Renewable Energy: The True Costs

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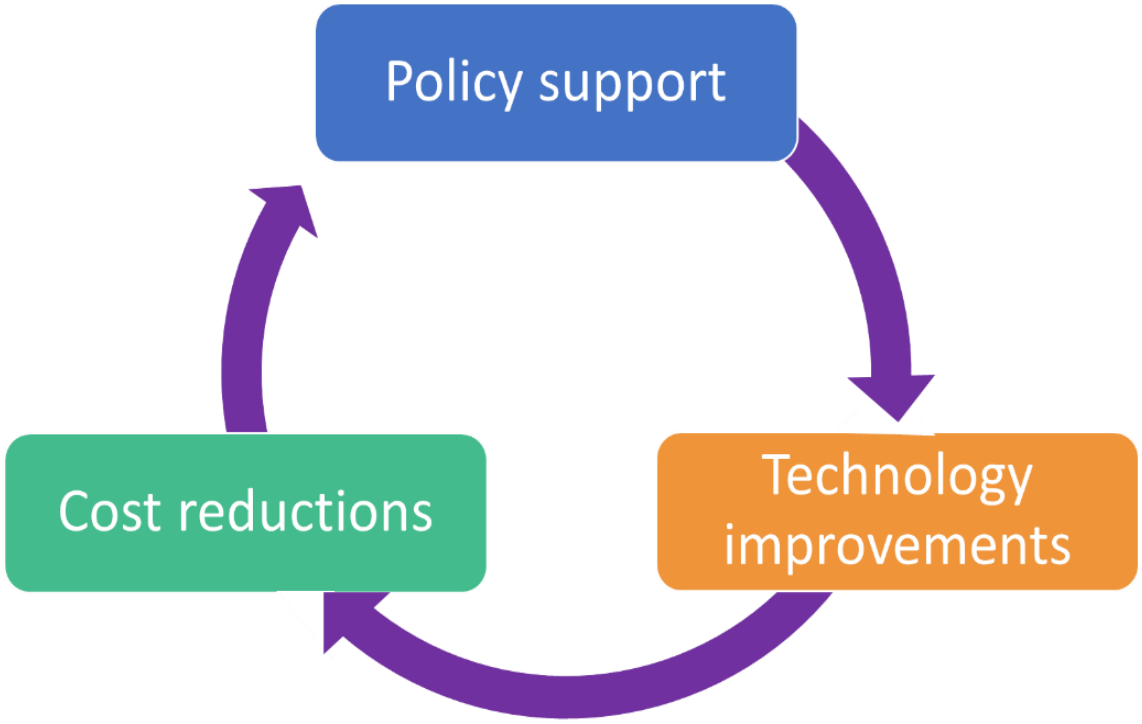
The Energy Sector is Being Transformed



A ***virtuous cycle*** is unlocking the ***economic***, ***social*** and ***environmental*** benefits of renewables

Highlights

Renewables now THE economic solution off-grid and for mini-grids

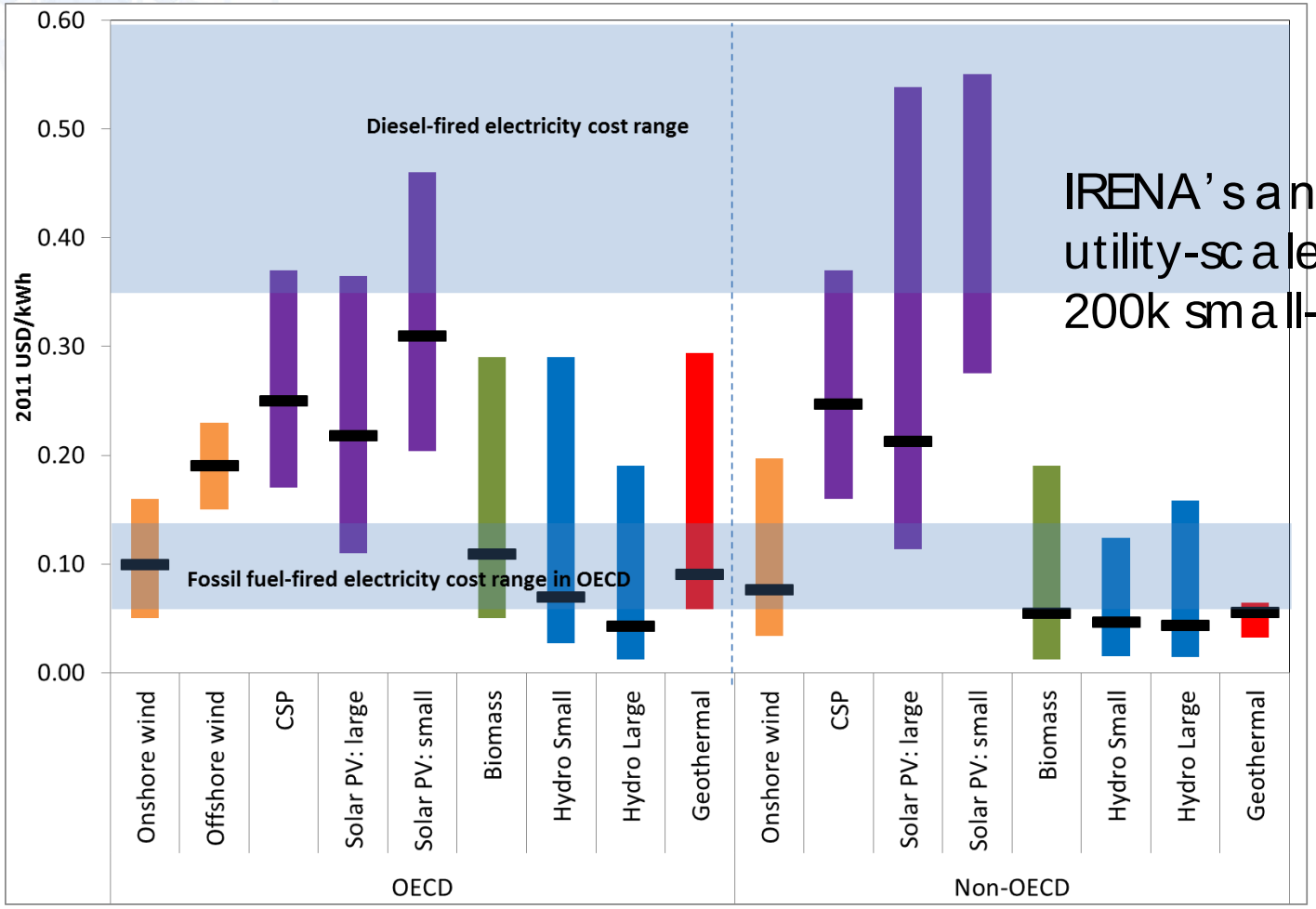
Increasingly competitive for the grid

Biofuels and electrification of transport by 2020

Equipment cost declines and technology improvements mean…..

The costs of renewable energy are declining

Renewables are increasingly competitive!



IRENA's analysis of 9000 utility-scale projects and 200k small-scale solar PV

Note: assumes a 10% cost of capital

Source: IRENA

Costs are falling….

IRENA
International Renewable Energy Agency

Wind Power

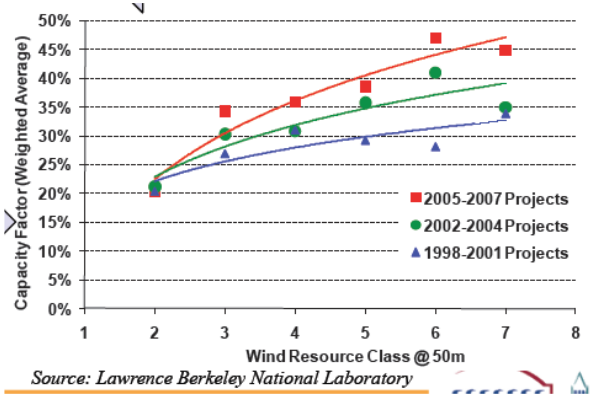
Higher capacity factors from improved technology

