International Energy Agency

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IEA Technology Roadmaps: Pathways for the Energy Transition

APEC EGNRET

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www.iea.org

IEA supports the energy transition

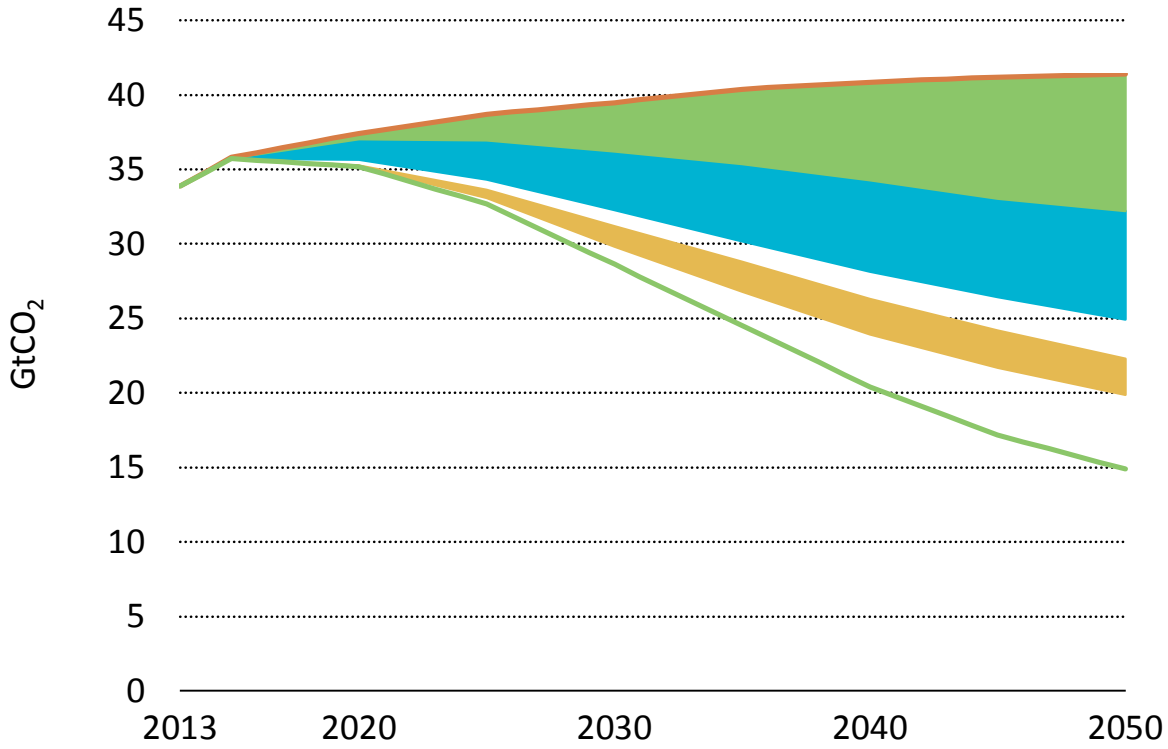
IEA: the global energy authority

- **Founded in 1974 to co-ordinate a response to oil supply disruptions**
- **2015: IEA Modernisation grounded on three main pillars**
  - global energy security
  - energy cooperation and global dialogue
  - **promoting an environmentally sustainable energy future**

- **Build on a decade of analysis on what we need to do to keep temperature increase below 2°C**
- **Now developing analysis on faster and deeper energy-sector decarbonisation**

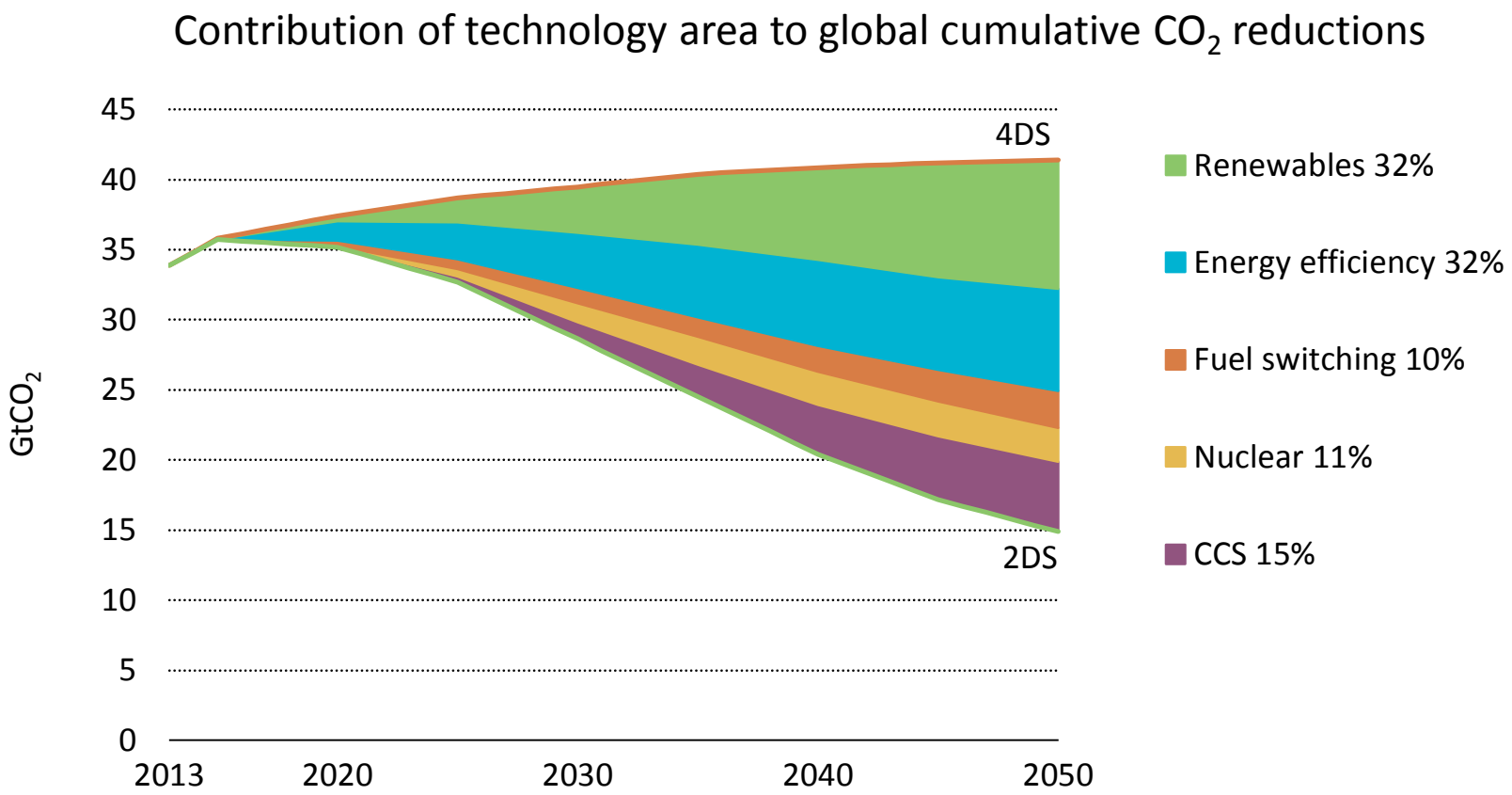
Energy Innovation is crucial to a sustainable energy transition

