How do models represent policies that come out of real governments? What are implications for international action?

Leon Clarke

Snowmass, 2011

Office of Science
U.S. DEPARTMENT OF ENERGY

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There's a long history of idealized carbon-tax policies and increasing work in scenarios that limit when and where flexibility.

	Model	650 CO2-e		550 CO2-e				450 CO2-e			
		Full	Delay	Full		Delay		Full		Delay	
		Not-to-Exceed	Not-to-Exceed	Overshoot	Not-to Exceed	Overshoot	Not-To-Exceed	Overshoot	Not-to Exceed	Overshoot	Not-To-Exceed
1	ETSAP-TIAM	+	+	+	+	+	+	+	+	+	XX
2	FUND	+	+	+	+	+	+	+	XX	XX	XX
3	GTEM	+	+	+	+	+	XX	+	XX	XX	XX
4	IMAGE	+	+	+	+	+	+	XX	XX	XX	XX
	IMAGE-BC	-N/A-	-N/A-	-N/A-	-N/A-	-N/A-	-N/A-	+	XX	XX	XX
5	MERGE Optimistic	+	+	+	+	XX	XX	XX	XX	XX	XX
	MERGE Pessimistic	+	+	+	+	+	+	XX	XX	XX	XX
6	MESSAGE	+	+	+	+	+	XX	+	XX	XX	XX
	MESSAGE - NOBECS	+	-N/A-	+	+	-N/A-	-N/A-	+	XX	XX	XX
7	MiniCAM Base	+	+	+	+	+	XX	+	+	+	XX
	MiniCAM LoTech	+	+	+	+	+	XX	+	XX	XX	XX
8	POLES	+	+	+	+	+	XX	XX	XX	XX	XX
9	SGM	+	+	+	+	+	+	XX	XX	XX	XX
10	WITCH	+	+	+	+	+	+	XX	XX	XX	XX
						12	6	8	2	2	0