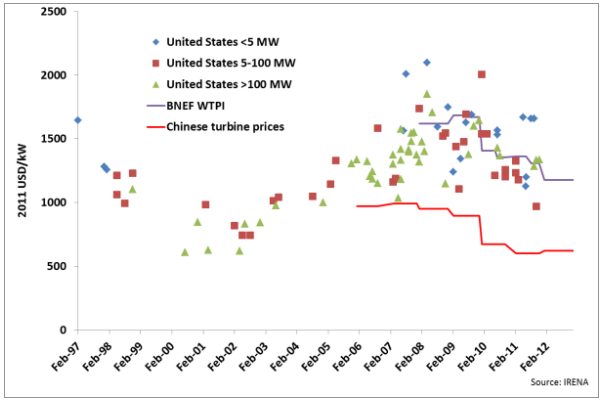
+

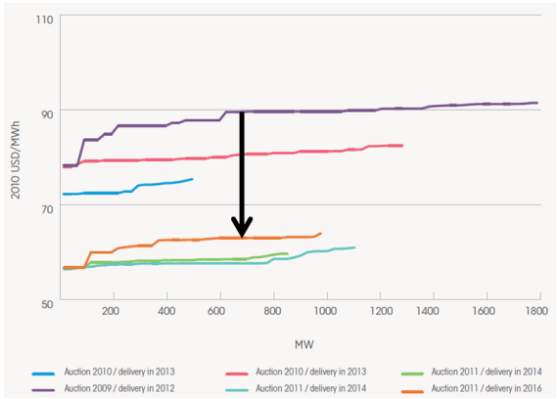
Wind turbine cost reductions

=

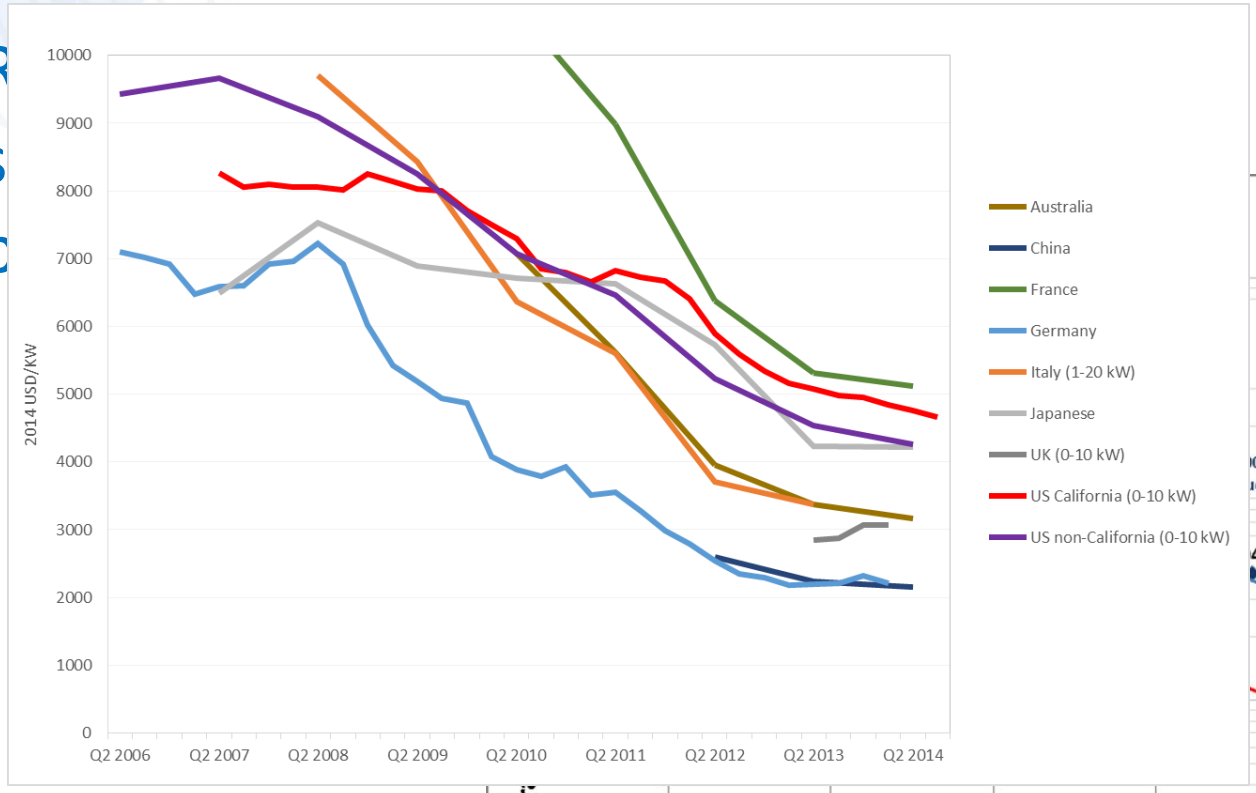
LCOEs are falling

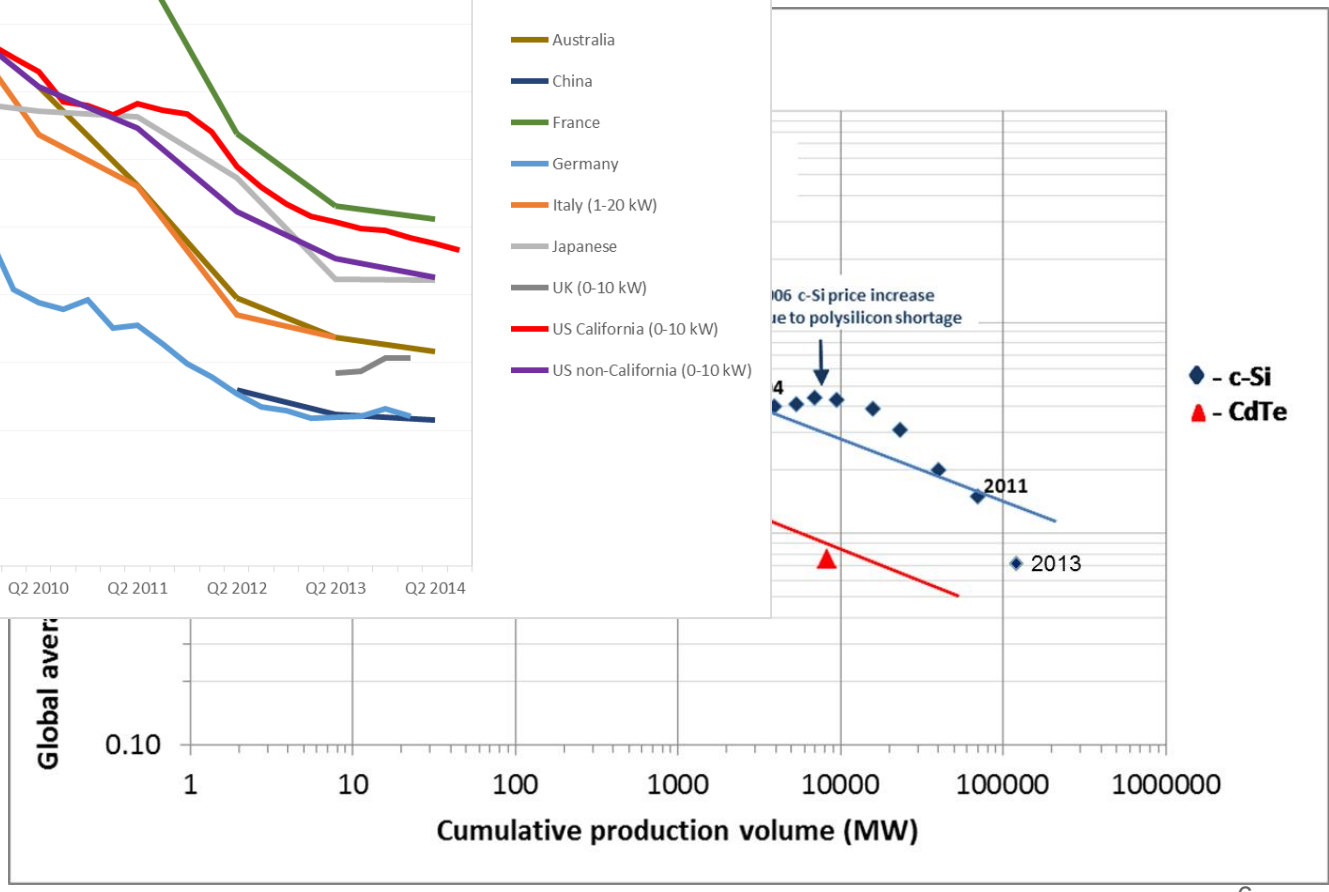






Recent solar PV cost trends

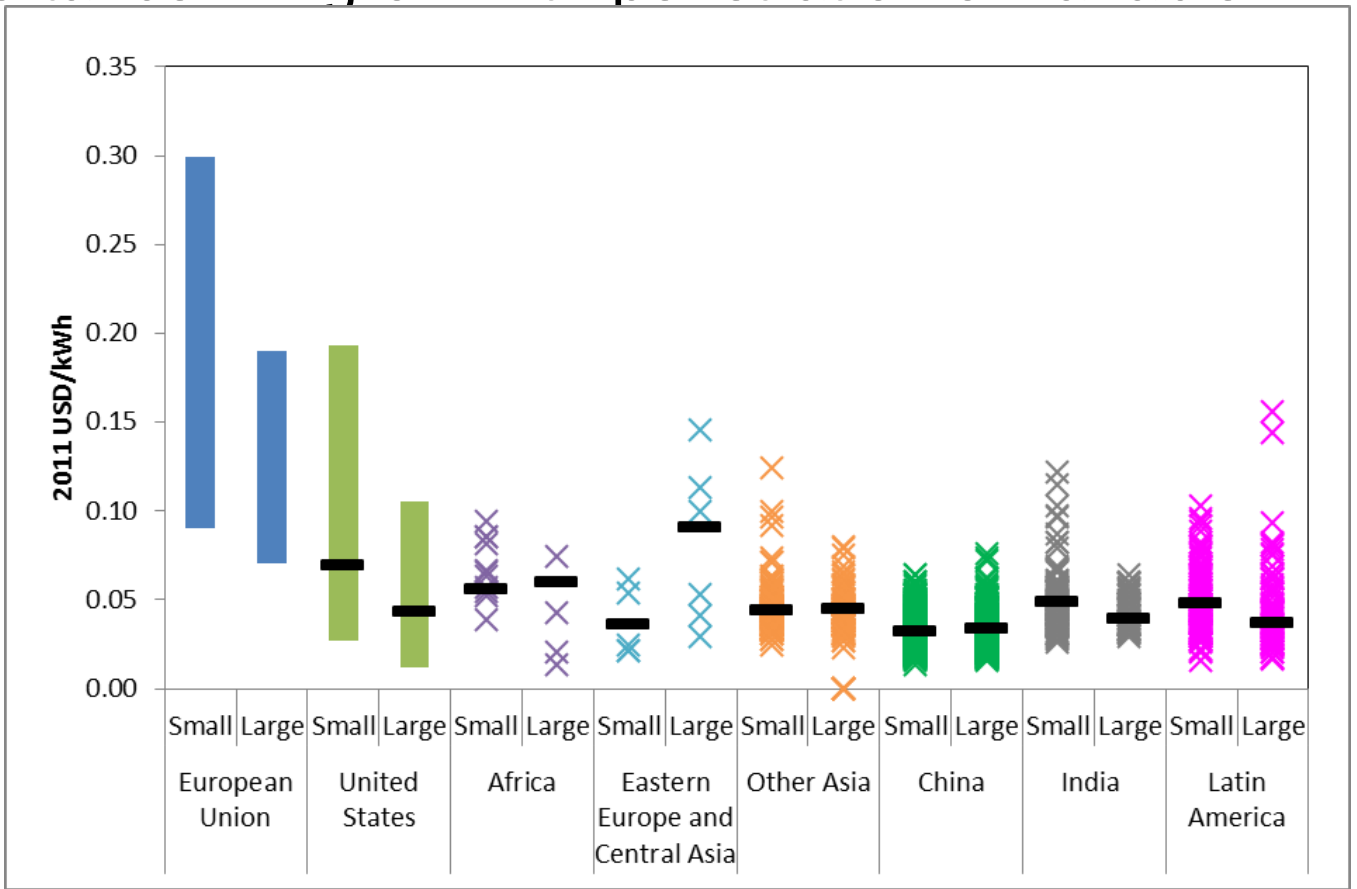




Source: IRENA Renewable Cost Database, BNEF and Global Data

Hydropower

- Mature technology, flexibility in design in many cases
- Lowest cost electricity of any source in many cases
- Importance will grow with penetration of variable RE



