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The Paris Process and the Role of Integrated Assessment

October 12, 2016

Jae Edmonds

JGCRI Integrated Assessment Workshop
College Park, MD

The Paris Agreement of 2015

- The Paris Agreement of 2015 created a new architecture for addressing greenhouse gas emissions mitigation, but, left many questions unanswered.

- Integrated assessment can potentially inform many of the difficult questions left unanswered by Paris

The Implications of Paris Project

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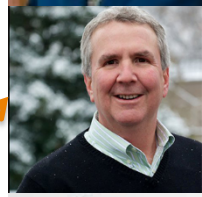
- The Joint Global Change Research Institute with UMD and PNNL partners has begun a project to better understand the implications of the December 2015 Paris Agreement
- The Implications of Paris Project has three goals:
  - Identify research priorities
  - Conduct research to inform the process
  - Communicate results
- The 1st workshop was advised by a prestigious Steering Committee

1st WORKSHOP STEERING COMMITTEE

- *Ghassem Asrar* (JGCRI/PNNL)
- *Rosina Bierbaum* (U. Mich/UMD)
- *Leon Clarke* (JGCRI/PNNL)
- *Armond Cohen* (Clean Air Task Force)
- *Jae Edmonds* (JGCRI/PNNL)
- *Allen Fawcett* (US EPA)
- *Dirk Forrister (IETA)*
- *Nate Hultman* (JGCRI/UMD)
- *Nathaniel Keohane* (Environmental Defense Fund)
- *Toshi Masui* (Nat. Inst. for Env. Studies, Japan)
- *Nakicenovic, Nebojsa* (IIASA)
- *Robert Orr* (JGCRI/UMD)
- *Jonathan Pershing* (U.S. DOS)
- *Rich Rosenzweig* (former, COO, Natsource; former COS, U.S. DOE)
- *John Weyant* (Stanford U.)
- *Tom Wilson* (EPRI)


The May Implications of Paris Workshop

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- The first workshop of the Implications of Paris project was held at the University of Maryland May 3-4, 2016.
- The goal: Identify the highest priority research questions needed to facilitate the successful implementation of the Paris agreement.

UNIVERSITY OF MARYLAND 18 56
SCHOOL OF PUBLIC POLICY
CENTER FOR GLOBAL SUSTAINABILITY

Five broad research questions from the first Implications of Paris workshop

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

1. *How will national circumstances, institutions and goals influence the implementation of NDCs and what are their emissions implications?*
2. *What roles will technology and control of non-energy emissions play in achieving NDCs and the long-term Paris goals?*
3. *What are the best measures of progress toward long-term objectives for the Global Stocktake?*
4. *Can new international institutions make NDCs more effective?*
5. *Can Sustainable Development Goals be achieved simultaneously with the goals of the Paris Agreement?*

Emissions Mitigation—Researchable Questions for IA

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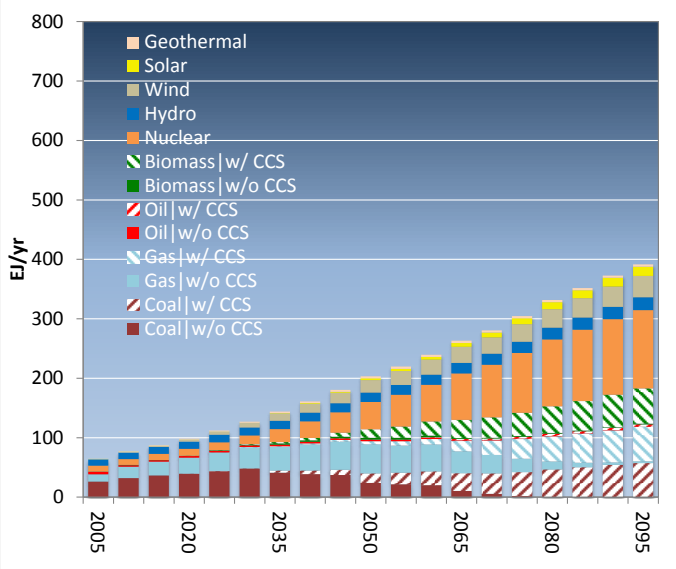
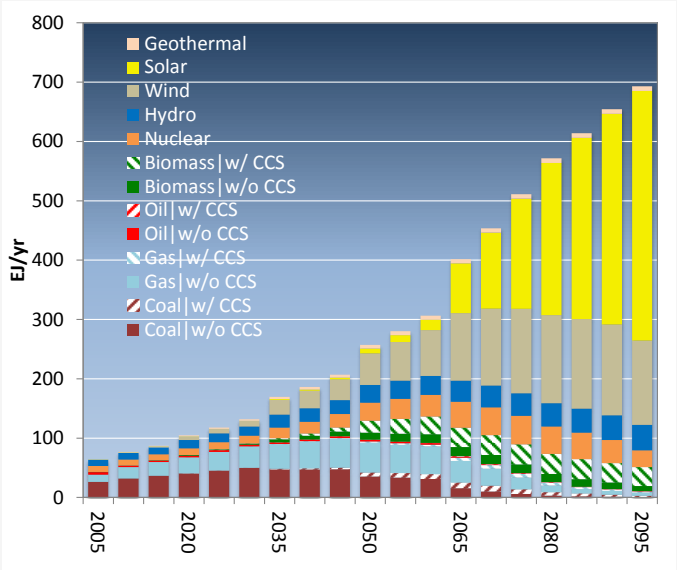
1 How will national circumstances, institutions and goals influence the implementation of NDCs and what are their emissions implications?

