Leveraging Technology, Market Creation and the Private Sector to Improve Global Access to Power

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IFC | International Finance Corporation
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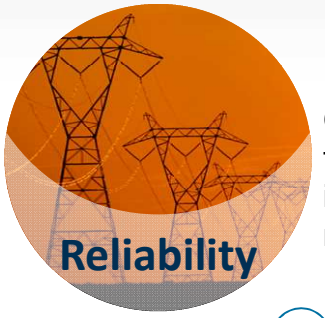
Creating Markets, Creating Opportunities

1 Power Critical for Development: Access to power is essential to achieve the Twin Goals of poverty alleviation and shared prosperity

There is a significant need to scale up investment in emerging market power…

1.2 billion individuals currently lack access to electricity



Outages are more than **6x more likely** in emerging markets

Total GHG emissions in LICs and MICs are **2.2x larger** than HICs

…as the power sector is one of the most important drivers of development

Recent gas-fired project in Bangladesh increased employment by **~1 million and increased GDP by 1.7% annually**[1]

Female employment rates increased by 9% after rural households in South Africa gained access to electricity[2]

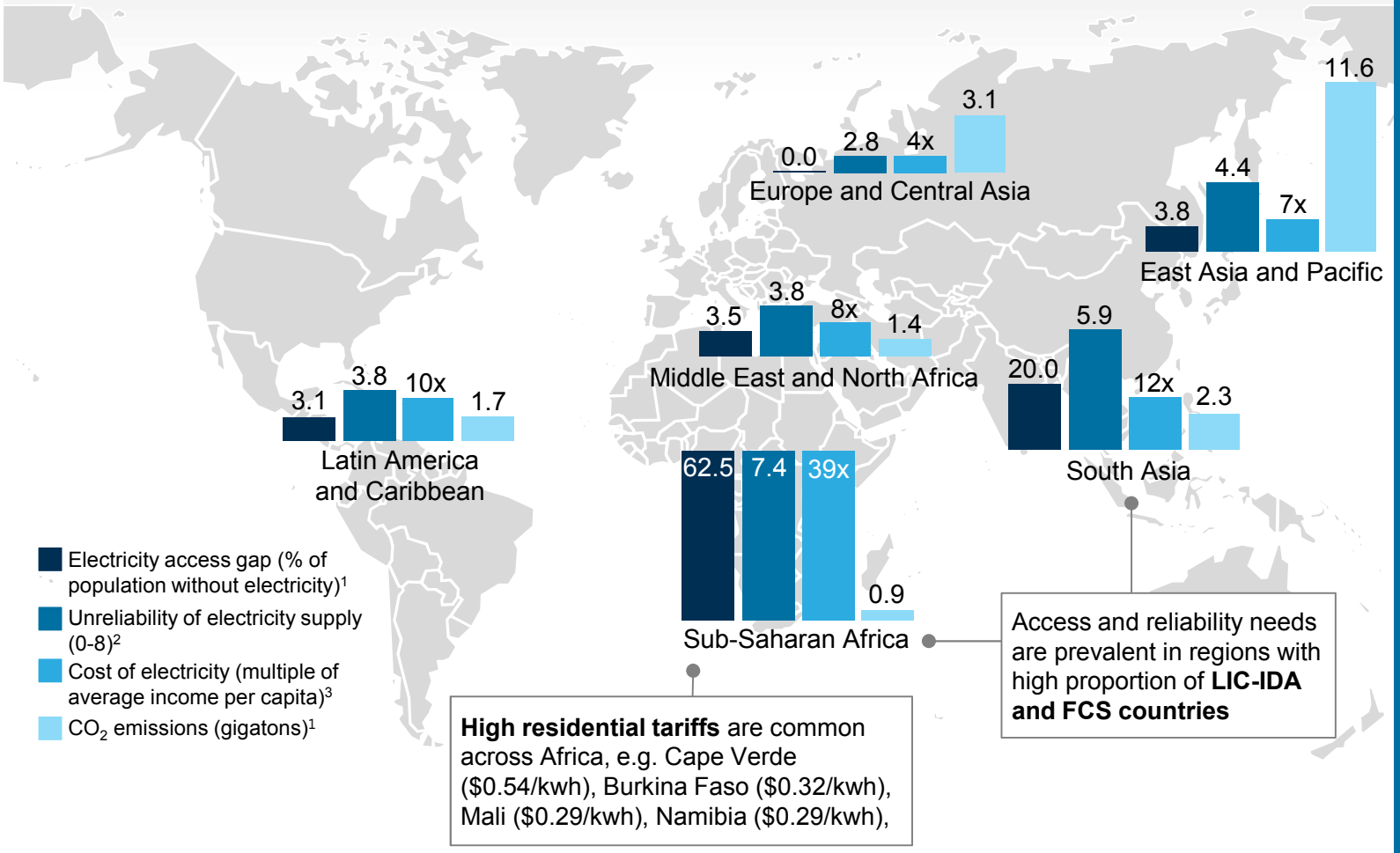
In the Indian state of Assam, complete rural electrification could **raise the literacy rate from 63% to 74%**[3]

