Technology Roadmaps:
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25 March 2013

Energy technology roadmaps

International Energy Agency

Key technologies for reducing global CO$_2$ emissions

6°C Scenario emissions 58 Gt ----------->

2°C Scenario emissions 16 Gt ----------->

- Power generation 42%
- Industry 20%
- Transport 17%
- Buildings 13%
- Other transformation 9%
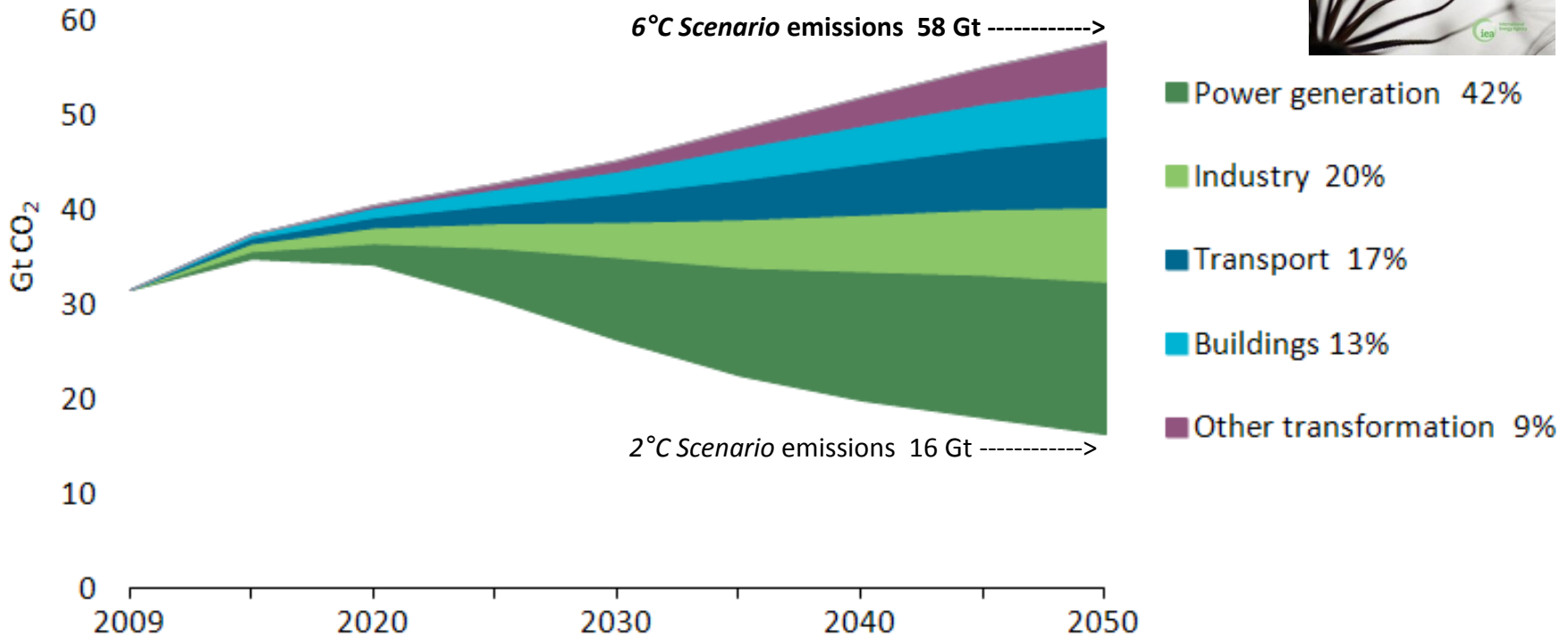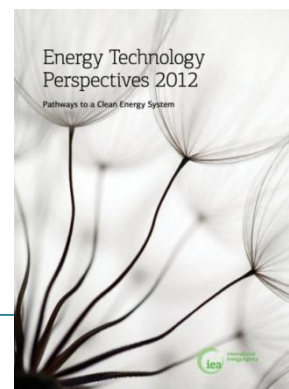
Source: Energy Technology Perspectives 2012

- **6°C Scenario – business-as-usual; no adoption of new energy and climate policies**
- **2°C Scenario - energy-related CO$_2$-emissions halved by 2050 through CO$_2$-price and strong policies**

3/21/2013

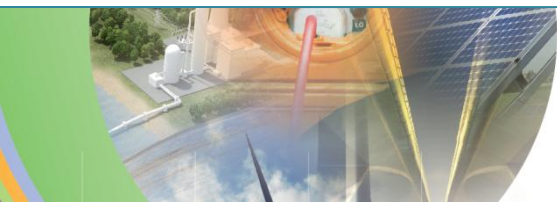**Energy technology roadmaps**

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IEA Roadmap Definition

"A technology roadmap is a dynamic set of technical, policy, legal, financial, market & organizational requirements identified by all stakeholders involved in its development. The effort shall lead to improved and enhanced sharing and collaboration of all related technology-specific RDD&D information among participants.

The goal is to accelerate the overall RDD&D process in order to deliver an earlier uptake of the specific energy technology into the marketplace".

