

# **Energy Transition toward Renewables G20, Japan and ASEAN findings**



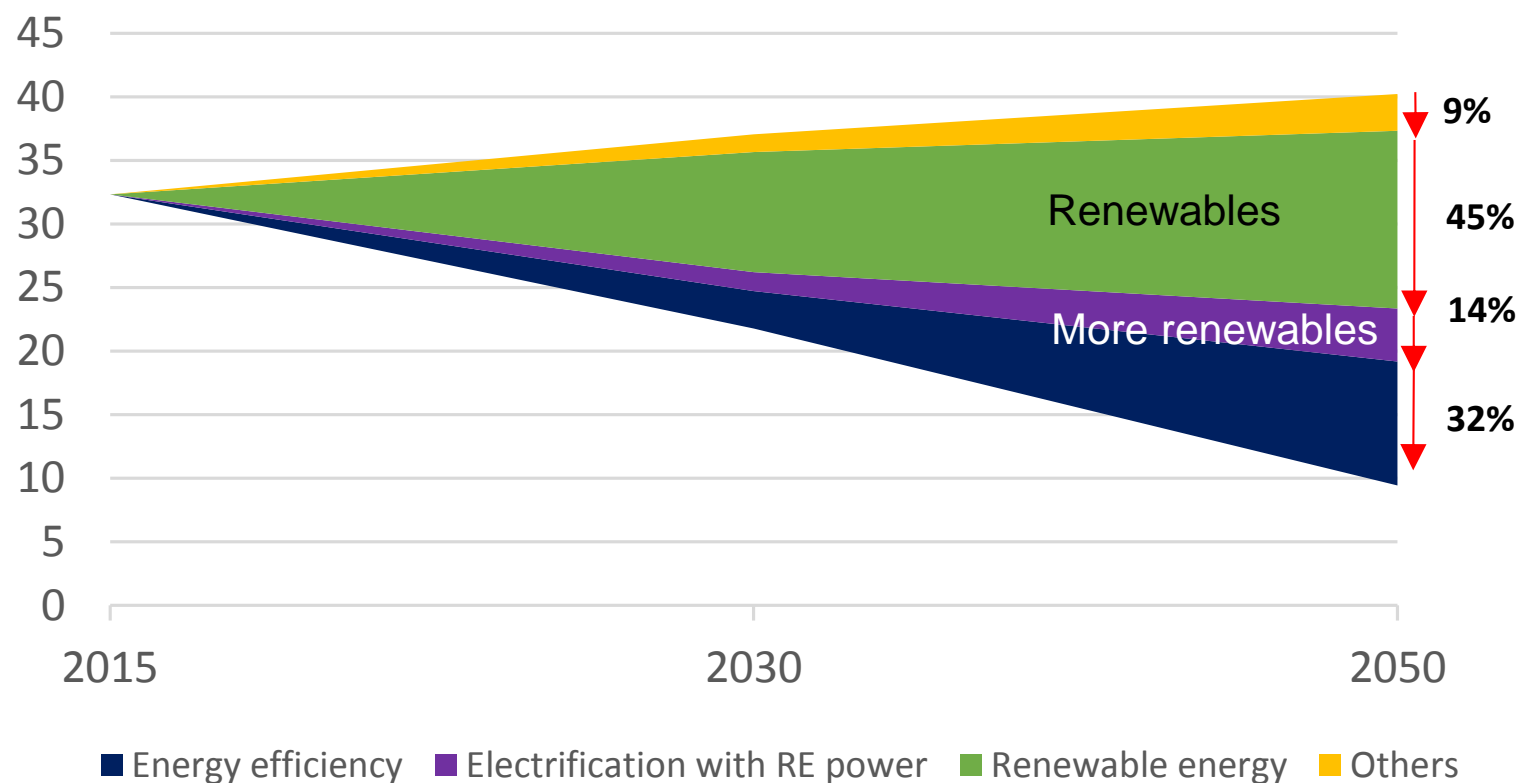
**Dolf Gielen, IRENA Director Innovation & Technology**  
**Revision 2017, Tokyo, 8 March**