Household electrification in El Salvador **reduced the incidence of acute respiratory infections** among children by 34%[3]

1 IFC internal estimates using SAM input/output models 2 Makoto Kanagawa and Toshihiko Nakata, "Assessment of access to electricity and the socioeconomic impacts in rural areas of developing countries," Energy Policy, volume 36, issue 6, June 2008 2 World development report 2012: Gender equality and development, World Bank, September 2011. 3 Manuel Barron and Maximo Torero, "Household electrification and Indoor Air Pollution," OCF Berkeley

1 Power Critical for Development: Power investments are needed to address energy access, reliability and climate change across regions

Development potential in power sector by region



1 World Bank WDI Database – Electricity access rates 2014, CO_2 emissions 2013
2 Doing Business – Getting Electricity Database 2016, Reliability and Transparency of Tariff Index, inverse (0=most reliable, 8= least reliable)
3 Doing Business – Getting Electricity Database 2016, measured as cost of obtaining permanent electricity connection for a newly constructed warehouse as a percentage of average income per capita

- Of the **1bn+ people** in LICs and MICs **without access to electricity**, ~90% are found in Sub-Saharan Africa (~600mn) and South Asia (~340mn)
- **Electricity supply** is unreliable across developing regions, but **the problem is acute in Sub-Saharan Africa (7.4) and South Asia (5.9)**
- **CO_2 emissions** are most concentrated in regions with relatively better electricity access, such as **Europe & Central Asia**, and **East Asia**

1 Power for Development: The power sector is experiencing profound changes, driven by shifts in technology and business models

Shift in generation away from fossil fuels to renewables		▪ Power generation is shifting away from fossil fuels to renewables, as **solar PV and wind have reached price parity with new fossil fuel capacity in more than 30 countries**[1] – Renewables made up more than half of cumulative planned capacity additions by end of 2016
Increasing importance of grid flexibility and resiliency		▪ Grids must be made more flexible and resilient via new investments and technologies to accommodate new renewables and increase efficiency – **Global smart grid market is expected to surpass $60bn in 2020;** although majority is expected to be in OECD, investments in emerging markets are expected to follow
Rapid growth of distributed generation		▪ In regions where the grid is unavailable, unreliable or the cost of connection and power is high, there will be continued growth in distributed generation – **Distributed generation accounted for $46bn of investment in 2015**
Increase in new business model innovations		▪ **Innovative businesses that deliver power as a service directly to consumers are growing** (e.g., Mobisol which provides solar home systems via a PAYGO model) and are increasing their market share of consumer spend on power at the expense of traditional utilities.
Shift in capital flows to key sub-sectors and emerging markets		▪ **Capital flows are shifting to renewables, distributed generation and to select emerging markets, creating more competitive capital markets** – Lower cost capital for power sector investments is increasingly being provided by local and international commercial banks, regional development banks, export credit agencies, and bilateral financing agencies – often via auctions