RENEWABLE POWER GENERATION COSTS IN 2014

Tentative key messages

Relentless decline in costs for some technologies continues

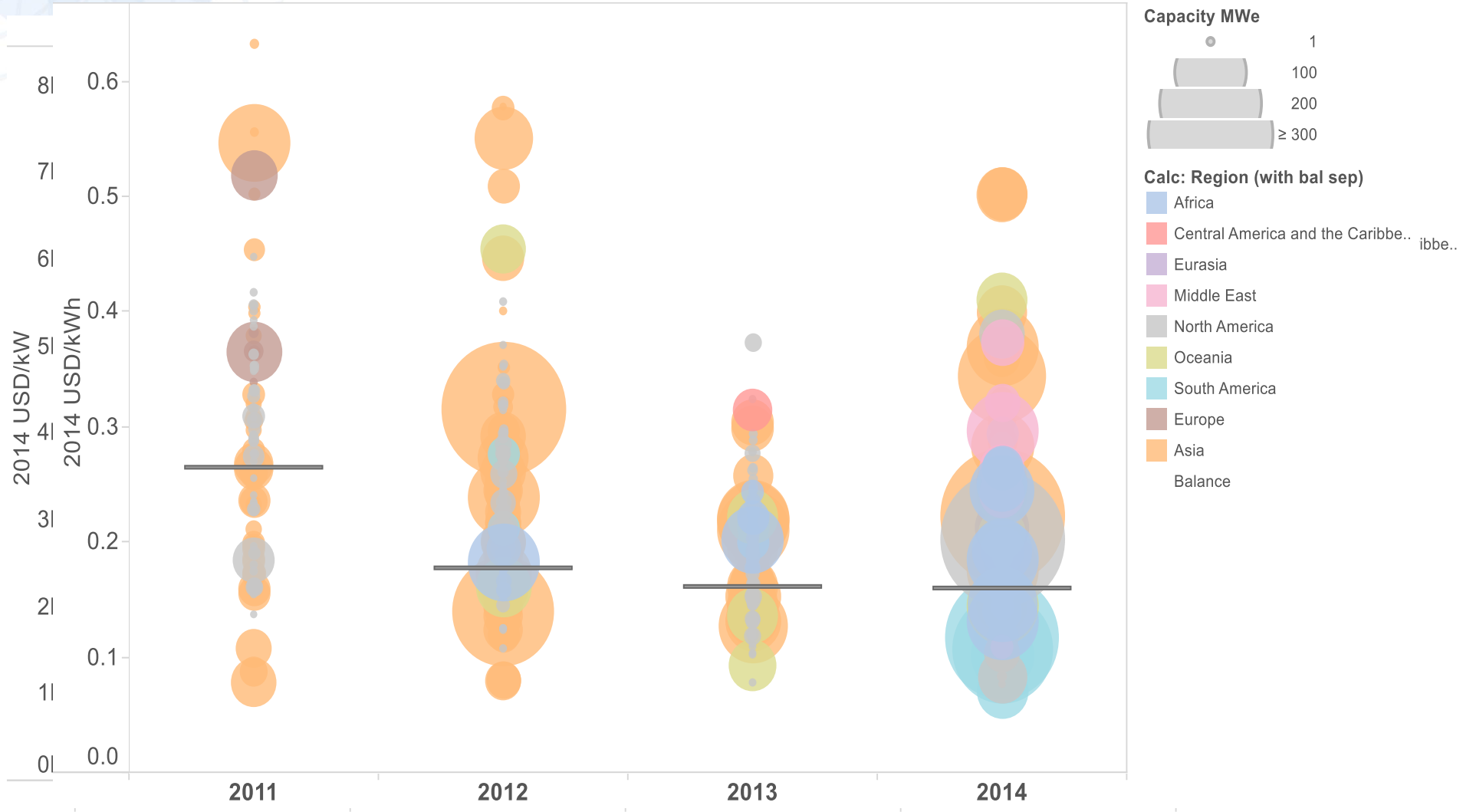
The future is here today

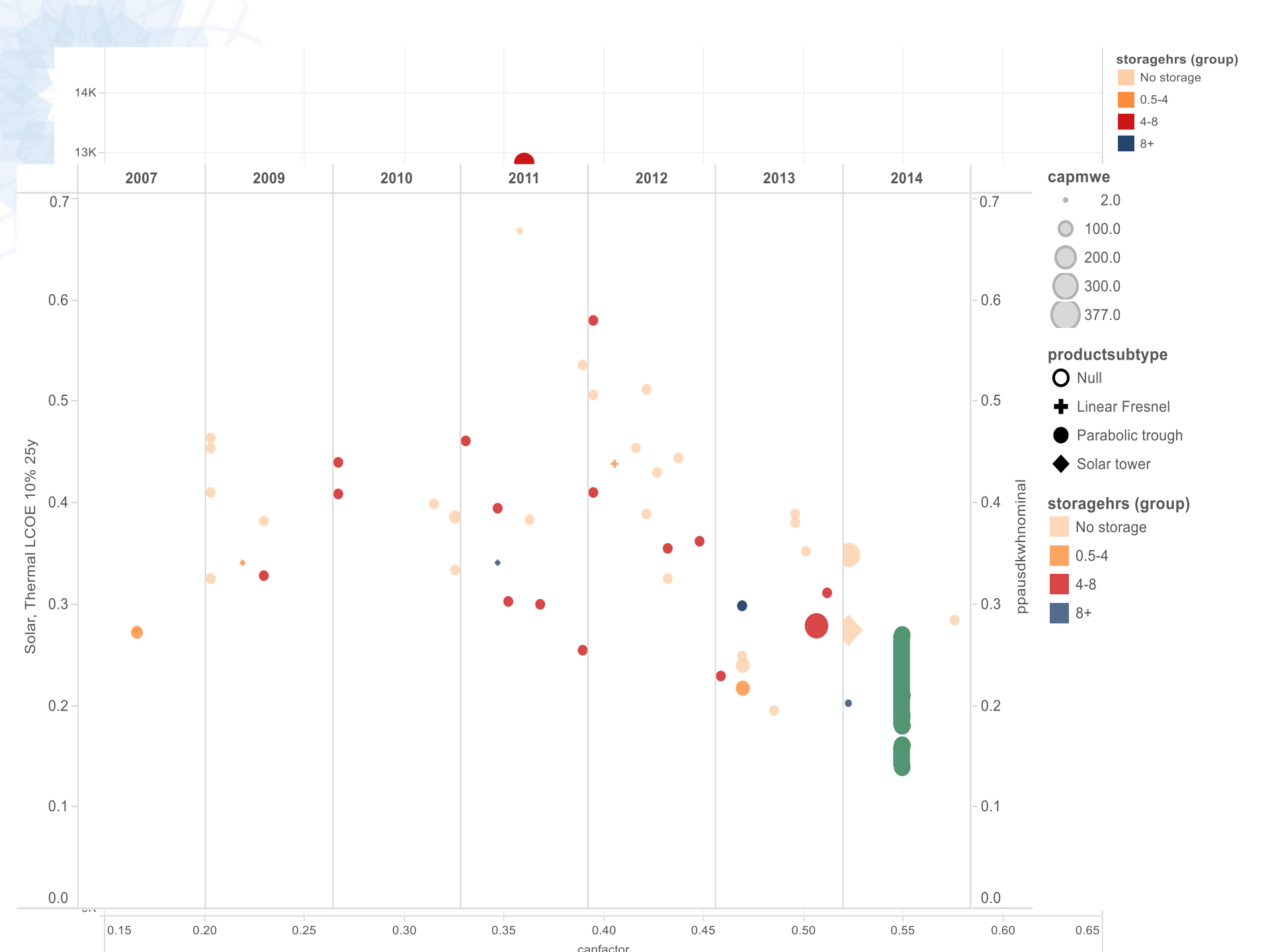
Solar PV LCOE has improved dramatically

Equipment cost declines mean BoS is an emerging issue

Is this the beginning of the myth of fossil fuel competitiveness?

Global utility-scale PV cost trends




storagehrs (group)
No storage
0.5-4
4-8
8+
14K
13K
2007
2009
2010
2011
2012
2013
2014
capmwe
2.0
100.0
200.0
300.0
377.0
productsubtype
Null
Linear Fresnel
Parabolic trough
Solar tower
storagehrs (group)
No storage
0.5-4
4-8
8+
Solar, Thermal LCOE 10% 25y
ppausdkwhnominal
0.7
0.6
0.5
0.4
0.3
0.2
0.1
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0.15
0.20
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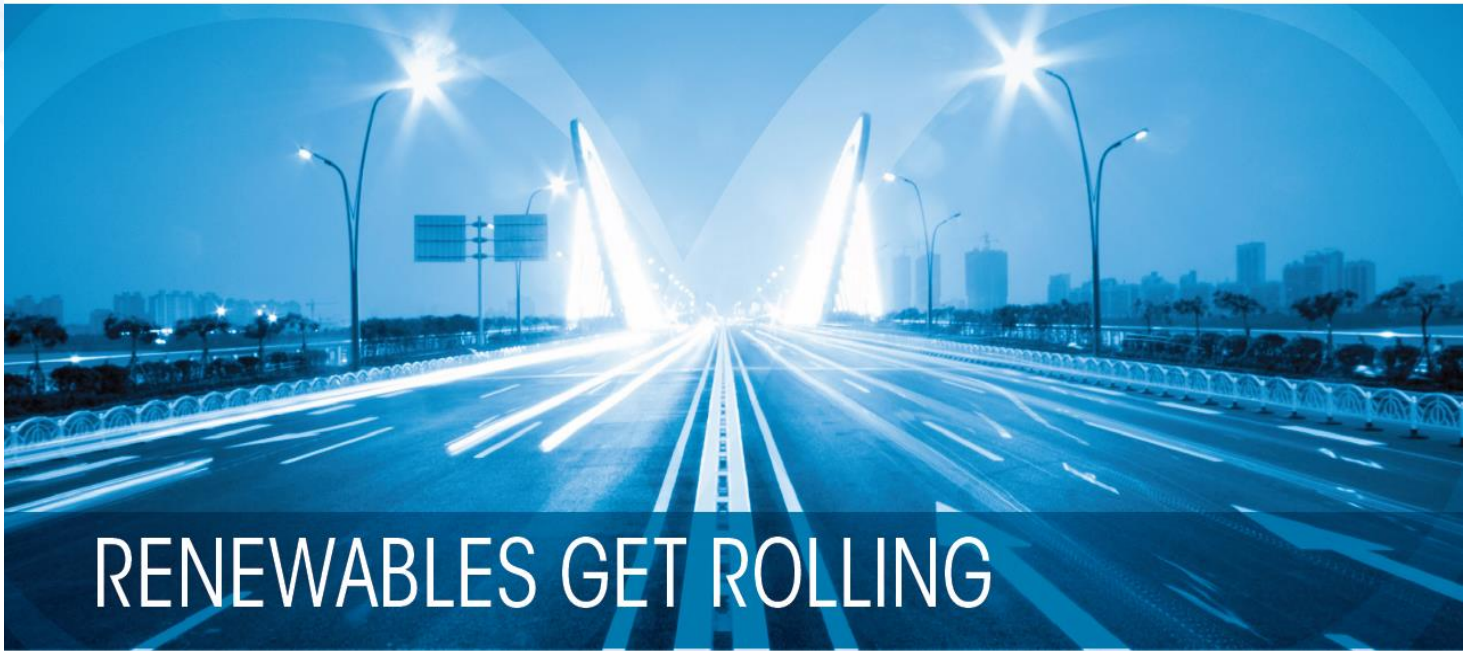
capfactor

