Potential of Renewable Energy in future Energy Mix of LDCs

Presented by Peter Wooders
Group Director, Energy
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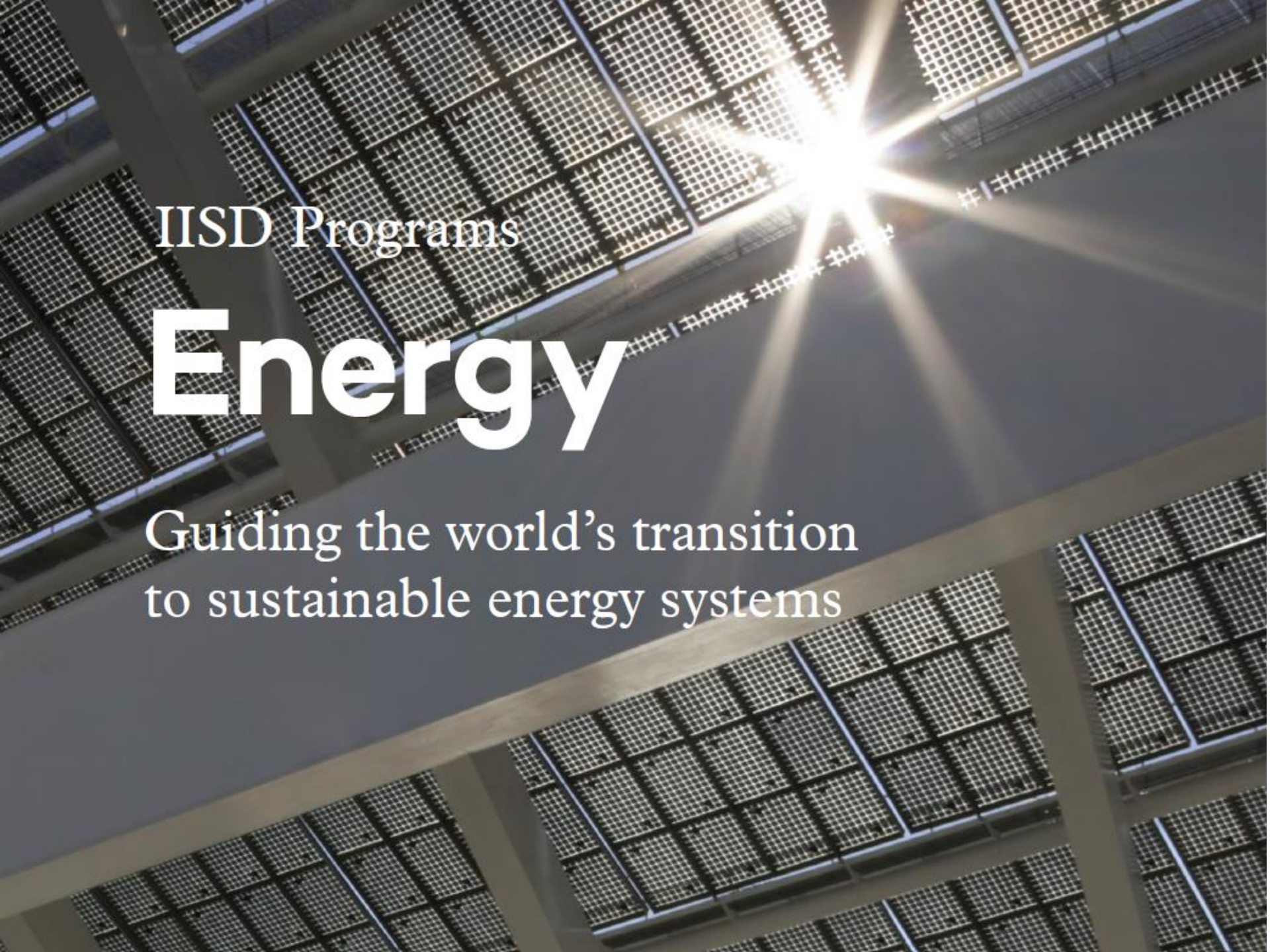
IISD
International Institute for Sustainable Development



IISD Programs

Energy

Guiding the world's transition to sustainable energy systems

Main Messages

1. Increased access to, and reliability of, electricity is **key for development**

2. A **Financially Sustainable Electricity System (FSES) is necessary** to build and maintain strong and growing electricity demand