Energy systems shaped by regulatory instruments can look very different than energy systems shaped by a carbon tax alone



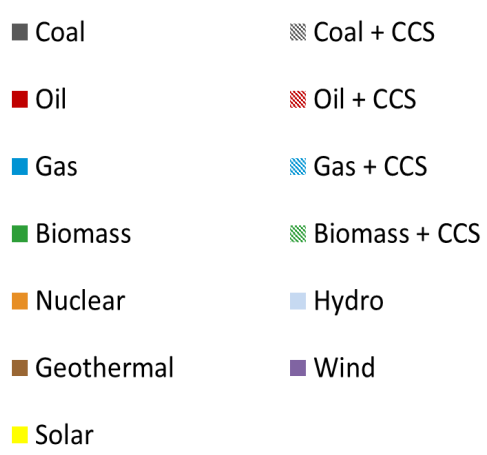


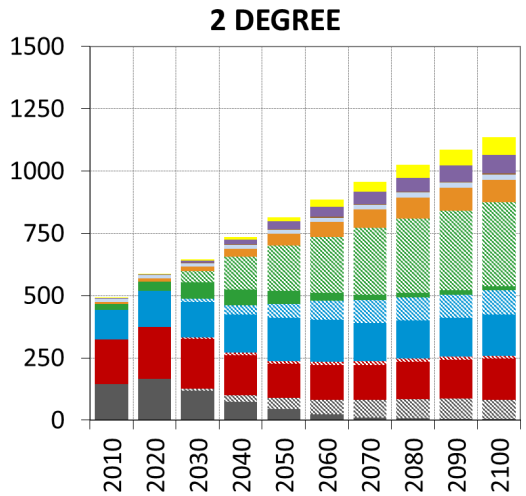
Source: Calvin, et al. , 2014.

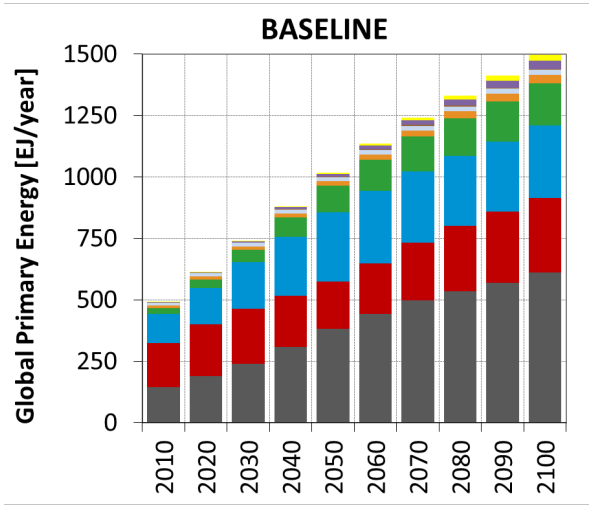
Emissions Mitigation—Researchable Questions for IA

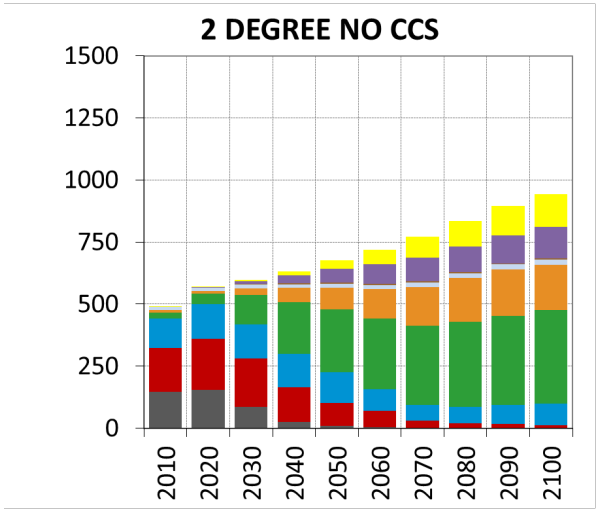
2 What roles will technology and control of non-energy emissions play in achieving NDCs and the long-term Paris goals—well below 2 degrees?