Energy technology roadmaps

The IEA roadmap approach

- **Engage cross-section of stakeholders**

- **Identify a baseline – where is technology today?**

- **Use *ETP* 2°C Scenario results for deployment pathway to 2050**

- **Identify barriers – technical, regulatory, policy, financial, public acceptance**

- **Develop implementation action items for stakeholders**

Technology roadmaps status

2009   **2010**   **2011**   **2012**

2013 2014
- Chemical catalysis
- Building envelopes
- Energy Storage
- Hydrogen

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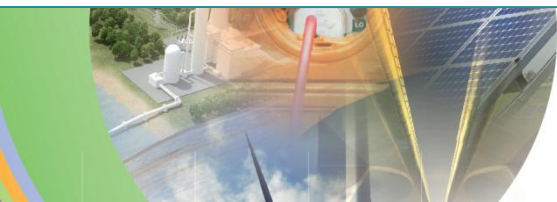
Energy technology roadmaps guide

- Guide published in 2010 by IEA

  – Understanding roadmaps

  – Roadmap development process

  – Tailoring the roadmap process

http://www.iea.org/publications/free_new_Desc.asp?PUBS_ID=2291

Energy Technology Roadmaps

a guide to development and implementation

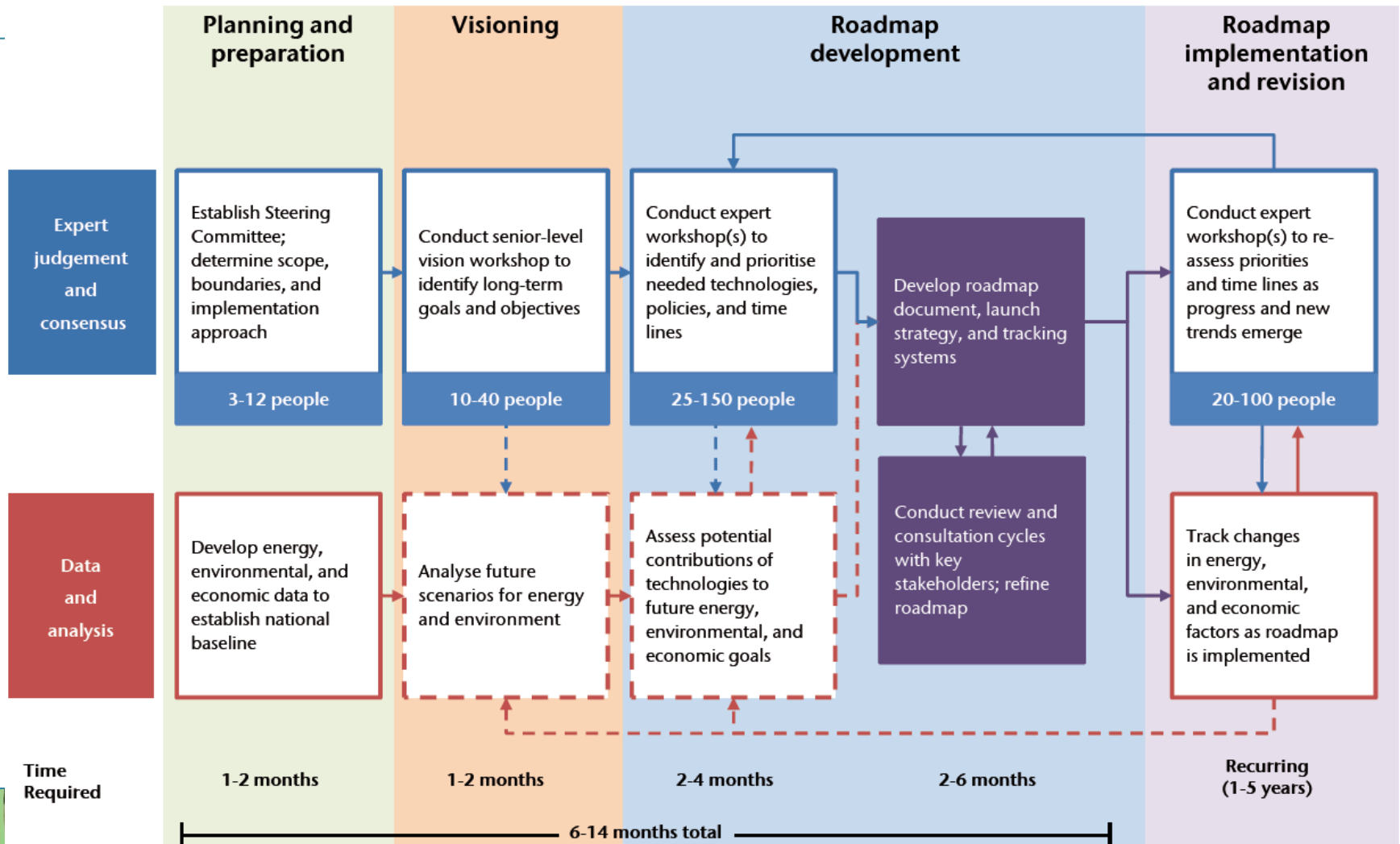International Energy Agency
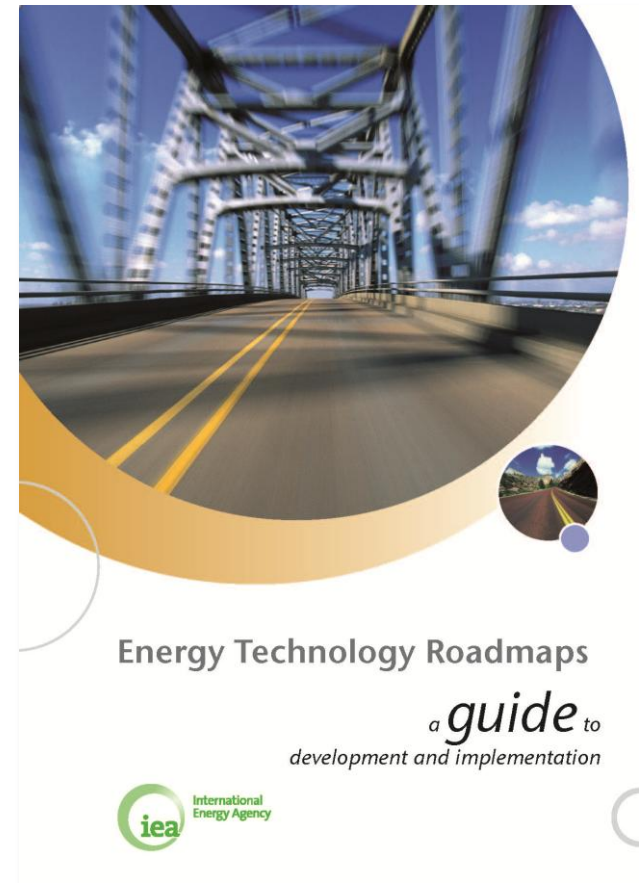
Roadmap logic

- 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

Roadmap process outline

Note: Dotted lines indicate optional steps, based on analysis capabilities and resources.

