



Global Solar Council

Global Context for Solar Energy Today

Bruce Douglas
Chairman

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Overview



- Solar industry collaboration
- Tipping point – energy transition
- Dramatic cost reduction
- Stable and positive policy framework
- Economic development tool
- Long-term growth trends



Solar industry collaboration

A strong global network of solar leadership

IRENA Renewable Energy Day, COP21, Paris, France



Founding Association Members



Founding Corporate Members



HERAEUS



GSC Mission and Principal Objectives



*The Global Solar Council's mission is to **encourage the rapid and wide-scale adoption of solar energy** through cooperation, education and training, supported by:*

- Developing actionable policy recommendations for intergovernmental organizations;
- Opening new markets and growing existing markets;
- Building partnerships with key intergovernmental organizations and international institutions, e.g., IRENA, CEM, ISA and REN21;
- Expanding local capacity; and
- Promoting standards, best practices, quality initiatives and sustainability



Tipping point – energy transition



Record Growth in 2016

- The global solar market had a record year in 2015, with total demand of 55 GW, 10 GW more than 2014.*
- 2016 is set to be another record year for solar globally, with the market set to grow by 43% to 73 GW.*
- China leads global demand in 2016 at 26.4 GW.*
- The U.S. is the second-largest market for solar in 2016 at 14.5 GW, bolstered by record installations tied to the previously expected expiration of the Investment Tax Credit, recently extended.*

***Global Solar Demand Monitor Executive Summary, Q3 2016, www.gtmresearch.com**

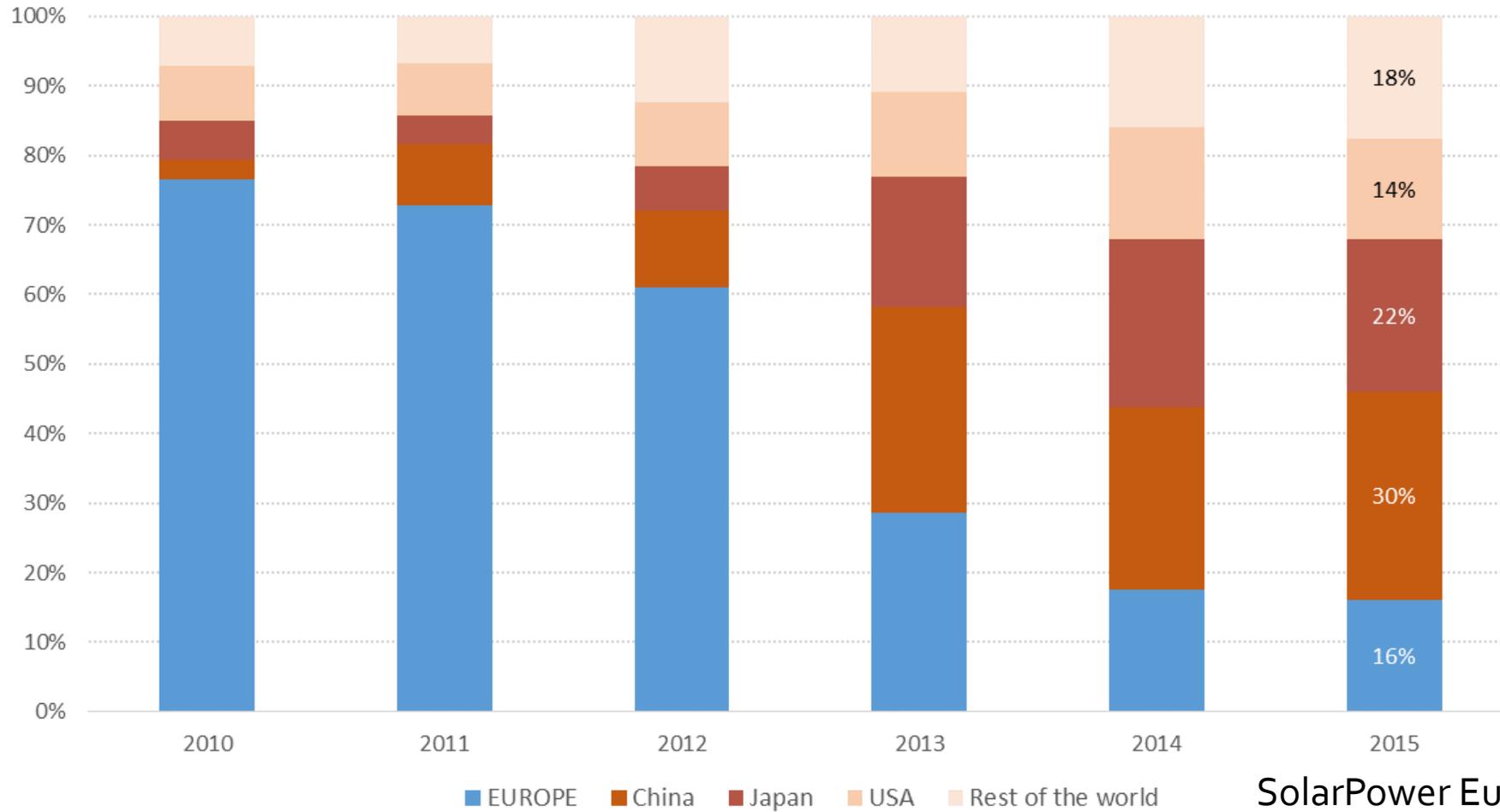
Global Demand, and Supply, Are Diversifying



- Large-scale solar auctions and net metering programs are picking up beyond the current top three markets.*
- India currently has a 25GW solar project pipeline.*
- Mexico's solar market is also growing rapidly.
- Several new manufacturing commitments and openings in Southeast Asia (Jinko, Talesun, Trina), India (JA Solar, Trina), Brazil (Canadian Solar) and the United States (SolarCity).