IRENA
International Renewable Energy Agency

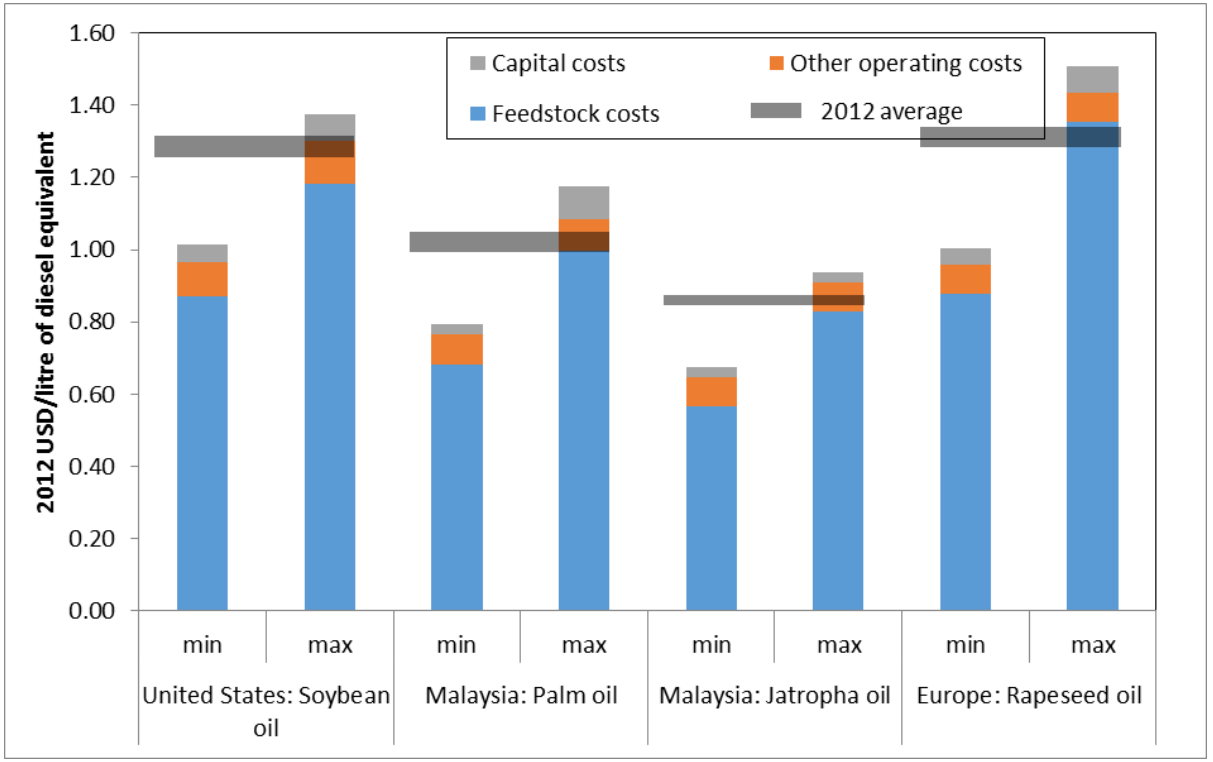






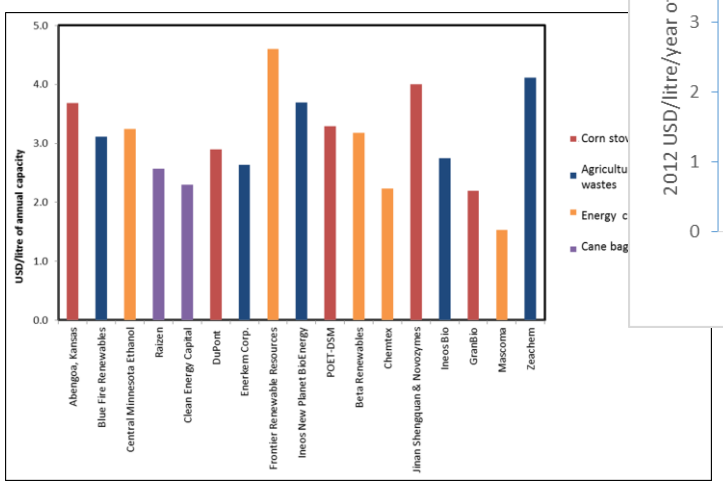
Conventional biofuels: Biodiesel

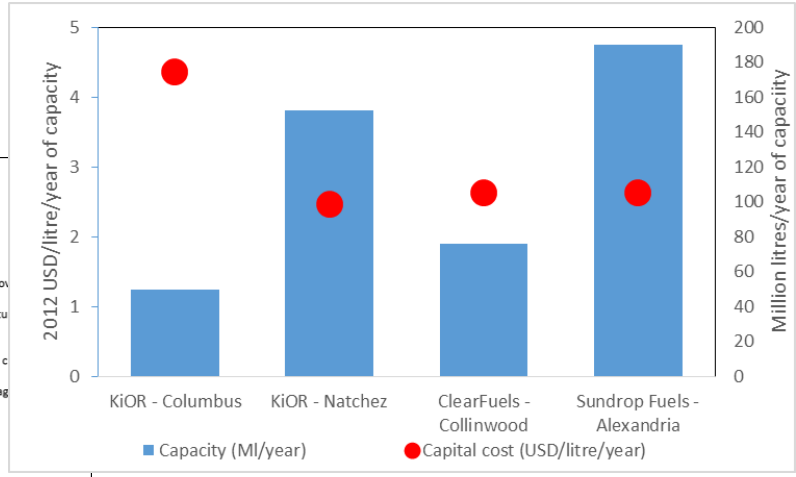
Biodiesel production costs (2009 to 2010)



Advanced biofuels

Numerous advantages





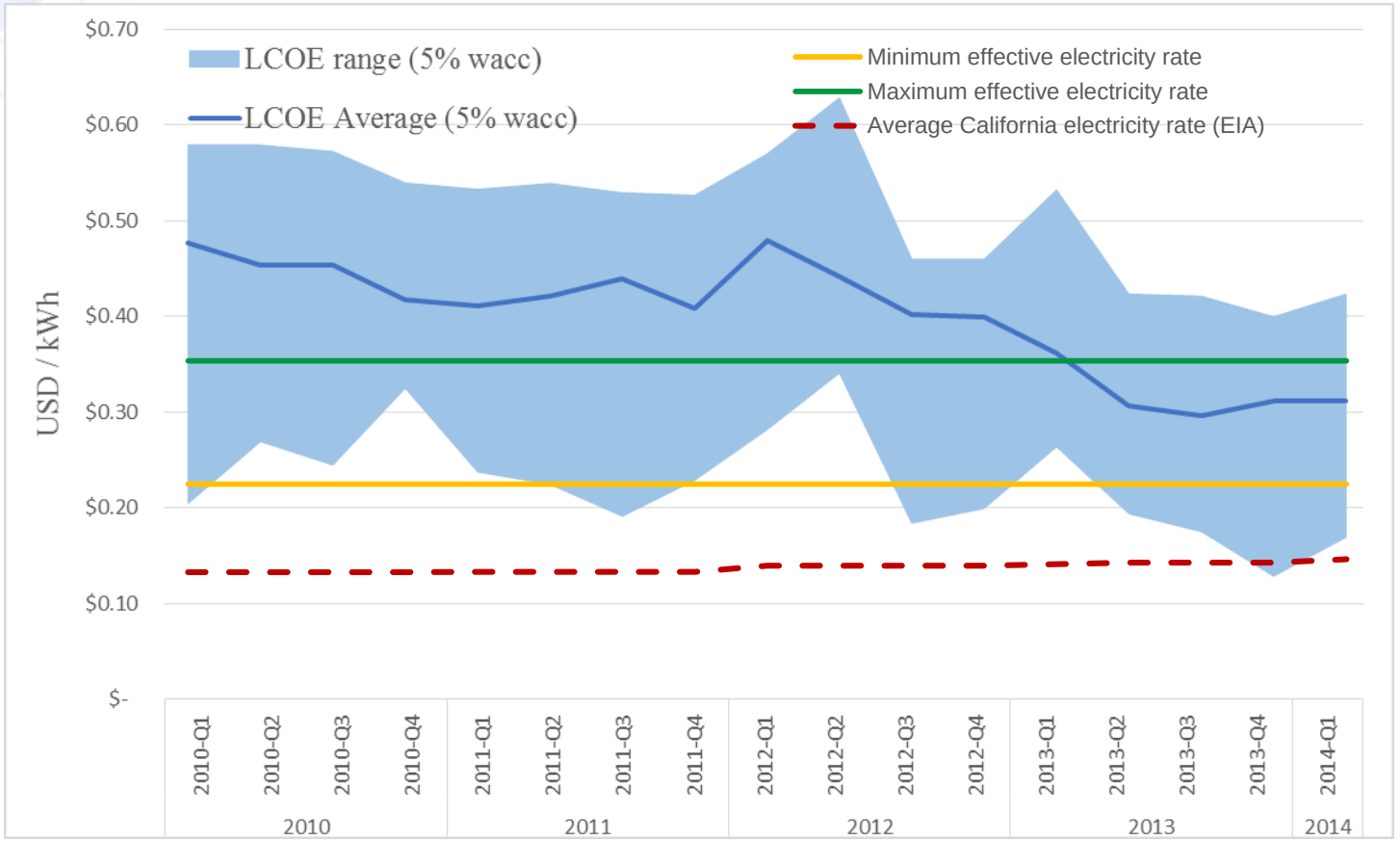
MOVING BEYOND DATA:

PRODUCTS TO SUPPORT POLICY MAKERS

PV Parity Indicators

- Tracks quarterly competiveness
- Indicators, not actual costs
- Target audience are policy makers and thought leaders
- Start with North America
- Can lead to more detailed analysis
- Supports other IRENA activities

Residential PV Parity: San Francisco



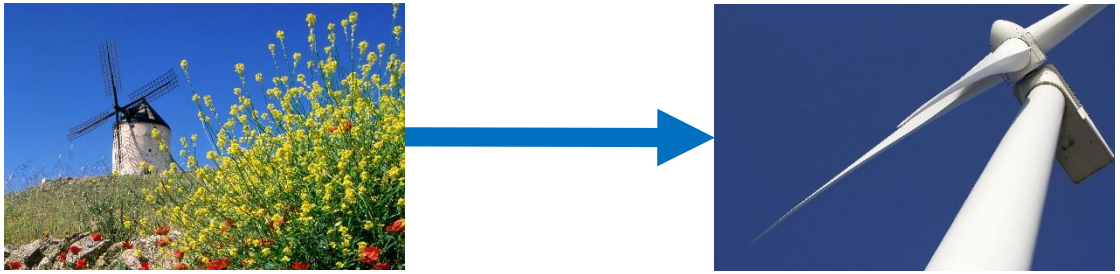
Wind power learning curve project

IRENA
International Renewable Energy Agency

Comprehensive new analysis of global learning curves for wind 1990 - 2013

Total installed cost and LCOE

Decomposition of LCOE learning curve



The True Costs: webpages for your work

Dedicated costing pages…

…with all our costing publications for free…

…charts, Alliance news, events, and more.