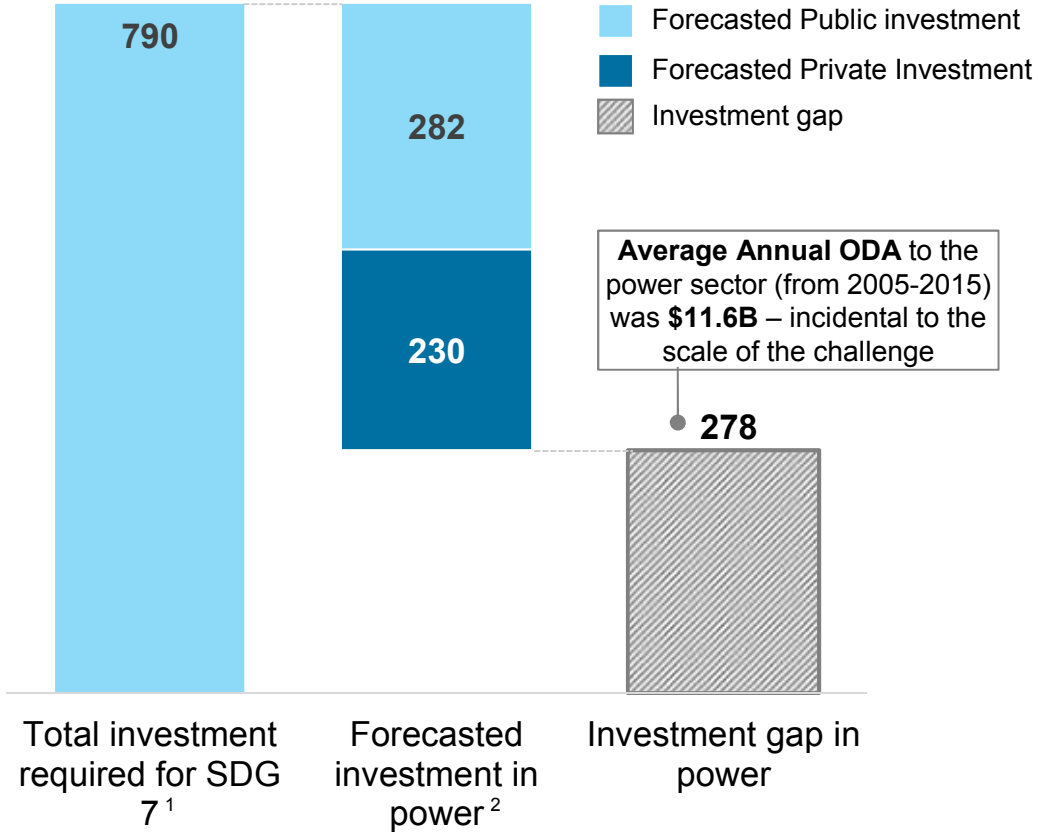
1 As reported by the World Economic Forum in Dec 2016

SOURCE: EIA, GTM research, WEF, World Energy Investment, UNEP's 10th Global Trends in Renewable Energy Investment, Bloomberg New Energy Finance

2 Scaling-Up Power Investment: Rising aspirations are creating even larger investment gaps – these cannot be met by public sources alone

Annual investment required to achieve SDG 7, forecasted investments, and investment gap (2016-30F)

US$ billion p.a.



Constraints to Public Sector Investment

Fiscal

- Limited fiscal space and elevated borrowings constrain scope of public sector investment in major infrastructure projects

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Political

- Scarce public funds compete against other governmental priorities – health, education
- Public subsidies and tariffs to consumers distort energy market

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Innovative

- The power sector is in a period of transformative technological change
- State-owned utilities are less able to adapt to these changes and are at risk of falling further behind

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Enhanced Role for Private Sector

1 Total investment required for SDG7 ranges from $630bn/year (low estimate) to $950bn/year (high estimate). Midpoint was taken for this analysis ($790bn).
2 Estimated annual investment in this sector was estimated to be $512bn total for the power sector based on WEO. Based on UNCTAD, 45% of investment in developing countries is expected to come from private sector.

SOURCE: World Energy Outlook, UNCTAD, World Investment Report 2014: Investing in the SDGs: An Action Plan

2 Scaling-Up Power Investment: Private sector also faces challenges in scaling-up investment

Challenges in attracting private investment

Generation

- Lack of **adequate procurement regimes** in emerging markets inhibits direct investment in generation projects
- **Strong public sector** presence for political economy reasons, limiting competition and crowding out private investment
- **Subsidies and below market tariffs** inhibit cost recovery and necessary upkeep
- Financially **weak utilities** and lack of alternate buyers

