



WHAT CAME OUT OF PARIS

Snowmass, Session I, July 20, 2016



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Contents

- Paris Agreement (What are the key features? What is the timeline and what are the next steps in the process?)
- Future Action (What is the outlook for NDC implementation? What about mid-century strategies?)
- Possible IA Community Activity (Informing goals? Prioritizing research and technology development agenda? Assessing risk?)

The Paris Agreement: A Little History

A Little History

Start UNFCCC Negotiations

Complete UNFCCC Negotiations

Start Kyoto Protocol Negotiations

Complete Kyoto Protocol Negotiations

Copenhagen Accord

Paris Agreement

1991

1992

1995

1997

2009

2015

The UNFCCC and Kyoto Protocol

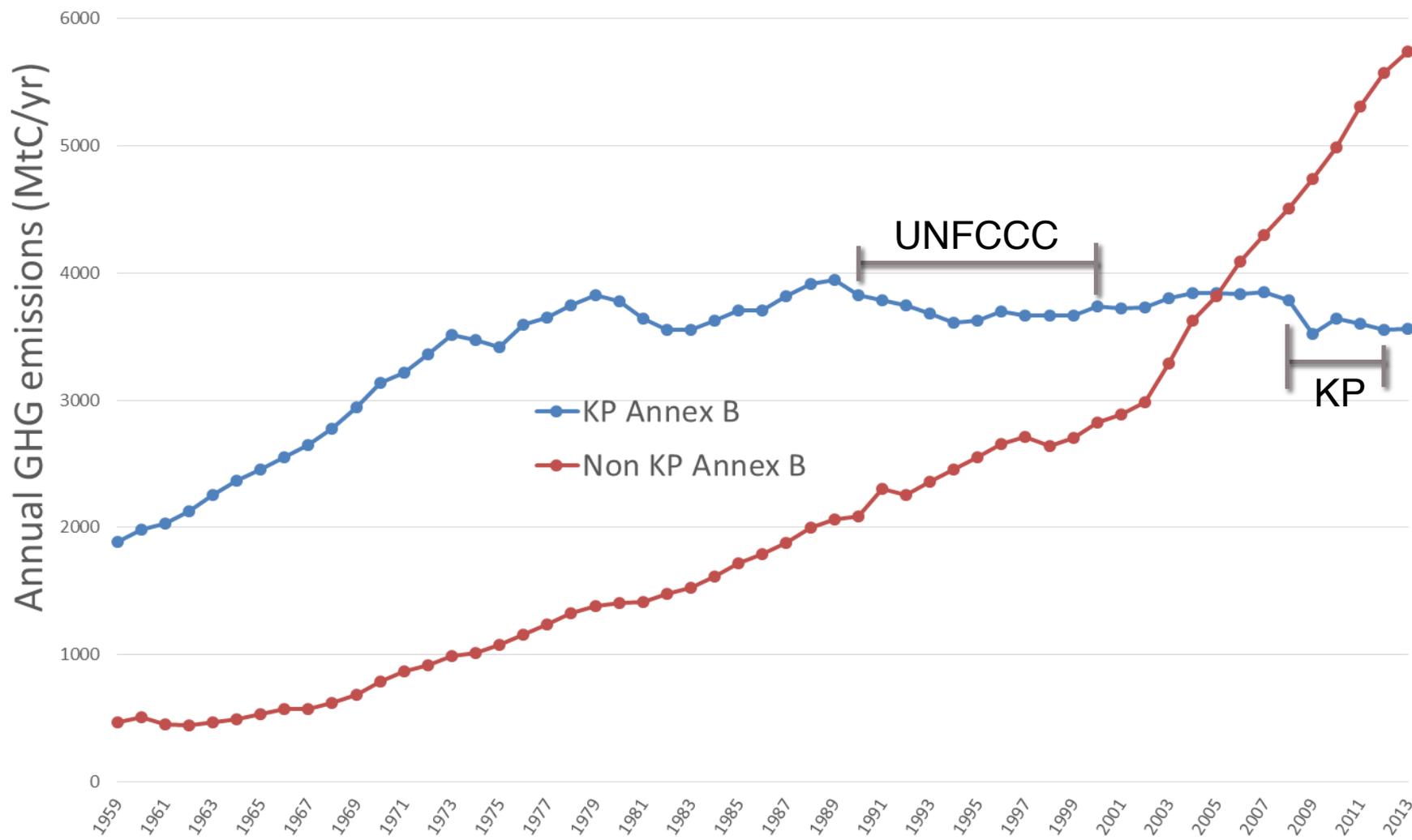
UNFCCC

- 1992, UNFCCC: “...stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.
- “Aim” to keep emissions below 1990 levels by 2000 (for developed countries)
- Establishes reporting framework, including methodologies for inventorying GHG emissions
- US ratifies, 1992; UNFCCC has 196 Parties

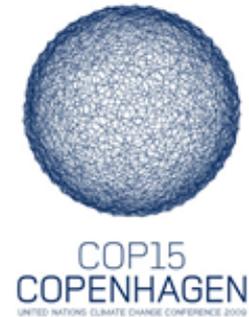
Kyoto Protocol

- 1997, KP: “The Parties included in Annex I shall...ensure that their GHG emissions ... do not exceed their assigned amounts ... with a view to reducing their overall emissions ... by at least 5% below 1990 levels in ... 2008 to 2012.”
- Has soft goals (“formulate and implement programs”) for developing countries
- Allows for emissions trading (including for “Joint Implementation” and the “Clean Development Mechanism”)
- US does NOT ratify; KP has 192 Parties

Compliance with the FCCC and KP



Copenhagen: Transition to global action



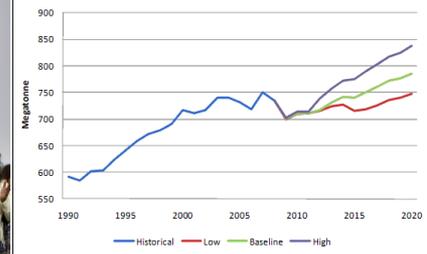
- Negotiated by heads of state
- Non-binding emissions targets (NAMAs) for all countries (and all major economies - including US and China - take on commitments)
- Bottom-up structure: countries determine their own actions/targets
- Obligation period to 2020
- New finance obligations for donor countries
- Session ends chaotically

The Paris Agreement



United nations conference
on climate change

COP21/CMP11



Paris Agreement: Aims



- “Aims to strengthen the global response to the threat of climate change ... by
 - (a) Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels,
 - (b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience
 - (c) Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate resilient development.”
- “Parties aim to reach global peaking of GHG emissions as soon as possible ... and to undertake rapid reductions thereafter ... so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century”
- “Agreement will be implemented to reflect equity and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.”

(Paris Agreement, Article 2)

Paris Agreement: NDCs & Reporting



PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

- “Each Party shall prepare, communicate and maintain successive nationally determined contributions that it intends to achieve.”
- “Each Party’s successive nationally determined contribution will represent a progression beyond the Party’s then current nationally determined contribution and reflect its highest possible ambition.”
- “Each Party shall communicate a nationally determined contribution every five years”

(Paris Agreement, Article 4)

Paris Agreement: Timetable



PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

- Intended Nationally Determined Contributions (INDCs) submitted before Paris meeting in December 2015.
- Most countries targeted 2025 or 2030 in their contributions.
- Agreement opened for signature on 22 April 2016.
- Agreement will enter into force after 55 countries that account for at least 55% of global emissions have ratified.
- Countries agreed to a five-yearly global stocktake, with the first in 2023.

