Renewables: The True Costs

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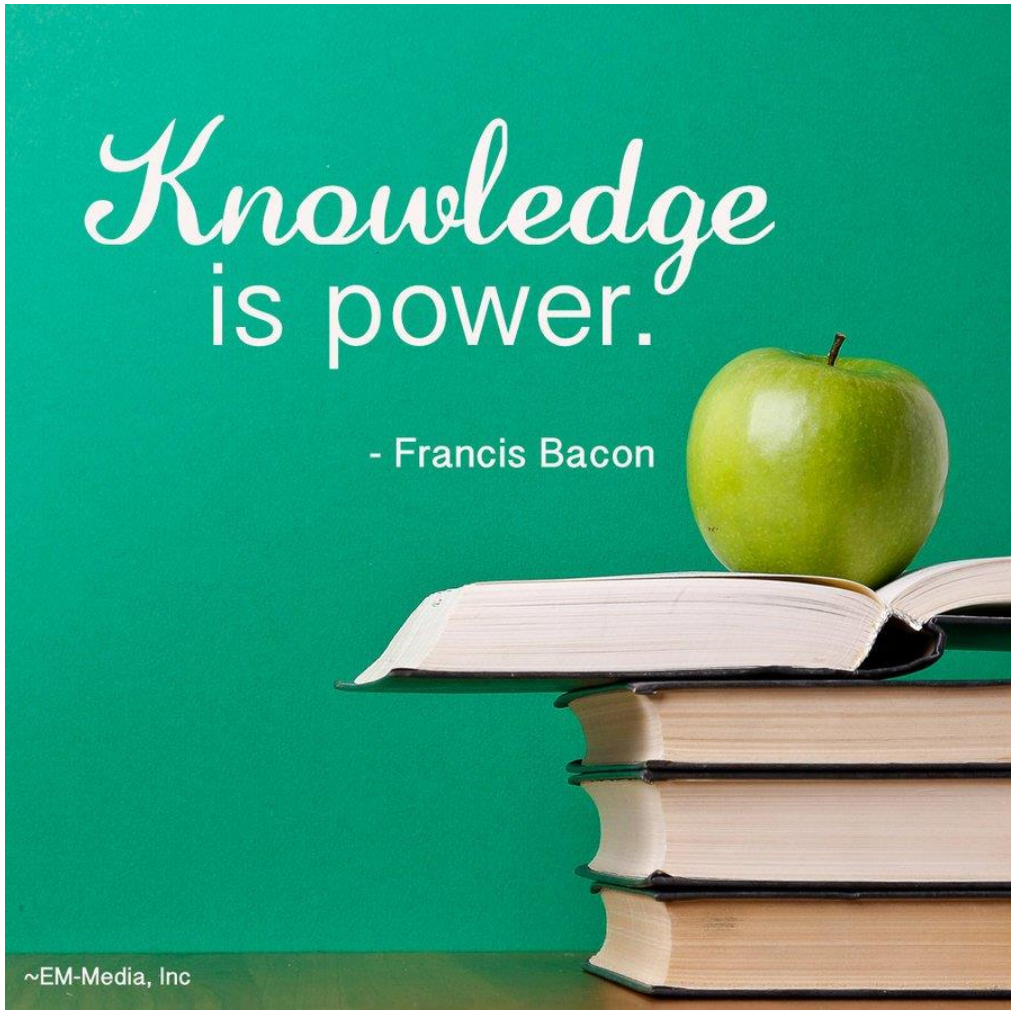
The energy transition

