

Power Sector Reform and Renewable Energy:

The potential for emerging economies to leapfrog
standard market models

IRENA INNOVATION WEEK

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Prof Anton Eberhard

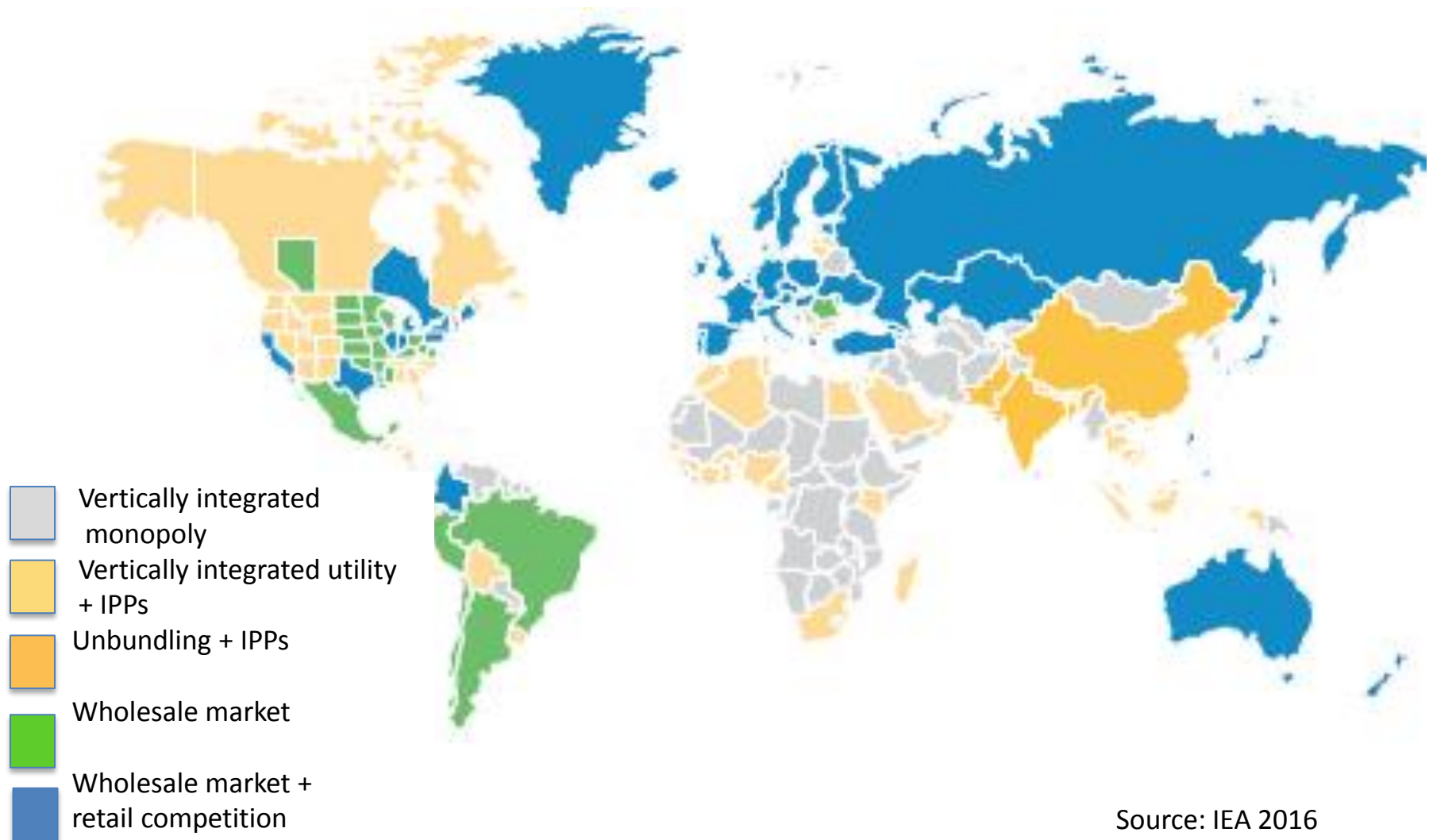
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Competitive power markets are absent in many developing regions



