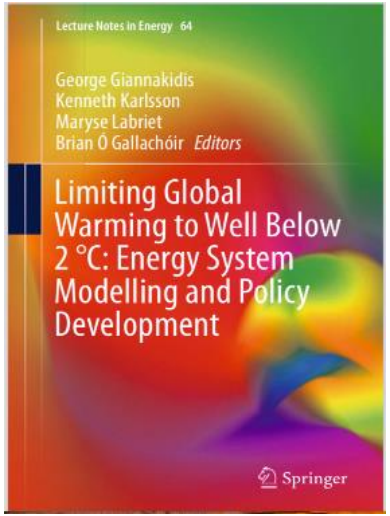

More Information

More information available from www.iea-etsap.org.

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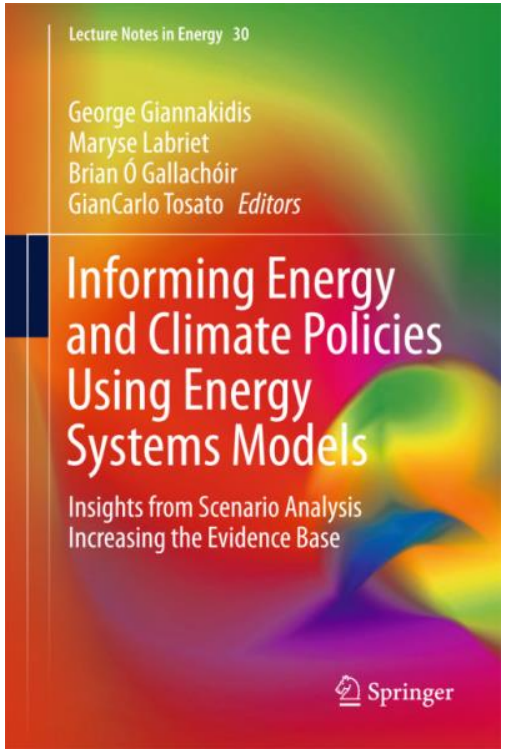
Books on the use of ETSAP tools for Policy formulation



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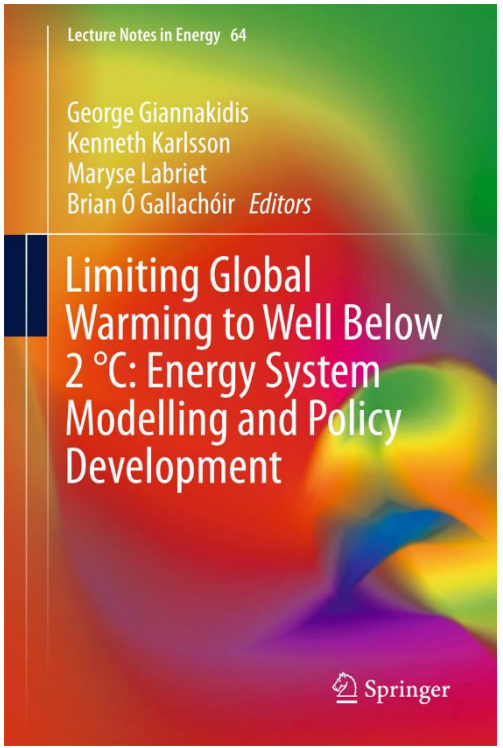

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