Roadmap process outline

Expert judgement and consensus

Planning and preparation

Establish Steering Committee; determine scope, boundaries, and implementation approach

3-12 people

Visioning

Conduct senior-level vision workshop to identify long-term goals and objectives

10-40 people
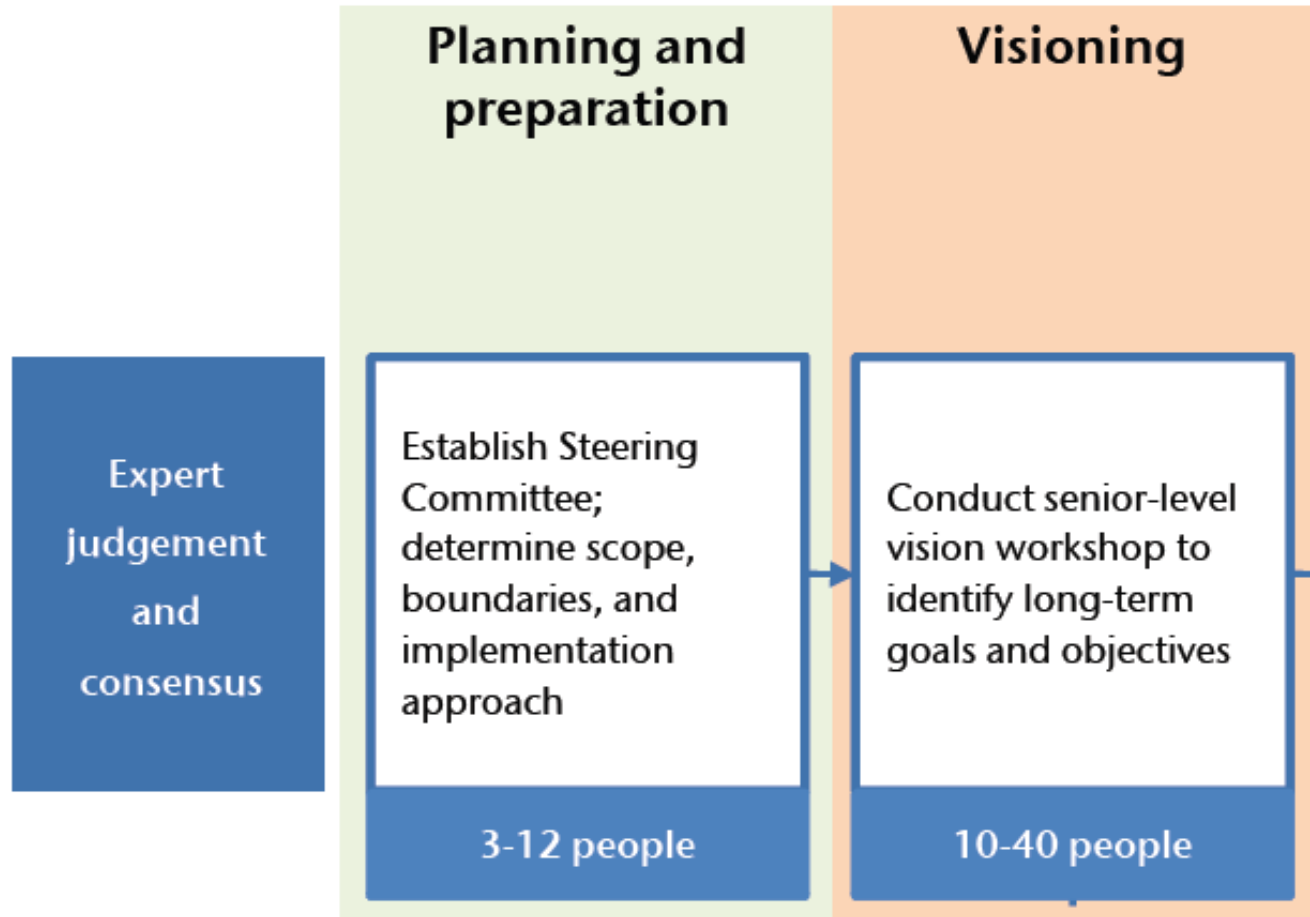
Energy technology roadmaps

Managing engagement

Steering group (3-12)

Expert workshop(s) (10-40)

Extended community (50-200)

Informed public (>500)

