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New Estimates of Global Offset Supply: Accounting for Market Realities

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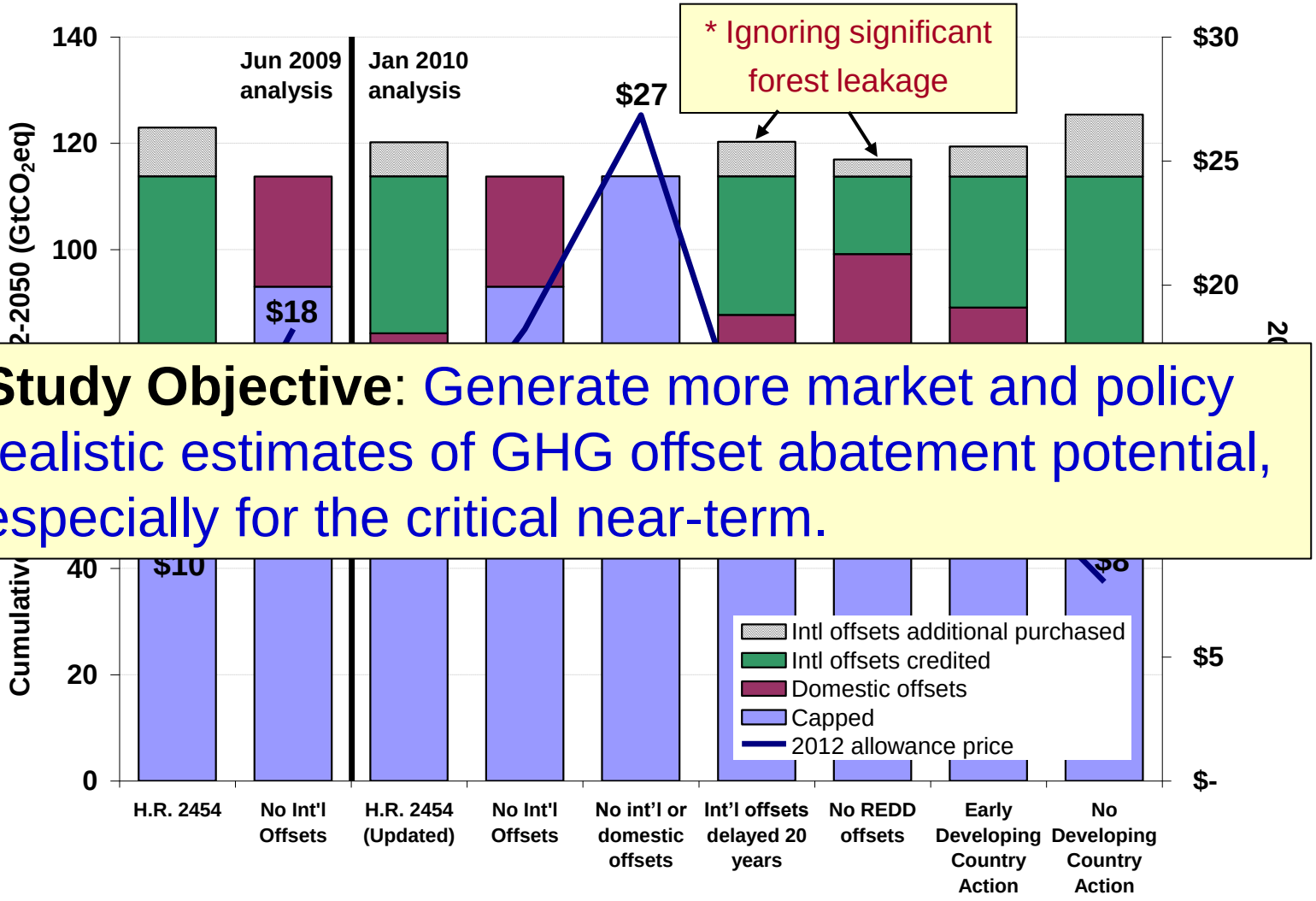
Paris, France

Preliminary results

Compliance Costs Extremely Sensitive to Offset Supply – e.g., H.R. 2454 (Waxman-Markey)



Study Objective: Generate more market and policy realistic estimates of GHG offset abatement potential, especially for the critical near-term.

Source: Derived by S Rose from original and supplemental EPA Analysis H.R. 2454
** See Rose and Sohngen (2011)*

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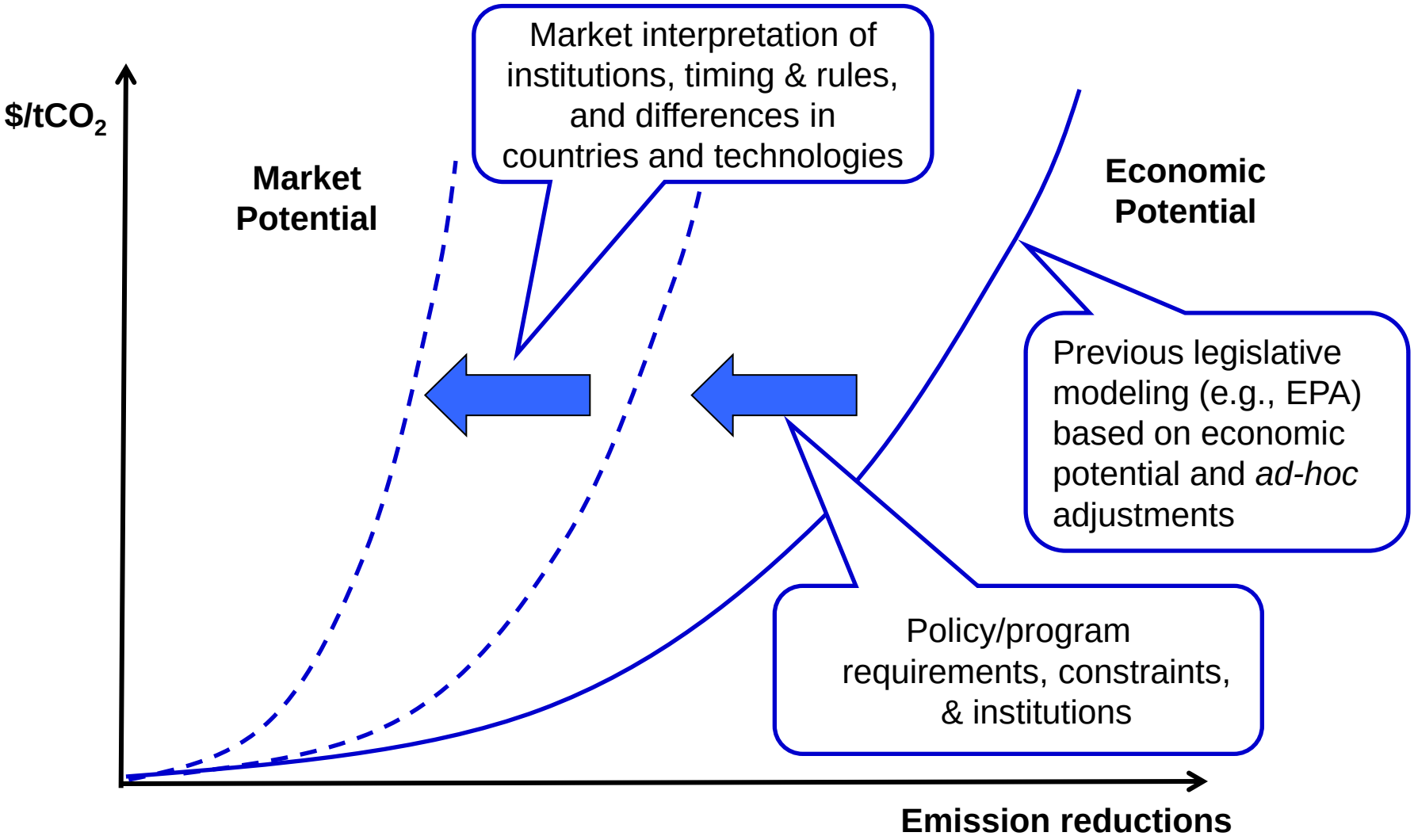
Moving from Economic to Market Abatement Potential



