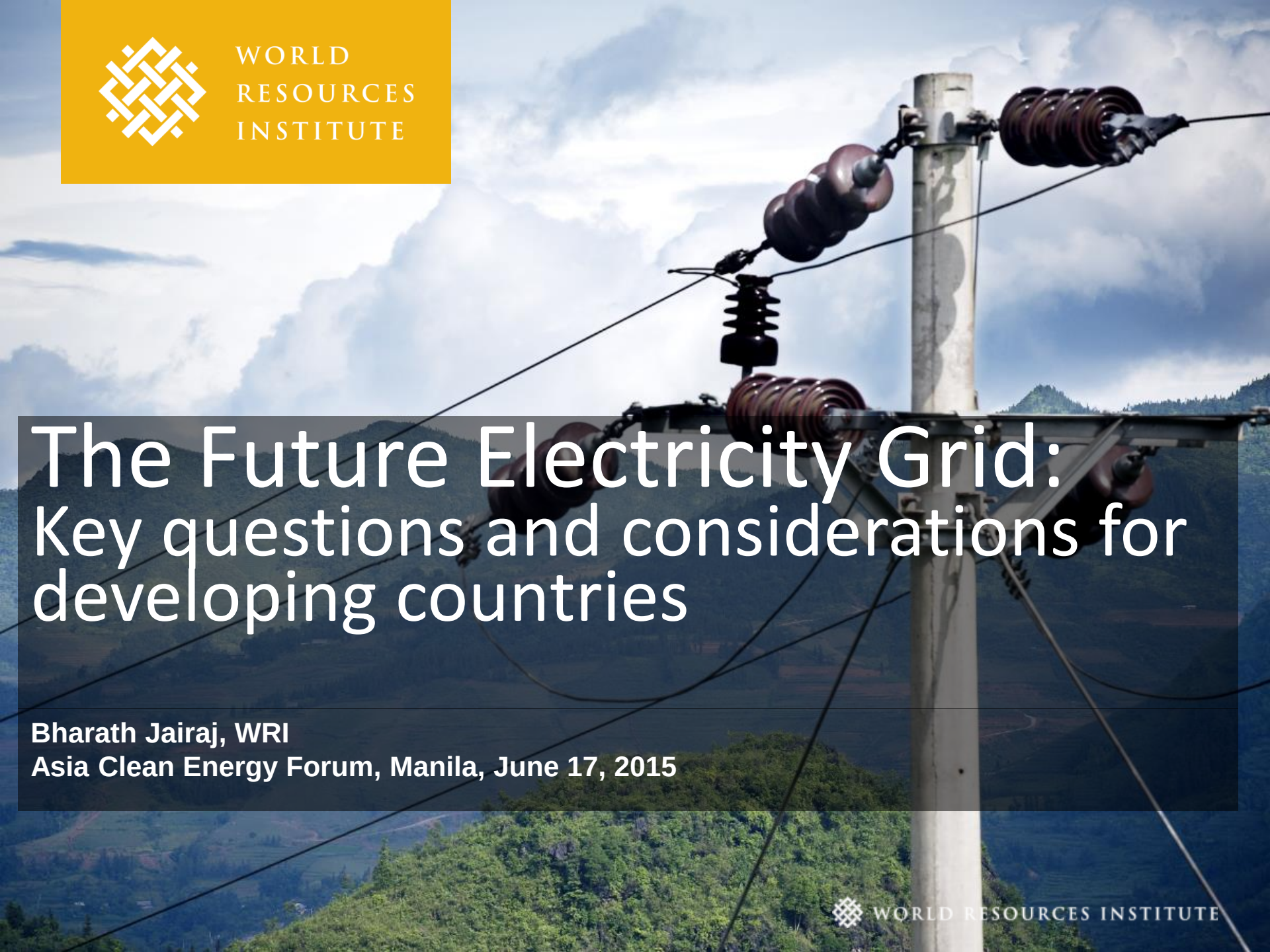