***Global Solar Demand Monitor Executive Summary, Q3 2016, www.gtmresearch.com**

Emerging markets



SolarPower Europe 2016

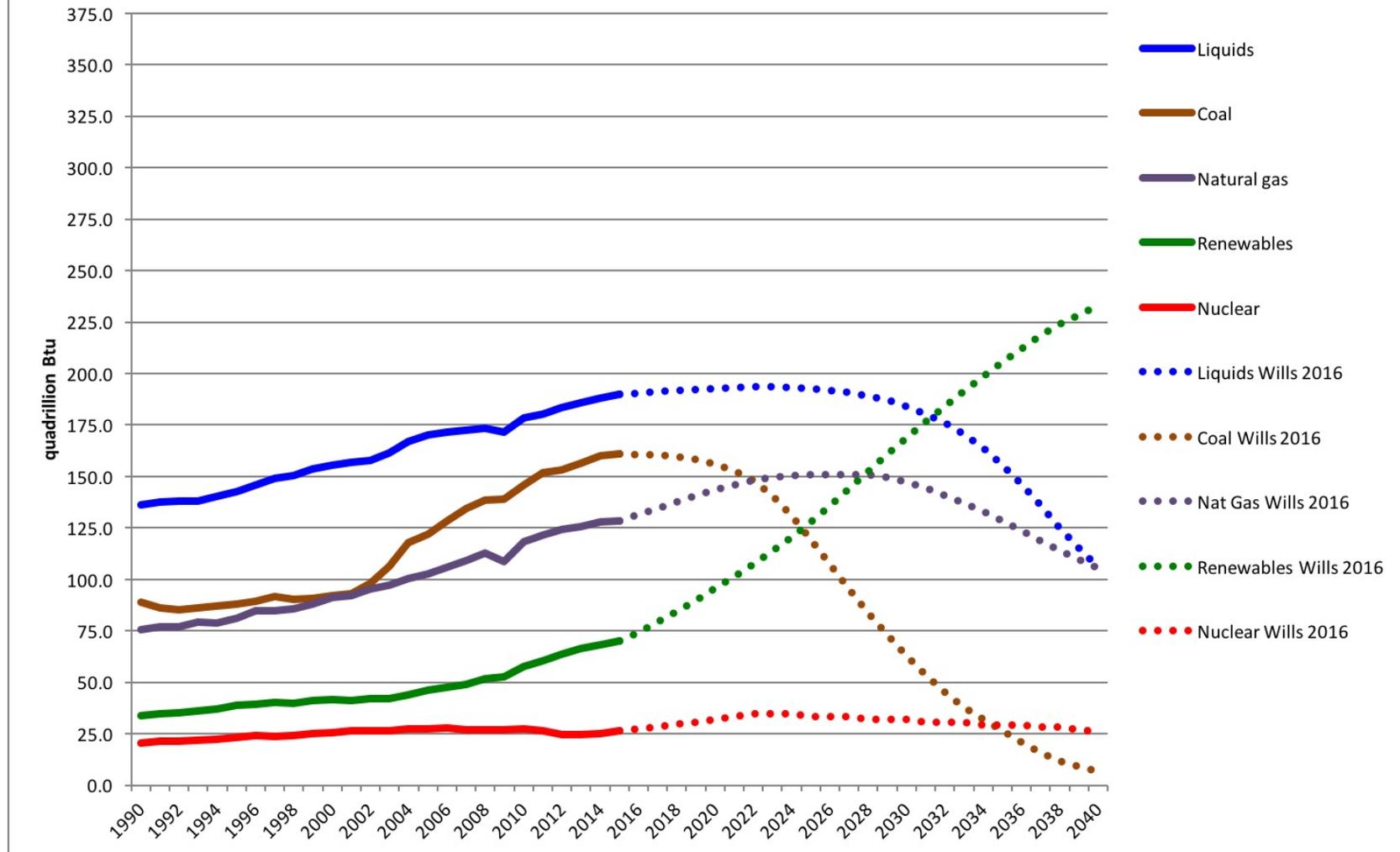
EVOLUTION OF ANNUAL PV GRID CONNECTIONS 2010 - 2015

Tipping point – energy transition



World energy consumption by fuel type, 1990-2040 (quadrillion Btu)

Actual: US EIA data 1990-2015 & forecast Chart @ProfRayWills Jun16





Dramatic cost reductions

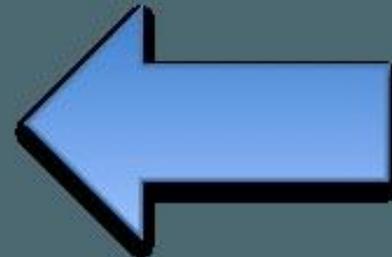
Downward price spiral – economies of scale