Must be accelerated

But lack of reliable cost data from trusted source

Robust data and facts can have a real impact



Renewable cost analysis at IRENA

Fills an important gap in knowledge

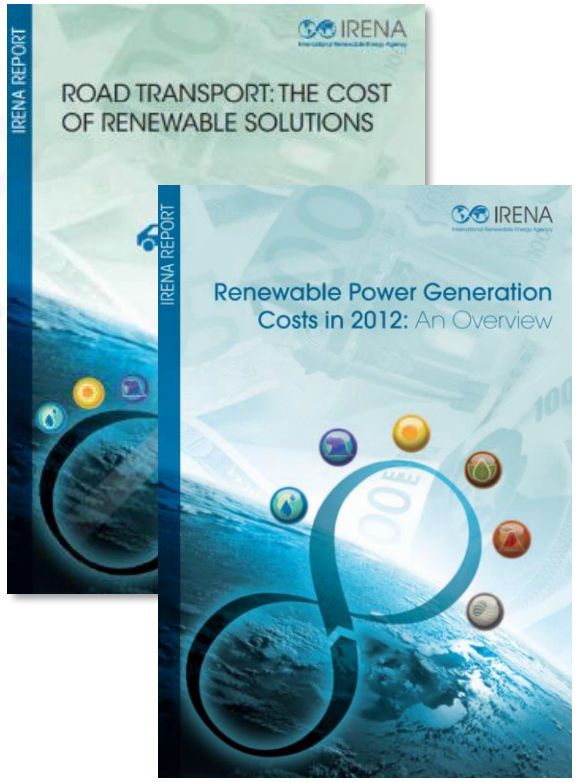
World-class database of costs

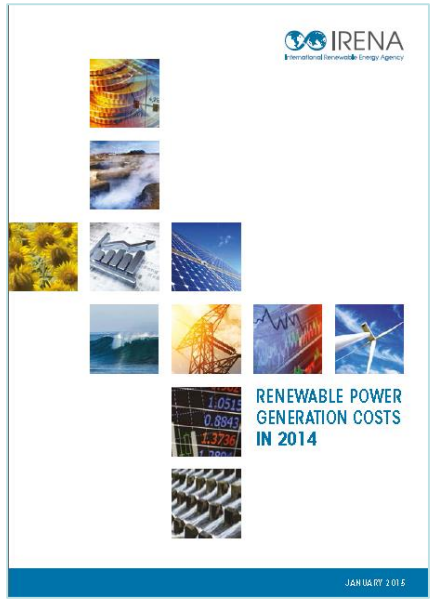
Cutting edge analysis, not just data

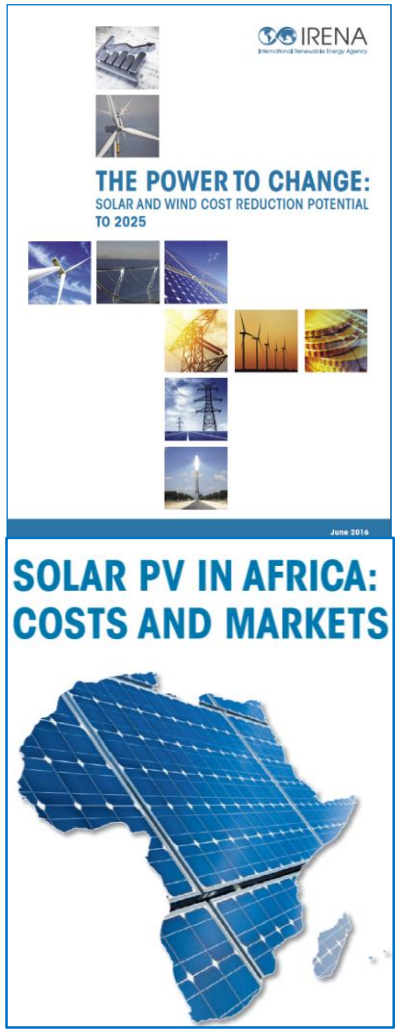
More products and analysis coming

Costing Alliance deepens engagement

IRENA Costing Analysis Products







2012 **2013** **2015** **2016**

THE IRENA RENEWABLE COST DATABASE

IRENA's database: Scope and coverage

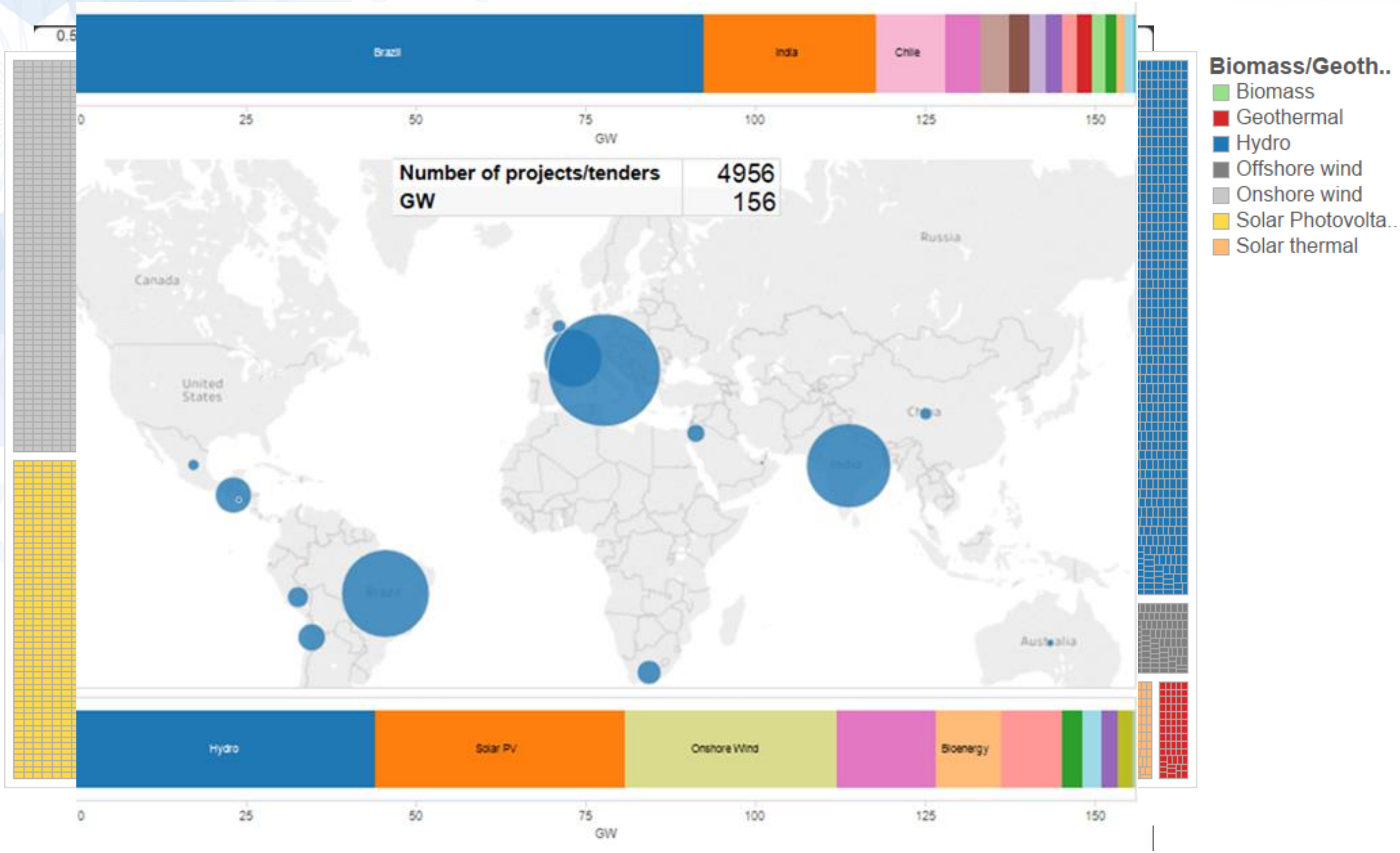
Power: 15000 utility-scale projects for LCOE
1 million small-scale solar PV