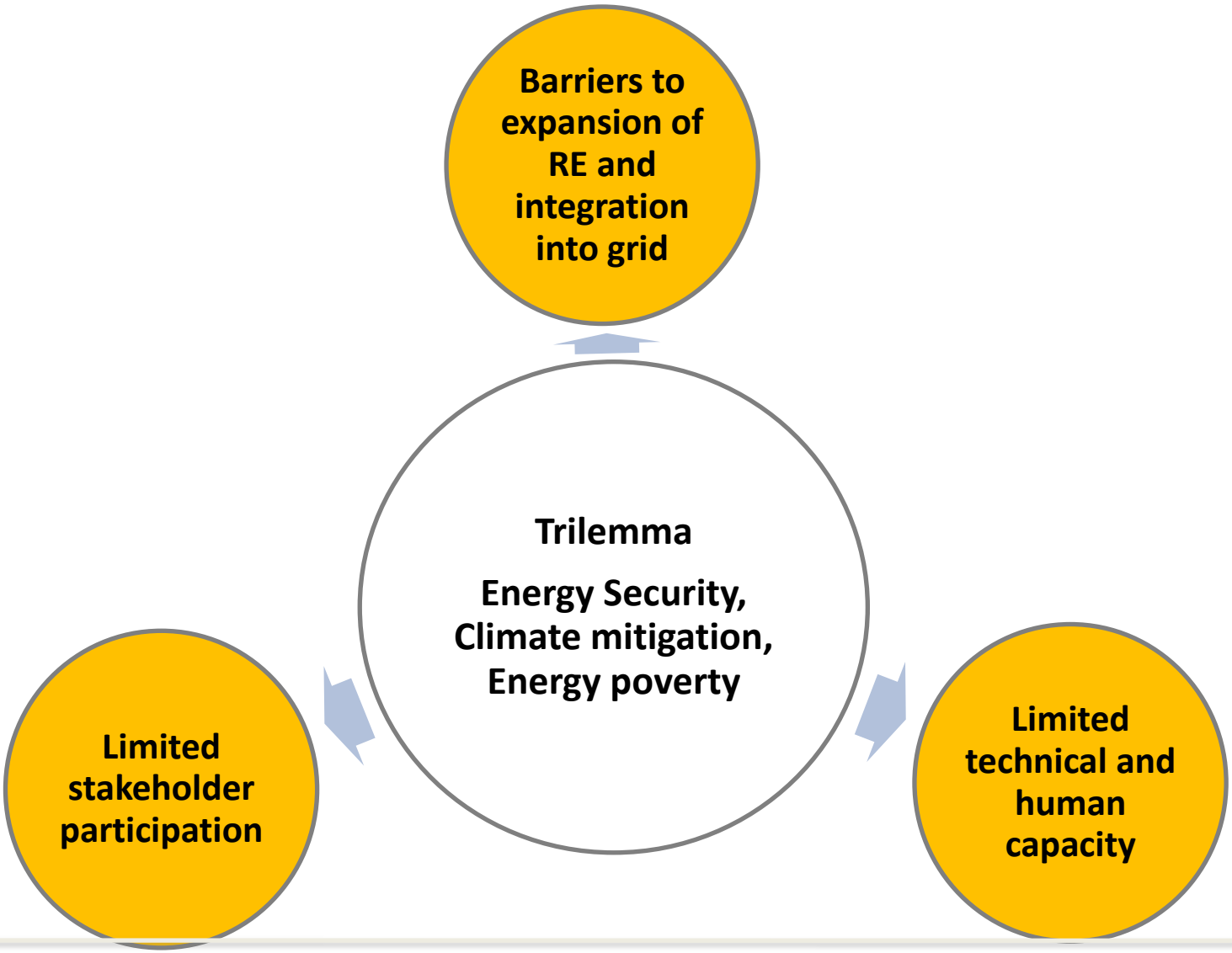