3. While some consumers need subsidised electricity tariffs, **many consumers can pay the full cost of electricity supply**

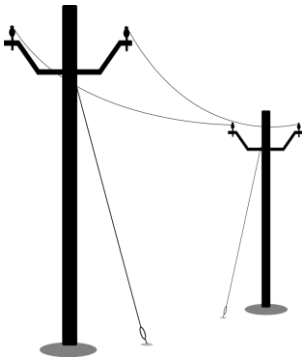
4. Subsidy "swaps" – e.g. kerosene subsidies – and taxing environmental "bads" such as transport fuels offer **ways to increase government support**

5. Technology change (notably around batteries) and costs reductions (notably solar PV) mean **renewables can play a very significant role in the future electricity mix of LDCs**

A financially sustainable electricity sector…….

Recovers operating costs

Makes investments



Delivers reliable power

Meets environmental and social norms

Example: Rajasthan (India)

Utilities in Rajasthan lose around 3 Rupees (40% of production cost) for every unit of power they sell. Periodic bailouts bridge the gap.

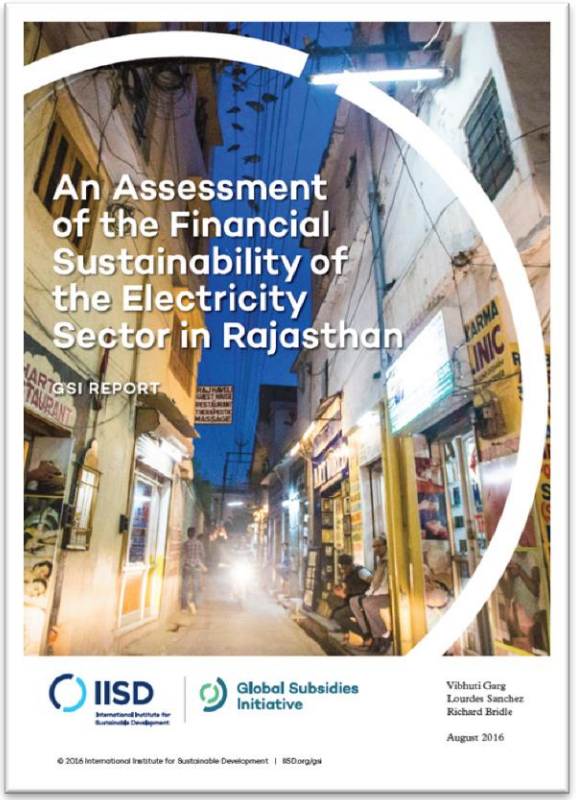
Large scale investment in coal and renewables

Generally positive. The ratio of capacity to demand improving and outages are reducing