Transmission & Distribution

- **Poor performance of T&D sub-sector** undermines the soundness of the entire power sector
- Sub-sector **traditionally operated by SOEs** across emerging markets
  - SOEs with **weak governance and corporate structures** as well as low operational efficiency dissuade private investment
- **Rural and remote customers** in areas with high-need complicate T&D economics and limit scale and scope of progress

Disruptive Technology

- Governments are unable to keep up with the **rapid pace of technology-driven change** within the power sector and hence are behind in creating business enabling environment to capitalize on new technology

3 World Bank Group can optimize public sector policies and investments and catalyze private sector solutions

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Power sector planning, investment and reform	Procurement advisory	De-risking via long-term insurance
Electrification plan	Project preparation and financing	Credit enhancement
Institutional development	Investment and mobilization of private capital	Damage prevention
Tariff and subsidy reform	Corporatization of public utilities	

4 IFC is at the forefront of market creation in the power sector

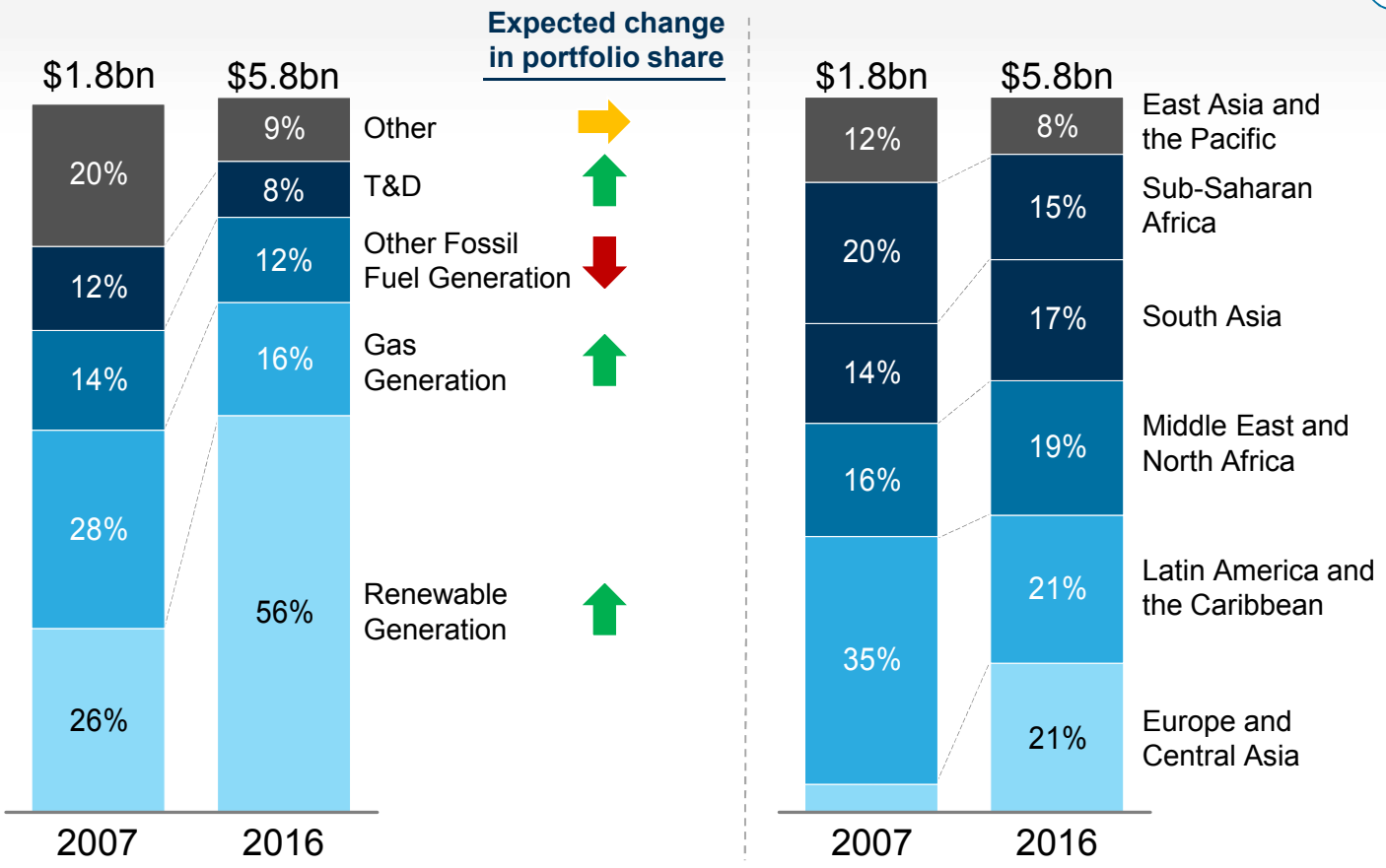
Procurement advisory	▪ **Scaling Solar in Zambia** aligns a "one-stop-shop" aimed at creating bankable utility-scale solar power projects ▪ **Established a bankable PPA** regime and energy auction process in Argentina
Solar PV aggregation	▪ **Jordan's Seven Sisters** project aggregates 7 small solar power projects into a single, standardized financing structure
Energy storage	▪ **Building up capabilities** in new market segment through venture capital investments
InfraVentures	▪ **Provides project development support** and financing to 24 projects, mainly wind and hydro
Transmission & Distribution	▪ Multiple investments in private distribution; supported **distribution privatization;** project financed **private transmission** ▪ **Enables renewables penetration and access**