The Future Electricity Grid:
Key questions and considerations for developing countries

Bharath Jairaj, WRI

Asia Clean Energy Forum, Manila, June 17, 2015

The Energy Trilemma

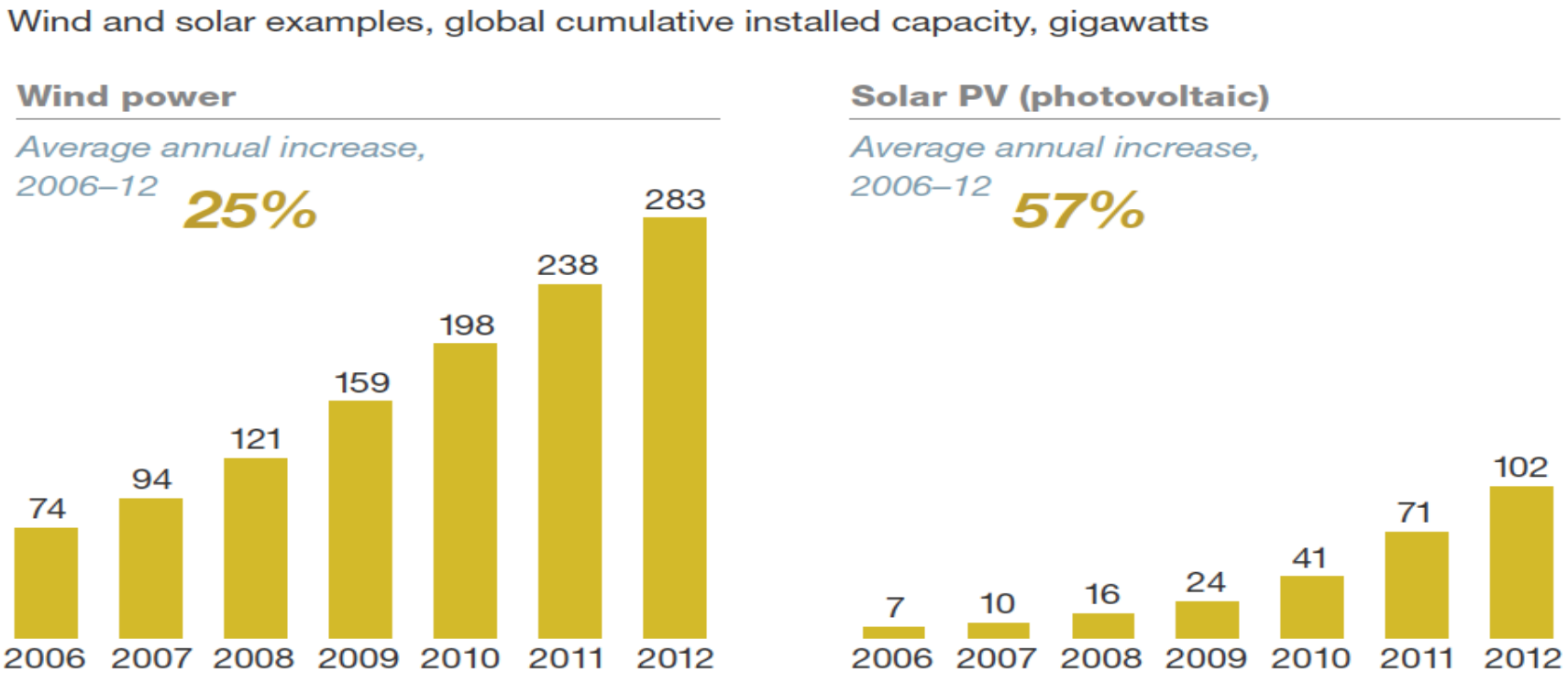


Research Questions:

- What are the mega-trends taking place in RE & EE technologies and costs, as well as in consumer behavior?
- What are the implications of these trends on developing countries identified in the study?
- What solutions, if any, are available to overcome the challenges and take advantage of the opportunities of these implications?

Global Trend 1: Growth Rates

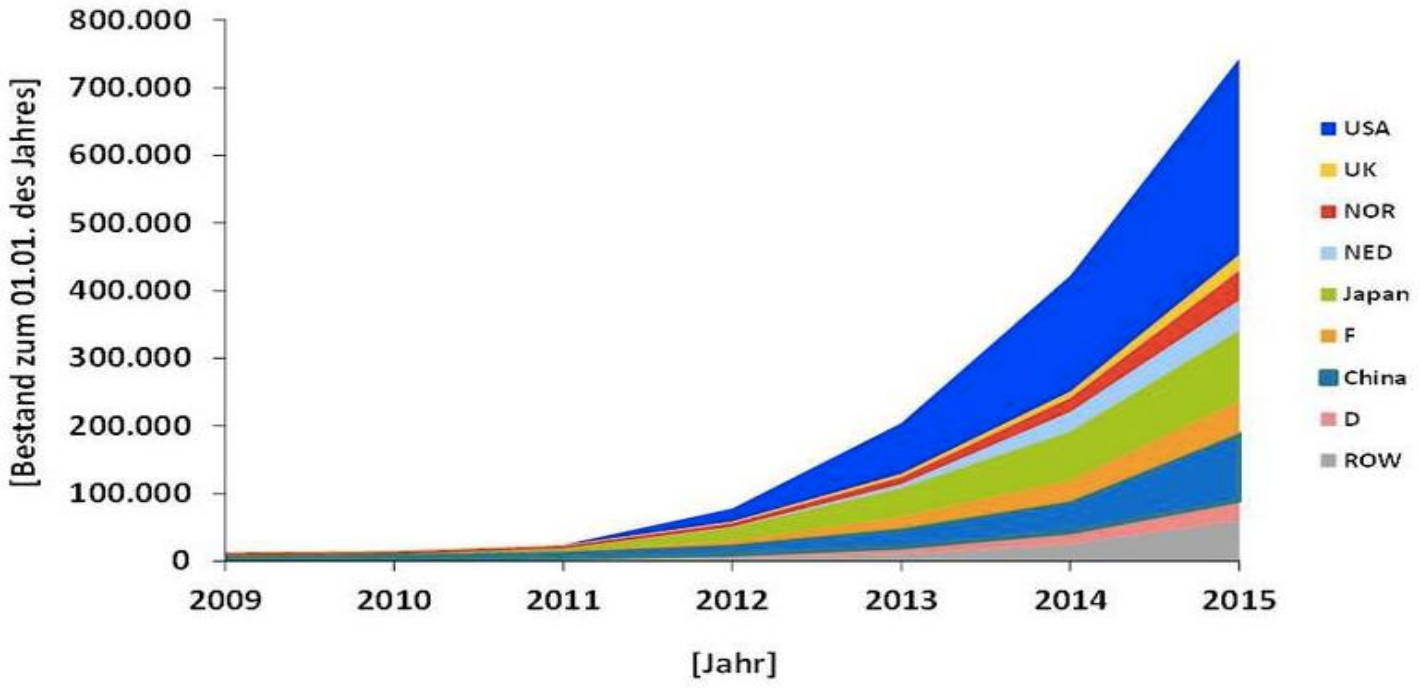
Growth rates of >50% for solar and ~25% for wind



