Real-world policy packages for sustainable energy transitions

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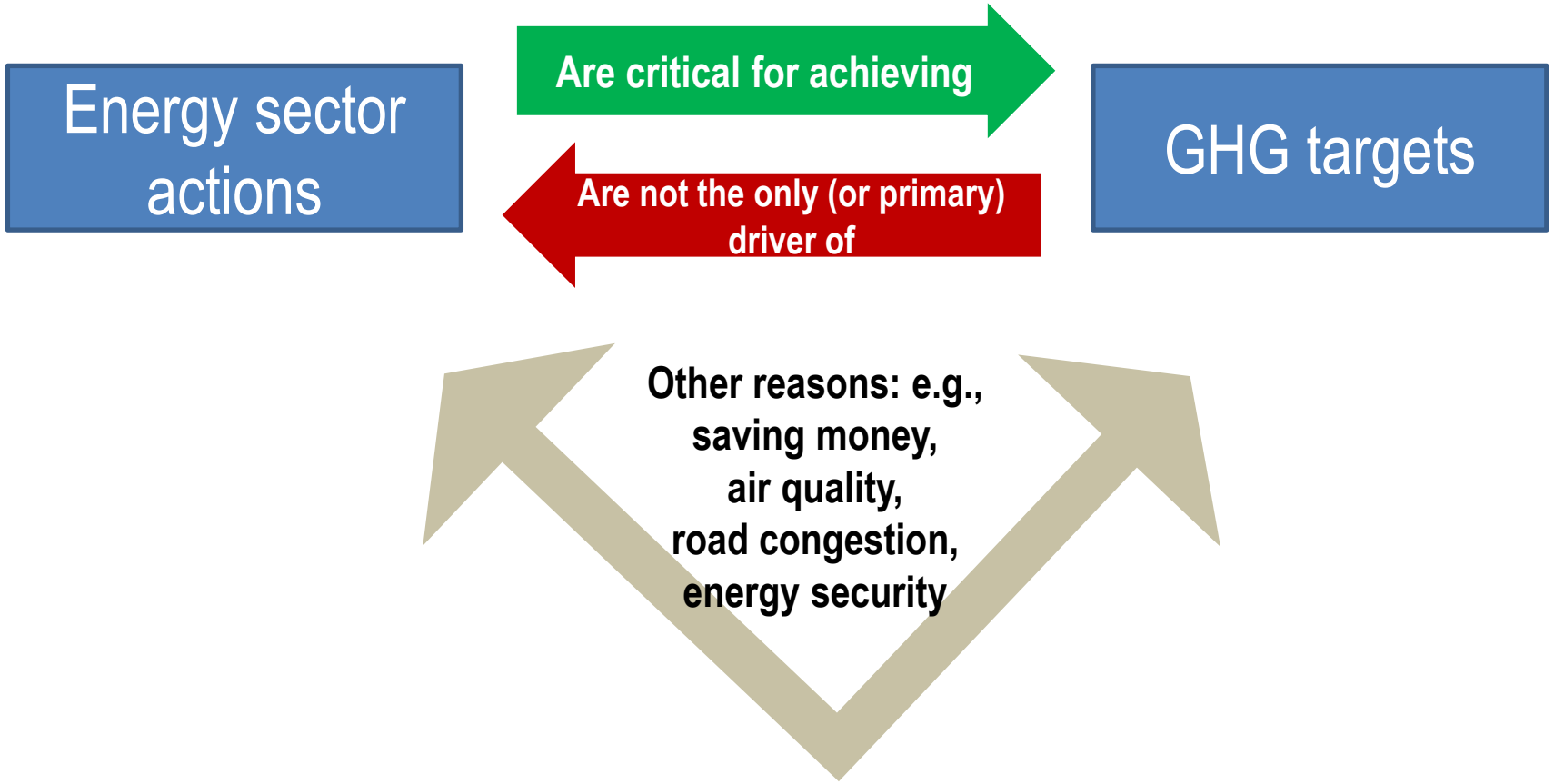
Introduction – Points of orientation