The Paris Agreement: Finance



- Calls for the provision of financial resources (*Article 9*)
 - Developed countries have obligation (while no amount is specified; language calls for a “progression beyond previous efforts”)
 - Developing countries are encouraged to provide support voluntarily
 - Funds are to “achieve a balance” between mitigation and adaptation
- Decision text:
 - Calls for developed countries to continue existing “collective mobilization” through 2025
 - Sets \$100 Billion /year as “floor” for establishing a new quantitative goal (prior to 2025)
 - Modalities for accounting to be developed (and considered by COP in 2018)

Nationally Determined Contributions (NDCs)

Nationally Determined Contributions

162 INDCs submitted representing 189 countries



 INDC Submitted
 No INDC Submitted

INDCs: The Big Players

China's INDC:

- Peak carbon dioxide emissions around 2030 and make best efforts to peak early
- Reduce carbon dioxide emissions per unit of GDP by 60% to 65% from 2005
- Increase the share of non-fossil fuels in primary energy consumption to around 20%
- Increase forest stock volume by around 4.5 billion cubic meters on the 2005 level

U.S. INDC:

- Reduce economy wide emissions 26-28 per cent below its 2005 level in 2025 and to make best efforts to reduce its emissions by 28%
- Consistent with a straight line emission reduction pathway from 2020 to deep, economy-wide emission reductions of 80% or more by 2050
- Includes all categories of emissions by sources and removals by sinks, and all pools and gases; to account for the land sector using a net-net approach

EU's INDC:

- EU and its Member States: binding target of at least 40% domestic absolute reduction in greenhouse gas emissions by 2030 compared to 1990 (to be fulfilled jointly)

India's INDC:

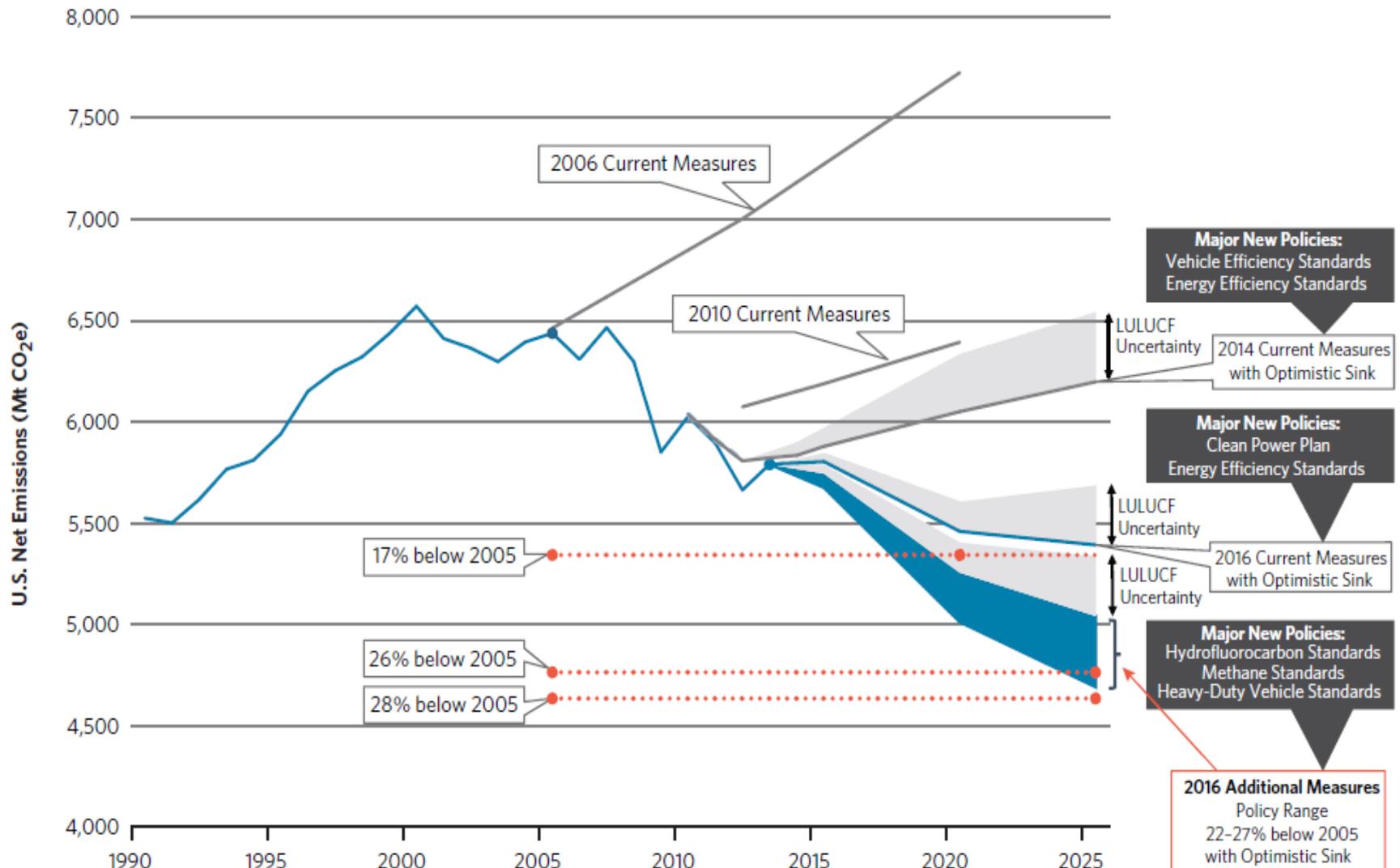
- Reduce the emissions intensity of GDP by 33-35% by 2030 from 2005 level
- Around 40% cumulative electric power installed capacity from non-fossil fuel resources by 2030
- Separate goal of 60 GW of wind and 100 GW of solar by 2022
- Create an additional carbon sink of 2.5-3 Gt CO₂e through additional forest and tree cover by 2030

INDC Implementation: China

- Plans to launch in 2017 a national emission trading system covering power generation, steel, cement, and other key industrial sectors
- Implementing a “green dispatch” system to favor low-carbon sources in the electric grid.
- China to finalize next-stage fuel efficiency standards for heavy-duty vehicles in 2016, and to implement them in 2019 (matches proposed timeline for the introduction of new heavy-duty vehicle standards in US).
- China calls for 50% of new buildings in urban areas to meet green building standards by 2020
- Calls for share of public transport in motorized urban travel to reach 30 percent by 2020.

INDC Implementation: United States

Also shown are previous projections from the 2006, 2010, and 2014 U.S. Climate Action Reports, which demonstrate the dramatic ratcheting down of projected U.S. emissions over the past decade.



