

Energy Technology Perspectives 2015: Mobilising Innovation to Accelerate Climate Action

ELERING SMART GRID CONFERENCE

Tallinn, 15 October 2015

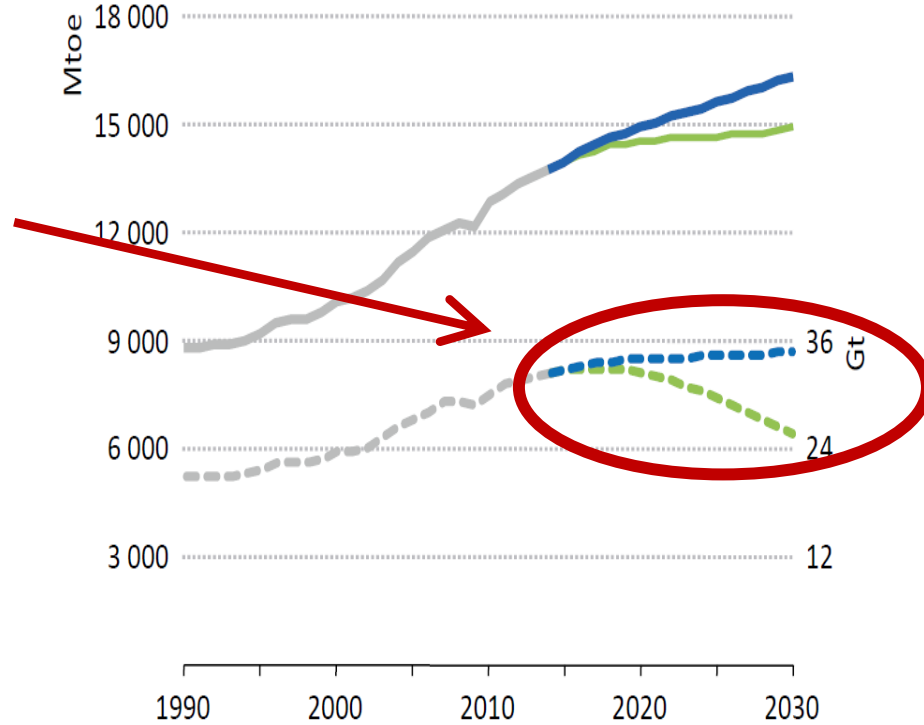
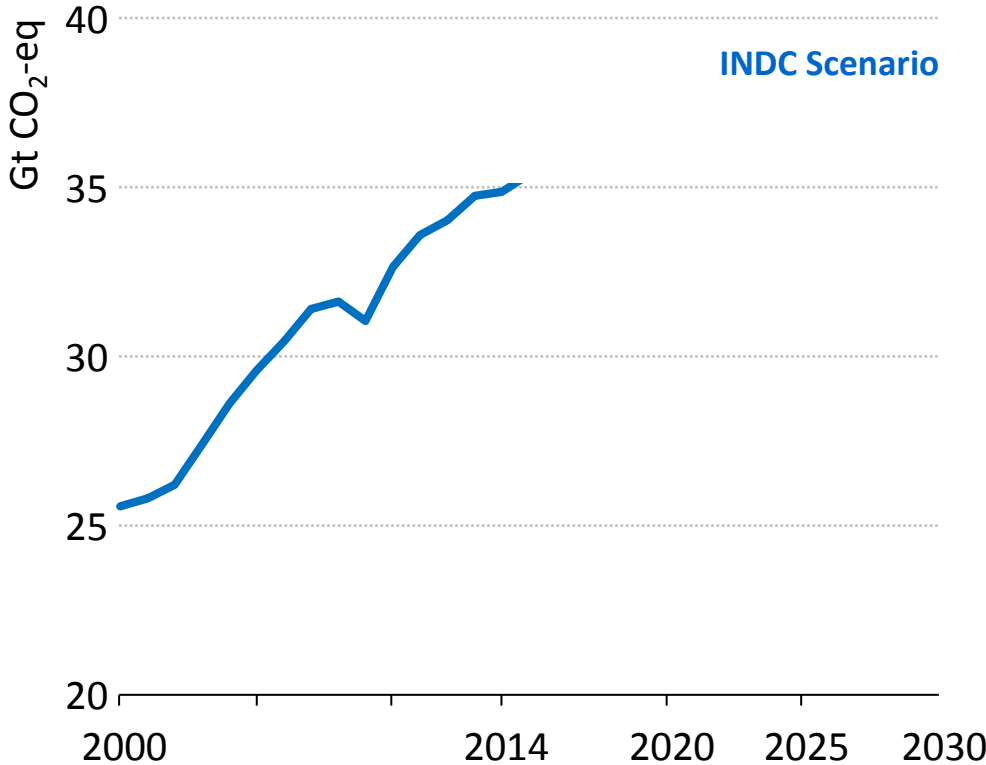
Jean-François Gagné

Energy Technology Policy Division,

International Energy Agency

National pledges build towards a global agreement

Global energy-related GHG emissions



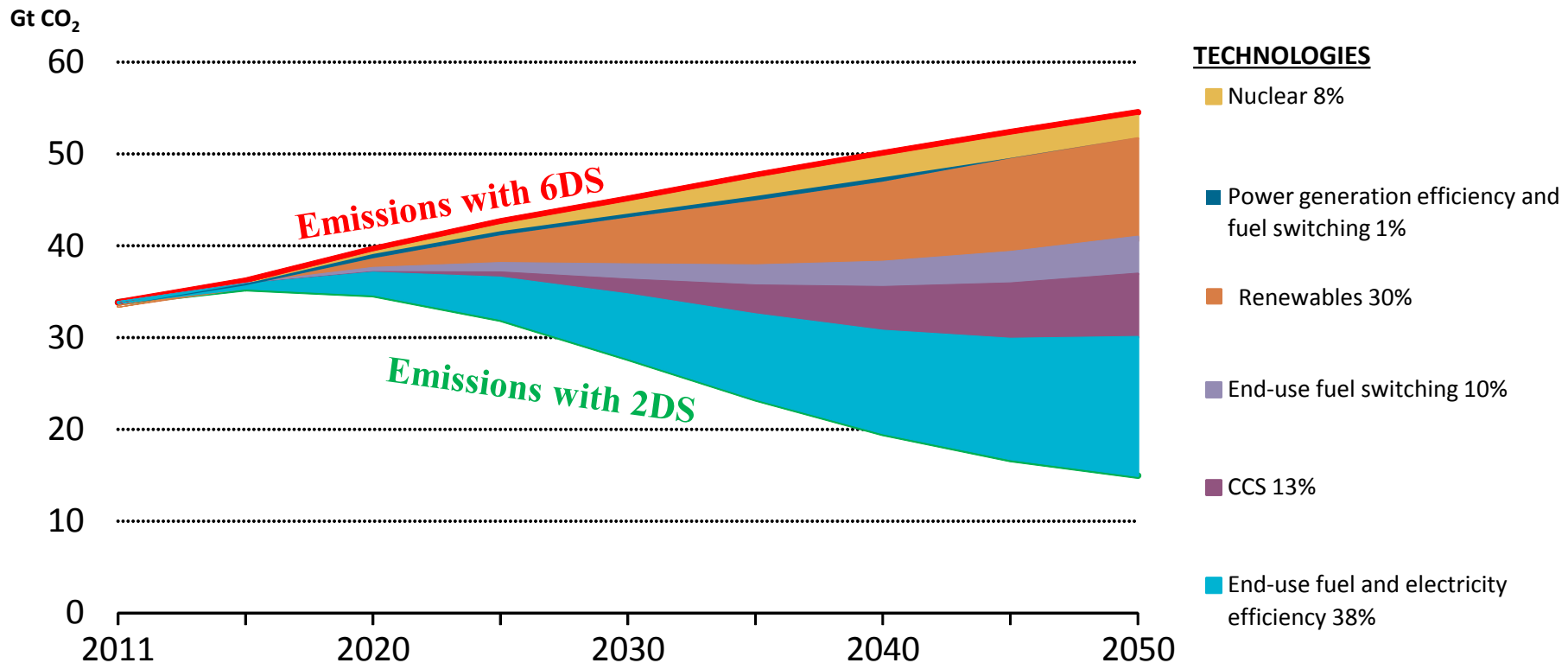
Note: Mtoe = million tonnes of oil equivalent; Gt = gigatonnes.

- Primary energy demand:**
 - INDC Scenario
 - 450 Scenario
- CO₂ emissions (right axis):**
 - - INDC Scenario
 - - 450 Scenario