Contribution of technology area to global cumulative CO_2 reductions



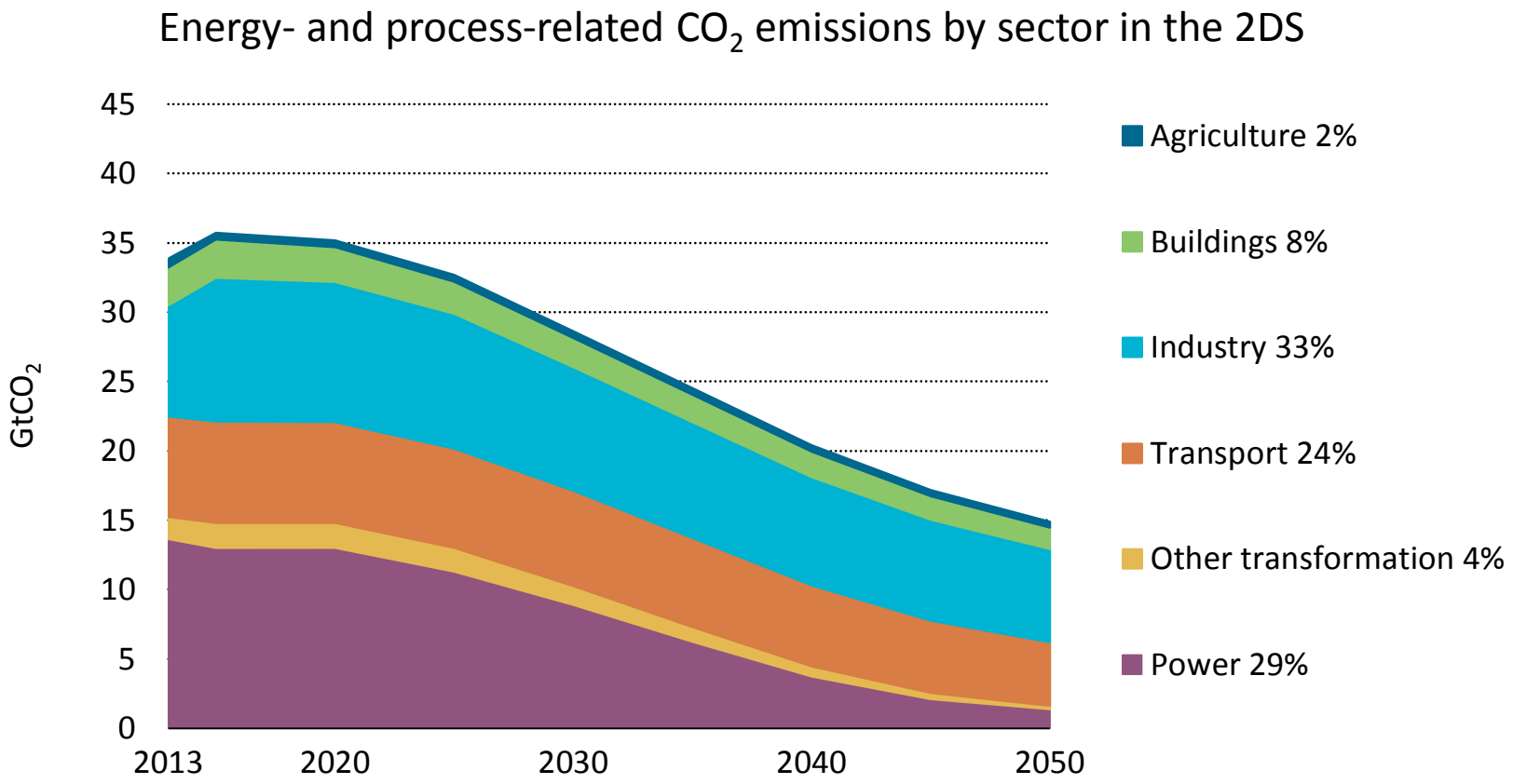
Energy innovation has already yielded solutions,

Energy Innovation is crucial to a sustainable energy transition



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

And the challenge increases to get from 2 degrees to "well below" 2 degrees



Industry and transport account for 75% of the remaining emissions in the 2DS in 2050.

IEA Technology Roadmaps

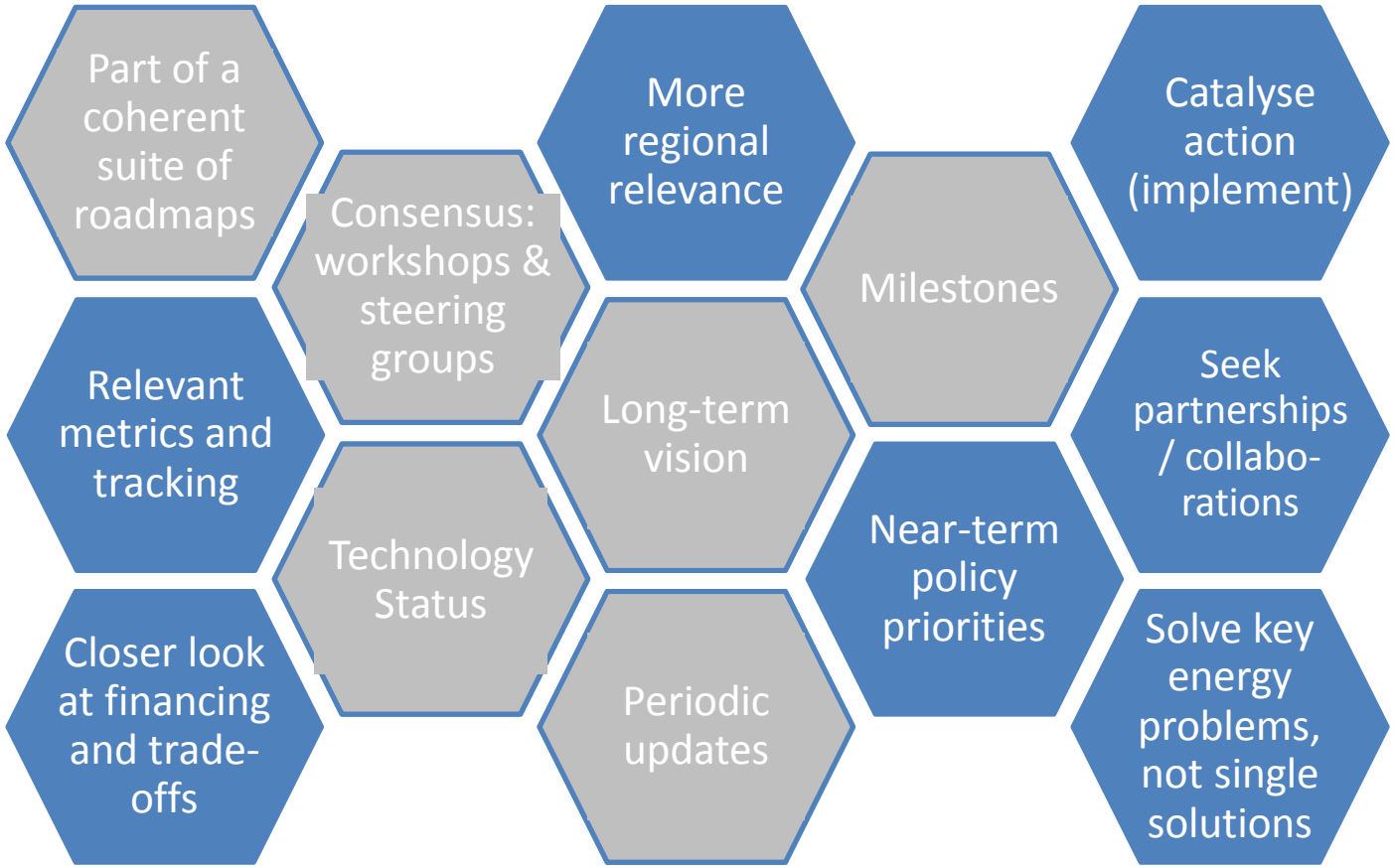
- **Re-endorsed at G7 Energy Ministerial Meeting in May 2016 (Kitakyushu)**