Source: IEA 2016

Nowhere in Africa are fully unbundled, private, competitive power markets to be found

Group 1: One vertically integrated state-owned utility (17 countries)

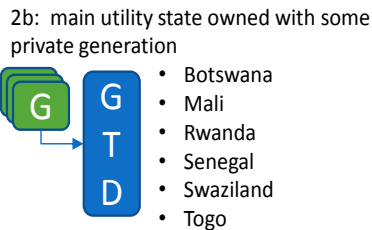
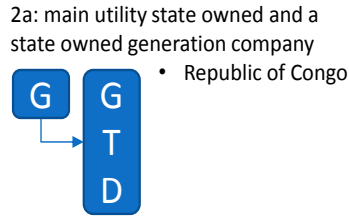


- Benin
- Burkina Faso
- *Burundi*
- Congo, Dem. Rep.
- Malawi
- Mauritania

Not interconnected:

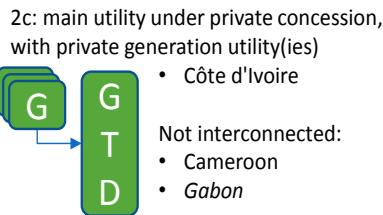
- Central African Republic
- Chad
- *Comoros*
- Equatorial Guinea
- Eritrea
- *Gambia, The*
- *Guinea-Bissau*
- Liberia
- *Seychelles*
- Somalia
- South Sudan

Group 2: One main vertically integrated utility with gencos (15 countries)

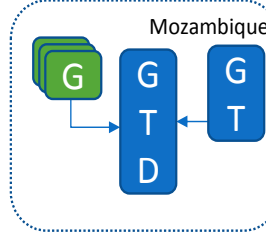
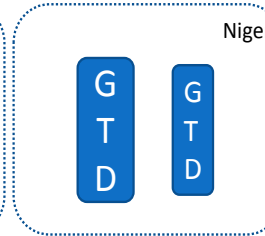
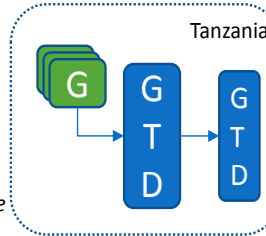
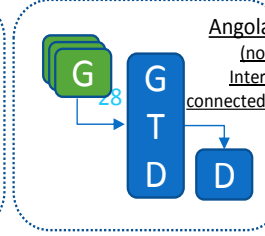
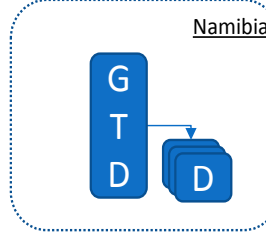
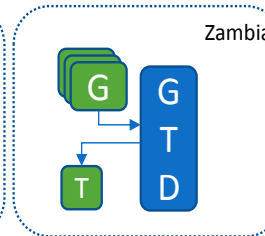
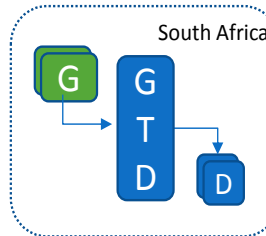


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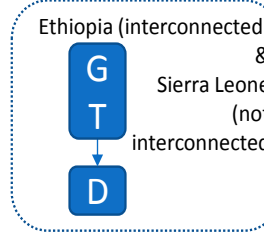
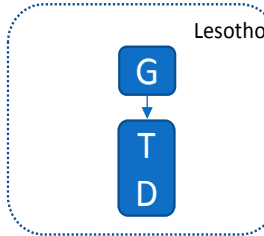
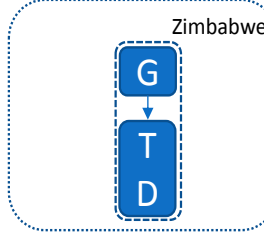
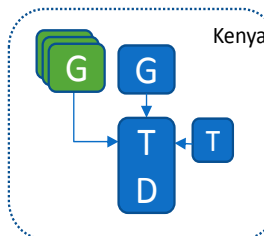
- *Cape Verde*
- Guinea
- *Madagascar*
- Mauritius
- *São Tomé and Príncipe*