Improving Offset Supply Estimates

1. Accounting for investment risks and different investment contexts

2. Modeling “voluntary supply” incentives by offset suppliers in carbon markets

Two products

1. Improved offset supply curves that better reflect market realities
2. A consistent and flexible global dataset of investment risks – (200 countries x 65 technologies)

Mitigation Estimates for these GHG Sources and Carbon Sinks

Domestic U.S. GHG emissions and sequestration

- Agriculture & forestry
  - Crops and livestock (CH_4, N_2O, soil C)
  - Forestry (primarily soil and above ground C)
- Non-CO_2 GHG sources
  - Landfills (CH_4)
  - Coal mines (CH_4)
  - Oil and gas production and transport (CH_4)
  - Nitric and adipic acid production (N_2O)

International GHG emissions and sequestration

- Agriculture & forestry
  - Crops and livestock (CH_4, N_2O, soil C)
  - Paddy rice (CH_4, N_2O, and soil C)
  - Forestry (primarily soil and above ground C)
- Non-CO_2 GHG sources
  - Landfills (CH_4)
  - Coal mines (CH_4)
  - Oil and gas production and transport (CH_4)
  - Nitric and adipic acid production (N_2O)
- Electric and non-electric energy (CO_2)

Investment Risk Data – Delivery Rates (DR)

Five Risk Factors Affect Delivery Rates

Country

- **Country Investment Risk (CI) –** Risk to the project's continuing operations created by the "host" country's macro-economic, monetary and fiscal policies, and overall stability.
- **Country Carbon Regulatory Risk (CCR) –** Risk associated with the nature and maturity of the host country's regulatory system for bringing forward an offset project for international transaction.

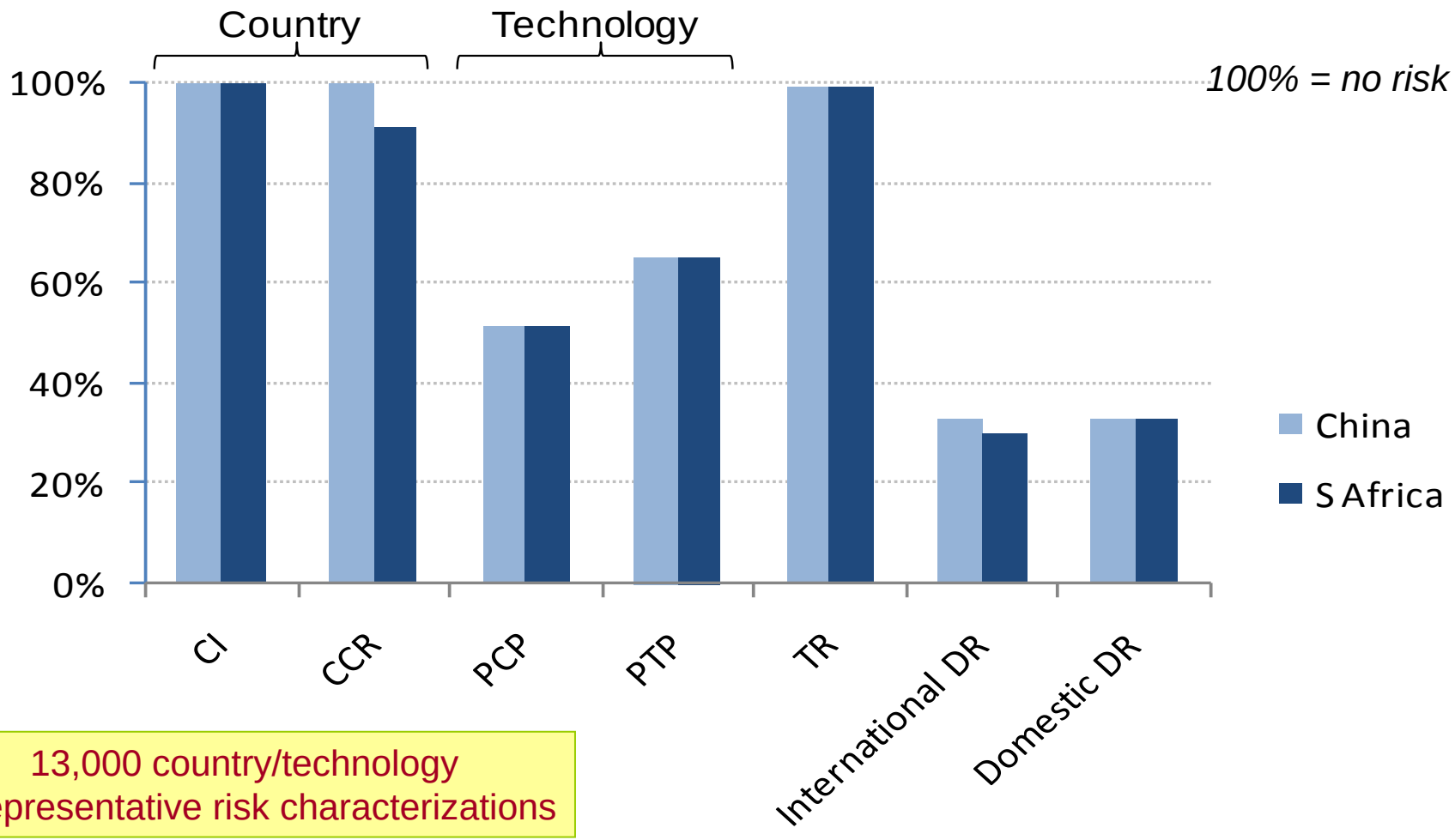
Project

- **Project Carbon Performance Risk (PCP) –** Risk that changes in the international regulatory process may affect a project's ability to produce the contracted volume.
- **Project Technology Performance Risk (PTP) –** Risk that project will not be fully implemented and operational, or that it would encounter operational difficulties once implemented.

Generic

- **Transaction Risk (TR) –** Inherent additional risk that a financial transaction could be cancelled.

Delivery Rate Factors and Overall Delivery Risk
Example: China & S Africa Coal Mine Methane