  "Building on the substantive outcome of the first phase of the IEA's Energy Technology Roadmaps programme, which was initiated by the G8 Hokkaido Toyako Leaders Summit in 2008 and resulted in 21 roadmaps, we welcome the launch of the second phase of IEA Technology Roadmaps focusing on viable and high impact technologies, and ask the IEA to report to us on its progress".

G7 Kitakyushu Energy Ministerial Meeting

- **22 Technology Roadmaps and How2Guides, 33 publications**

Building a new cycle on existing foundations



A new cycle of roadmaps for a stronger bridge to implementation

- Criteria to selecting priority technologies and roadmapping opportunities:
  - **Support**
  - **Relevance**
  - **Innovation gap**
  - **Funding**
  - **Resources**

- **Tentative titles 2017-2018:**

UPDATES	NEW TITLES
• Smart Energy Systems (Q3 2017)	• Iron & Steel
• Bioenergy (Q3 2017)	• Efficient Freight
• Heating and Cooling in Buildings	
• Cement	

Smart Energy Systems

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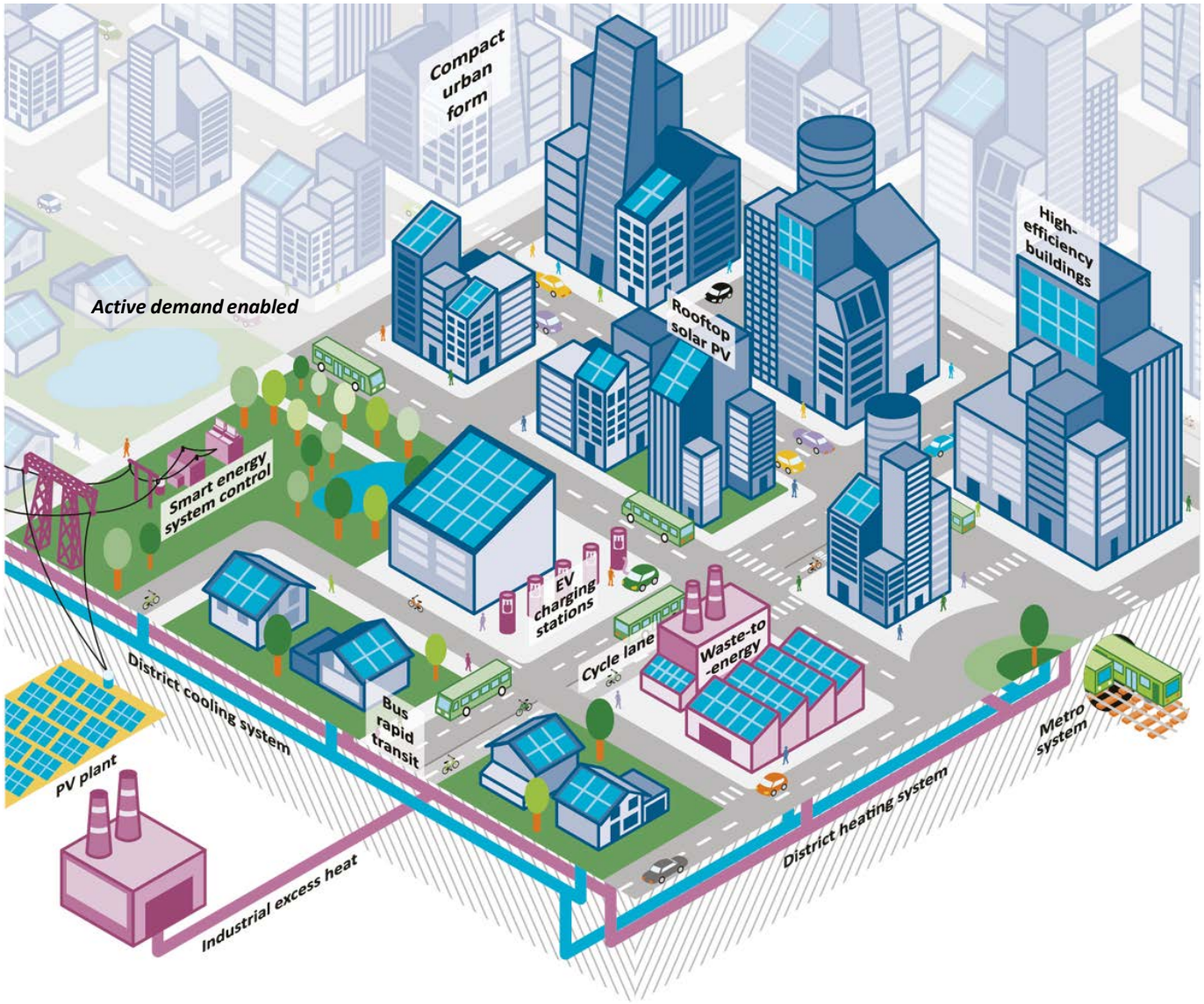
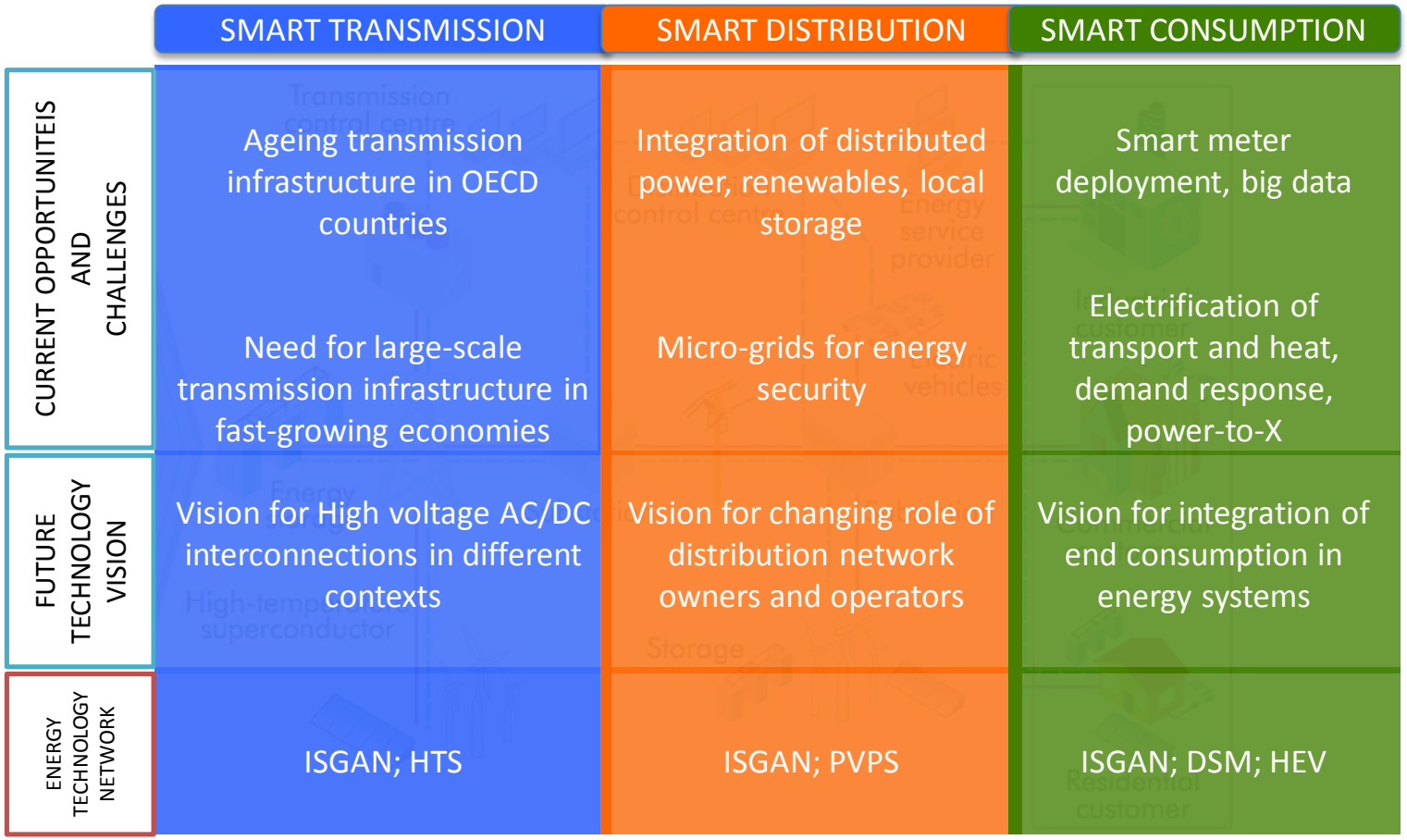
2011 *2015*