Real-world policies may be real-complicated

An illustrative multi-track regime: Targets + Policy Commitments

	Electricity	Transportation	Industry	Buildings
Australia/New Zealand, Canada, Europe, Former Soviet Union, Japan, United States	Economy-Wide Carbon Constraint CO2 emissions relative to 2005 (80%, 50%, 20%)			
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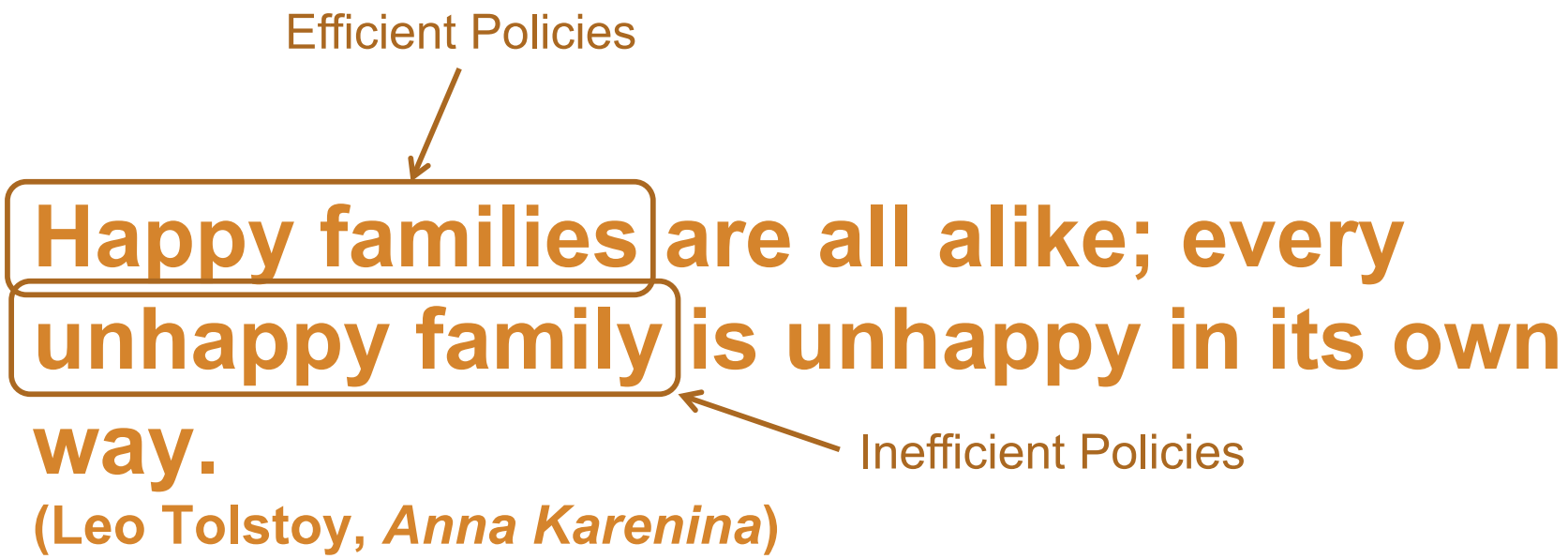
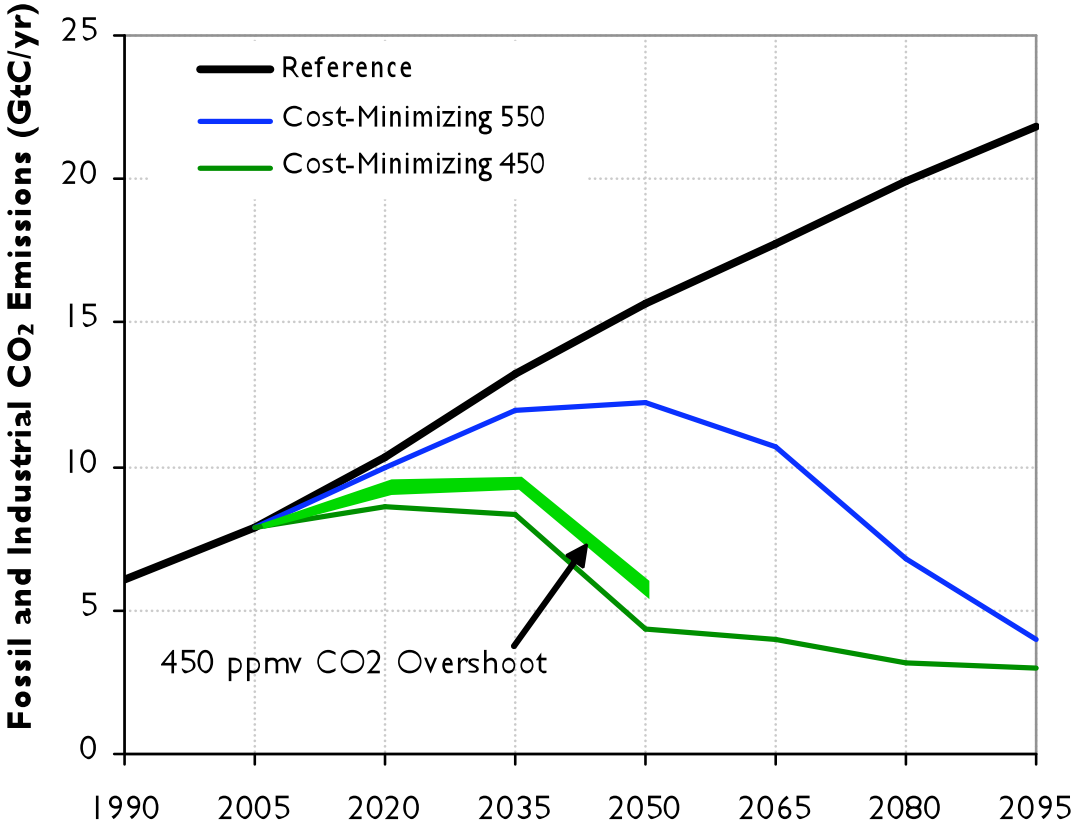


(Leo Tolstoy, *Anna Karenina*)

Exploring "multi-track" pathways to long-term goals.

Objective: visualize and assess illustrative "multi-track" architectures integrating different types of mitigation commitments

- Economy-wide targets
- Policy-based commitments
  - National-level sectoral targets/ standards
- Sectoral agreements
  - Sector-specific policies applied across regions
- Funds for adaptation and technology



