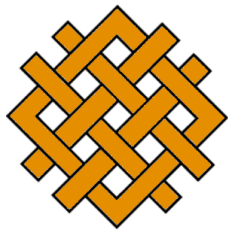


Scaling up Low-carbon Technology Deployment: Lessons from China

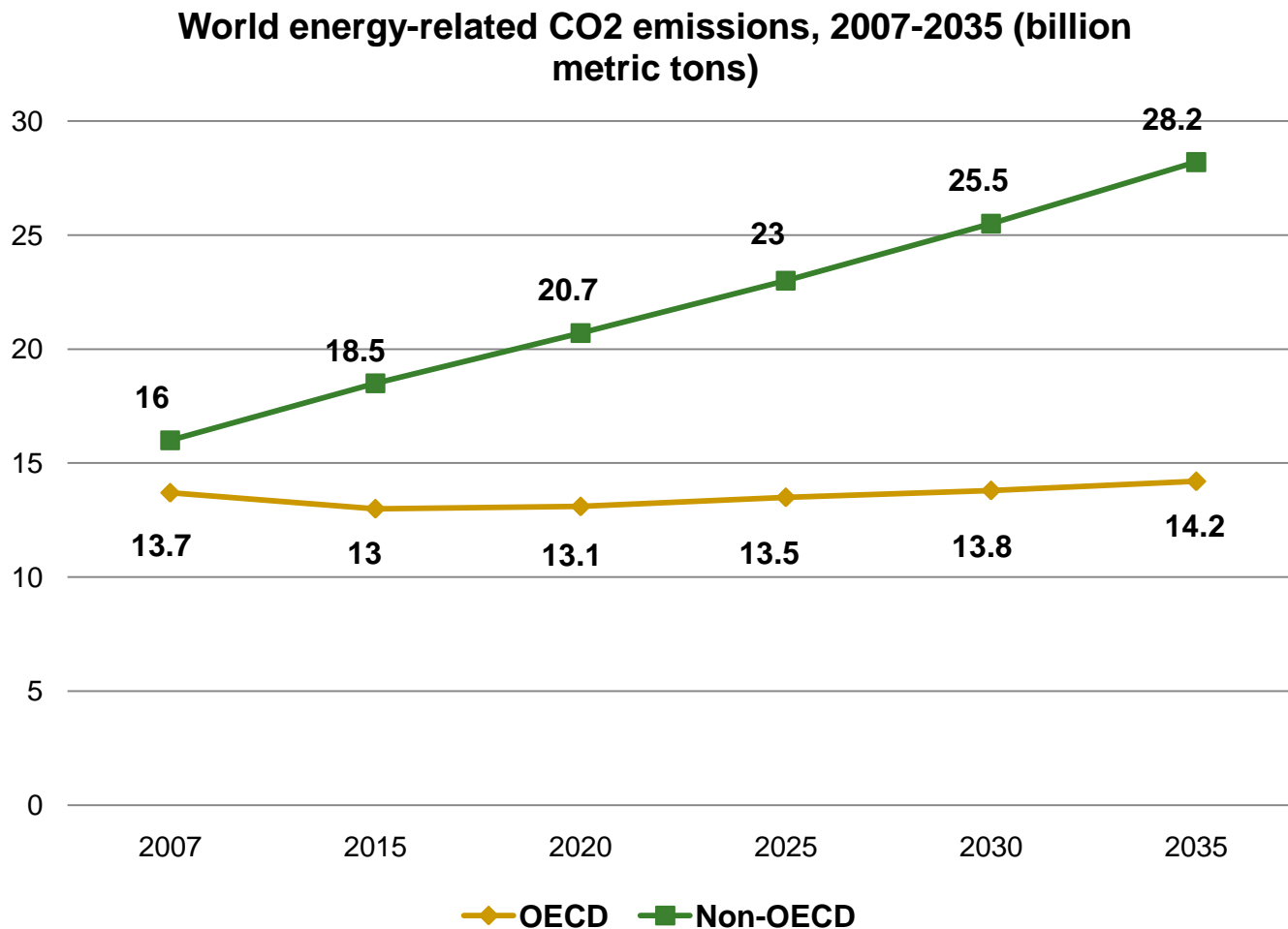
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Project Manager
China Climate and Energy Program
World Resources Institute
September 14th, CSIS



