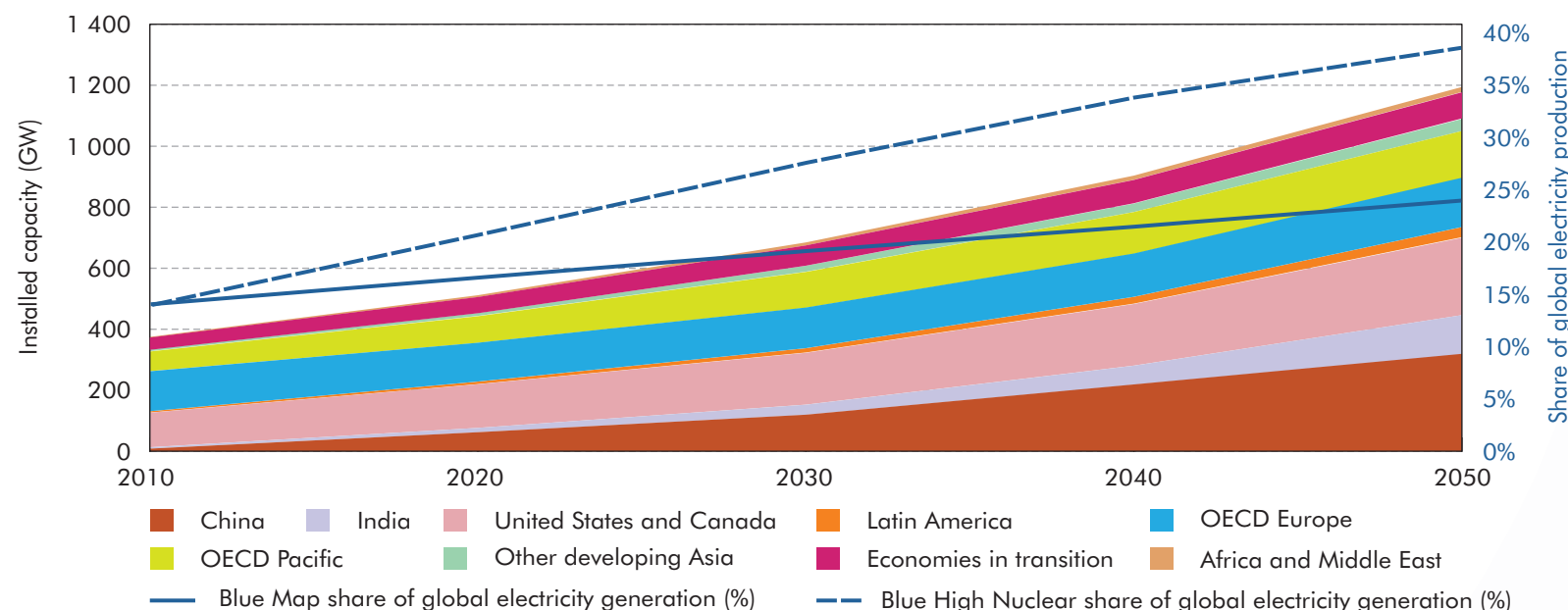


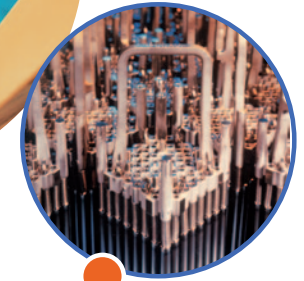
Growth in nuclear power capacity and its share of global electricity production