Smaller dataset on biofuels/EVs

Stationary applications to be added in 2016/2017

Power: database concentrated in non-OECD as more publicly available information

Power generation cost and PPA databases



IRENA
International Renewable Energy Agency

Renewable Power Generation Costs in 2016

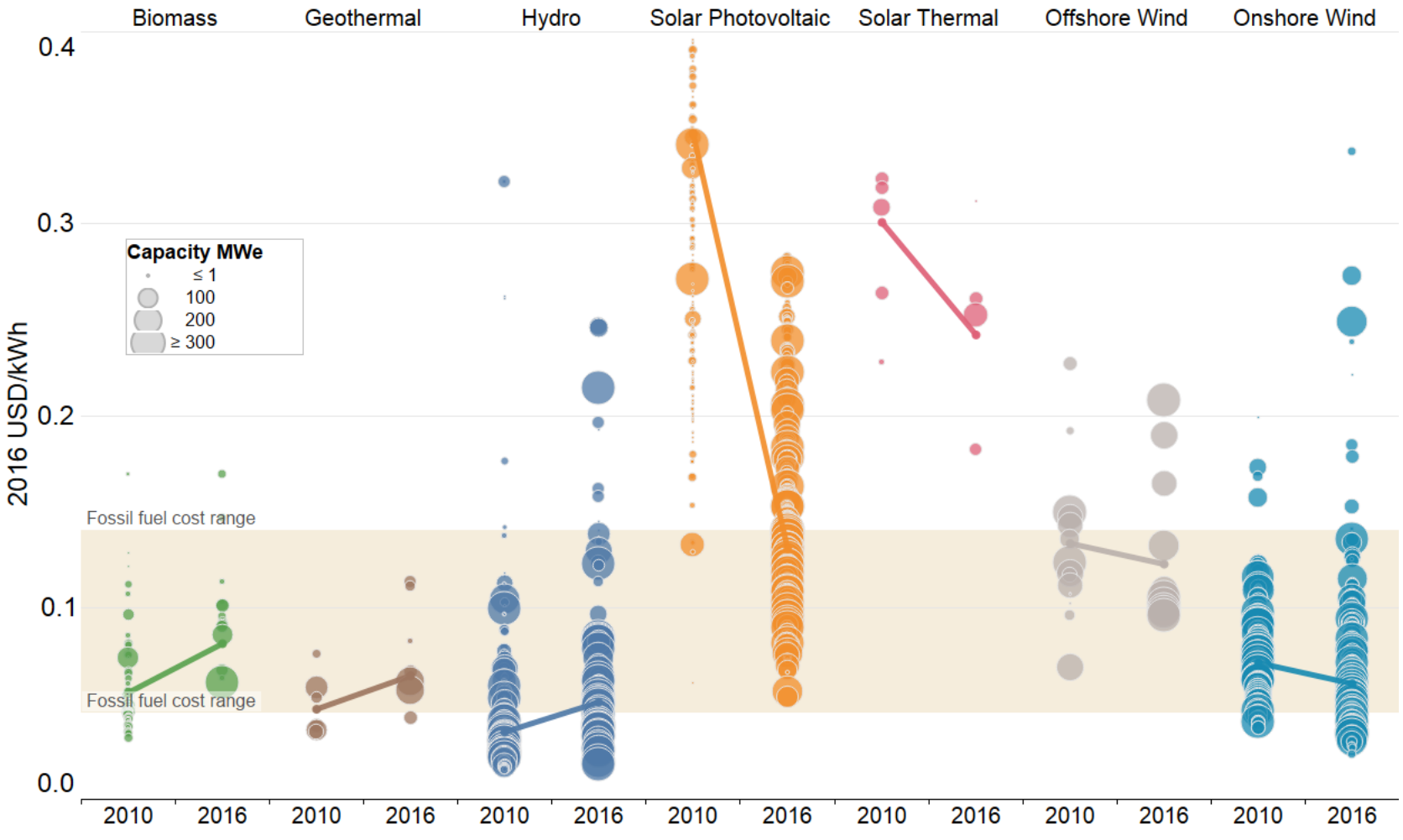
Highlights

The relentless improvement in competiveness continues

Renewables competing head-to-head with fossil fuels

Future cost reductions will be more challenging, policy driven

Renewables: Highly competitive for new capacity



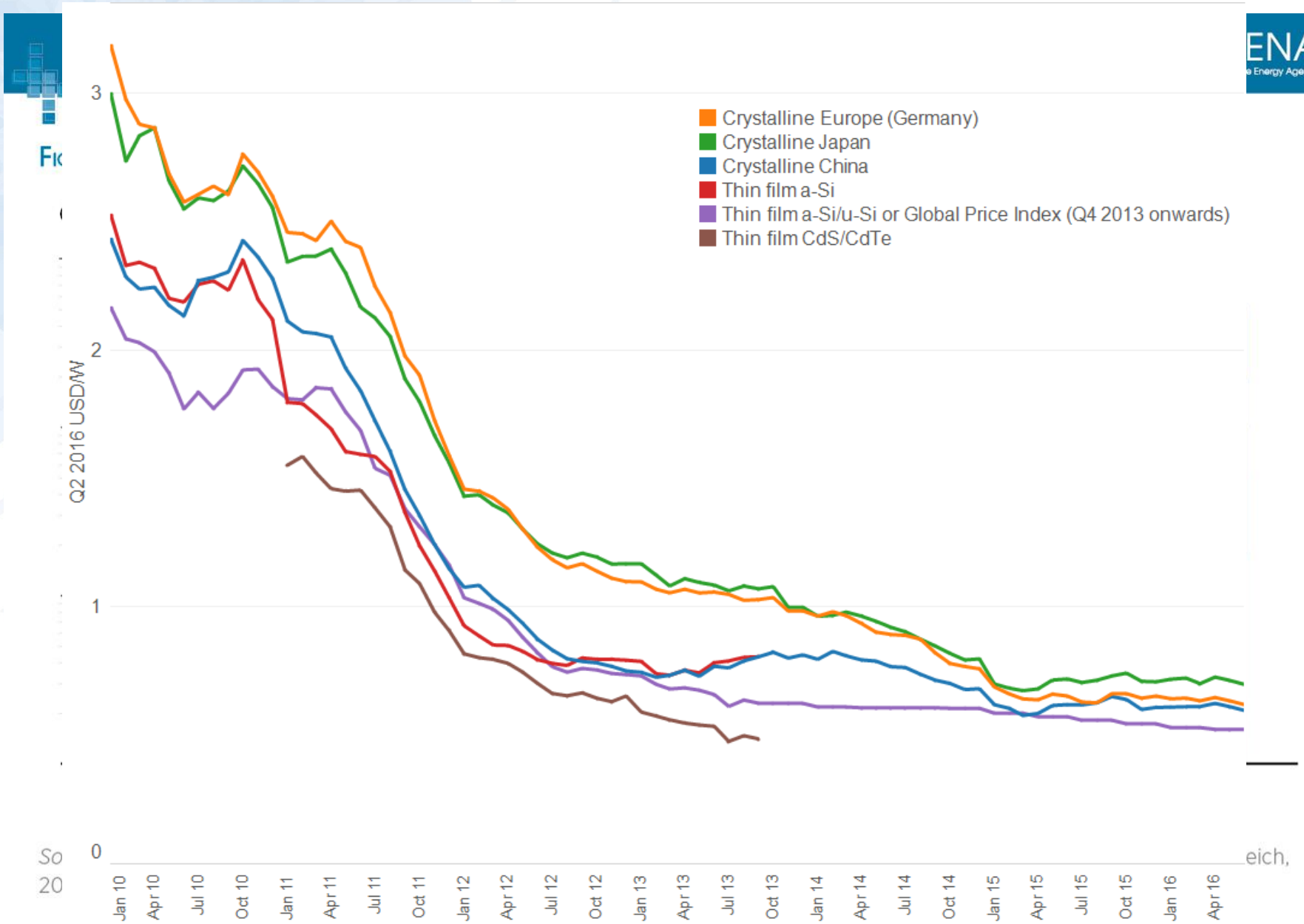
Traditional renewables highly competitive

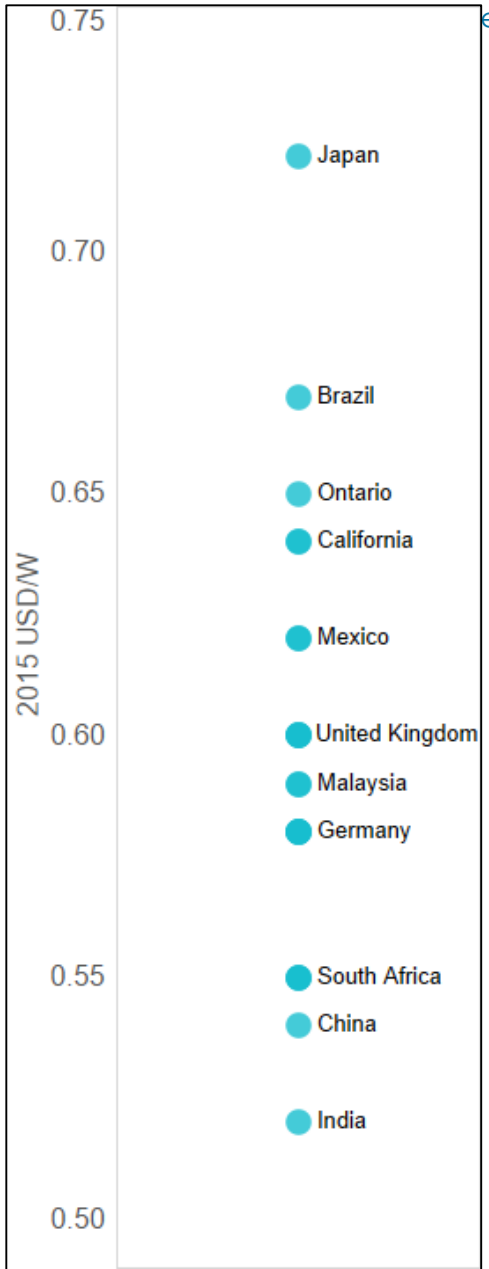
Cost reductions for wind and solar, make them increasingly competitive

Cost rise for average hydro projects, geo & biomass data needs more work

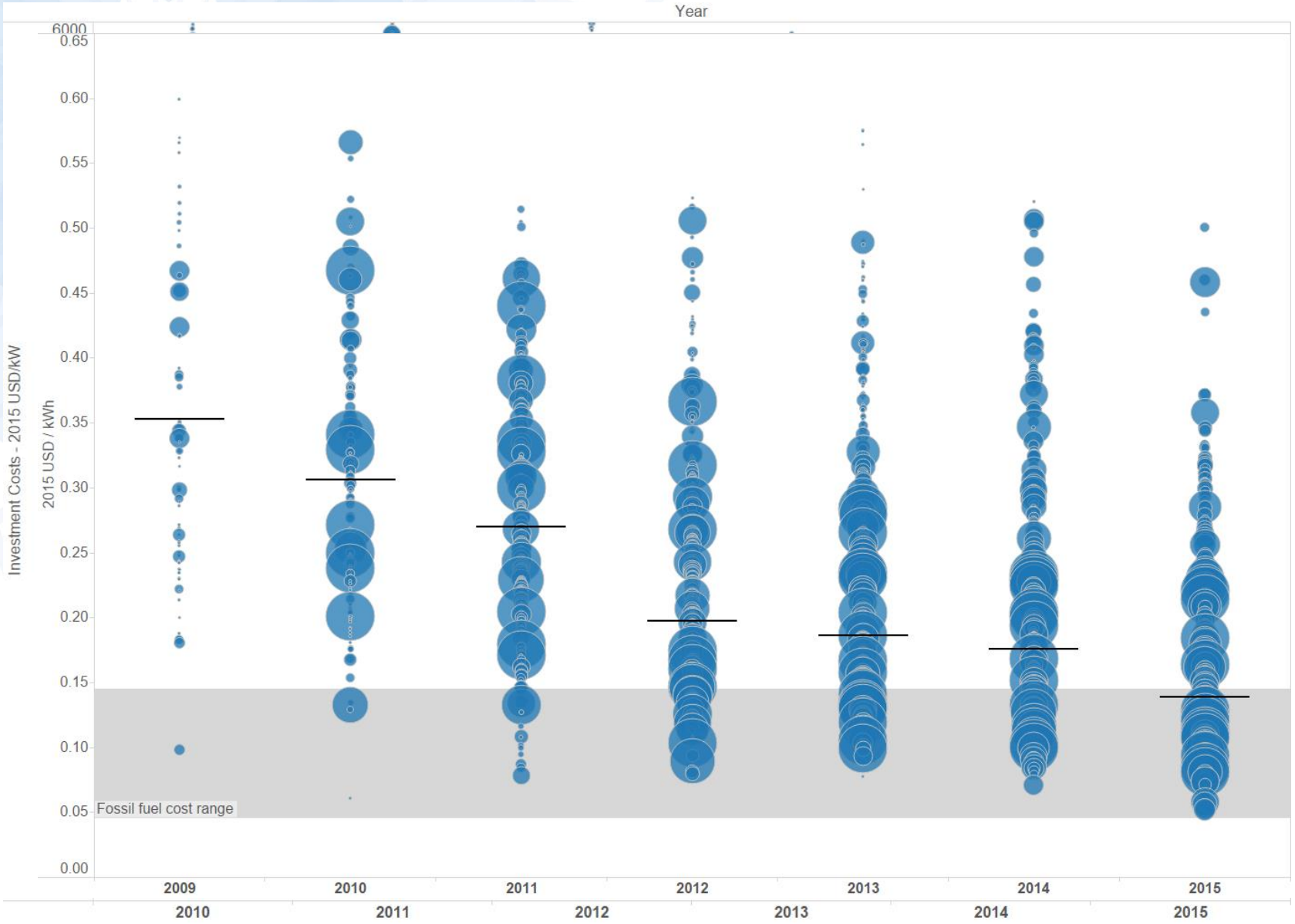
Each circle represents one project, centre of circle is LCOE value on Y axis, diameter is size of project. Year is year commissioned.