## Key points

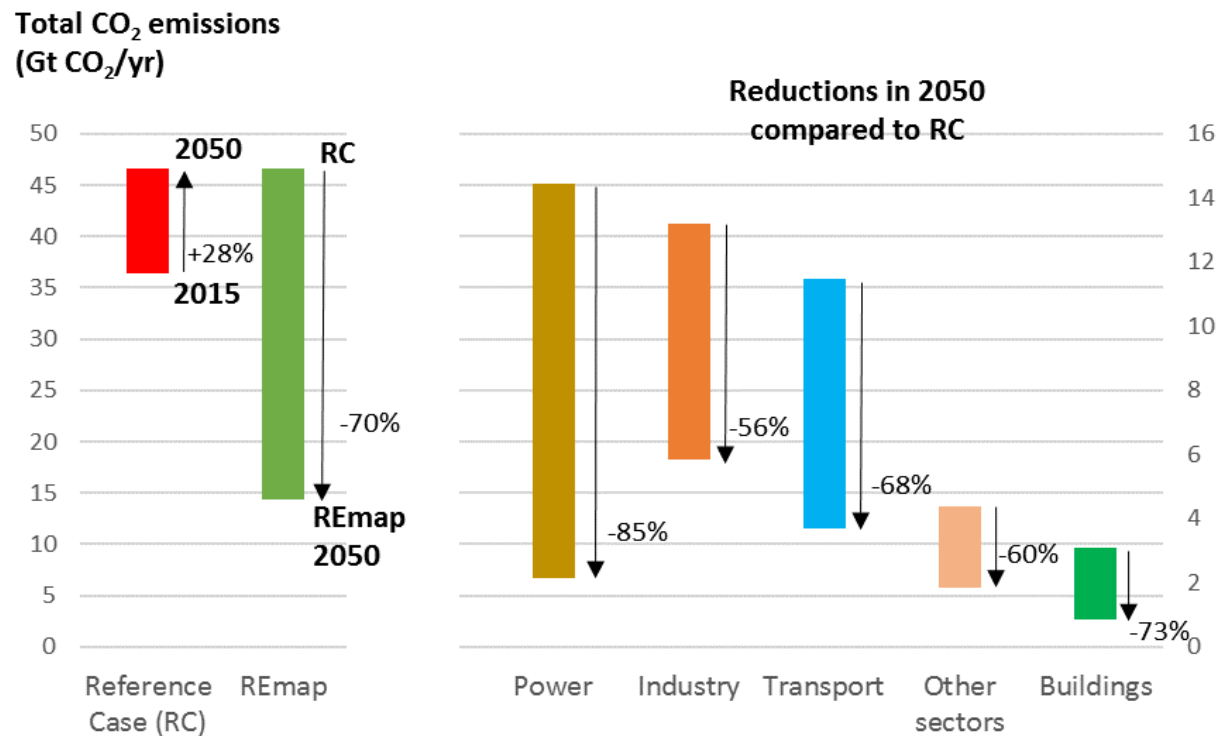
- The world needs an energy transformation. We have started the energy transition in recent years
- This energy transition needs to be accelerated further. Energy efficiency and renewable energy are at the core
- The renewable energy deployment rate needs to increase seven-fold
- Energy efficiency deployment rate needs to increase as well
- This is technically feasible and benefits exceed cost
- Immediate and decisive action is needed if we want to meet climate objectives
- Each country and every region has a role to play, including Japan and ASEAN

## REMAP high level projection and cost/ benefits

**Total energy CO<sub>2</sub> emissions from all sectors (Gt CO<sub>2</sub>/yr)**



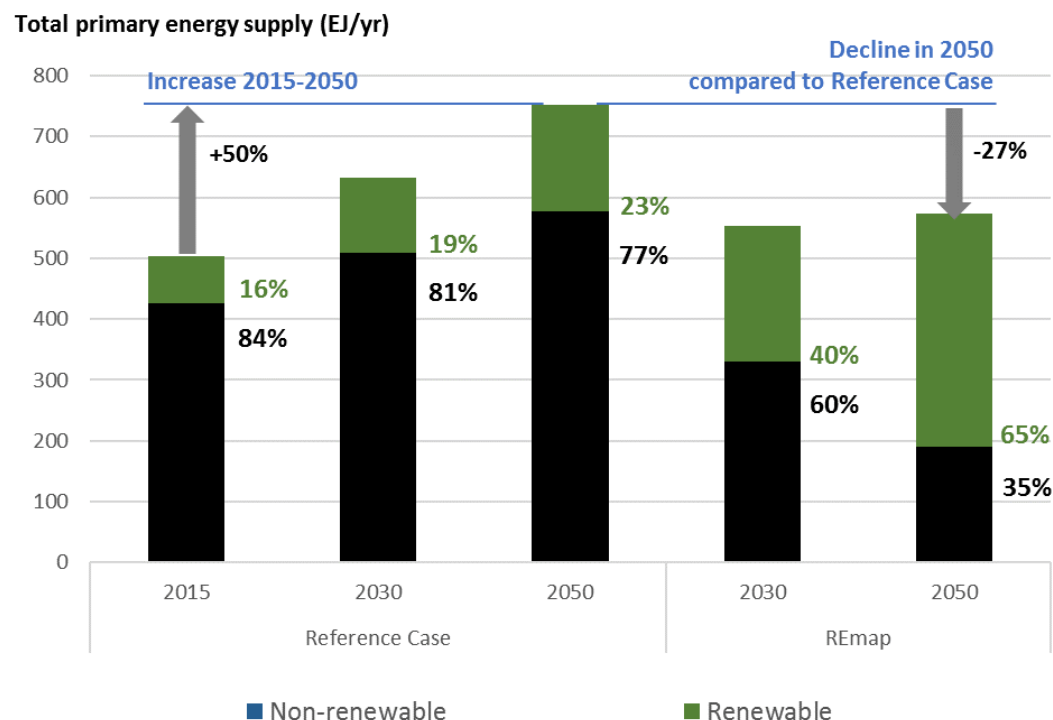
## Development in CO<sub>2</sub> emissions by sector



