



AMPERE

Assessment of Climate Change Mitigation Pathways and Evaluation of the Robustness of Mitigation Cost Estimates

PROJECT NEWSLETTER – 02/2013

The AMPERE project aims to increase the robustness of climate policy modelling while accounting for the conceivable complexities of future climate policies. Modelling idealized global policy scenarios with long-term targets and full global cooperation is already a complex endeavour, but the task is more challenging yet when we take into account that actual international climate policy has largely been fragmented and focussed on the short term. Nonetheless, some countries – including the members of the European Union – have begun to discuss roadmaps for emissions reduction until 2050 and can benefit greatly from more robust insights into the costs of possible mitigation scenarios. Through AMPERE, which commenced in February 2011 with funding from the European Union, we aim to provide such insights. The AMPERE partners in Europe, Asia and America combine the capabilities of 19 integrated assessment models to examine a broad range of mitigation scenarios that reflect the limitations of real-world policies.

In its second project year (February 2012 through January 2013), AMPERE studied the role of near-term goals and technology options for climate stabilisation and the impact of regional policies under delayed global cooperation. These studies are based on model results from across the AMPERE teams. The modelling specifications that had been developed during the first project year were further refined during the second year. Furthermore, we held a first stakeholder meeting to help focus our analysis so that it is most relevant from the economic and political perspective. Equipped with new research findings and insights from the stakeholder dialogue, we are now preparing to complete, synthesise, and disseminate our mitigation pathway assessments and for evaluations of the robustness of mitigation cost estimates.

AMPERE Work Packages

- WP1: The role of climate system representation for mitigation pathways
- WP2: The role of path dependence in energy systems for mitigation pathways
- WP3: The role of inflexible carbon markets for mitigation pathways
- WP4: Mitigation pathways under climate, technology and policy constraints in context
- WP5: Decarbonisation scenarios for Europe
- WP6: Stakeholder involvement and dissemination of results

Implementation of AMPERE model intercomparison studies

In January 2013, the AMPERE teams achieved a key objective of the project by conducting studies on the role of path dependency in energy systems and incomplete regional policy coverage for mitigation pathways. These studies are intended for publication as an AMPERE special issue of the international journal *Technological Forecasting and Social Change*. The findings are based on AMPERE work packages 1, 2 and 3, including data from twelve global integrated assessment models supplemented with climate model data. At project meetings in Venice and Utrecht, the AMPERE teams coordinated the data analysis in order to ensure that the special issue covers a wide range of questions related to the dynamics of international energy systems and policies.

Studies on the role of path dependence in energy systems

Several of the conducted studies focus on the role of path dependence in energy systems. These studies, based on AMPERE work package 2, include topics such as:

- The relevance of short-term emission targets for long-term climate objectives
- Path dependence and carbon lock-in
- The role of key mitigation technologies and energy efficiency

The findings from these studies provide insights into the implications of near-term policies for the costs and attainability of long-term climate objectives. A preliminary finding is that if international mitigation efforts until 2030 remain comparable to the national pledges of the Copenhagen Accord and Cancún Agreement, further lock-in of energy systems into fossil fuels would not be avoided. This in turn would result in significantly higher transitional costs and larger reliance on negative emissions technologies for attaining low greenhouse gas stabilization targets.

Studies on the role of fragmented regional climate policies

Another set of studies, based on AMPERE work package 3, focuses on topics related to regionally fragmented climate policy and potential staged accession to global cooperation:

- Regional cost implications
- The role of potential regional climate policy pioneers such as the European Union
- Carbon leakage and technology diffusion

Among other questions, the findings from these studies address the climate change mitigation potential and cost of unilateral early action by the European Union. Preliminary findings are that unilateral EU action induces only moderate carbon leakage to other regions and only a small increase in mitigation costs. However, EU action has only a small climate change mitigation effect unless joined by action from the rest of the world within the coming decades.

Climate projections for delayed and fragmented action scenarios

The climate outcome of the AMPERE mitigation scenarios is being addressed through Work Package 1. The AMPERE partners Climate Analytics and the Hadley Centre have established a common climate modelling framework for all scenarios using a simple carbon cycle/climate model in combination with an emulator of general circulation climate models. This is being used to examine how policy delay or fragmentation impact the climate outcome of mitigation efforts. We are also investigating the relationship between cumulated CO₂ budgets and climate stabilization targets in greater depth.