Smart Grids have the potential to provide a contribution to all energy needs and play a very important role in low-carbon energy scenarios in each sector

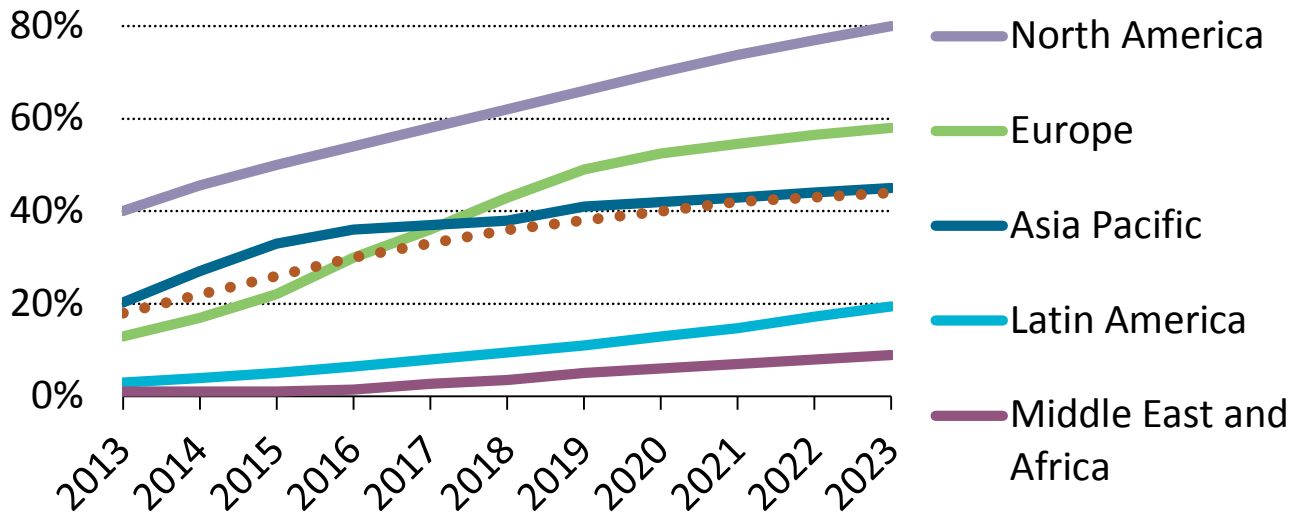
11 Oct 2016: IEA-ISGAN joint workshop on *"flexibility in future energy systems"*