By 2050, total energy and process related CO<sub>2</sub> emissions will need to decrease to below 15 Gt CO<sub>2</sub> emissions from the power and buildings sectors will be almost eliminated

Industry and transport would be the main sources of emissions in 2050

## Breakdown of total global primary energy supply

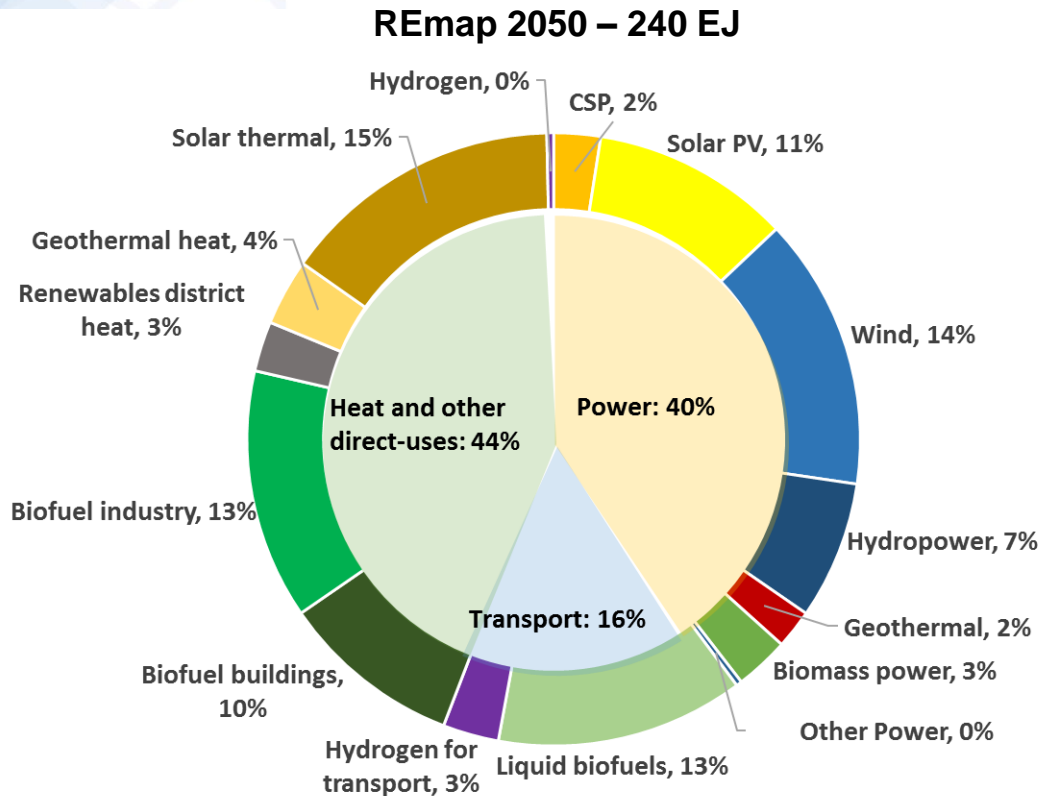


Energy supply in 2050 slightly higher than today's levels

Renewable energy would account for two-thirds of energy supply under REmap in 2050