Energy technology roadmaps
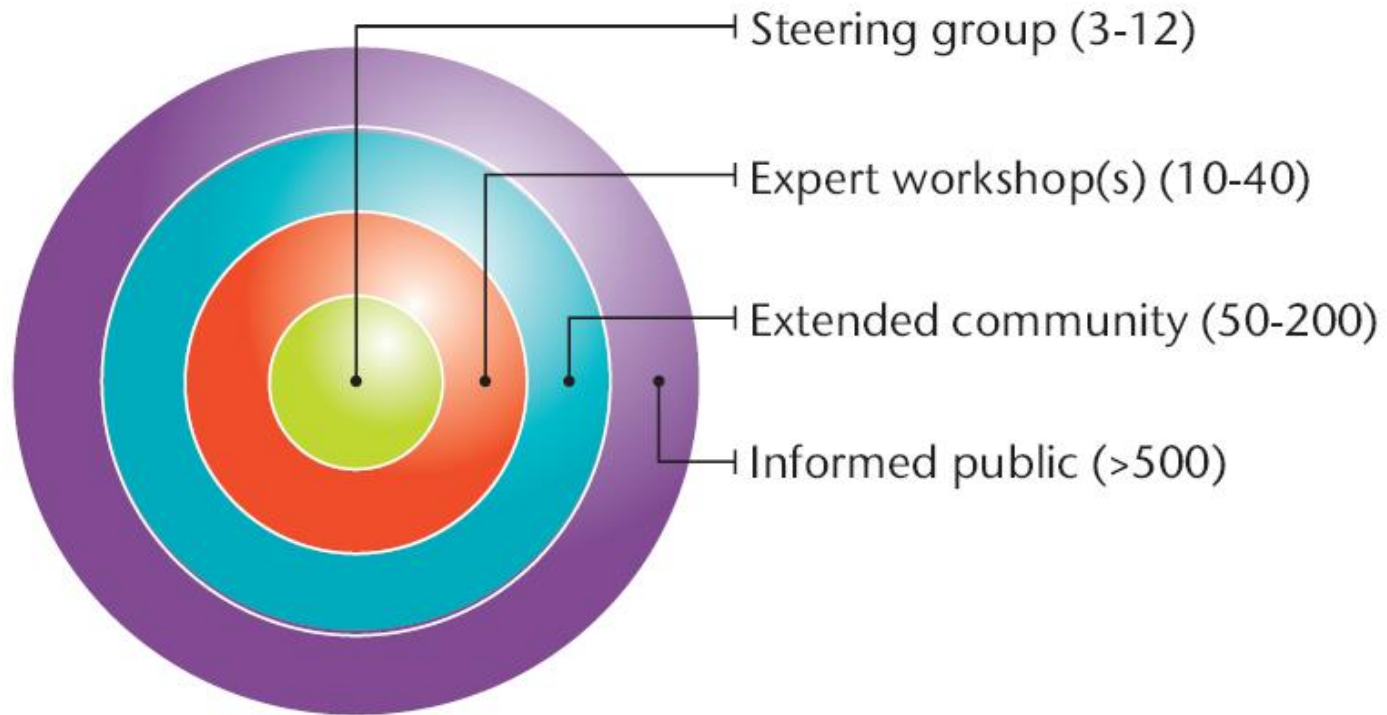
Planning and preparation phase

- Ensure leadership commitment

- Appoint a steering committee

- Develop a statement of purpose and scope

- Conduct baseline research
  - Technologies, markets, policies

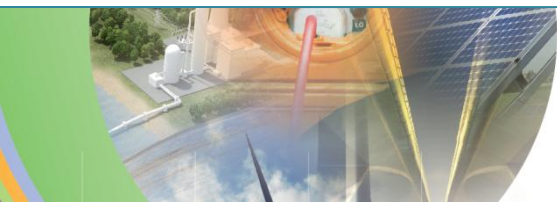- Select stakeholders and experts

Visioning

- What is the status of the technology today?

- What data are needed to establish baseline conditions, set goals and targets, and prepare forecasts?

- Are essential analytic capabilities and tools available to evaluate alternative scenarios?

- What technical expertise is needed to evaluate technology performance and limitations?

- Will goals and milestones include date-based, quantitative targets?

Roadmap process outline
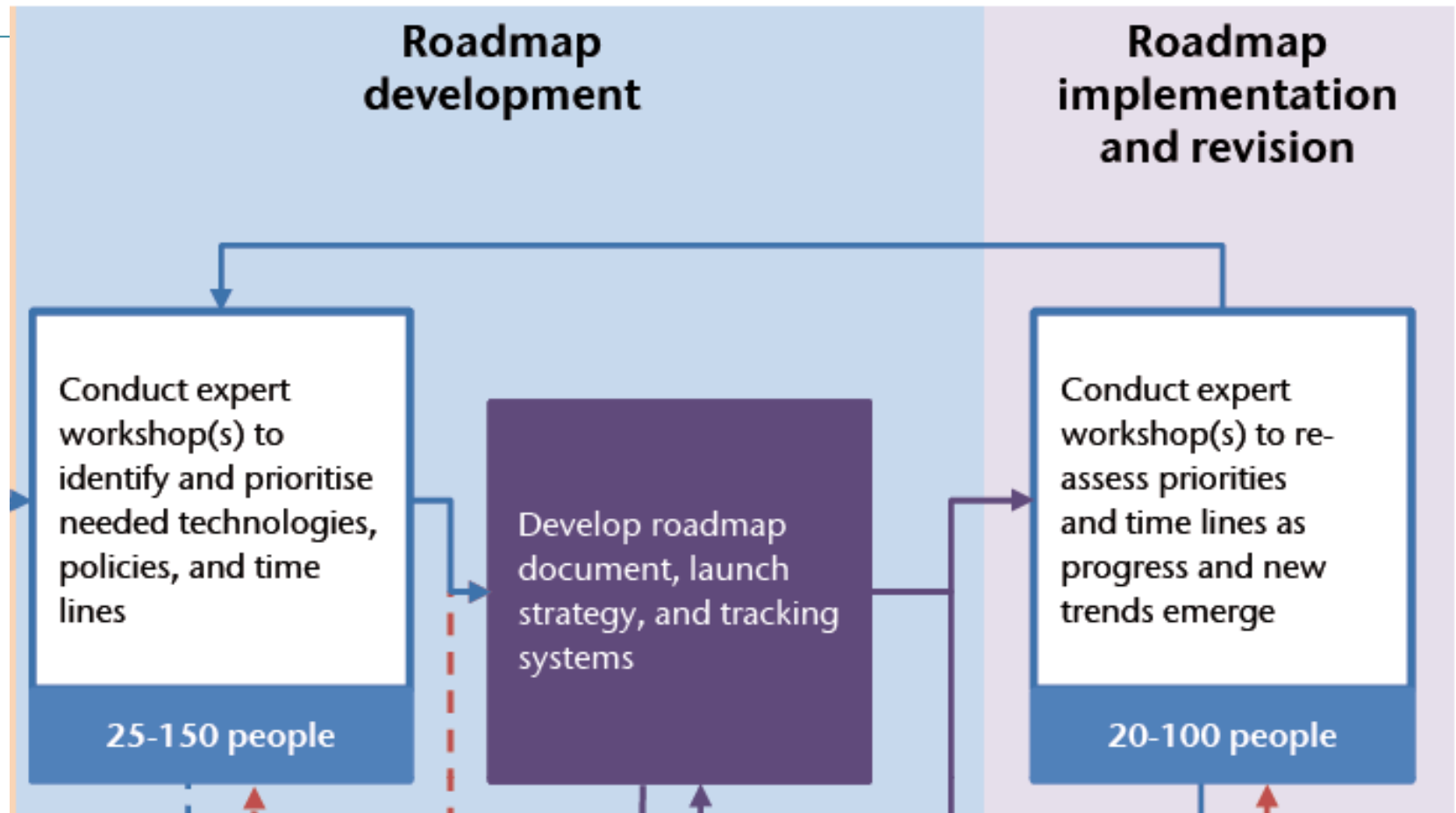
Energy technology roadmaps