Energy systems consistent with 2 degrees have fundamentally different technology than those that are not









Source: Muratori, et al., 2016.

Five Strategy Element IAMs Us to Get Emissions to Zero

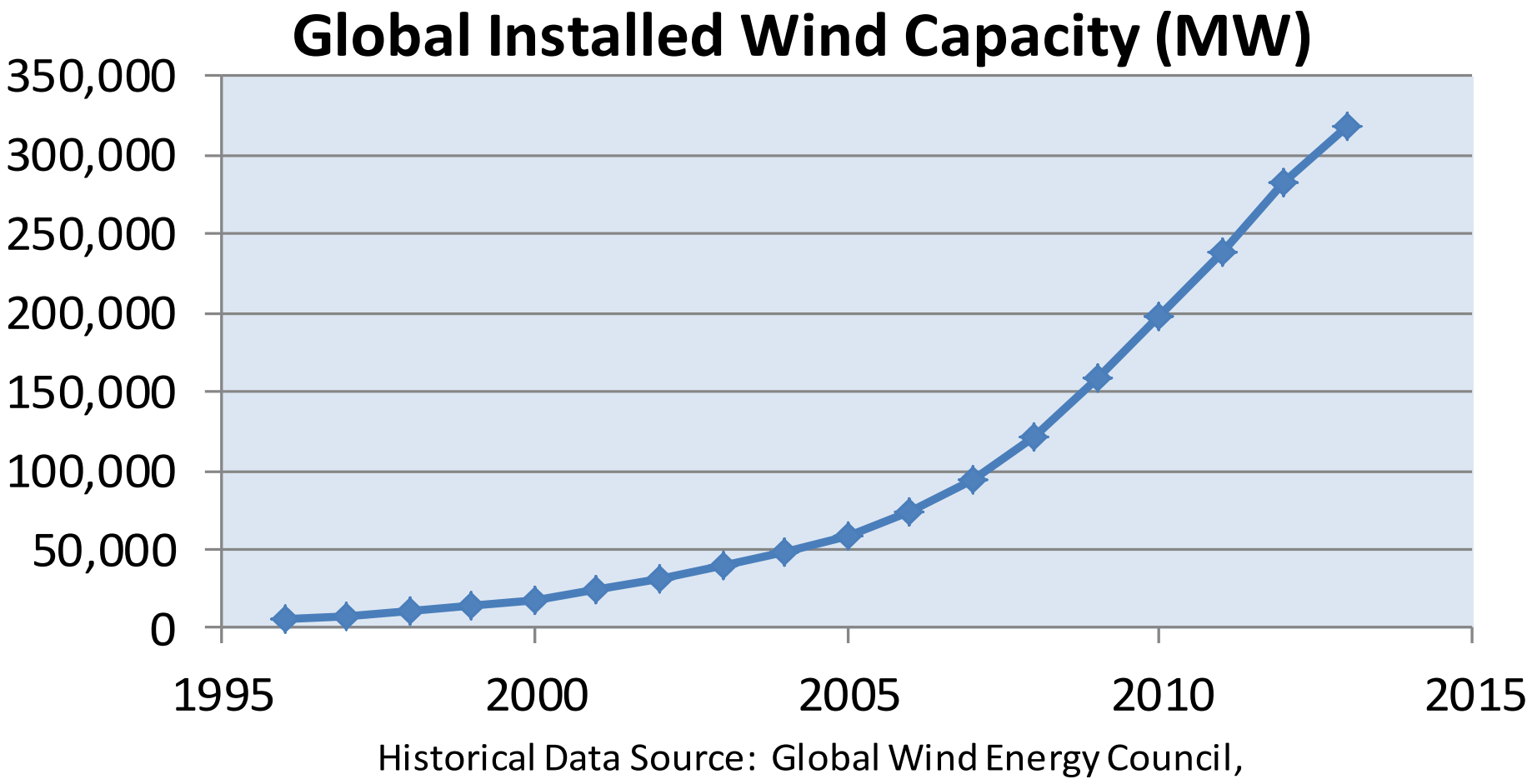
- Energy efficiency—reduce demand for energy as much as economical
- Decarbonize power generation
  - Renewable power
  - Nuclear power
  - Bioenergy
  - Fossil fuel with CCS
  - Bioenergy with CCS
- Electrify Buildings and Industry
- Decarbonize transport
  - Electrify
  - Biofuels
  - H2

Source: http://www.energy.gov/science-innovation/energy-sources/renewable-energy/wind