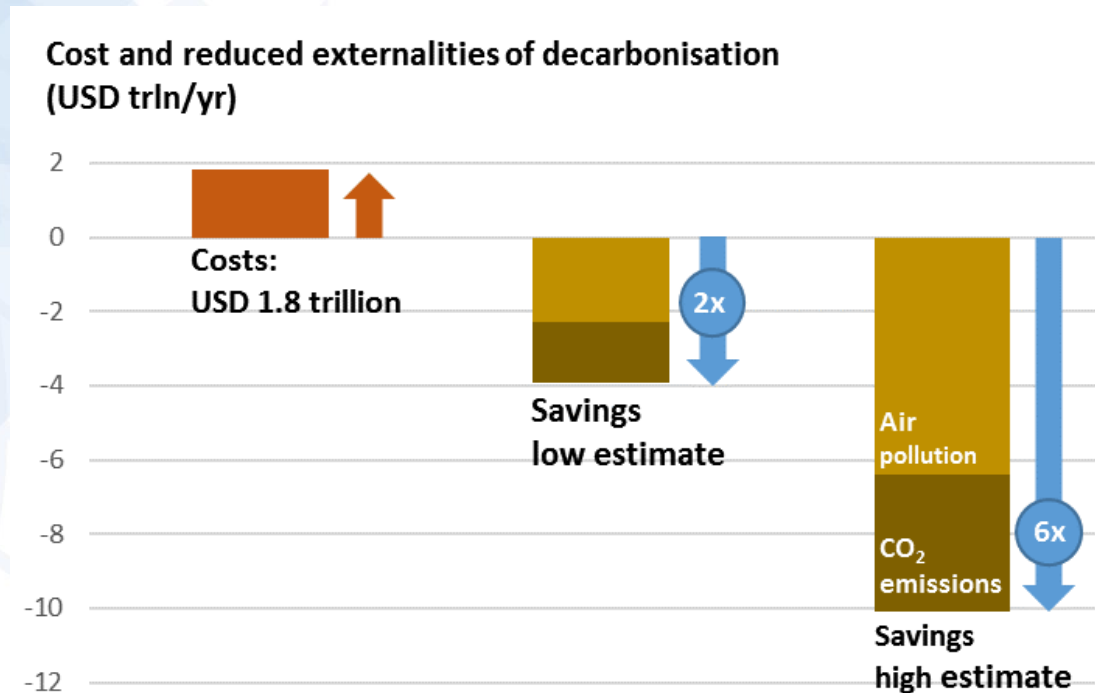
This requires an increase in share of about 1.5%/yr, a significant growth acceleration compared to recent years

## Final renewable energy use in REmap 2050



Power and heat each consume about 40% of the total renewable energy, while transport uses about 20%  
~30% electrification of all demand & primary biomass demand of about 120 EJ (60% in transport)

## Costs and reduced externalities of decarbonisation



Savings due to reduced externalities exceed the costs by a factor between two and six in 2050  
Outdoor air pollution health benefits alone exceed the costs



## Content of the G20 Toolkit

### Five Actions on a voluntary opt-in basis

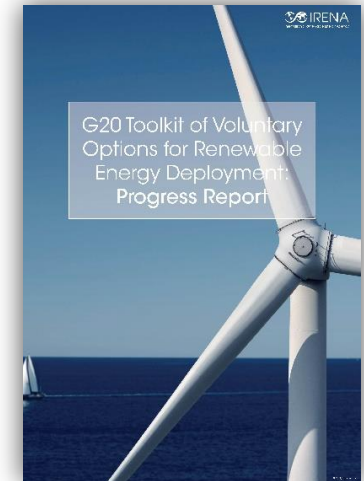
1. Analysis of RE costs, cost reduction potentials and best practice exchange

2. Best practice exchanges on  
(i) enabling policy framework  
(ii) integration of high shares of variable renewables

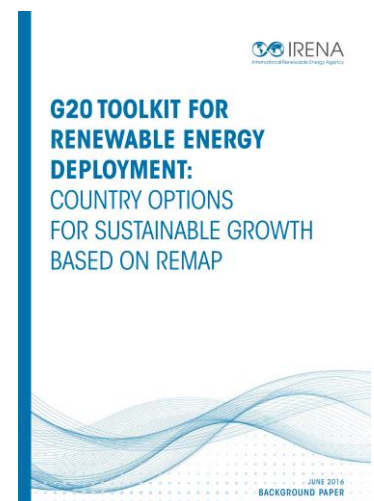
3. Development of a renewable energy specific risk mitigation facility