Energy Innovation is crucial to a sustainable energy transition

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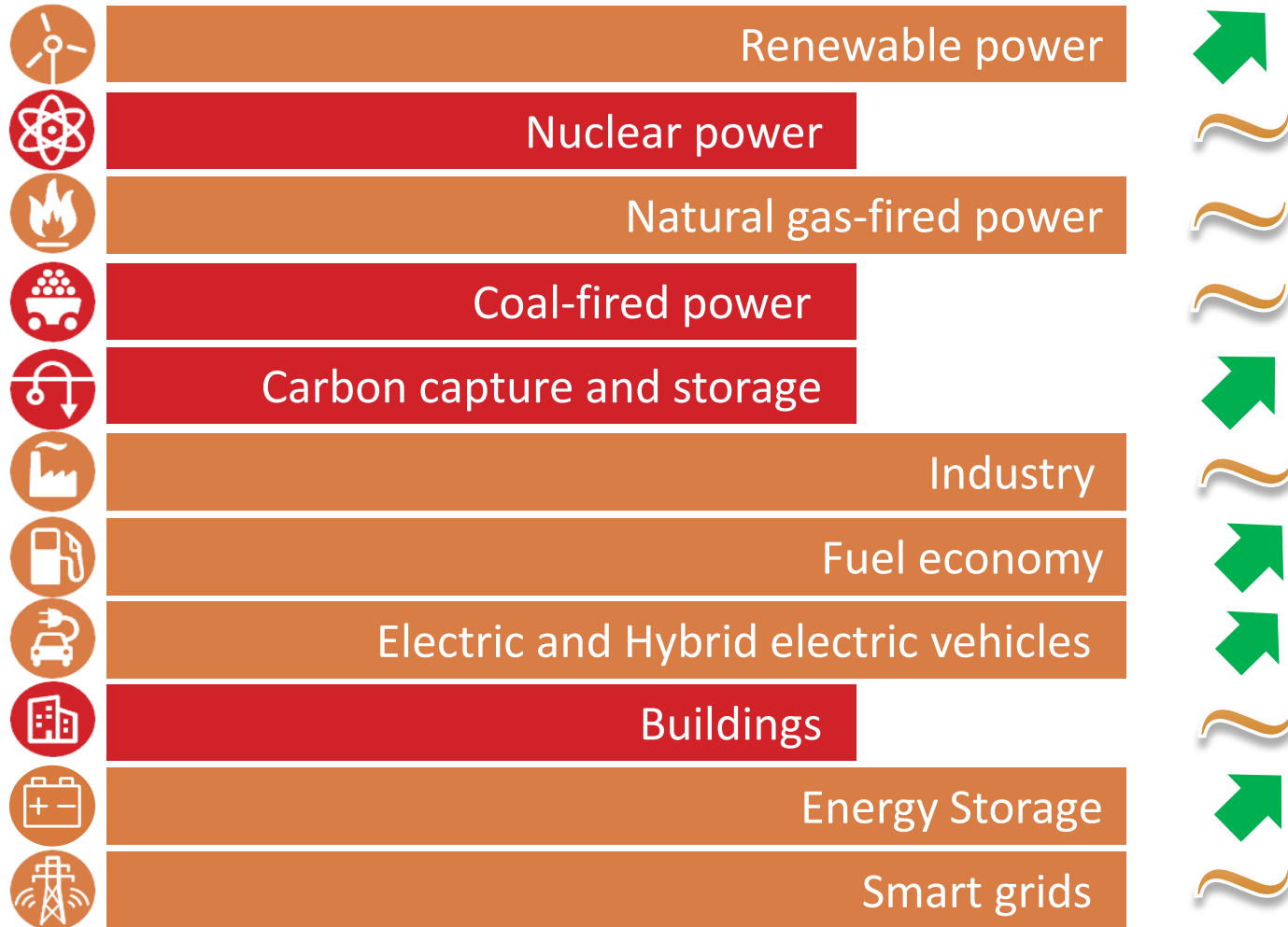
Contribution of technology area to global cumulative CO2 reductions



Energy innovation has already yielded solutions, but needs support and guidance to deliver on its promises

Clean energy is not ramping up fast enough - Despite some progress

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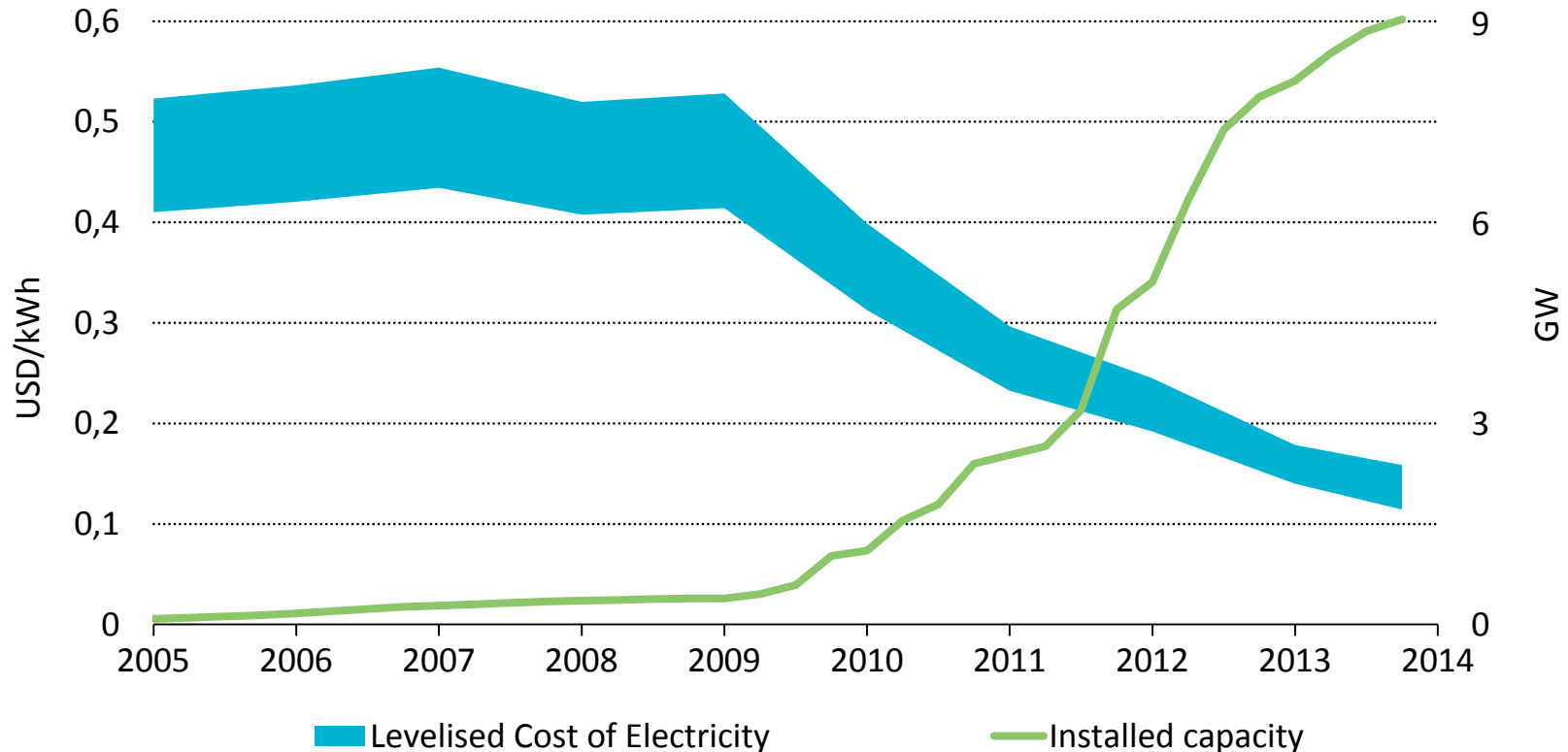


Evidence shows that despite continued progress in many areas, for the first time none of the technologies are in line with 2DS goals

Technology innovation is making renewable energy markets viable

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Cost of electricity generated and utility-scale PV capacity installations in Germany

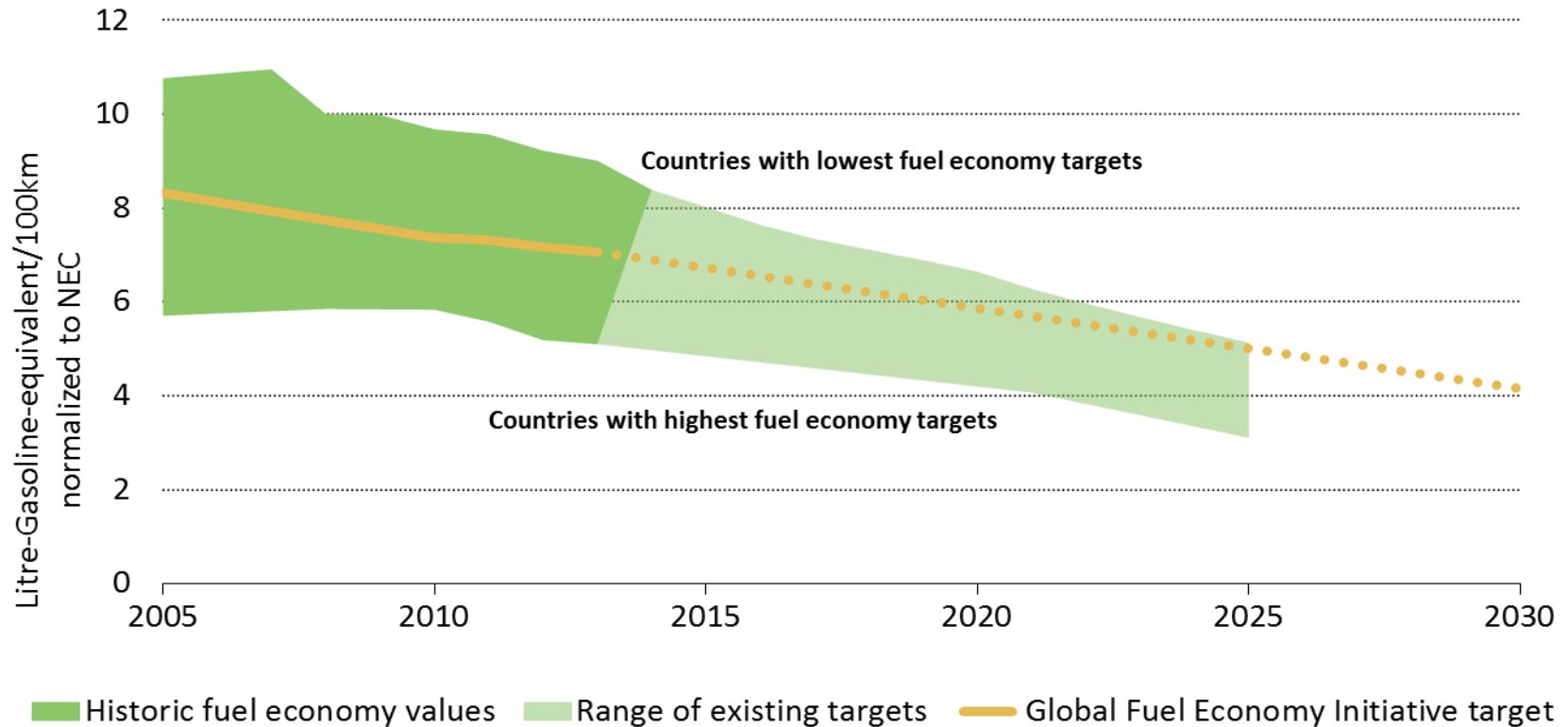


Thanks to 40 years of innovation efforts, solar PV generation is an increasingly cost competitive option