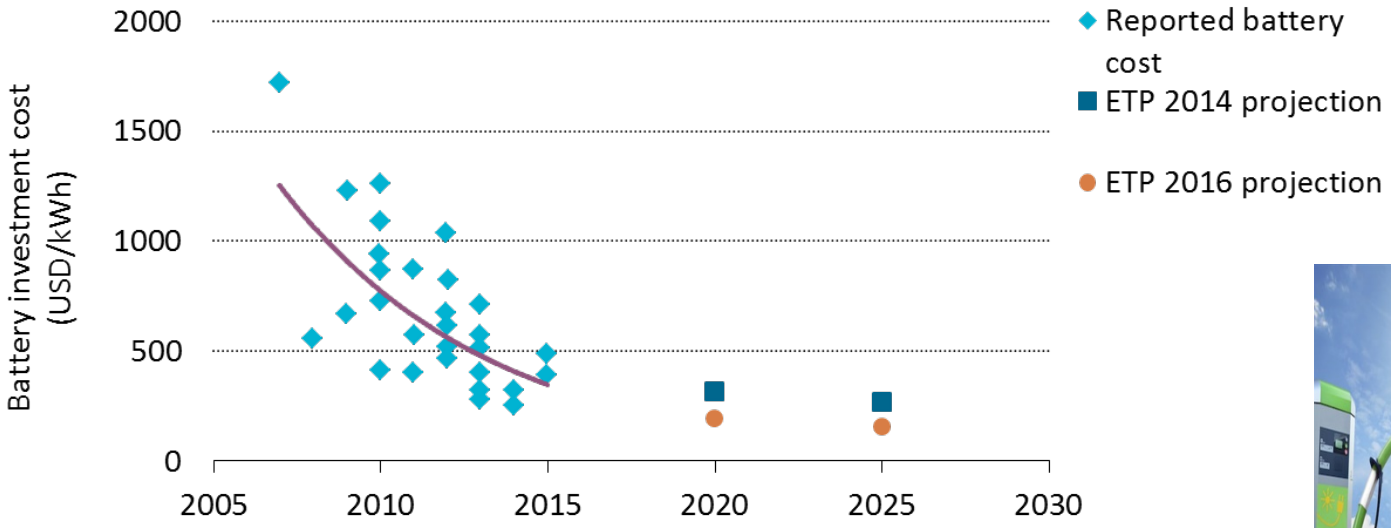


2017 Smart Energy Systems roadmap



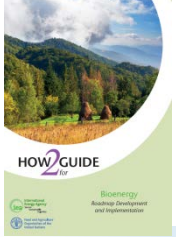
Trends in smarter energy systems





2011

2012



Bioenergy

Global biofuels production and medium-term forecast compared with IEA 2DS scenario requirements

WHAT HAS CHANGED?

- Structural challenges in the US / policy uncertainty in the EU / good growth in Asia
- Increased attention to the overall carbon savings and sustainability issues relating to bioenergy, including ILUC and food competition
- Slow technology progress
- Increasing competition from both fossil fuels (at current low prices), other clean technologies (including renewable electricity)
- More focus on the broader role of bio-based materials as feedstocks for non-energy products

A significant advanced biofuels contribution, alongside improved fuel economy and EV roll-out, is central to decarbonisation of the transport sector.

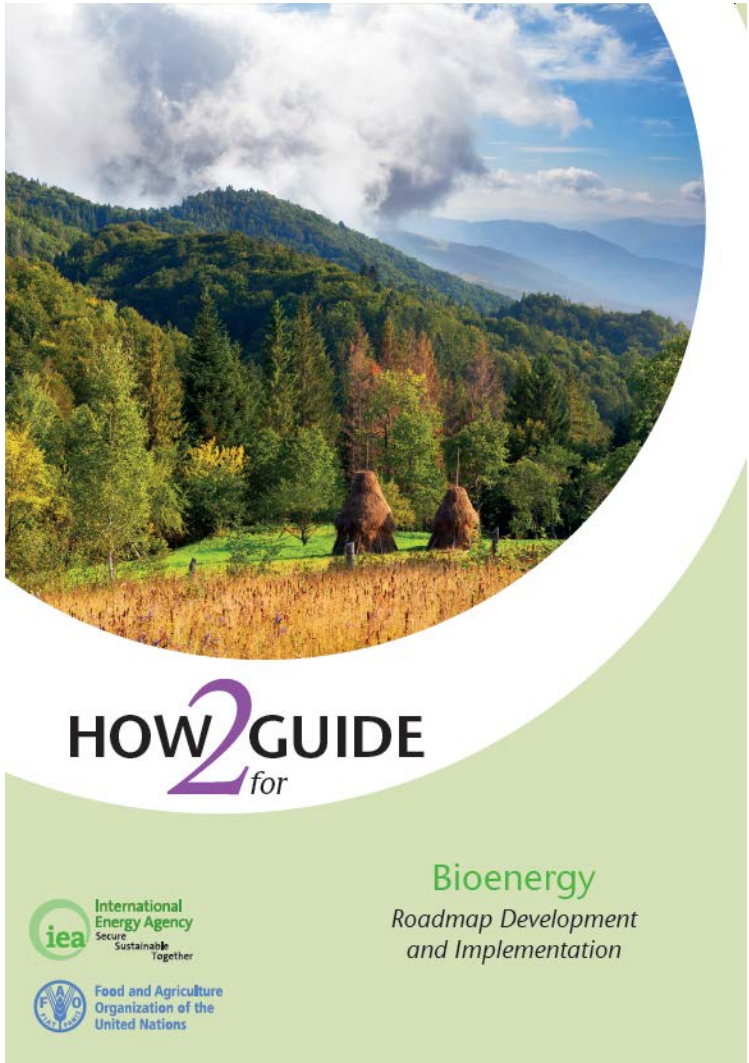
How2Guide for Bioenergy

IEA Technology Roadmaps

- Where do we need to go?
- Where are we today?
- Global vision and guidance on deployment pathways

IEA *How2Guides*

- Provide practical information for policy makers and planners to establish a national or regional technology-specific roadmap



Released 30 Jan 2017

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How2Guide for Bioenergy

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Why are we doing this?

- To scale-up IEA capabilities to provide support to countries for national / regional bioenergy roadmap development
- To enhance the impact of the IEA's technology roadmap programme

Is this only for IEA Members?

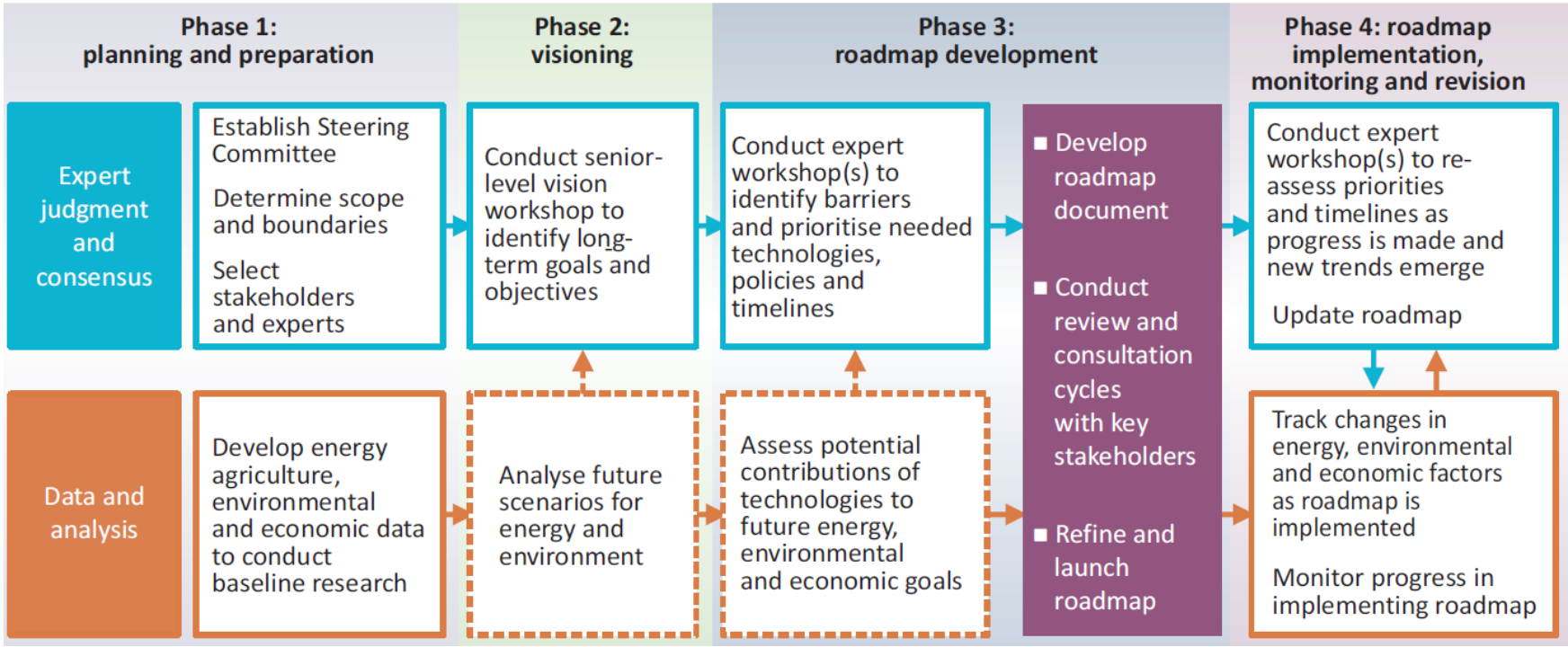
- Not at all – key Partner countries and other emerging economies are key How2Guides contributors and audience
- Countries that already have bioenergy roadmaps can use it as a tool for internal revision and to accelerate technology deployment