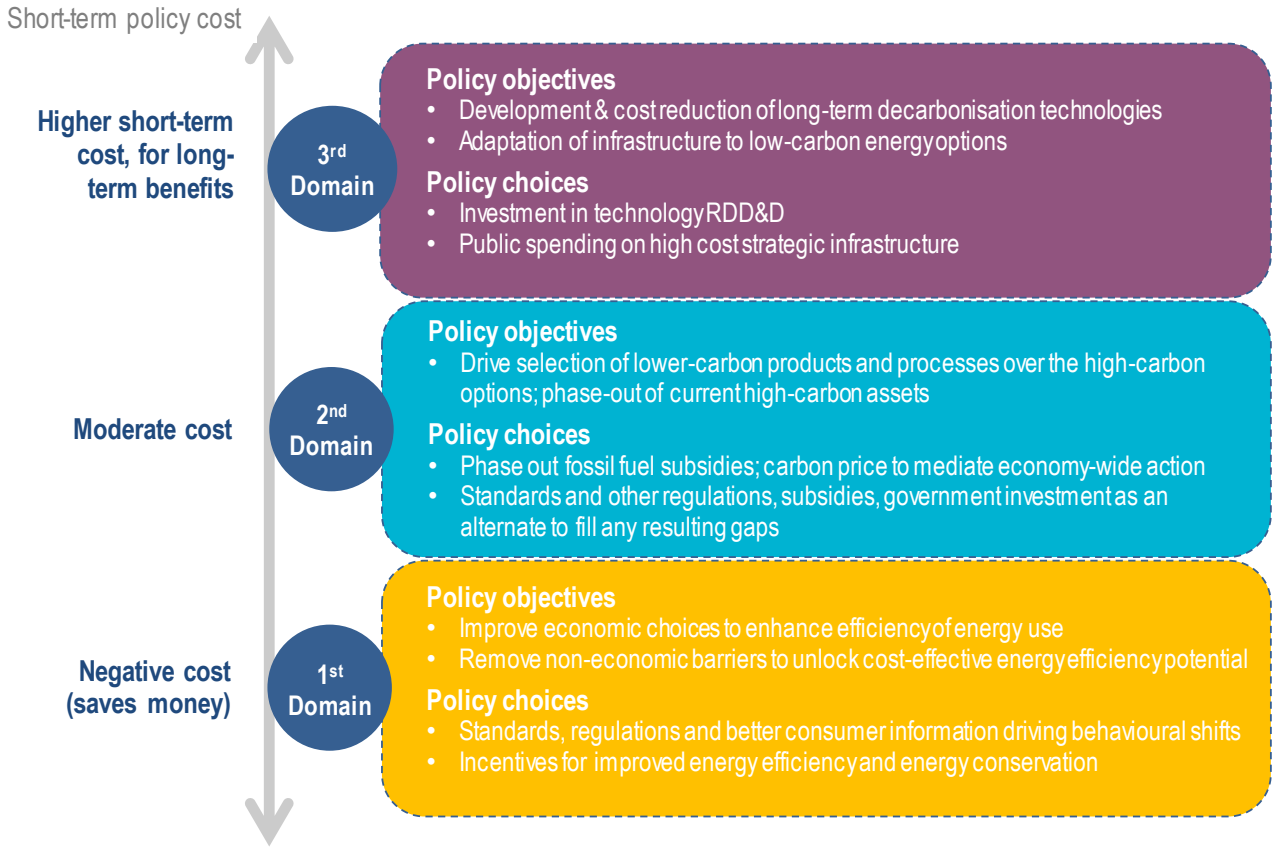
- **We provide an initial exploration of issues surrounding the design and implementation of "real-world" policy packages to support countries' transitions to sustainable energy systems:**
  - What are the key elements of policy packages?
  - How are they shaped by linked national objectives (air pollution, economic competitiveness, energy access, energy security) and local constraints on policymaking?

- **Three main parts of the report:**
  - Conceptual framework and research base to explain the role of policy packages for a low-carbon energy sector transition
  - A deep-dive quantitative analysis of one constraint on policy-making – the potential short-term difficulty in implementing ambitious carbon pricing.
  - A country case study of Canada is included as an example of complex policy packages

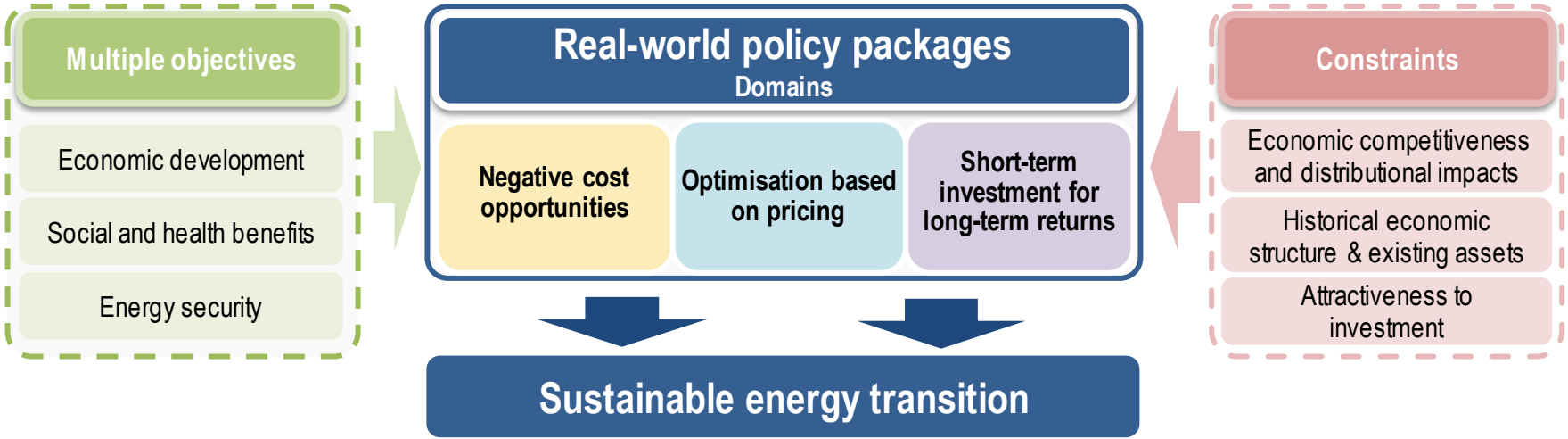
What drives sustainable energy transitions?