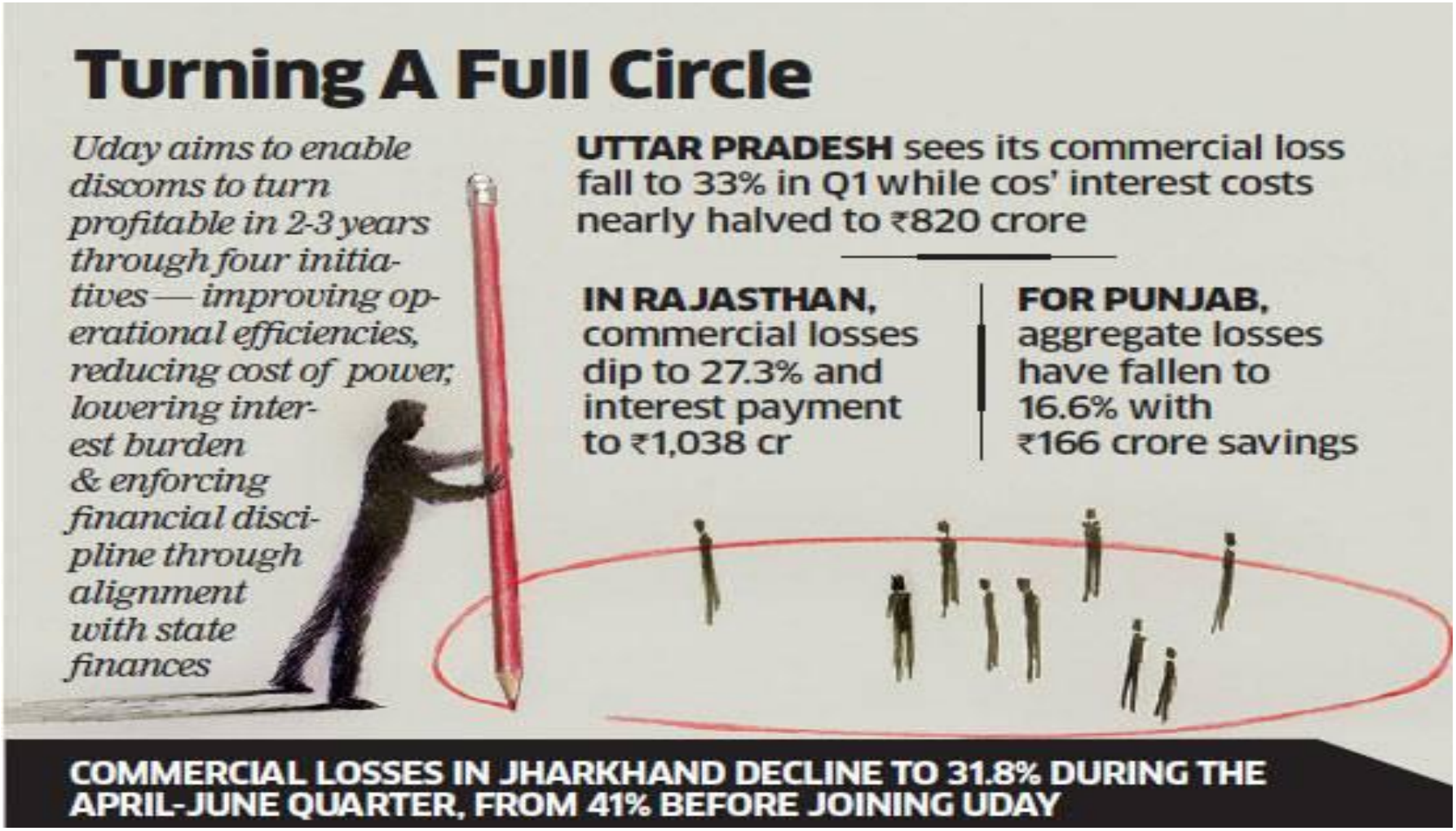
Challenge to expand electricity access. Renewable capacity share is increasing but generation remains static.