Innovation has also helped improve energy efficient technologies

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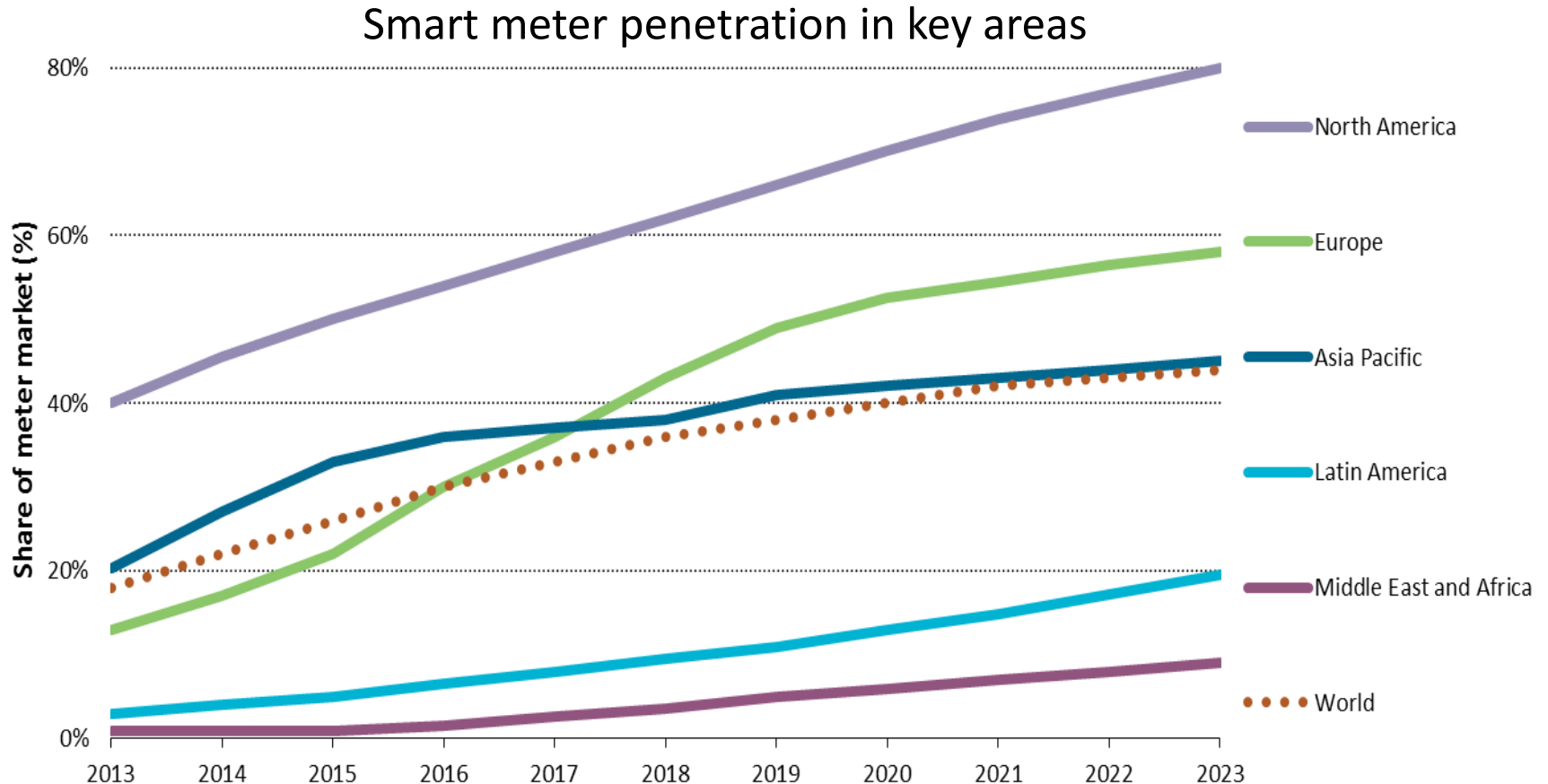
Average new Light-duty vehicle fuel economy evolution by country, 2005 to 2013



Fuel economy is improving as policy increasingly drives the deployment of more efficient vehicle technologies

Focus is needed on systems integration innovations

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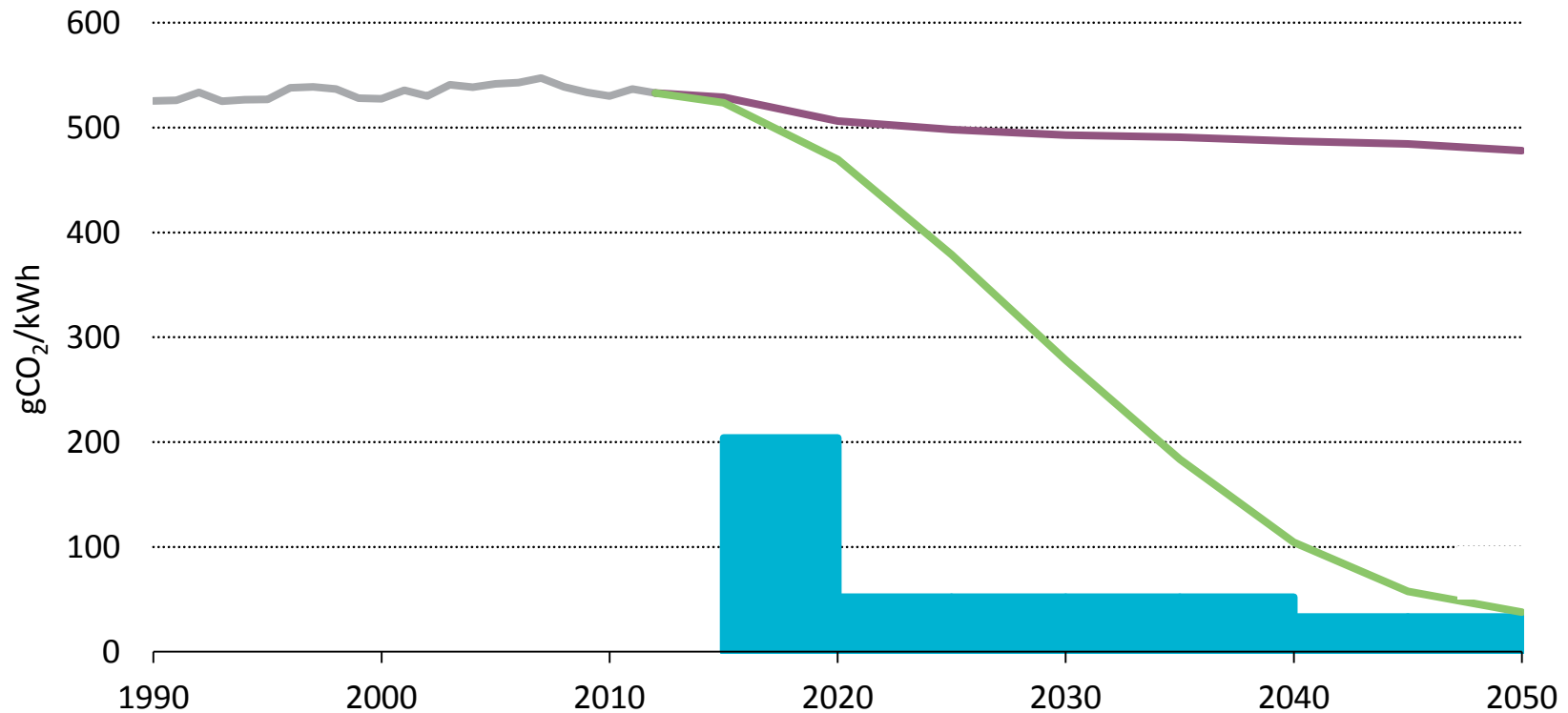


Data availability currently precludes a complete picture of smart grid deployment.

Having the right information can help stimulate support

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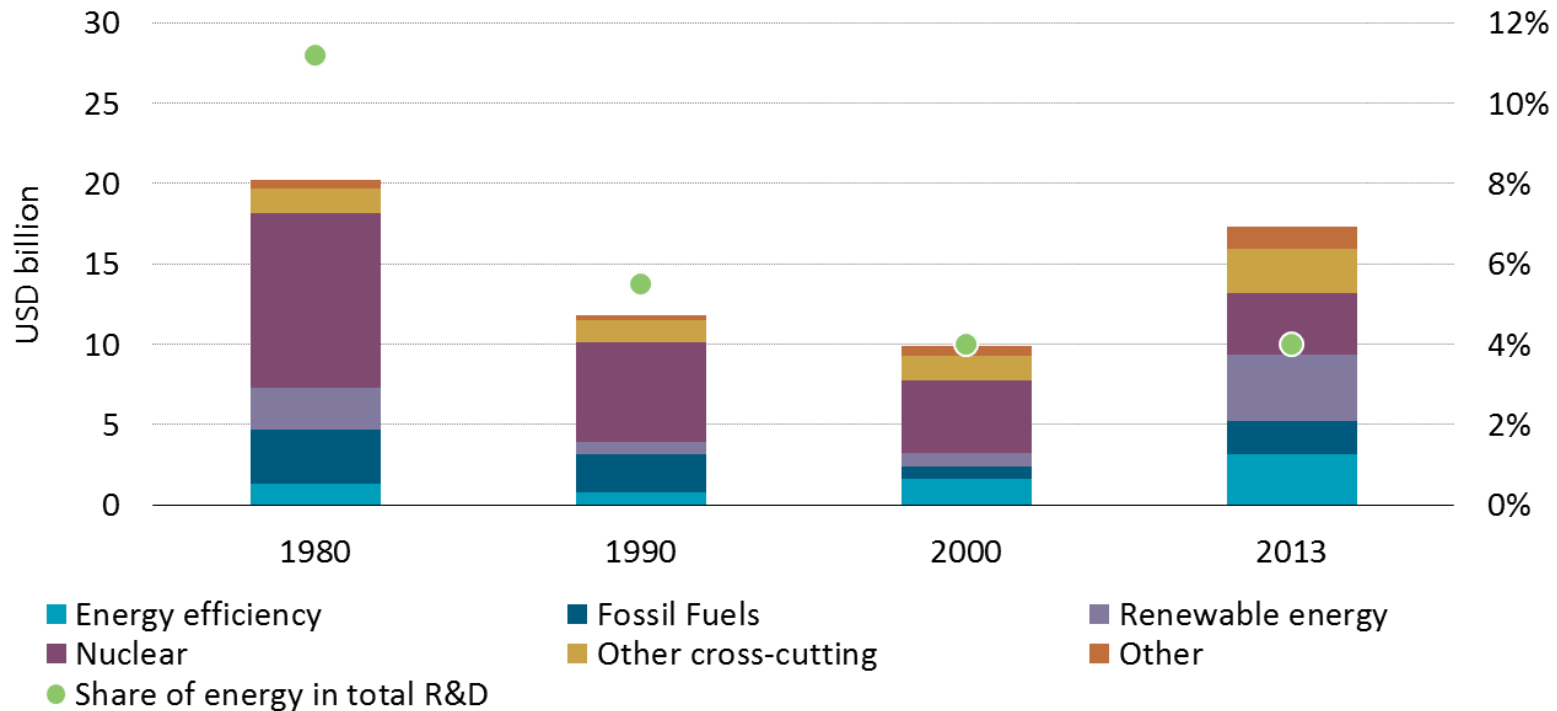
Global fleet average and new-build plants emissions intensity of power generation in IEA scenarios