More solar installed



It makes more sense
for people to install solar

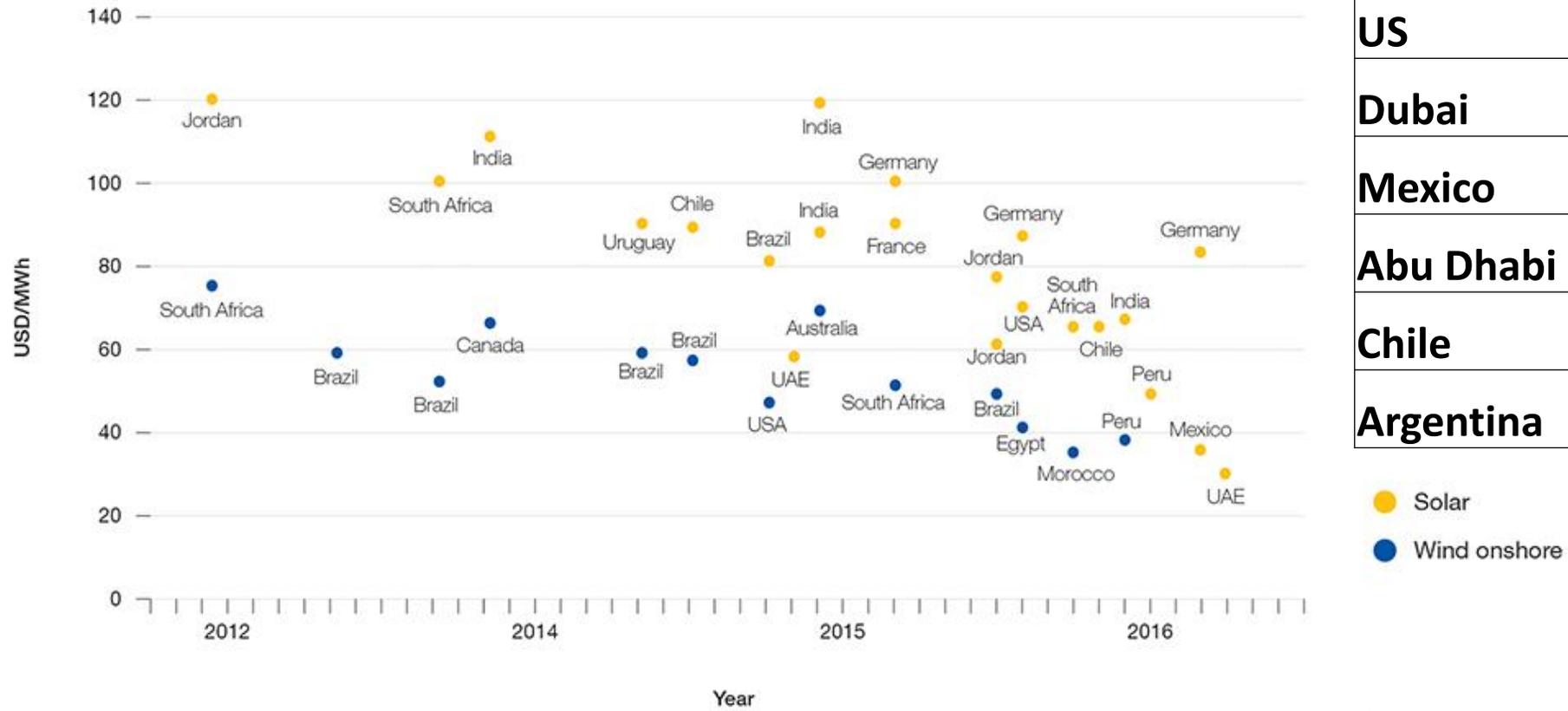


Prices go down



LCOE reductions

FIGURE 1 PPA PRICE OFFERS FOR SOLAR PV AND WIND ONSHORE POWER PLANTS IN DIFFERENT COUNTRIES



Location	\$/MWh
US	38
Dubai	29
Mexico	35
Abu Dhabi	24
Chile	29
Argentina	59

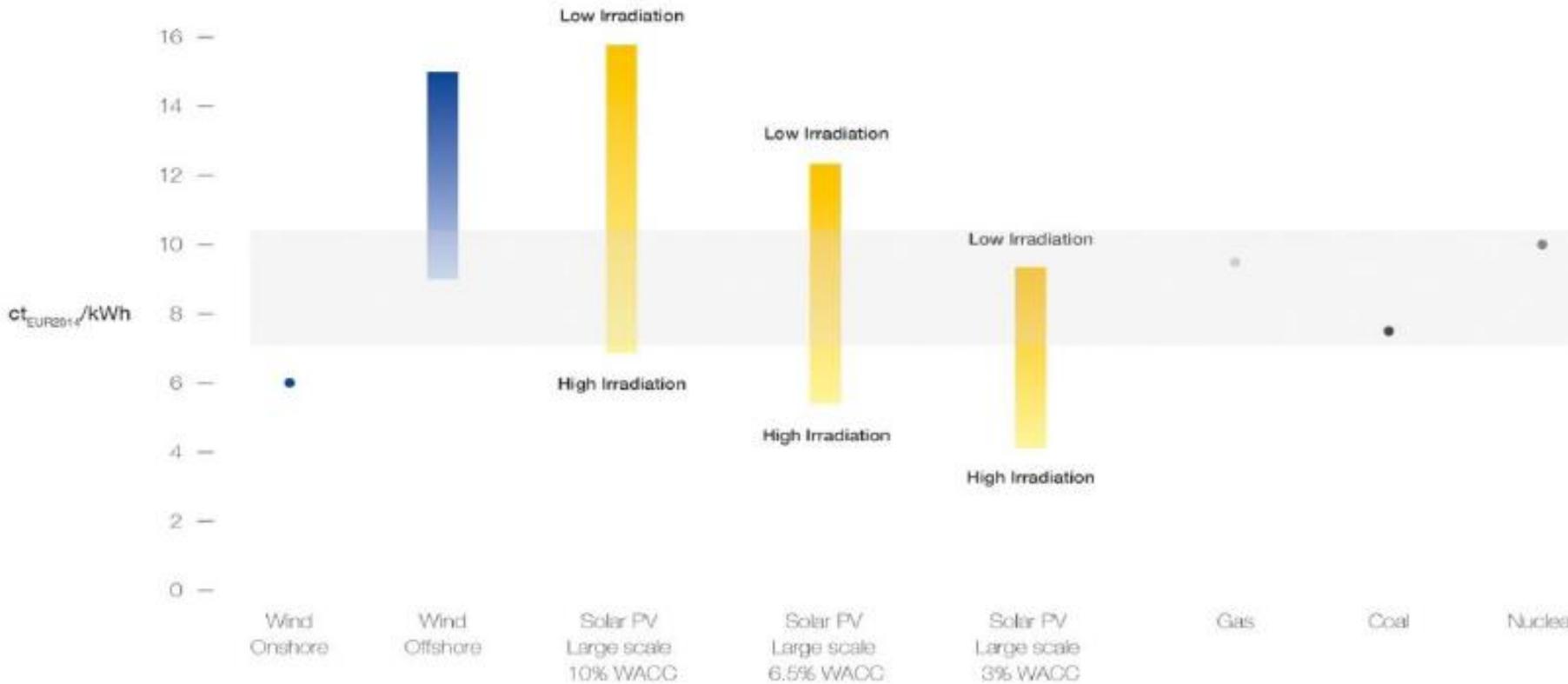
SOURCE: International Energy Agency 2016

SolarPower Europe 2016



Cheapest power source (1 of 2)

The levelised costs of solar power and wind are already in the same range as conventional fuels today, even without taking into account the external costs to society



Sources:
Solar Photovoltaic Large Scale: Agora Energiewende - LCDE Model. Wind: IRENA. Gas, Coal, Nuclear: Ecofys.

