

China's Renewable Energy Scaling Up: Successes and Challenges

Dr. Xiaodong Wang

The World Bank

EAP Renewable Energy Workshop

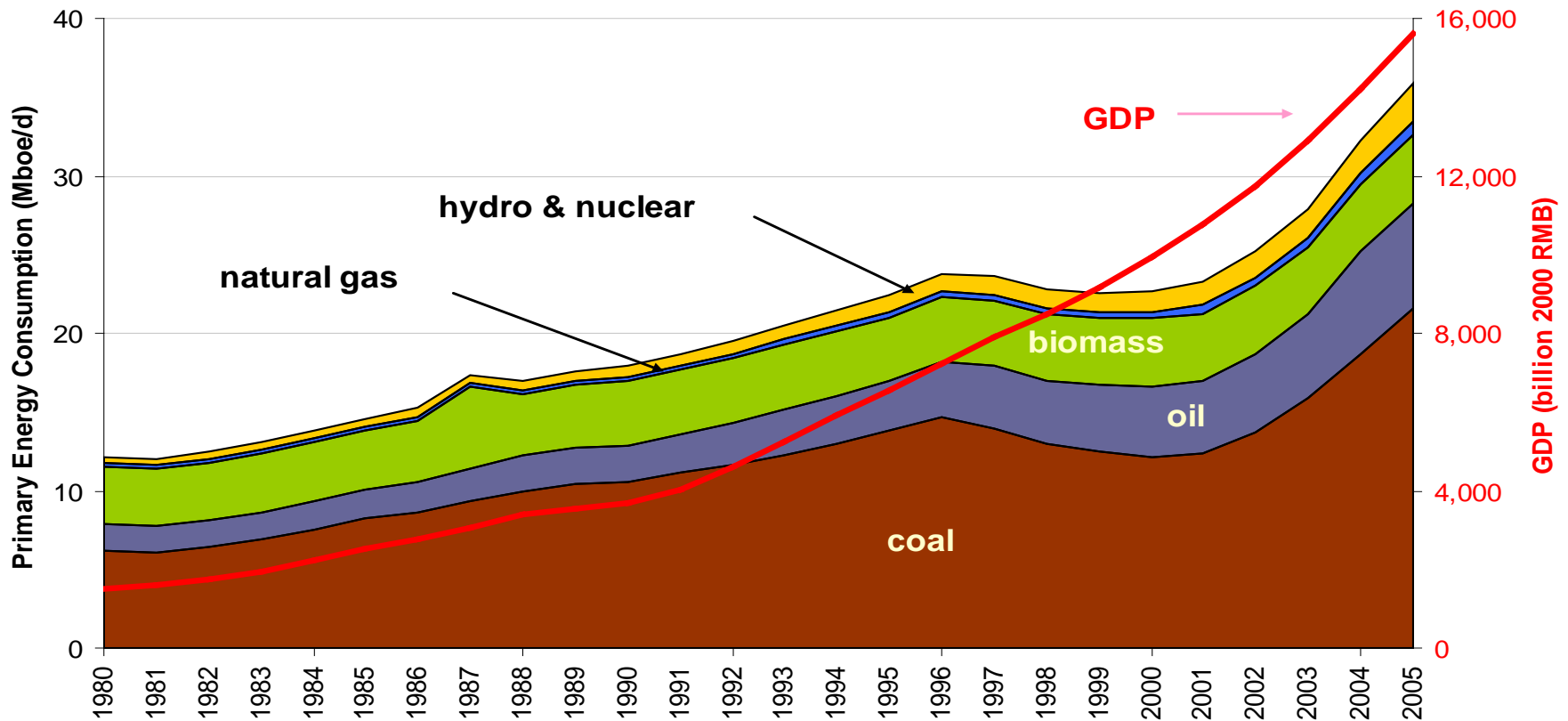
Pattaya, Thailand, April 2014

Structure of the Presentation

- **Context:** China's ambitious green energy campaign and World Bank's green energy portfolio
- **China's Success in Renewable Energy:** Government's effective policies
- **Challenges in Renewable Energy:** Grid integration and cost reduction
- **China Renewable Energy Scaling Up Program (CRESP):** achievements of CRESP I and tasks of CRESP II