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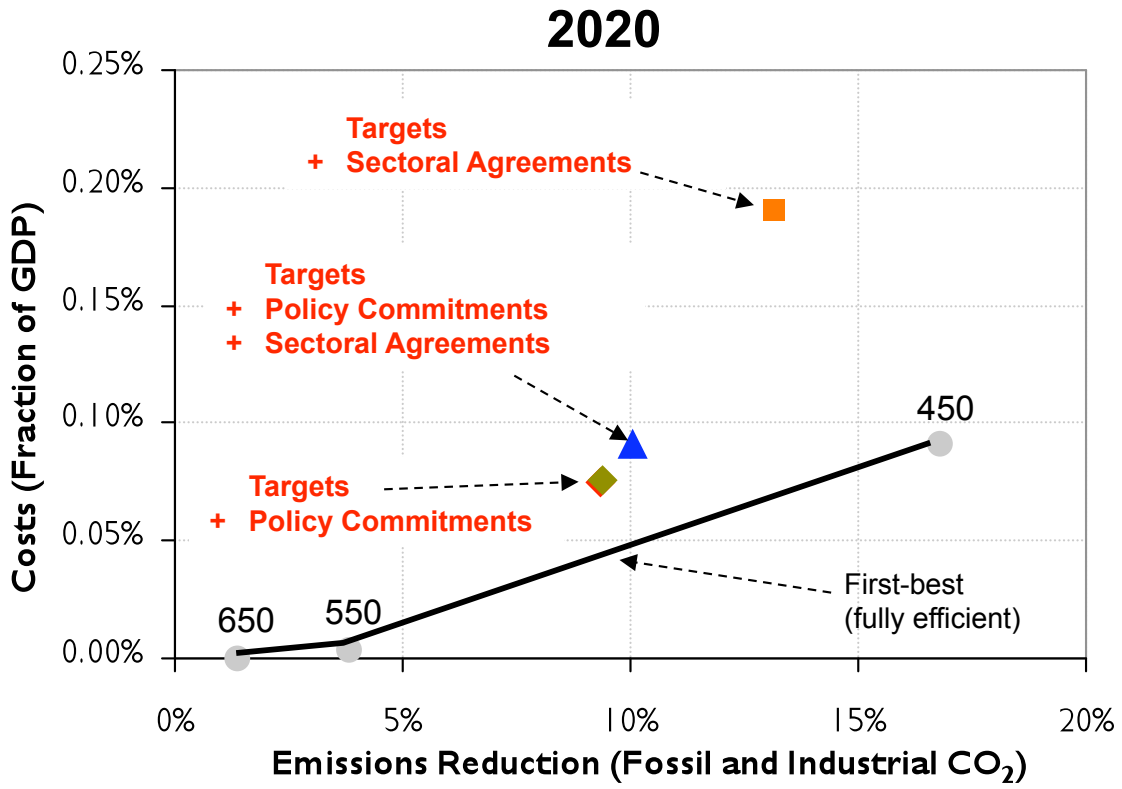
Multi-track regimes lead to less efficient allocation of emissions mitigation, across regions, sectors, and technologies.



- Inefficient policies are ….inefficient.
- The devil is in the details of the policy itself.

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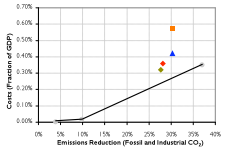
Multi-track regimes lead to less efficient allocation of emissions mitigation, across regions, sectors, and technologies.

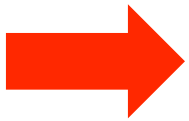
It becomes increasingly challenging to use these policy structures as mitigation becomes more stringent

The 450 ppmv overshoot pathway with Targets & Policy Commitments could not be met without either **expanding coverage** of the multi-track policy or **transitioning to a fully-efficient regime**