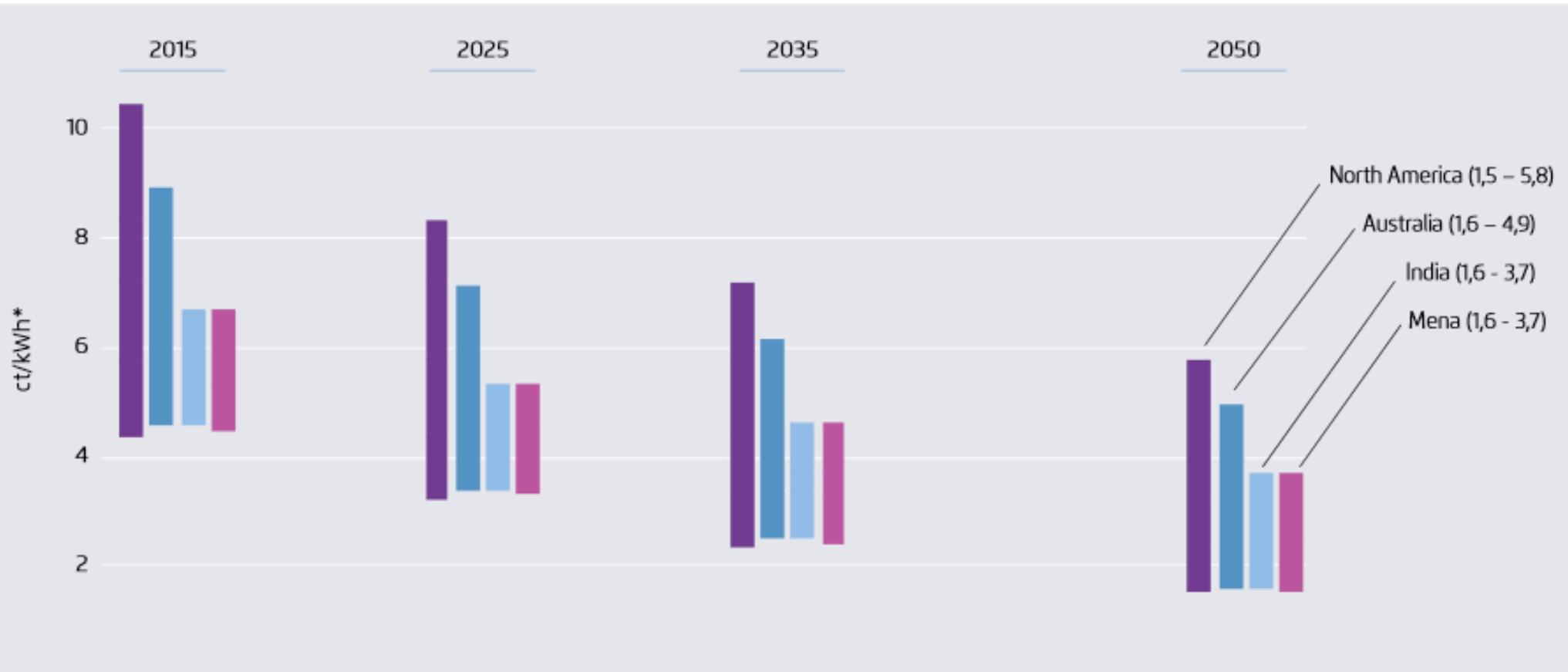
SolarPower Europe 2016

Cheapest power source (2 of 2)



Cost of electricity from new solar power plants in North America, Australia, India and Mena region*