Source: Bloomberg; Thomson Reuters Datastream; Dow Jones; *Global Market Outlook for Photovoltaics 2013–2017*, European Photovoltaic Industry Association, May 2013; Factiva; Global Wind Energy Council

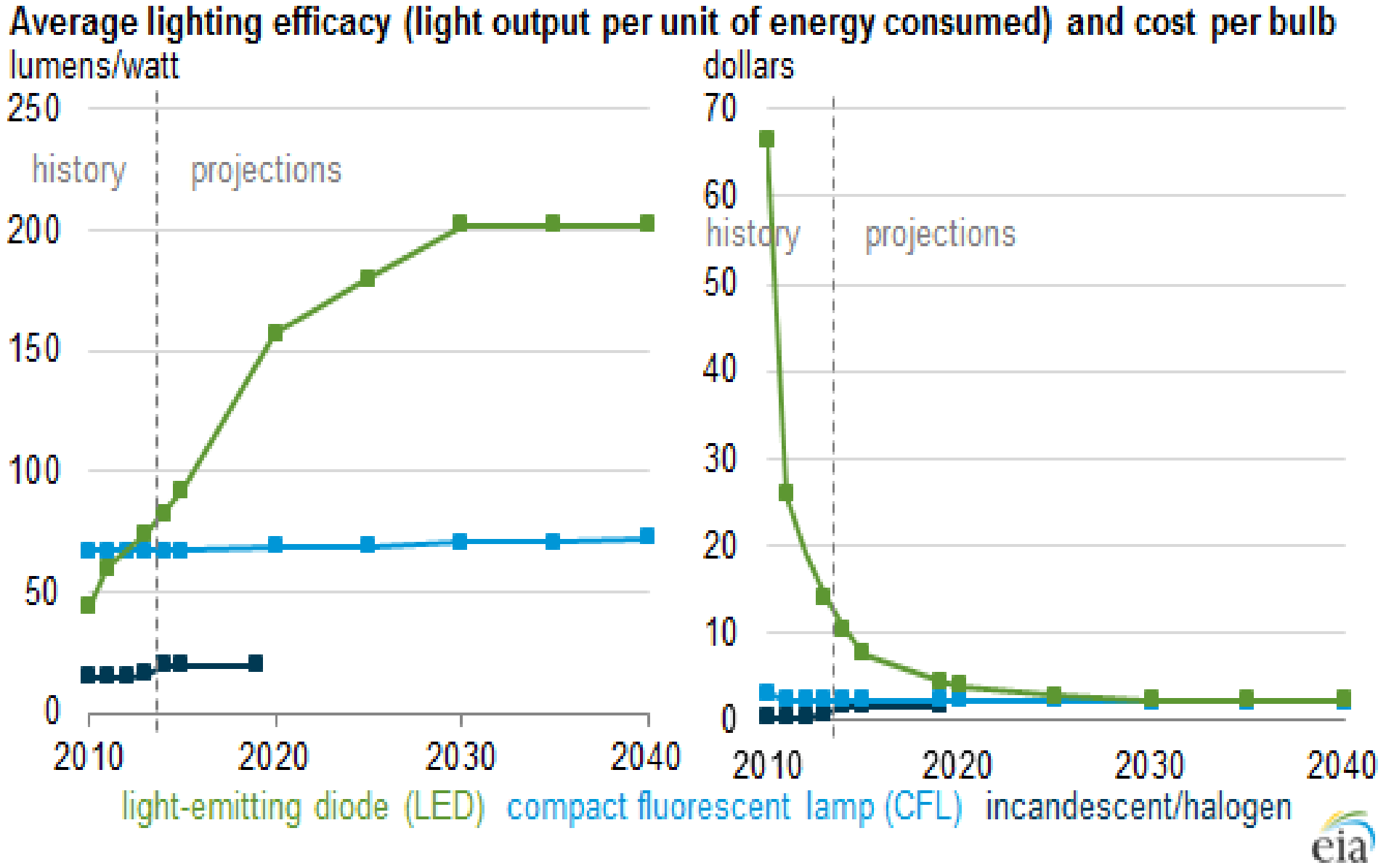
Global Trend 1: Growth Rates

100% annual growth in Electric Vehicles sales



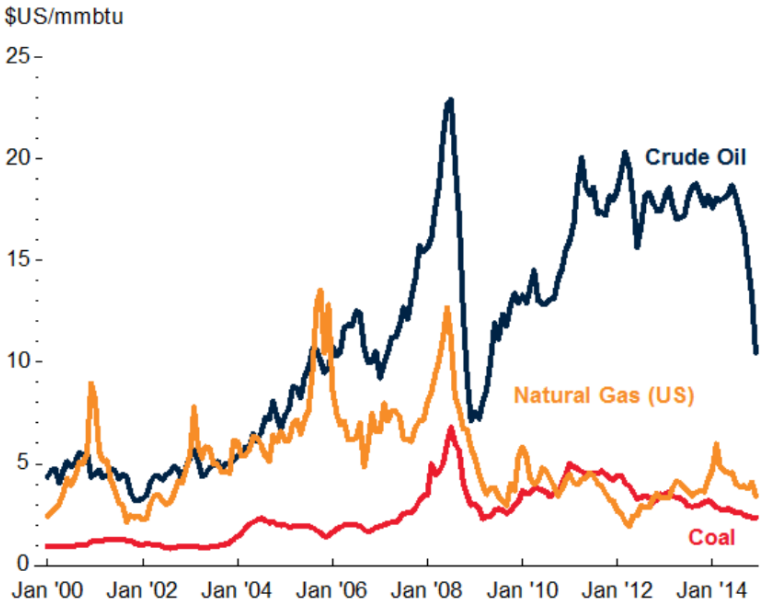
Source: Centre for Solar Energy and Hydrogen Research, 2015 http://cleantechnica.com/2015/03/28/ev-demand-growing-global-market-hits-740000-units/

Global Trend 2: Technology Improvements



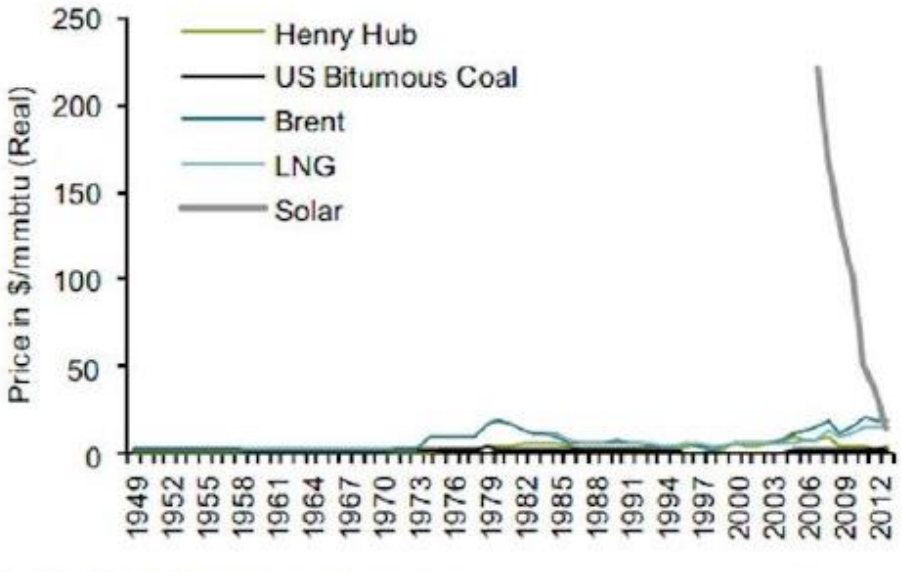
Global Trend 3: Costs

Volatile fossil fuel prices



Source: World Bank.