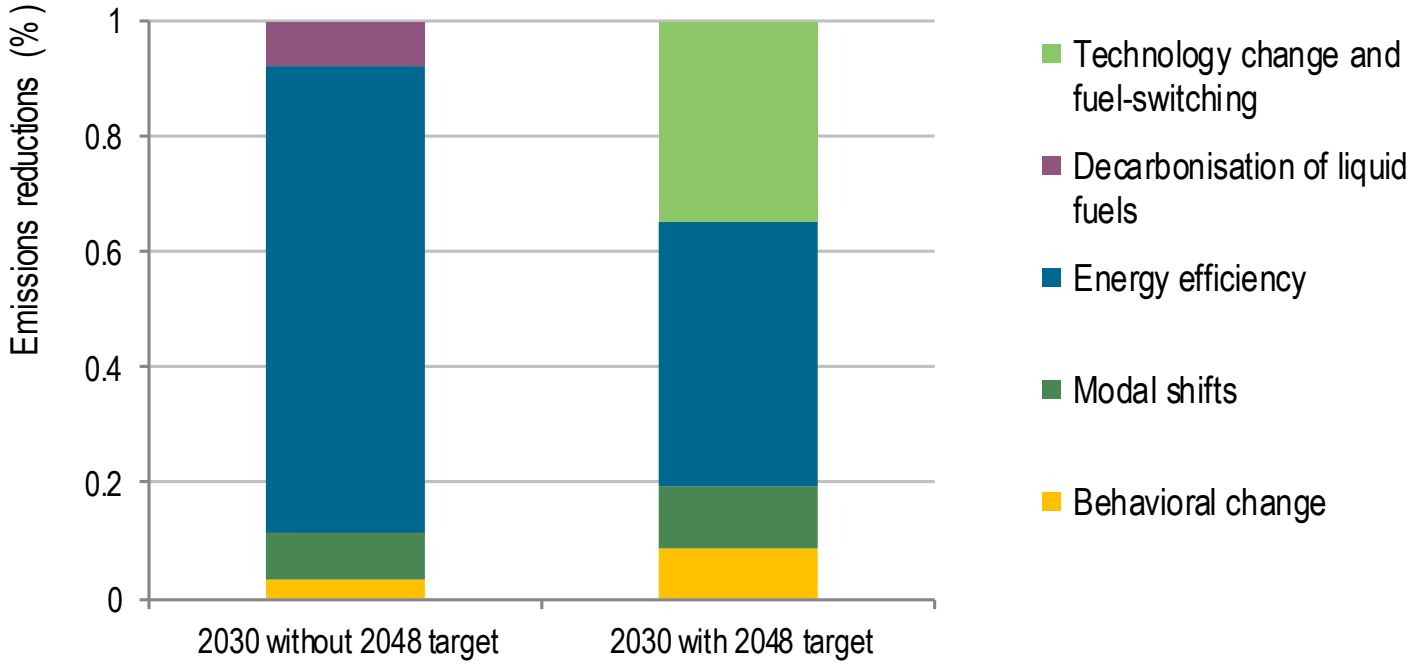
Sustainable energy transition: Domains of policy packages



Integrating policy objectives and constraints in “real-world” policy packages



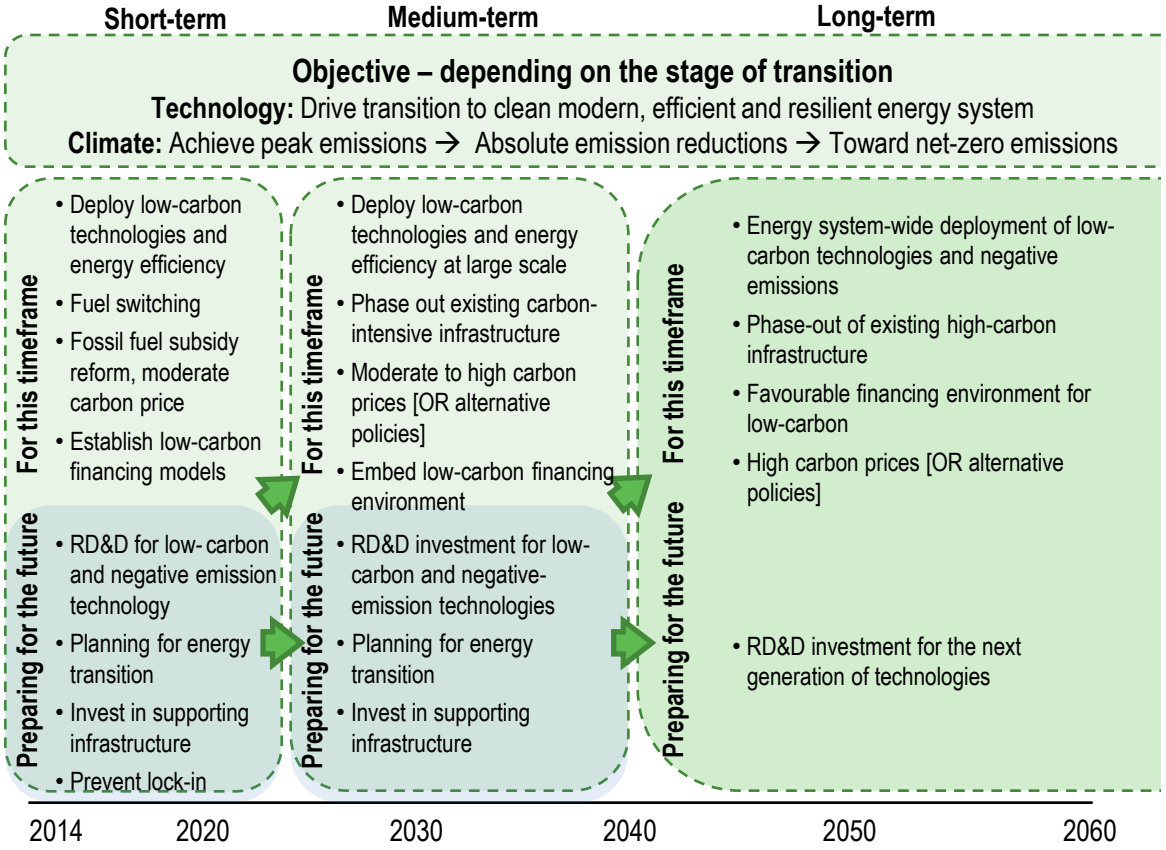
Optimising for short- and long-term reductions ?