www.irena.org/costs

Upcoming costing work

Renewable power costs in 2014

PV parity indicators

Global wind learning curve

Stationary applications

RE power cost reduction potentials

RE and energy security

Our goal is simple

sourc cost data for our Member States

mtaylor@irena.org www.irena.org/costs

ADDITIONAL SLIDES

We've only just begun

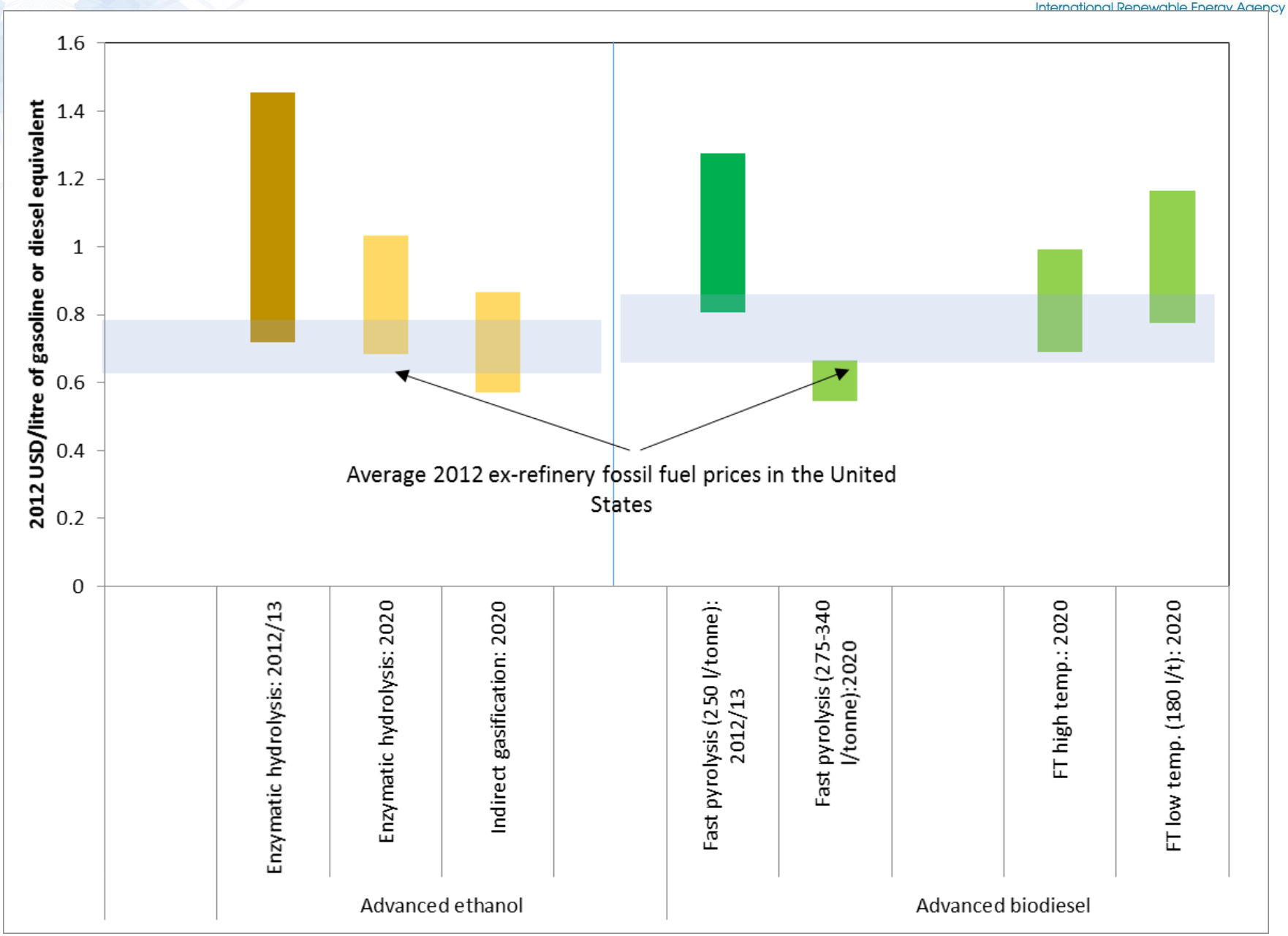
Stationary applications

Power generation update

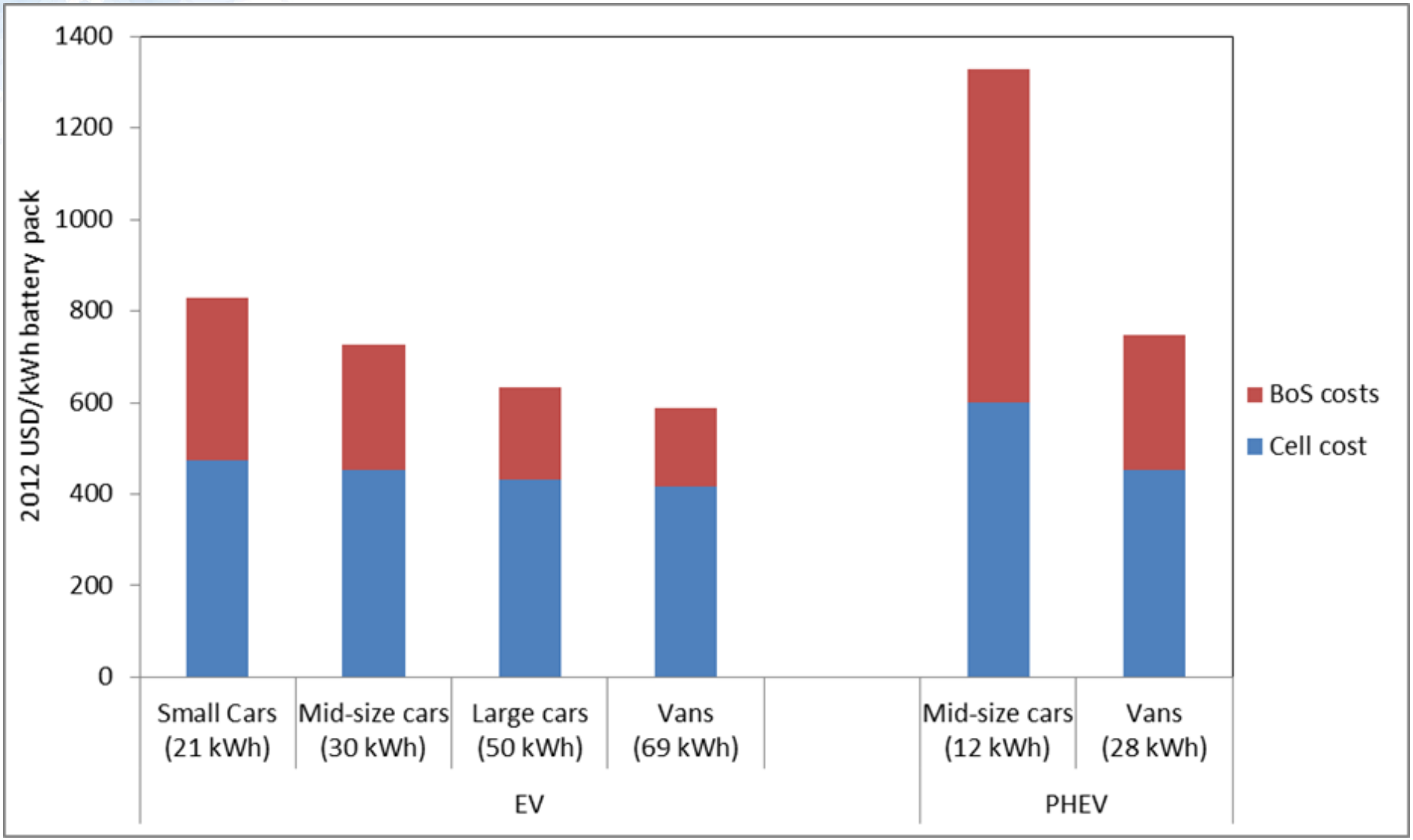
PV Parity Indicators

Integration technologies

Advanced biofuels

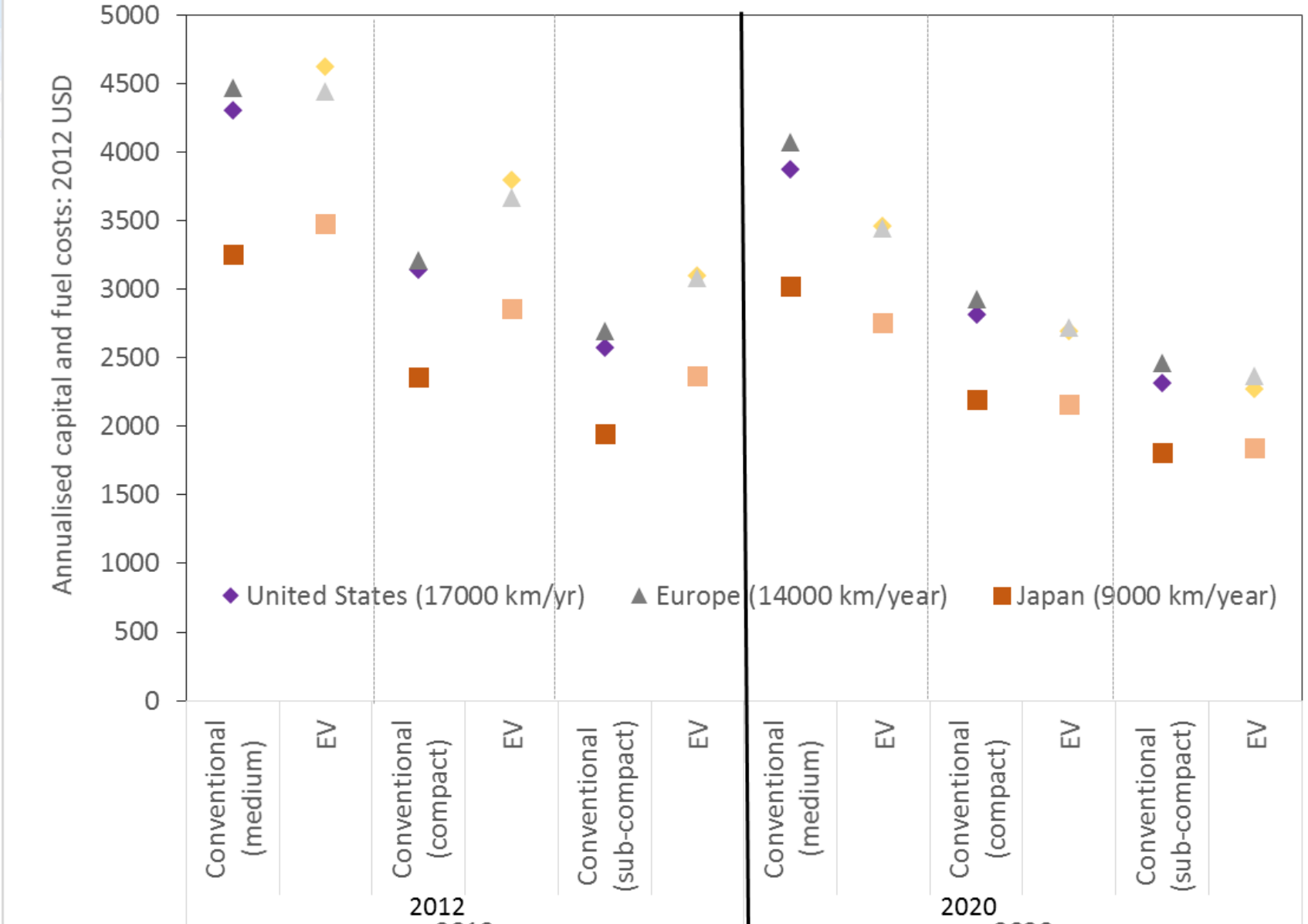


Electrification



- Battery pack costs are still too high, EV's could be a more interesting solution than PHEV's