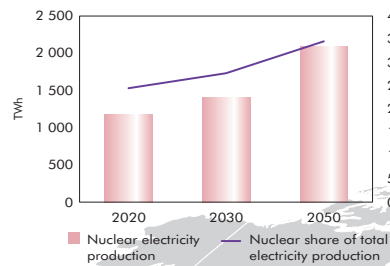
Key findings

- ▶ This roadmap targets installed nuclear capacity reaching 1 200 GW in 2050, with annual electricity production of nearly 10 000 TWh. This would represent around 24% of electricity generated worldwide, making nuclear the single largest source of electricity.
- ▶ The 2050 target for nuclear energy deployment does not require major technological breakthroughs, although further development will help maintain nuclear's competitiveness.
- ▶ Political support and public acceptance are key requirements for the implementation of nuclear energy programmes, with a clear and stable commitment to nuclear energy in national energy policy.
- ▶ Financing the very large investments needed to build nuclear power plants will be a major challenge in many countries, and in some cases governments will need to take a role in addressing this.
- ▶ There is an urgent need to strengthen the nuclear workforce to meet future demands, by investing in education and training.
- ▶ Industrial capacities for constructing nuclear power plants will need to increase substantially. Uranium production and fuel cycle capacities will also need to grow.
- ▶ The management and disposal of radioactive wastes is an essential component of all nuclear programmes. Progress needs to be made in building and operating facilities for the disposal of high-level wastes.
- ▶ The international system of safeguards on sensitive nuclear materials and technologies must be maintained and strengthened where necessary.
- ▶ Advanced nuclear technologies, now under development, potentially offer advantages over current technologies. The first of these could be ready for commercial deployment after 2030, although they are not expected to form a large part of nuclear capacity by 2050.

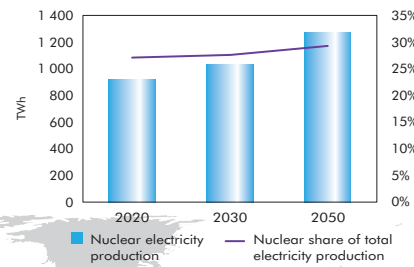
Regional production of nuclear electricity by 2050