Source: Perrissin and Foussard., *2016*

A policy package for long-term transition may contain different elements than one for a shorter timeframe

The time dimension of policy packages: Tailoring to timeframes



The roles of carbon pricing in policy packages for sustainable energy transition: Lessons from IEA scenarios

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06 December 2017

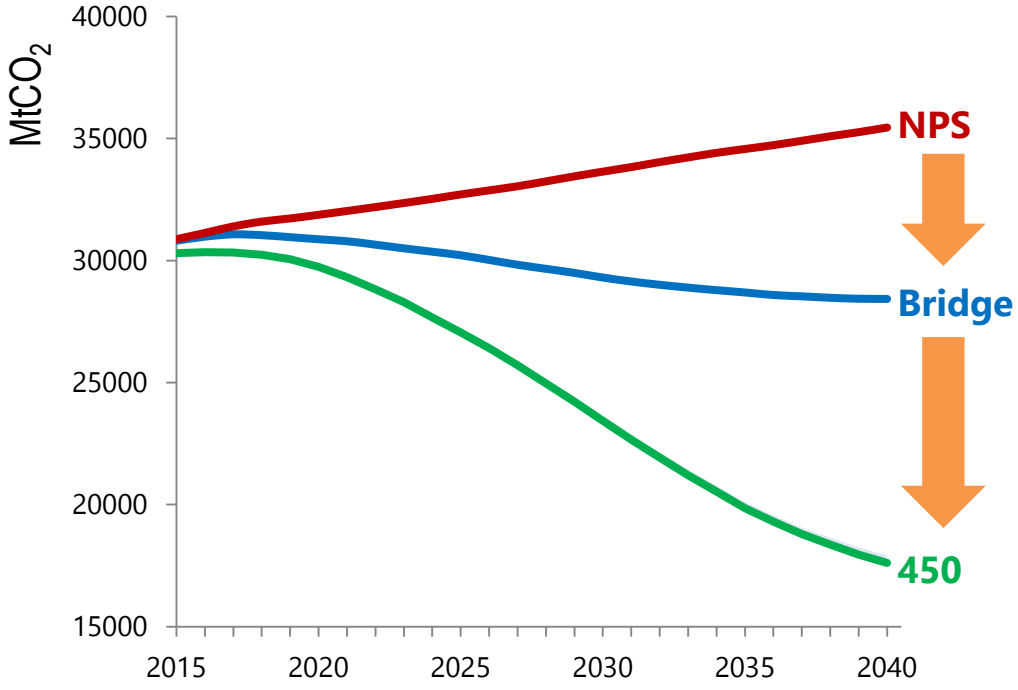
IEA

Policy packages with “moderate” carbon prices

	Region	2020	2030	2040
NPS [And “Bridge” Scenario]	European Union	20	37	50
	Chile	6	12	20
	Republic of Korea	20	37	50
	China	10	23	35
	South Africa	7	15	24
450 Scenario	United States and Canada	20	100	140
	European Union	22	100	140
	Japan	20	100	140
	Republic of Korea	20	100	140
	Australia and New Zealand	20	100	140
	China, Russia, Brazil and South Africa	10	75	125