Solar PV module prices in 2015/16





Solar PV utility-scale projects

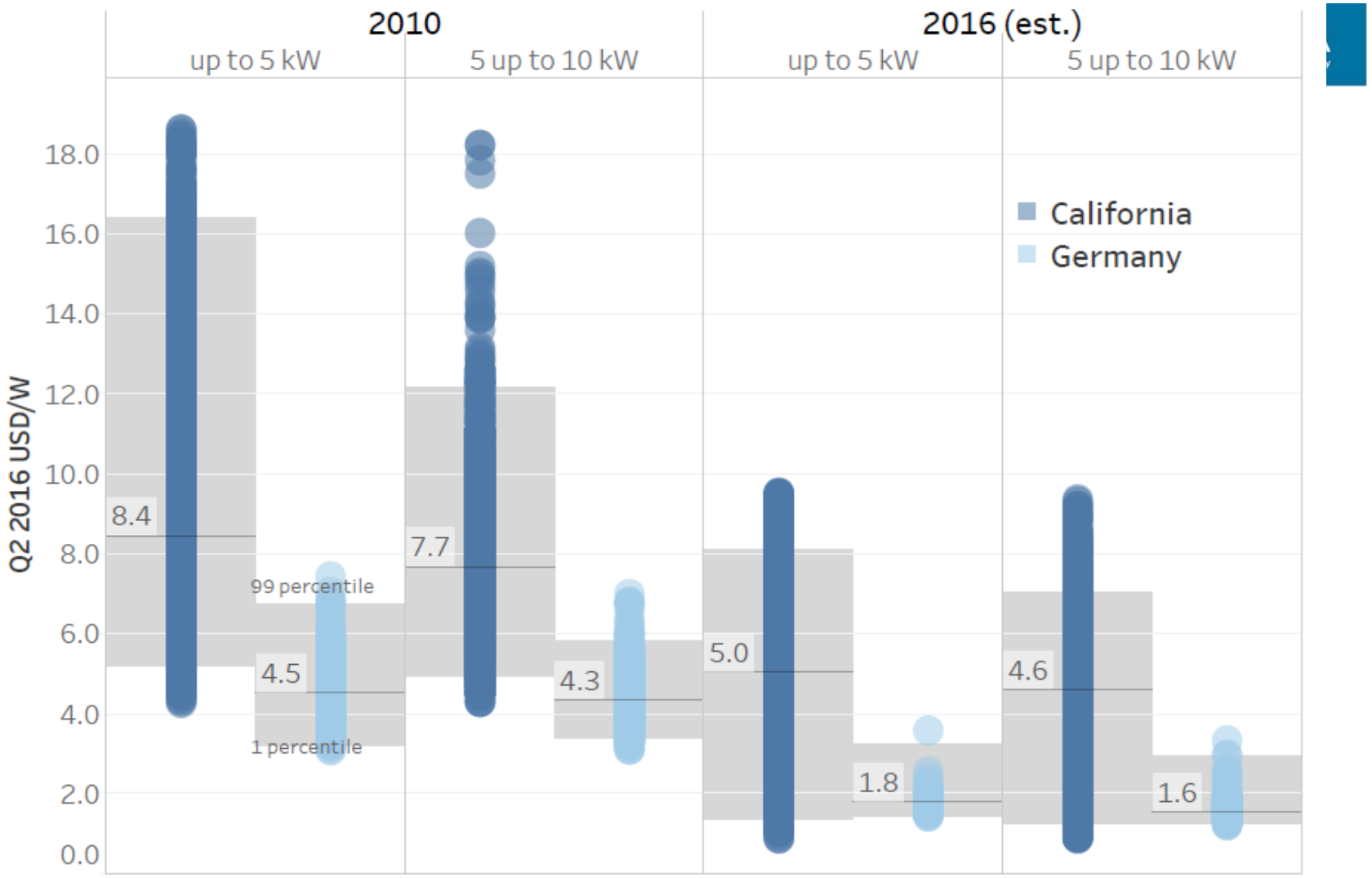


Technology improvements
and
cost reductions

=

Falling LCOEs

Residential solar PV: Average cost differentials



SOLAR PV IN AFRICA: COSTS AND MARKETS

NEW OPPORTUNITIES UNLOCKED

Solar PV Costs in Africa

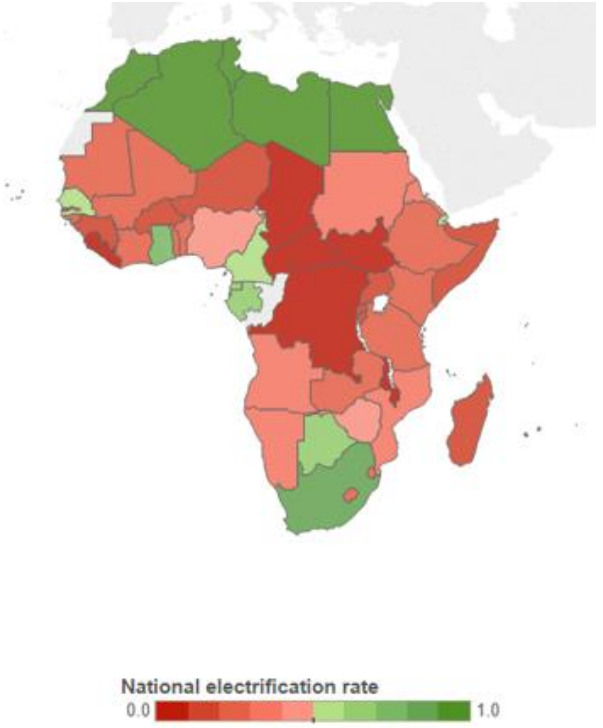
Africa has a need for power:
Solar resources make PV an excellent fit

But poor understanding of costs today

Data collection challenging, but encouraging results

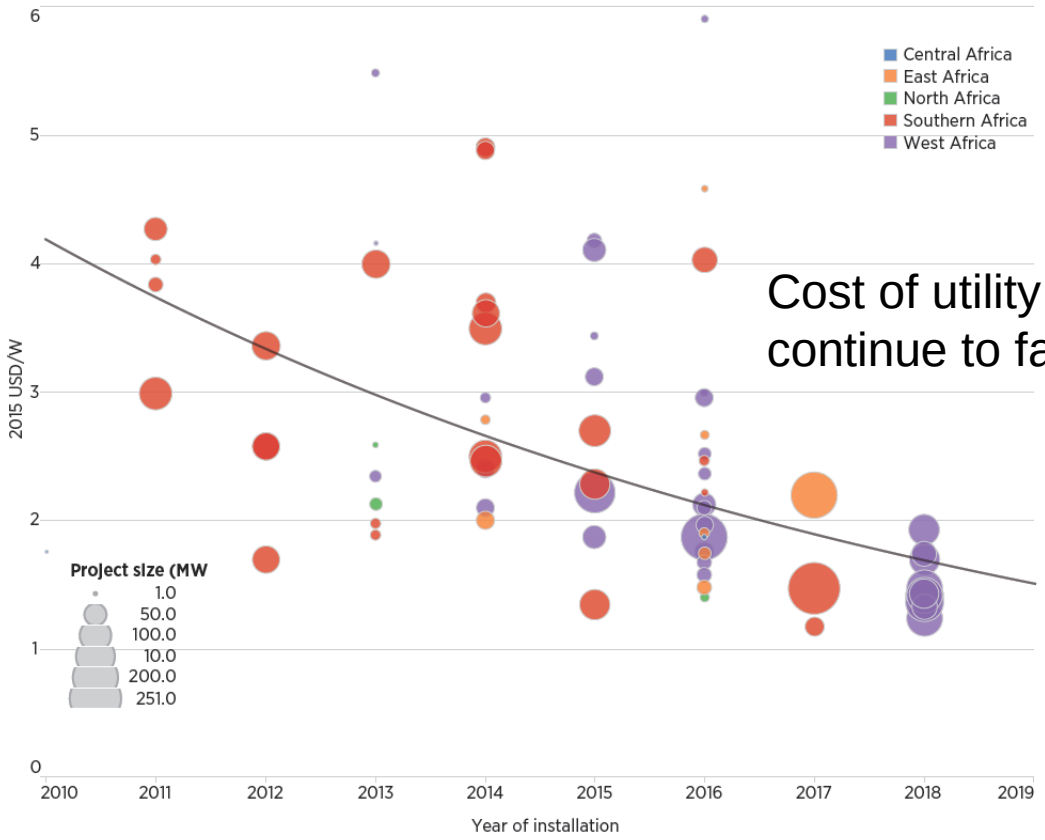
- Some markets relatively competitive
- Very small SHS cost structures are challenging
- Regional deep-dives necessary for greater clarity

