Use of Scenarios in the Special Report on Renewable Energy of the IPCC Fifth Assessment Report

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May 25, 2011

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There was a long discussion about using scenarios across chapters in the SRREN.

Energy-economic or integrated assessment models

The interaction should go both ways.

Scenarios of scale, timing, location.

Supply curves and related aggregate representations

Vetting scenarios from aggregate models

Bottom-up assessments of technology cost and potential
For Chapter 10, we took on a thorough review of existing scenarios.

► Driving Questions:
  - What sorts of future levels of renewable energy deployment are consistent with different CO₂ concentration goals; or, put another way, what is the linkage between CO₂ concentration goals and the deployment of renewable energy?
  - Which classes of renewable energy will be the most prominent energy producers and how quickly might they expand production?
  - Where would an expansion in renewable energy occur?
  - What is the linkage between the costs of mitigation and an expansion of renewable energy?

► The value of the dataset
  - Latest scenarios, including delayed participation scenarios and limited technology scenarios.
  - Collected data on renewable energy at a more detailed level than in previous assessments.
There is a broad spread of mitigation levels in the dataset.

Imagine how much stronger the story is going to be when we have thousands of scenarios.
Although there is some correlation between renewable deployment and mitigation level, there is enormous uncertainty.
Primary energy is not all that linked to stabilization level.
Fossil energy is tightly correlated to fossil and industrial \( \text{CO}_2 \) emissions.
Low-carbon energy is far less correlated, because of energy demand.
Looking only at renewable energy adds the uncertainty of competition between nuclear and CCS.
Maybe the deployment of renewable energy is just a function of whether nuclear and CCS are available.
But that is clearly not the whole story.
The increase in costs from limiting renewables is comparable to the increase from limiting other technologies.
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There is no correlation between carbon prices and renewable energy deployment levels.
The growth rates for some technologies are quite large.
One of the main lessons is that much of the growth in renewable energy takes place in the developing world.
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In the SRREN, a small set of scenarios were used to for a more detailed exploration.
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Chapter 10 used these specific scenarios to construct cost curves.
Chapter 10 also produced mitigation by technology for these scenarios.
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These sorts of ranges were passed to the chapter with the goal that they would try to explain what might need to happen to get to the higher deployment levels.

Global Biomass Primary Energy Supply

Global Wind Primary Energy Supply

Global Solar Primary Energy Supply

Global Hydro Primary Energy Supply

Global Geothermal Primary Energy Supply

Global Wind and Solar PV Electricity Share
Where are we headed with AR5?

- Lots and lots and lots and lots of scenarios
  - AMPERE, EMF 24, RoSE, LINKS, AME
- Imagine how much more illuminating this graph will be with ten times more scenarios!!
Where are we headed with AR5?

► But there are some particularly important new dimensions of coordination of scenarios:
  
  ■ Technology, particularly with limits on the deployment of particular technologies, for example, nuclear energy and CCS.
  
  ■ Policy, particularly idealized policy scenarios, for example the EMF 22 and EMF 24 scenarios.
  
  ■ Linkage to RCPs.
  
  ■ Some scenarios with coordinated socioeconomics.

► Remaining to be worked out

  ■ How will scenarios be used within WGIII?
  
  ■ How will the RCPs be used to link across working groups?
Questions