China: Decoupling Energy from Growth

- 18x GDP, 5x Energy: Energy intensity dramatically declined 1980-2010
- Little change in the energy mix



China: Committed to Reducing Carbon Emissions with an Aggressive Clean Energy Campaign

National level targets:

- Carbon intensity reduction: 40-45% 2005-2020
- Energy intensity reduction: 20% 2006-2010 and 16% 2011-2015
- Non-fossil fuels: 15% in primary energy by 2020

Municipal level initiatives:

- Pilot low-carbon cities in 42 cities/provinces
- Pilot carbon cap and trade in 5 cities/2 provinces

China 2030 Study: Clean Energy -- Engine for Green Growth

Meeting energy needs
securely , sustainably, and cost
effectively

- **Sustainability:** Cap coal supply by environmental constraints
- **Security:** Minimize energy supply disruption and risks to envir. and pop.

- **Affordability:** Maintain competitiveness of the economy and safeguard consumers

Sustainability and security: Rein in demand and scale up green supply

Rein in energy demand:

- Rebalance structure change
- Contain urban energy growth
- Improve energy efficiency

Scale up green energy supply:

- Green energy mix
- Green technologies

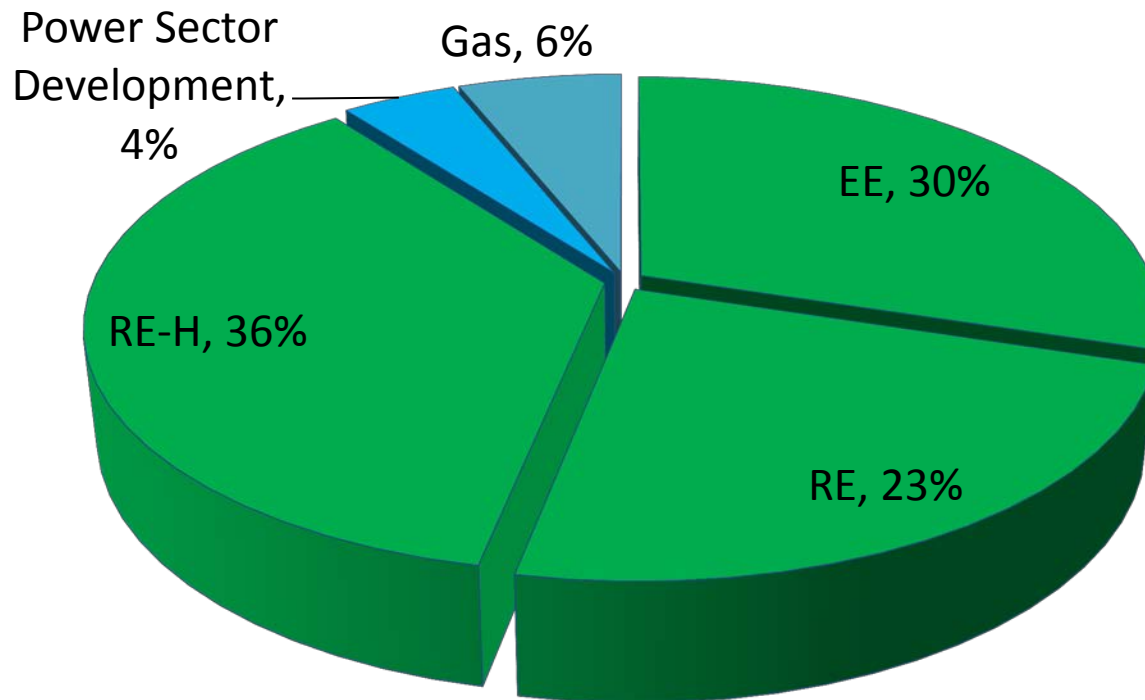
Efficiency and Competitiveness: Shift from planning to market economy