Developing a richer set of data and tracking the right metrics can focalise actions and enhance ambitions

Energy RD&D funding now targets the right issues, but is not enough ETP 2015

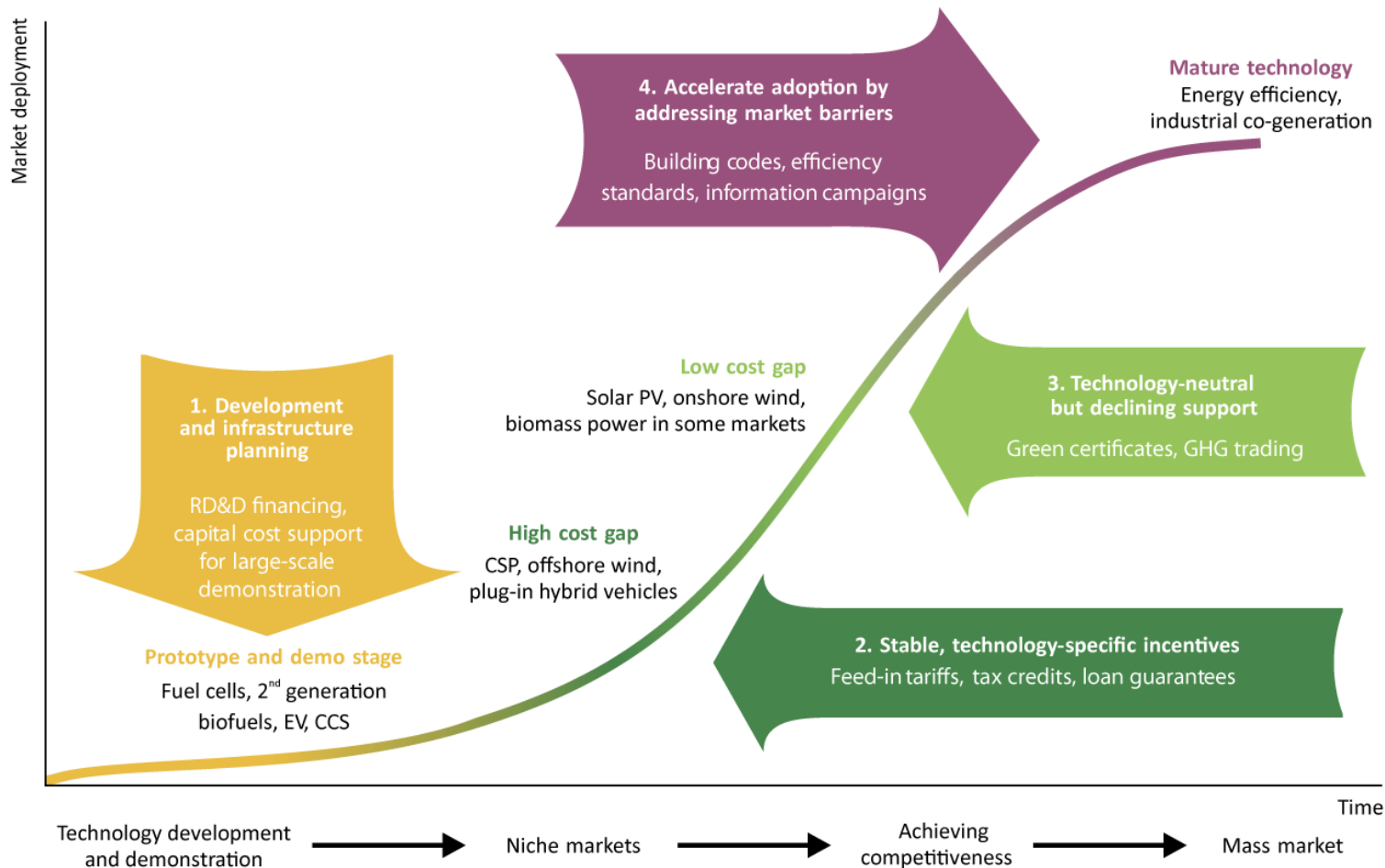
IEA government Energy RD&D expenditure



Energy RD&D spending should reflect the importance of energy technology in meeting climate objectives

Supporting Energy Innovation: The right policy at the right time

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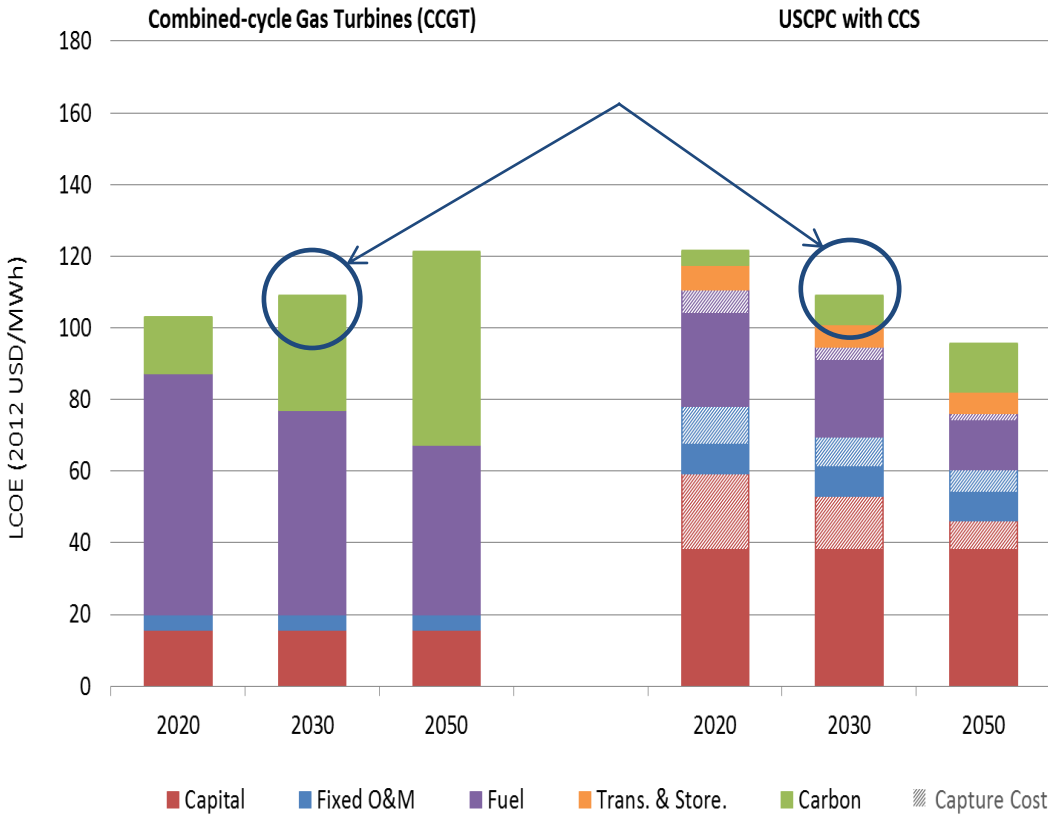


The right support depends on the maturity of the technology and the degree of market uptake

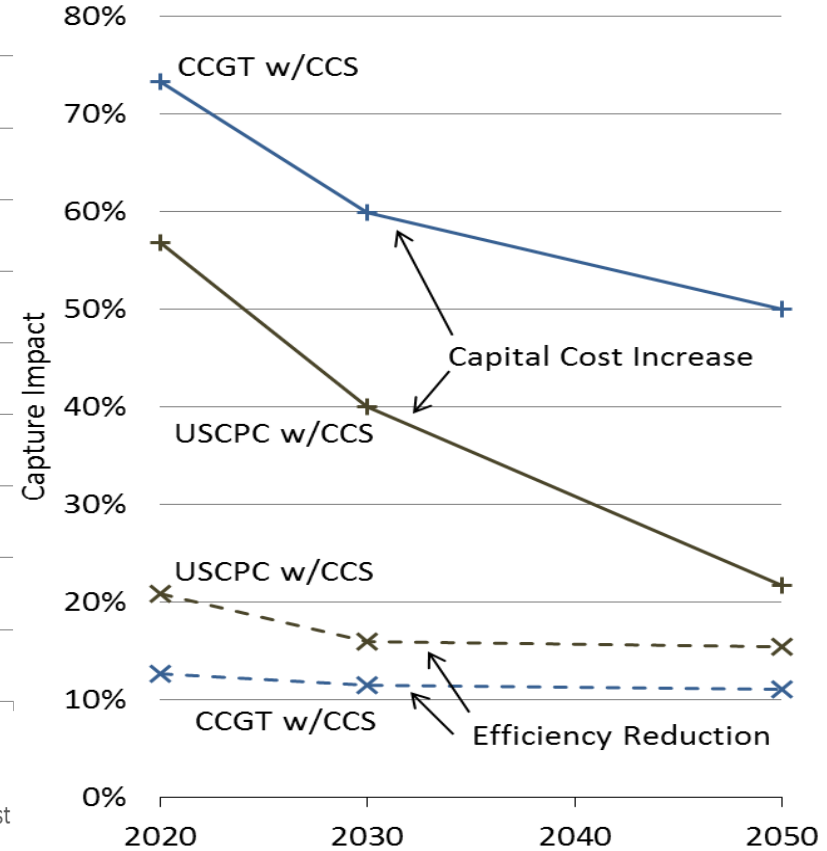
Early stage support is key to improve future technology competitiveness

