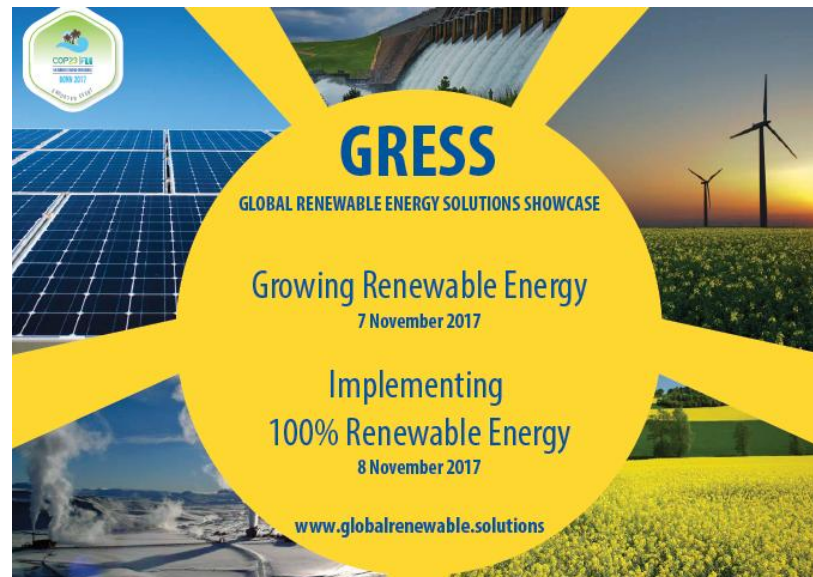


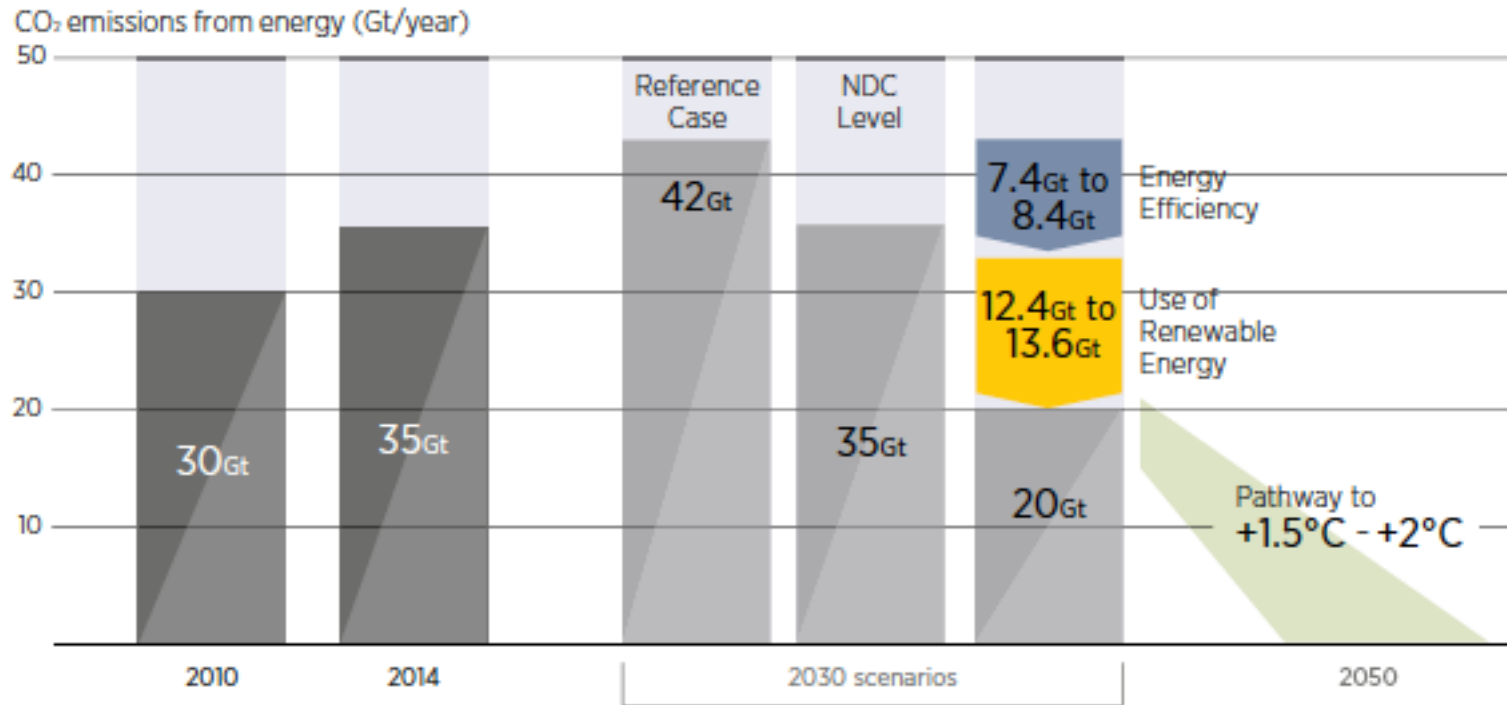
# The Range of Soar Energy Today: Diverse and Multifunctional

Dr. David Renné  
President, International Solar Energy Society  
7 November, 2017