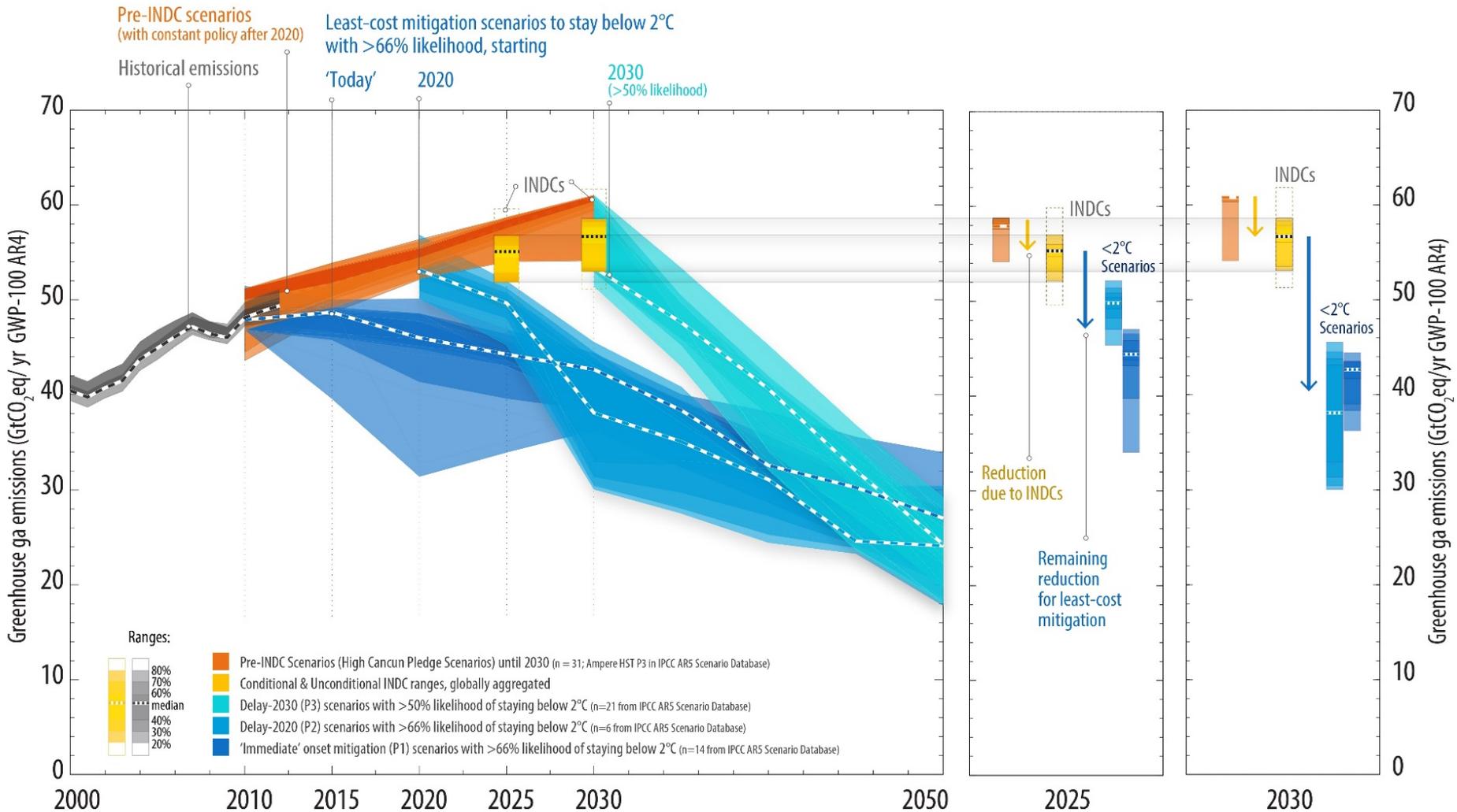
INDC Implementation: European Union

- For 2020
 - A 20% reduction in EU greenhouse gas emissions from 1990 levels;
 - Raising the share of EU energy consumption produced from renewable resources to 20%;
 - A 20% improvement in the EU's energy efficiency
- For 2030
 - Binding domestic target to reduce greenhouse gas emissions by 40% below 1990 levels by 2030 (and path toward 80-95% reduction by 2050).
 - Raising the share of renewable energy to at least 27%
 - Set indicative energy efficiency target of at least 27% (to be reviewed in 2020 having in mind a 30% target)
- EU Emission Trading System (ETS)
 - Cornerstone of EU policy; covers more than 11,000 power stations and industrial plants in 31 countries, as well as airlines. Operates in 28 EU countries and EEA-EFTA states. Covers around 40-45% of the EU's greenhouse gas emissions.
 - By 2020, emissions from sectors covered by the EU ETS will be 21% lower than in 2005. Under the Commission's current climate and energy proposals for 2030, they would be 43% lower.

INDC Implementation: European Union

- TODAY, EC RELEASED DRAFT BURDEN SHARING ARRANGEMENT
 - Luxembourg, Sweden: -40%
 - Denmark, Finland : -39%
 - Germany: -38%
 - France, UK: -37%
 - Netherlands, Austria: -36%
 - Belgium: -35%
 - Italy: -33%
 - Poland, Hungary: -7%
 - Romania: -2%
 - Bulgaria: 0%
- Some limited flexibility provided to cover emissions from non-ETS sectors, as well as from land use.

INDCs: Significant but Insufficient



Source: UNFCCC Secretariat *Synthesis Report on the Aggregate Effect of the INDCs*, includes INDCs representing 147 countries and approximately 85% of 2010 global emissions.

IAM issues/opportunities related to NDCs

- Supporting countries in the development and implementation of their NDCs, including assistance in policy design and implementation
- Prioritizing financing/investment for NDC implementation
- Helping align next iteration of NDCs with long term goals to meet global targets targets

NB: Many NDCs also include adaptation. IAM work can help assess damages - and help prioritize areas for investment to minimize these