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Projected Levelised Cost of Electricity of coal power generation in Asia



Assumptions on Capture Cost and Performance in the 2DS

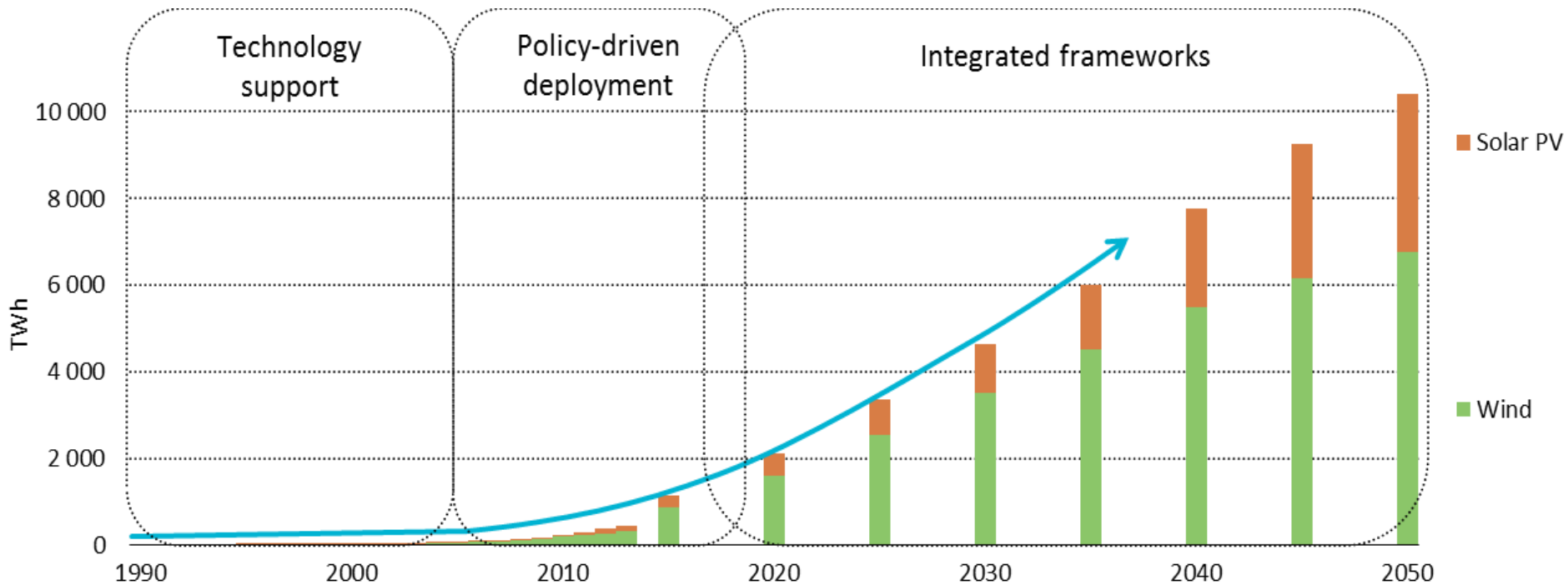


Aggressive cost reductions are needed in the near term to make these projections a reality

Deployment at scale needs support addressing market uptake barriers

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Projections of wind and solar PV generation

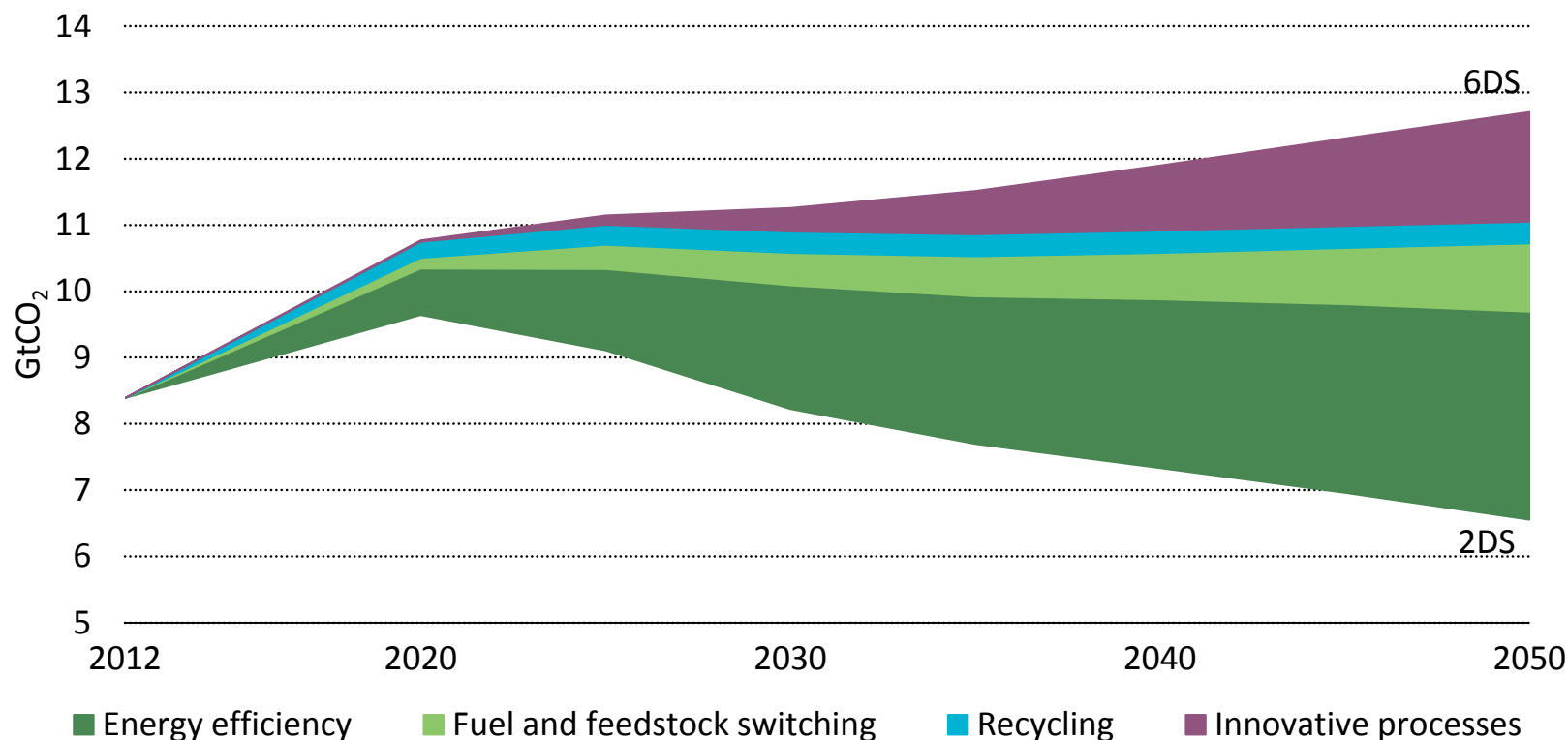


Wind and solar PV support needs to move from strictly incentives to integrated and well-designed market, policy and regulatory frameworks

Innovation is essential for sustainable growth in the industrial sector

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Annual energy-related direct CO₂ Emissions in the industrial sector in the 2DS

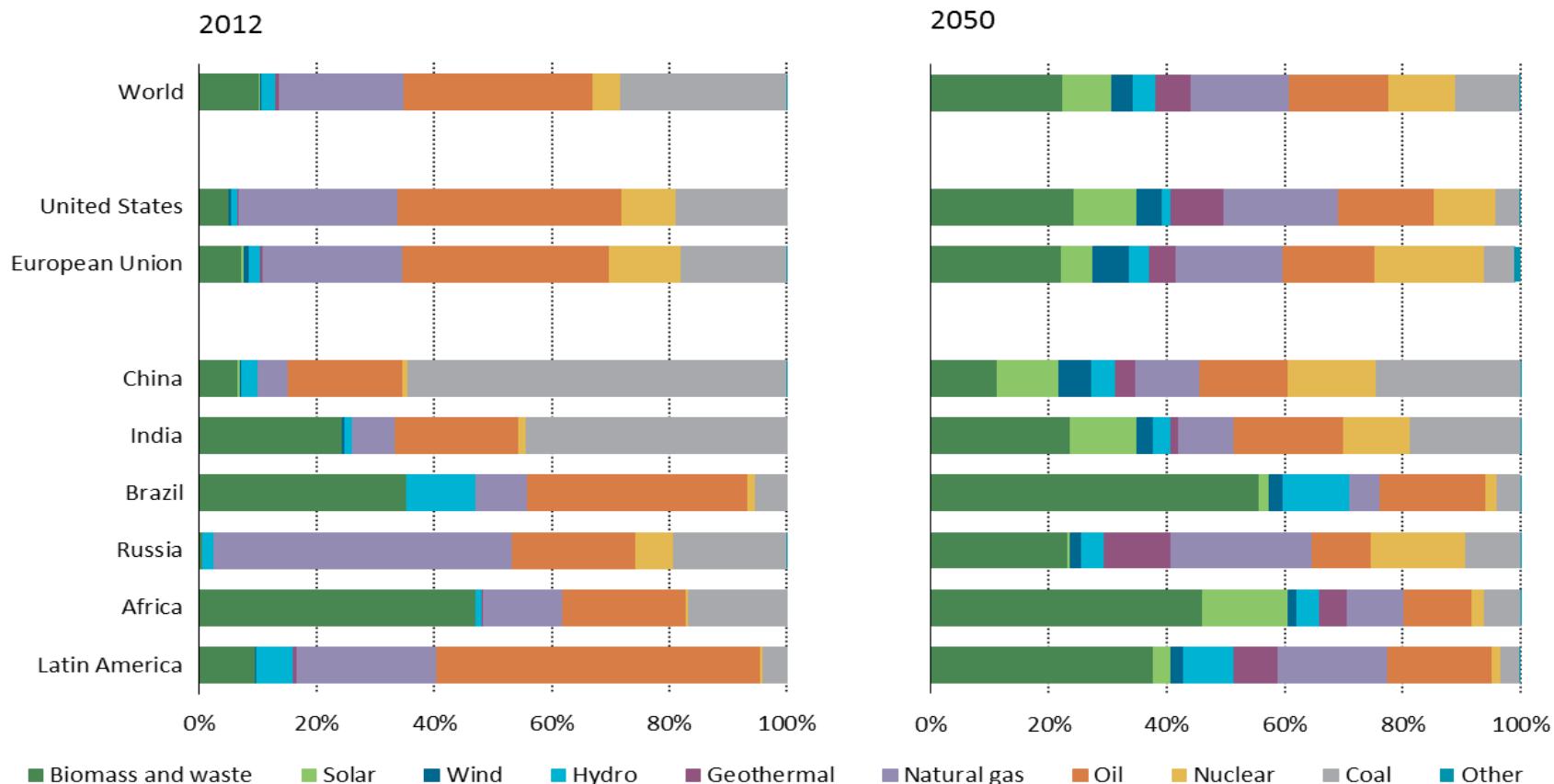


Public and private entities need to work together to align innovation goals and achieve multiple benefits