Example: Rajasthan India

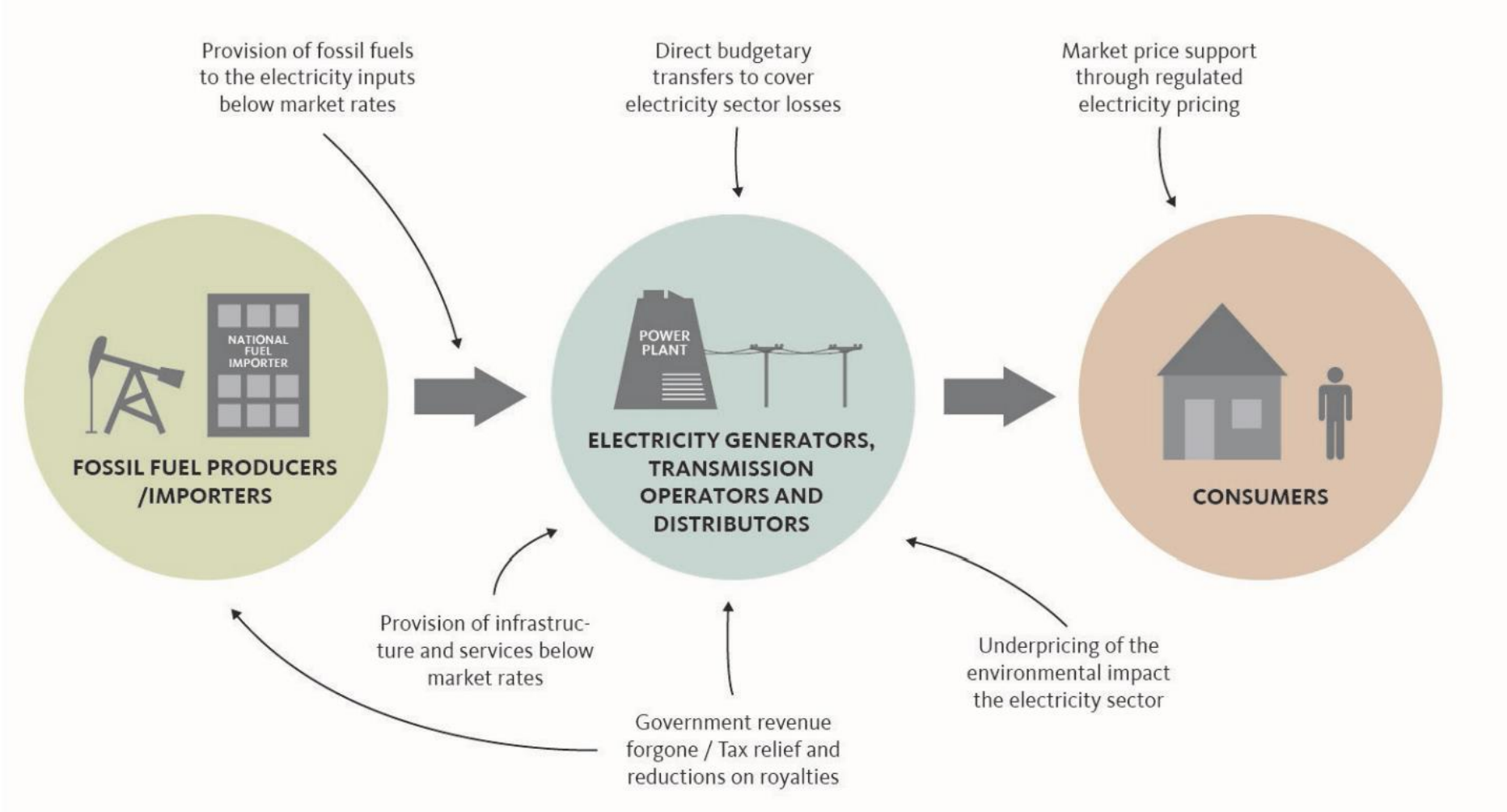
- The sector is functional but ad-hoc bailouts are regressive and costly
- There is an open question of who should pay more for electricity?
- Even if it is decided that the government should pay more, these payments could be better targeted



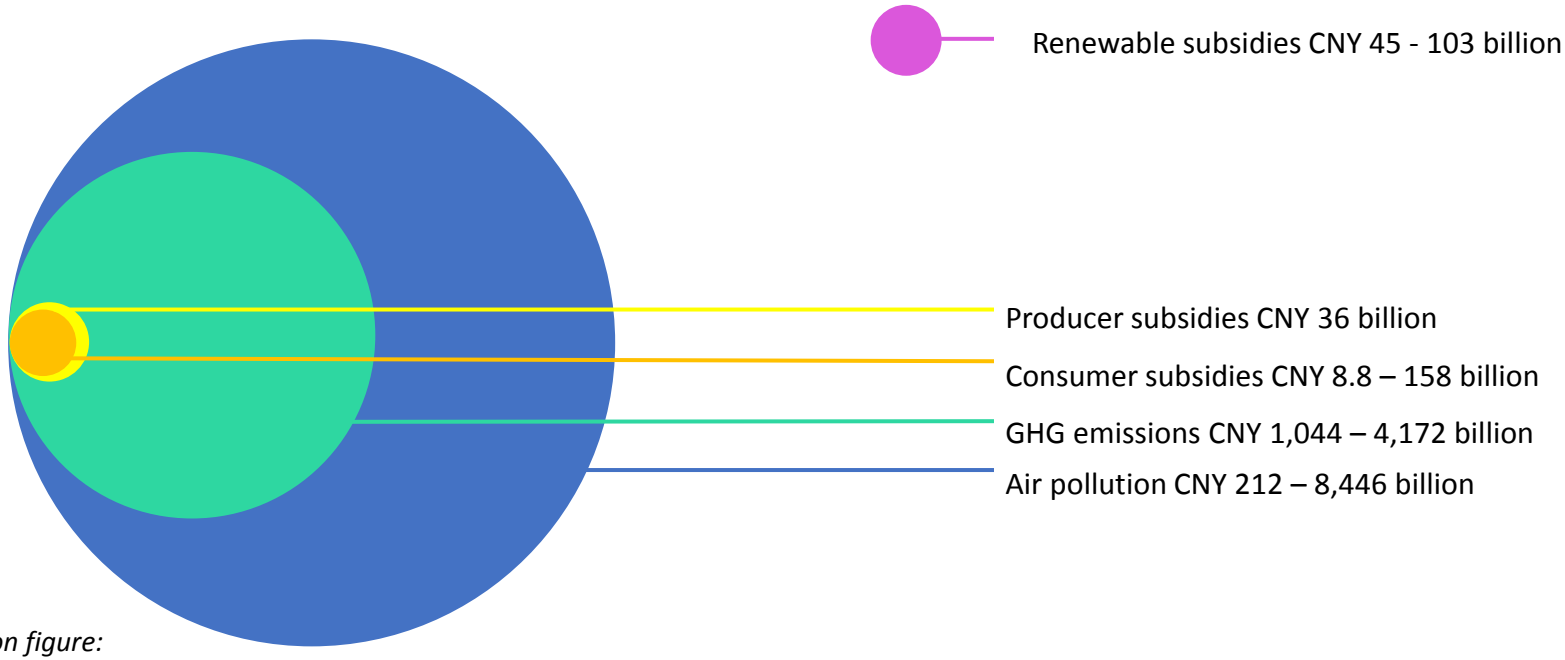
India looking to move away from ad hoc bailouts of Discoms