Pure electric vehicles



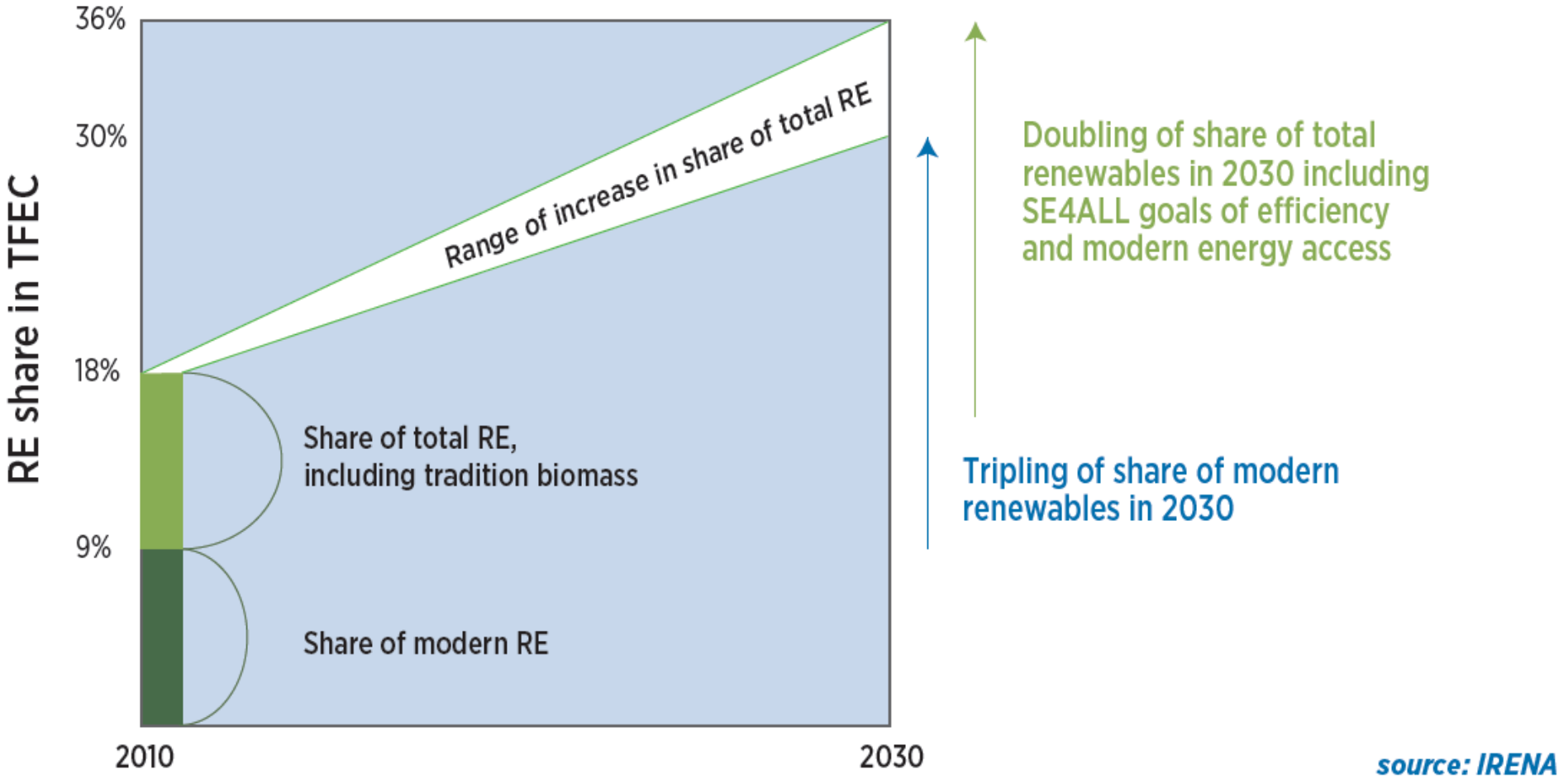
IRENA
International Renewable Energy Agency

REmap 2030

A Renewable Energy Roadmap

Doubling the share of renewable energy by 2030

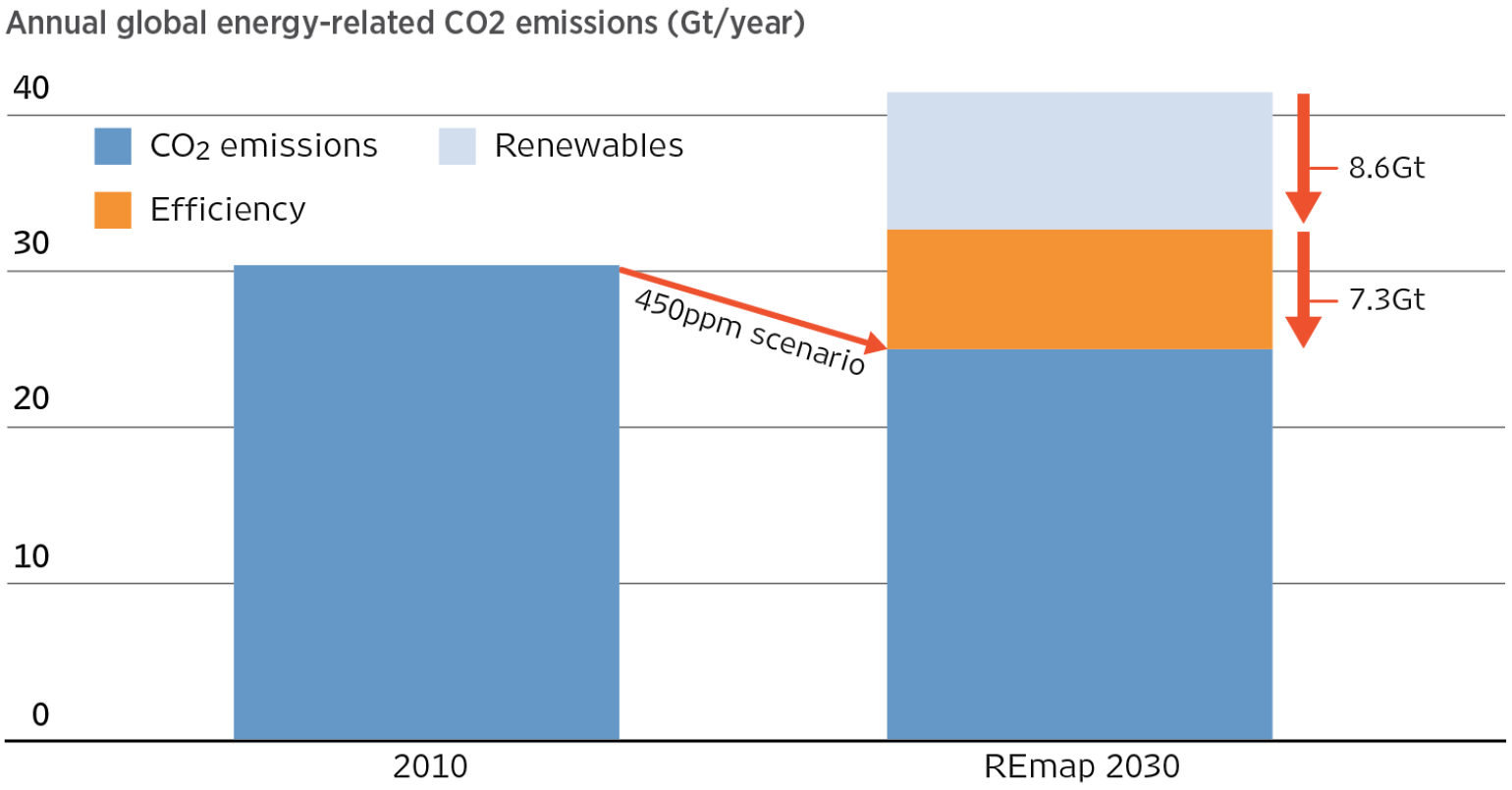
REmap 2030
A Renewable Energy Roadmap
International Renewable Energy Agency