Increase use of market-based mechanism: get Pricing right

Complete the sector reform to increase Competitiveness and Modernize regulations

- **New paradigm: Leapfrog to a green growth model**
 - **Window of opportunities is closing fast**

Green Energy Dominates WB China Energy Portfolio (1999–2009)



- IBRD, GEF, carbon finance – \$1.6 billion
- 90% renewable and energy efficiency, \$1.4 billion

Effective Policies Are the Key Success Factor

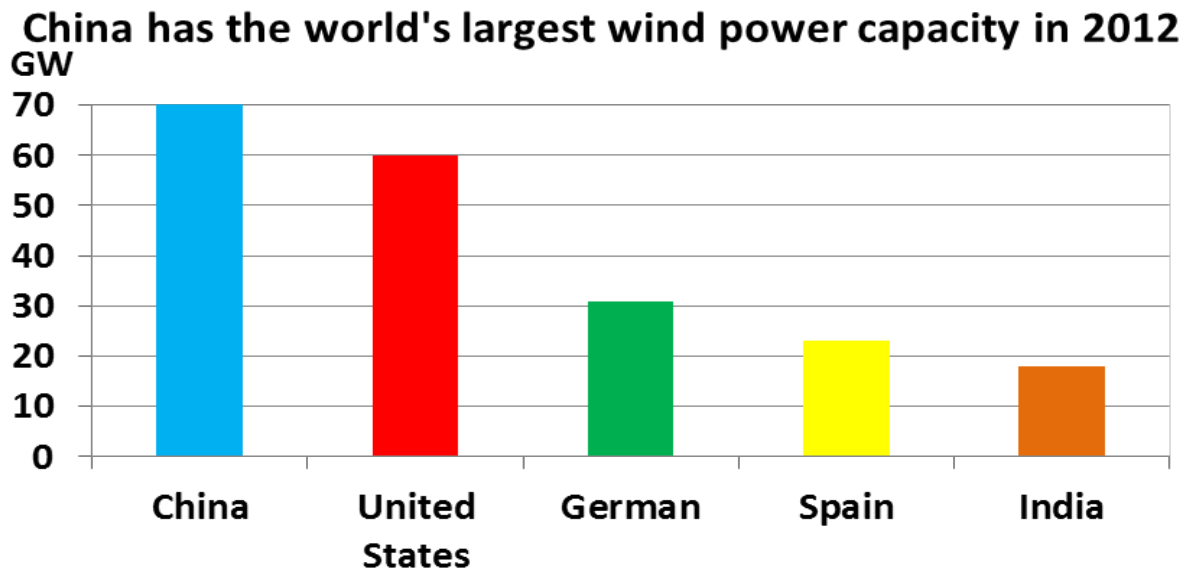
- **Challenges:** Not much progress before 2005
 - RE targets for three five-year plans not achieved
 - International pressure on climate change and domestic concerns over energy security and local environment
 - Driver: to build a strong local RE industry
 - World Bank loan of 100 MW wind farm cancelled
- **Designing RE law:**
 - **Debate:** RPS or FIT
 - **A critical requirement:** Incremental costs have to be shared nationwide
- **Passed RE law in 2005:** one of the first in developing world
 - Mandatory grid access and incremental cost pass-through
 - But RE Law passed quickly, leaving out tariff details for implementation