Expected carbon prices are well below those needed in a 2C scenario

Comparing the role of carbon price and policies in IEA scenarios



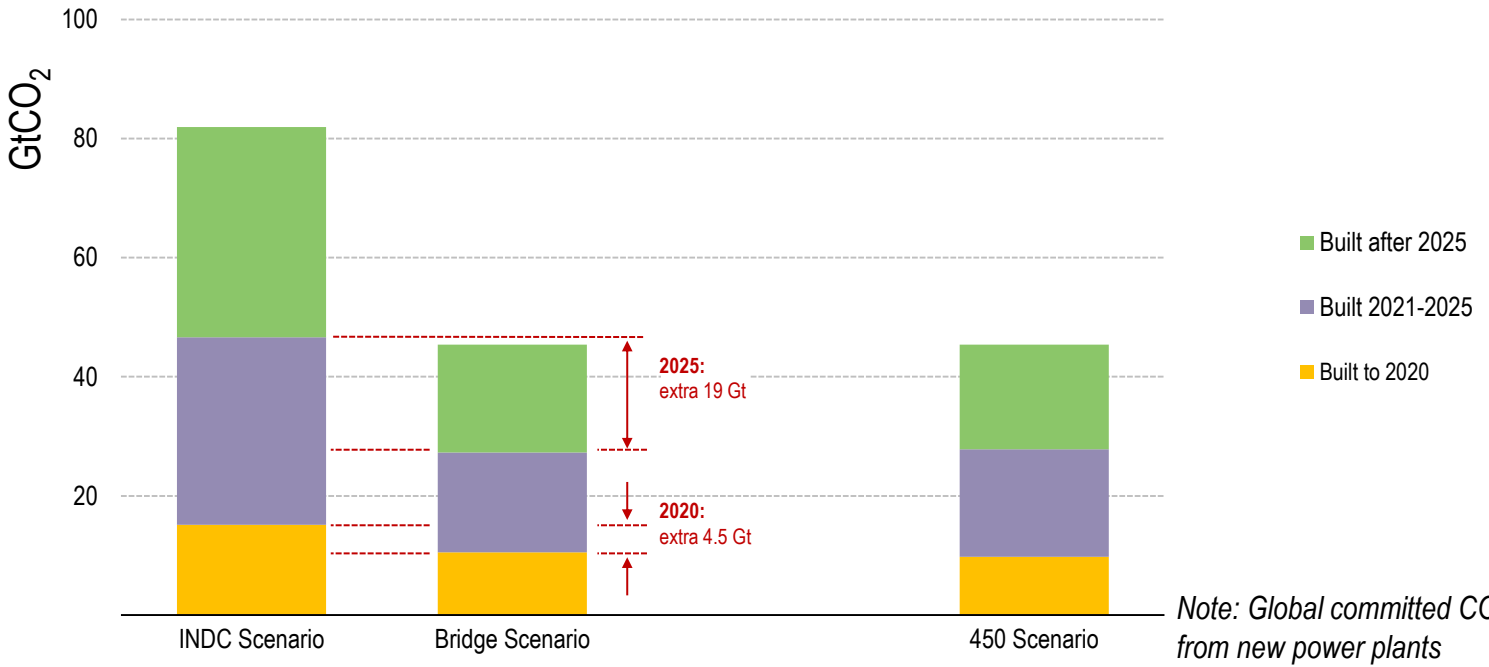
Five policies that deliver cost-effective short-term emission reductions to peak

High carbon price plus early support for advanced technologies

Source: World Energy Outlook Special Report: Energy and Climate Change, 2015

Targeted policies can peak emissions, but high carbon prices and advance technologies give deeper reductions consistent with climate goals