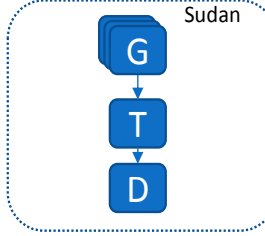
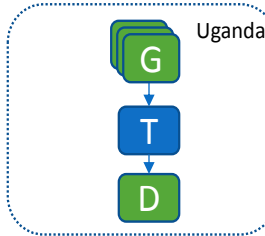
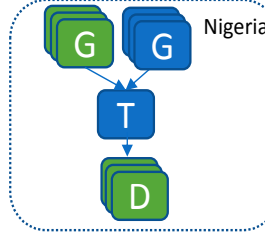
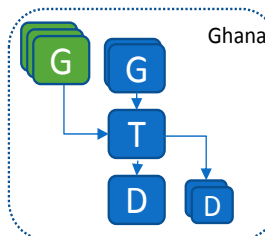
Group 3: One main vertically integrated utility with other operators (7 countries)



Group 4: Partial vertical unbundling w & w/o other operators (5 countries)



Group 5: Full vertical unbundling w & w/o horizontal unbundling (4 countries)



Key:
 G = Generation activities
 T = Transmission activities
 D = Distribution activities

Majority state-owned utility
 Majority private owned company

Power sector markets have evolved differently across developing countries

Africa & South Asia

- Very few instances of wholesale or retail competition
- Unbundling not common
- Dominant state-owned utility often still present
- Private investment via IPPs with long-term contracts

Latin America

- Privatisation and wholesale competition ubiquitous, but
- Second wave of reforms
 - Greater reliance on least-cost planning
 - Incentivised investment through auctions for long term contracts
 - Improved efficiencies and credit-worthiness of distribution utilities