13,000 country/technology representative risk characterizations

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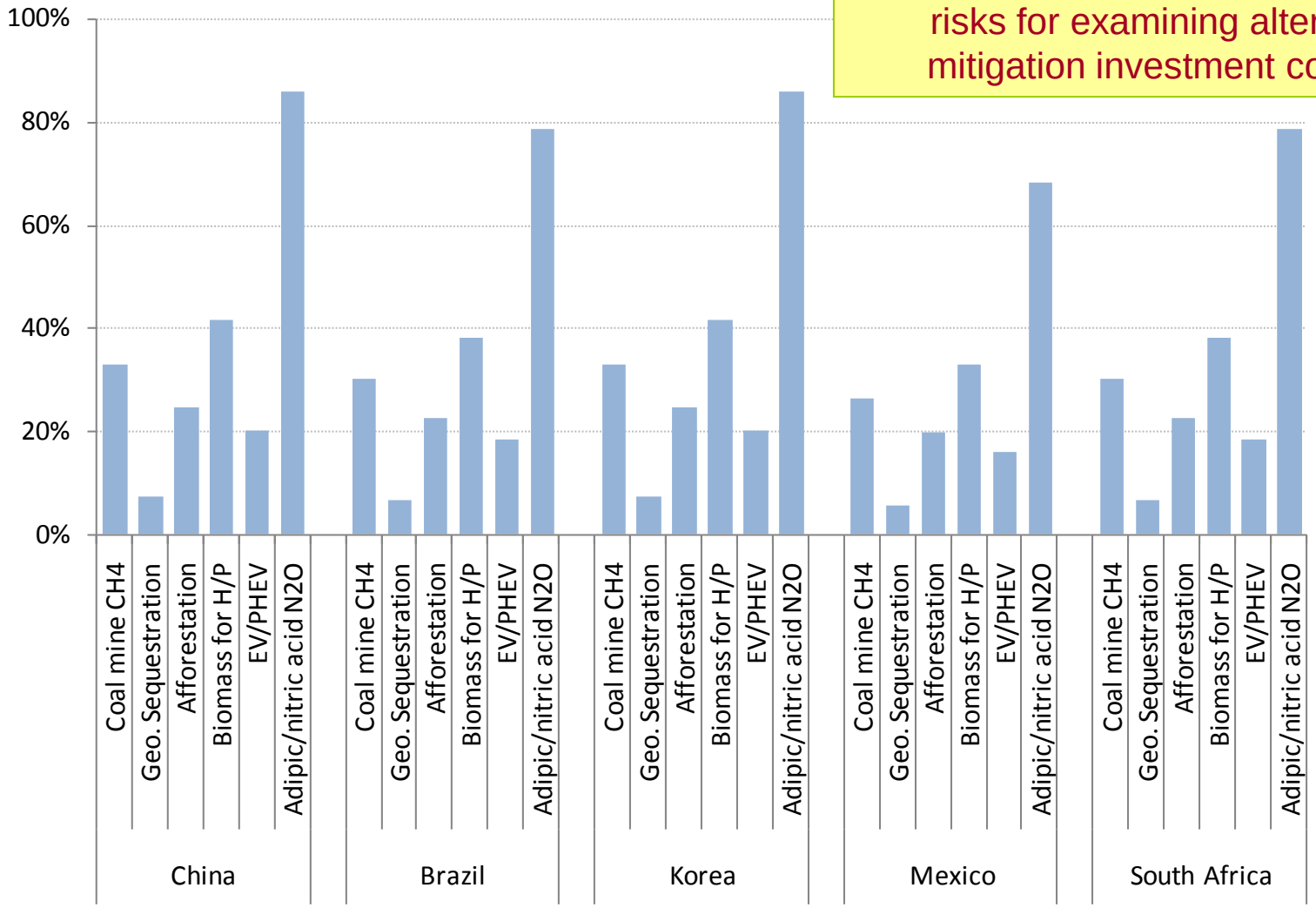
Sample of International Delivery Rates for Different Project Types

The data is raw material on relative risks for examining alternative mitigation investment contexts



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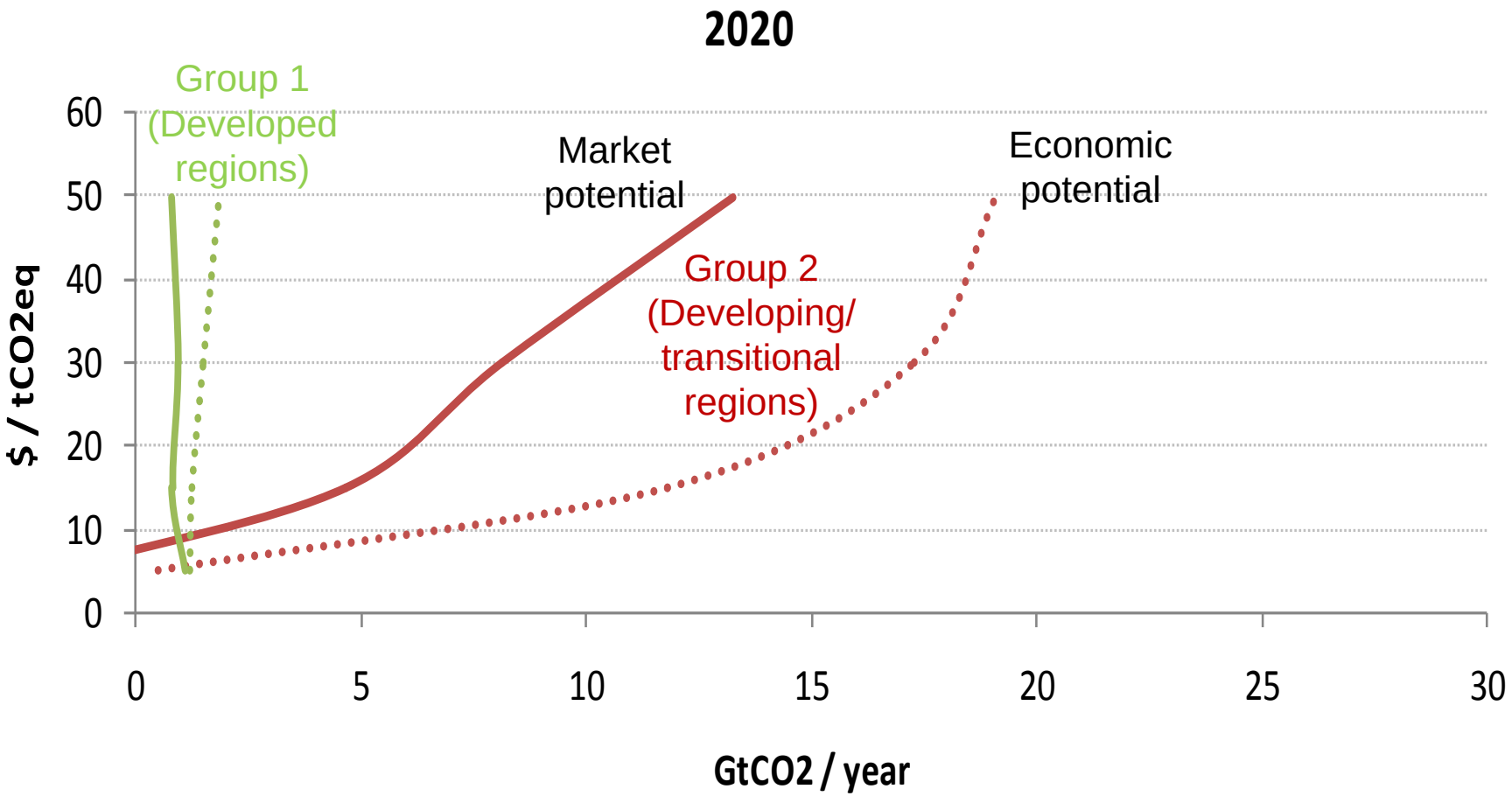
Delivery Rate Adjusted “Market Potential” Results – Sample