Emissions from new investments in power generation

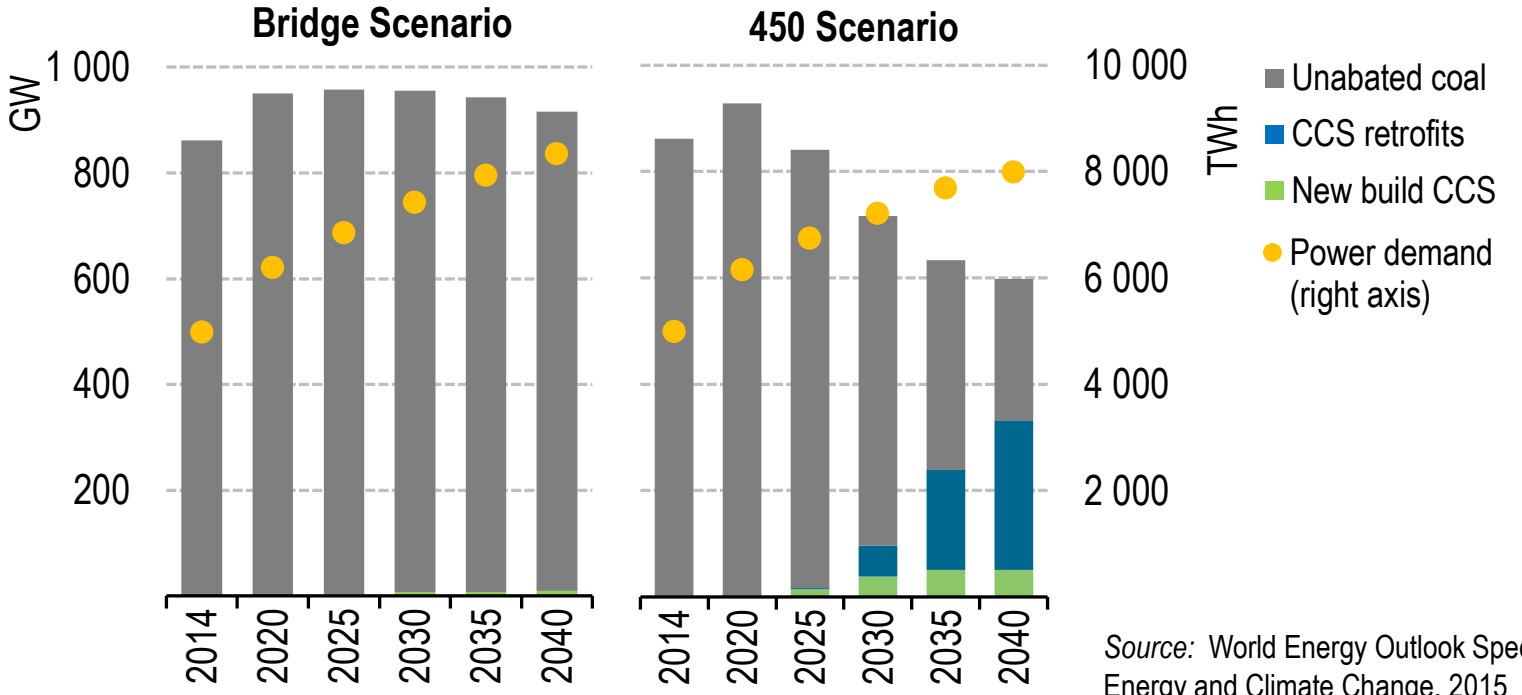


Note: Global committed CO_2 emissions through 2040 from new power plants

Source: World Energy Outlook Special Report: Energy and Climate Change, 2015

The targeted policies of the Bridge Scenario do a good job of aligning new power sector investment with a 2C Scenario

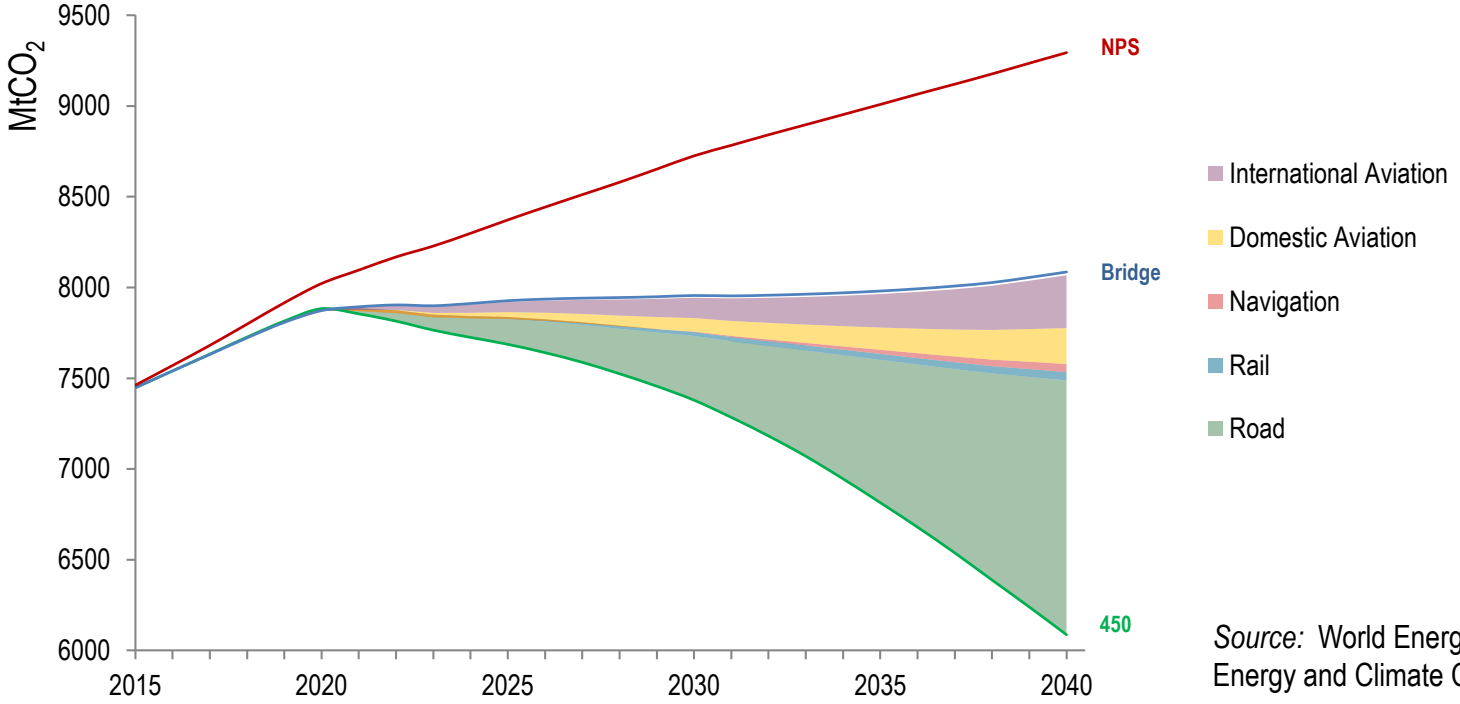
What's missing? Coal retirement and CCS retrofit



Source: World Energy Outlook Special Report: Energy and Climate Change, 2015

High carbon prices in the 450 Scenario are needed to drive early retirement of coal plant and retrofit for carbon capture and storage.