Different RE challenges and opportunities in different power sectors markets

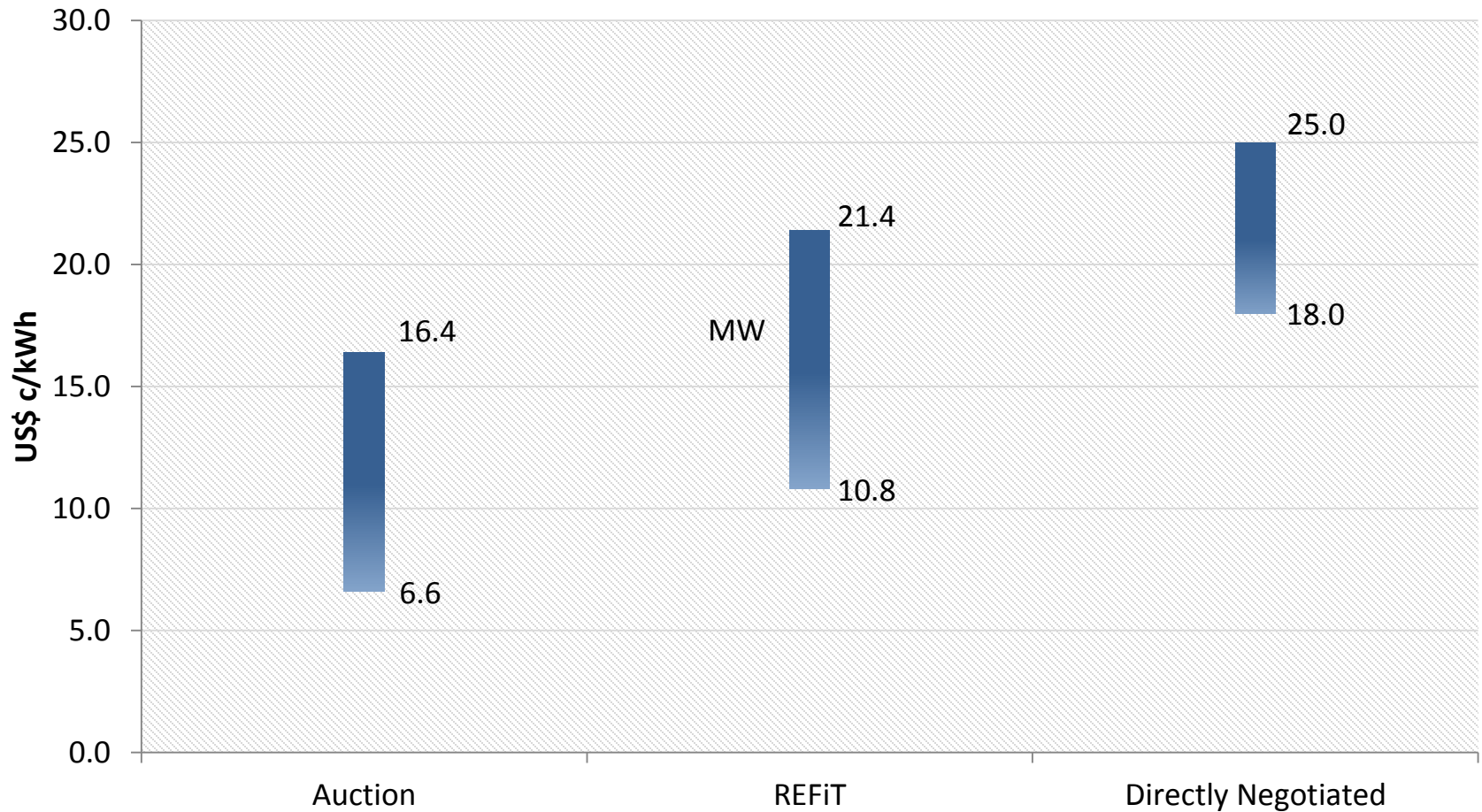
OECD

- Integration of low-carbon technologies needs to be efficient while maintaining reliability and security
- Low market prices (30-50 EUR/MWh)
- Need for support mechanisms for RE
 - Carbon pricing
 - Auctions