Declining costs of RE technologies

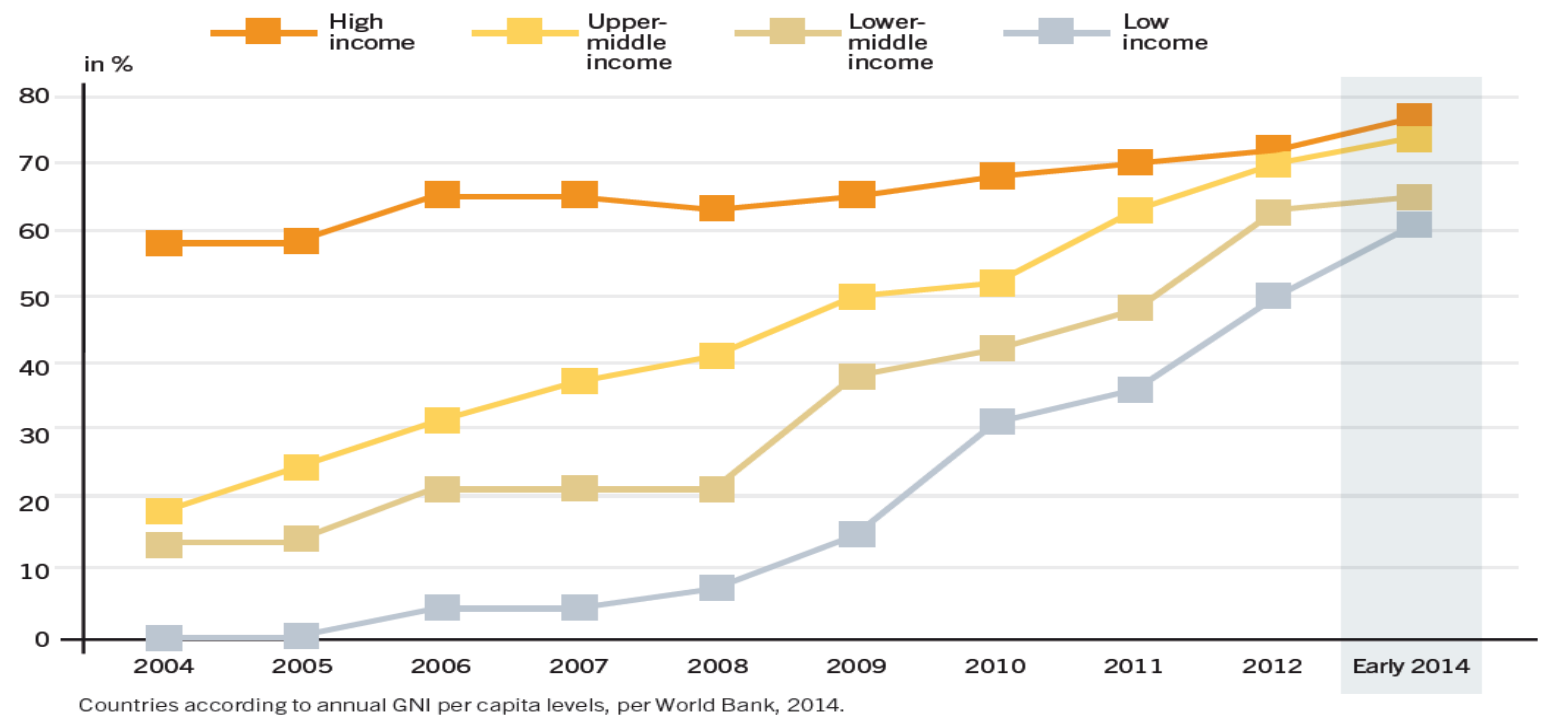


Source: EIA, CIA, World Bank, Bernstein analysis

Global Trend 4: Policies

Growth in Government Support for RE