Mid-Century Low-Emission Development Strategies

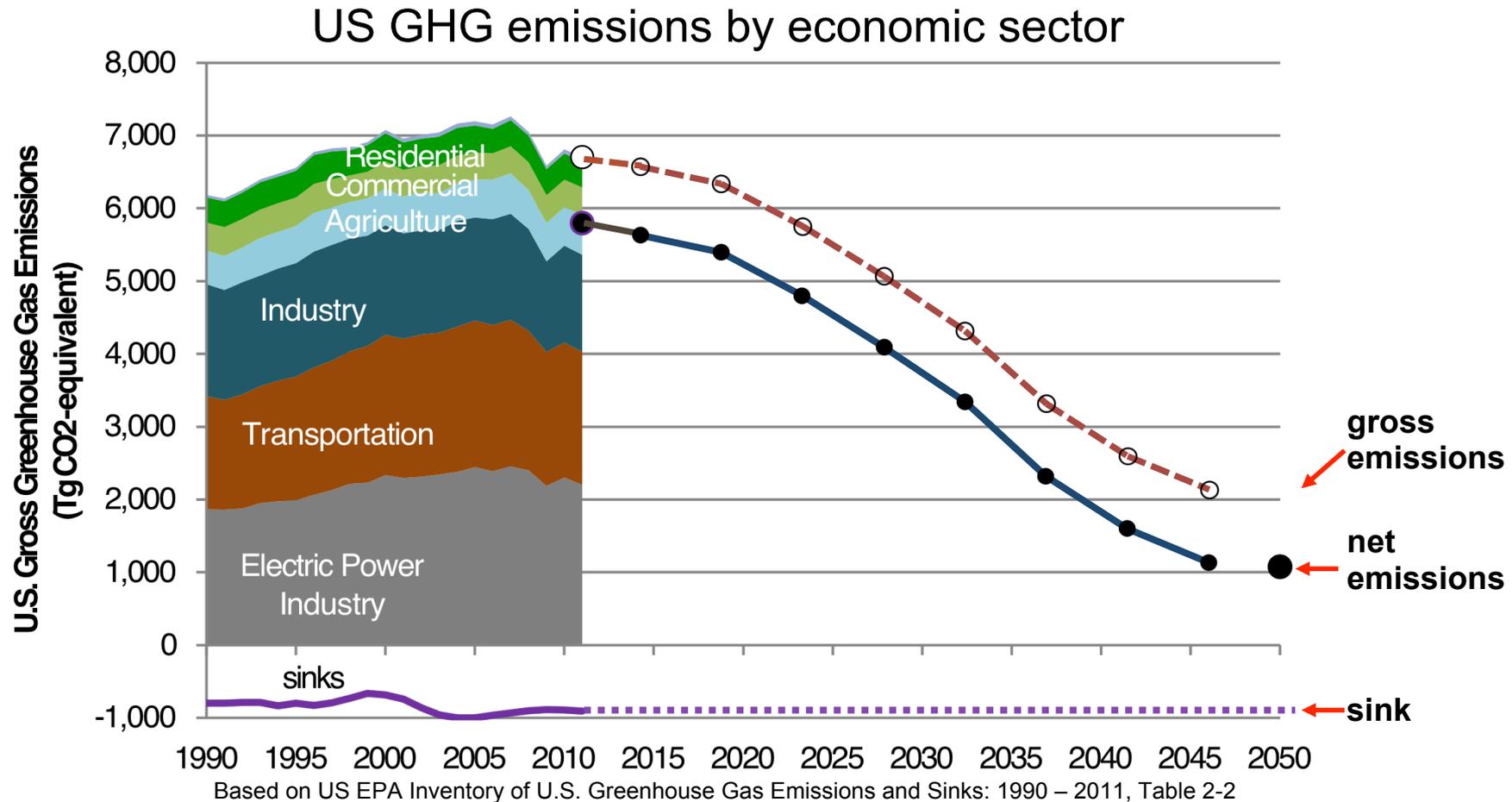
Mid-Century Strategies

- Paris Agreement, Article 4.19:

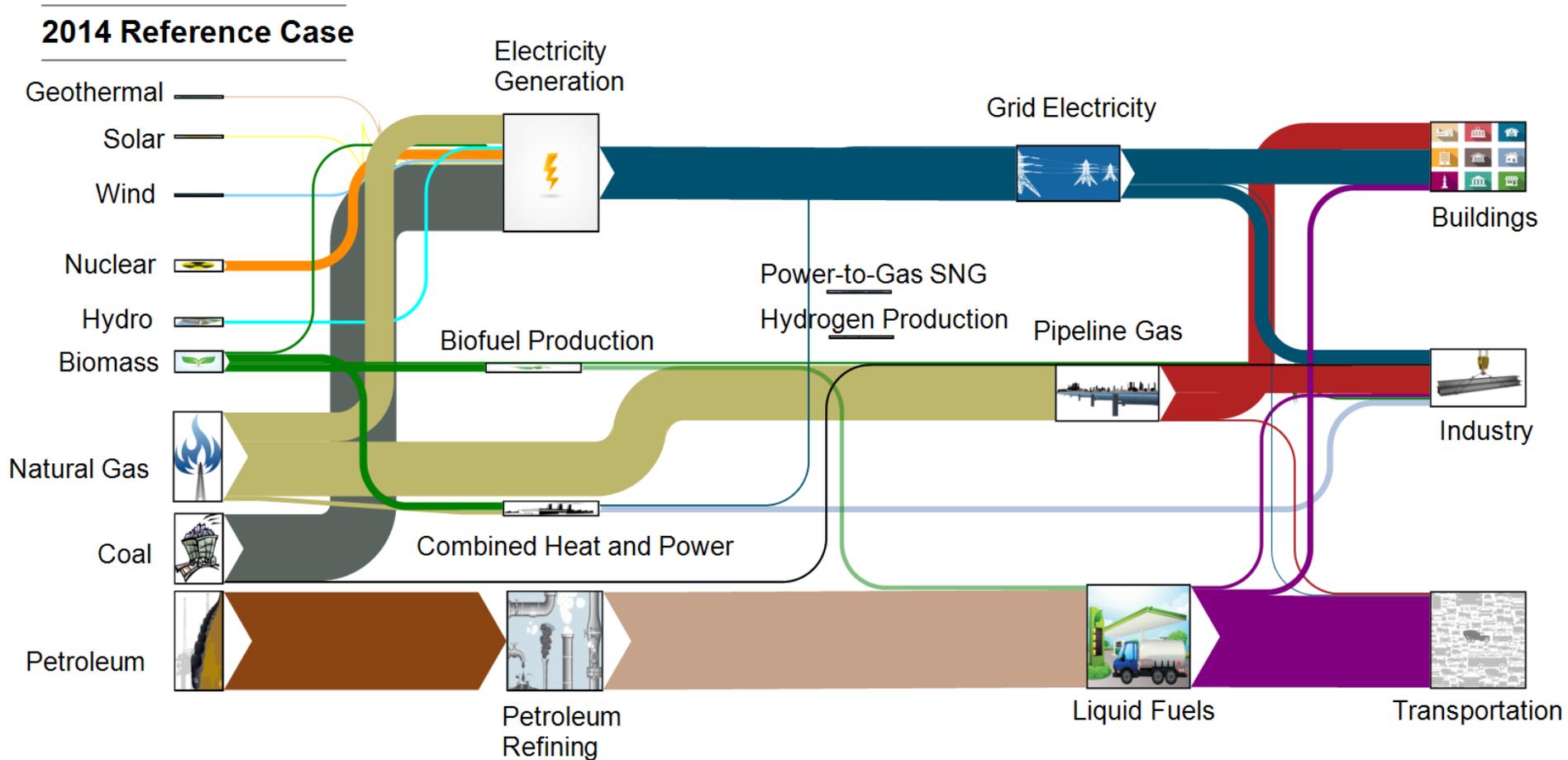
“All Parties should strive to formulate and communicate long-term low greenhouse gas emission development strategies, mindful of Article 2 taking into account their common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.”

- COP21 Decision invites Parties to submit strategies by 2020

80% Reduction in U.S. CO₂e by 2050?