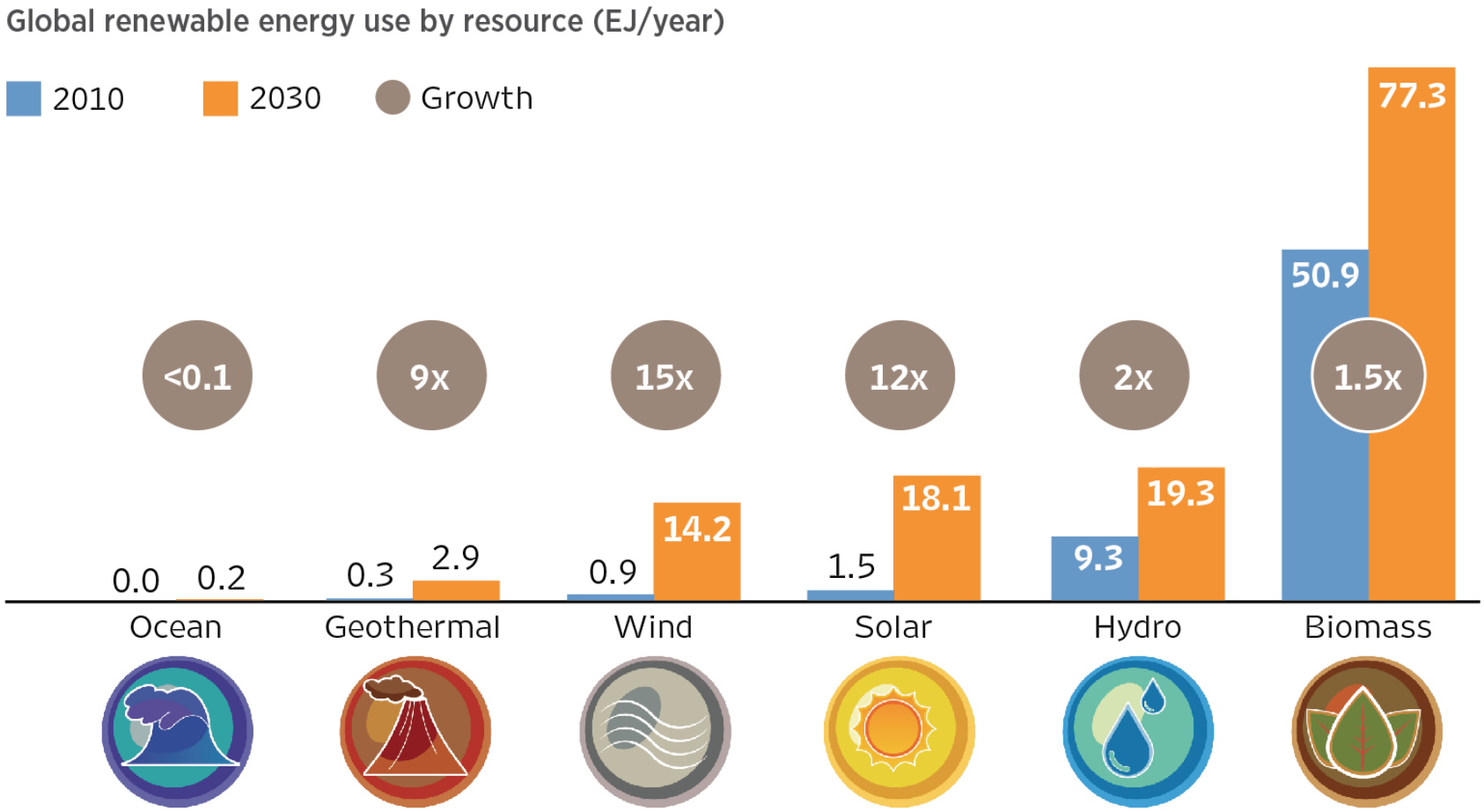
source: IRENA

Doubling the share of renewable energy implies a tripling of the share of modern renewables.

With Renewables + Efficiency we can achieve a 450ppm Path

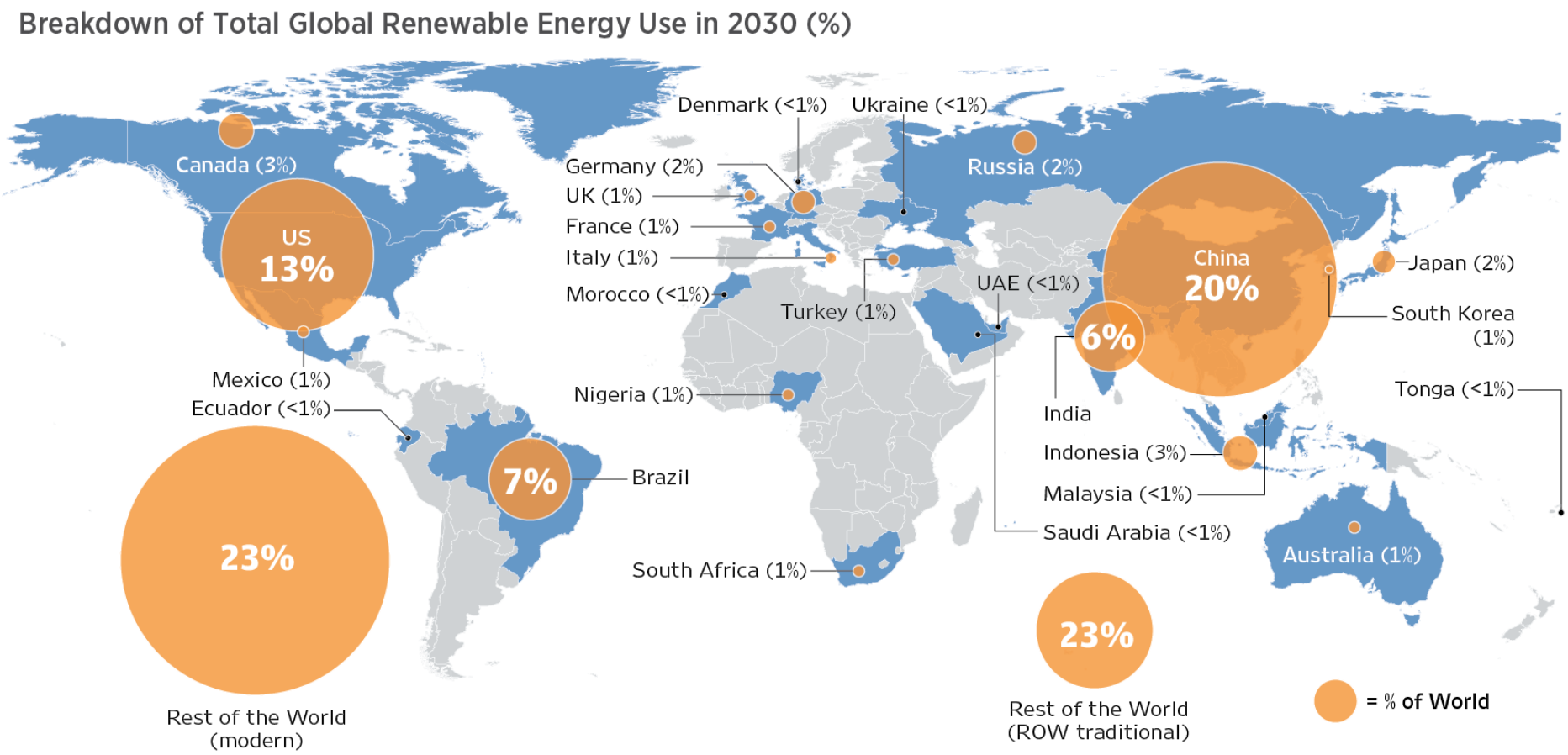


Scaling-up All Renewable Energy Sources

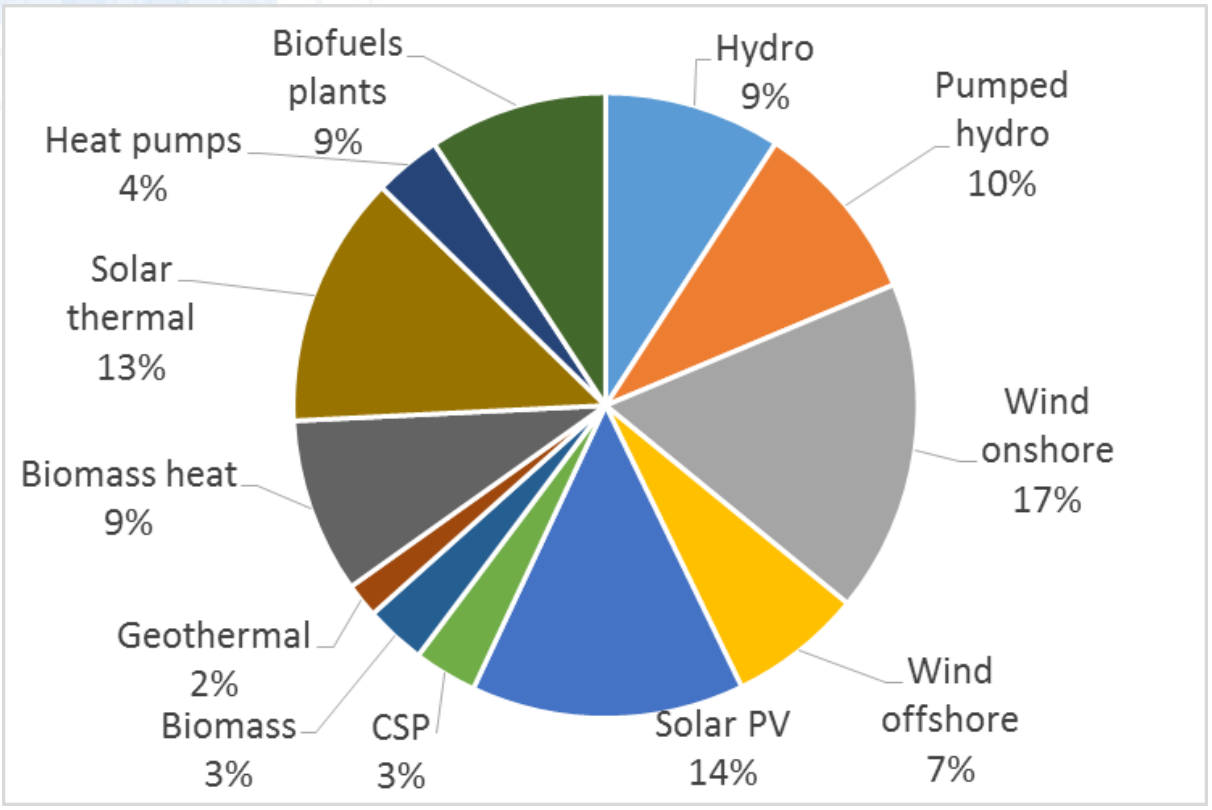


Total Renewable Energy consumption in REmap 2030: 132 EJ/yr

REMAP 2030 RE energy shares



Large and sustained financing needs



Quadrupling modern RE use: average investment ~USD 550 bn/year to 2030

Annual system costs in 2030 allowing for externalities: *SAVINGS* of ~USD 230-740 bn/year!