W R I



Clean Technology Deployment Imperative in Developing Economies



Source: US EIA Annual Energy Outlook 2010



Older energy technologies fail to diffuse widely in developing economies

	Electricity consumption, 2004 (kwh/capita)	Electricity transmission and distribution losses, 2004 (percentage of output)
World	2,606	9
High-income countries	9,609	6
Upper-middle-income countries	3,454	12
Lower-middle-income countries	1,448	10
Low-income countries	375	23

Source: The World Bank 2008 report



Focus on three low-carbon technologies

- Supercritical and ultrasupercritical coal-fired power generation technology;
- Onshore wind turbine technology; and
- Blast furnace top gas recovery turbine technology.



Where does China stand in SC/USC technology development?

China is the largest SC/USC manufacturer in the world

		Production capacity (MW)	Technology source	Transfer approach
Shanghai Electric Group	Boiler	4500	Alstom	Licensing
	Turbine	36000	Siemens	Joint-venture
	Generator		Siemens	Joint-venture
Harbin Electric Corporation	Boiler	53000	SC: Mitsui-Babcock; USC: Mitsuibishi	Licensing
	Turbine	12000	600 MW: Mitsuibish; 1000MW: Toshiba	Licensing
	Generator		Toshiba	Licensing
Dongfang Electric Corporation	Boiler	25000	BHK	Joint-venture
	Turbine	20560	Hitachi	License
	Generator		Hitachi	License

Sources: World Bank 2008; Websites of SEG, EC and DEC

Chinese made SC/USC technology on average is 40% cheaper

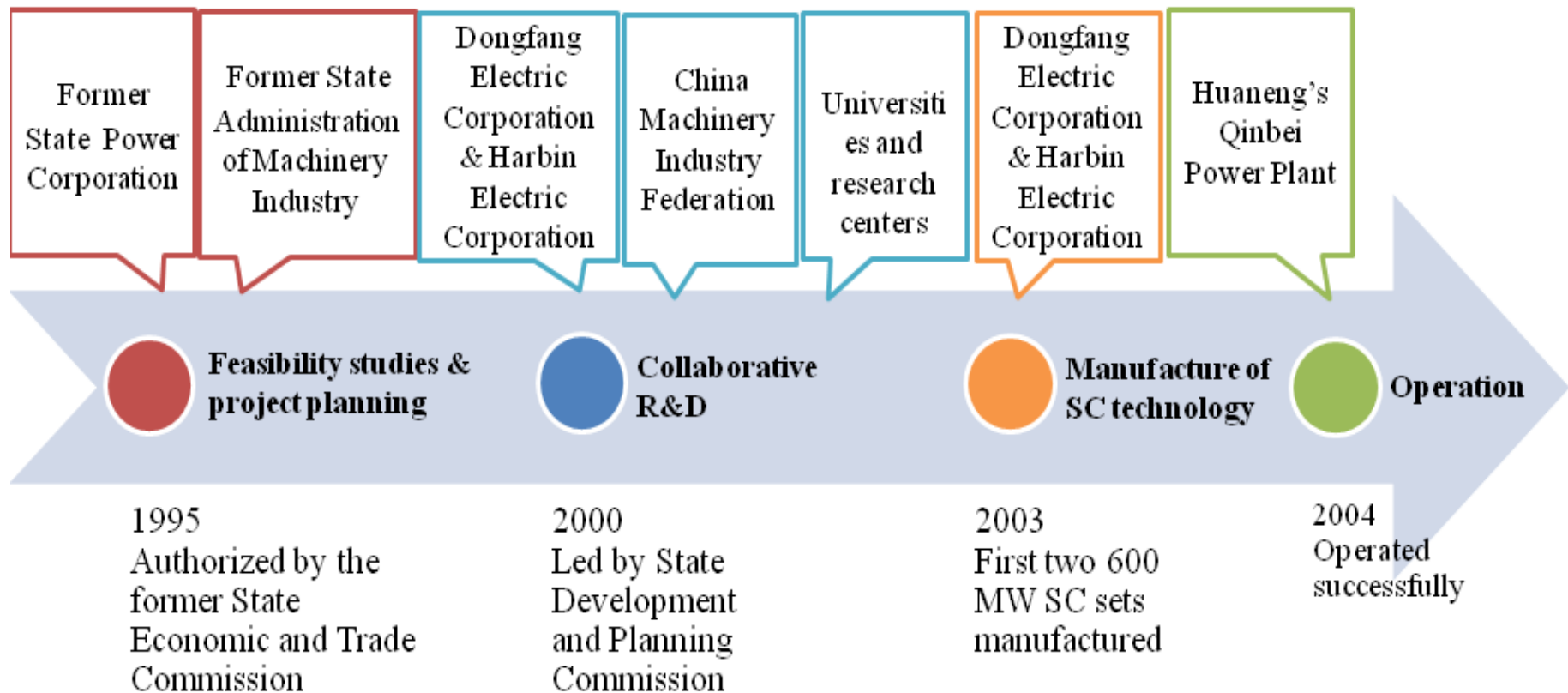
	China, US\$/kW	OECD, US\$/kW
Subcritical (300MW)	650-800	1095-1150
Supercritical (600MW)	550-700	950-1350
Ultrasupercritical (1000MW)	550-700	1160-1190