Regional Forest Mitigation Supply 2020



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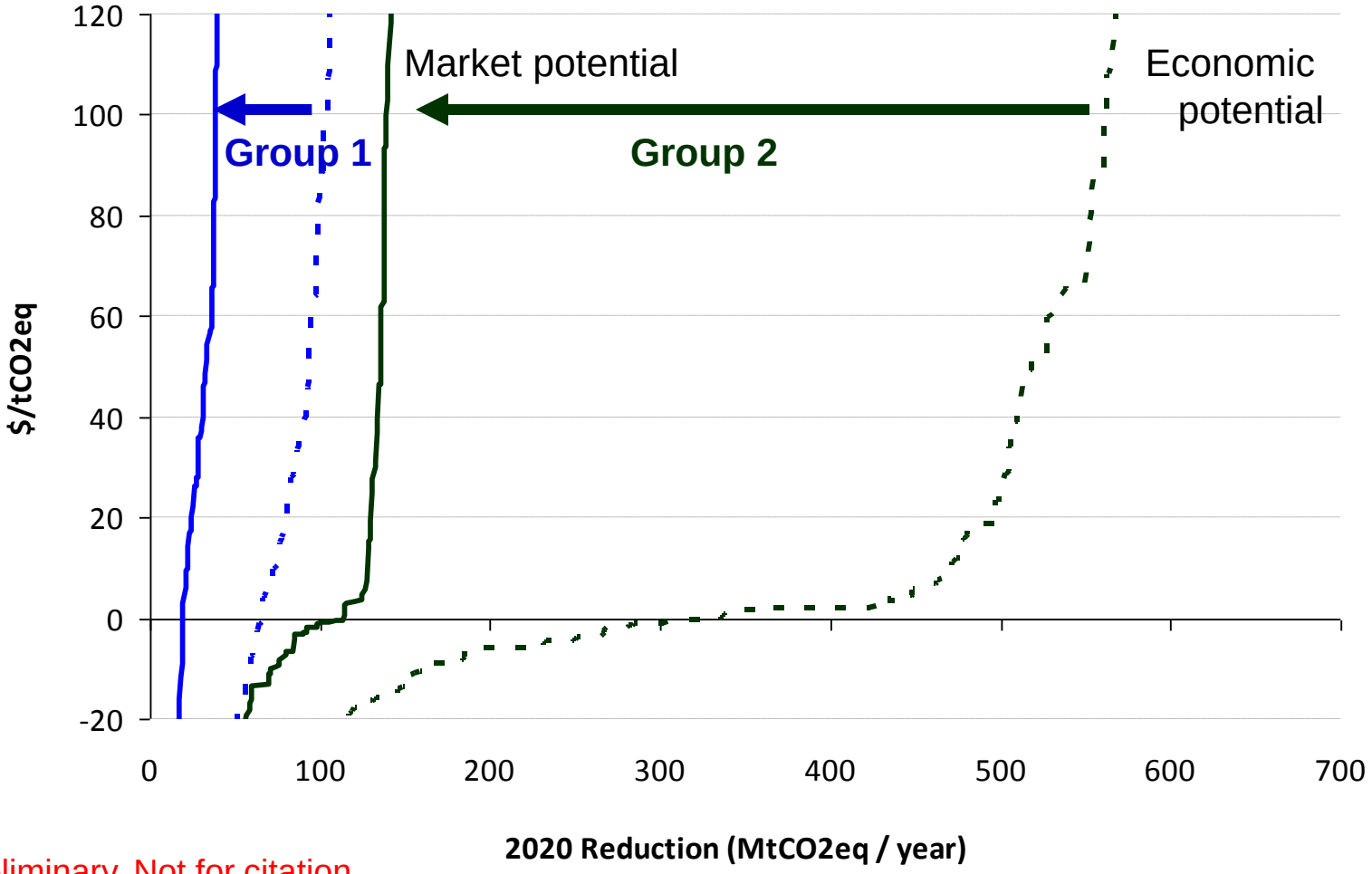
International Agriculture (Crops, Rice Paddies, Livestock) GHG Mitigation Supply in 2020



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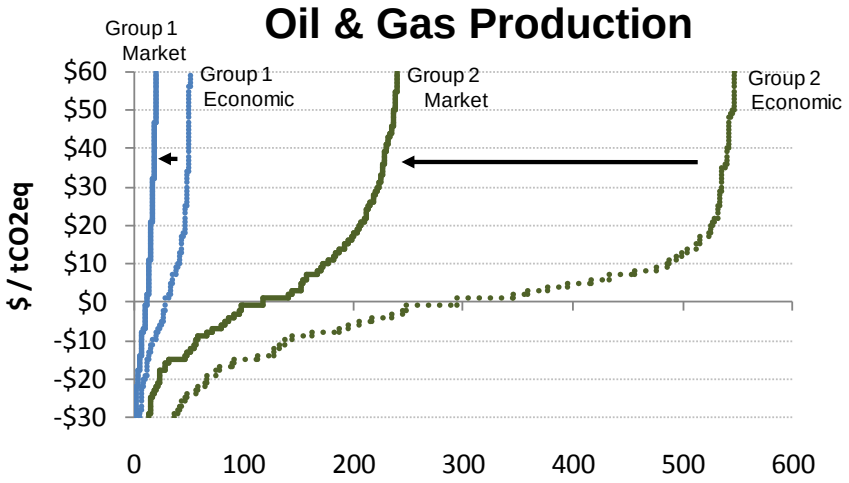
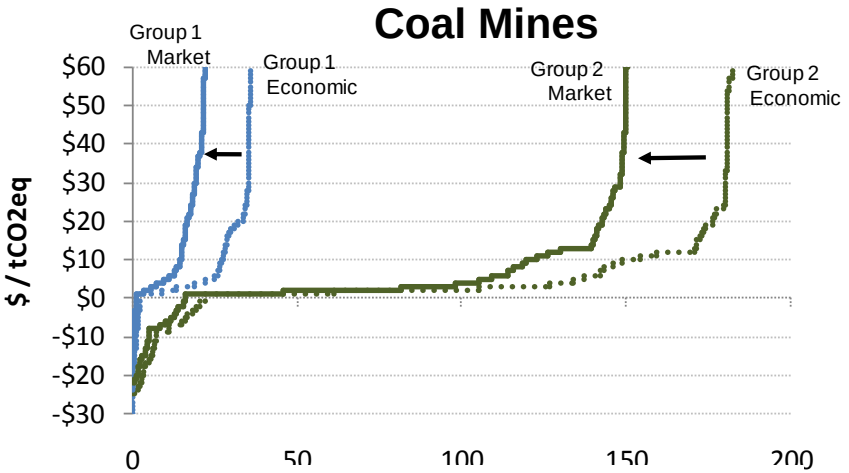
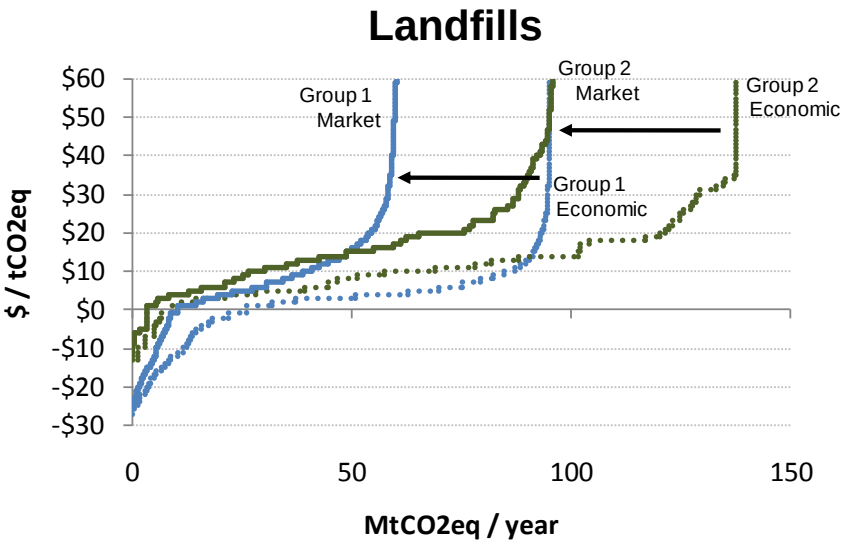
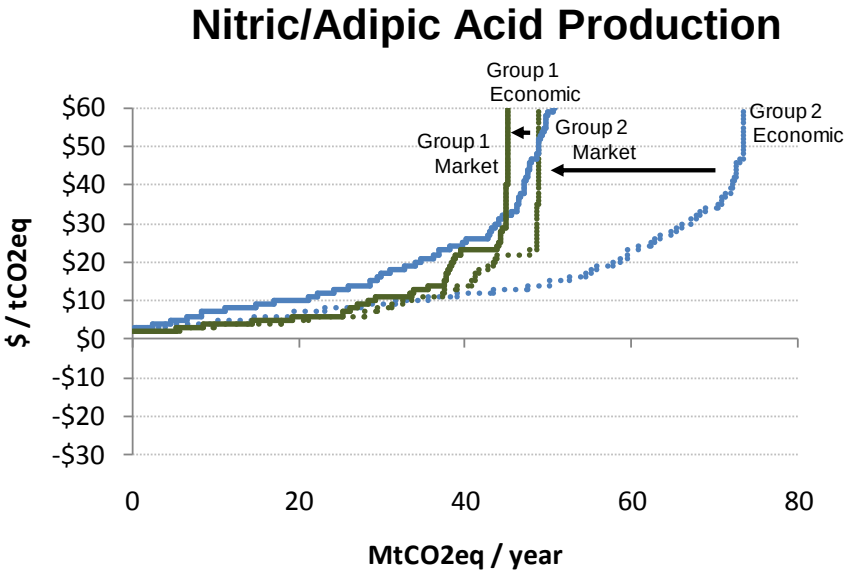
International Energy, Industry, Waste Non-CO2 GHG Mitigation Supply in 2020