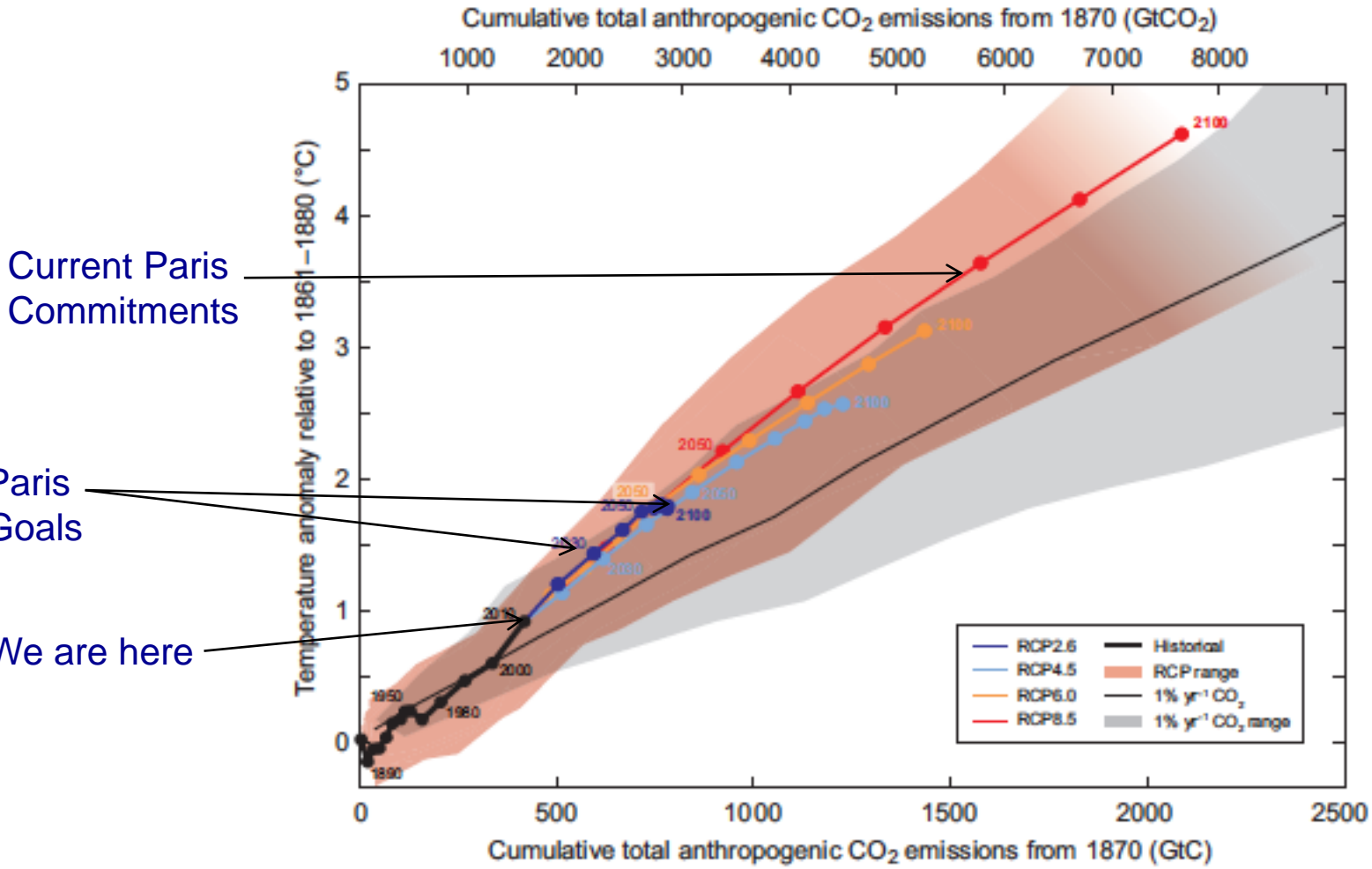
# The Challenge Facing Society...

To limit climate change to +2 °C, cumulative CO<sub>2</sub> emissions must not increase beyond ~1900 GtCO<sub>2</sub> **from now on...**