Transport sector: Comprehensive policy packages needed



Source: World Energy Outlook Special Report: Energy and Climate Change, 2015

Carbon pricing itself cannot unlock more substantial technology shifts such as electrification or advanced biofuels development.

Canada's policy package for low carbon energy transition

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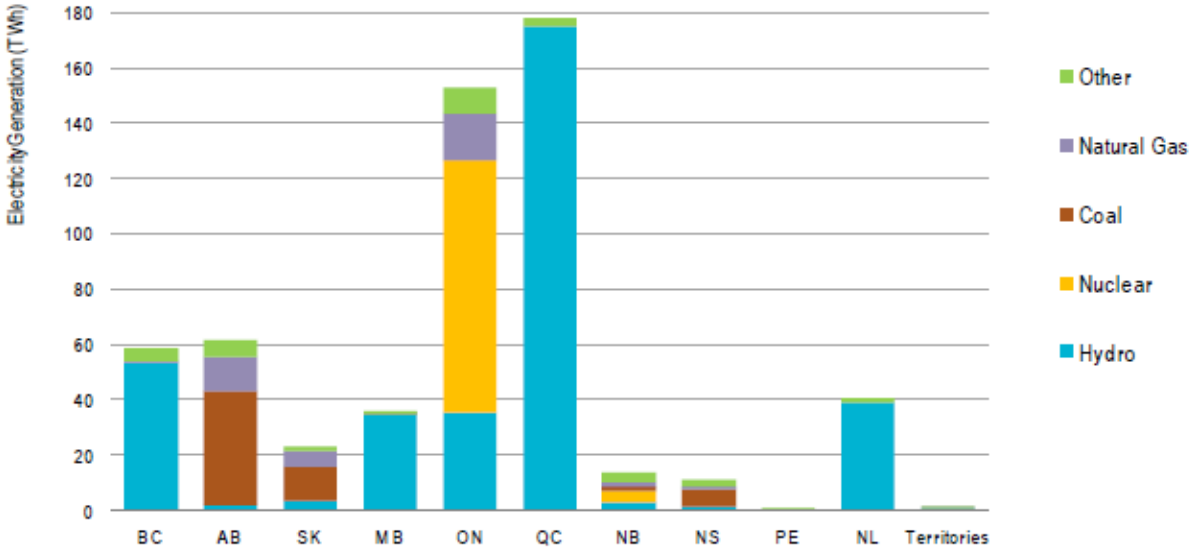
Canada's energy context

- Highest energy producer/capita across IEA member countries
- Strong regional diversity in energy resource endowment, political priorities, economic structure

Sources of provincial electricity generation in Canada, 2015

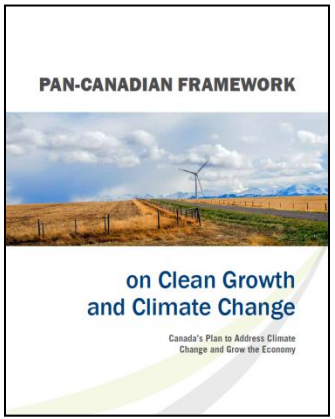


Canada's low carbon policy package

Two defining features of the Canadian case:

1) Shared jurisdiction between federal and sub-national governments over low carbon and energy policy
   - Provinces and territories have significant authority over energy and low-carbon policy
   - High regional variability on energy, economy, policy
   - Provinces have largely defined the current low carbon policy landscape

2) Complex mix of policies under the *Pan-Canadian Framework on Clean Growth and Climate Change*
   - Multiple policy objectives
   - Carbon price as central component of policy package (CAD 10 by 2018, rising to CAD 50 by 2022)
   - Other key federal policies: regulated coal phase-out, vehicle standards, clean fuel and renewable fuels regulations, support for technology and innovation, and sub-national policies



1. Shared jurisdiction over low-carbon energy policy

- Both benefits and costs to policy being driven at the sub-national level

- Canada's approach to carbon pricing: balancing federal coordination with sub-national autonomy:
  - Backstop carbon price only applies to jurisdictions that do not meet benchmark
  - Revenues of federally-imposed carbon price are fully returned to jurisdictions
  - Many policy design features are left to provinces/territories
  - Silent on jurisdictions' GHG targets and contributions to national target

Credit: Environment and Climate Change Canada

2. Complementing a carbon price with other policies

Role in complementing a carbon price	Canada policy example
Acting where carbon prices do not act effectively (1st domain)	• National model building code • Appliance energy efficiency standards
Driving clean energy technology innovation (3rd domain)	• Financial and research support for various stages of innovation
Strengthening a moderate, medium-term carbon price (2nd domain)	• Coal phase-out

Carbon pricing is critical to driving energy transition, but other policies are needed.