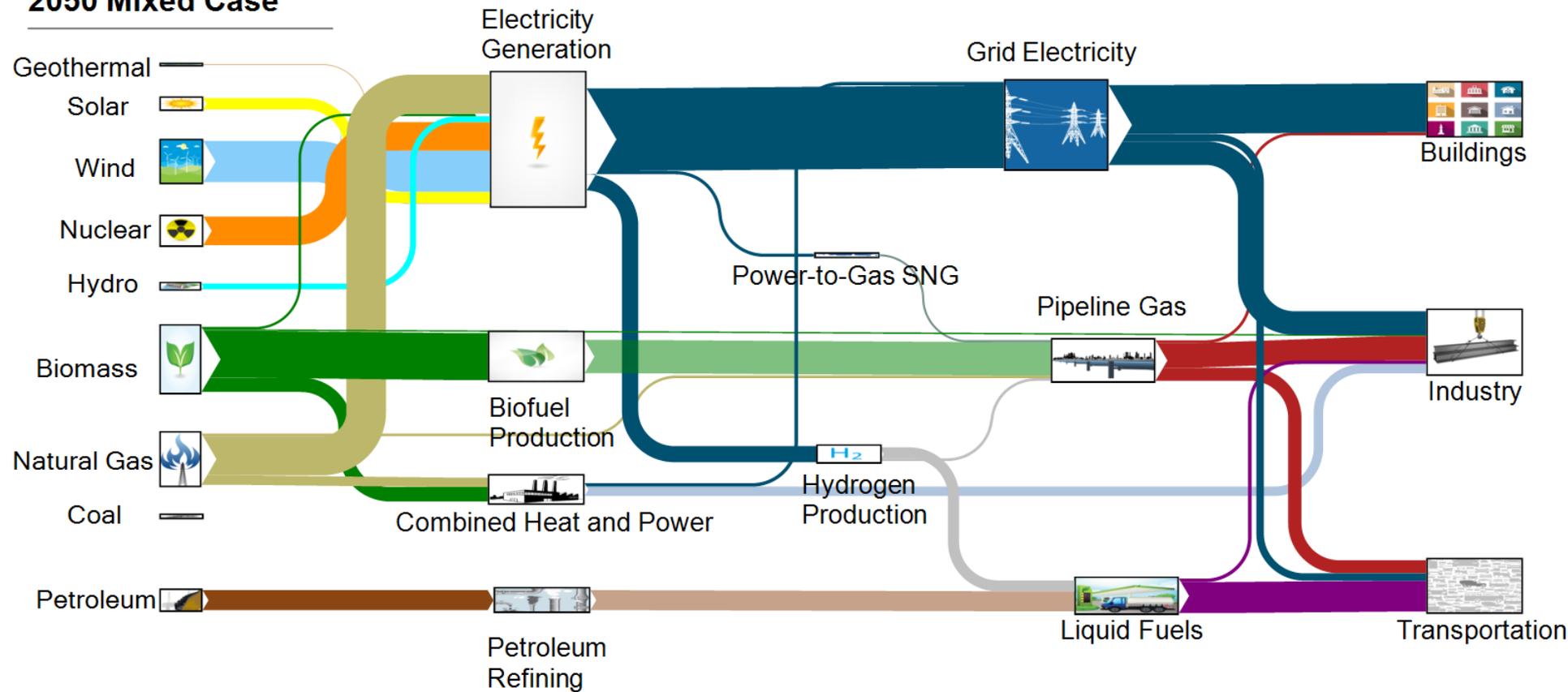


Current U.S. energy system in 2014



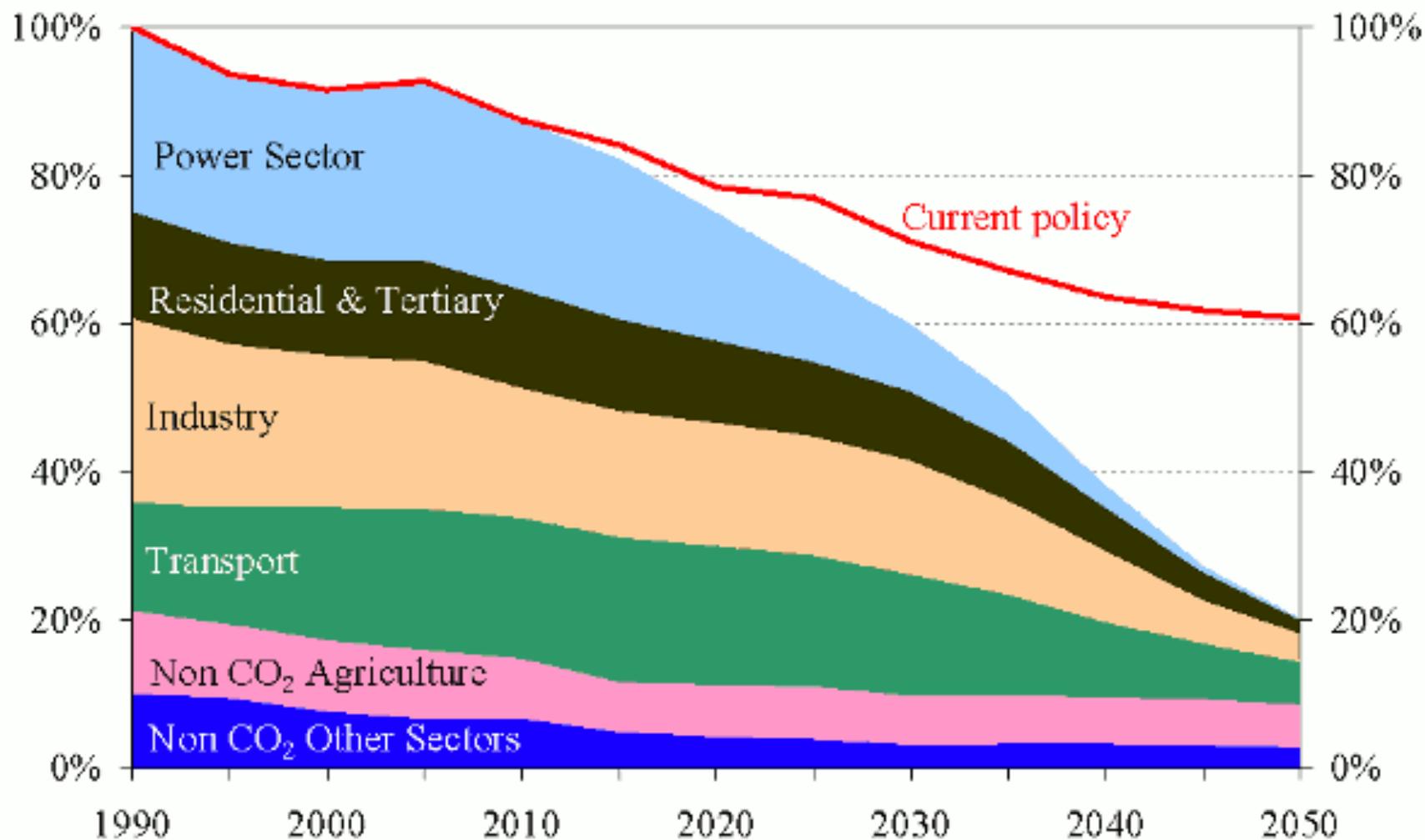
U.S. Decarbonized energy system in 2050

2050 Mixed Case



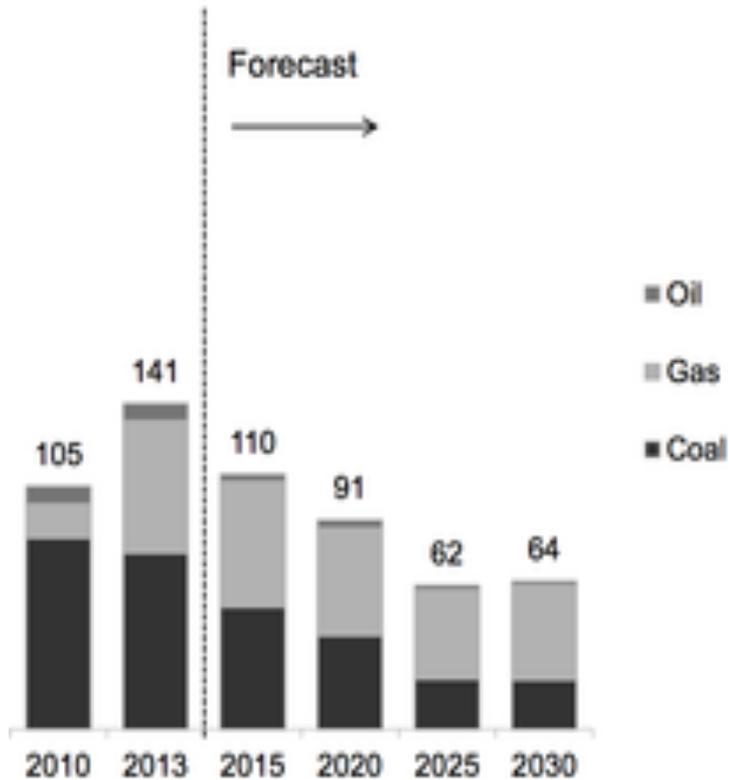
E3: Pathways to Deep Decarbonization in the United States, Mixed case results