Key enablers

- Continued **close coordination with World Bank, government and other actors** is necessary in upstream interventions
- **Market creation requires sustained efforts** over extended periods of time with uncertain outcomes

4 IFC has reoriented its strategy towards renewables

IFC Power sector portfolio shares by subsector and region (FY07 to FY16), % portfolio share



Power is the largest real sector component of IFC's portfolio, averaging $2.2bn in Commitments + Mobilization from FY12-FY16

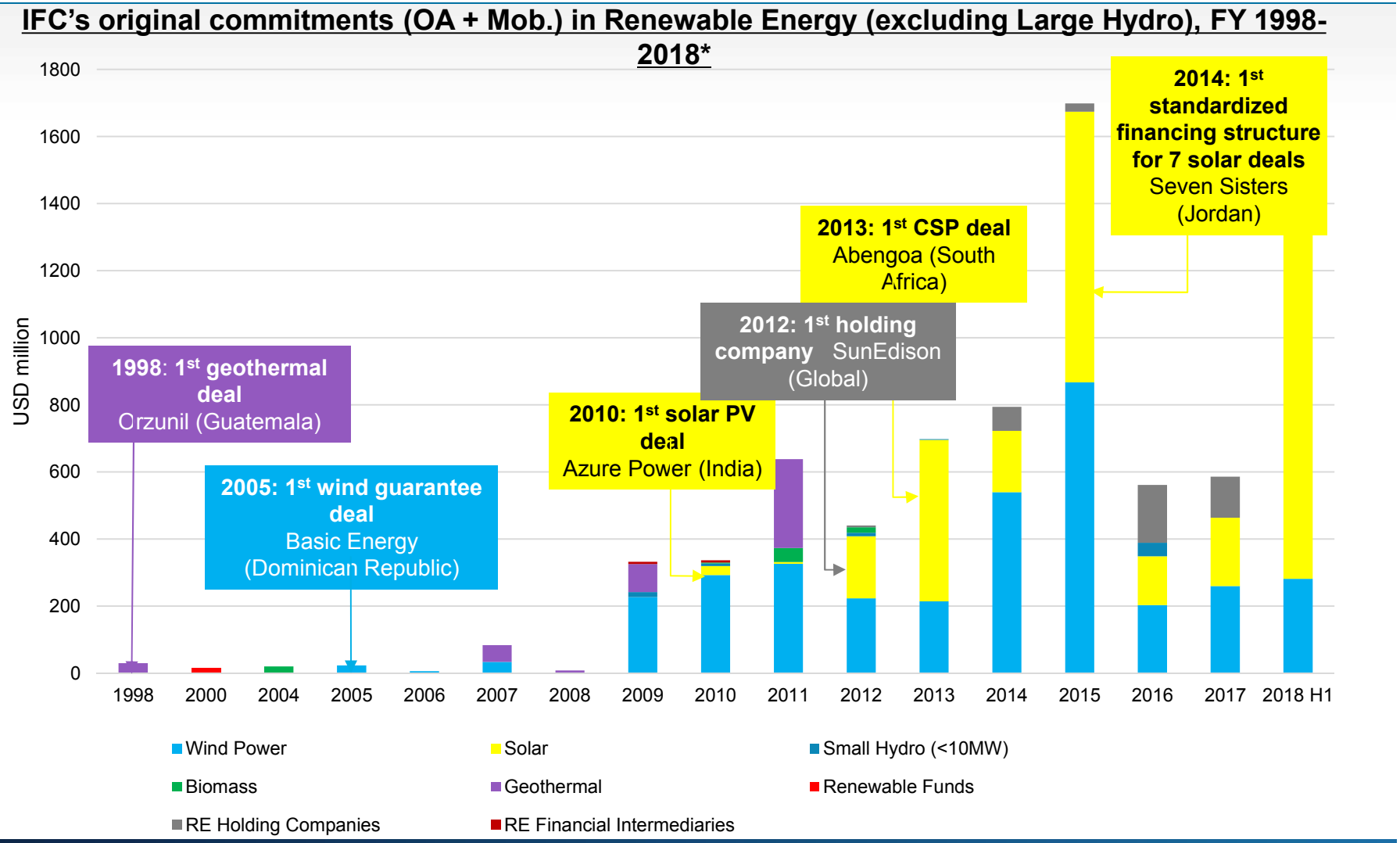
- Expected decline in share
- Limited expected change
- Expected increase in share