Source: IRENA, 2016d

# Where will we be by 2100?



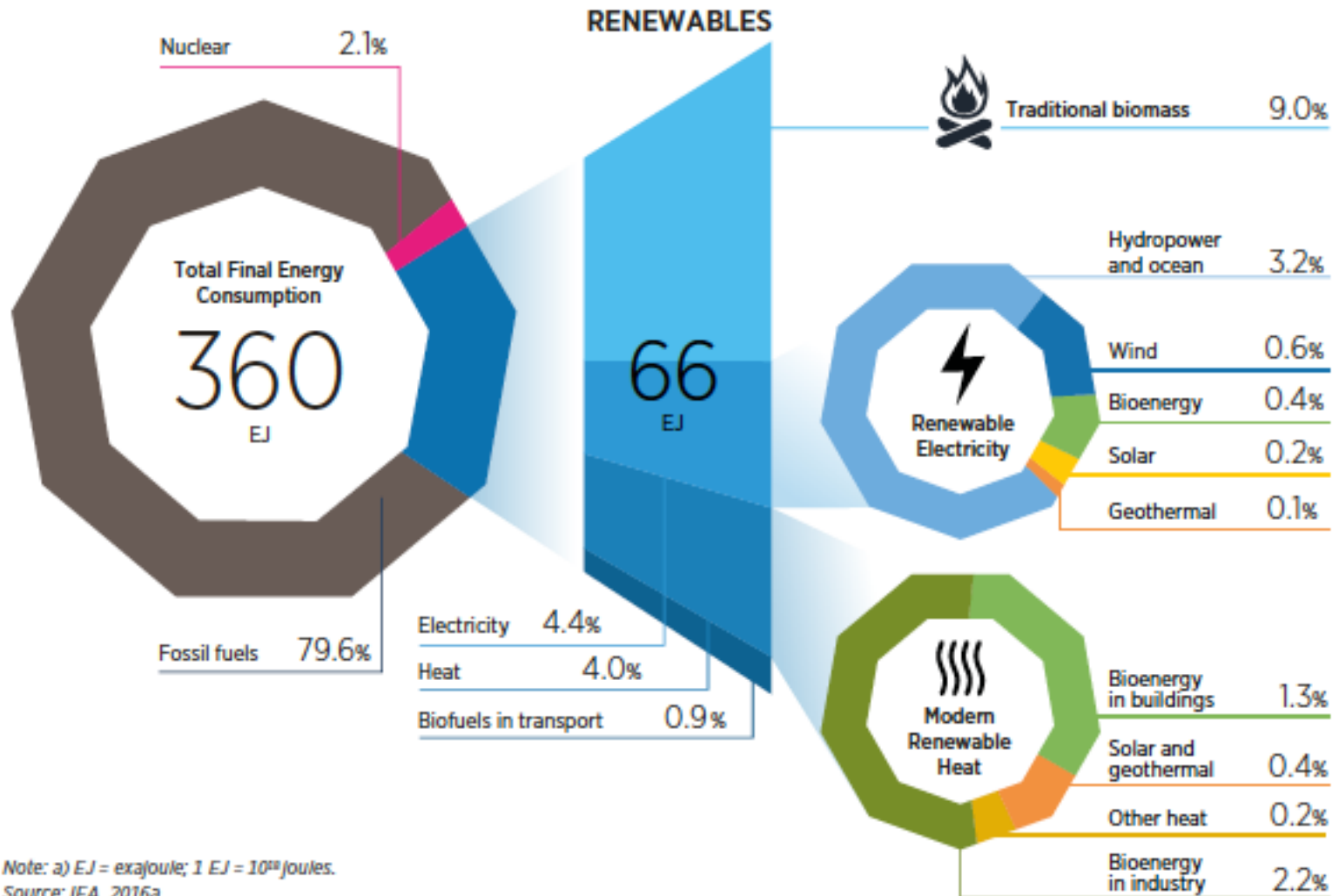
- All end-use energy consumption sectors (power, transport, and heat) must be included
  - Power Sector ~20% and growing rapidly
  - Transport Sector ~ 37%
  - Heat Sector ~43%
- All renewables must work together
- A transformation of our energy system is required
- The transformation is already occurring...

Decarbonising only the Power Sector is insufficient...

...and overall, end use energy consumption only accounts for 65-75% of total GHG emissions