4. Assessment of country renewable energy technology potentials and development of roadmaps

5. Accelerate deployment of modern bioenergy



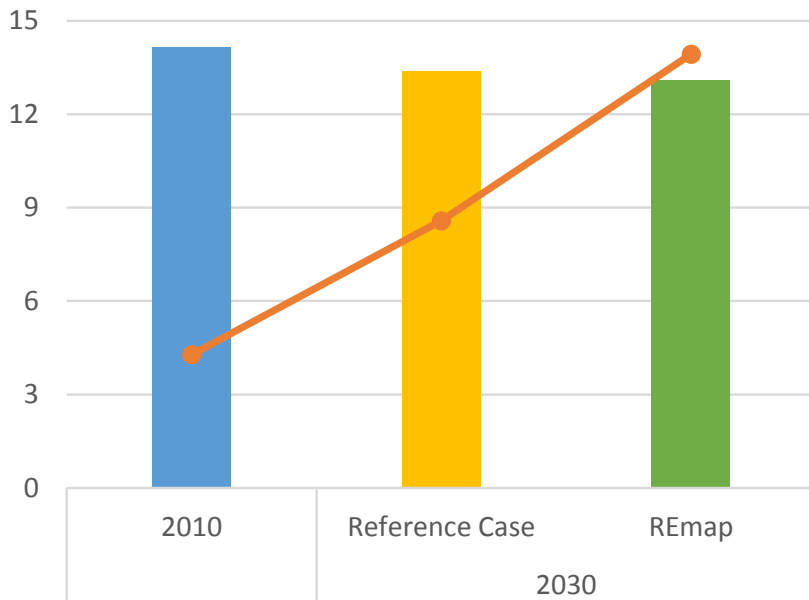
September 2016



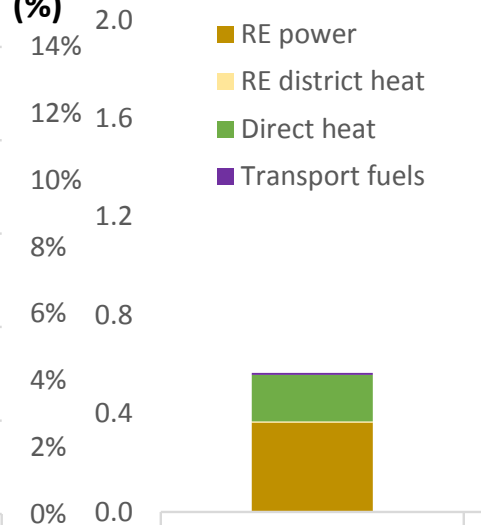


# Growth potential of total RE use in Japan

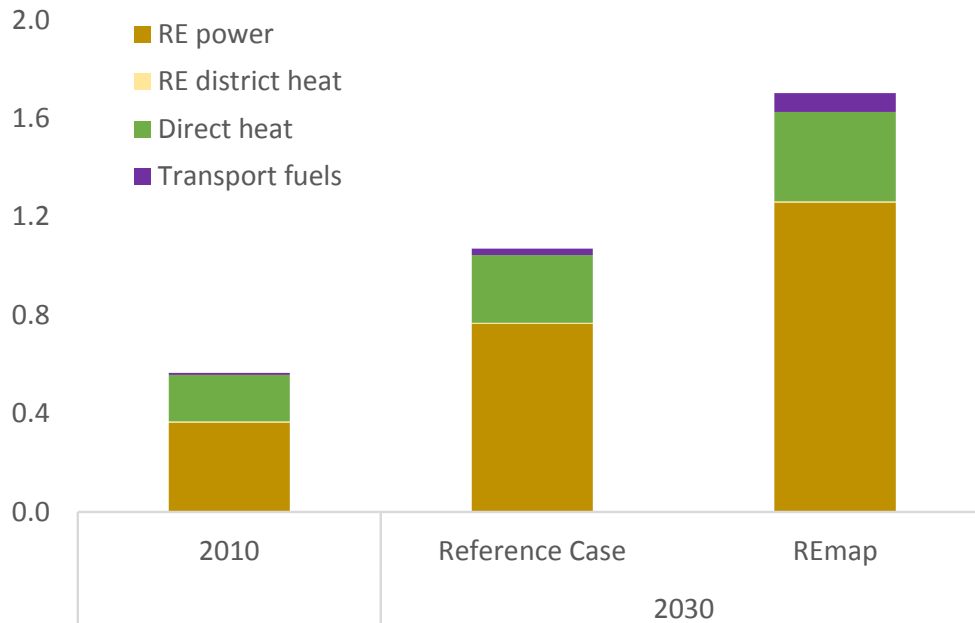
**Total final energy consumption (EJ/yr)**