Innovation in a diverse world: no “one-size fits all” solution

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Different regions have differing technology shares today and in 2050-2DS



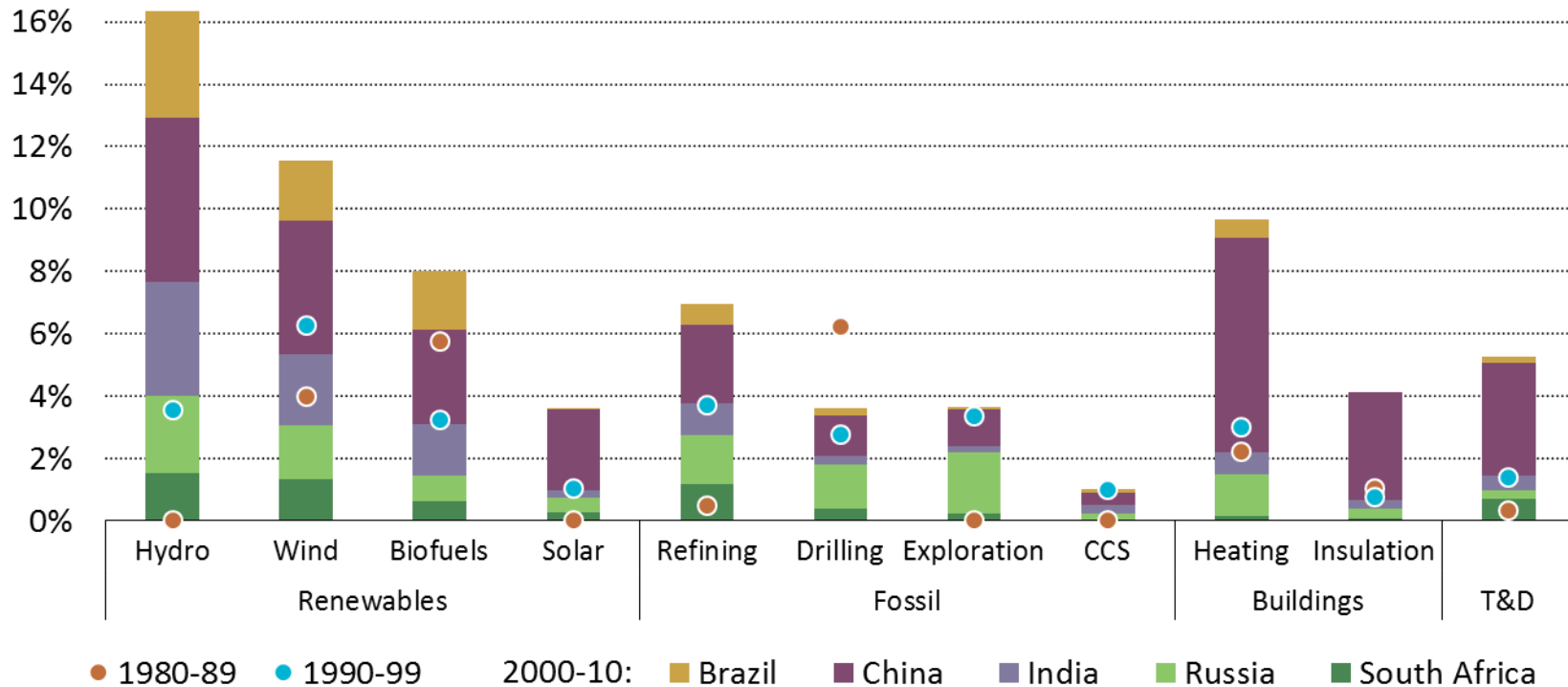
Source: ETP 2015

*National circumstances and resources will drive
different technology portfolios and pathways*

Local innovation cultures provide the frameworks to identify priorities

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Emerging economy patent applications as percent of total IEA

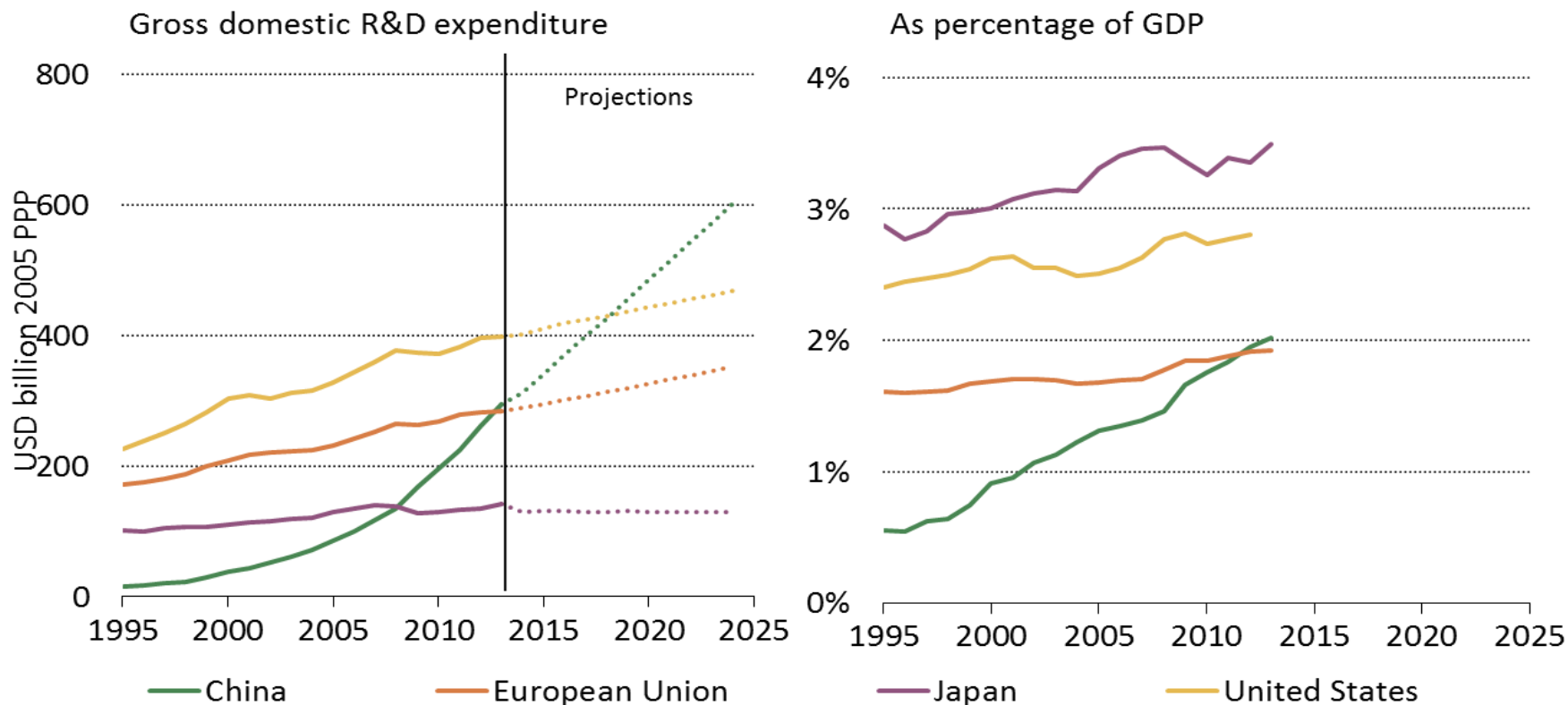


Evaluating challenges and opportunities is essential to supporting innovation where it has the most impact

China is taking action to reap the benefits of a strong innovation system

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China's total R&D spending and OECD projections



China is poised to become the global leader in R&D spending by 2019.