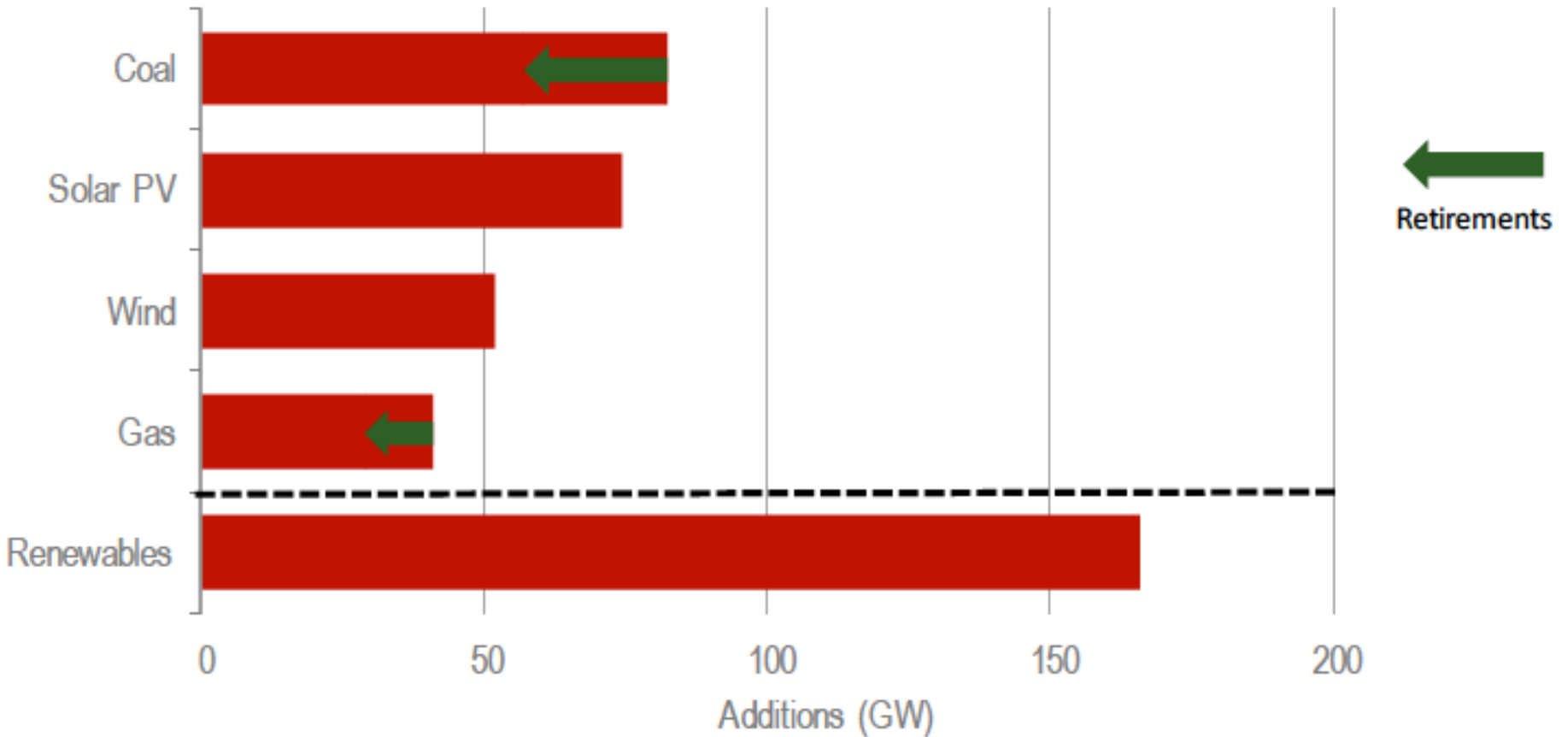
# Total Final Energy Consumption, 2014

1 EJ =  $10^{18}$ J =  $3.6 \times 10^{18}$  kW-hr = 23.8 Mtoe



Note: a) EJ = exajoule; 1 EJ =  $10^{18}$  joules.  
Source: IEA, 2016a

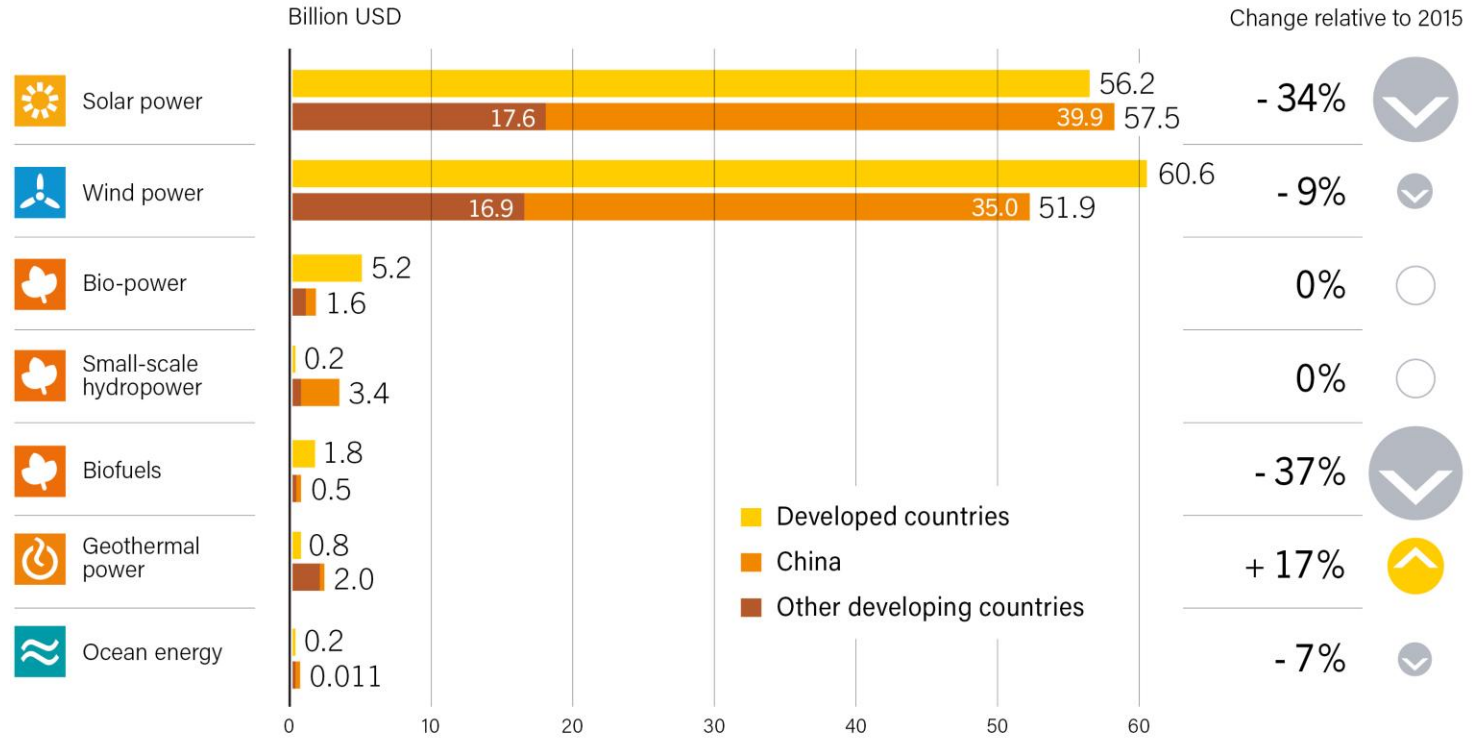
# Power Capacity Additions by Fuel, 2016



Source: IEA Renewables 2017

# Global Investments by Technology

Global New Investment in Renewable Energy by Technology, Developed and Developing Countries, 2016