Collaboration with FAO and IRENA

- **Southern Africa** (6 countries): workshop on biogas and waste to energy
- **South East Asia** (7 ASEAN countries incl. Thailand and Indonesia + China): workshop on biomass sustainability
- **South America**: workshop in Brazil on biofuels

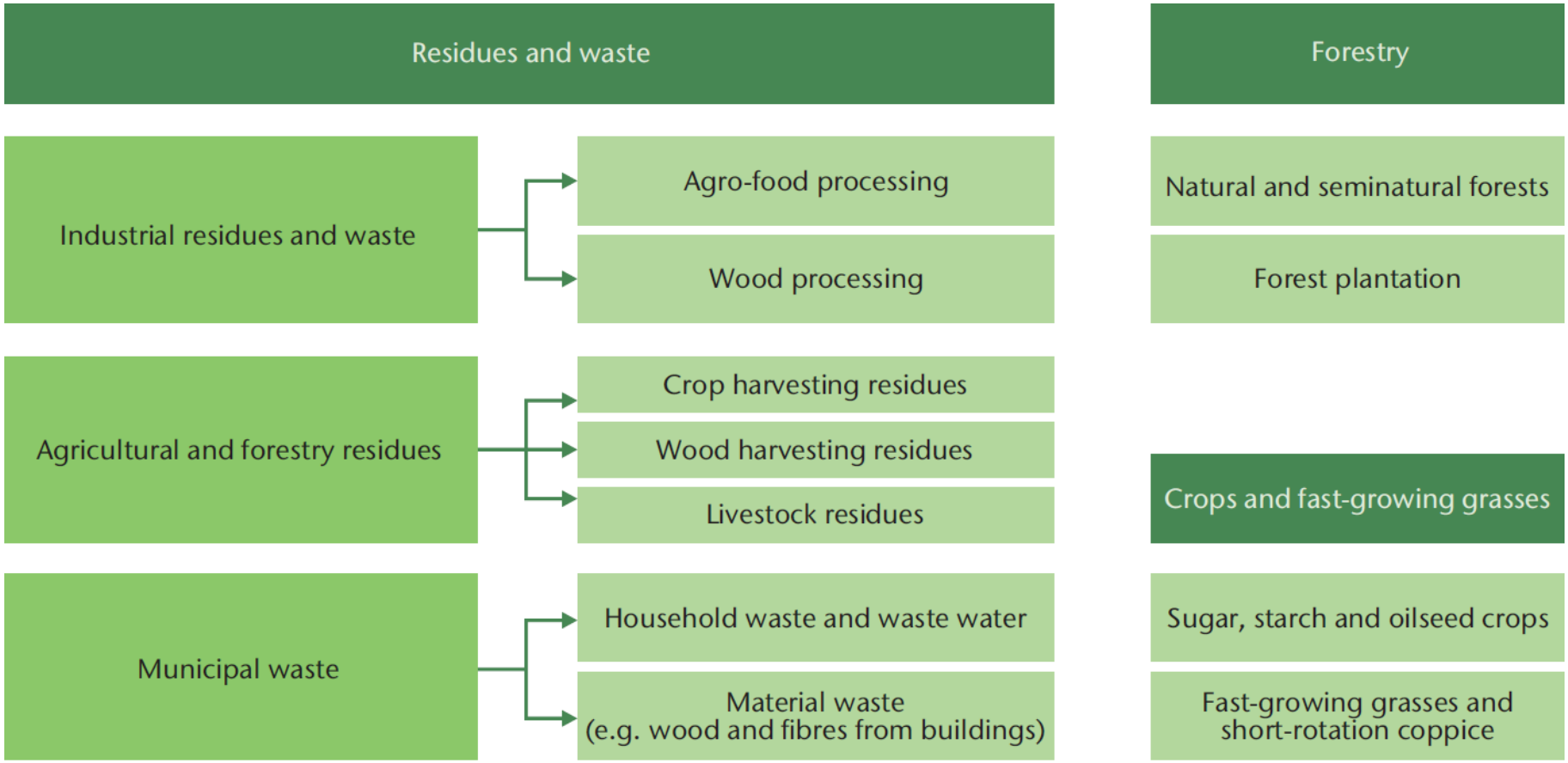
How2Guide framework

- Provides tools and steps for decision makers to implement a strategic technology roll-out