- Halt deforestation/afforestation and continue improving crop yields

The challenge of scale should not be underestimated

- Historical Growth in Wind Installed Capacity: 1996-2013



Historical Data Source: Global Wind Energy Council,

Installed Wind Capacity: 450 ppm CO_2-e Limit (No Nuclear and No CCS)

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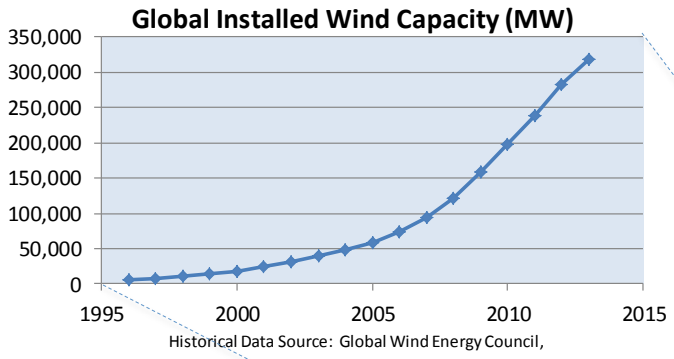
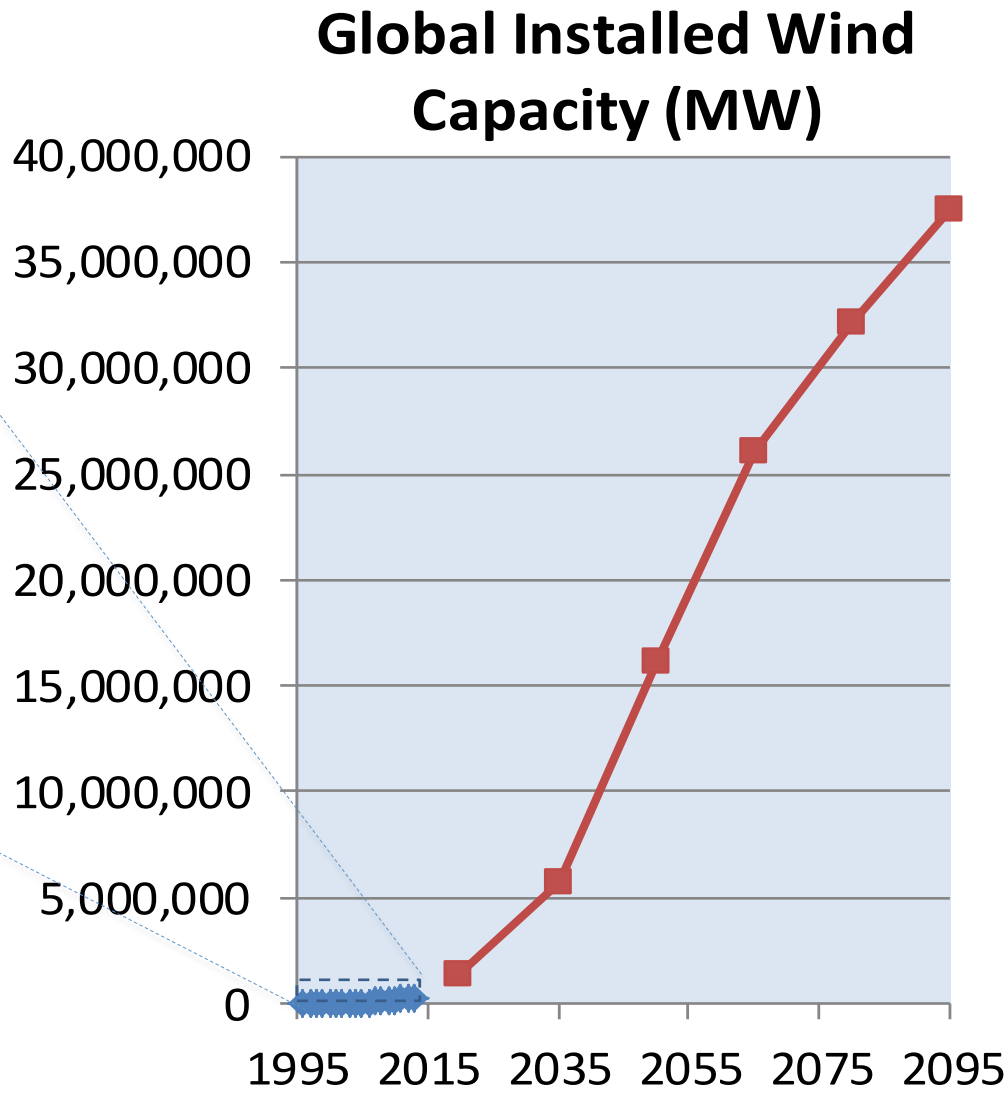