Lessons learned

- Integration of renewables into energy systems carries a number of technical risks, notably oversupply, curtailment and interconnection delay
- Resource risk is significant in geothermal and biomass projects
- Technical risks in hydropower remain very material
- Changing economics in the power sector can pose significant stress on sponsors
- Policy support underpinning renewables investments may not always be stable
- Policy risk remains high in a number of IDA countries, notably with respect to tariff adjustments
- E&S issues are emerging in wind projects

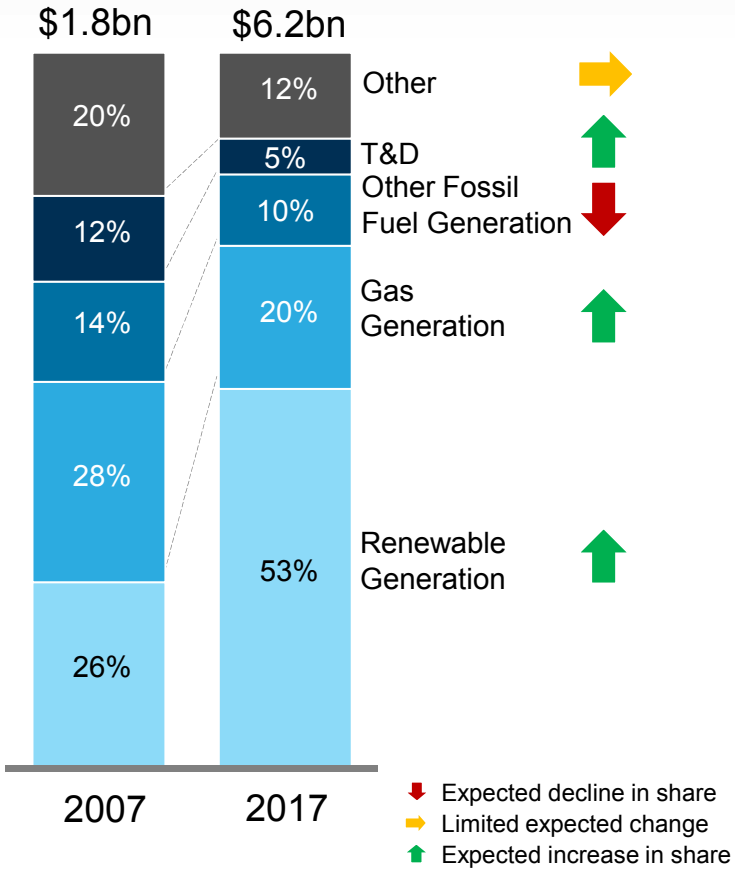
3 IFC's experience in Renewables

Excluding large hydro, IFC has invested $ 7.7bn (original commitments, 49% IFC own account + 51% mobilization) in renewable energy since IFC's first non-hydro renewables deal in 1998.