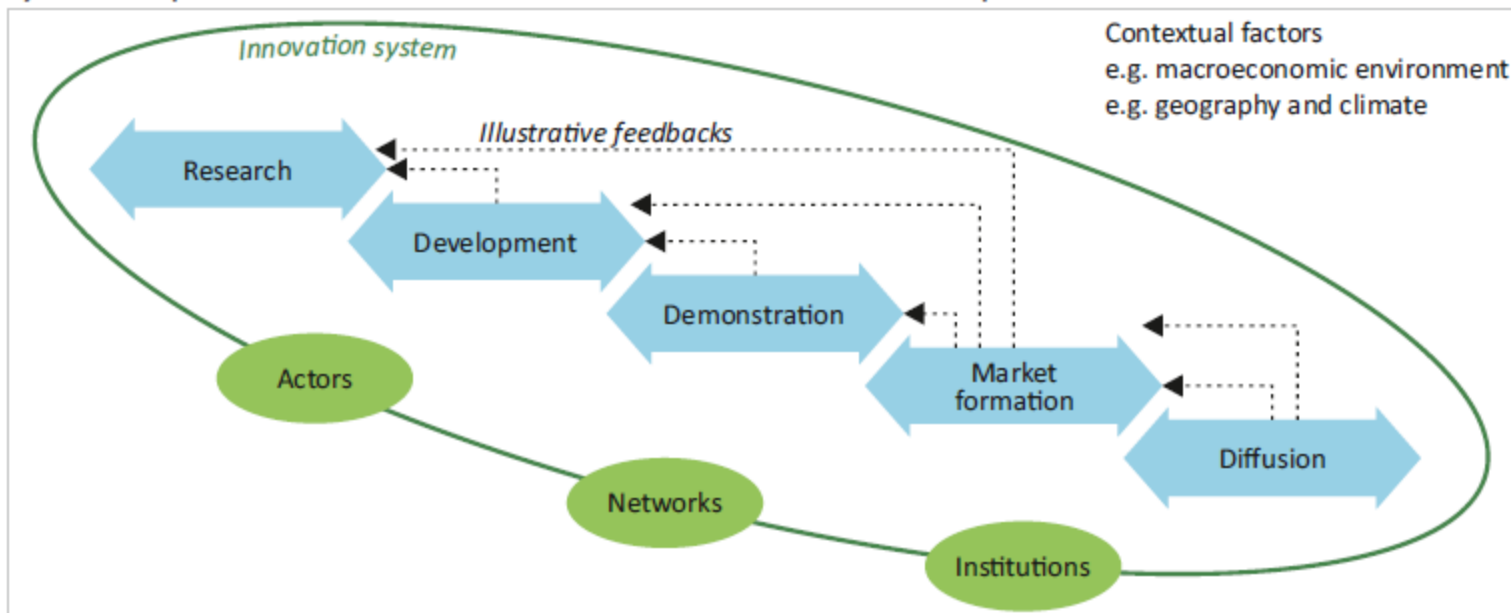
Better understanding innovation can increase confidence in its outcomes

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Linear model of innovation process



Systematic representation of innovation with chain-linked model of innovation process

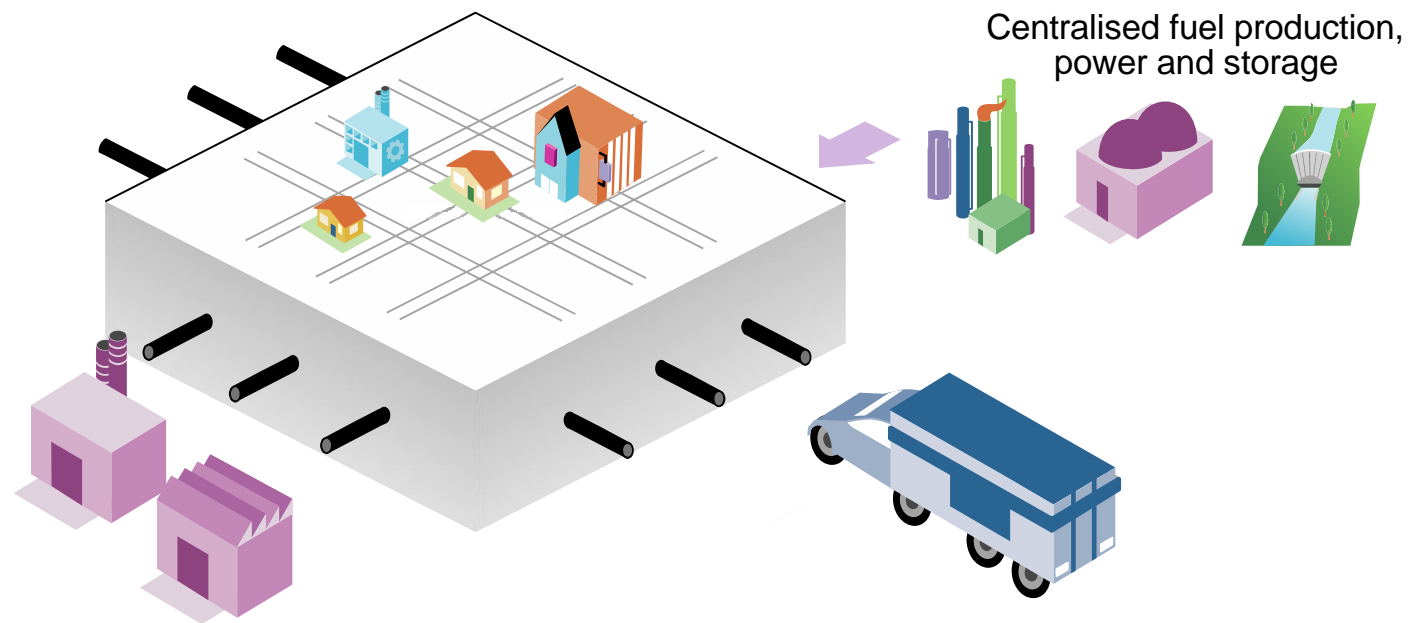


Understanding innovation

From this

To this

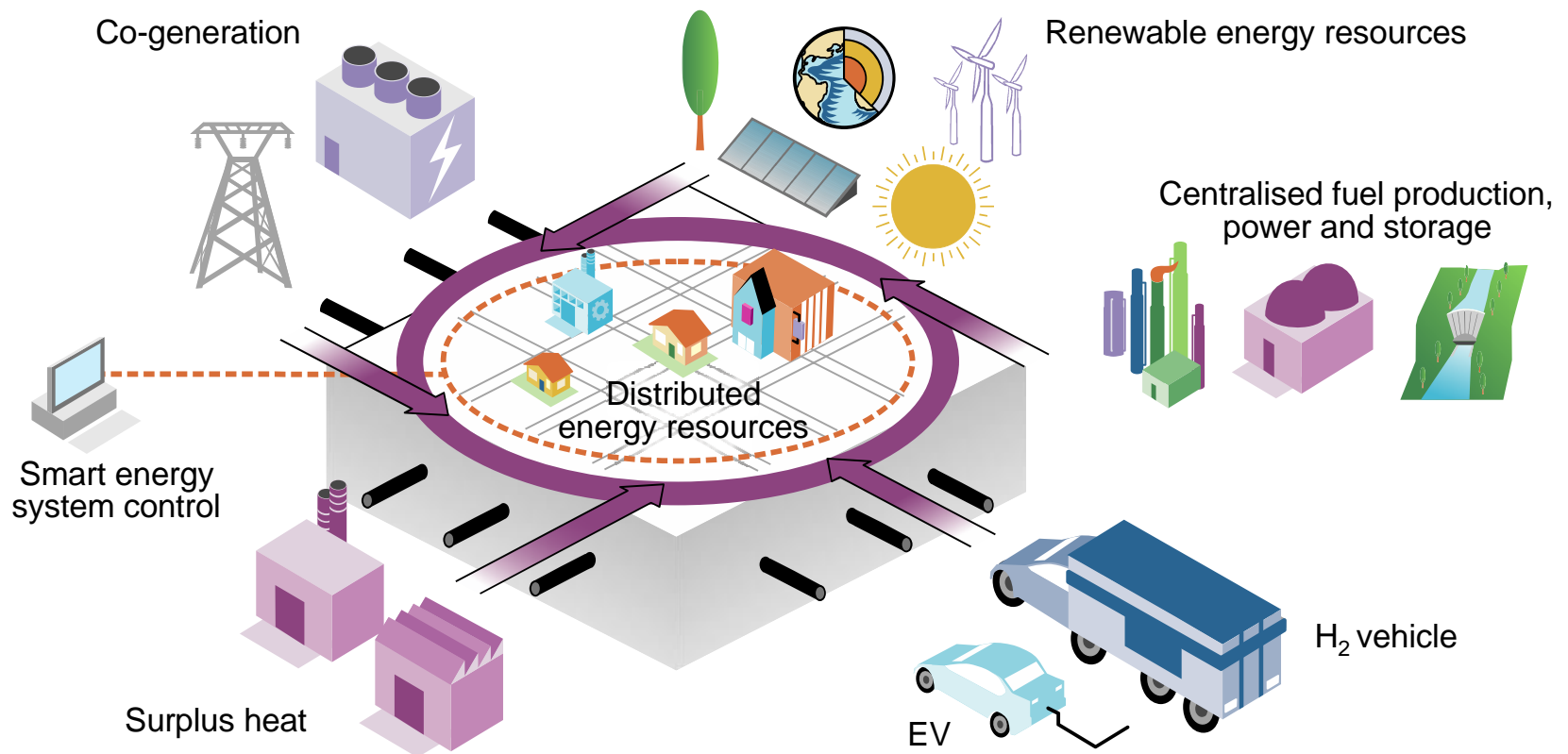
In order to accelerate technological progress in low-carbon technologies, innovation policies should be systemic



Today's energy system paradigm is based on a unidirectional energy delivery philosophy

Systems thinking and integration

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A sustainable energy system is smarter, multidirectional and integrated - requiring long-term planning for services delivery

IEA Energy Technology Activities

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- Where do we need to go?
- Where are we today?
- How do we get there?



ETP publication programme

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ETP 2014

ETP 2015

ETP 2016

ETP 2017

Part 1. Setting the Scene

Global Outlook, Tracking Clean Energy Progress

Part 2. Driving the Change (Thematic Focus) *

Harnessing
Electricity's
Potential

Mobilising
Innovation to
Accelerate
Climate Action

Building Urban
Energy Systems

- TBD
- Securing sustainable resources
 - Investing in sustainable infrastructure

Partner Country

India

China

Mexico

TBD
(Indonesia)

IEA Technology Roadmaps

Mapping where we need to go ...