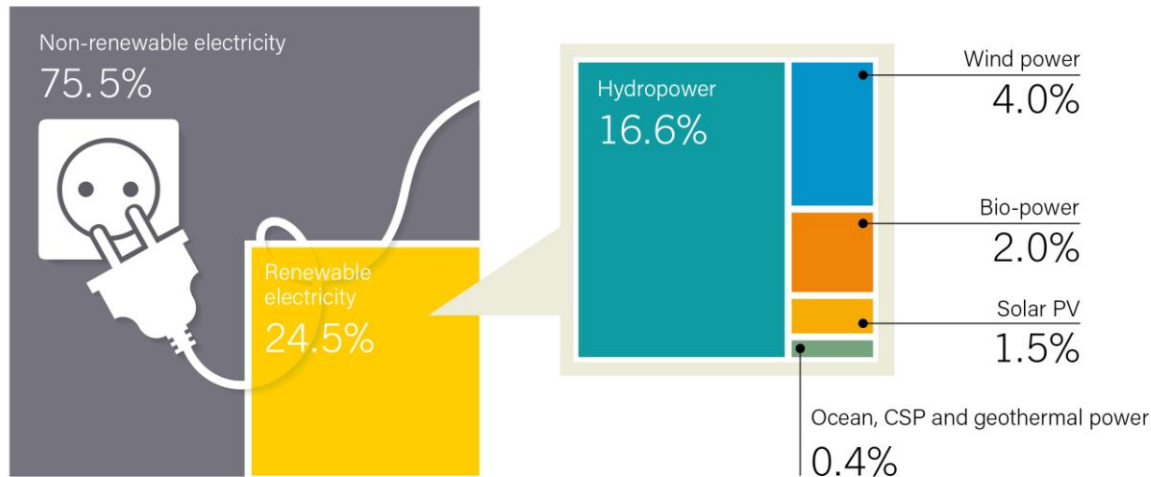
REN21 *Renewables 2017 Global Status Report*



Source: BNEF.

# RE Share of Global Electricity Production

Estimated Renewable Energy Share of Global Electricity Production, End-2016



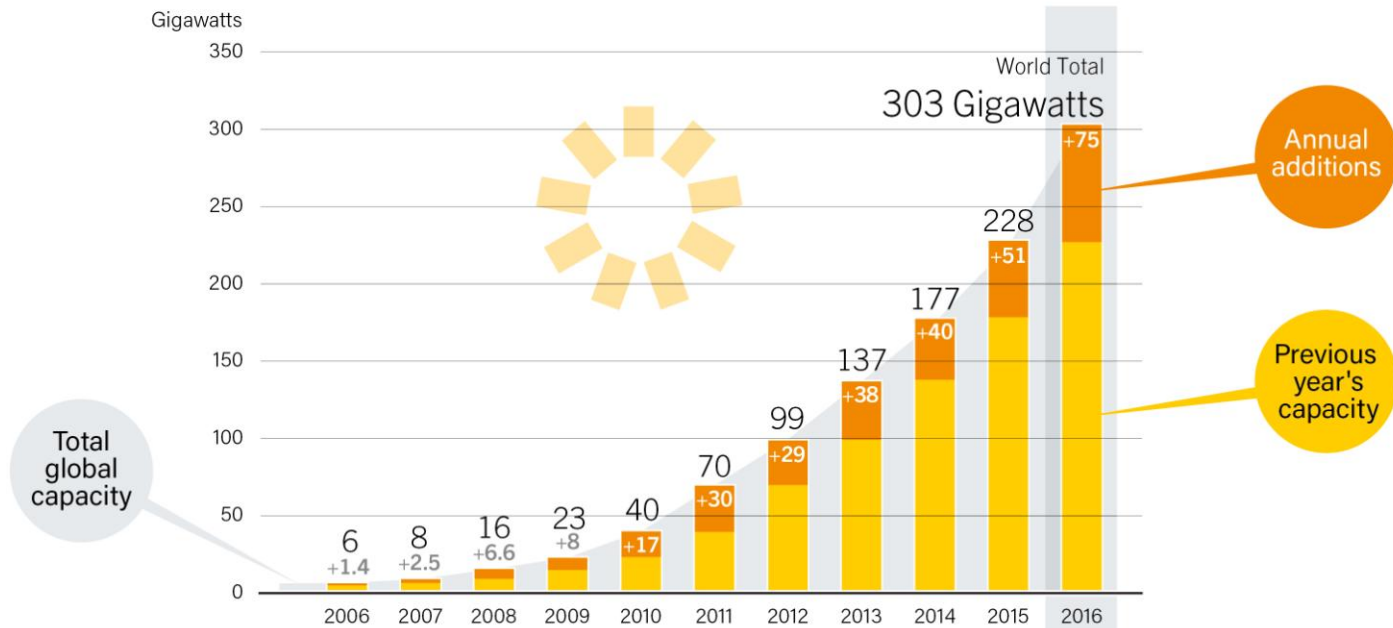
REN21 *Renewables 2017 Global Status Report*

## RE Share Continues to Increase in Power Sector



# Global PV Capacity by 2016

Solar PV Global Capacity and Annual Additions, 2006-2016



REN21 *Renewables 2017 Global Status Report*



Largest 2016 capacity additions: China (46%), U.S. (20%), Japan (11.5%)