EU 2050 Targets

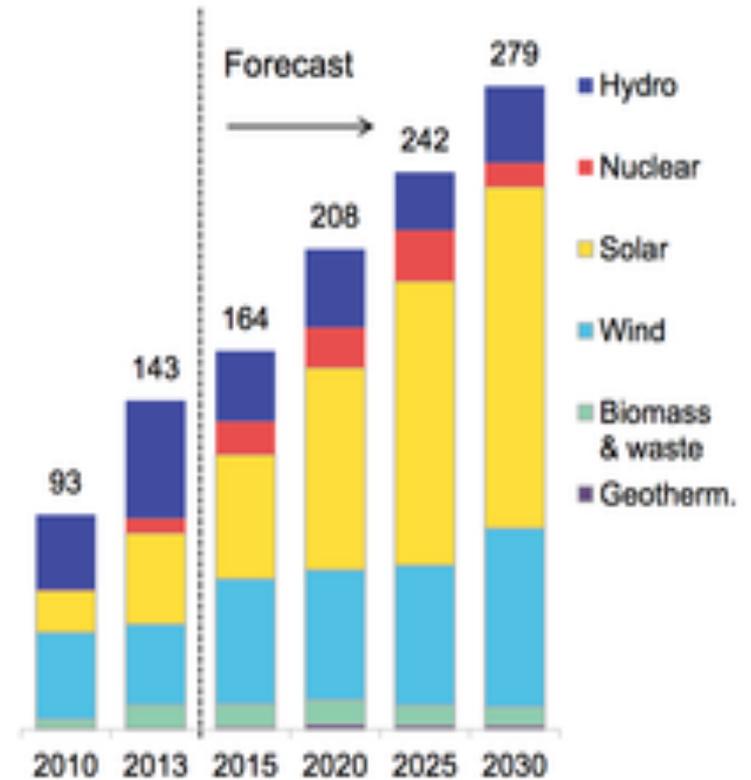


Power Generation Capacity Additions (GW)