~600 million lack access

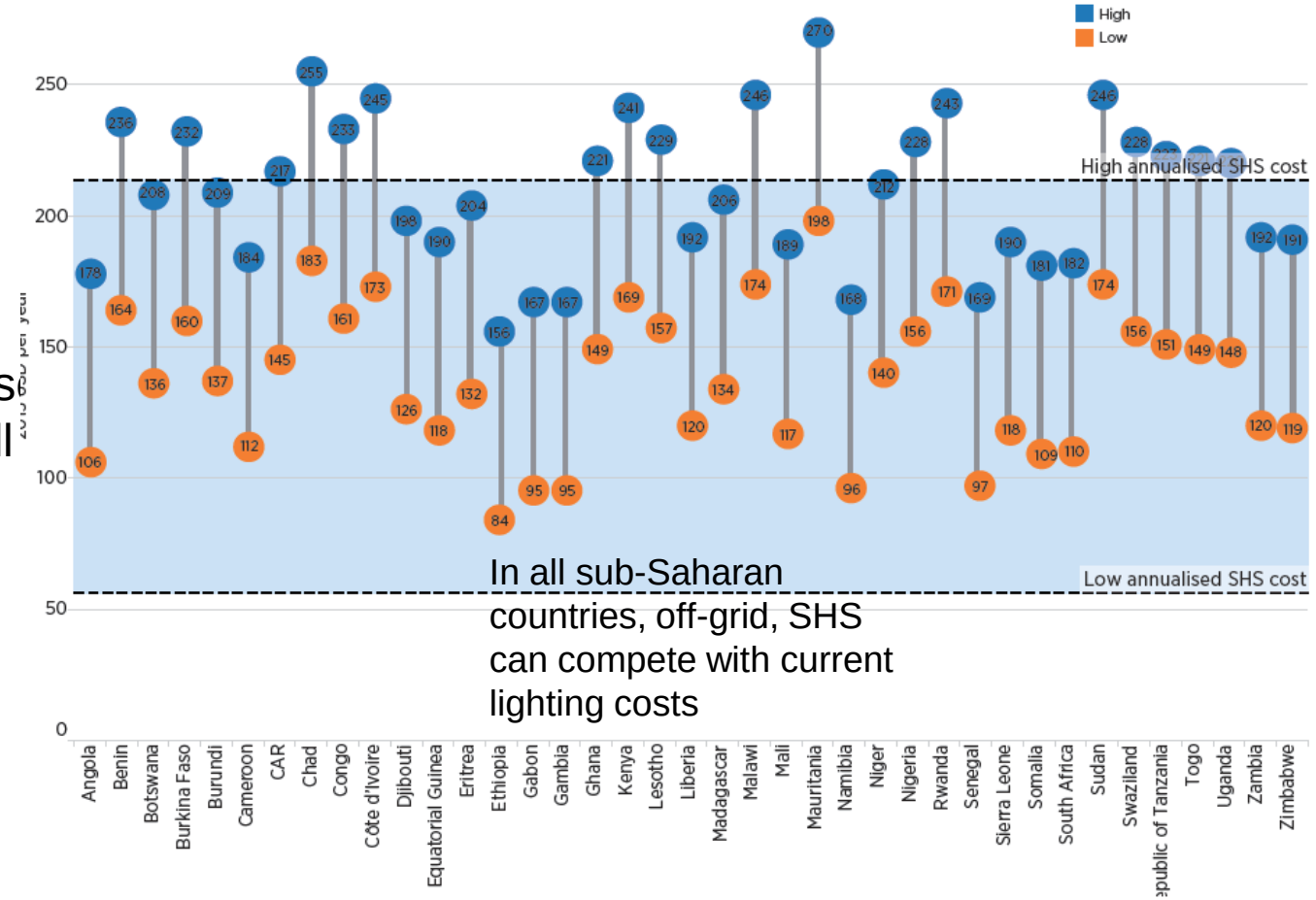


Solar PV costs in Africa: Utility-scale and SHS

Operating and proposed utility scale solar PV project installed costs in Africa, 2010-2018 (IRENA)



Annual off-grid household expenditure on lighting and mobile phone charging compared to SHS (<1kW) annualized costs, by country (IRENA)