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Regional Reordering in Mitigation Supply
E.g., International Forests

- Delivery likelihood changes supply importance of regions (e.g., SE Asia, SSA)
- Relative likelihood magnifies these effects ➔ shows importance of modeling

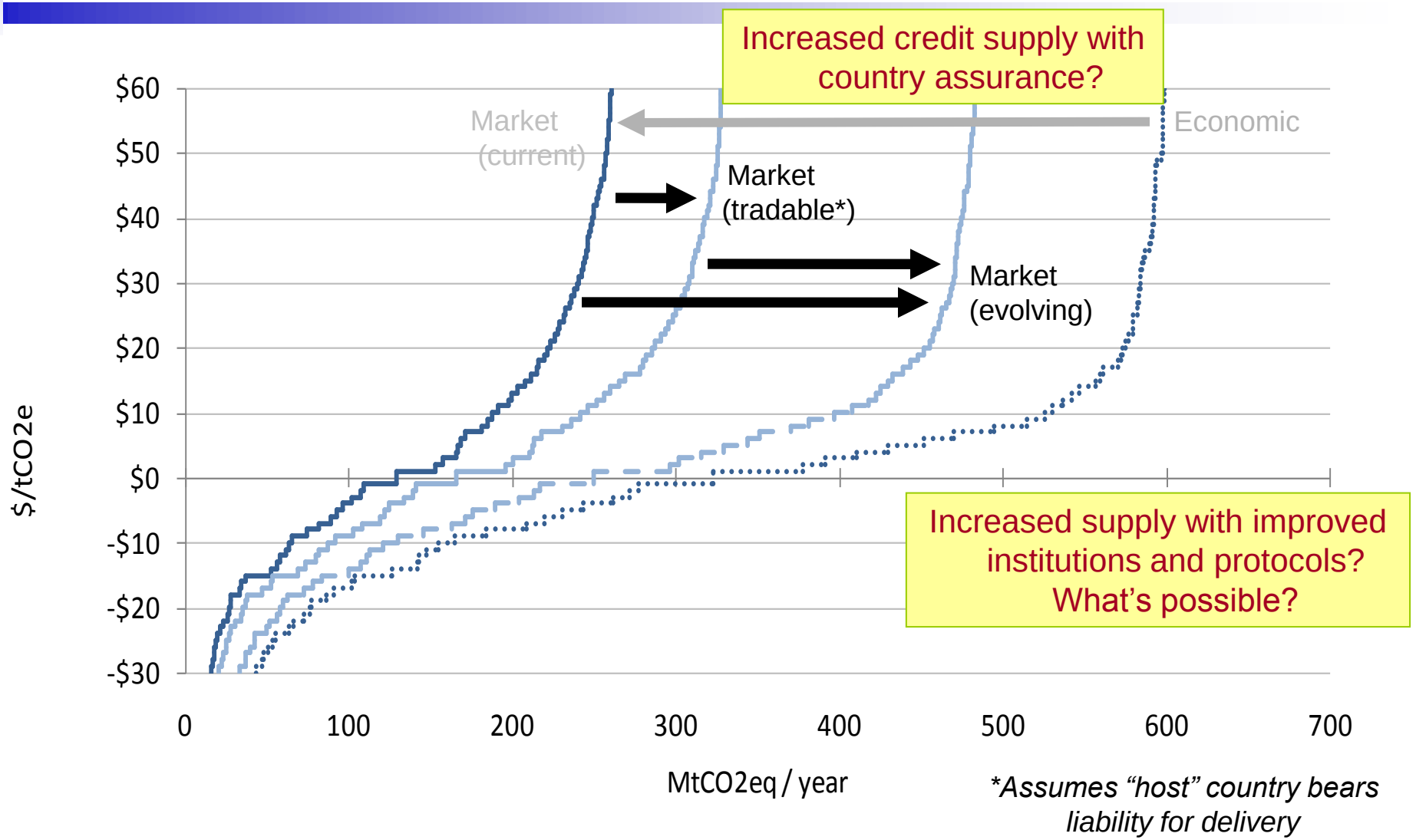
Cumulative Carbon Gains* Above Baseline by 2020 ($15/tCO$_2$)

	Economic potential (GtCO2)	Market potential (GtCO2)	% of economic potential	Prescribed delivery rate
India	11.6	10.6	91%	50%
SE Asia	8.7	0.5	6%	37%
Sub-Saharan Africa	7.3	1.4	19%	22%
Rest of S America	6.3	3.4	55%	38%
Brazil	5.7	4.2	73%	46%
China	4.5	4.2	94%	50%
Russia	3.1	2.0	63%	51%
Oceania	2.6	0.8	31%	29%
C America	2.6	2.5	97%	38%
E Asia	2.2	0.2	10%	35%
S Asia	0.6	0.1	16%	28%
N Africa/Middle E	0.6	0.5	82%	25%
Group 2 Total	55.7	30.4	55%	n/a

* Notes: Includes additional aboveground and below ground carbon sequestration

Improved Risk Conditions in the Future?