Focus: Policy packages in Canada's transport sector

Policy	Primary objective(s)
Vehicle emissions standards	• Improve vehicle fuel efficiency
Renewable Fuels Regulation	• Drive switch to biofuels in transportation and supporting infrastructure
Clean Fuel Standard (proposed)	• Drive switch to cleaner fuels in all sectors and supporting infrastructure
Support for transit and active transportation; Urban planning	• Drive modal shift • Reduce vehicle distance travelled
Carbon price	• Lower demand (especially in the long term) • Switch to cleaner fuels • Drive modal shift

Different policies in Canada's transport sector serve different objectives

…but attention must be paid to policy interactions

- Clean Fuel Standard (CFS) would overlap (i.e. cover same emissions sources) as:
  - Renewable fuels regulations
  - Provincial clean fuel standards
  - Cap-and-trade and output-based performance standards

Understanding policy interactions can help determine whether added costs justify added value of policies

Conclusions

- Carbon pricing plays a critical role in the policy mix for energy sector decarbonisation…

  …. but understanding its role, and how it layers with other policies, can be complex.

- A high carbon price alone does not address all the aspects of energy transition…

  …. Comprehensive policy packages are needed which vary by energy sub-sector and over time.

- Future IEA work in this area:
  - 2018 project with China's NDRC Department of Climate Change to map China's policy mix and interactions, particularly with ETS.

Thank you

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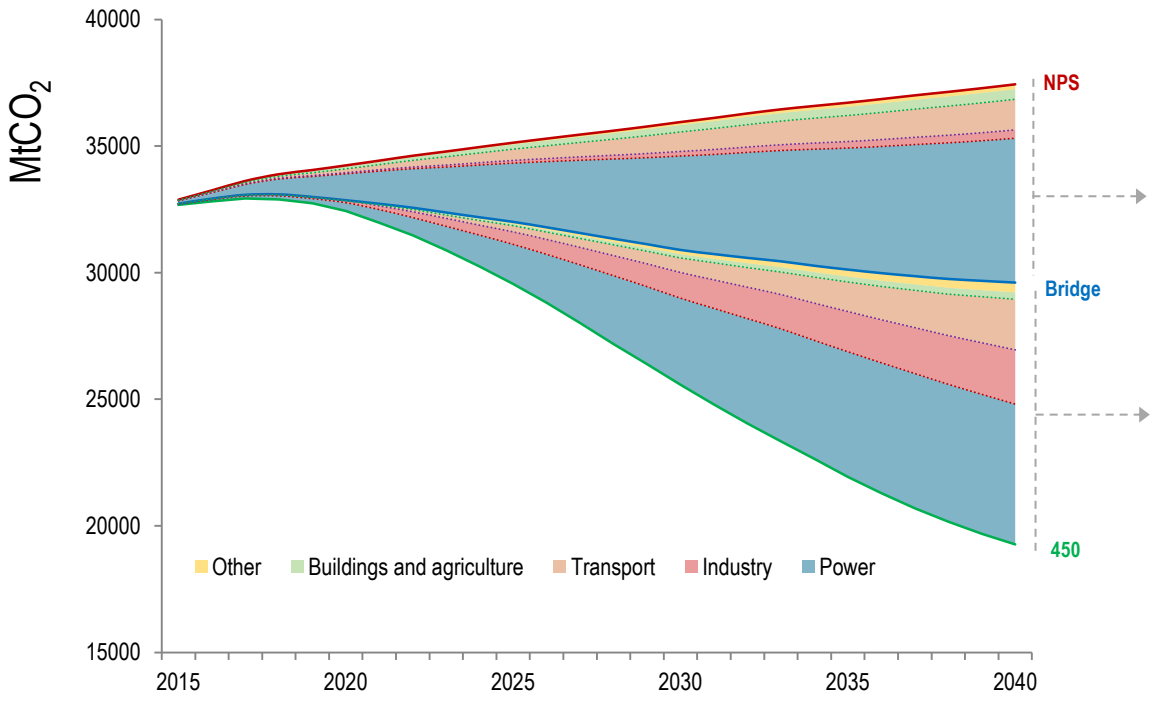
Conclusions: Lessons learned from IEA scenarios and Canada case study

- Policy packaging that includes carbon pricing plays an important role within the IEA's low-carbon scenarios
- Within the IEA's low-carbon scenarios, the steep cuts in emissions needed after 2030 point to the importance of both short-term policy actions that deliver immediate results and those that support long-term mitigation ambitions, such as RDD&D investment in emerging technologies.
- The role of carbon pricing across sub-sectors differs based on their price sensitivity.
- Carbon pricing can incentivise a large share of opportunities in power generation and industry, but it plays only a supporting role in the transport and buildings sectors.

Comparing the role of carbon price and policies in IEA scenarios



- Pricing: fossil fuel subsidy removal and moderate carbon pricing
- Phasing out of inefficient coal plants and support for renewable sources in power generation
- High energy efficiency standards for vehicles, appliances, heating & cooling, industry

- Pricing: progressively very high carbon pricing, with major impacts in power generation and industry
- Early R&D and later deployment of advanced technologies such as electric vehicles, advanced biofuels, nuclear, CCS
- Very high energy efficiency standards in buildings, industry and transportation

Source: World Energy Outlook Special Report: Energy and Climate Change, 2015

Targeted policies can peak emissions, but high carbon prices and advance technologies give deeper reductions consistent with climate goals

Summary: Policy packages for the power sector