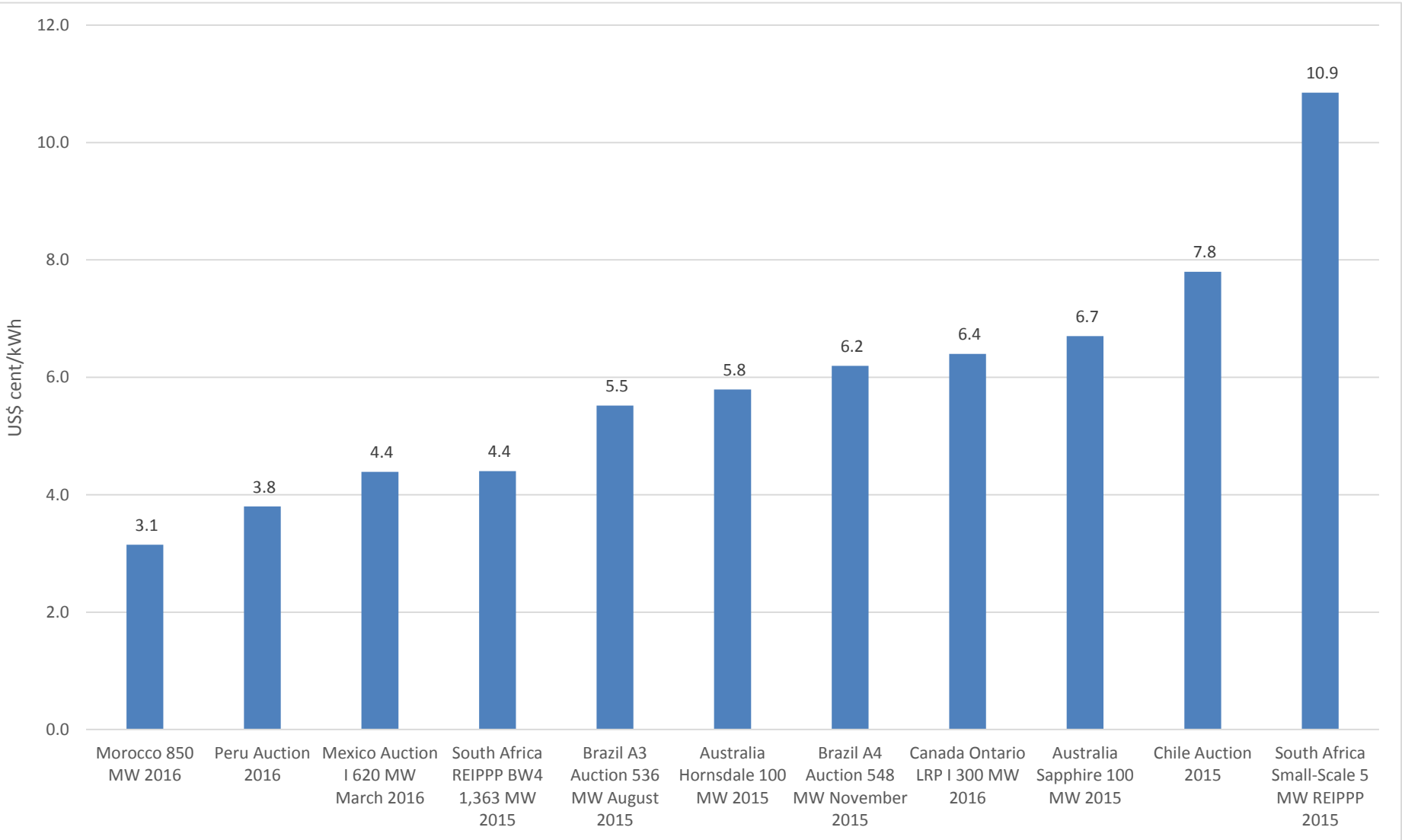
Emerging economies

- Inadequate capacity
- Poor reliability
- Average prices need to move upward to cost-reflectivity
- Nevertheless grid-connected solar PV and wind energy now competitive without subsidies
- Auctions are delivering lowest prices