Sources: Tsinghua University Study 2009



Life cycle of SC/USC technology adoption and localization in China

In 1992, China purchased supercritical technologies from the ABB Group and CE.



Government's front-end R&D supports

National Basic Research Program (973 Program):

- Established a number of large-scale national labs

National High-Tech R&D Program (863 Program):

- Established five R&D subjects

National Key Technology Program:

- Established key program - Development of 600MW SC Thermal Power Complete Set.

Shanghai Key Research Project:

- Shanghai Municipal Government established the key project, R&D of Special Materials for SC/USC Power Station Equipments



Government's Back-end Policy Pull

Incentive policies

Medium and Long-term Plan for Energy Conservation

The State Council Decision on Strengthening Energy Conservation

Funding Allocation for Energy Efficiency and Pollution Abatement

China Energy Technology Policy Outline

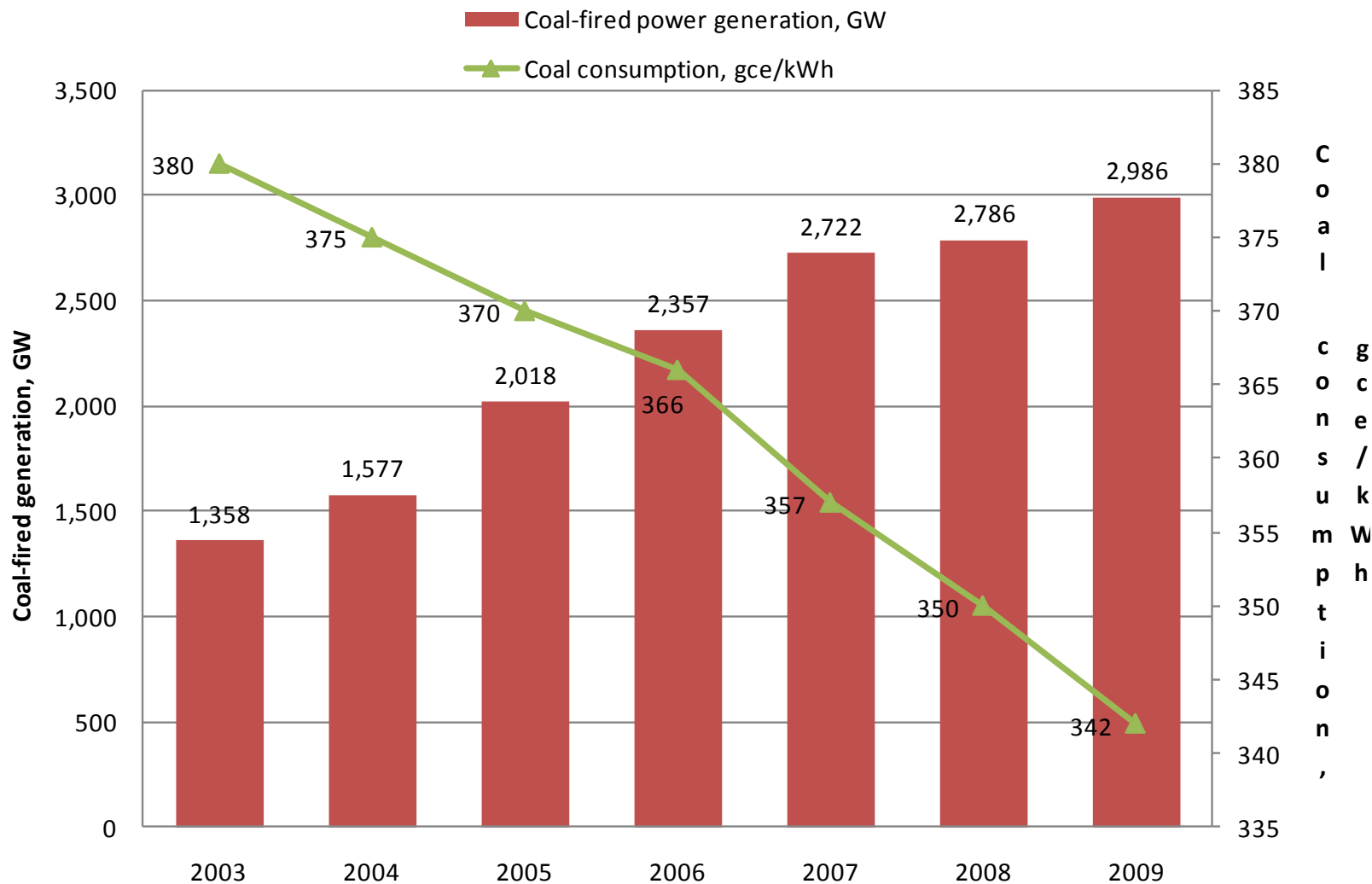
Regulatory mandates

All new coal-fired power plants with a capacity equal to or over 600 MW must apply SC/USC technology