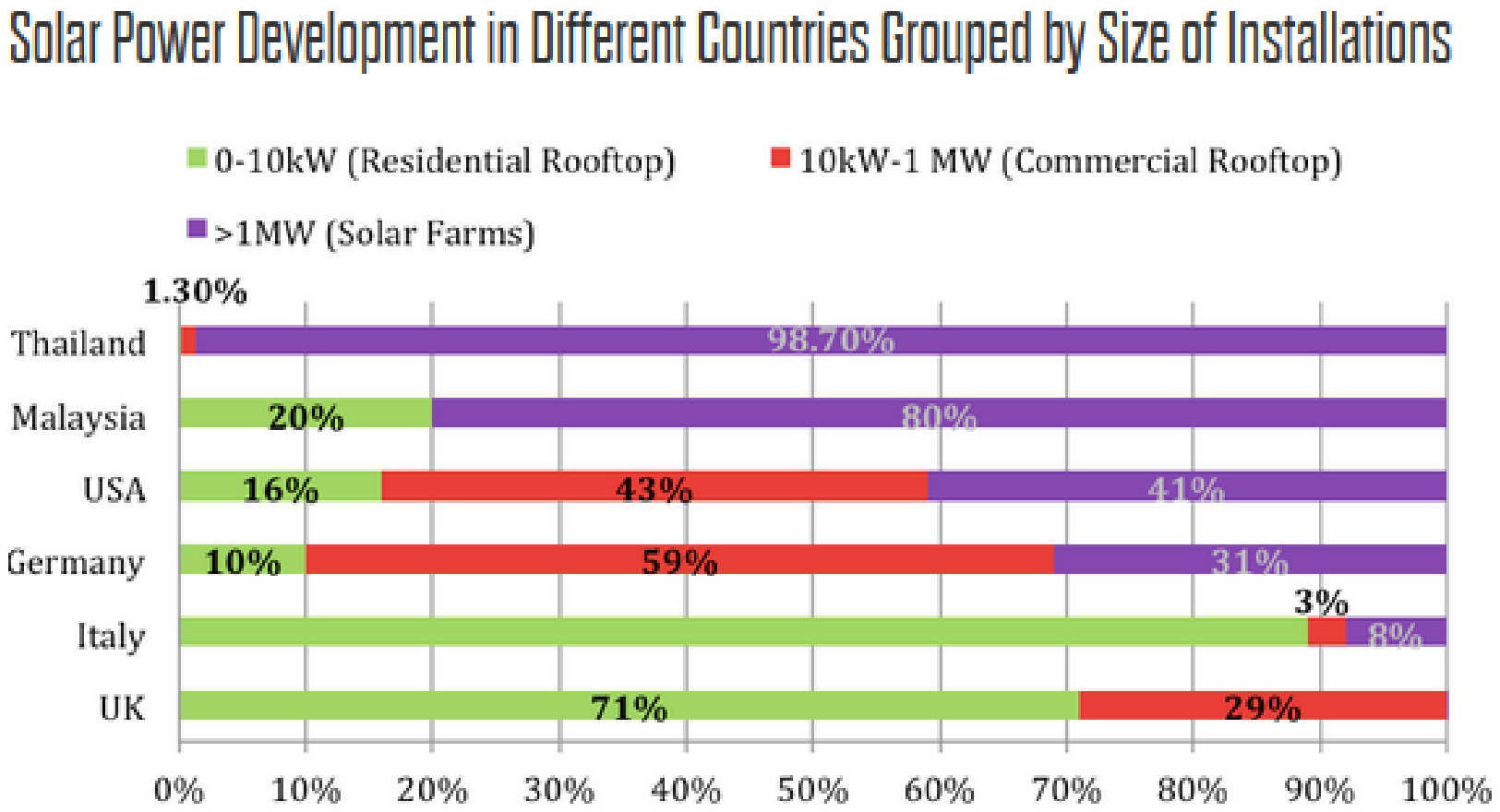
Figure 29. Share of Countries with Renewable Energy Policies by Income Group, 2004–Early 2014



Countries according to annual GNI per capita levels, per World Bank, 2014.