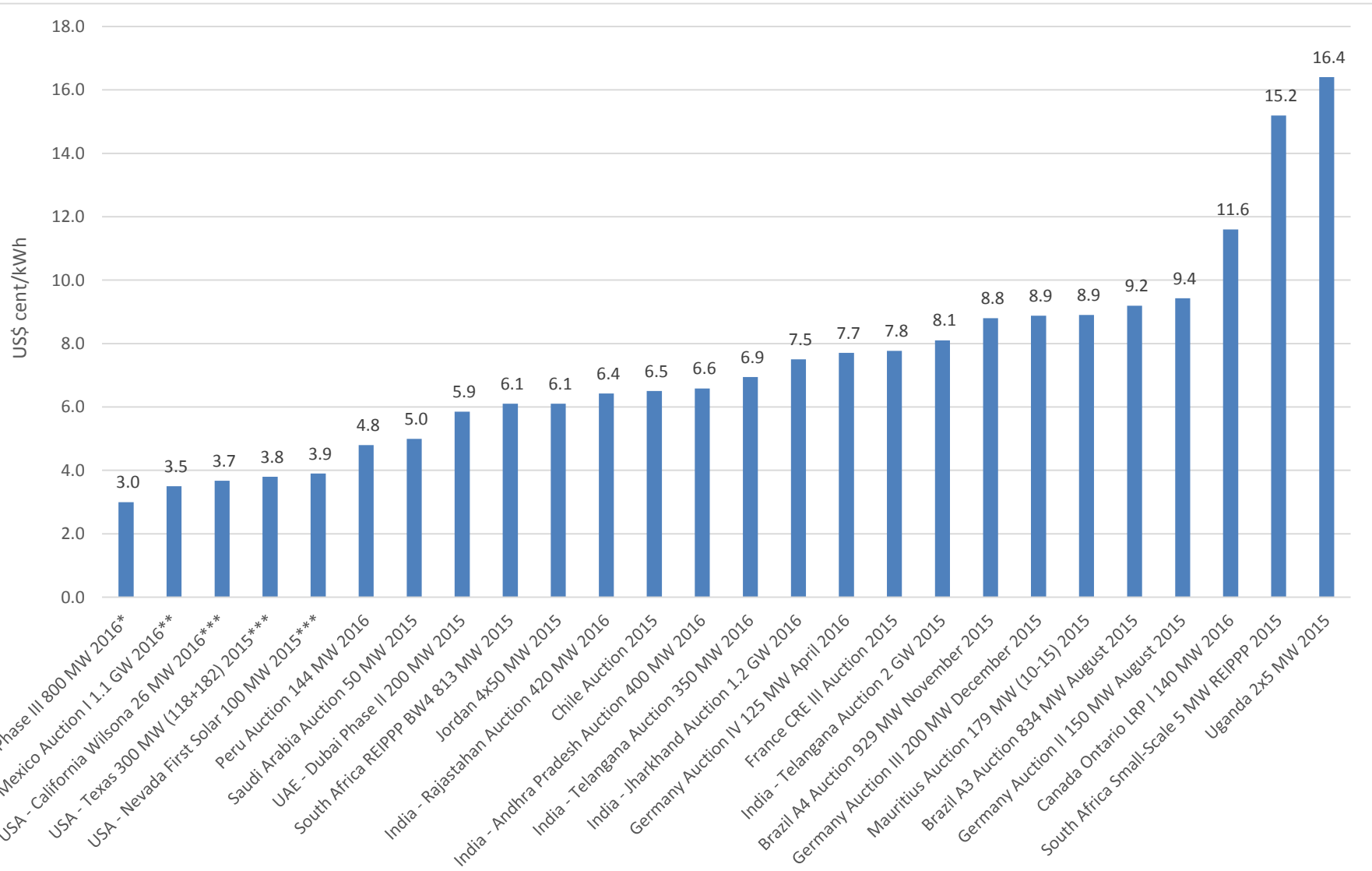
Auctions yield better price outcomes than directly negotiated projects or feed-in tariffs in Sub-Saharan Africa (example – solar PV)



Onshore Wind Auction Prices (US\$/kWh), 2015-2016



Solar PV Auction Prices (US\$/kWh), 2015-2016



Market & regulatory challenges for integrating more renewable energy in OECD countries

- Long-term support (carbon pricing / auctions) for RE while capturing market value
- Short-term market design with higher temporal and geographical price resolution
- Regulator to set reliability standards and scarcity pricing (e.g. ex-ante to reflect increasing value and probability of load shedding up to the value of loss of load)
- Further use of targeted capacity mechanisms / strategic reserves
- Further development of demand response markets
- Improved regional transmission planning and possibly auctioning
- Modernised (output-based) regulation of distribution networks
- Network tariffs to be rebalanced towards fixed and capacity components to induce efficient investment in distributed energy