**+21 GW<sub>th</sub>**



**Global Capacity at end of 2016 = 456 GW<sub>th</sub>**

Source: "Global Heat Worldwide" as published in REN21 GSR, 2017 ; Photo Credit: NREL Photo Library

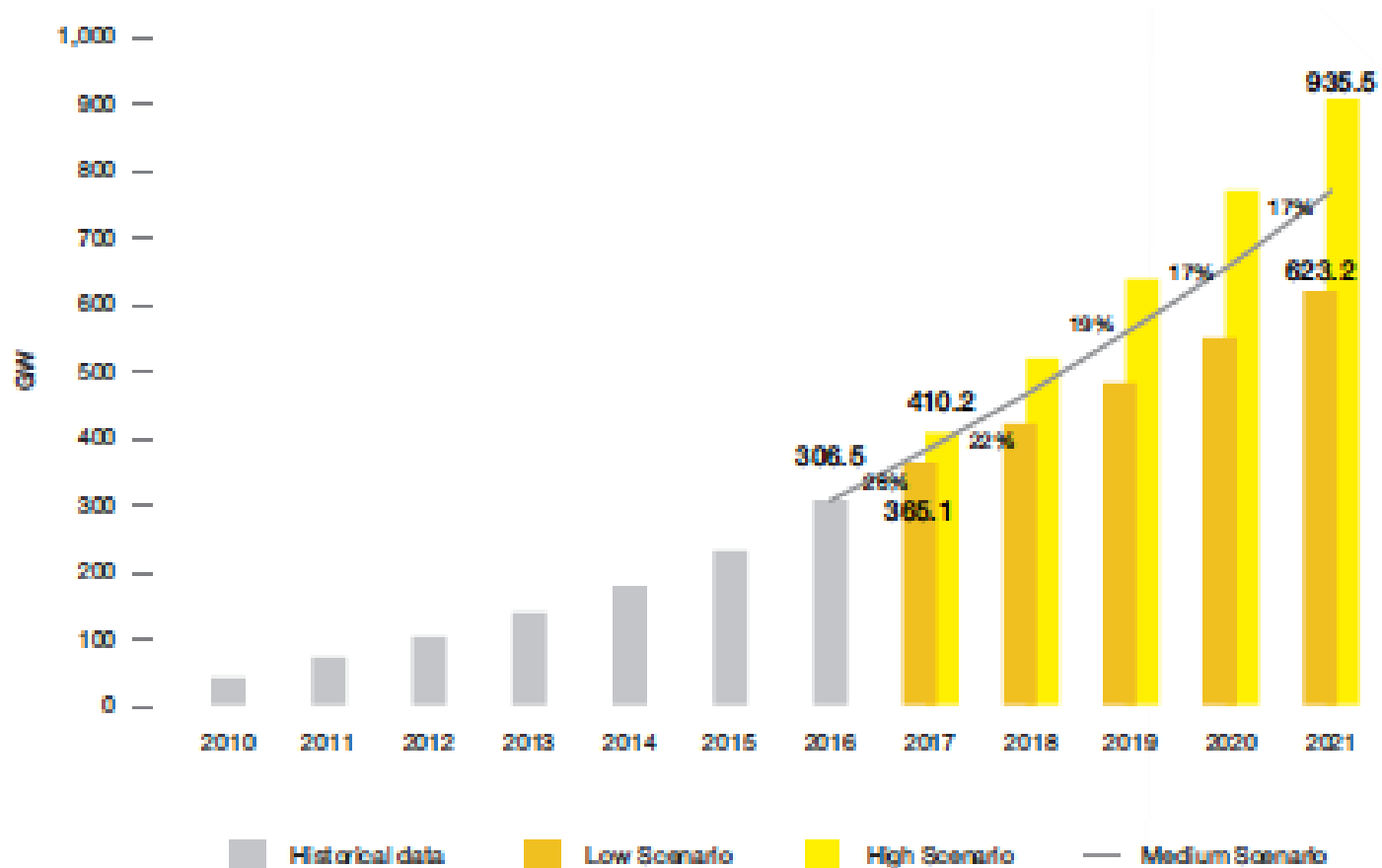
## +0.1 GW



## Global Capacity at end of 2016 = 4.8 GW

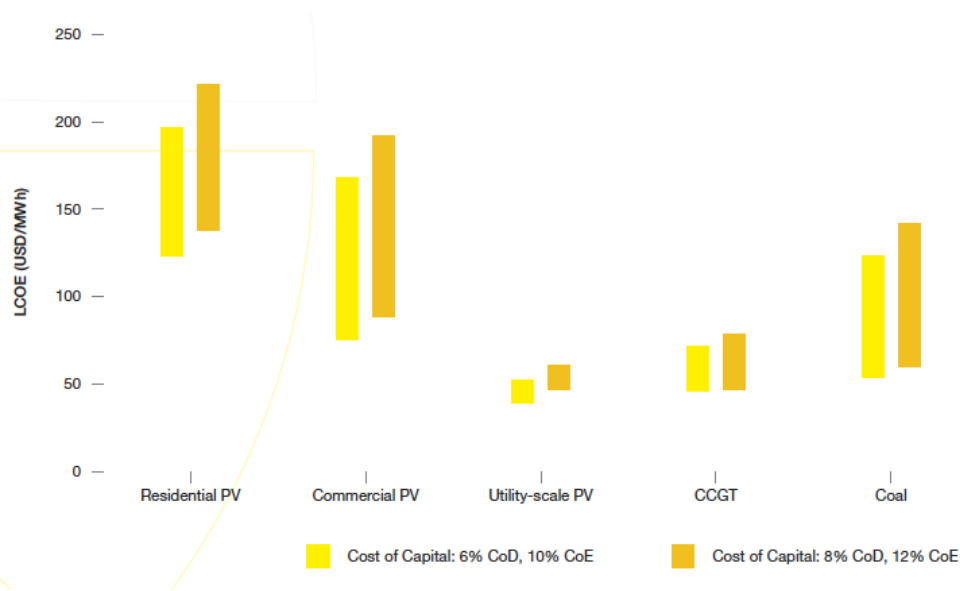
Source: REN21 GSR, 2017; Photo Credit: NREL Photo Library