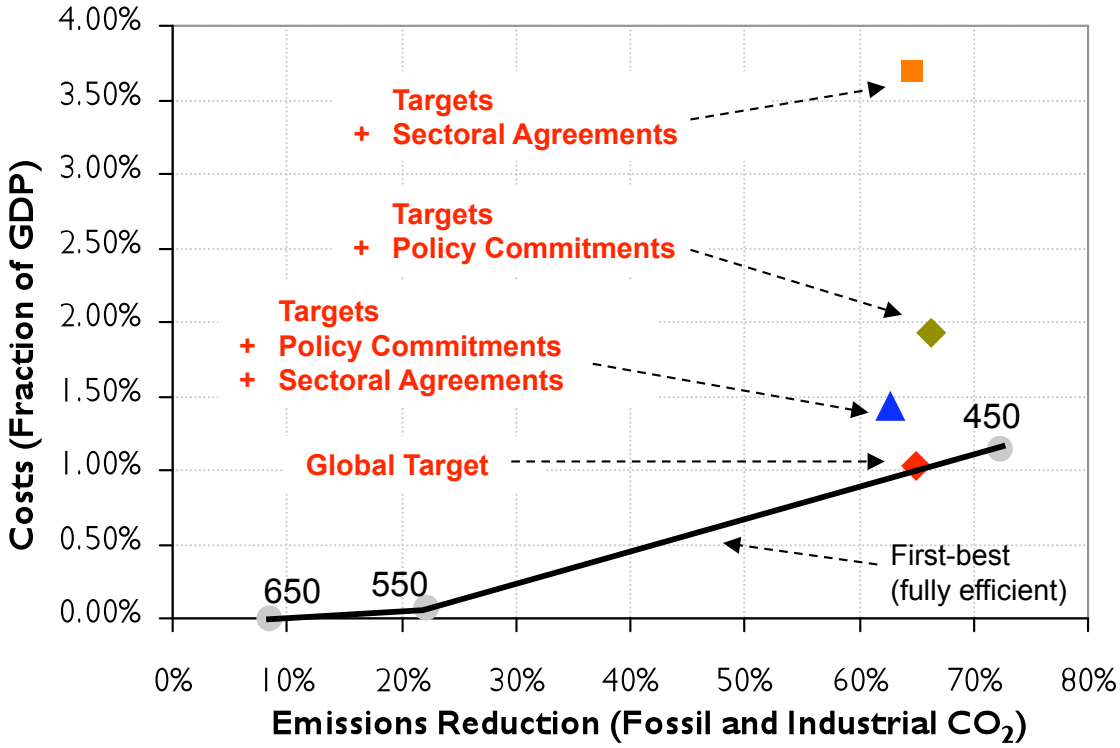
2020

2035





2050



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Transportation and Electricity Sectoral/ Regulatory Policies Scenario

For the first round of EMF 24 (October 2010)

- A **Renewable Portfolio Standard (RPS) in the electricity sector** (note that renewable energy includes all hydroelectric power and bioenergy).
  - The RPS is defined as 20% by 2020, 30% by 2030, 40% by 2040, and 50% by 2050.
  - Nuclear and CCS are not covered under the RPS.
- A requirement that **all new coal power plants** be required to capture and store 90+ percent of their CO2 emissions.
- A requirement for CO_2 emissions reductions in **transportation**.
  - This policy will cover all transportation sectors, as defined in the particular model (it should cover more than light-duty transportation).
  - The policy is defined as a linear reduction from 2012 to 50% below 2005 levels in 2050.
  - Some flexibility if modelers cannot meet the standard.
  - Modelers are encouraged to use whatever policy approaches will work in their model to achieve transportation emissions reductions and that would seem meaningful to develop the scenarios.
  - Biofuels and electricity are assumed to be zero-emissions fuels for calculating the emissions cap.
- Later rounds of EMF 24 are also exploring the implications of a **Clean Energy Standard (CES) in the electricity sector**.

EMF 24 U.S. Specs

Technology Dimension								
	High (Default)	**Single Technology Sensitivities**				**Combined Sensitivities**		**Low**
End Use Technology	High	Low	High	High	High	High	Low	Low
CCS	High	High	Low	High	High	Low	High	Low
Nuclear energy	High	High	High	Low	High	Low	High	Low
Wind & Solar	High	High	High	High	Low	High	Low	Low
Bioenergy	High	High	High	High	Low	High	Low	Low
Shale Gas	M.C.	M.C.	M.C.	M.C.	M.C.	M.C.	M.C.	M.C.
Policy Dimension								
Baseline	US13	US15		US19	US21	US1	US2	US23
Cap & Trade 80%						US25	US26	
Cap & Trade 0%						US 29	US 30	
Cap & Trade 50%	US14	US16	US18	US20	US22	US3	US4	US24
Electricity (Coal + RES) + Transport						US5	US6	
Elecricity (Coal + RES) + Transport + 50% Cap & Trade						US7	US8	
Transport						US9	US10	
Electricity (Coal + RES)						US11	US12	
Electricity (Coal + CES)						US27	US28	