Roadmap Development

- What information must be included in the roadmap?

- What level of detail is needed for effective implementation and action?

- What supporting information and data are needed?

- Which regulators and policy leaders can provide insight on factors affecting technology adoption?

- Which private entities will be key to technology success?

- Will activities be assigned to organisations for action?

Energy technology roadmaps

Expert judgment and consensus: roadmap workshops

- Structured vision and technology roadmap workshops can:

  – Build consensus on goals and targets

  – Evaluate and verify assumptions

  – Identify technical and institutional barriers

  – Define alternative technology pathways

  – Develop implementation strategies and priorities

Roadmap process outline

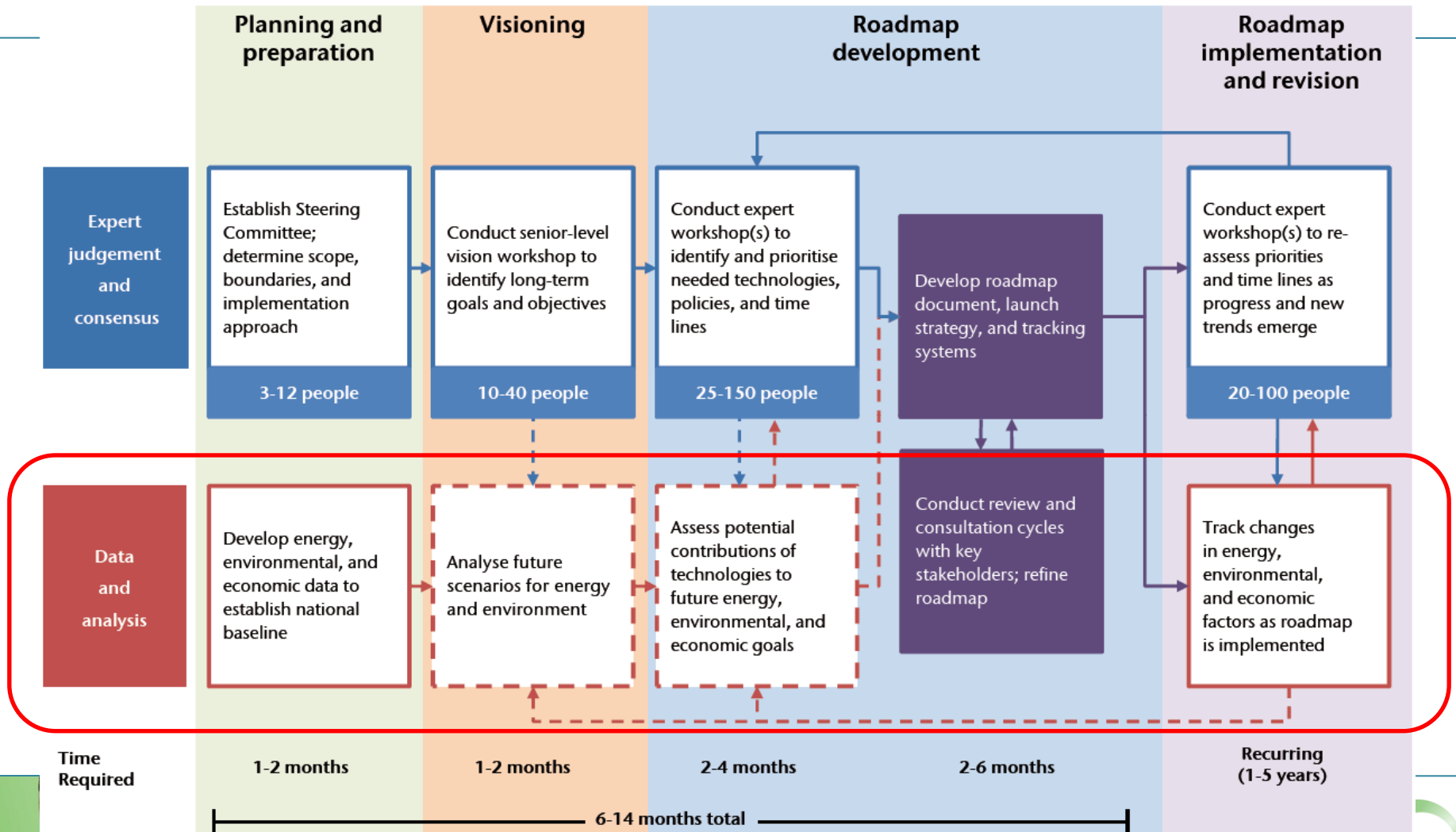|	Planning and preparation	Visioning	Roadmap development		Roadmap implementation and revision
Expert judgement and consensus	Establish Steering Committee; determine scope, boundaries, and implementation approach 3-12 people	Conduct senior-level vision workshop to identify long-term goals and objectives 10-40 people	Conduct expert workshop(s) to identify and prioritise needed technologies, policies, and time lines 25-150 people	Develop roadmap document, launch strategy, and tracking systems	Conduct expert workshop(s) to re-assess priorities and time lines as progress and new trends emerge 20-100 people
Data and analysis	Develop energy, environmental, and economic data to establish national baseline	Analyse future scenarios for energy and environment	Assess potential contributions of technologies to future energy, environmental, and economic goals	Conduct review and consultation cycles with key stakeholders; refine roadmap	Track changes in energy, environmental, and economic factors as roadmap is implemented
Time Required	1-2 months	1-2 months	2-4 months	2-6 months	Recurring (1-5 years)