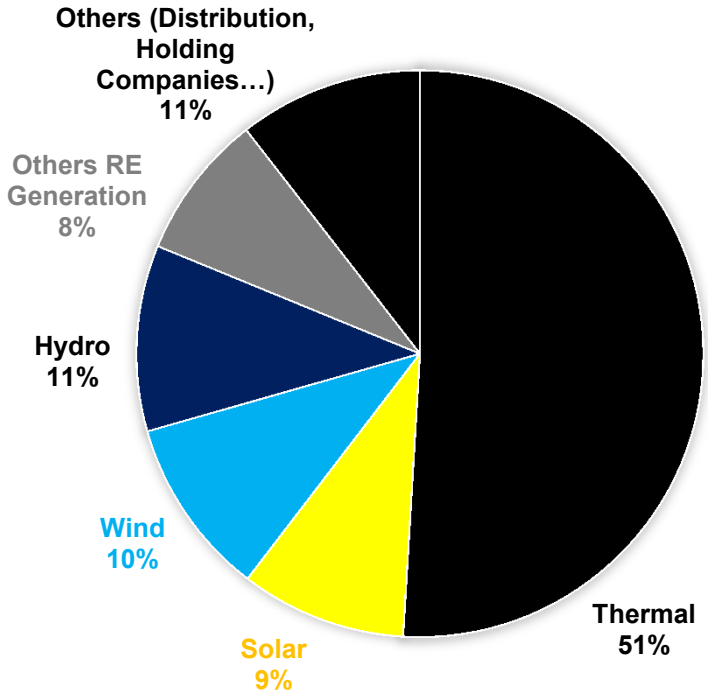
3 IFC's experience in Renewables

Power Portfolio by sector



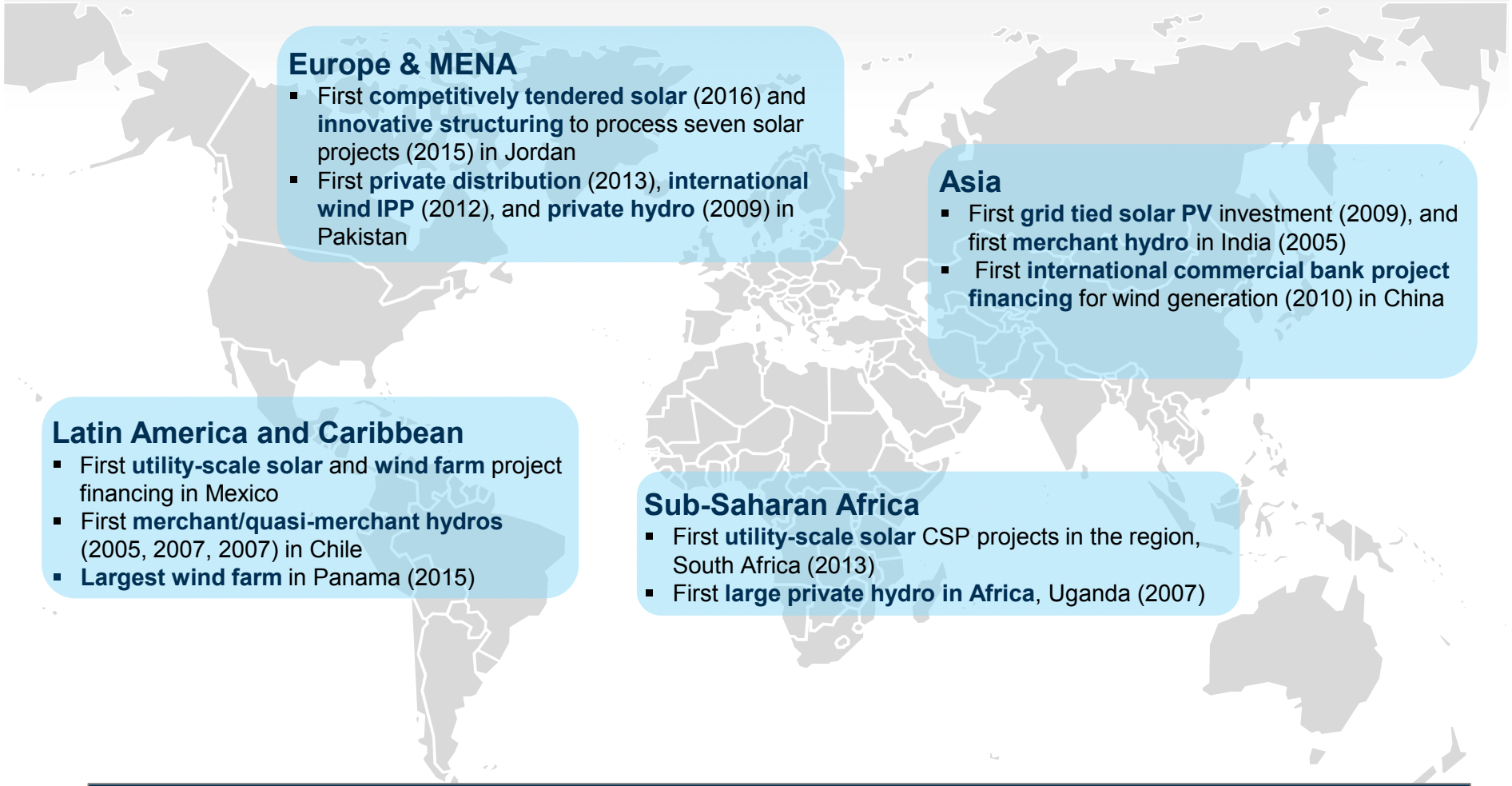
The share of renewables in IFC Power Portfolio has **doubled** between FY07-FY17