China's RE Policy: From Concession to Feed-in Tariff

- **Implementing RE law:**
 - **Wind:** from concession to feed-in tariff
 - At first, *no consensus on FIT levels*
 - **Concession:** Mixed results -- bidding too low and winner bids not materialized; but provided cost benchmarks for FIT
 - **FIT:** 7.8-9.4 cent/kWh, differentiated by region
 - **Biomass:**
 - **Fuel supply** is the key. FIT needs to factor in *fuel price volatility*.
 - **FIT:** moving from FIT premium to 11.5 cent/kWh
 - **Solar PV:** from concession to FIT:
 - **Grid-connected PV:** 15-16.7 c/kWh, differentiated by region
 - **Distributed PV:** fixed premium 7.5 c/kWh
 - **CSP and off-shore wind:** concession
 - **Wire charge to RE Fund:** 0.25 cent/kWh

RE Scale-Up Achieved in a Short Time Period

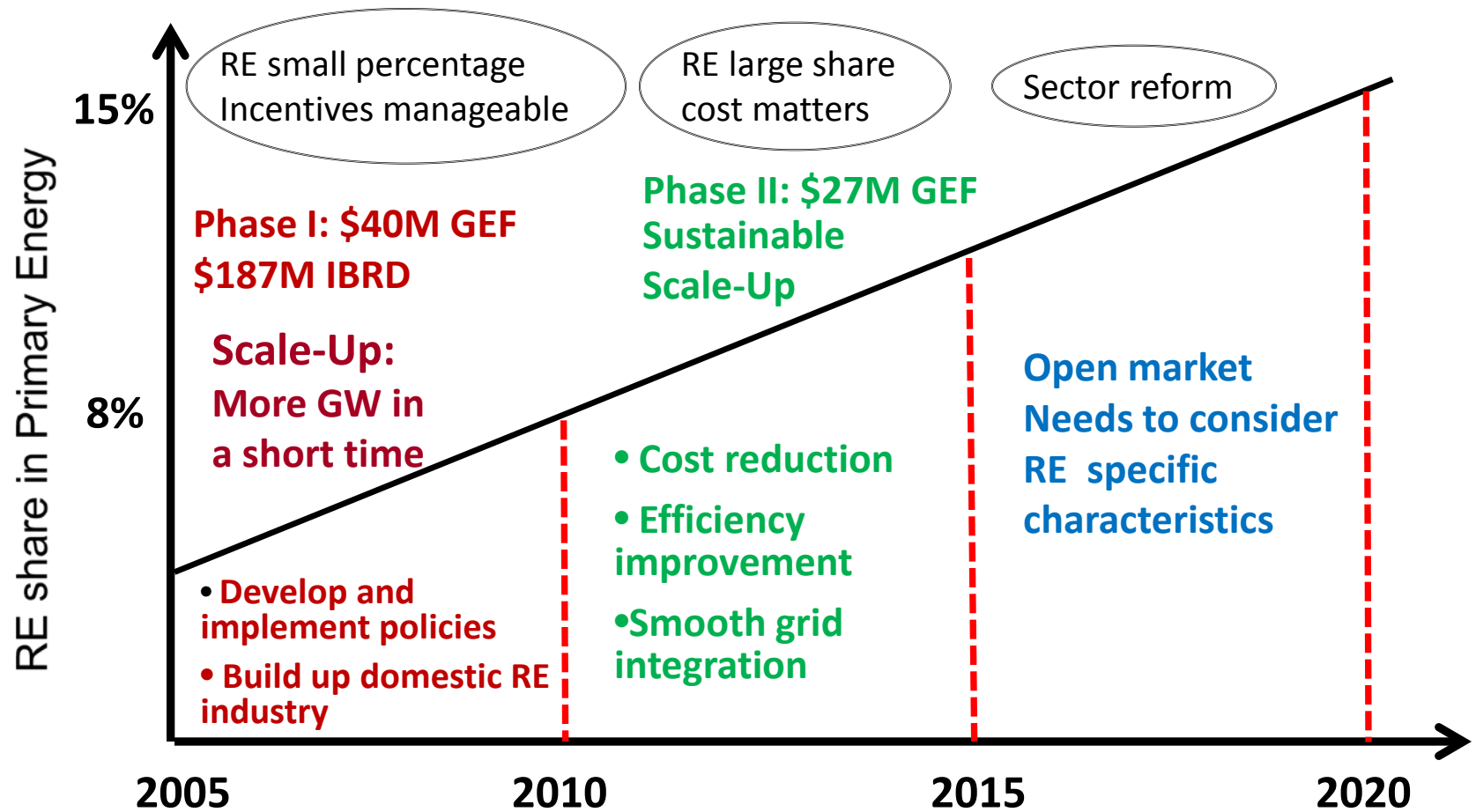
- **RE Share:** 10% now and 15% by 2020 in primary energy
- **Achievements:** Globally
 - No. 1 in RE capacity
 - No. 1 in wind capacity (75 GW grid connected, 92 GW erected)
 - No. 1 in solar water heaters (2/3 of global capacity)
 - No. 3 in solar PV capacity (18 GW)
 - No. 3 in biomass capacity