6-14 months total

Note: Dotted lines indicate optional steps, based on analysis capabilities and resources.
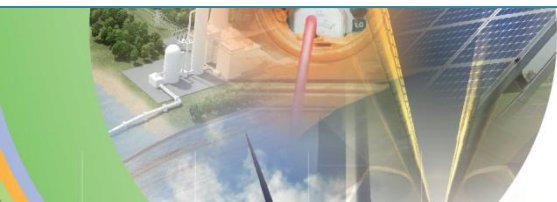
Baseline data

- Technologies:
  - Current status of costs and performance
  - Technology readiness
  - Market penetration and limitations

- Markets:
  - Suppliers, distributors and customers
  - Energy characteristics (production, delivery, storage and consumption)
  - Environmental impacts (air, water and land impacts)

- Public policies:
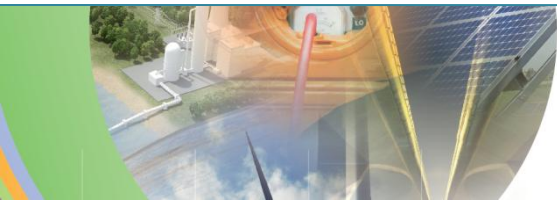 - Current status and requirements of relevant, laws and regulations

Roadmap review

- Conduct one review with roadmap contributors and at least one external review

- Engage wider expert audiences in later reviews to extend reach and gain additional support

- Create clear timing for review comments; limit each review cycle to 2–4 weeks to maintain progress

- Define in advance how you will resolve conflicting comments received during reviews, either through selecting one position or documenting the minority view
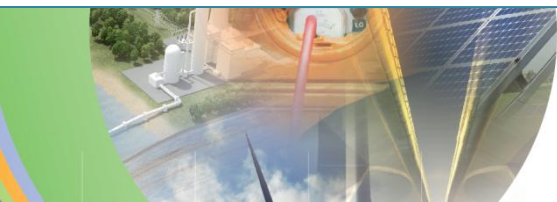
Energy technology roadmaps