Evolution of power markets in emerging economies

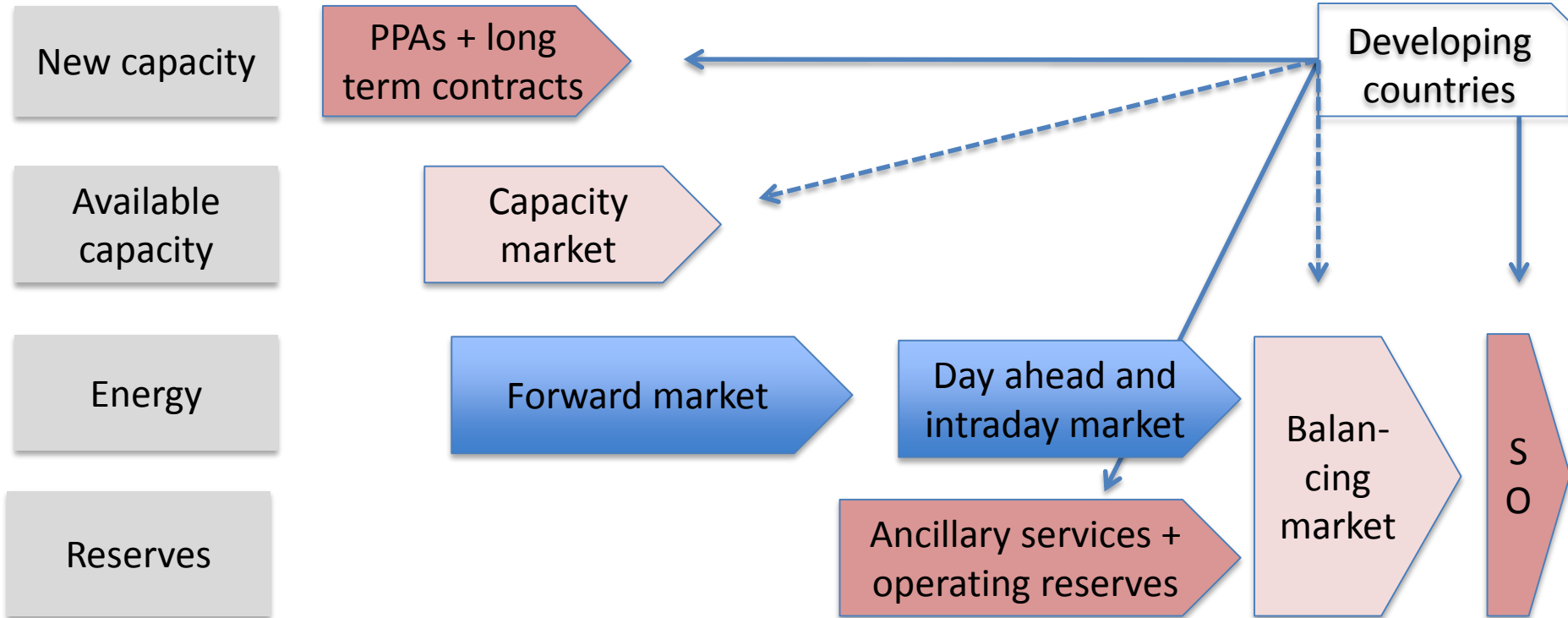
- Primary need is to add more power generation capacity
 - Power expansion planning linked to auctions for long-term contracts, coupled with credit-worthy off-take arrangements, are an effective way to attract private investment at competitive prices
 - i.e. competition FOR not IN the market
- Full development of wholesale competition (forward, day-ahead and intra-day markets) will probably be slow or absent in many developing regions

Building blocks of power markets

Long-term markets
15-35 yrs ahead

Medium-term markets
3-4 yrs months ahead

Short-term markets
day ahead intraday 30-60 min delivery



Evolution of power markets in emerging economies

- As share of (especially RE) IPPs grows, will need further development of medium and short-term capacity mechanisms, ancillary services and balancing real-time operations or markets
- National utilities can try to become more sophisticated in these areas

OR separate markets will need to be developed

- Over time there will need to be greater temporal and geographical resolution to pricing

Evolution of power markets in emerging economies

- Promote demand response markets
 - possible even without wholesale generation markets
- Integrate regional transmission planning & investments
- Consider transmission auctions where utility investment constraints
- Modernise distribution network regulation
- Where no retail competition, regulate retail tariffs to facilitate efficient investment in distributed resources

Emerging economies need to adopt appropriate elements of latest power market reforms as they leapfrog into the future

Thank you for your attention

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