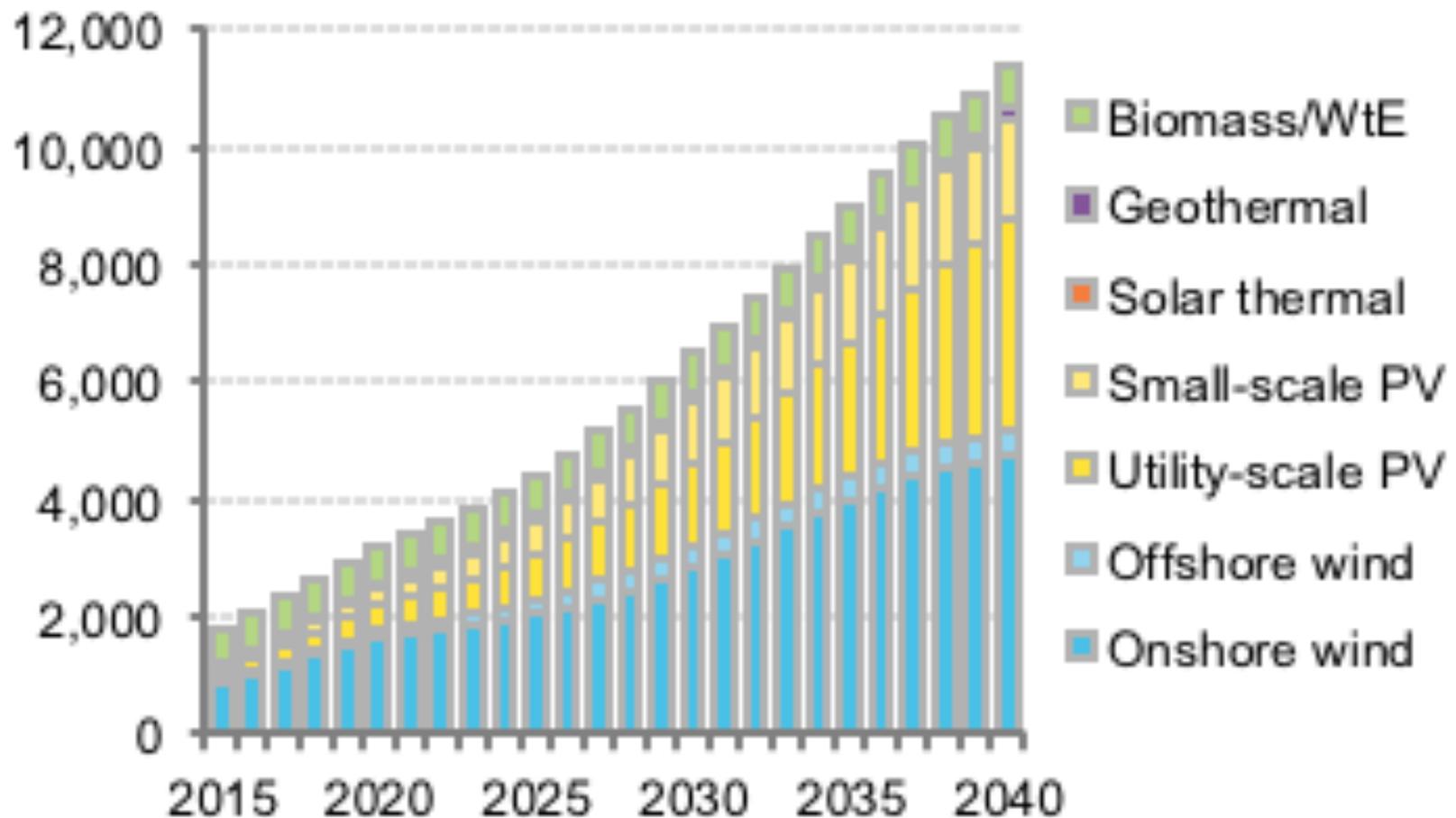
FOSSIL FUEL



CLEAN ENERGY

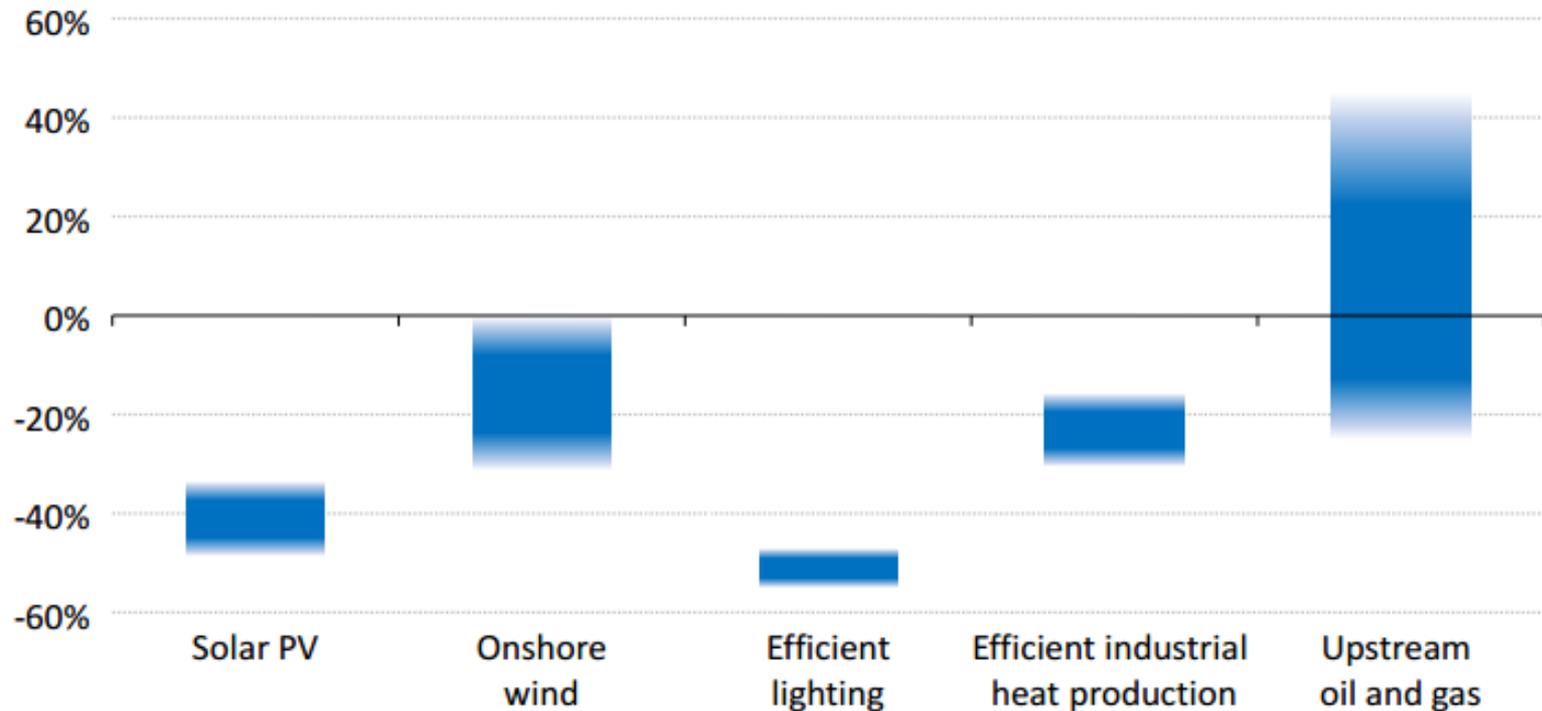


Global Renewable Energy Generation by Technology (TWH)