E.g., Intl. Oil & Gas Production Mitigation Supply 2020



*Assumes "host" country bears liability for delivery

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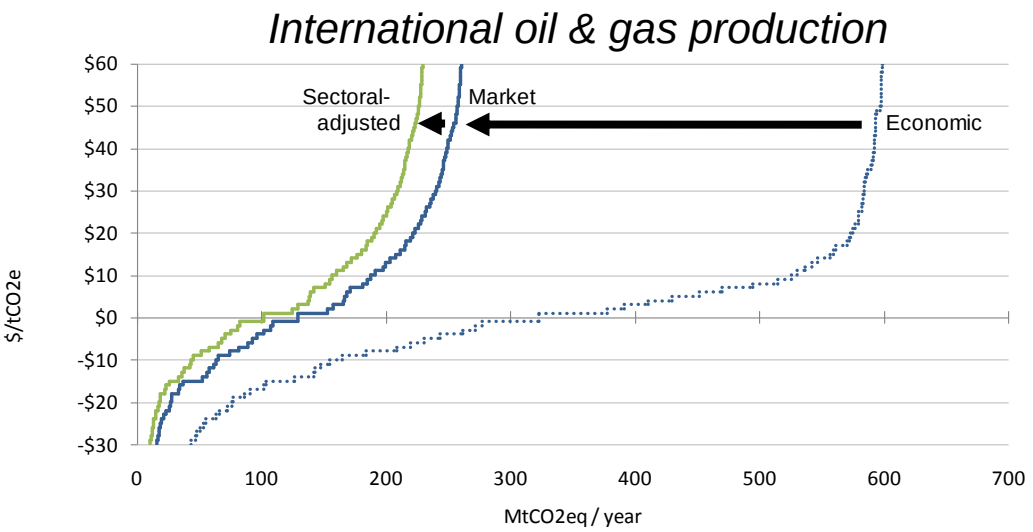
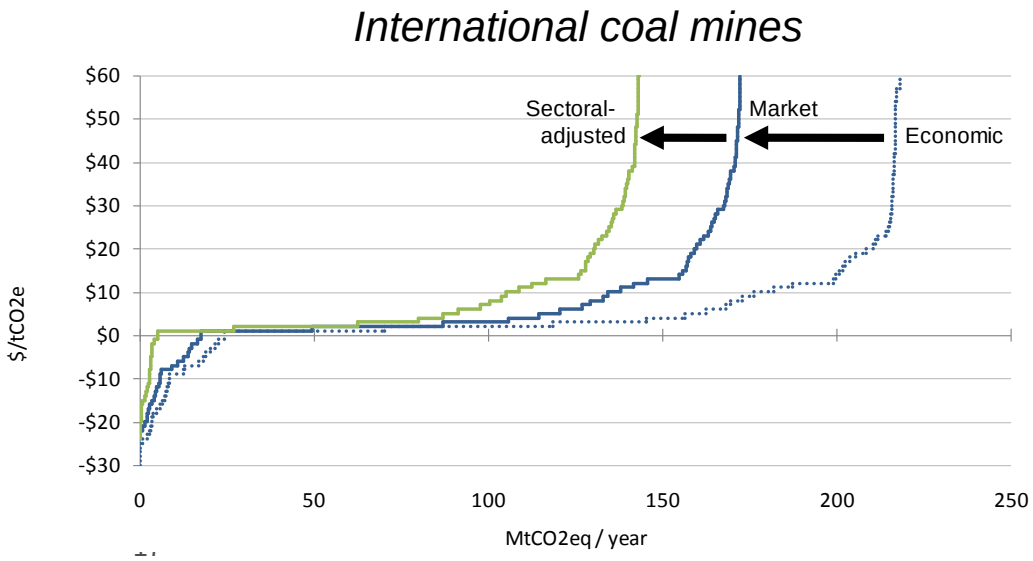
Mitigation Potential Adjusted for "Sectoral" Offset Policy Environment

Country	Sectoral policy
Brazil	35% below business as usual (BAU) by 2020
China	45% emission intensity reduction below 2005 levels by 2020
Russia	25% below 1990 levels
India	25% emission intensity reduction below 2005 levels by 2020
Mexico	30% reduction below BAU by 2020
South Africa	34% below BAU by 2020

Reduced supply due to delivery risks & sectoral compliance





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Modeling “Voluntary Supply” Incentives by Offset Suppliers in Carbon Markets

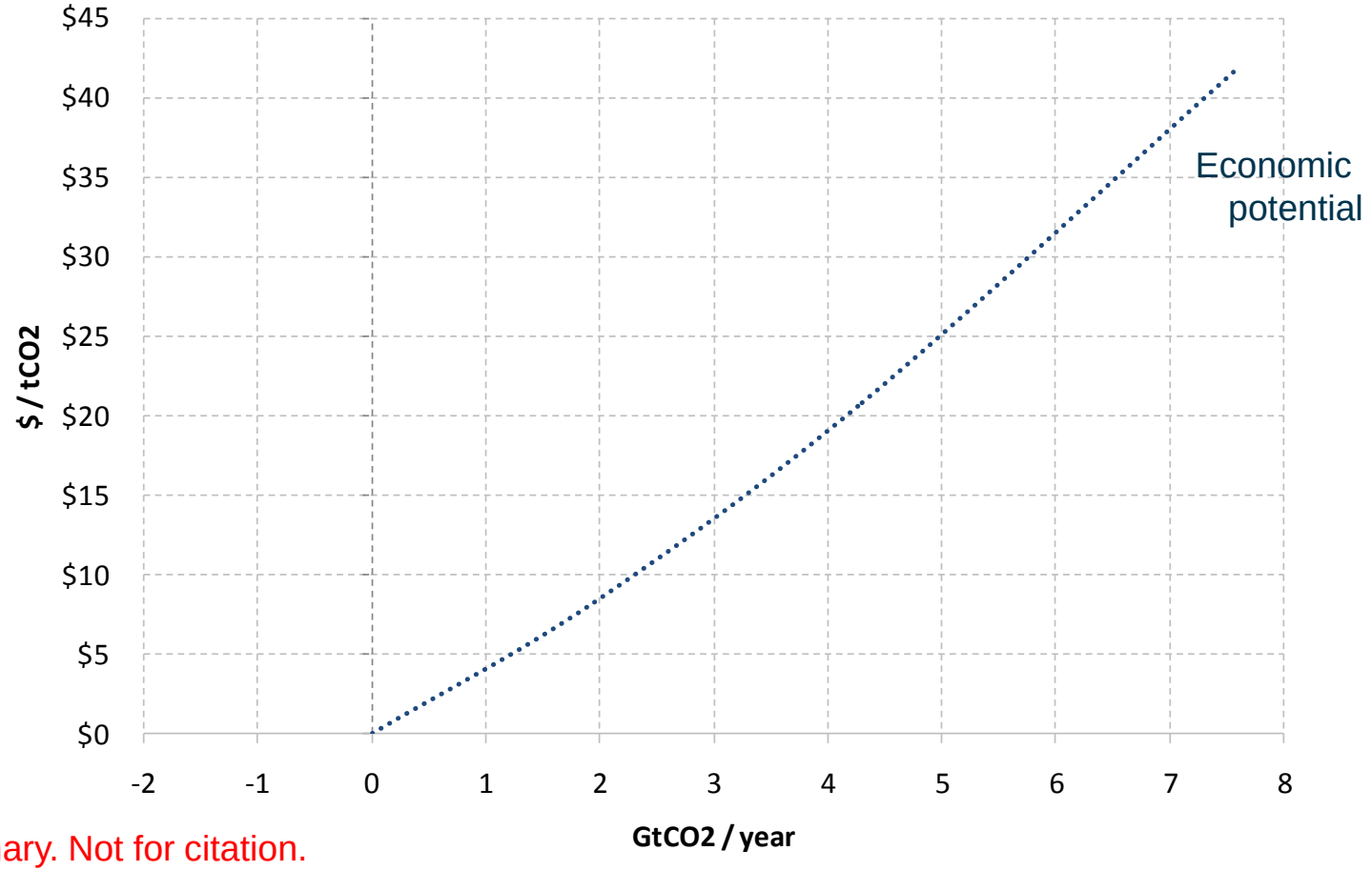
Voluntary Supply by Offset Suppliers

- Past offset supply modeling was based on comprehensive pricing of all emissions (and sequestration), but this approach is inconsistent with how offset markets operate in practice.
  - In capped sectors, all GHG emissions are priced and participants have no choice whether to participate. Mitigation avoids the marginal cost of emissions (i.e., allowance price)
  - In offset sectors, offset suppliers volunteer mitigation in exchange for payment. Emissions are not priced in these sectors, and there is no emissions cost for non-participants.

Voluntary supply incentives should be modeled in estimating offset supplies. This has not been done in previous analyses.

International Energy Voluntary Supply 2020
(Subsidy for Low-Carbon Energy)

Crediting for above baseline deployment and better than average energy mix emissions. Including delivery risk.