Figure E5

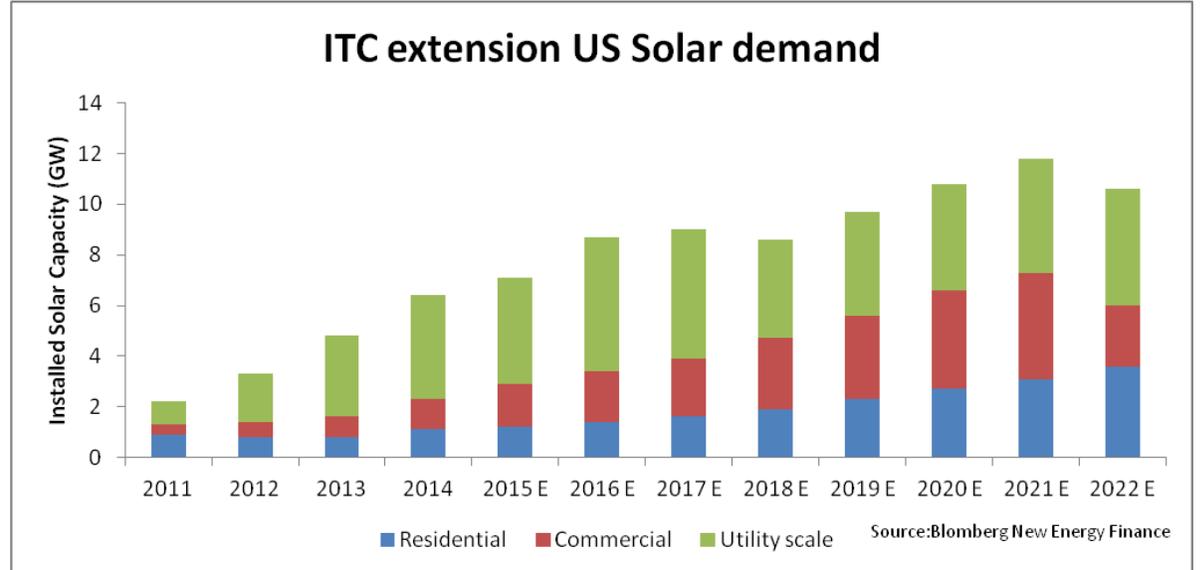
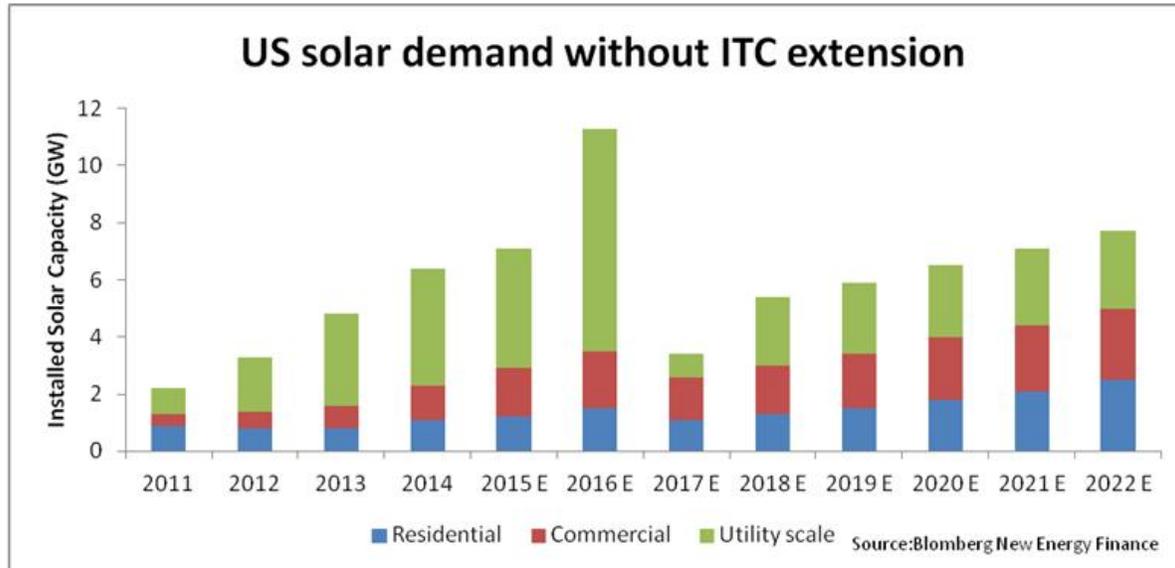


* Real values EUR 2014; full load hours based on [27], investment cost bandwidth based on different scenarios of market, technology and cost development; assuming 5% (real) weighted average cost of capital.