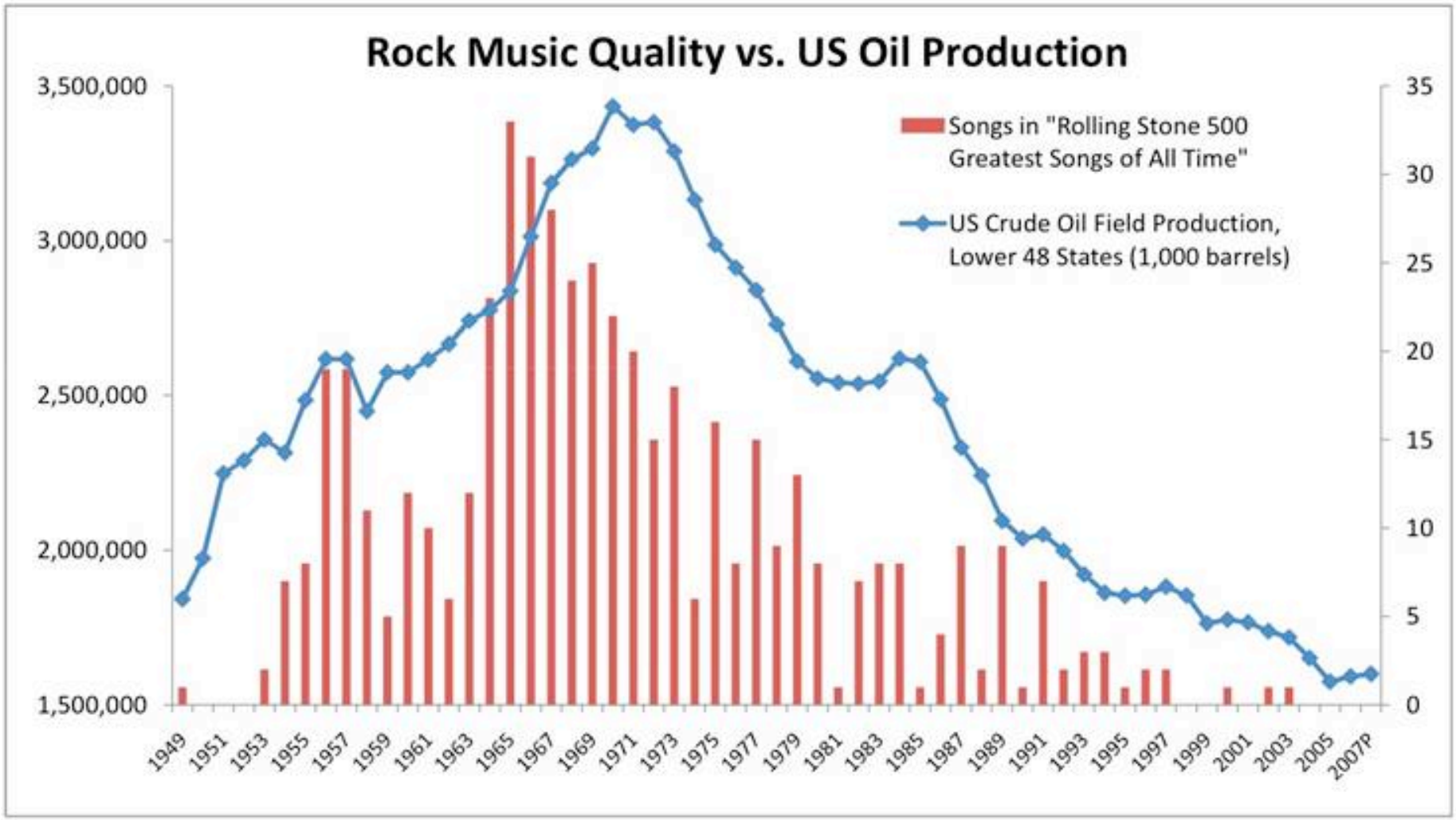
LEGEND

- Required Common Scenarios
- Required Policy Scenarios
- Rquired Technology Scenarios
- Optional (but STRONGLY Recommended) Scenarios

Final Thoughts

- It is possible to explore more complicated policy structures within the higher-resolution IA models.
- Once you deviate from economy-wide policies, there are a lot of different options, and this raises challenging conceptual issues.
- Exploring complex, real-world policy structures does lead to insights about the evolution of climate policy over time and its linkage to other national priorities.
- Considering “real-world” issues highlights the tug-of-war between normative and descriptive analysis
  - as well as the relationship between the near-term and the long-term.
- The emphasis on costs can deemphasize linkage to other national priorities that may have an equal or more important linkage to the realism or feasibility of action.

The effects of policies may be far more reaching that we might anticipate.



Questions