Source: IRENA Renewable Cost Database, 2016

The Power to Change

Cost Reduction Potentials for Solar and Wind

Costs will continue to fall for solar and wind power technologies to 2025

Large cost differentials

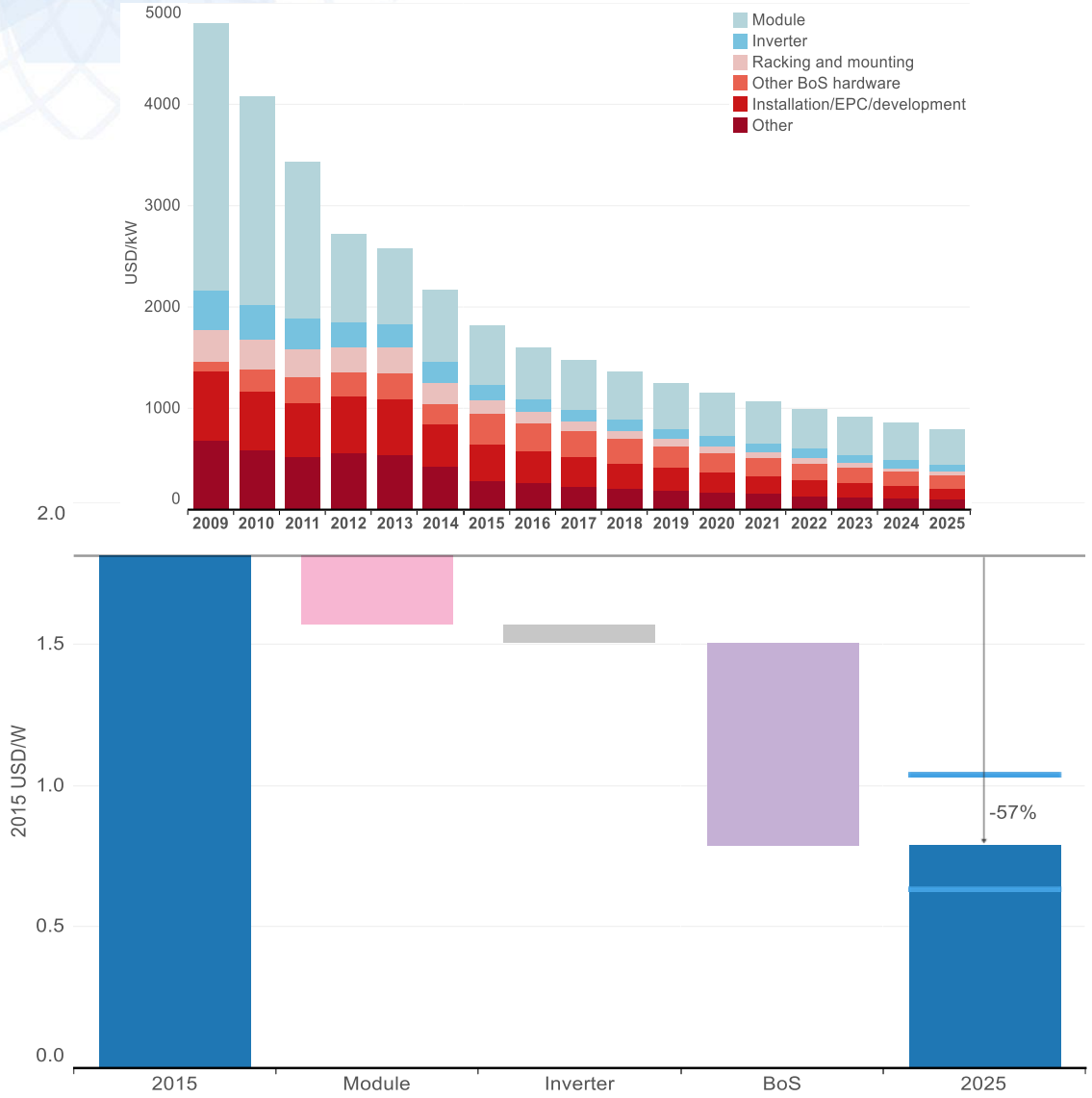
Continued technology innovation

Growing scale of markets

Policy framework critical to unlocking largest savings

Cost reduction drivers are changing

Solar PV:
Installed system costs to 2025



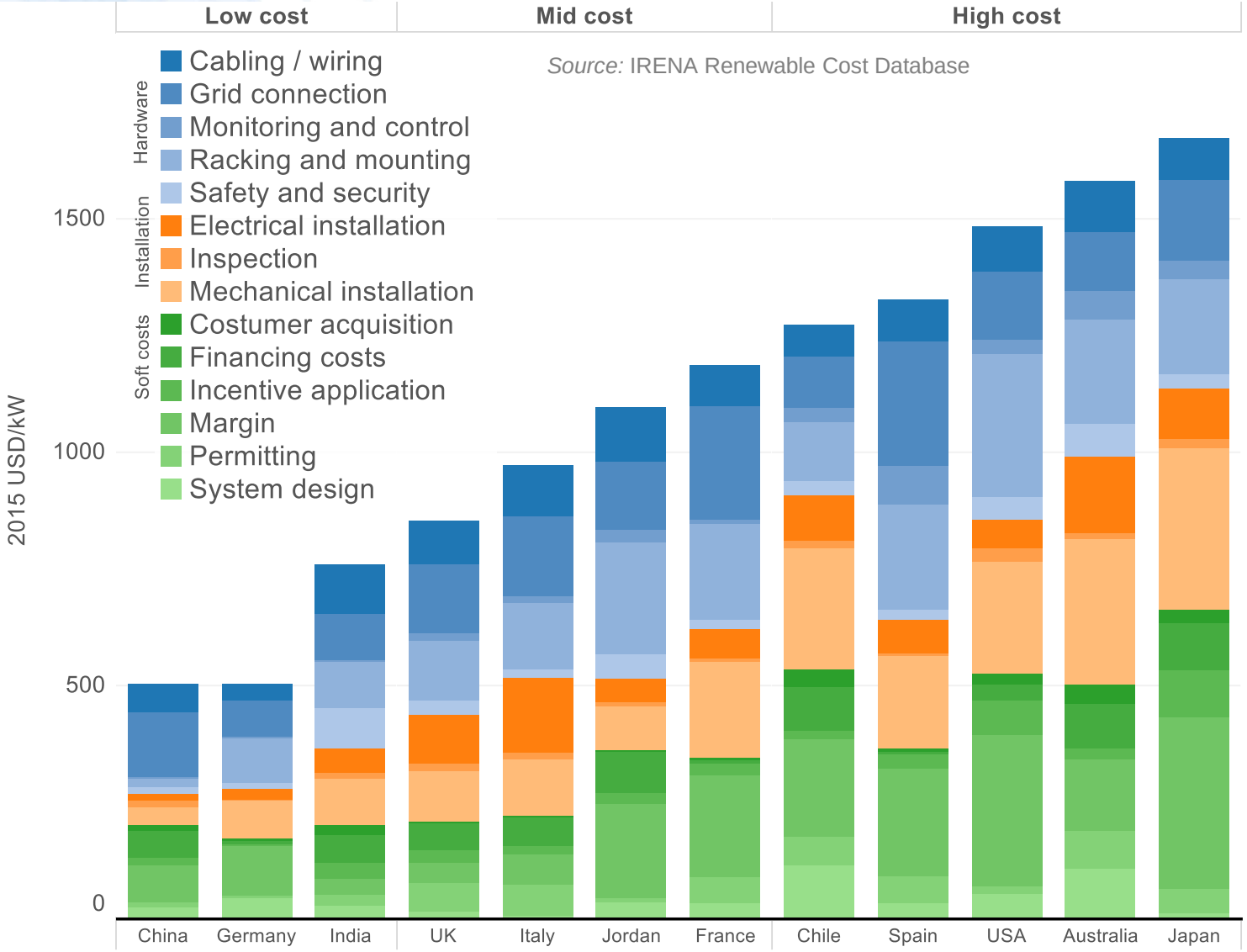
Large average cost reduction potential

BoS dominates potential

Will require action by policy makers

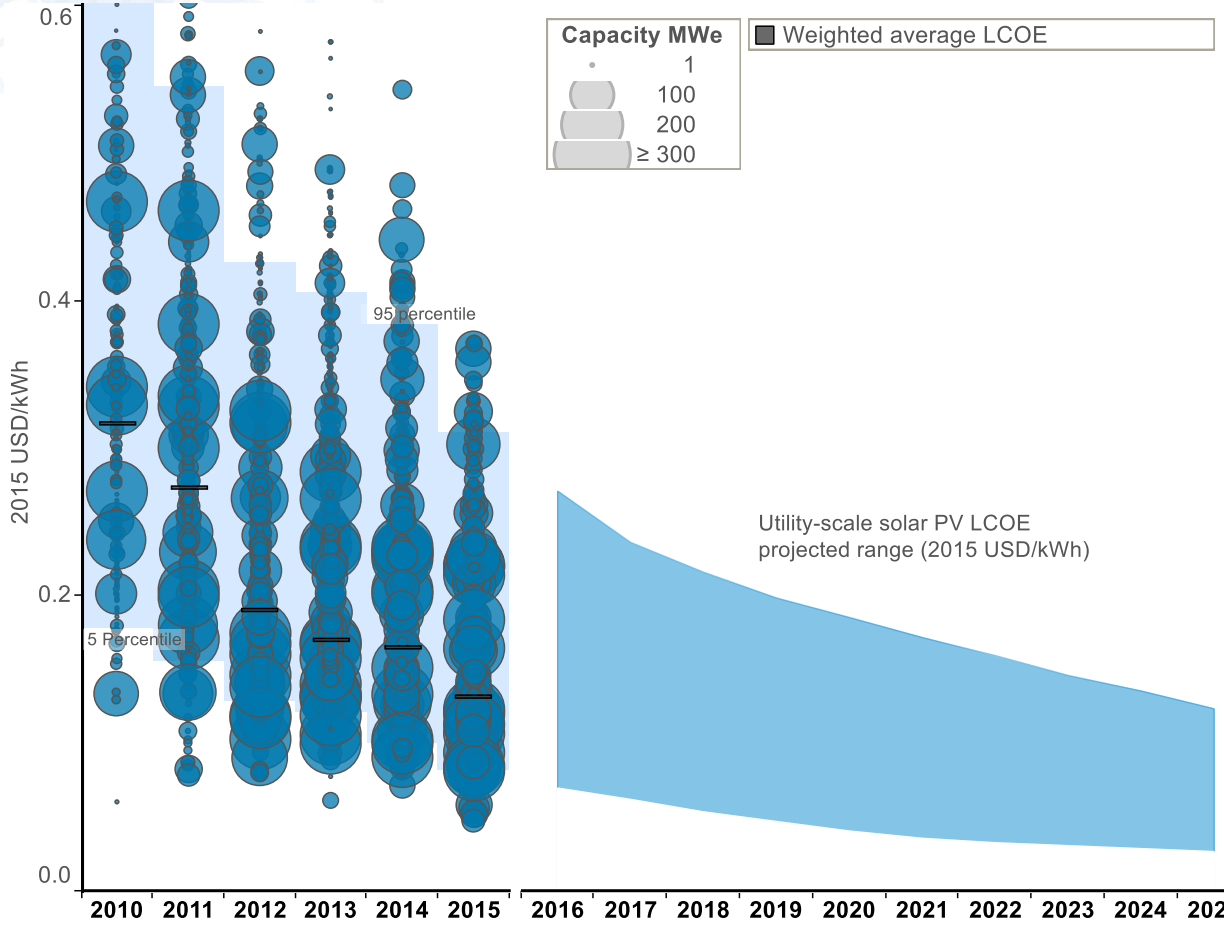