Electricity sector subsidies



Visualizing the costs of subsidies and externalities: Coal in China



Notes on figure:

a) *Ranges indicate the range of all available data. Size of circle indicates average of all available data. Consumer subsidies based on* (Lin & Ouyang, 2014) *and* (IEA, 2014)

b) *Renewable energy subsidies based on Shen & Luo (2015) and IEA (2014) GHG emissions based on* (Coady, Parry, Sears, & Shang, 2015) *and Authors' calculations*

c) *Producer subsidies based on (Xue et al., forthcoming)*

d) *Consumer subsidies based on Lin & Ouyang (2014) and IEA (2014)*

e) *GHG emissions based on Coady, Parry, Sears, & Shang (2015) and Authors' calculations*

f) *Air pollution based on Coady, Parry, Sears, & Shang (2015), NRDC (2014) and Chinese Academy for Environmental Planning (2014)*

Many countries "stretching" banded electricity tariffs

- >60 countries use tiered electricity bands
  - Politically expedient but only reasonably effective
  - Viet Nam cash transfer eligibility = low volume users
- Some – e.g. Jordan, Egypt –"stretching" bands wide

TABLE 1. TIMELINE OF CHINA'S TEP REFORM

TIME	CONTENTS
2006	Demonstration of TEP in few provinces, including Zhejiang and Sichuan.
2008–2010	Feasibility study of TEP pricing system in household sector by the government and think tanks
October 2010	Official document No. [2010] 2617 to launch the reform and clarify the general principle
All of 2011 and the first half of 2012	Proposal design by provincial governments, public debate, hearings on the pricing change, finalization of the pricing system
July 2012	Pilot run in all the provinces except Xinjiang and Tibet
December 2013	Summary and prospect, by official document No. [2013] 2523

A Gender Sensitive Approach to Reform (Welfare > Pricing)

Income effect	Energy use effect	Energy supply
Measures compensating for loss of income (e.g. cash transfers, provision of services)	Measures facilitating continued use of energy source (e.g. coupon schemes, provision of equipment)	Improvements in energy supply can be realised through planning and investment
Targeting at women and women's needs (e.g. women to receive UCTs / CCTs)	Targeting at women (e.g. women in receipt of coupons or equipment)	
Oportunidades (Mexico)	FISE (Peru)	
Time poverty & traditional gender roles	Intra-household dynamics, acceptability of technologies	

Huge RE potential in Mining: *all (Auto)-Generators need right price and regulatory signals*

Kerosene ⟶ Solar

Swaping Kerosene for Solar in 5 villages in Sarda, Odisha, India

OPPORTUNITY: FINANCIAL SAVINGS

District Administration will annually save INR 2.32 Lakhs (US$ 3450) in just 5 villages from reduced kerosene subsidy expenditure