Closure of small and inefficient power plants



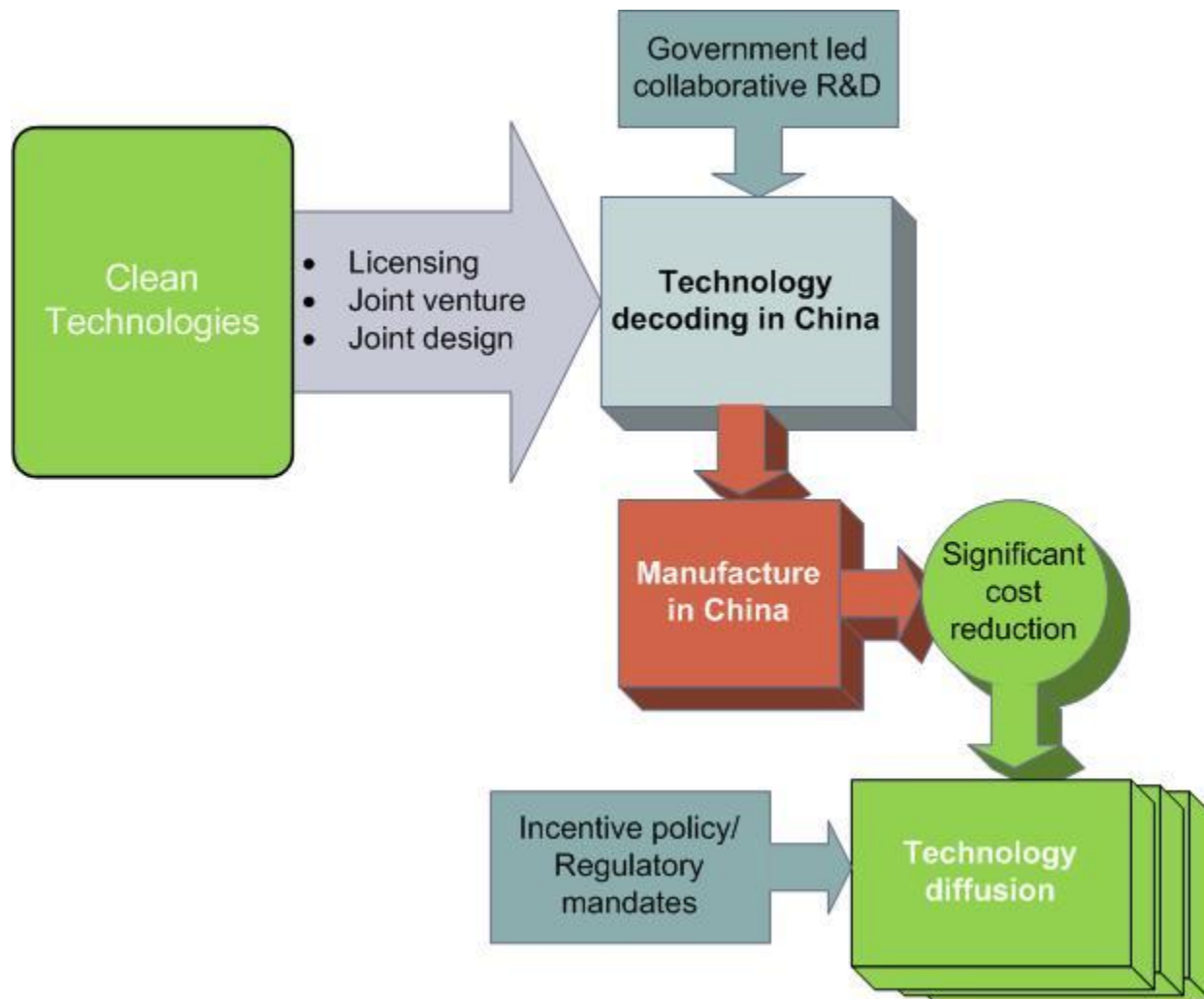
Coal-fired power plants' energy efficiency improves consistently