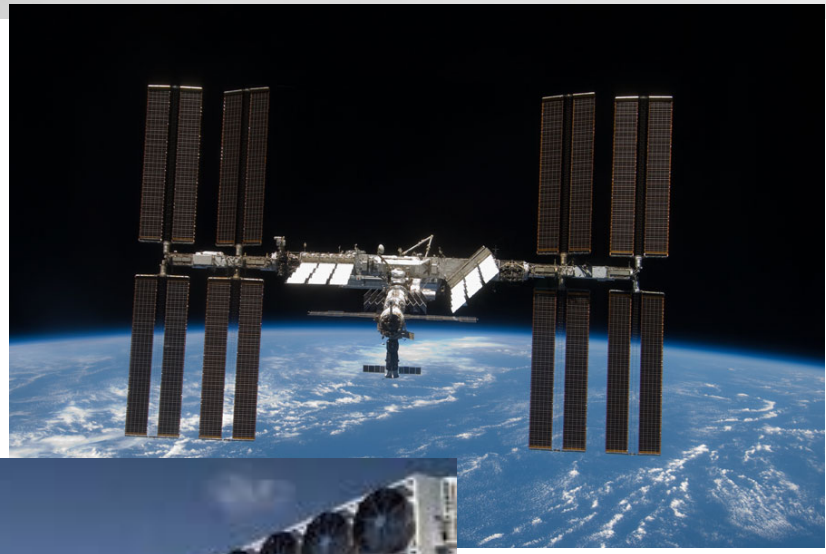


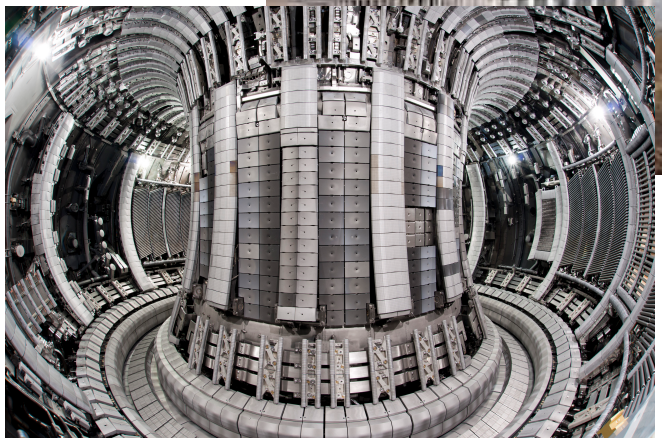
Future Scenario Source:
Calvin, , et al., 2009.

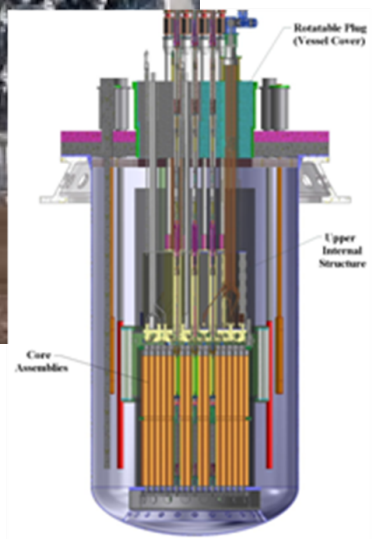
Historical Data Source: Global Wind Energy Council,
http://www.gwec.net/global-figures/graphs/

Technology Wild Cards

- Some technologies that scenarios may or may not include, but which could make a large contribution include:
  - Advanced Nuclear Reactor (HTGR, SFR, FHRs, aSMR)
  - Hydrogen
  - Nuclear Fusion
  - Space Solar Power
  - Free air capture







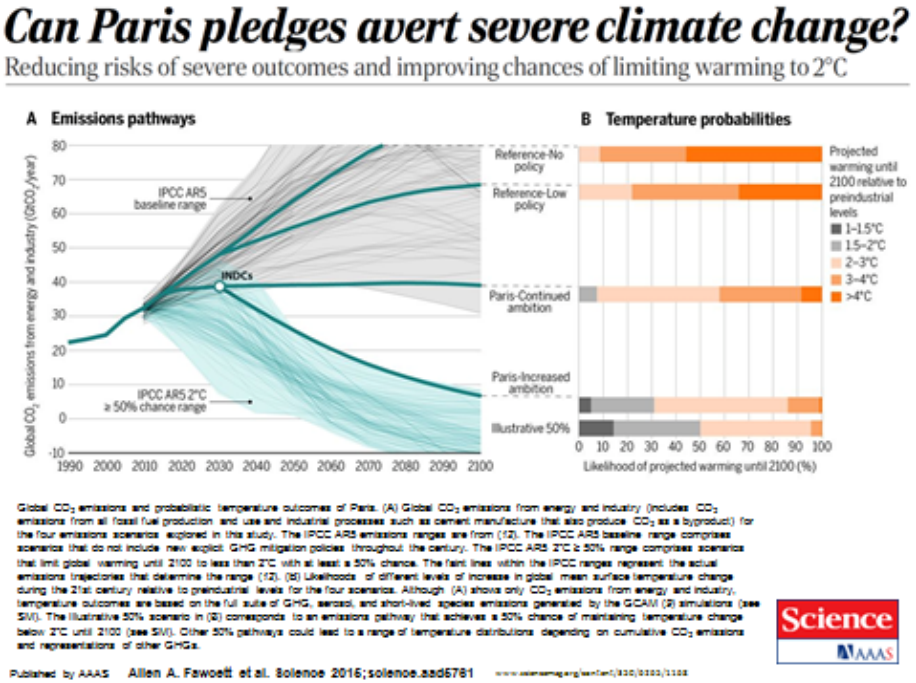
Advanced Sodium-cooled Fast Reactor (AFR-100)