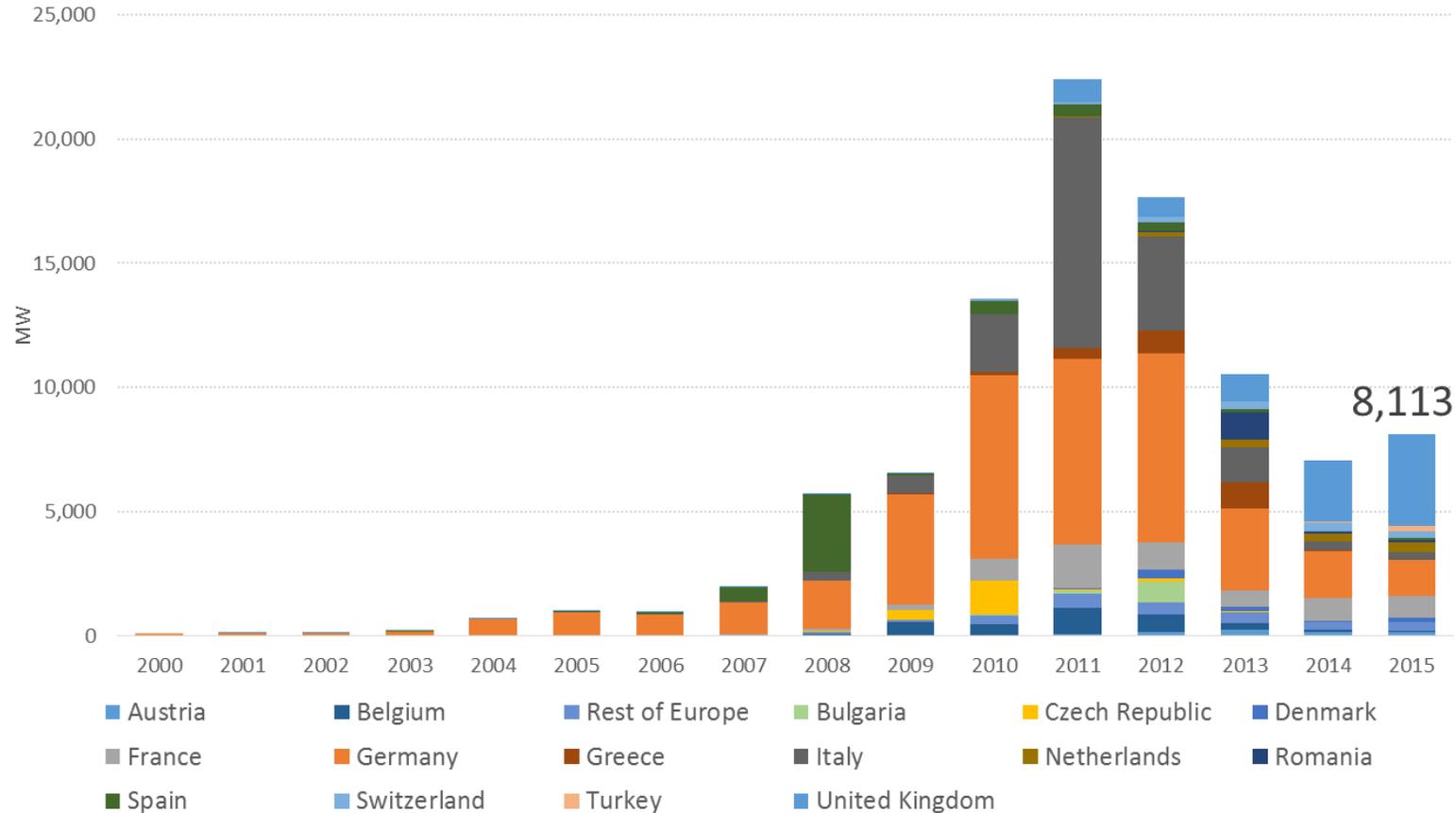
Stable and positive policy frameworks

Stable and positive policy frameworks



Stable policies deliver stable and sustainable growth

Stable and positive policy frameworks



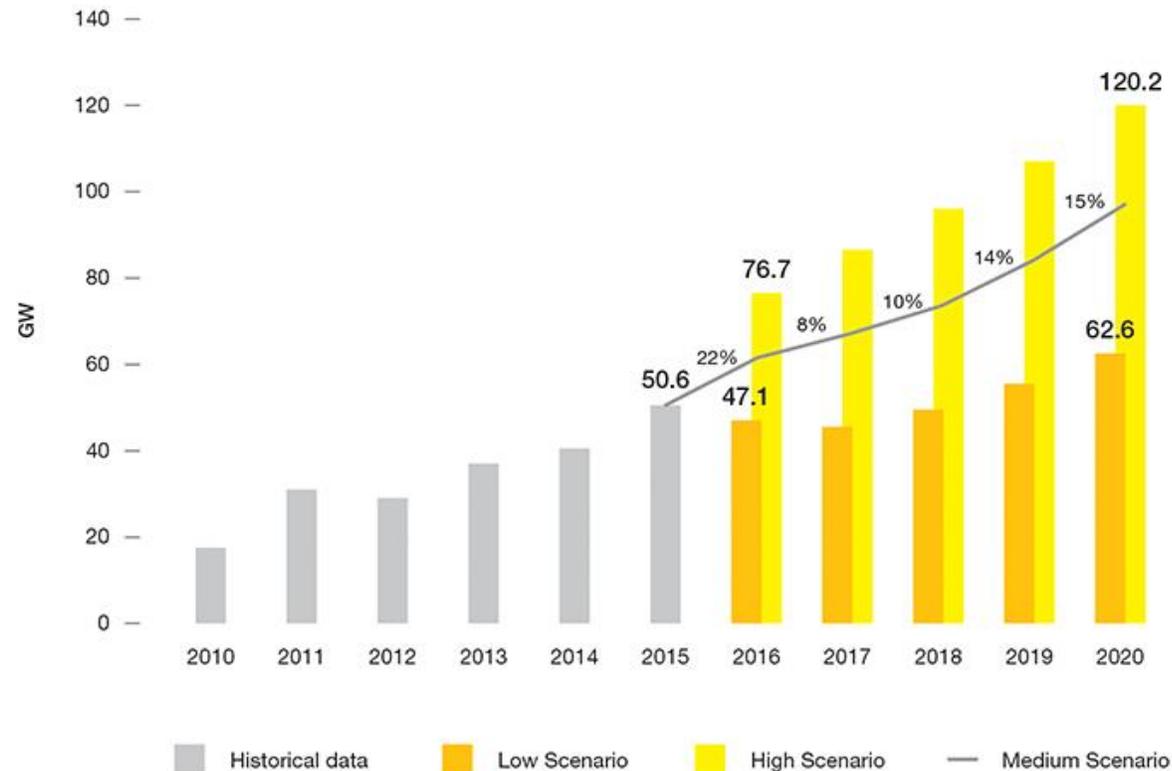
SolarPower Europe 2016

Unstable and negative solar policies in Spain, Italy and UK have delivered boom and bust development and investor insecurity

Stable and positive policy frameworks



FIGURE 8 GLOBAL ANNUAL SOLAR PV MARKET SCENARIOS UNTIL 2020



SolarPower Europe 2016

The difference between the high scenario (122GW installed in 2020) and the low scenario (63GW) is mainly policy support



Economic development tool

JOBS IN RENEWABLE ENERGY



Jobs in solar :

- 2.8 Million in 2015
- 10 Million by 2030

Table 1. Estimated Direct and Indirect Jobs in Renewable Energy Worldwide, by Industry

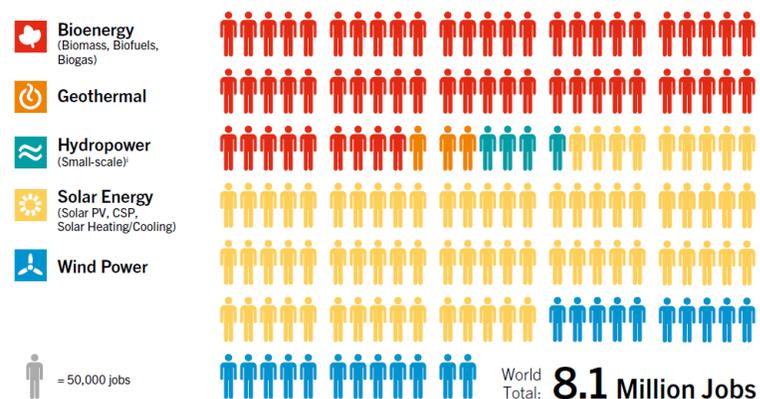
	World	China	Brazil	United States	India	Japan	Bangladesh	European Union ⁱ		
								Germany	France	Rest of EU
THOUSAND JOBS										
☀️ Solar PV	2,772	1,652	4	194	103	377	127	38	21	84
🔥 Liquid biofuels	1,678	71	821 ^c	277 ^d	35	3		23	35	47
🌬️ Wind power	1,081	507	41	88	48	5	0.1	149	20	162
☀️ Solar heating / cooling	939	743	41 ^d	10	75	0.7		10	6	19
🌾 Solid biomass ^{a,g}	822	241		152 ^e	58			49	48	214
🔥 Biogas	382	209			85		9	48	4	14
💧 Hydropower (small) ^h	204	100	12	8	12		5	12	4	31
🌋 Geothermal energy ^g	160			35		2		17	31	55
☀️ CSP	14			4				0.7		5
Total	8,079^h	3,523	918	769	416	388	141	355^j	170	644^k

Note: Figures provided in the table are the result of a comprehensive review of primary (national entities such as ministries, statistical agencies, etc.) and secondary (regional and global studies) data sources and represent an ongoing effort to update and refine available knowledge. Totals may not add up due to rounding.