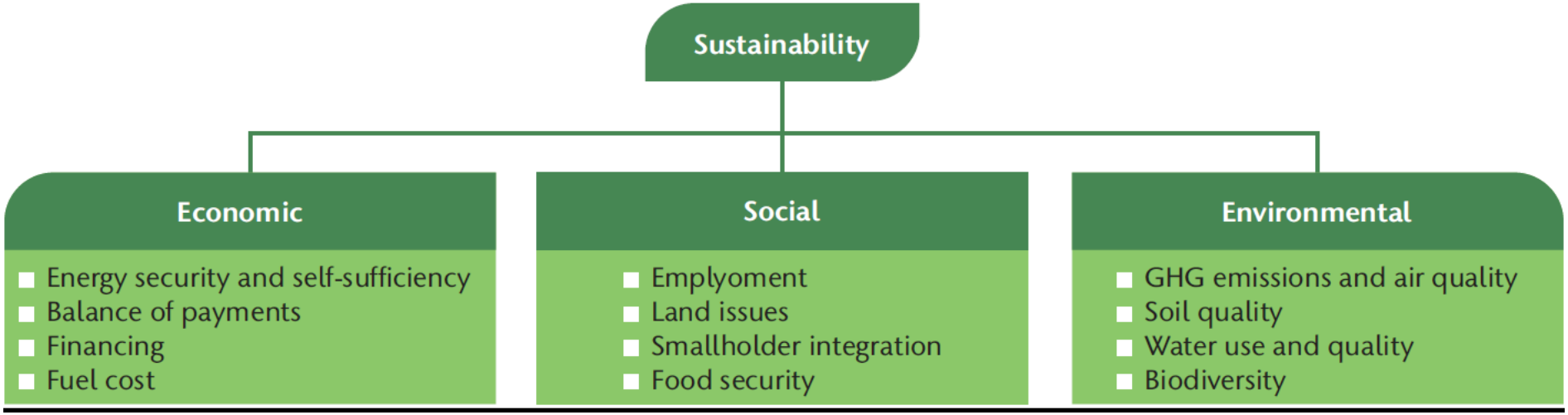


Phase 1: Planning and preparation

Assessing biomass potential and resources



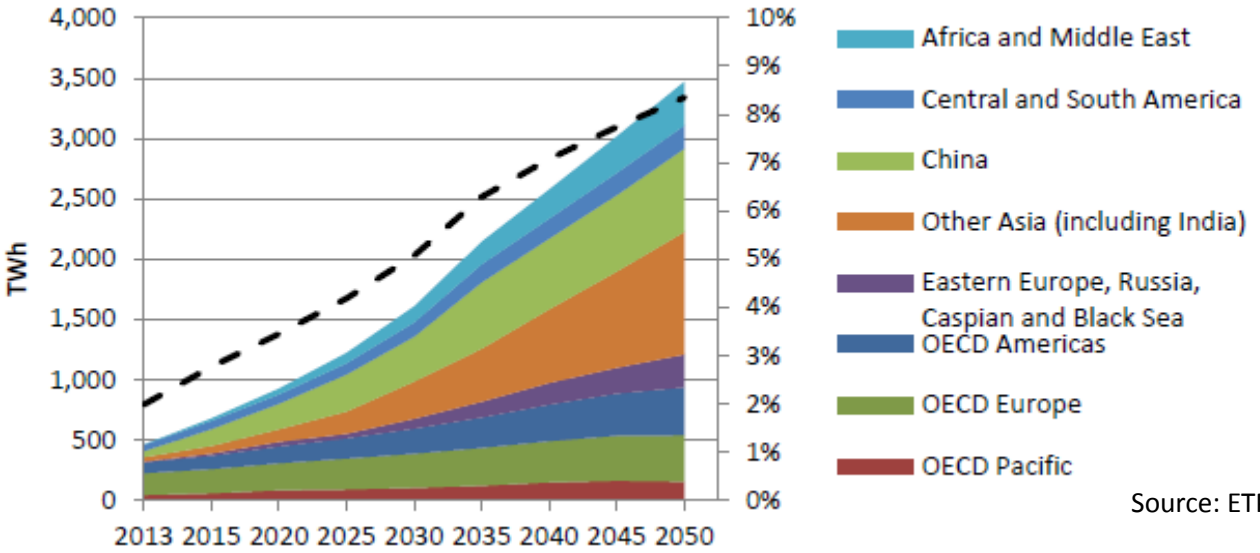
Phase 1: Planning and preparation



- A range of environmental, social and economic factors may influence the final performance of the bioenergy supply chain.
- This will result in the identification of the preferable biomass types, feedstock sourcing patterns and bioenergy technology options that can deliver the desired forms of energy in the country or region

Phase 2: Visioning

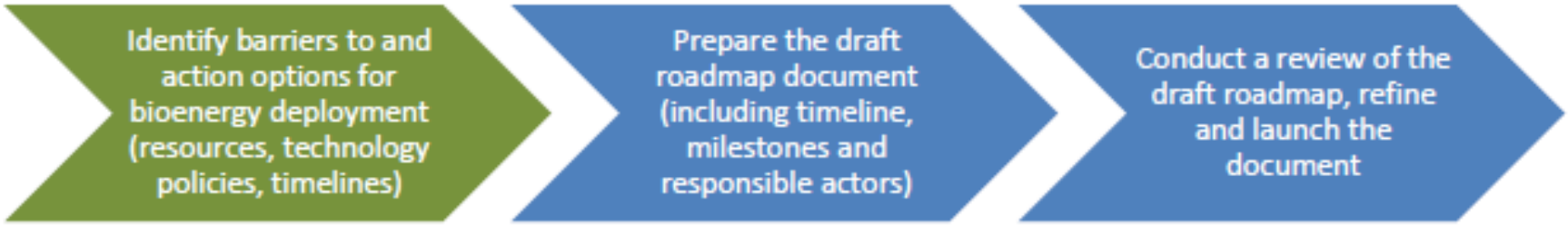
Global vision of biomass for electricity generation



Source: ETP 2016

- Determine **long-term goals** and objectives through stakeholder involvement
- Clarify **drivers** and consider **project types** that can meet national and regional needs
- Define **desired outcomes** and **course of actions** for reaching them
- Establish a **mission statement** taking into account objectives, national considerations and long-term strategies

Phase 3: The roadmap document



- Assess the technology deployment in terms of **holistic energy, environmental and economic strategies**
- Identify **potential barriers** and correlated **response actions**
- Determine **priority technologies** that can meet objectives
- Develop a roadmap with stakeholder consultation, setting **timeline and milestones**

Correlation of selected bioenergy barriers with relevant policy and regulatory measures

	REGULATORY SUPPORT			ECONOMIC SUPPORT						
Barrier	**Renewable energy laws/ targets**	**Quotas / RPS**	**Certification schemes**	**FIT / FIP**	**Capital grants/subsidies**	**Soft loans**	**Tax relief**	**Tradable green certificates**	**Carbon pricing**	**Auction schemes**
Lack of or inadequate market for bioenergy heat										
High upfront investment costs										
High real (or perceived) investment risk										
Lack of private investors										
Cost-competitiveness of bioenergy and biofuels projects										
Competition with other socio-economic activities										
Environmental concerns										
Inadequate supply of feedstock/high cost of feedstock										