Solar PV: BoS costs

Detailed breakdown of solar PV BoS costs by country, 2015



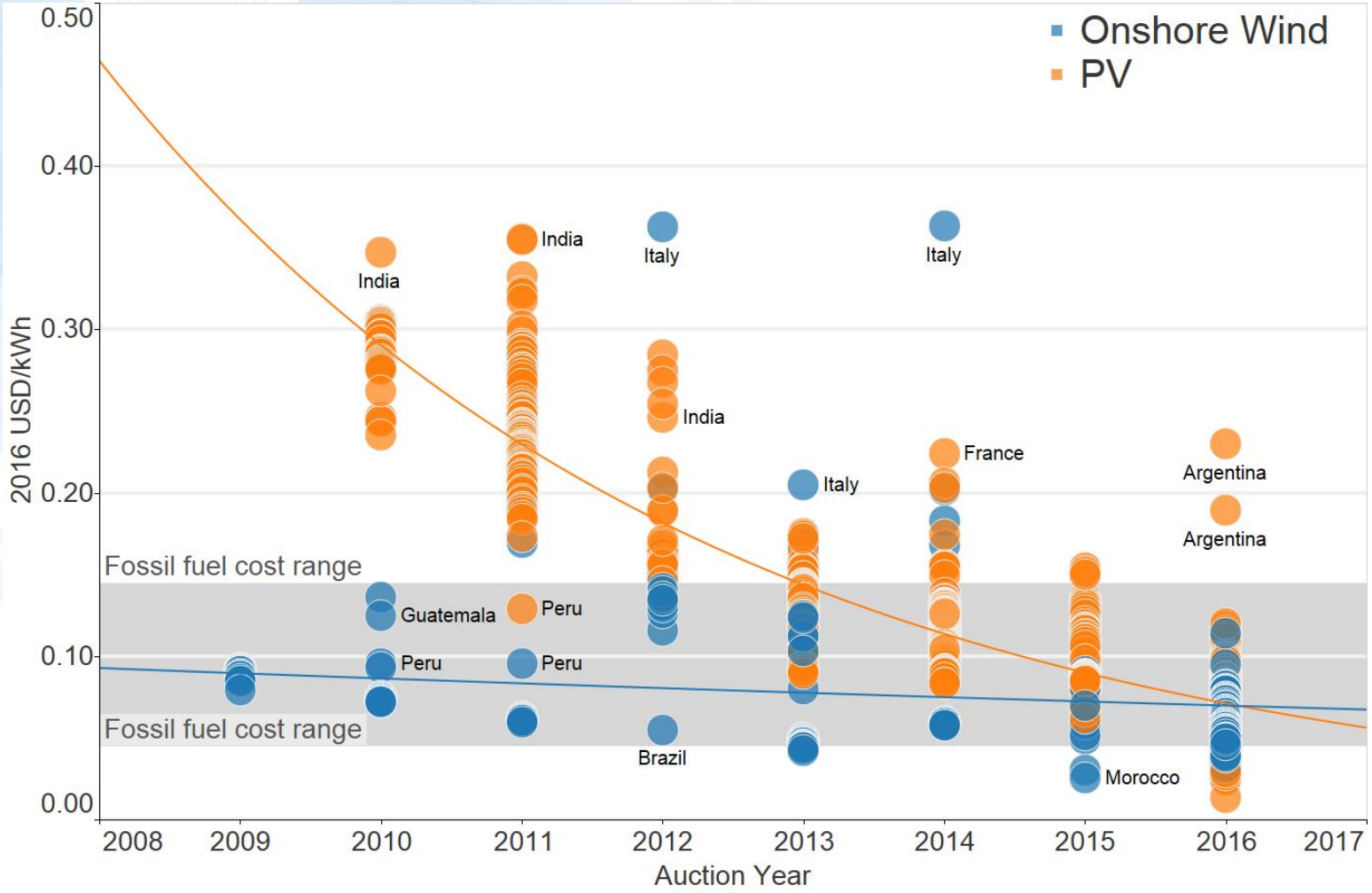
The range of BoS costs between costs groups is very large, but BoS costs also present the greatest opportunities for reduction potential

Solar PV LCOE to 2025



Highly dependent on BoS convergence scenario

Tender and PPA results



Dramatic convergence of solar PV and onshore wind to same LCOE range

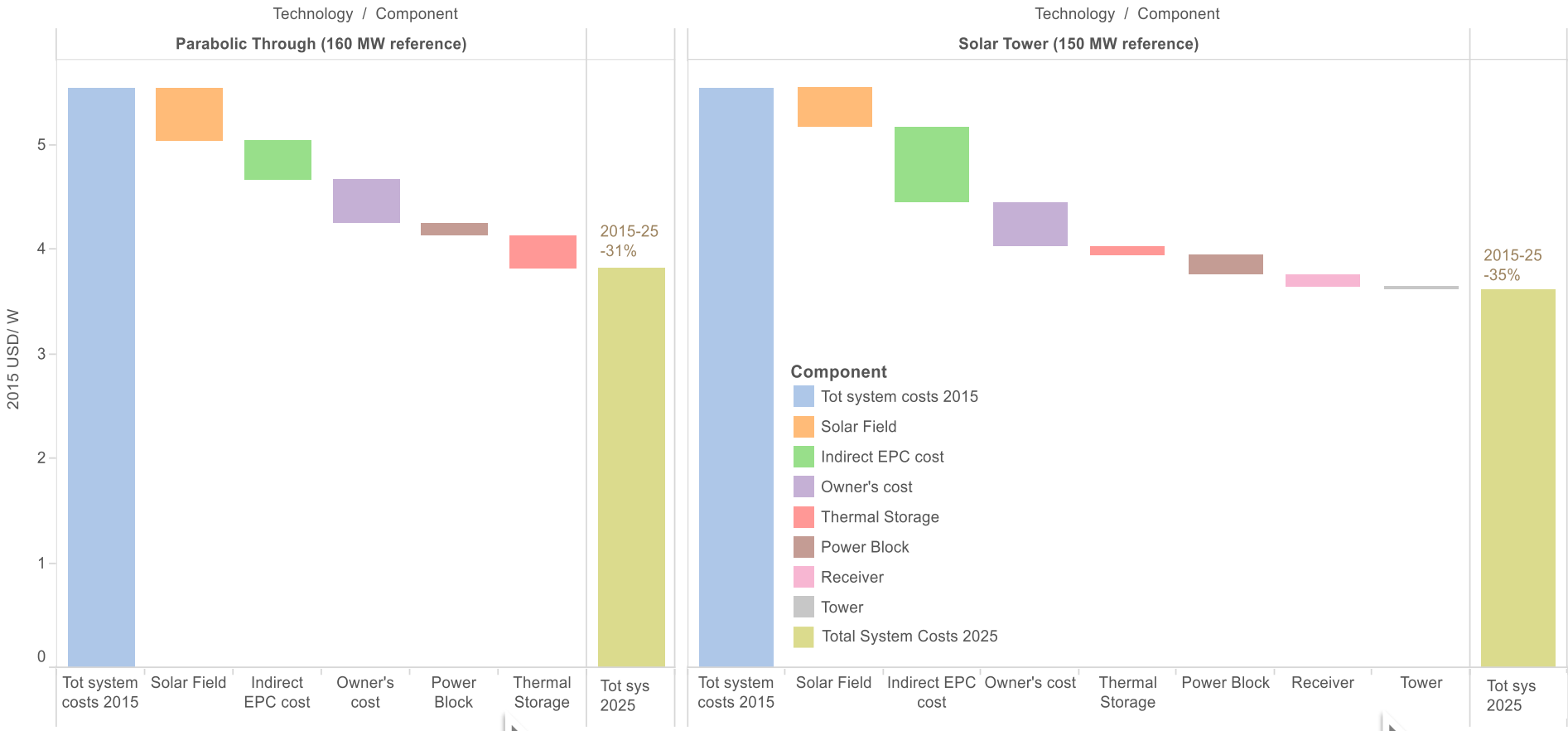
But some of these projects are "boundary" projects, difficult to replicate for solar PV

CONCENTRATING SOLAR POWER

Concentrating solar power

Deployment in its infancy!