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2009

2010

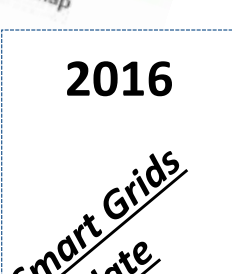
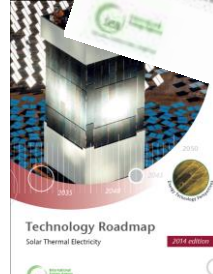
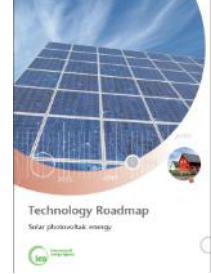
2011

2012

2013

2014

2015



<https://www.iea.org/roadmaps/>

Low-Carbon Technology Roadmaps



... By building consensus among all stakeholders

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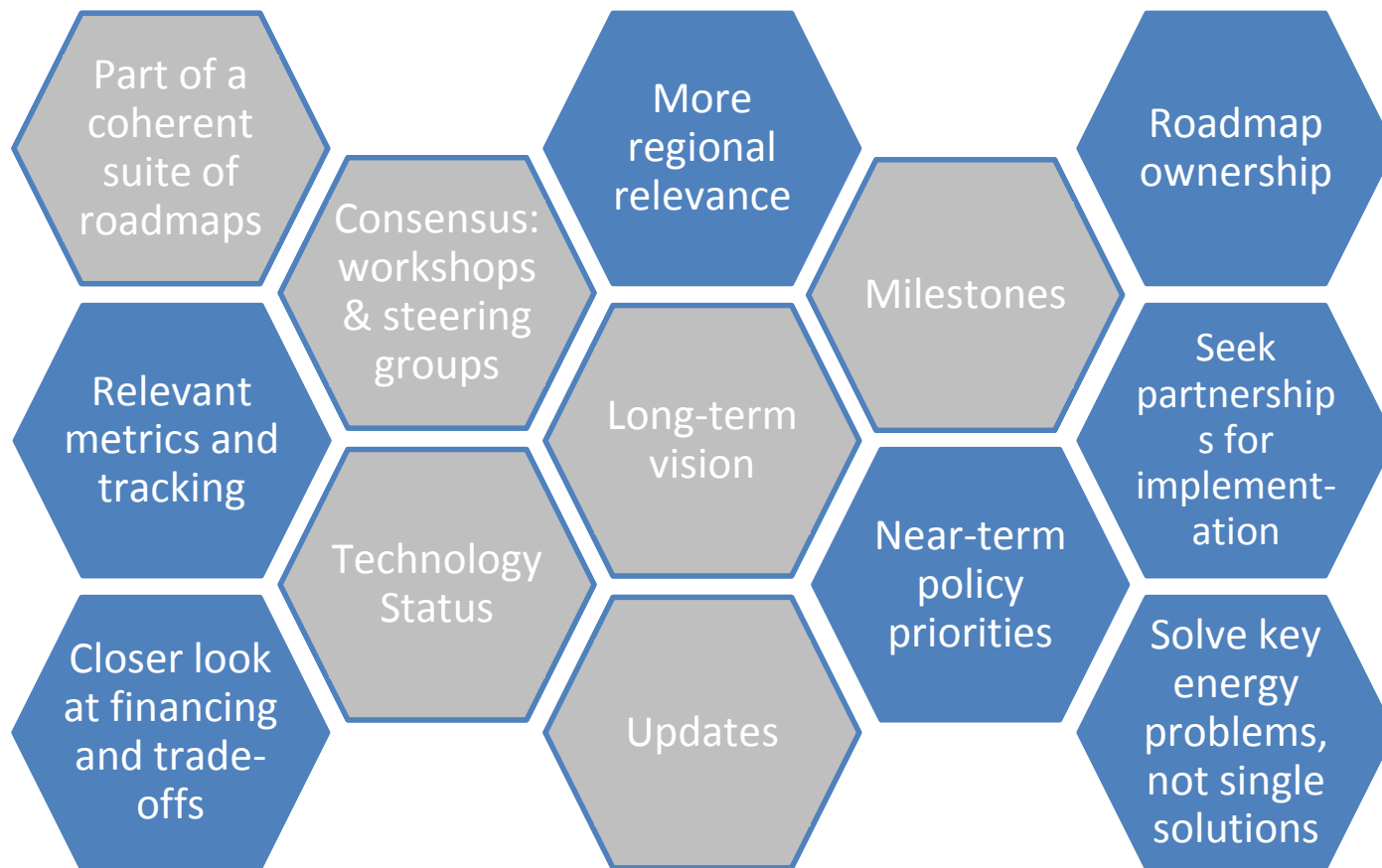
- Goal to achieve
- Milestones to be met
- Gaps to be filled
- Actions to overcome gaps and barriers
- What and when things need to be achieved



Low-Carbon Technology Roadmaps

A New Cycle of Roadmaps: Building on existing foundations

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Low-Carbon Technology Roadmaps

Updating Knowledge: Smart Energy Systems roadmap

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CURRENT OPPORTUNITIES AND CHALLENGES

SMART TRANSMISSION

Transmission control centre
Ageing transmission infrastructure in OECD countries
Need for large-scale transmission infrastructure in fast-growing economies



FUTURE TECHNOLOGY VISION

Energy storage
Substation
superconductor
Vision for High voltage AC/DC interconnections in different contexts



ENERGY TECHNOLOGY NETWORK

ISGAN; HTS

SMART DISTRIBUTION

Integration of distributed power, renewables, local storage
Micro-grids for energy security
Energy service provider
Electric vehicles

Substation
Storage
Vision for changing role of distribution network owners and operators

ISGAN; PVPS

SMART CONSUMPTION

Smart meter deployment, big data
Electrification of transport and heat, demand response, power-to-X
customer

Commercial
Vision for integration of end consumption in energy systems

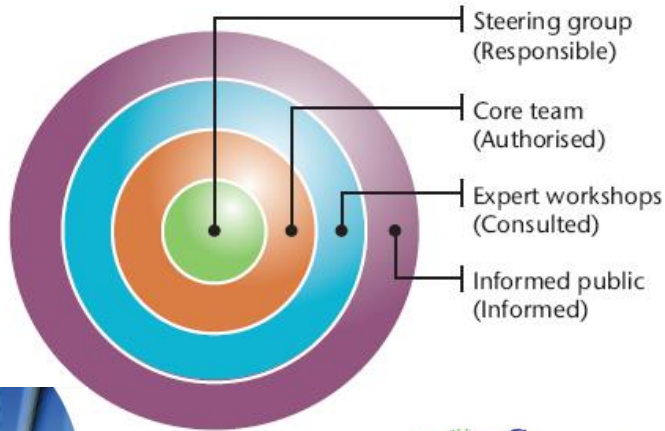
ISGAN; DSM; HEV
Residential customer



Low-Carbon Technology Roadmaps

New Roadmaps: keeping the inherently collaborative nature

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Energy Technology Roadmaps
a guide to
development and implementation

2014 edition

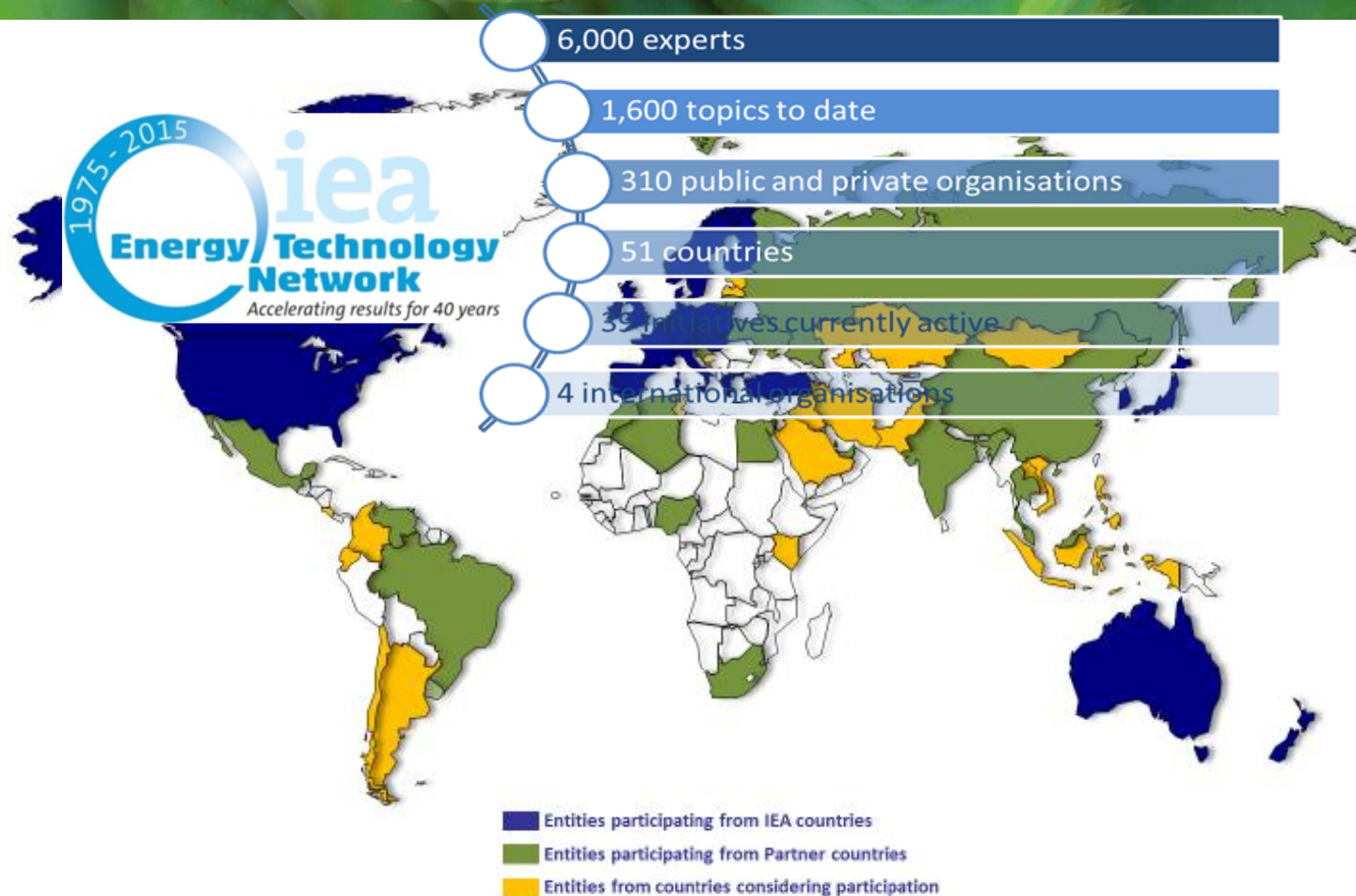


Low-Carbon Technology Roadmaps



Multilateral Collaboration: The IEA Energy Technology Network

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Thank you

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Explore the data behind *ETP*



www.iea.org/etp