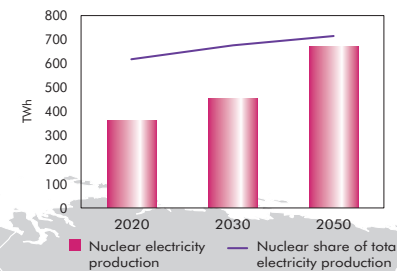
United States and Canada



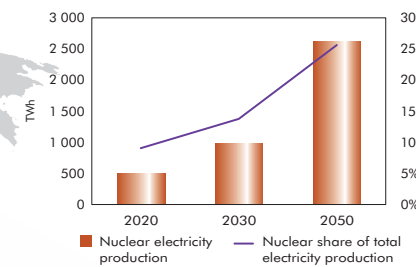
OECD Europe



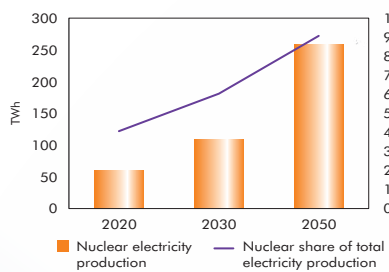
Economies in transition



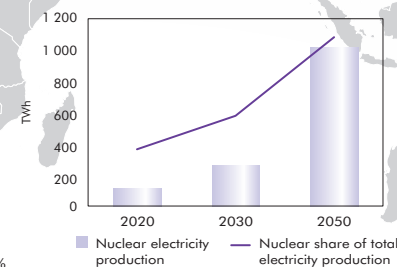
China



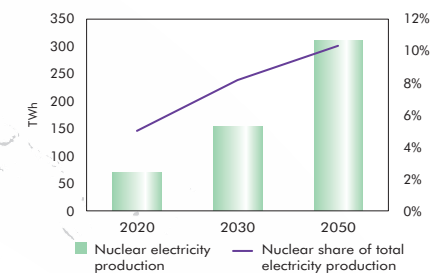
Latin America



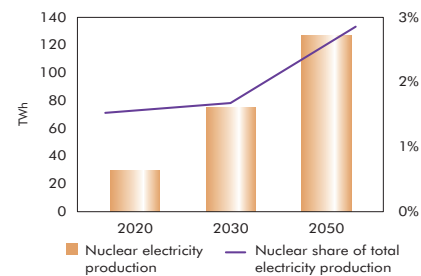
India



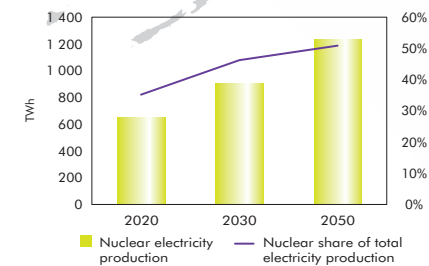
Other developing Asia



Africa and Middle East



OECD Pacific



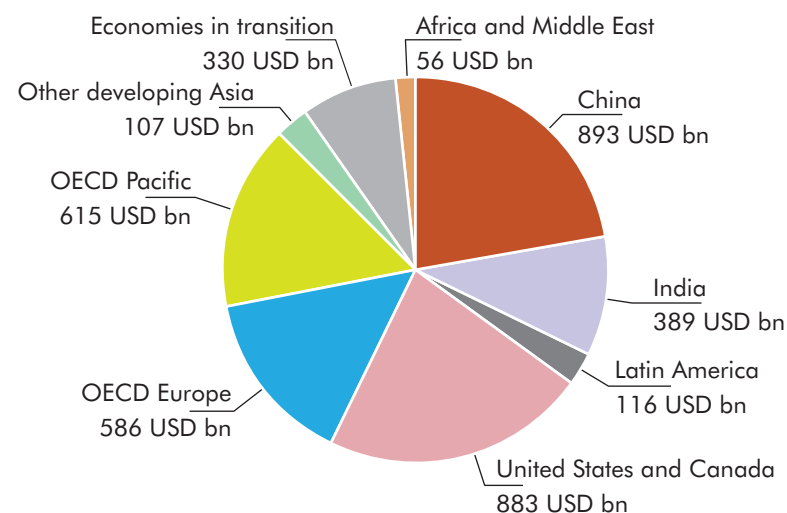
Key actions in the next ten years

During the next 10 years, key nuclear power development milestones include:

- Demonstrate the ability to build the latest nuclear plant designs on time and within budget.
- Develop the industrial capacities and skilled human resources to support sustained growth in nuclear capacity.
- Establish the required legal frameworks and institutions in countries where these do not yet exist.
- Encourage the participation of private sector investors in nuclear power projects.
- Make progress in implementing plans for permanent disposal of high-level radioactive wastes.
- Enhance public dialogue to inform stakeholders about the role of nuclear in energy strategy.
- Expand the supply of nuclear fuel in line with increased nuclear generating capacity.

Analysis for this roadmap is consistent with the IEA *Energy Technology Perspectives 2010* BLUE Map scenario, which describes how annual CO₂ emissions can be reduced by 50% from 2005 levels, with nuclear power providing 24% of global electricity production.

Regional investment needs for nuclear 2010 to 2050



Avoided annual CO ₂ emissions compared to the Baseline scenario (Mt CO ₂)			
	2020	2030	2050
United States and Canada	100	170	450
OECD Europe	110	170	200
OECD Pacific	25	75	140
China	85	325	1 200
India	25	110	500
Latin America	5	15	50
Other developing Asia	5	35	100
Economies in transition	5	5	65
Africa and Middle East	5	5	20

Nuclear energy roadmap milestones

2010

2020

2030

2040

2050

GW added 130
Share of electricity 16%

GW added 170
Share of electricity 19%

GW added 220
Share of electricity 21%

GW added 290
Share of electricity 24%

Policy support

Provide a clear and stable commitment to nuclear power in energy and environmental policy

Ensure that the relevant legal and regulatory systems work effectively

Strengthen international non-proliferation regimes, while providing security of fuel supply

Ensure that institutions and funding are in place for waste disposal and decommissioning

Harmonise regulatory requirements to facilitate the use of standardised designs

Develop international legal and institutional frameworks for the wider use of advanced fuel cycles

Technology development and deployment

Fully establish Generation III+ designs, bringing first-of-a-kind plants on line

Demonstrate on-time and on-budget completion of further Generation III+ plants

Implement plans to build and operate geological repositories for waste disposal

Complete demonstration projects for the most promising Generation IV nuclear plants

Strengthen RD&D in advanced fuel cycles

Increase the use of nuclear energy for non-electricity applications such as industrial heat

Build and operate commercial-scale Generation IV nuclear plants

Capacity building and industry

Increase industrial capacities to supply nuclear plant components and systems

Develop the qualified and skilled human resources needed

Achieve nuclear construction rates from 2020 around double present levels

Continue to increase nuclear construction rates

Develop industrial capacities to support advanced fuel cycles

Strengthen and broaden global supply chains as more countries launch nuclear programmes

Increase uranium production and nuclear fuel cycle capacities to meet rapid demand growth

Financing

Establish electricity and carbon markets that support large, long-term investments

Consider direct government support or guarantees for nuclear investments

Increase the availability of private sector finance for nuclear plants

Establish routine private sector investment in proven nuclear plant designs

Develop nuclear energy expertise in private sector financial institutions

The timescales shown are approximate and will vary from country to country. In particular, countries without an existing nuclear programme will need to take additional capacity and institution building steps that may require more time.

www.iea.org/roadmaps