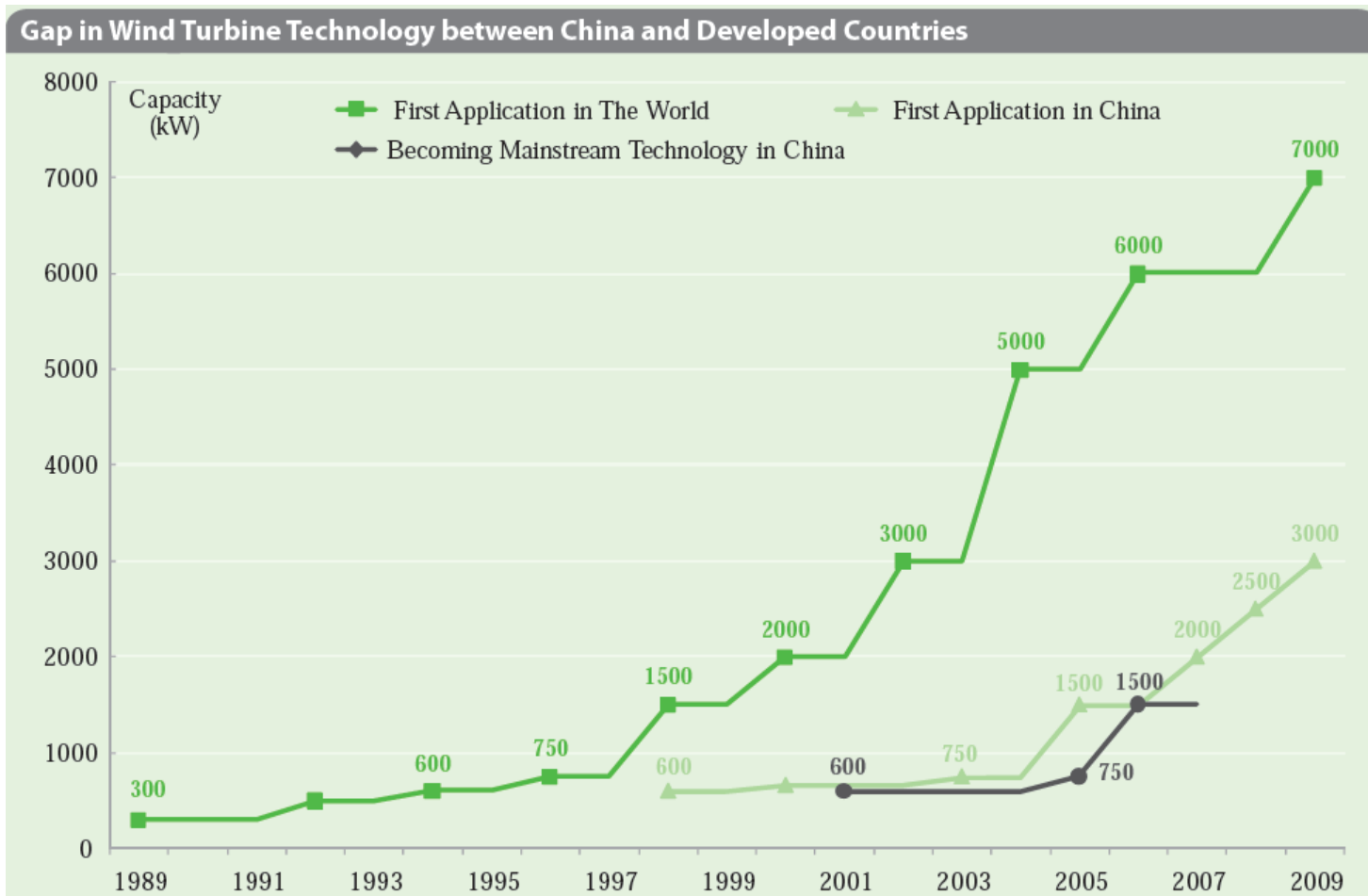
Source: China Statistics Bureau, 2007; China Statistics Yearbook 2008, 2009



Technology deployment pipeline



China is still lagging behind in low-carbon technology innovation



Source: Cui Xueqin, 2009, "Research on Mode and Performance of International Transfer of Climate Friendly Technologies," Beijing, Renmin University.