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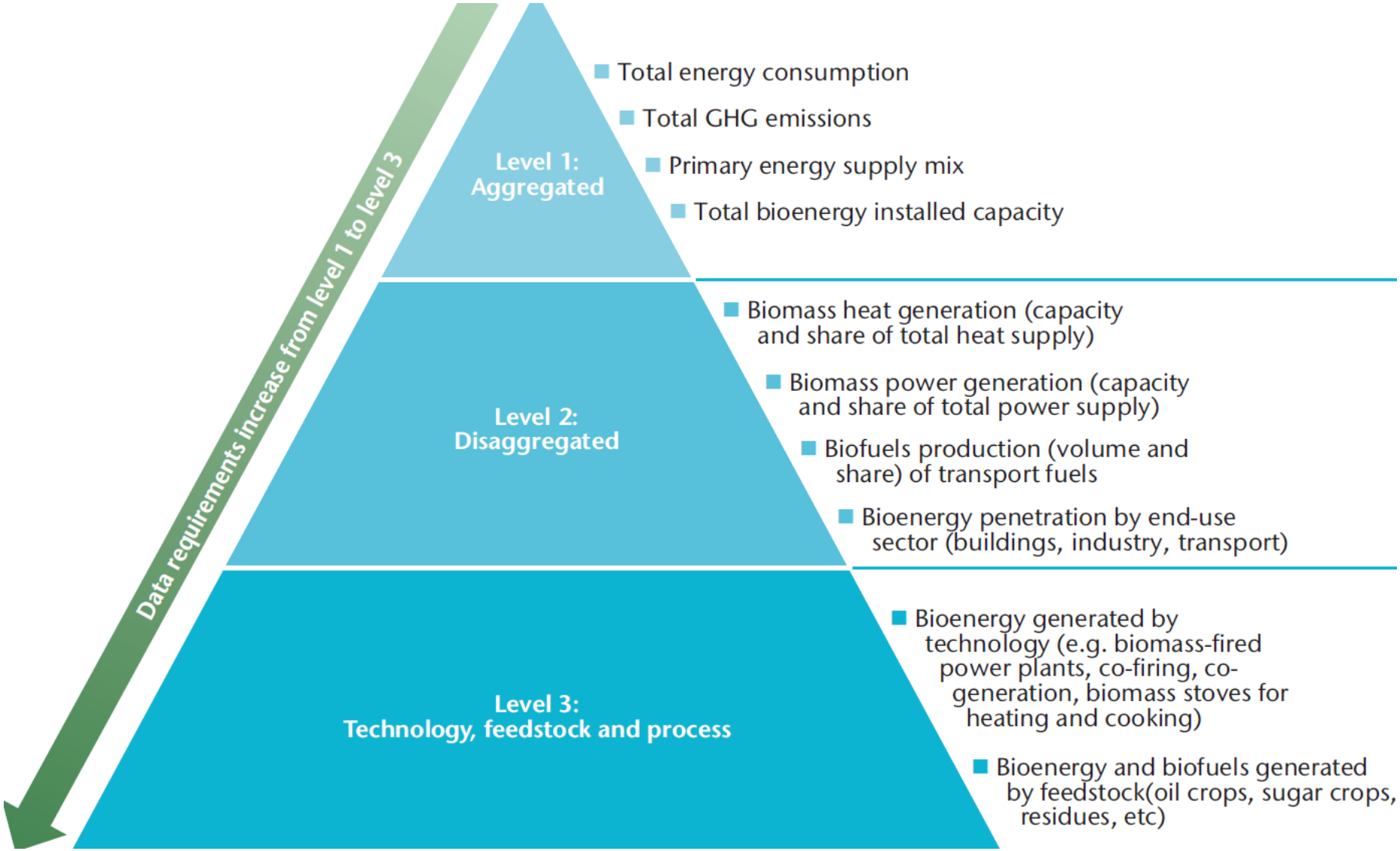
Phase 4: Implementation, monitoring and revision



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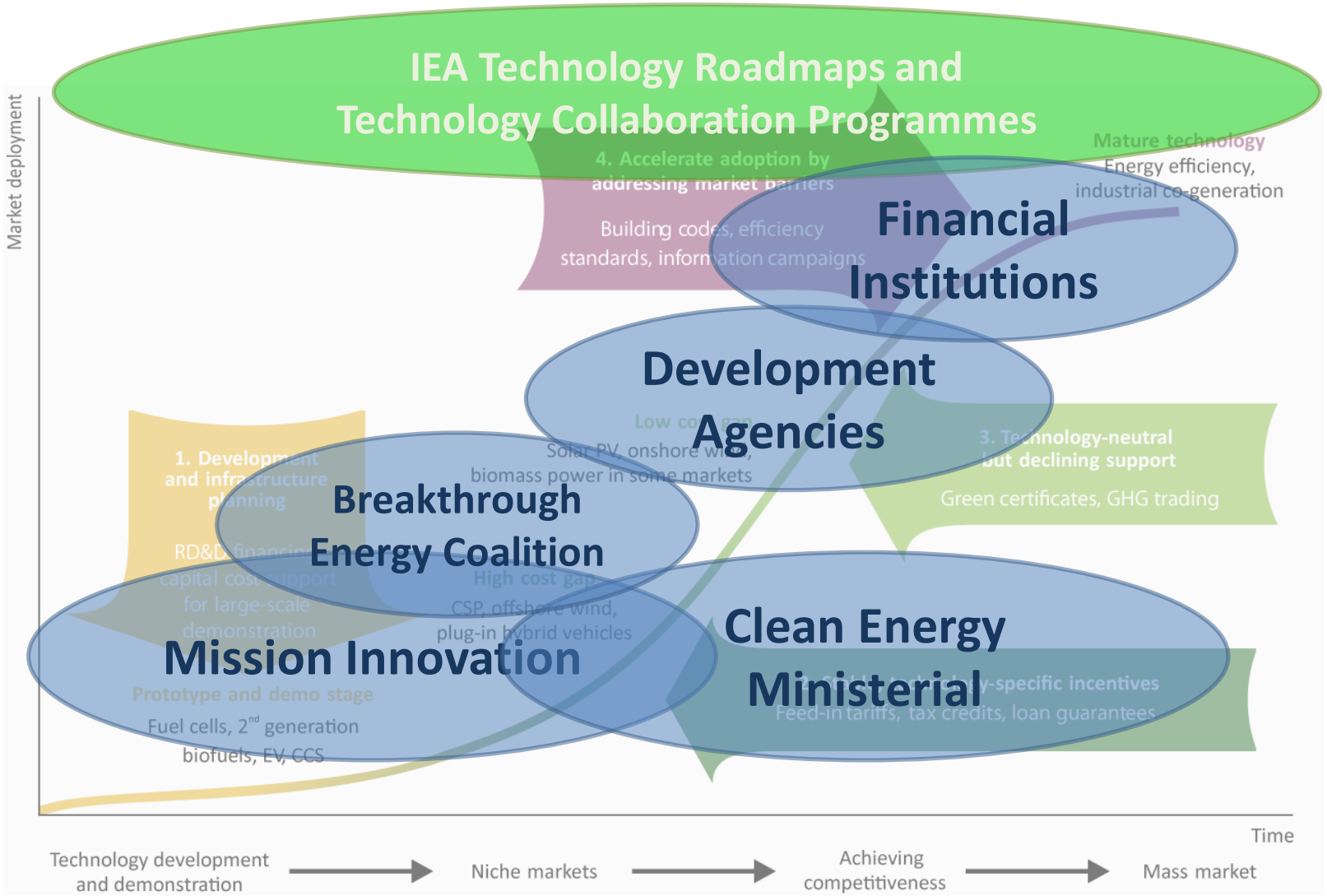
Supporting Energy Innovation Throughout the Entire Cycle



Linking multi-lateral efforts

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MISSION INNOVATION
Accelerating the Clean Energy Revolution

iea Energy Technology Network
Technology Collaboration Programmes

CLEAN ENERGY MINISTERIAL
Accelerating the Global Clean Energy Transition

IC#1 - Smart Grids
(China, India, Italy)

ISGAN
international smart grid action network

21st Century POWER PARTNERSHIP
Accelerating the transformation of power systems

IC#4 – Biofuels
(Canada, China, India, Brazil)

IEA Bioenergy

biofuture platform
Kickstarting a global, advanced bioeconomy

Thank you for your attention