IRENA'S
PV PARITY INDICATORS

PV Parity Indicators

- Tracks quarterly competiveness
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- Target audience are policy makers and thought leaders
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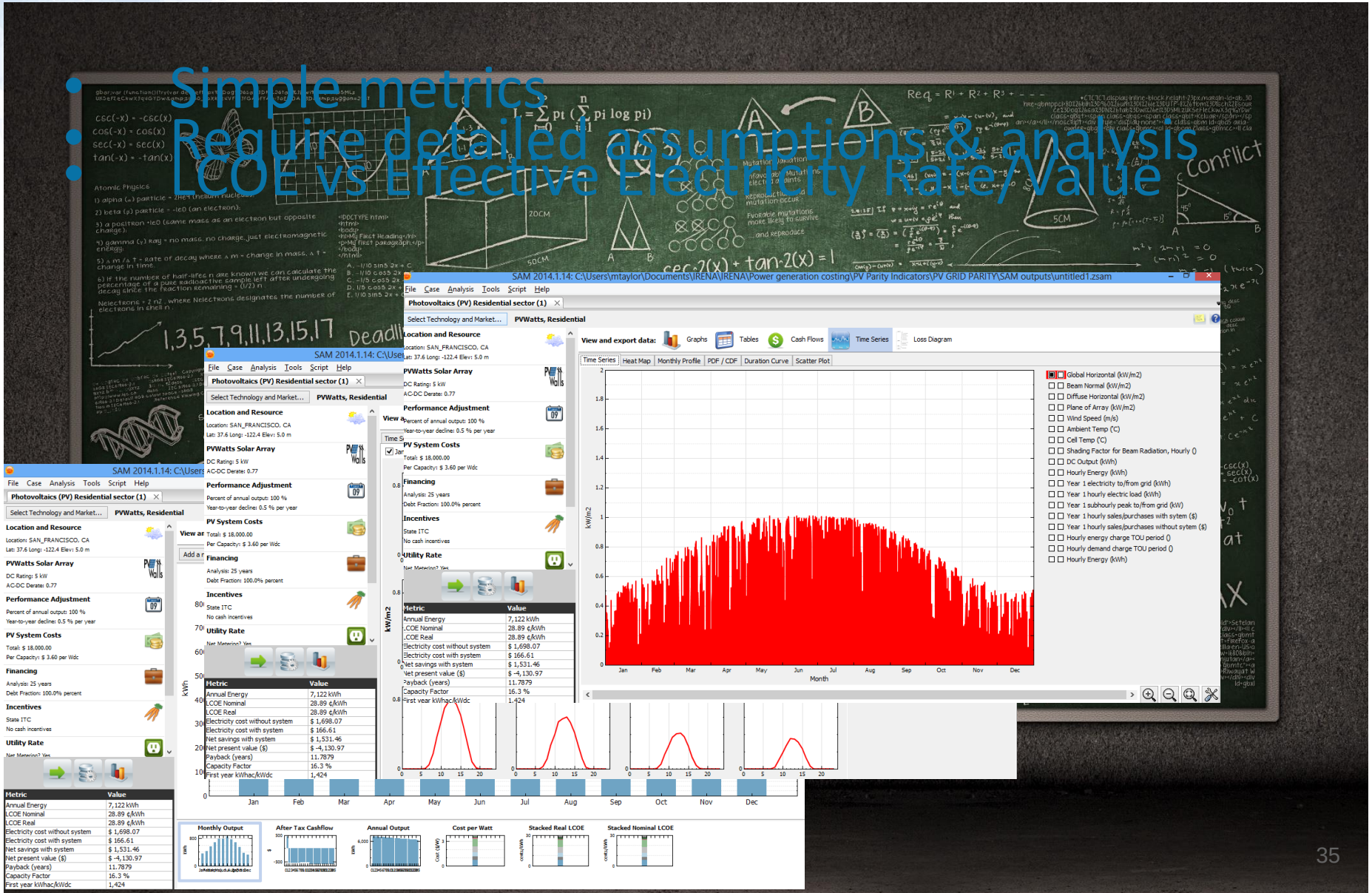
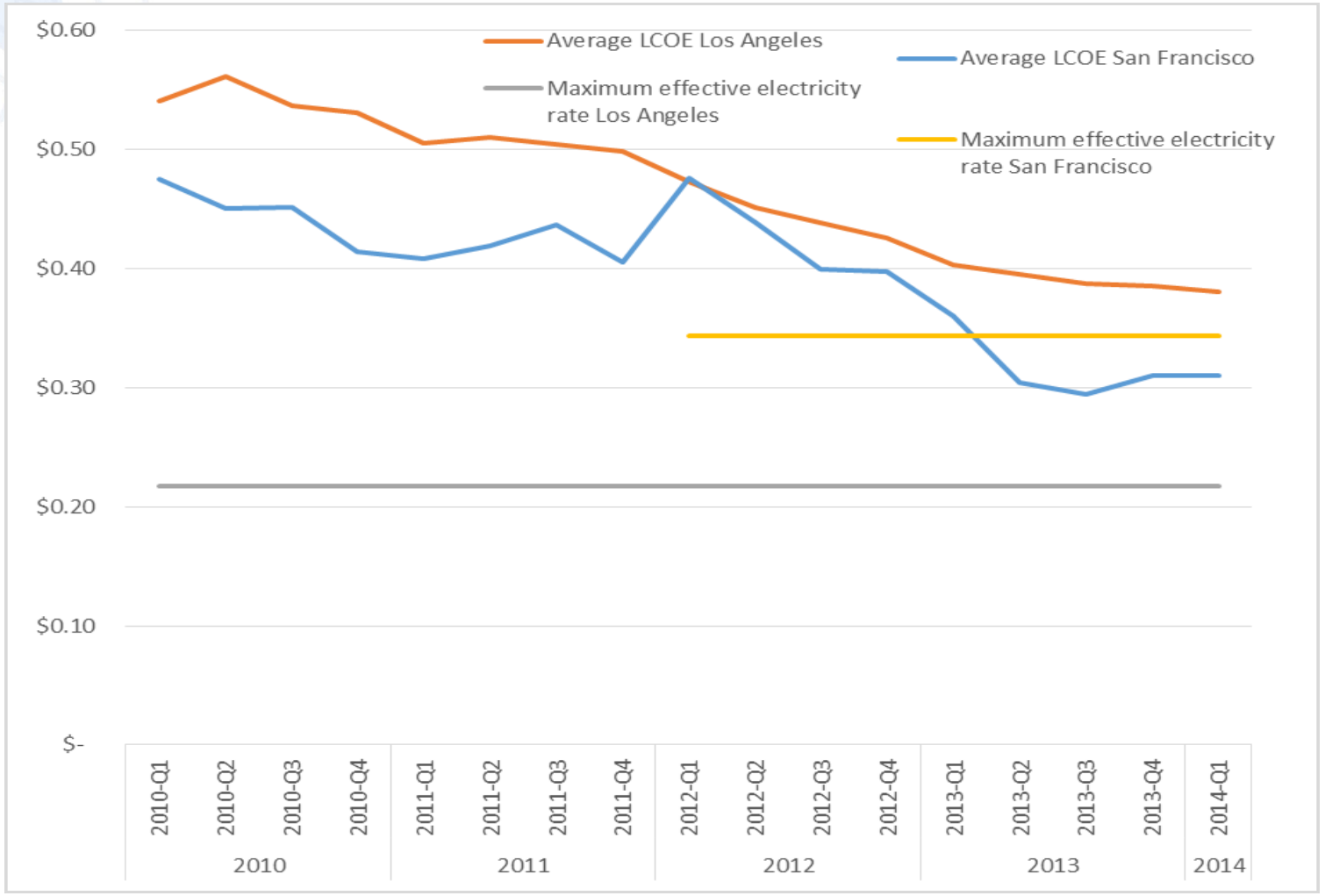
Methodology

- Simple metrics
- Require detailed assumptions & analysis
- LCOE vs Effective Electricity Rate/Value

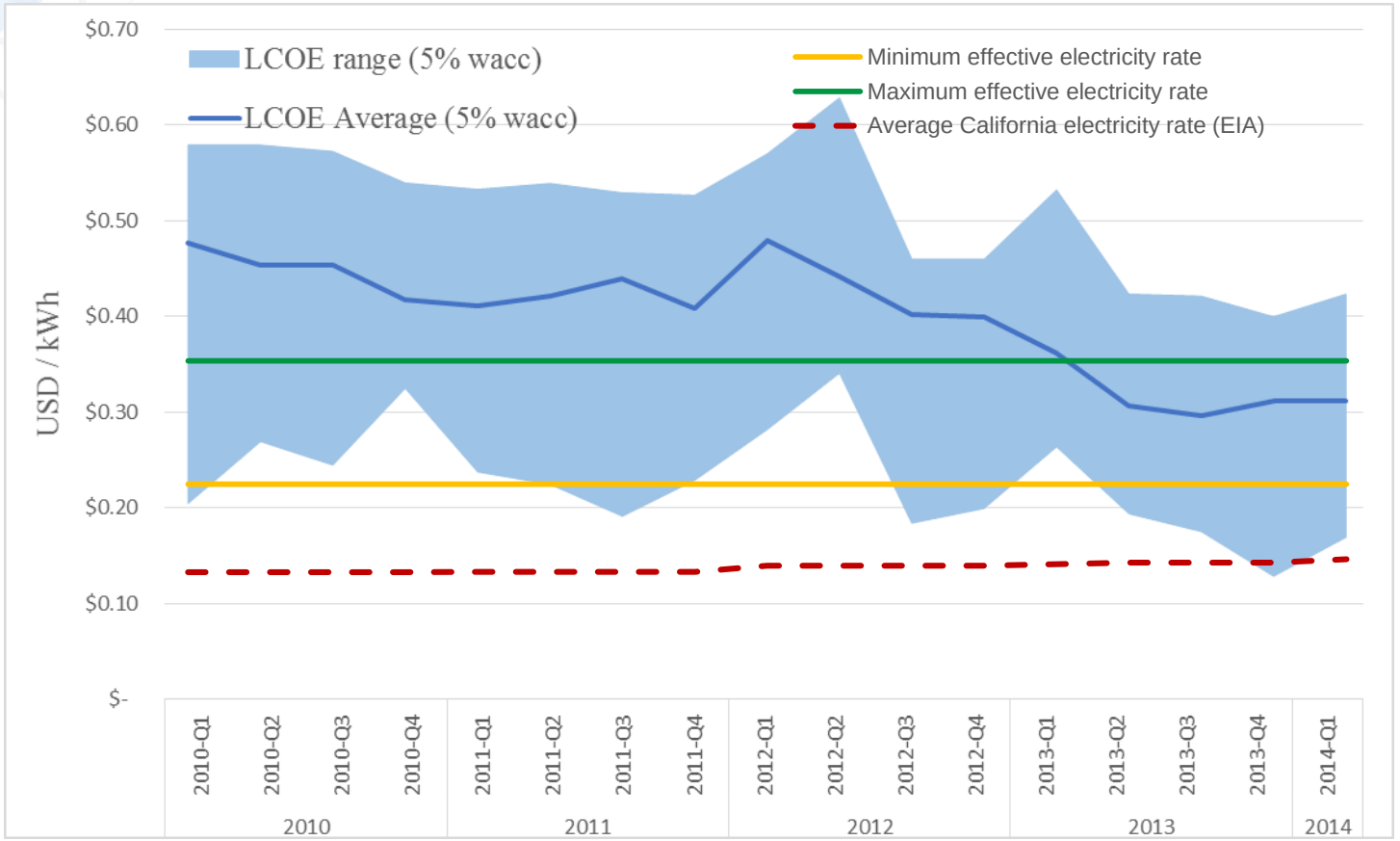


Residential PV Parity: A nuanced story



Recent module price reductions make solar PV competitive

Residential PV Parity: San Francisco



Installed cost variation by city

Consistently wide variation in installed costs, why?

IRENA's PV cost analysis

Transparent data

Simple methodology

Timely and policy re

IRENA's PV Cost Analysis

Bringing Our Future Forward