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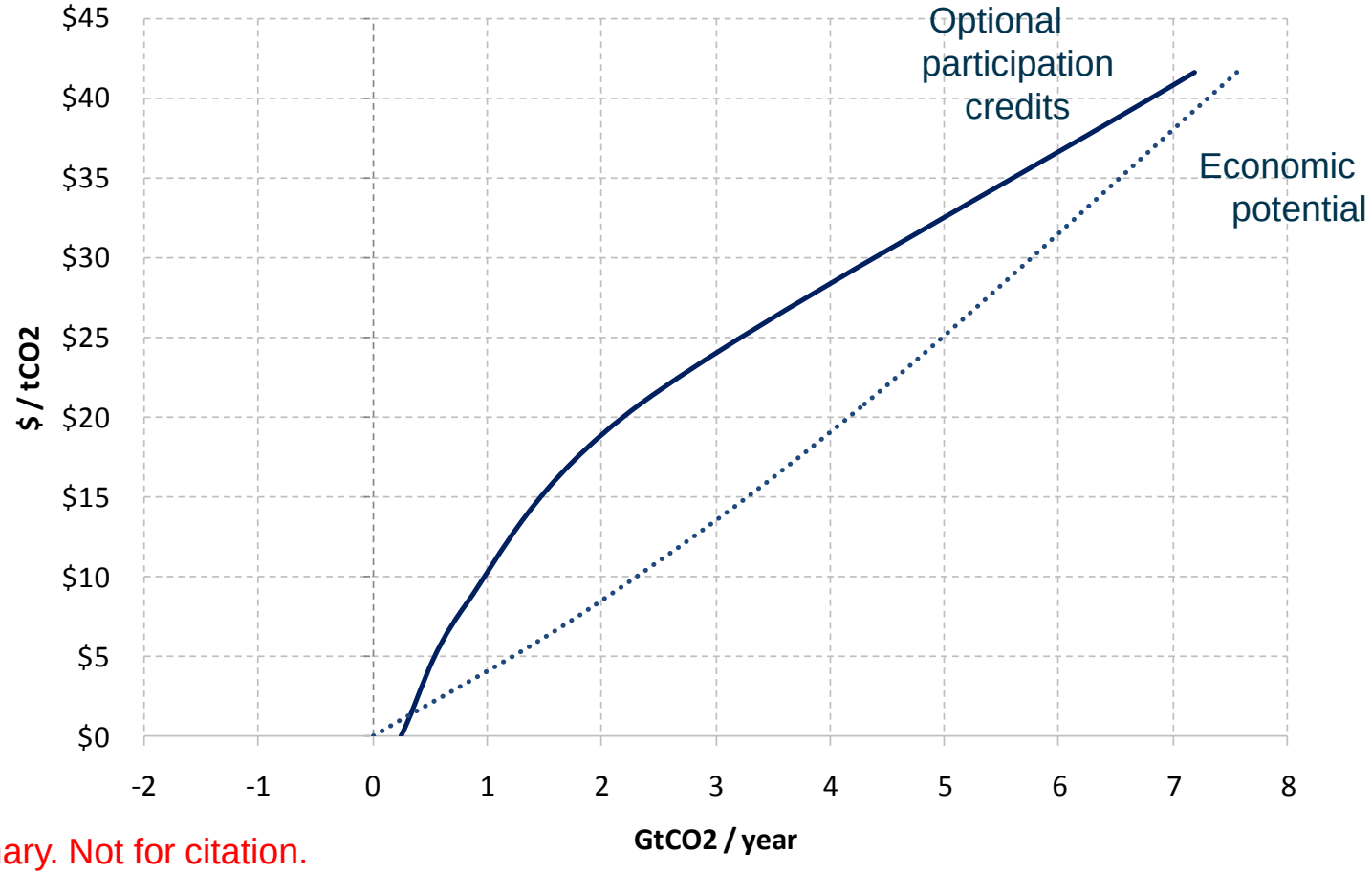

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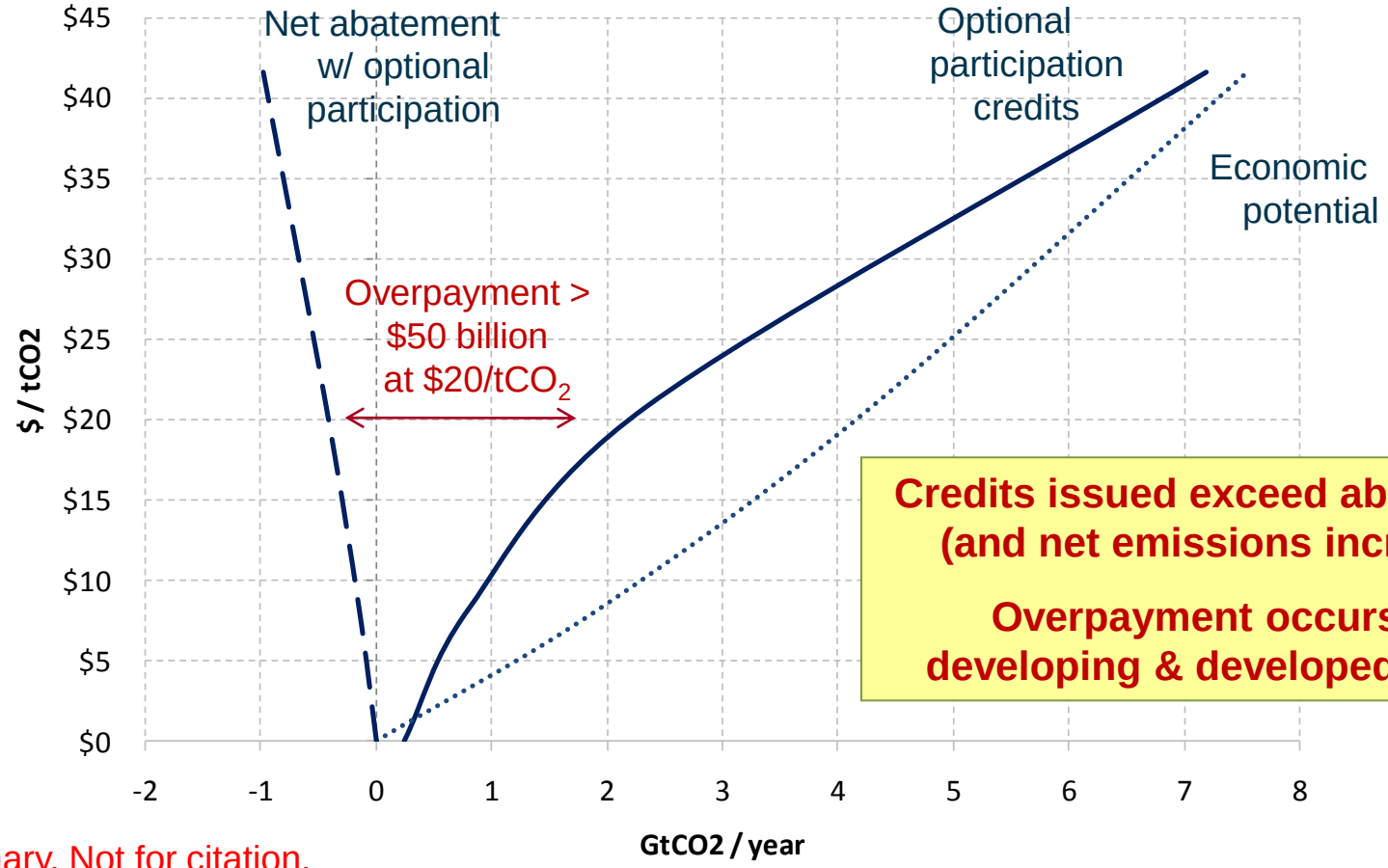

Credits issued exceed abatement (and net emissions increasing)