CAPEX could decline by one-third by 2025



Plant Efficiency: 15% currently to 17% by 2025

Plant Efficiency: 15.5% currently to 18% by 2025

PT -31% CAPEX (15-25)

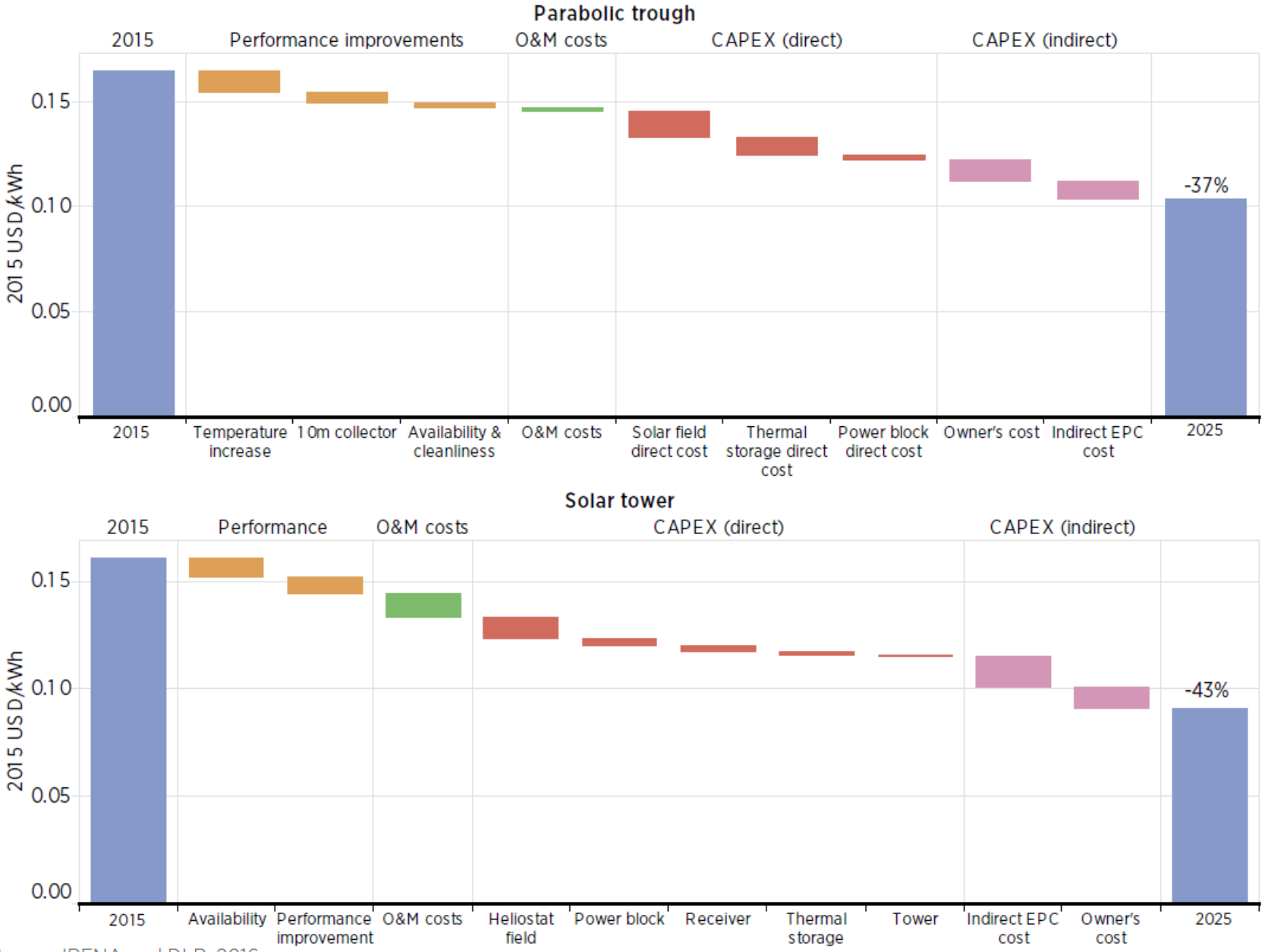
- USD 5550/kW to USD 3800/kW 2025

ST -35% CAPEX (15-25)

- USD 5450/kW to USD 3600/kW

Indirect EPC costs + Owner's costs also major contributors to reduction potential

CSP: LCOE reduction potential



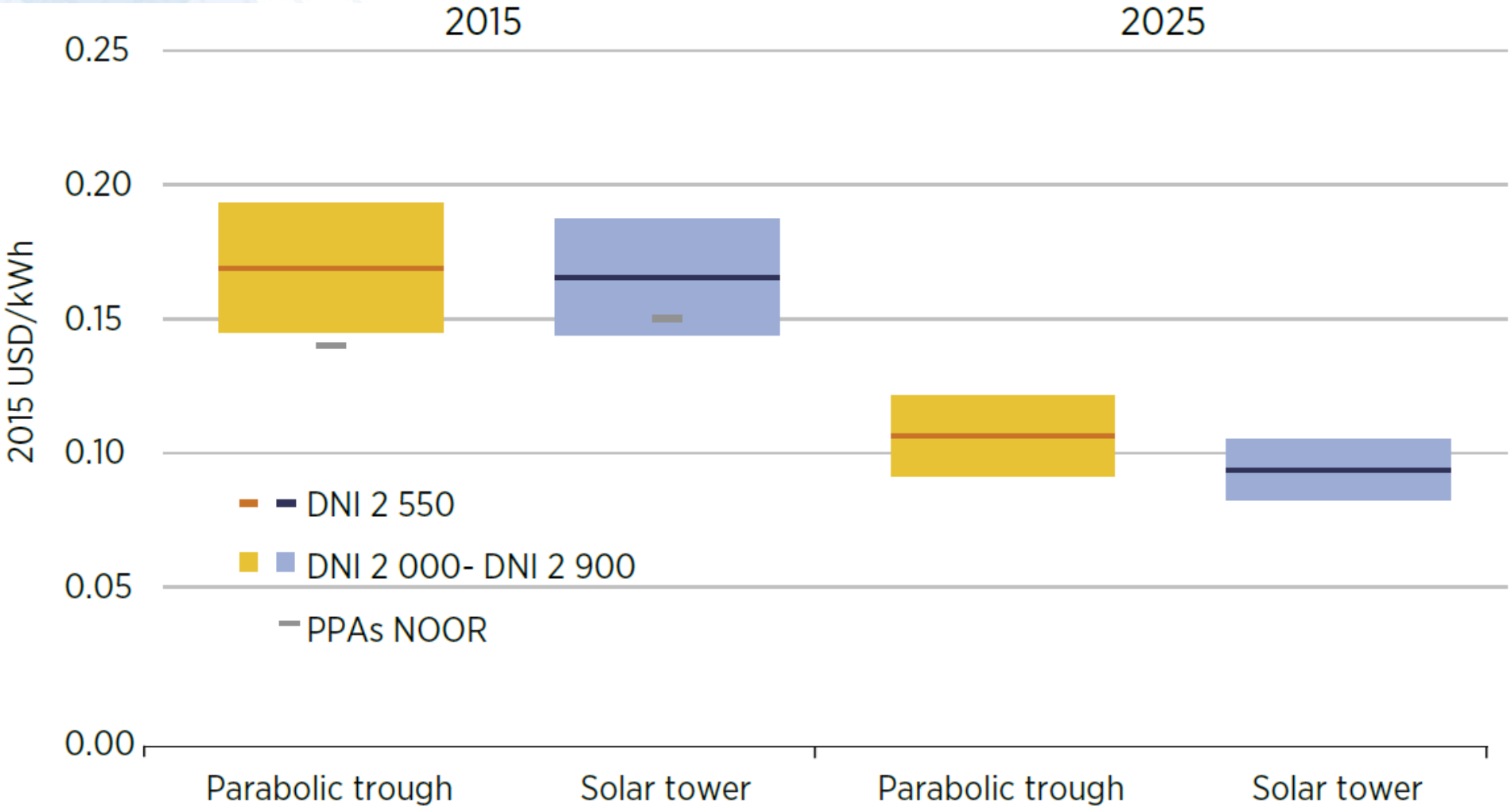
Source: IRENA and DLR, 2016.

For PTCs, major drivers are an increase in the temperature level enabled by the switchover to molten salt as the HTF which accounts for about 13% of the total LCOE reduction. The second important cost driver is the reduction of solar field costs.

For STs, the largest single driver for LCOE reductions is related to gains in the EPC experience. The indirect EPC cost alone is expected to contribute about one-fifth to the overall LCOE reduction potential of towers.

CSP: LCOE development to 2025

The levelised cost of electricity of PTC and ST technologies, 2015 and 2025



Source: IRENA and DLR, 2016.

In 2015, both trough and tower technologies were in the same LCOE range of about USD 0.15 to USD 0.19/kWh. By 2025, the LCOE range could decline to USD 0.09 to USD 0.12/kWh for troughs and USD 0.08 to USD 0.11/kWh for towers.

Upcoming cost analysis: Firm

PV parity indicators

Global wind learning curve

Stationary applications

Energy security

Battery markets & costs to 2025

RE financing costs

Renewables are increasingly competitive

IRENA
International Renewable Energy Agency

The winners are customers, the environment and our future

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