^a Power and heat applications (including heat pumps in the case of the EU). ^b Although 10 MW is often used as a threshold, definitions are inconsistent across countries. ^c About 268,400 jobs in sugar cane and 190,000 in ethanol processing in 2014; also includes 200,000 indirect jobs in equipment manufacturing and 162,600 jobs in biodiesel in 2015. ^d Equipment manufacturing and installation jobs. ^e Biomass power direct jobs run to only 15,500. ^f Includes 227,562 jobs for ethanol and 49,486 jobs for biodiesel in 2015. ^g Traditional biomass is not included. ^h The total for 'World' is calculated by adding the individual totals of the technologies, with 3,700 jobs in ocean energy, 11,000 jobs in renewable municipal and industrial waste and 14,000 jobs in others (jobs that cannot be broken down by technology). ⁱ All EU data are from 2014, and the two major EU countries are represented individually. ^j Includes 8,300 jobs in publicly funded R&D and administration; not broken down by technology. ^k Includes 8,000 jobs in renewable municipal and industrial waste and 3,700 jobs in ocean energy.

Source: IRENA

Figure XX. Jobs in Renewable Energy



Source: IRENA

REN21

¹ This sidebar is drawn from IRENA, Renewable Energy and Jobs – Annual Review 2016. Data are principally for 2014–2015, with dates varying by country and technology, including some instances where only dated information is available.

² IRENA defines large-scale hydropower as projects above 10 MW. Definitions may vary across IRENA member countries. Projects below 10 MW are considered as small-scale hydropower.



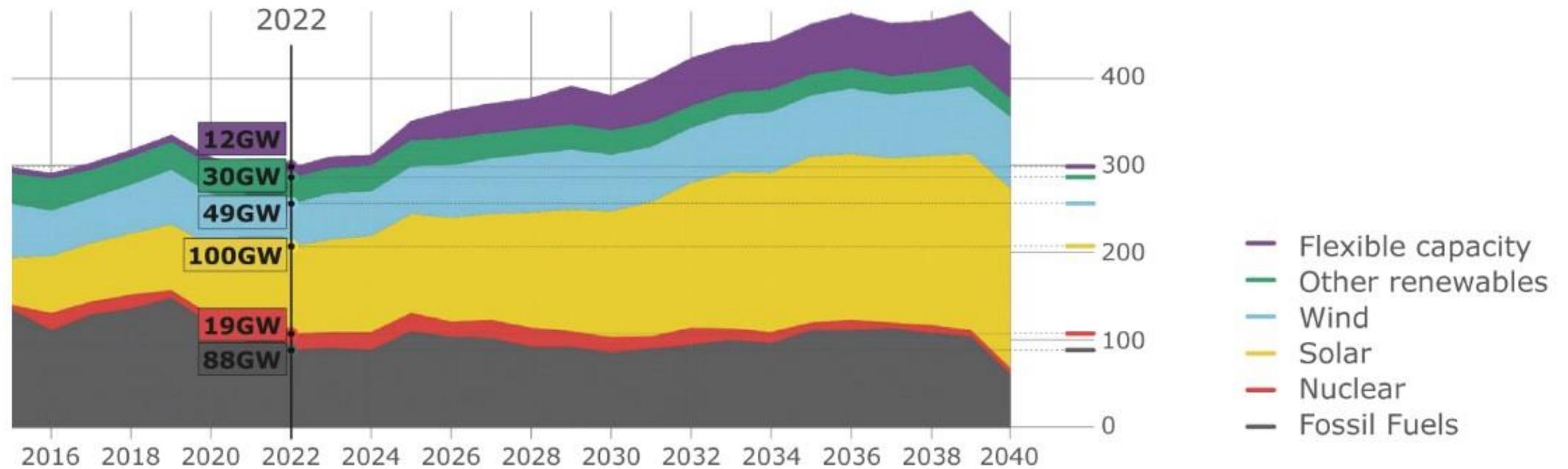
Long-term growth trends



No. 1 Power Source

SOLAR POWER - THE FASTEST GROWING ELECTRICITY SOURCE BY 2022

Global gross annual capacity additions by technology, 2015-2040 (GW)