Emissions Mitigation—Researchable Questions for IA

3

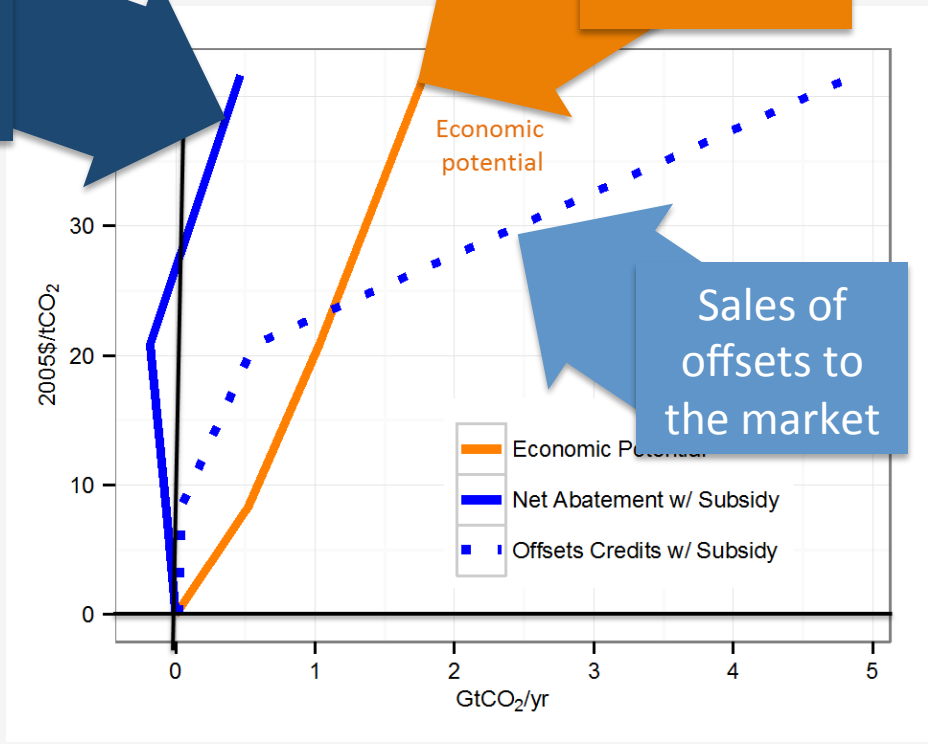
What are the best measures of progress toward long-term objectives —2 degrees /1.5 degrees— for the Global Stocktake?

- Emissions along will be inadequate as a measure of progress toward long-term goals



4 Can new international institutions make NDCs more effective?

- Article 6 and other elements of the Paris Agreement provide for joint implementation and emissions trading without saying how.
- Careful analysis is needed to ensure that the new institutions reduce costs and increases ambition.



The net effect of offset trades depends strongly on the rules. It is not simply a fraction of economic potential. If the rules are constructed poorly, they can even result in an increase in emissions. (Calvin, et al. 2015)

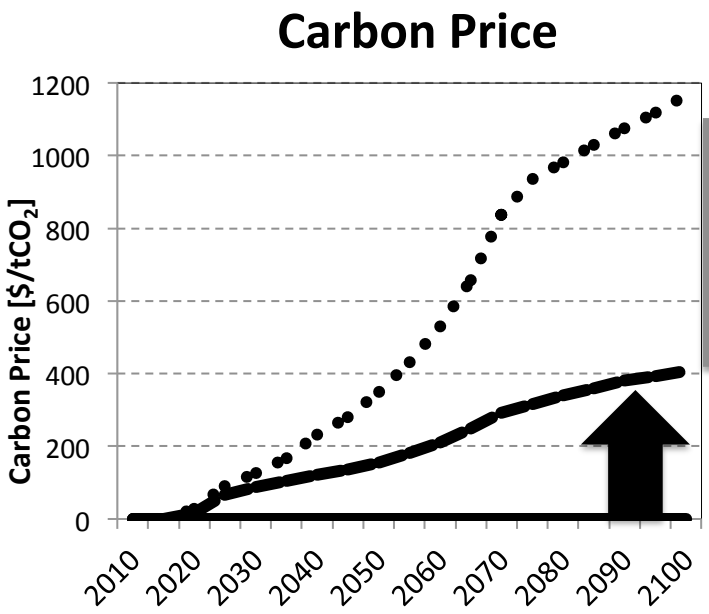
Paris and the Sustainable Development Goals