**RE share (%)**

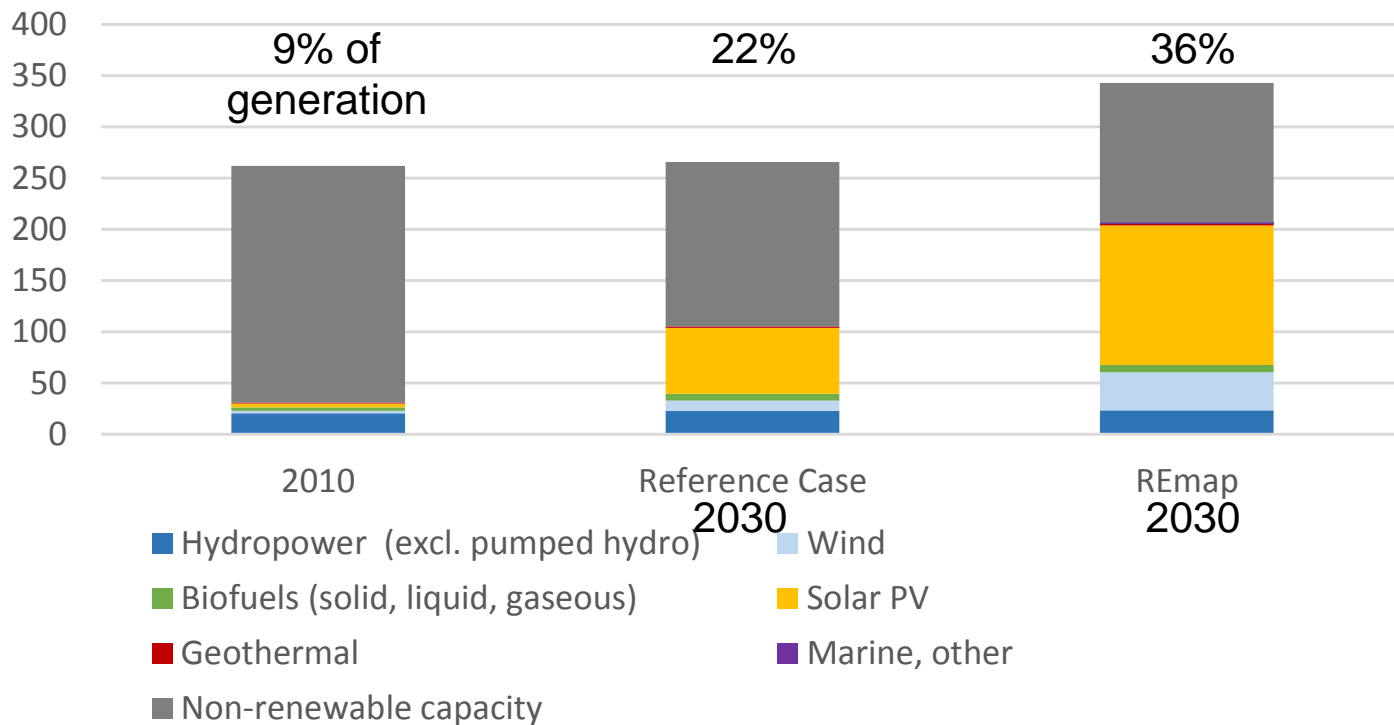


**Total final RE use (EJ/yr)**



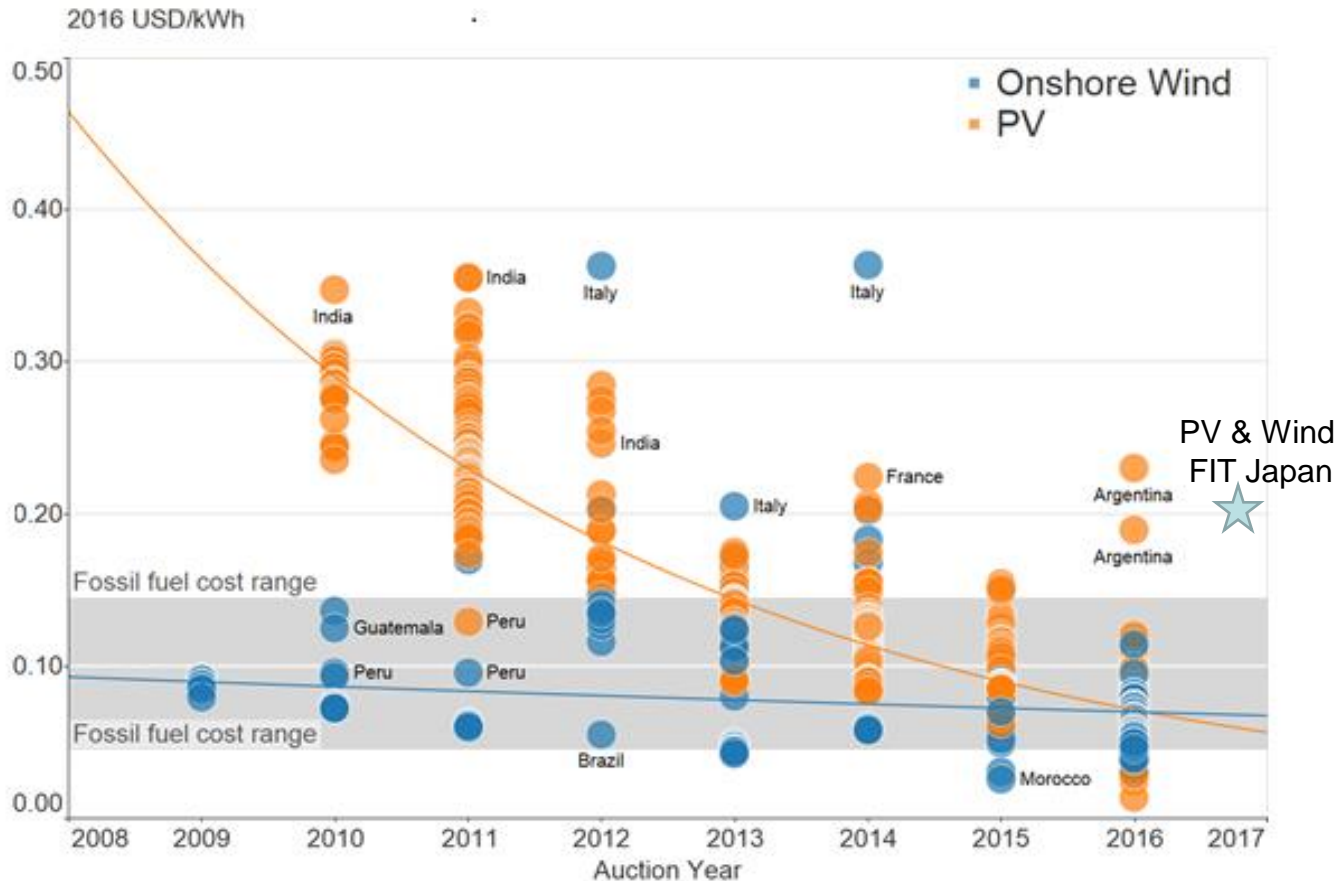
# Growth of total power generation capacity in Japan