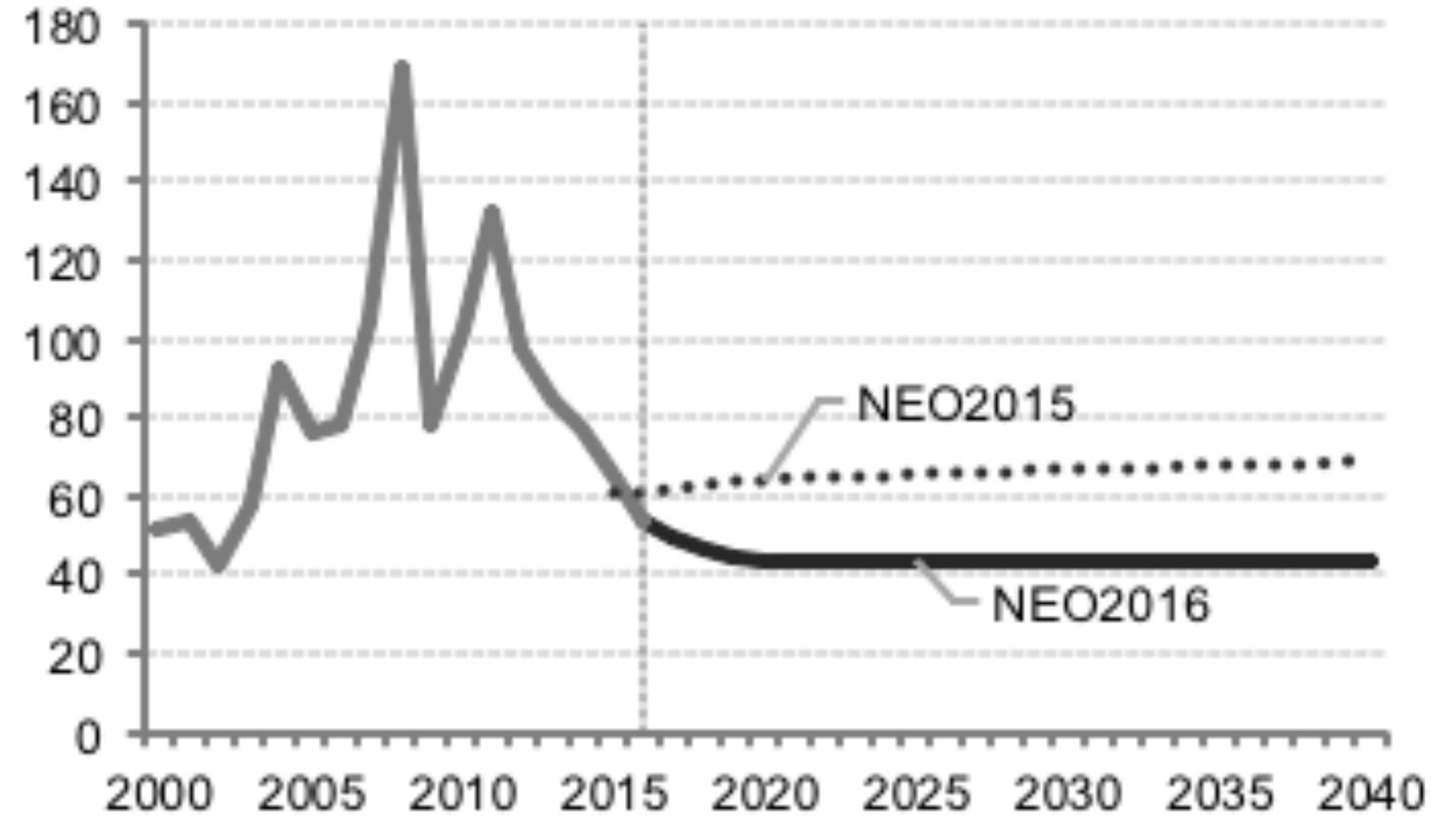


Changes in energy costs through 2040

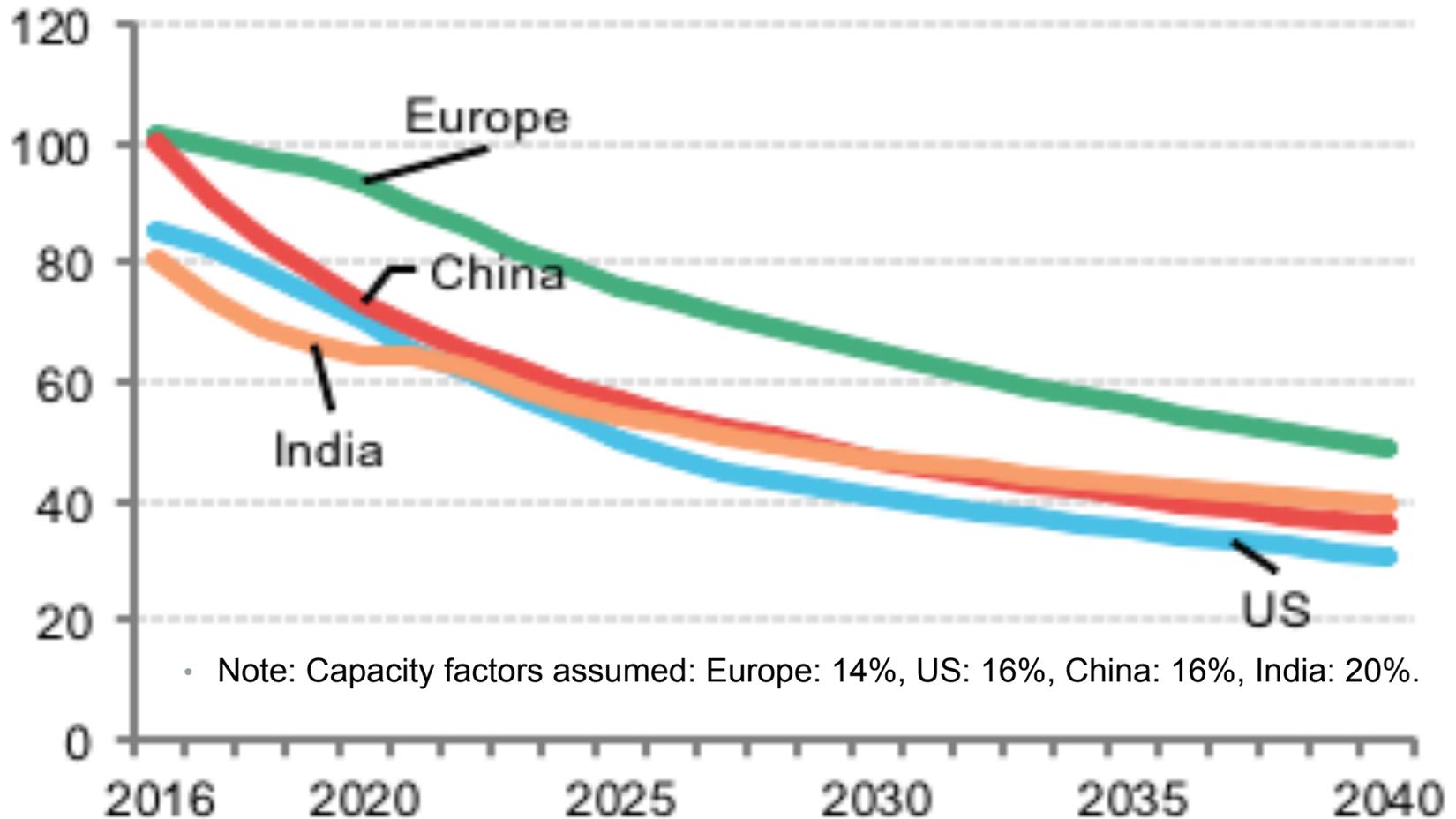
Costs in 2040 for different energy sources/technologies, relative to 2014



E.U. Benchmark Coal Price (\$/T)



Utility-Scale PV LCOE Projections (\$/MWH)



Mission Innovation: Inventing Tomorrow's Clean Energy Technologies

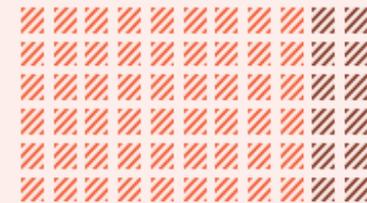
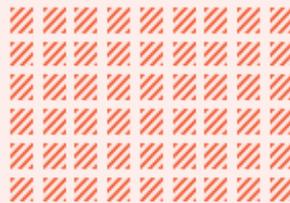


- 20 Countries
- Representing 85-90% global clean energy research and development investment
- Supporting a **doubling** of research and development investment over 5 years
- Complemented by a parallel private sector initiative: Breakthrough Energy Coalition

Financing for Mitigating and Adapting to Climate Change

The current scale of global investment is insufficient

■ \$0.25 trillion



INVESTED, 2011-2014

\$1.095 trillion

Renewable energy and energy efficiency investment captured in the global landscape reports over the last four years.

NEEDED TO SUPPORT NDC PLEDGES

\$13.5 trillion³

Investment required over the next 15 years in energy efficiency and low-carbon technologies to implement the national climate pledges (so-called "Nationally Determined Contributions") countries made before international climate negotiations held in Paris in December 2015.

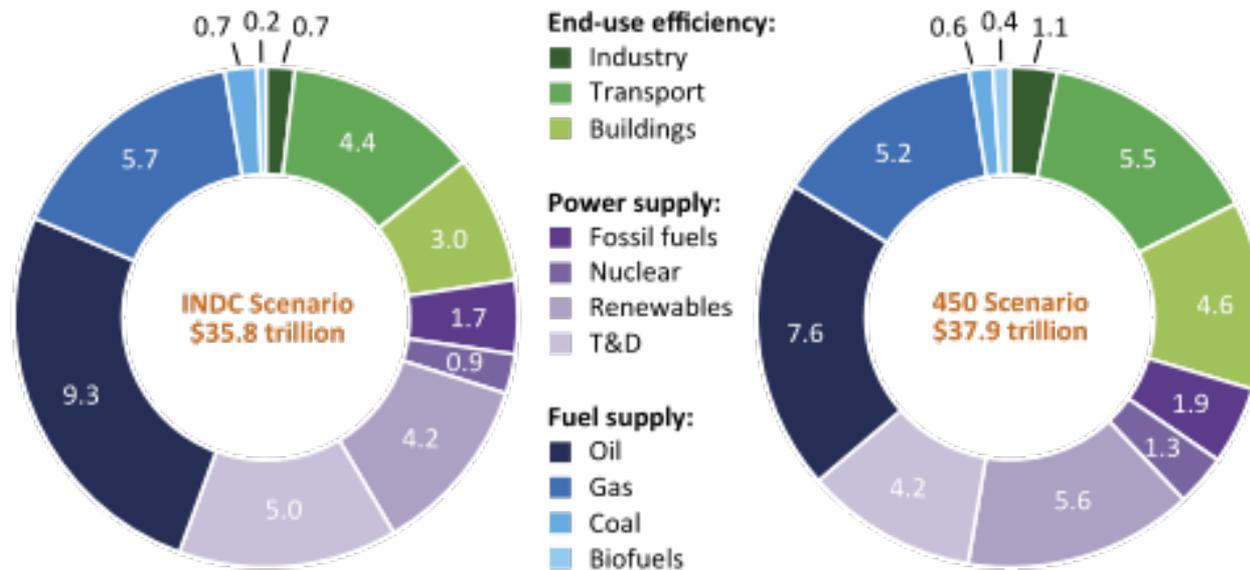
NEEDED TO LIMIT TO 2°C

\$16.5 trillion⁵

Investment required over the next 15 years in energy efficiency and low-carbon technologies to meet the NDCs plus the additional investment required over the same time to limit global temperature increase to 2°C.

Large energy investments will tilt toward RE, EE, other clean tech

Figure 2.4 ▶ Cumulative global energy sector investments by sector in the INDC and 450 Scenarios, 2015-2030 (trillion dollars, 2013)



Source: IEA Special Report on Energy & CC 2015

IAM Issues for Mid-Century Strategies

- Supporting the Development of MCS
 - Modeling and policy analysis/projections
 - Assessment of impacts of policy design and implementation
- Implications for policy development (choice of next NDC, decisions on allocation of R&D resources, etc)
- Global integration: Alignment with long term, global targets

Questions / Discussion



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