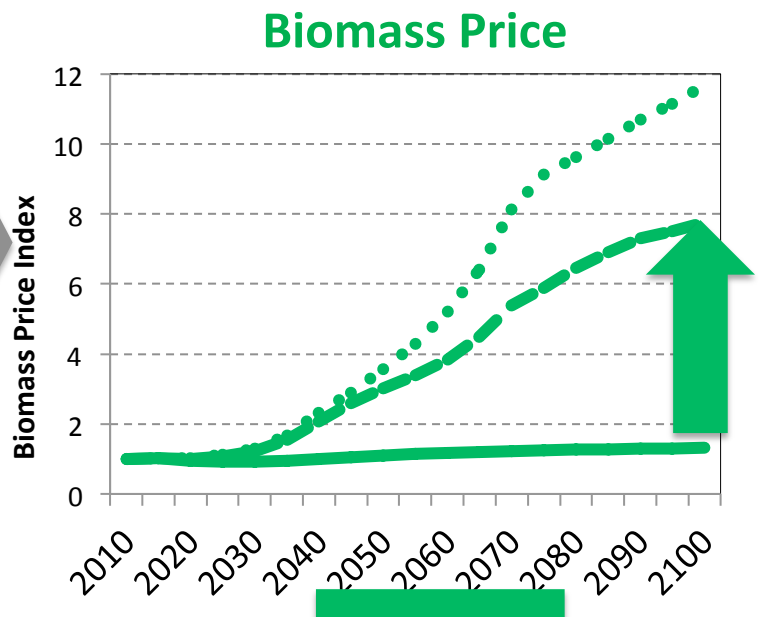
5

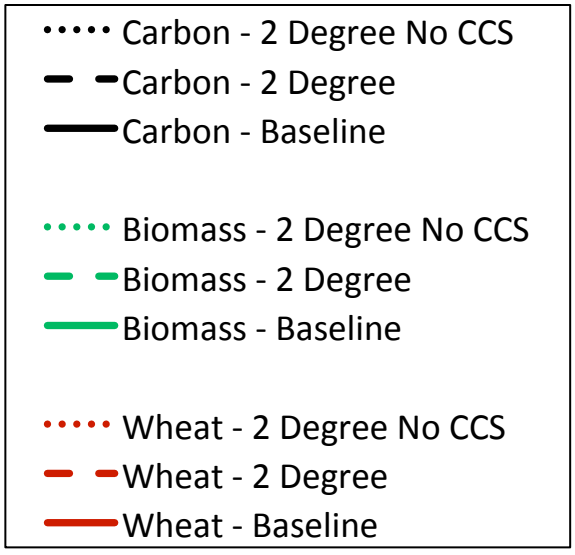
Can Sustainable Development Goals be achieved simultaneously with the goals of the Paris Agreement?

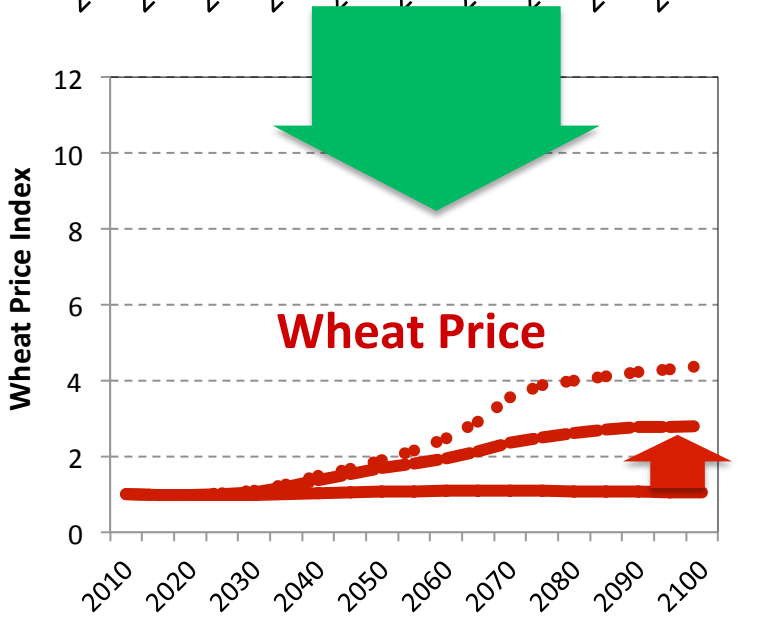
- The assumption that climate policies can be assessed independently of other human goals and objectives is no longer tenable
- Interaction effects are likely too large to ignore
- Policies that pursue multiple objectives —violating the one objective, one policy rule—need to be assessed