**Total installed  
power generation capacity (GW)**



Solar PV and wind capacity account for half of all capacity in REmap 2030

# Auction and PPA price trends



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

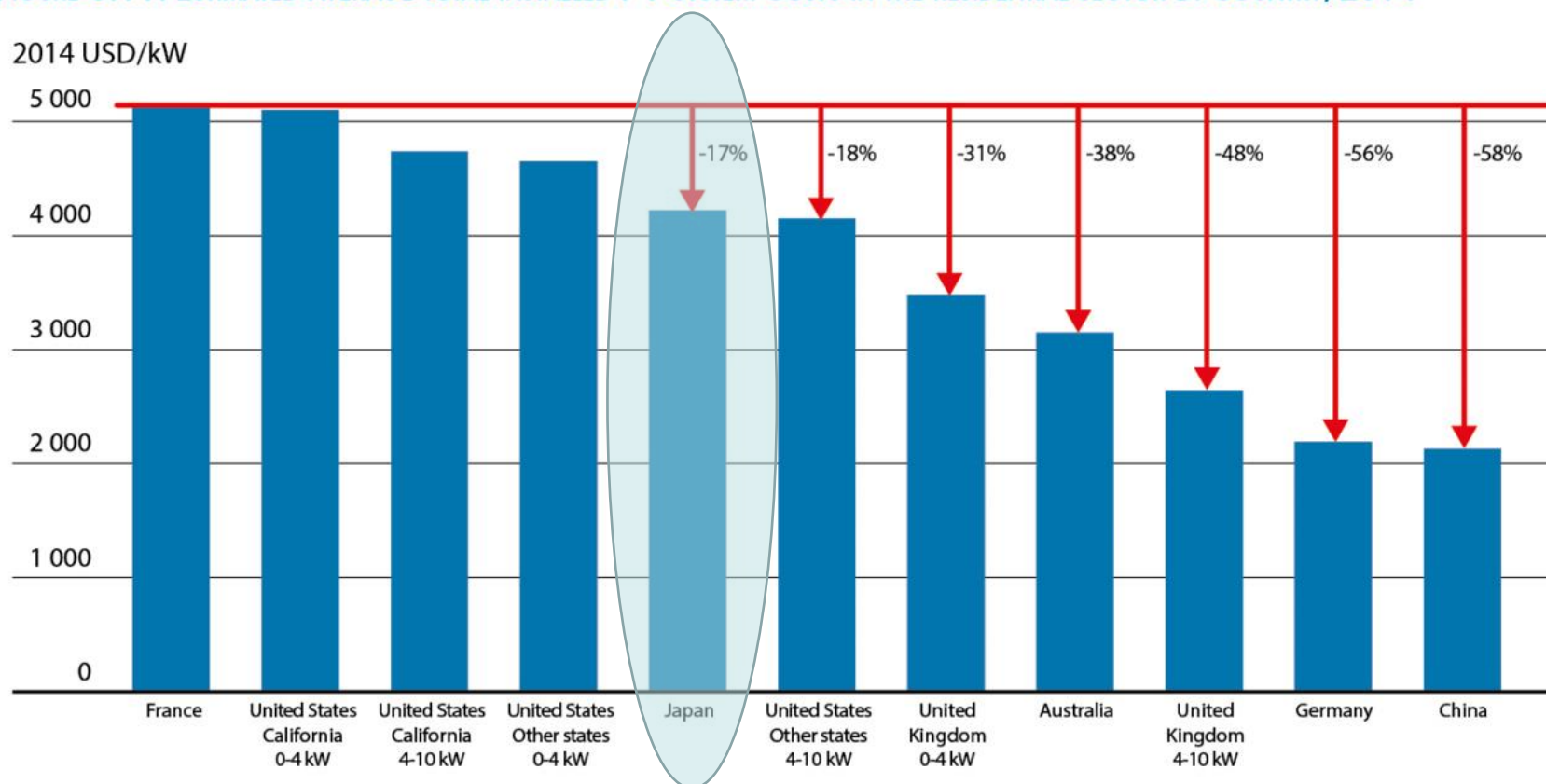
But some of these projects are “boundary” projects, difficult to replicate for solar PV