Tailoring the roadmap process

- Six considerations when designing a roadmap process:
  - Stakeholder participation
  - Resource constraints
  - Critical inputs
  - Roadmap design
  - Buy-in and dissemination
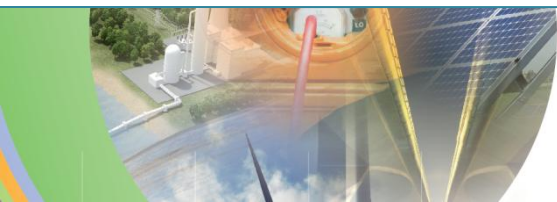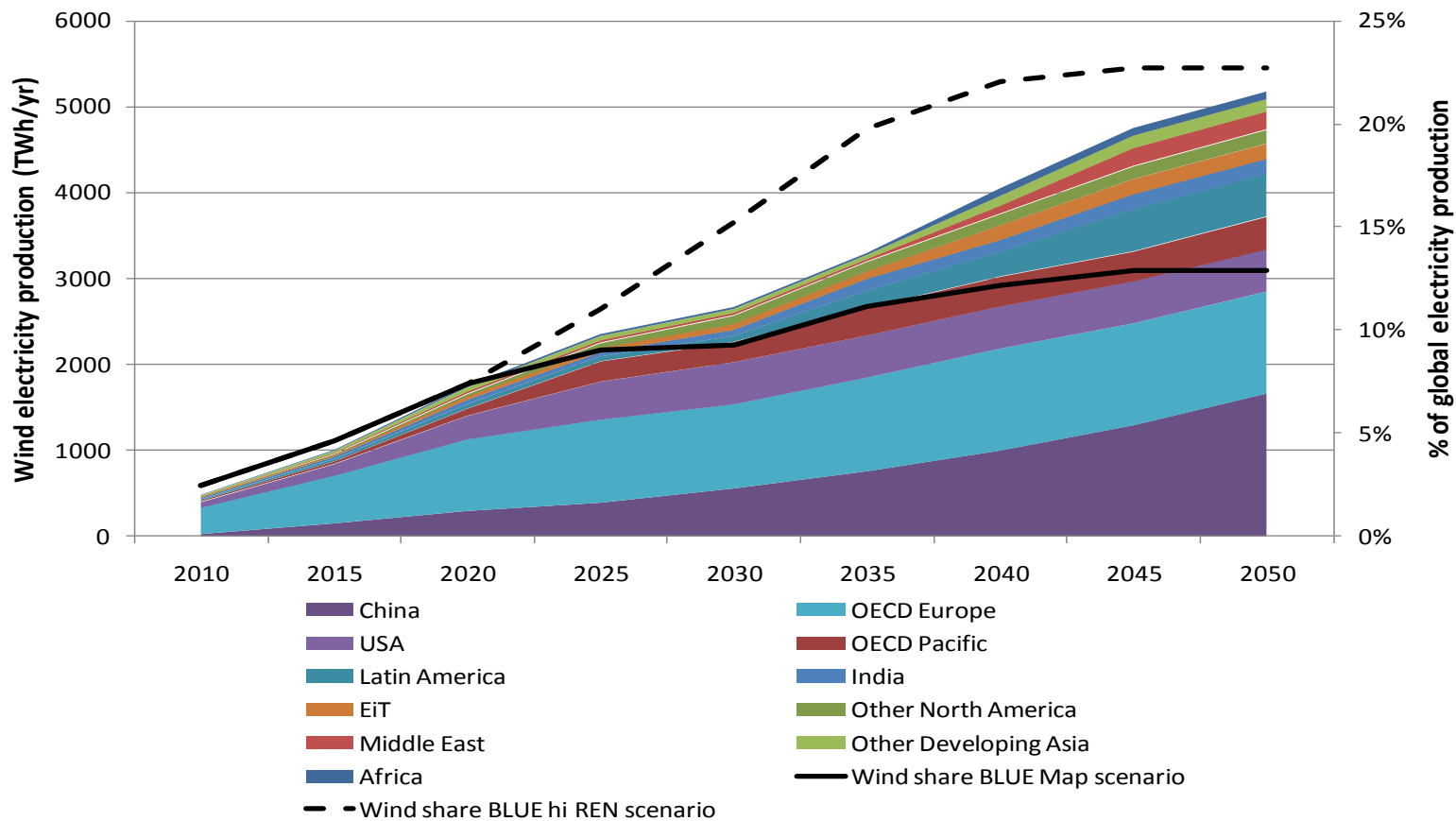 - Monitoring and tracking

IEA ROADMAP EXAMPLES
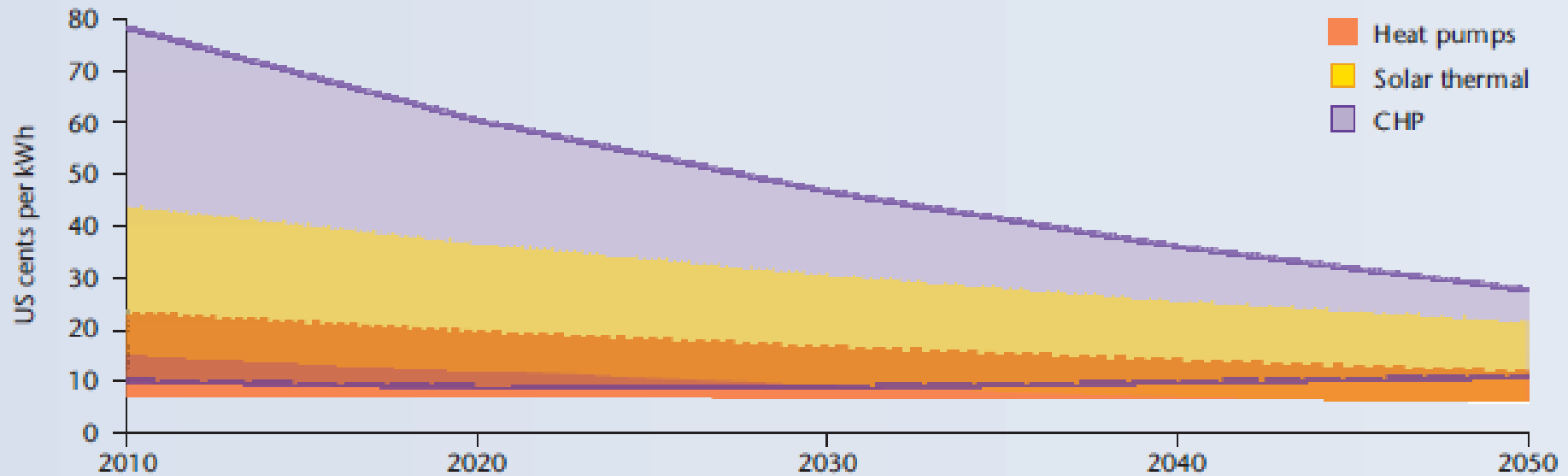
Wind Roadmap:
An ambitious growth pathway