Bioenergy Use (and/or afforestation) Produces Upward Pressure On Food Prices









Source: Muratori, et al., 2016

Bioenergy Use (and/or afforestation) Produces Upward Pressure On Food Prices

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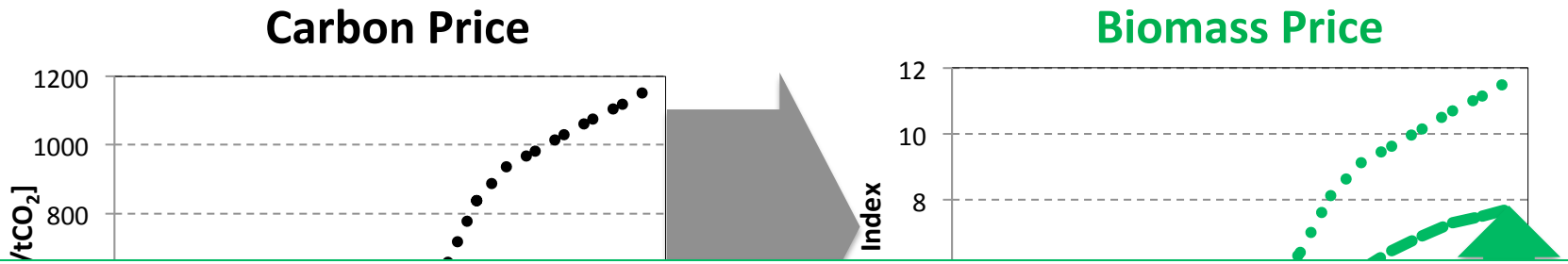
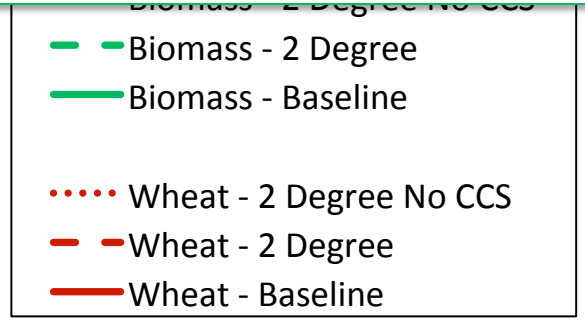
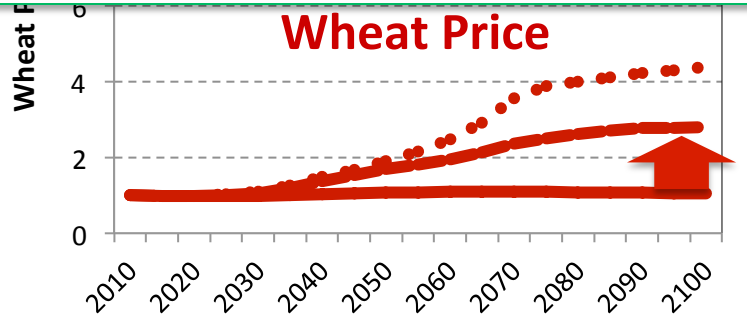


The rate at which crop yields improve will have an important effect on deforestation rates and crop price interaction with mitigation





ratori, et al., 2016

The Implications of Paris is an Ongoing Project

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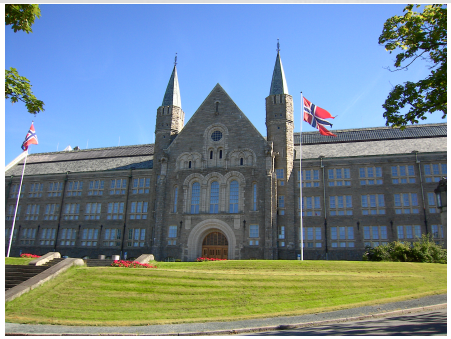
- We at the JGCRI are hard at work on many of these topics
  - Mid-century Strategy work
  - The role of technology
  - Climate and SDG interactions

- Two more workshops are in preparation:
  - March 7, 2017 Trondheim, Norway with an outreach event March 9 in Oslo
  - October 2-3, 2017 Tokyo, Japan



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Discussion