# Global Solar PV Capacity Projections



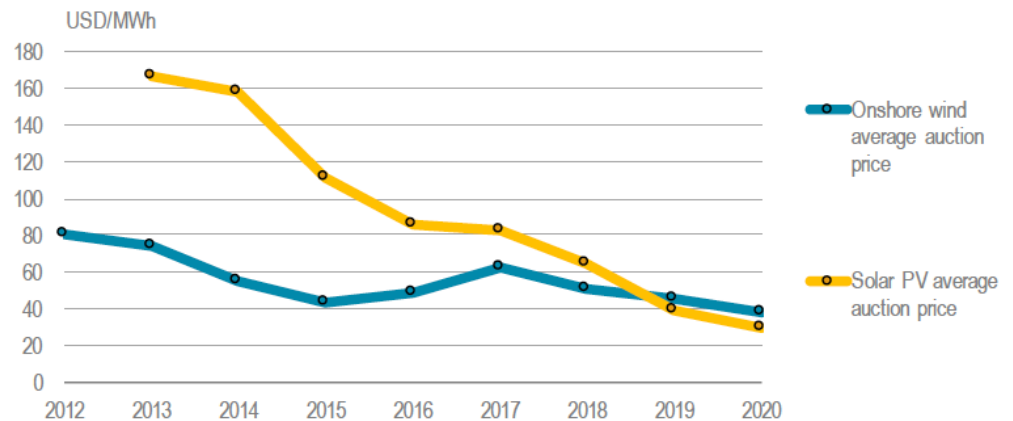
Source: SolarPower Europe Global Market Outlook 2017

# PV is Becoming Competitive with Other Power Generation Technologies



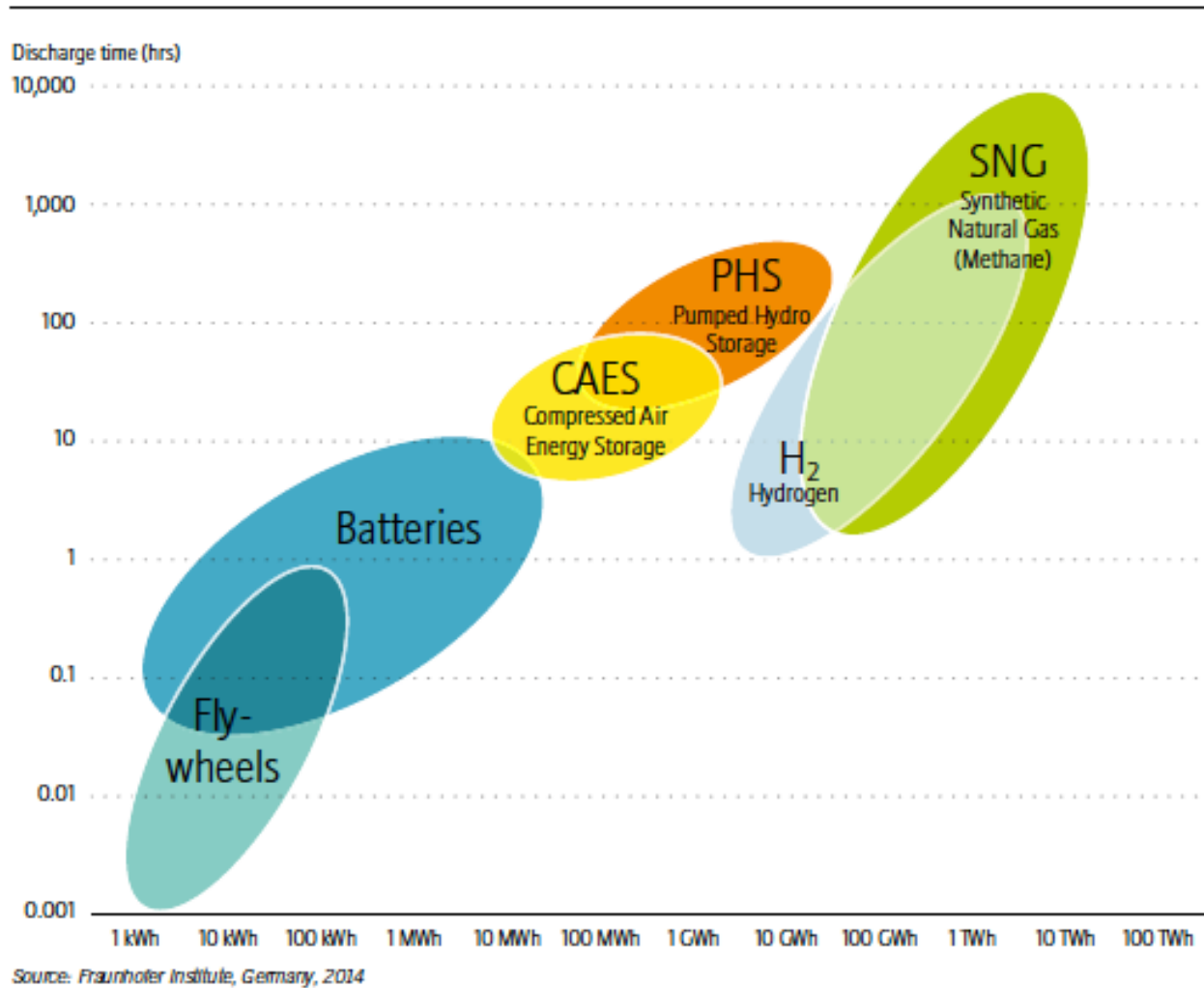
Source: SolarPower Europe Global Market Outlook 2017