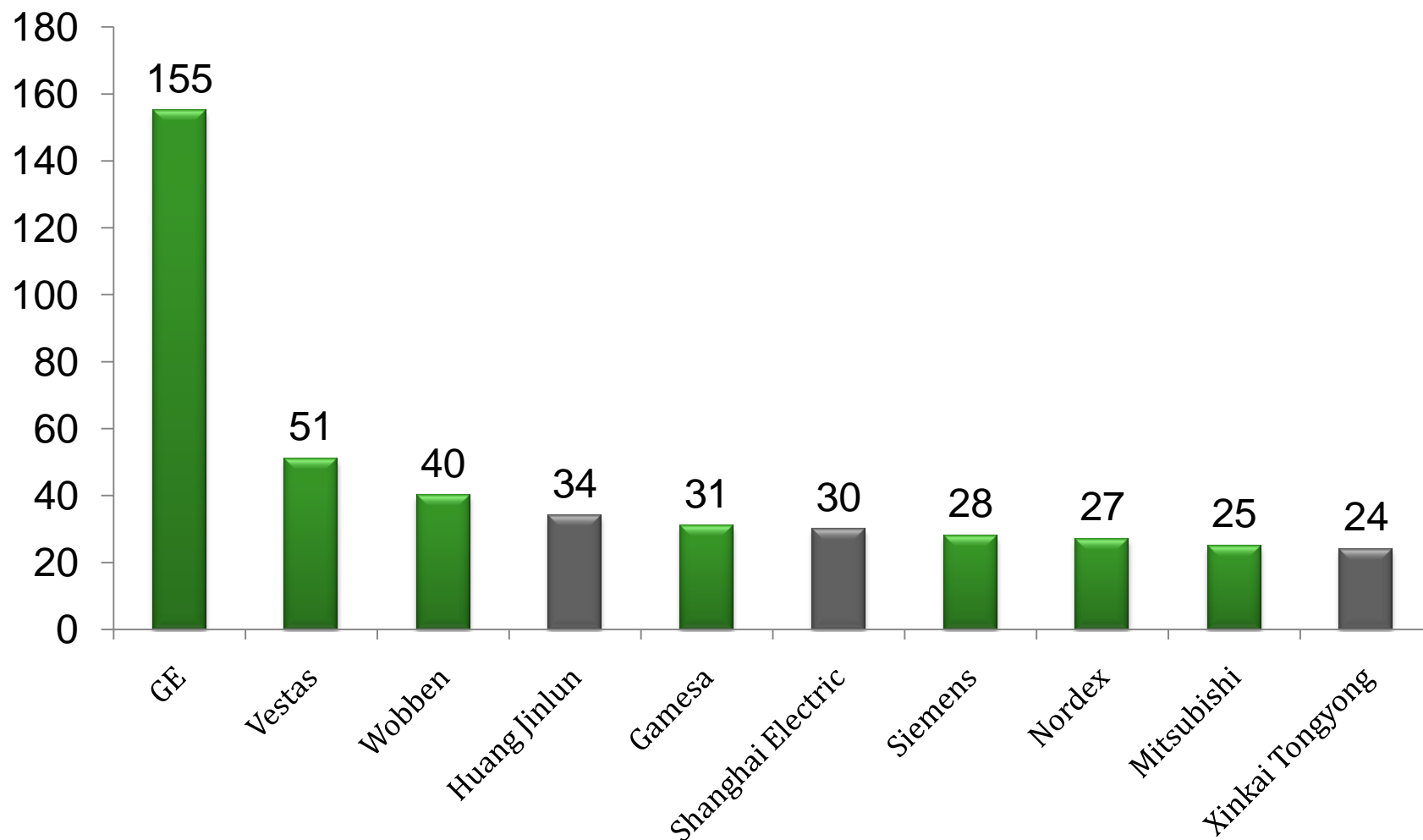
Source: Clean Energy Patent Growth Index, 2008, "Clean Energy Patent Growth Index 4th Quarter 2008". Available at

http://cepgi.typepad.com/heslin_rothenberg_farley_/2009/02/index.html (last accessed 31 March 2010). Clean Energy Patent Growth Index, 2008, "Clean Energy Patent Growth Index 4th Quarter 2008". Available at http://cepgi.typepad.com/heslin_rothenberg_farley_/2009/02/index.html (last accessed 31 March 2010).

Source: Database of the State Intellectual Property Office of the People's Republic of China. Cui Xueqin, 2009, "Research on Mode and Performance of International Transfer of Climate Friendly Technologies," Beijing, Renmin University.



Wind turbine technology related patents granted in China



Source: China Human Development Report 2009/2010, p43



Questions for you

- What are the contributing factors to be an innovation power?
- What contributes to the US's lead in global innovation chain?
- What can developing countries do to improve its innovation capacity?