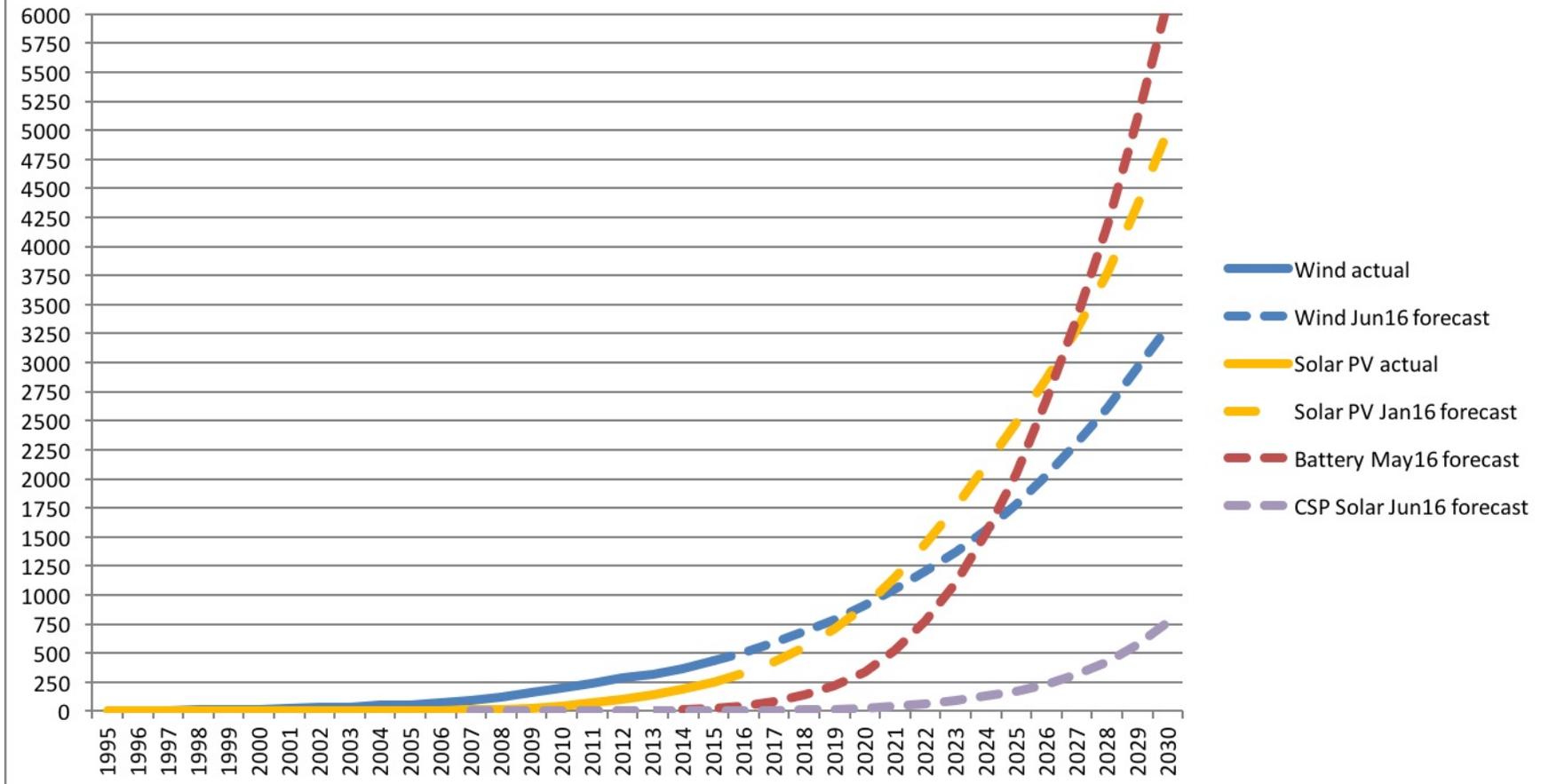
Source: BNEF New Energy Outlook 2015

Growth to 2030 (US EIA)



Global capacity growth 2015 and forecast to 2030

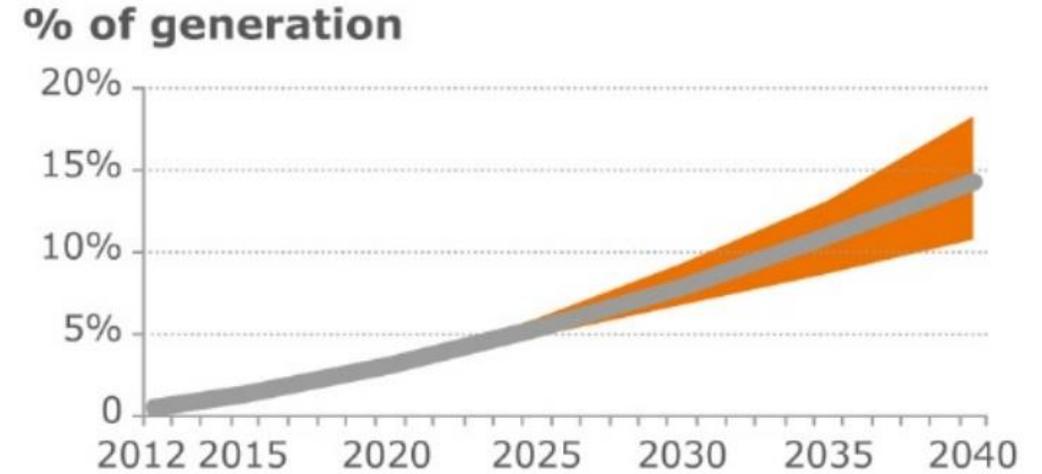
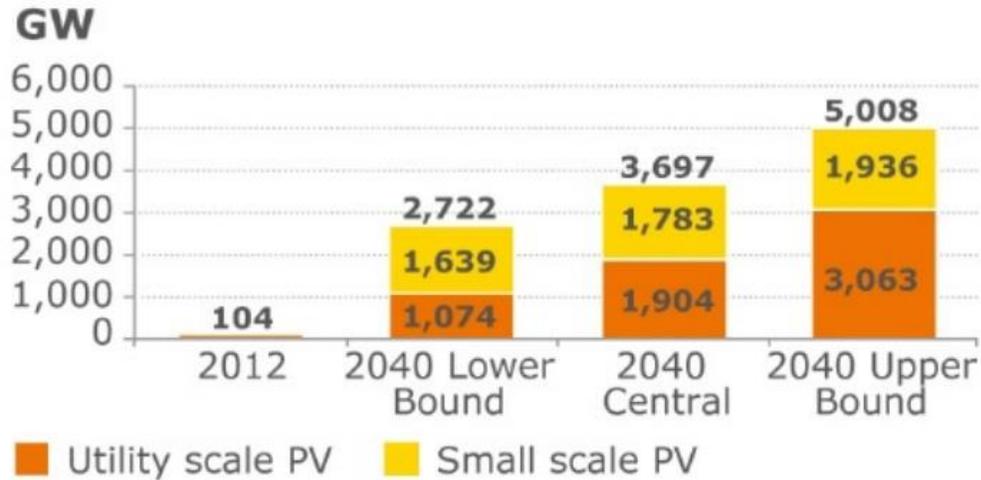
wind, PV, CSP (GW) battery (GWh) actual; forecast @ProfRayWills Data update 3Jun16





Growth to 2040 (BNEF)

THE POTENTIAL OF SOLAR IS HUGE - FORECASTS FOR GLOBAL INSTALLATIONS & PENETRATION



Source: BNEF New Energy Outlook 2015



Growth to 2050 (IEA)