Announced wind and solar PV average auction prices by commissioning date



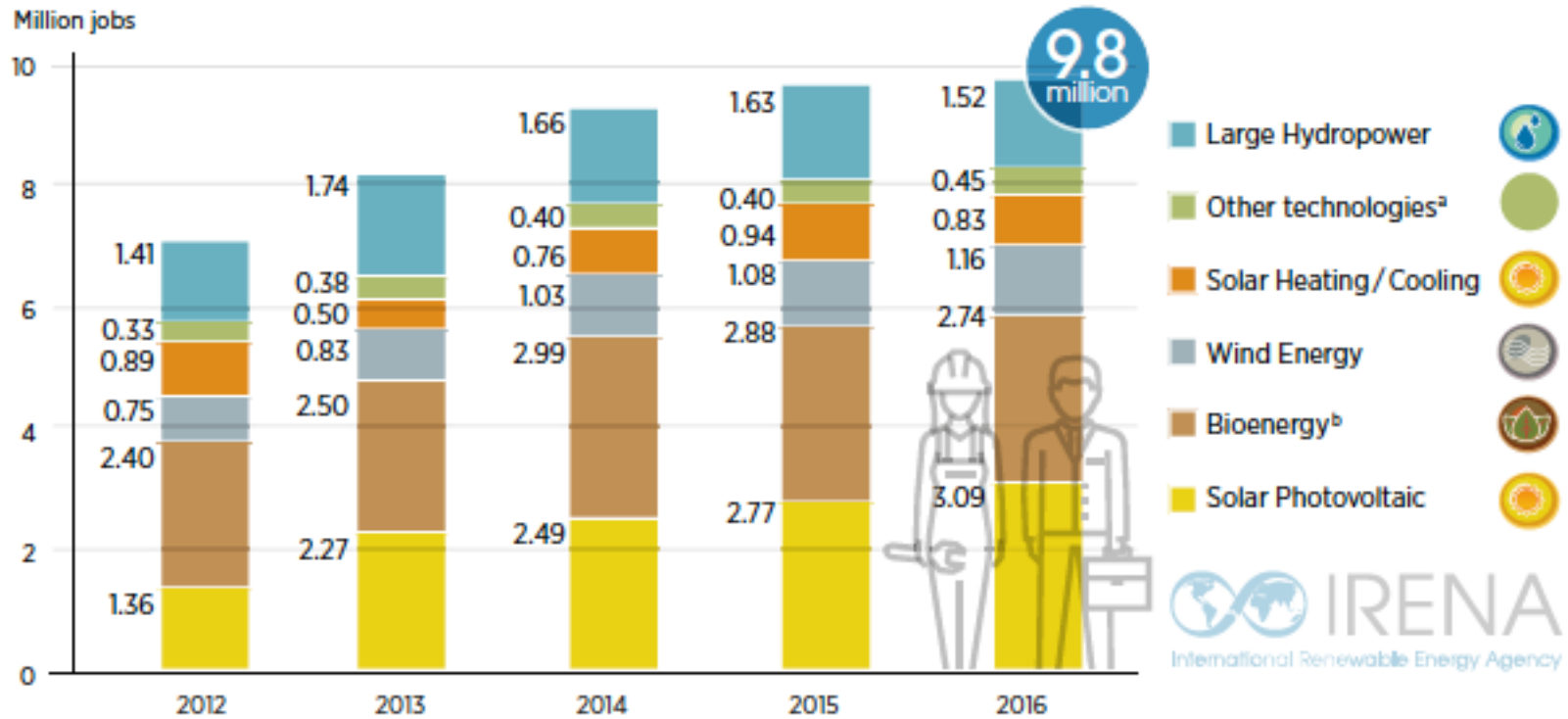
Source: IEA Renewables 2017

# Storage will be Key



Source: REN21 Global Futures Report 2017

# Growth in the Global RE Work Force



Source: IRENA Jobs Report 2017

# The Prospects for 100% Renewables

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- To achieve Paris climate mitigation goals, all energy sector carbon emissions must be eliminated by mid-century
- Notwithstanding climate challenges, RE makes good business sense (jobs, energy access, energy security, community power, etc.)
- 100% Renewables is technically feasible for all end use sectors
  - The electrification sector is growing rapidly
  - All RE technologies work together to support key end-use sectors
- However, challenges remain:
  - Stable and consistent policies
  - “Bankable” Technologies
  - Resiliency in all energy systems



# Thank You!

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