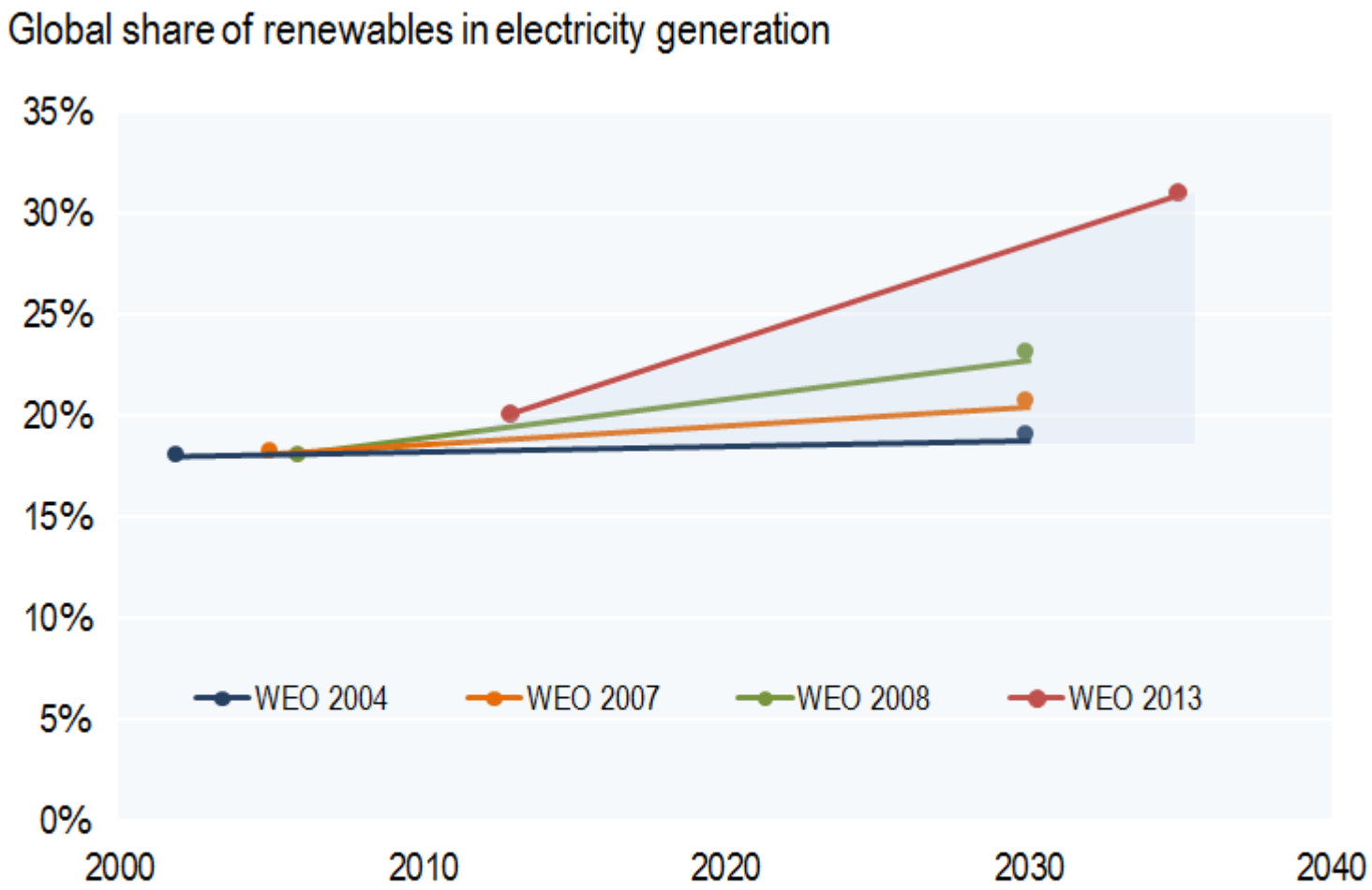
REN21, 2014

Global trend 5: Generating entities



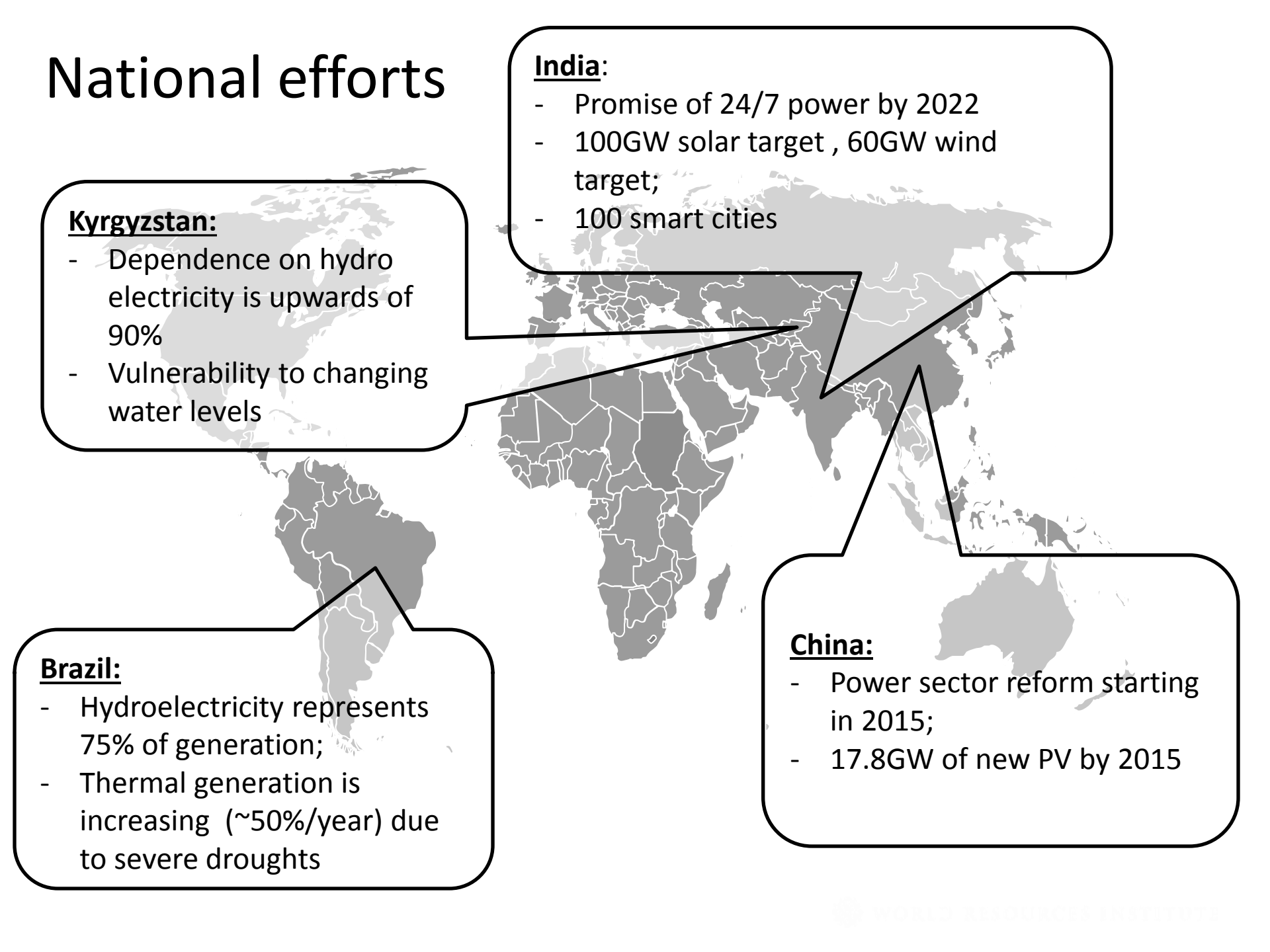
Source: *Solar Power Development in Different Countries Grouped by Size of Installations Source: Analyzed from Malaysia (Chen, 2013); Italy (GSE, 2013); Thailand (EPPO, 2012),Germany (Schoenfeld, 2012), USA (SEIA, 2012); UK (DECC, 2013)* http://thaisolarpvroadmap.org/wordpress/?page_id=1189

Global trend 6: Rate of Adoption



Source: Based on projections of IEA World Energy Outlooks in Reference Scenarios of WEO 2004, 2007 and 2008, and New Policies Scenarios in WEO 2013.

National efforts



India:
- Promise of 24/7 power by 2022
- 100GW solar target , 60GW wind target;
- 100 smart cities

Kyrgyzstan:
- Dependence on hydro electricity is upwards of 90%
- Vulnerability to changing water levels

Brazil:
- Hydroelectricity represents 75% of generation;
- Thermal generation is increasing (~50%/year) due to severe droughts

China:
- Power sector reform starting in 2015;
- 17.8GW of new PV by 2015

Implications

Increased complexities and physical constraints to the grid

Challenges to the conventional utility model

Electricity price and equity concerns

Need for national discussions on the future electricity grid:

1. Ensuring system reliability and improving service quality
2. Rethinking tariffs
3. Overcoming technical limitations
4. Enhancing Institutional capacities
5. Strengthening sector governance


Thank you!
bjairaj@wri.org
WORLD RESOURCES INSTITUTE