Challenges to Renewable Energy in China

- **Grid integration bottleneck:** A large share of wind power cannot be integrated to the grids:
 - Barriers: more institutional and regulatory than technical
 - Irrational power pricing structure
 - One-part generation tariff: disincentive to dispatch coal-fired power
 - Lack of transparent transmission pricing: disincentive to the grids
 - Lack of location pricing: disincentive to the developers
 - Who pays for curtailment loss, ancillary services, etc.
 - Lack of coordination in planning:
 - between generation and transmission
 - Between RE and other generation sources
 - Inflexible generation mix: coal-dominated, particularly in heating season
 - Regional inter-connection: limited
 - Grid code issued, but compliance with grid-friendly turbines?
- **High cost of the RE program:** the cost will become prohibitive without efficiency improvement and cost reduction

Renewable Energy: From Scale-up to Sustainable Growth



Made Significant Contributions to China's RE Scale-Up

- **Technical Assistance:**
 - *Policy matters:* Policy studies made important contributions to RE policies
 - **Supported regulations and amendment** for RE Law
 - *The quest for manufacturing quality:* Technology improvement and transfer contributed to rapid growth of Chinese wind and solar industry
 - **Cost-shared sub-grants:** supported wind manufacturers
 - **Quality control:** standards, testing, and certification
- **Investments:** 2 x 100 MW wind farms, 25 MW biomass plant, and 16 small hydro plants with a total capacity of 24 MW
- **Lessons Learned:**
 - **Long-term engagement** with the government paid off
 - **A programmatic approach** -- blending policy dialogue/TA (GEF) and IBRD investments, is the best conduit for scaling up RE
 - **Cost-shared sub-grant** to support domestic manufacturers works well
 - **Flexible approach** is required
 - **Improving manufacturing quality** is essential for the transition to a world class manufacturing industry

Project Objective and Components

- **Project Objective**

- To support the ambitious RE scale-up program in China, with a focus on efficiency improvement and reduction of incremental costs

- **Project Components**


1. Policy support: e.g. power pricing/sector reform
2. Grid integration/access and technical design:
 - Optimize site layout design for on-shore Wind Power Bases
 - Technical standards/specifications of grid connection for DG
 - Curtailed wind for heating
3. Technology improvements:
 - Increase efficiency of existing wind and solar PV farms
 - Improve quality and reduce cost of off-shore wind
4. Pilot demonstration
5. Capacity building and investment support

Take Away Messages

China's RE Scale-Up Successes

- Concession: price finding mechanism to set up FIT
- FIT: the cornerstone of China's RE policies and essential driver for RE scale-up
- Someone has to pay for the incremental costs

China's RE Challenges

- Grid integration
- Efficiency improvement  Cost reduction

Bank's Support: CRESP

- **CRESP I:** made significant contributions to China's RE scale-up
- **CRESP II:** intends to tackle the current challenges