IMPACT: WELFARE & PRODUCTIVITY

- ✧ Emission reduction from fuel switching will lower respiratory illnesses, premature deaths
- ✧ Prolonged working hours will increase incomes

BARRIERS: CURRENT LIGHTING EXPENDITURE by Households

- ✧ Households are keen to have access to solar/grid power
- ✧ Households unwilling/unable to spend more than INR 100 per month for lighting needs
- ✧ High Upfront Capital Cost of Solar Systems is a barrier towards adoption

CHALLENGE: IDENTIFYING BUSINESS MODELS

- ✧ Lack of existing solar markets invokes a need for identifying *business models* involving *multiple stakeholders* – village representatives, banks, district administration – coordination becomes key

Blended Customer Mini Grid

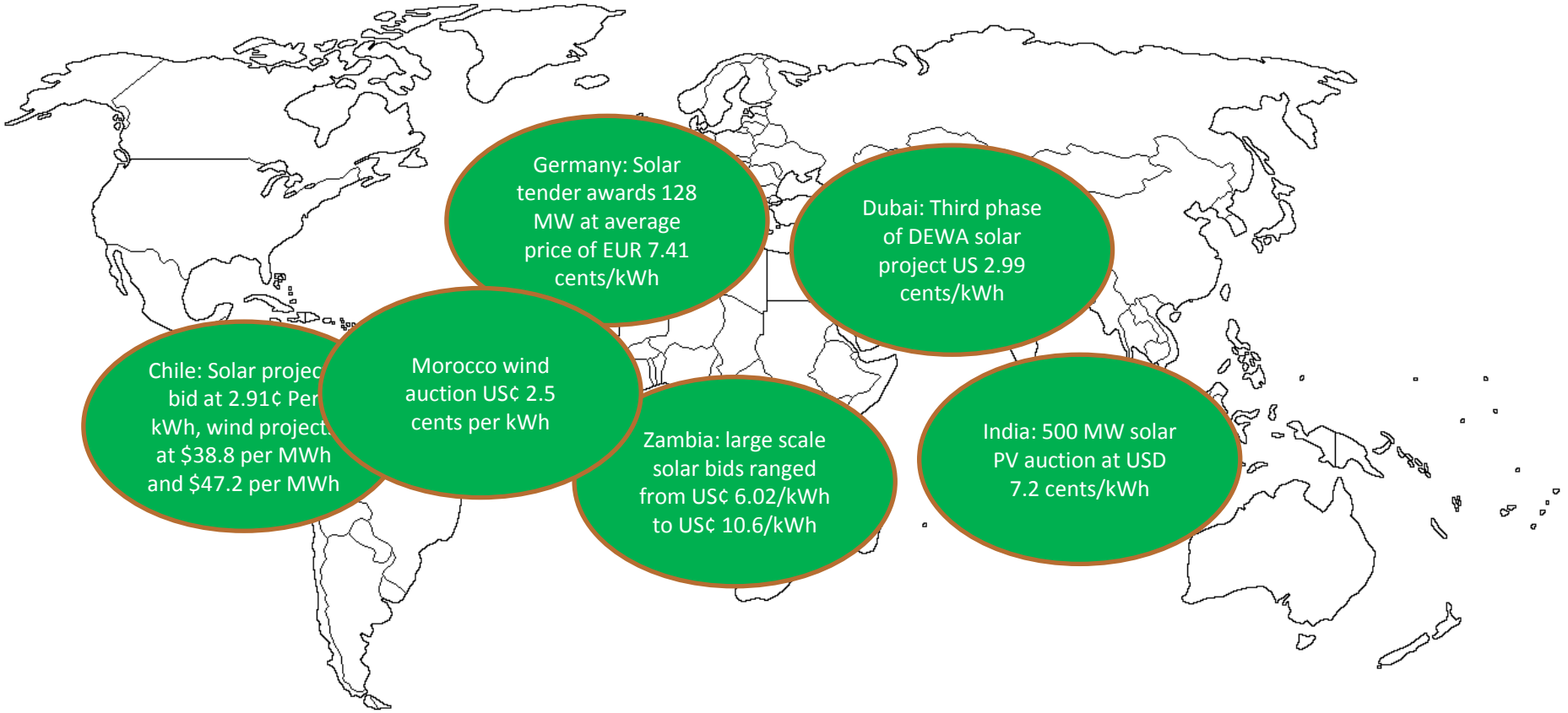
- *Aim: Provide sufficient package flexibility to be able to attract any customer in the village.*