FY2017 Power Commitment Activity by Sector (incl. mobilization)



From the **$2.5bn commitments** for FY17, **Renewables represent 38%**

3 IFC has a strong record as a pioneer in creating and supporting renewable energy investment opportunities



Europe & MENA

- First **competitively tendered solar** (2016) and **innovative structuring** to process seven solar projects (2015) in Jordan
- First **private distribution** (2013), **international wind IPP** (2012), and **private hydro** (2009) in Pakistan

Asia

- First **grid tied solar PV** investment (2009), and first **merchant hydro** in India (2005)
- First **international commercial bank project financing** for wind generation (2010) in China

Latin America and Caribbean

- First **utility-scale solar** and **wind farm** project financing in Mexico
- First **merchant/quasi-merchant hydros** (2005, 2007, 2007) in Chile
- **Largest wind farm** in Panama (2015)

Sub-Saharan Africa

- First **utility-scale solar** CSP projects in the region, South Africa (2013)
- First **large private hydro in Africa**, Uganda (2007)

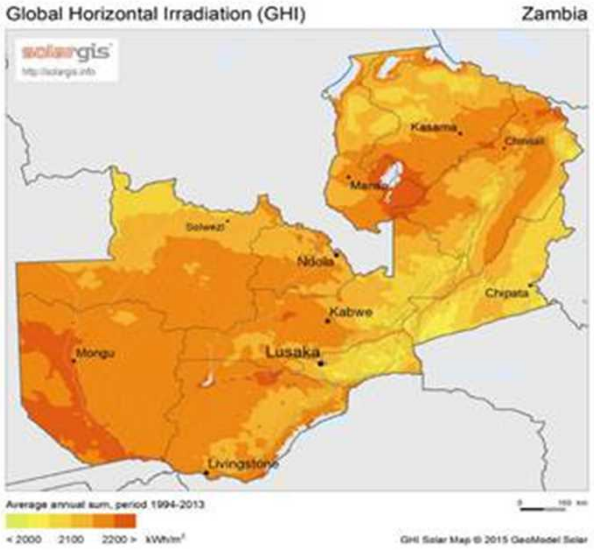
IFC has financed ~40 GW of generation capacity, including >2 GW of solar PV, >4 GW of wind and 8 GW of hydropower

World Bank Group "Scaling Solar" Program

ZAMBIA

- Projects were developed and tender was prepared and executed to conclusion in 9 months; round 2 for 200MW already announced
- USD 6 cents/kWh non-indexed is equivalent to average in current dollars over contract lifetime of USD 4.7 cents/kWh

	West Lunga Site	Mosi-oa Tunya Site
Neoen/First Solar (47.5 MW)	**USD cents 6.0150/kWh**	
ENEL Green Power (28.2 MW)		**USD cents 7.8390/kWh**



- All bidders who submitted an offer requested the IDA payment guarantee; no IDA loan guarantee was needed
- Both of the winning bidders used IFC as lead financial arranger/senior loan financing; Sponsors also utilized concessional finance loans from IFC-Canada Climate Change Program and IDA partial risk guarantee