Energy technology roadmaps

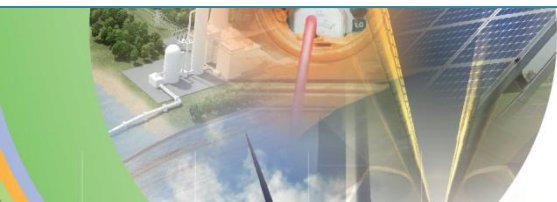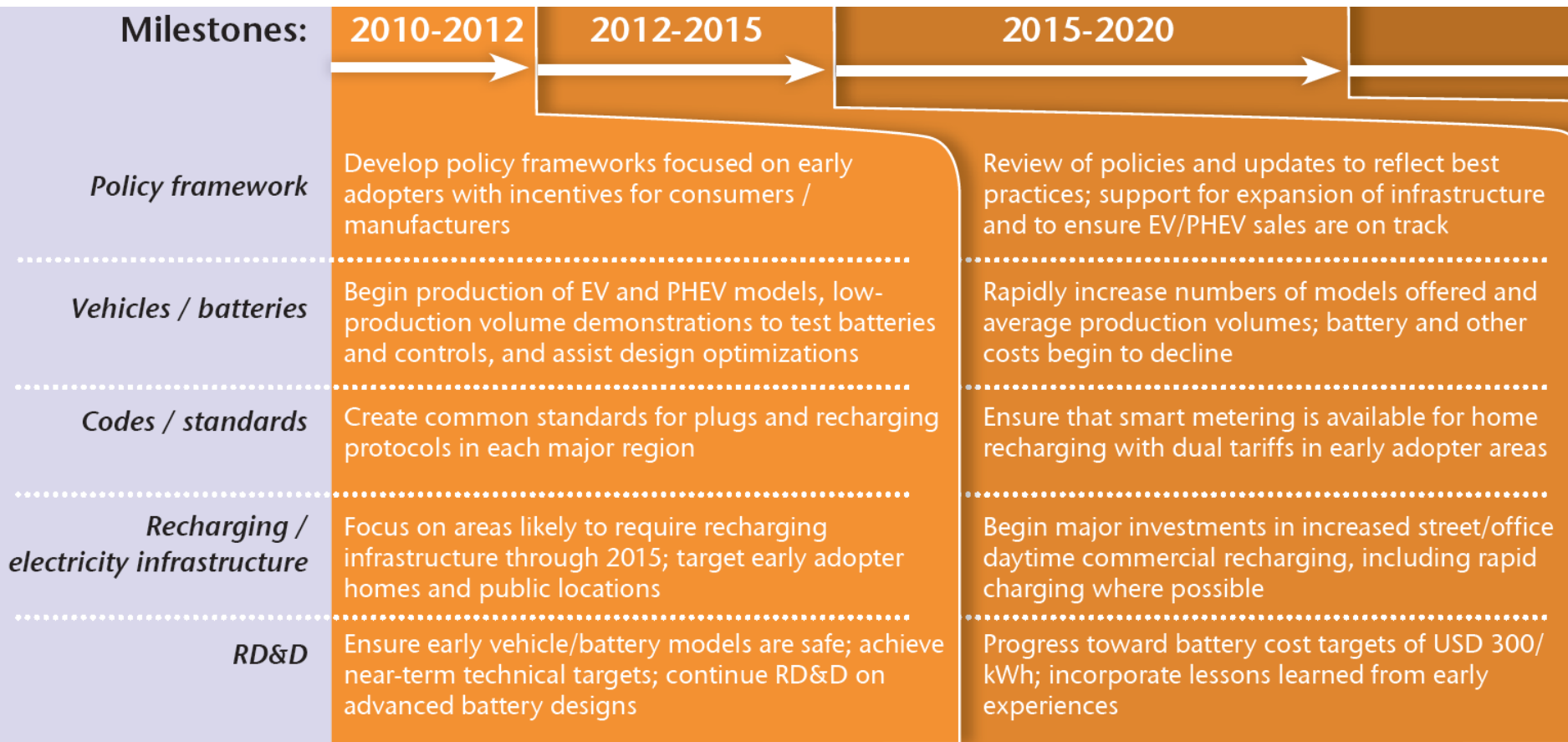# EE in Buildings roadmap example:
Cost reduction goals

Delivered energy cost reduction goals

EV/PHEV roadmap example: milestones

Milestones:	2010-2012	2012-2015	2015-2020	
Policy framework	Develop policy frameworks focused on early adopters with incentives for consumers / manufacturers		Review of policies and updates to reflect best practices; support for expansion of infrastructure and to ensure EV/PHEV sales are on track	
Vehicles / batteries	Begin production of EV and PHEV models, low-production volume demonstrations to test batteries and controls, and assist design optimizations		Rapidly increase numbers of models offered and average production volumes; battery and other costs begin to decline	
Codes / standards	Create common standards for plugs and recharging protocols in each major region		Ensure that smart metering is available for home recharging with dual tariffs in early adopter areas	
Recharging / electricity infrastructure	Focus on areas likely to require recharging infrastructure through 2015; target early adopter homes and public locations		Begin major investments in increased street/office daytime commercial recharging, including rapid charging where possible	
RD&D	Ensure early vehicle/battery models are safe; achieve near-term technical targets; continue RD&D on advanced battery designs		Progress toward battery cost targets of USD 300/kWh; incorporate lessons learned from early experiences	

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NATIONAL ROADMAPS

Cement in India Roadmap

India Cement Technology Roadmap partners

In consultation with

Principal supporter

Industry supporters

Roadmap development process

Phase I

Technology papers (CII/NCBM)

Cement demand data, data modeling and analysis (IEA)

Phase II

Data coverage (>70% of Indian industry)

Partner and stakeholder review

unit-level analysis at 6-9 CSI member company cement plants

Technology Roadmap
Low-Carbon Technology for the Indian Cement Industry

wbcsd iea

Stakeholder outreach

Technology

Financing

Policy

How2Guides
- Develop technology specific guidance for national level policymakers on development and implementation of national technology strategy.

Context:

❑ ~20 IEA Global Technology roadmaps -published or under development

❑ Increasing demand for IEA guidance at national level

❑ Maximising IEA reach

How2Guides scope & objectives:

❑ Technology, policy, and methodological guidance for governments

❑ Encourage and facilitate the <u>development</u> and <u>implementation</u> of national roadmaps

❑ Guidance will be technology specific + geographically neutral

❑ Targeting Policy manager, not technical specialists

For more information

- Download the guide:

  http://www.iea.org/papers/roadmaps/guide.pdf

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