- *Pros: Efficiencies of scale for distribution costs, blends multiple customer types together, increasing overall demand and diversifying risk*

- *Cons: Complex operations – inclusion of meters; difficulty in sizing (estimate of demand) the system leads to inefficient generation and storage. A poor estimate of total power demand will either result in incomplete service to customers, and therefore unhappy customers, or excess generation and storage capacity, translating into higher CAPEX for the same revenue and thus lower project IRR*

The inclusion of meters brings the project IRR down to below 10%, but without meters collections may be more complex and thus inefficient, expensive, or both.

RE Auctions in 2016



Sources:
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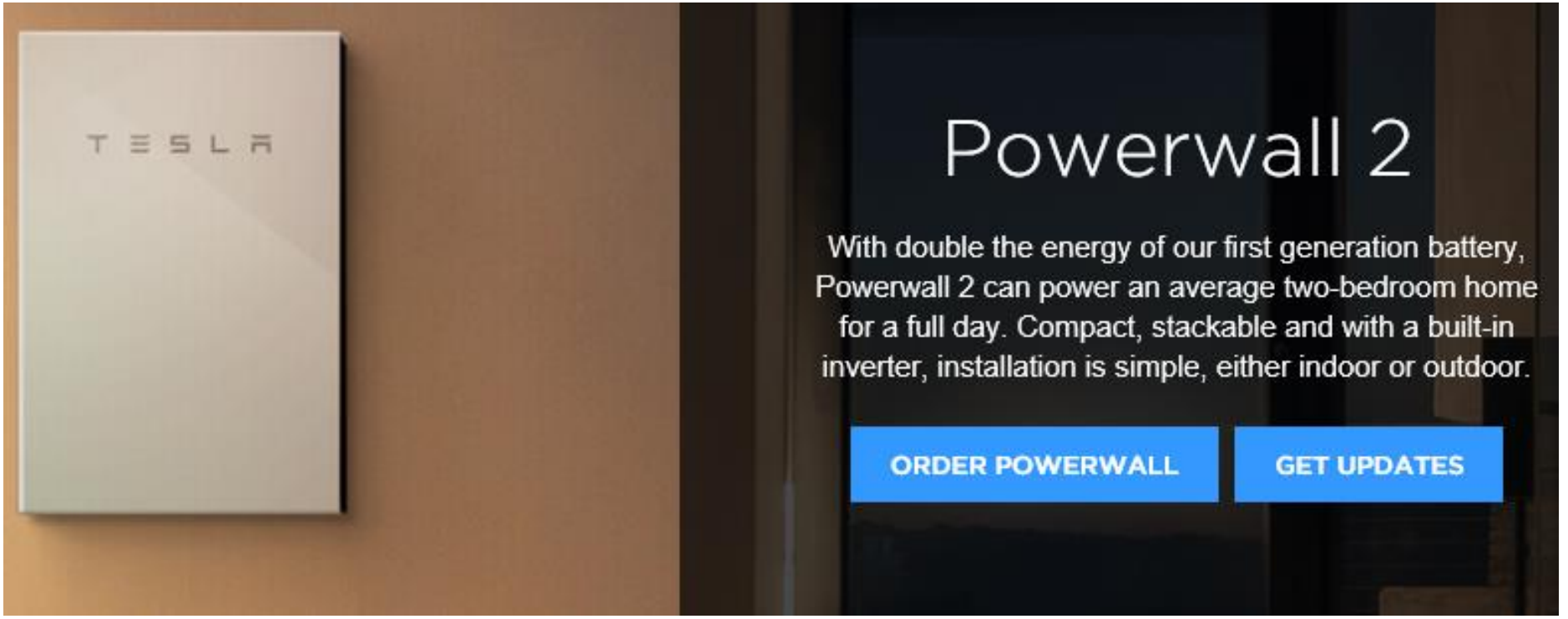
https://cleantechnica.com/2016/08/18/new-low-solar-price-record-set-chile-2-91%C2%A2-per-kwh/;
http://www.thenational.ae/business/energy/year-in-review-renewables-surpass-critical-tipping-point

Better Batteries & Controls ➔ off -grid solutions increasingly viable



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