Model diagnostics and validation

The AMPERE model comparison exercises conducted in 2012 offered an opportunity to diagnose the behaviour of the participating models in order to facilitate the interpretation of model results and improve the robustness of conclusions. We performed a diagnostic analysis of responses to carbon price signals among participating models. Based on this, we have established a rough classification scheme for integrated assessment models. This classification is expected to add value to community-wide integrated assessment modelling efforts beyond the scope of AMPERE. In this context, AMPERE collaborated with the U.S. DOE-funded program on integrated assessment modelling development, diagnostics and intercomparison (PIAMDDI) in holding a joint workshop on model diagnostics and validation at Stanford University in May 2012.

The robustness of modelling outcomes can be further gauged through systematic validation. This is why AMPERE work package 4 has established a framework for the validation of model results through analyses and comparisons with historical trends. This model validation concept is exploring new ground as there is currently no standard or protocol for the validation of integrated assessment models. The AMPERE validation framework will be tested in the third year of the project.

Decarbonisation scenarios for Europe

The role of Europe as a potential pioneer for international climate policy is an important element of the AMPERE studies on fragmented regional climate policy. This is going to be followed by more detailed studies of the implications of decarbonisation for Europe. These studies, which are being conducted by AMPERE work package 5, will examine the direct energy system and economic impacts as well as conceivable co-benefits of climate mitigation action across Europe.

Stakeholder engagement

To ensure that the AMPERE research direction leads to outcomes that are valuable to policymakers and stakeholders, AMPERE researchers exchanged ideas and insights with expert stakeholders at a workshop in Venice in May 2012. Participants joined from institutions like the UN, the European Commission's DG Energy and DG Climate, IEA and EURELECTRIC, amongst others. The workshop discussions helped to clarify what policy analysts and stakeholders need to learn from model-based climate policy assessments and what type of assessments we should aim for. The workshop proceedings can be found at: http://ampere-project.eu/web/images/General_information/1st_stakeholder_meeting_notes.pdf

A further stakeholder workshop is planned for June 12, 2013 in Brussels, focusing on what conclusions can be drawn from the conducted AMPERE studies.

Outlook

The third and final AMPERE year will be dedicated to the publication and synthesis of the results from completed modelling exercises, further modelling studies, and the dissemination of findings. Whereas the studies that we conducted during the second project year look primarily at global dynamics, we are preparing further studies on the specific impacts on Europe. The dissemination of the ensemble of AMPERE model results is going to be coordinated with relevant stakeholders and policy analysts in Brussels and elsewhere.

The AMPERE Consortium

The AMPERE consortium involves 21 project partners from several European countries, China, India and Japan, as well as one external partner from the United States:

Potsdam-Institut für Klimafolgenforschung (PIK), the Coordinator

Internationales Institut für Angewandte Systemanalyse (IIASA)

Universiteit Utrecht (UU)

Fondazione Eni Enrico Mattei (FEEM)

Institute of Communication and Computer Systems (ICCS)

Centre for European Policy Studies (CEPS)

Société de mathématiques appliqués aux sciences humaines - Centre International de Recherche sur l'Environnement et le Développement (SMASH-CIRED)

Paul Scherrer Institut (PSI)

Centre National de la Recherche Scientifique - Laboratoire d'Economie de la Production et de l'Integration Internationale (CNRS-LEPII)

ENERDATA SA (Enerdata)

Commission of the European Communities – Directorate General Joint Research Centre – Institute for Prospective Technology Studies (EU-JRC-IPTS)

Universität Stuttgart (USTUTT-IER)

Technische Universität Wien (TUW-EEG)

Centraal Planbureau (CPB)

Université Paris I Pantheon-Sorbonne (ERASME)

MetOffice Hadley Centre (MetO-Had)

Climate Analytics (ClimA)

National Institute for Environmental Studies (NIES)

Research Institute of Innovative Technology for the Earth (RITE)

National Development and Reform Commission Energy Research Institute (NDRC-ERI)

Indian Institute of Management (IIM)

External partner: *Pacific Northwest National Laboratory (PNNL)*

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