Overpayment occurs in developing & developed regions

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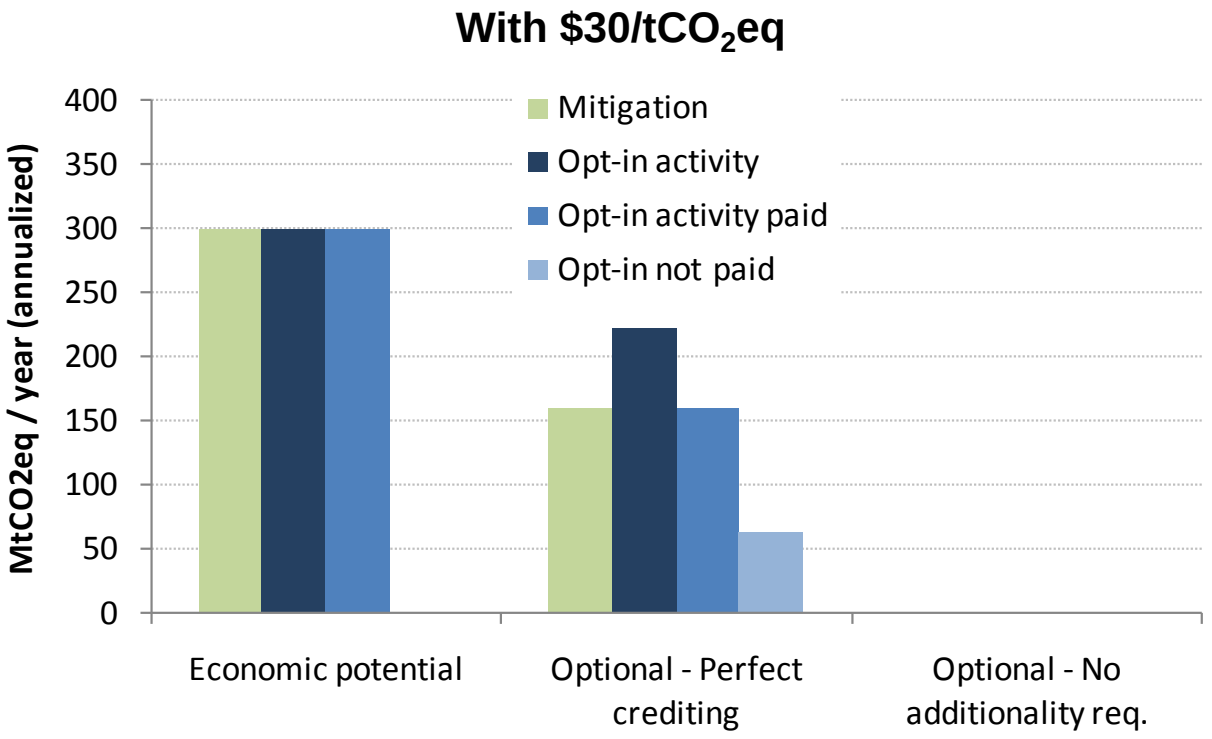
US Ag/Forest Voluntary Supply
(Opt-in Program with Crediting Bookends)

1. "*Perfect crediting*." Crediting only for *net mitigation* (= participant + non-participant emissions – baseline emissions). Captures additionality and leakage.



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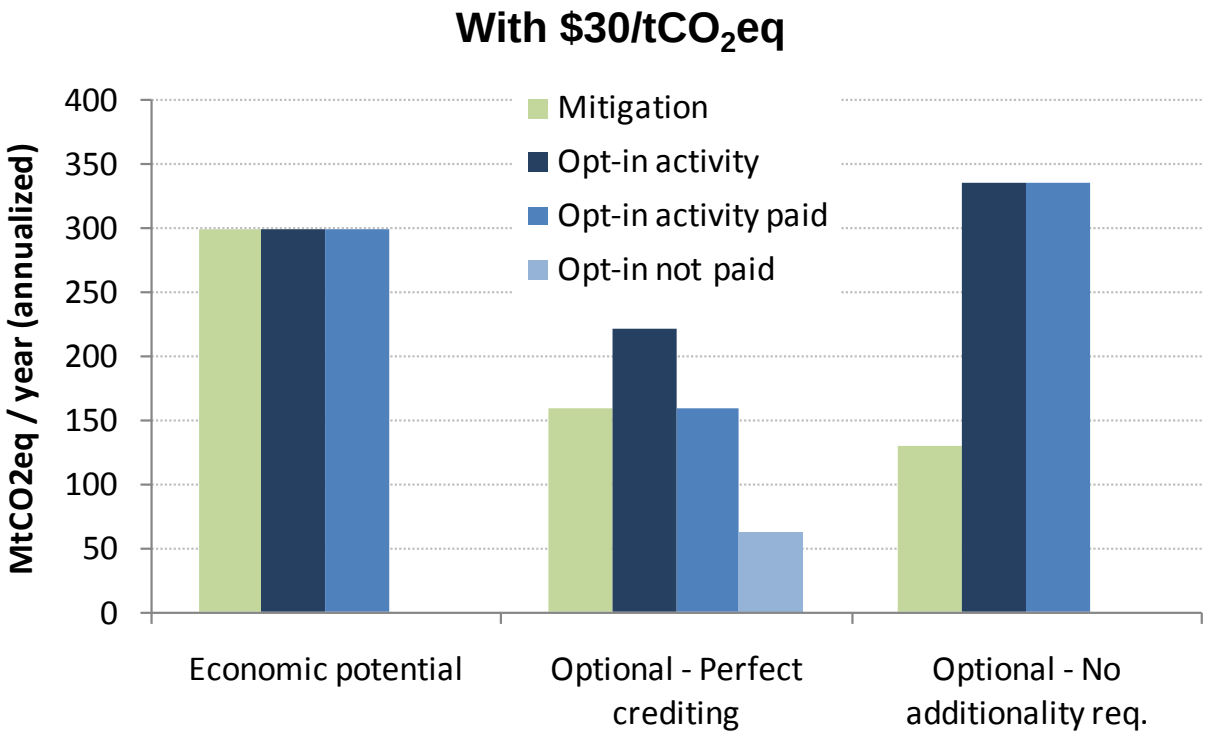
US Ag/Forest Voluntary Supply
(Opt-in Program with Crediting Bookends)

1. "*Perfect crediting*." Crediting only for *net mitigation* (= participant + non-participant emissions – baseline emissions). Captures additionality and leakage.
2. Crediting for existing carbon and new mitigation w/o additionality requirement

- Bookends reveal that mitigation will be less than when emissions are "priced."
- Mitigation could be positive.
- Real world crediting lies in between bookends. "Perfect crediting" information requirements very demanding (realistic?).



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Preliminary Insights

Preliminary Insights

- The market potential for offsets is significantly less than the economic potential previously estimated by US EPA and others.
- Investment risks were not included in previous analyses.
  - Investment risks affect the cardinal and ordinal value of GHG abatement technologies & regions, with strong interactions.
  - It may be difficult to reduce some investment risks.
- Sectoral approaches are likely to further reduce international offset supplies, rather than increase them.
- The option of offset suppliers to participate should be modeled in estimating offset supplies. This has not been done in previous analyses.
  - Our analysis to date suggests that this is an important topic, with possible policy design ramifications – the potential for actual abatement to be less than the credits supplied.
- Study relevant to many policy contexts – offsets writ large (e.g., Australia, California), sectoral, UNFCCC, linked markets, generic risks.

Preliminary. Not for citation.

Project Team

- Principal investigator: Steven Rose
- Collaborators
  - EPRI: Adam Diamant, Francisco de la Chesnaye
  - Non-CO_2: Jeff Petrusa, Robert Beach (RTI International)
  - International energy: Kate Calvin, Jae Edmonds, Marshall Wise (PNNL)
  - U.S. forest/agriculture: Bruce McCarl (Texas A&M Univ.)
  - Global forest: Brent Sohngen (Ohio State University)
  - Investment Risk: Rob Youngman, Rich Rosenzweig (Natsource LLC)

Thank You

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