Projects in a wide range of technologies and locations are being offered at very low long-term contract prices



## RENEWABLE POWER GENERATION COSTS IN 2014

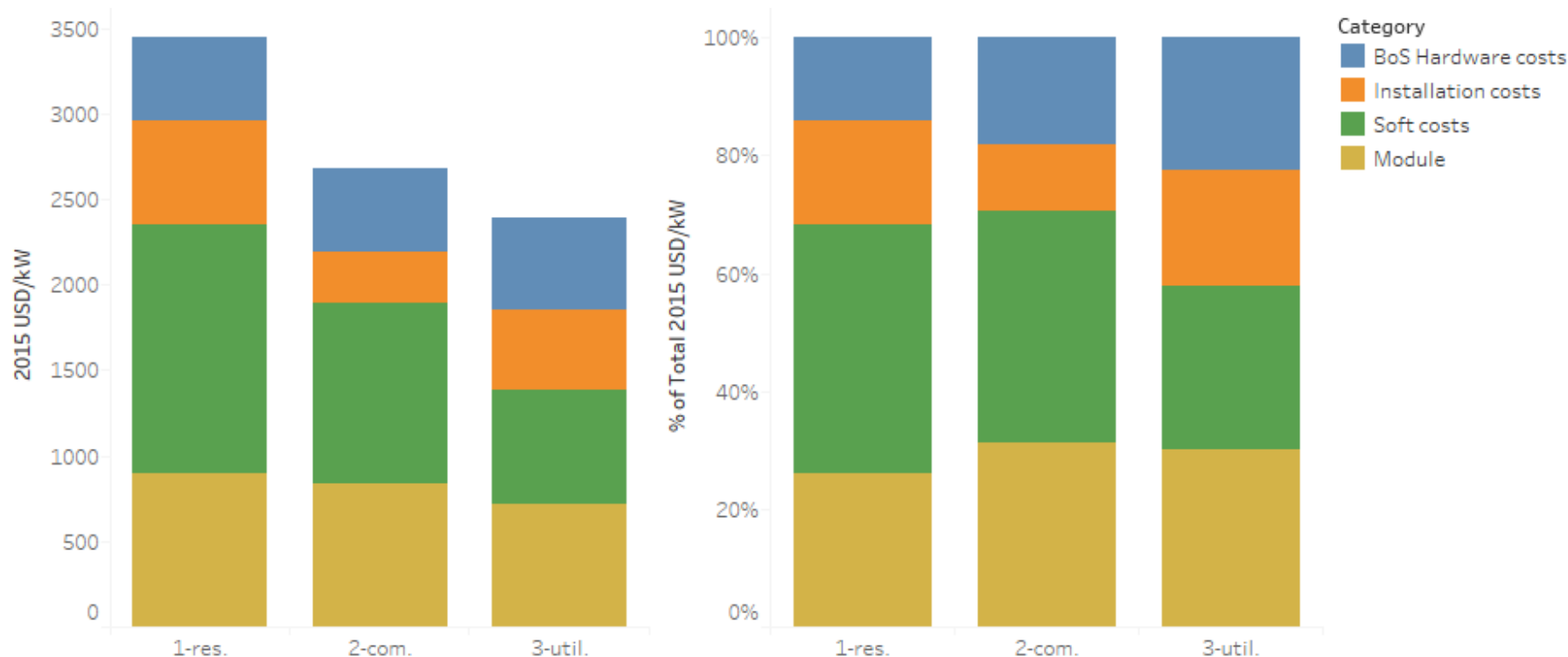
**FIGURE 5.11: ESTIMATED AVERAGE TOTAL INSTALLED PV SYSTEM COSTS IN THE RESIDENTIAL SECTOR BY COUNTRY, 2014**



Source: IRENA Renewable Cost Database; DECC, 2014; GSE, 2014; IEA PVPS, 2014; and Photon Consulting, 2014.

# Cost of PV systems in Japan

## Soft costs made up more than 28% of PV systems in Japan in 2015



- Available data shows that in the residential segment, the share of soft costs can be up to 42% (39% in the commercial systems).
- Installation and BoS hardware costs make up 20% and 22% of total system costs respectively in utility-scale systems.

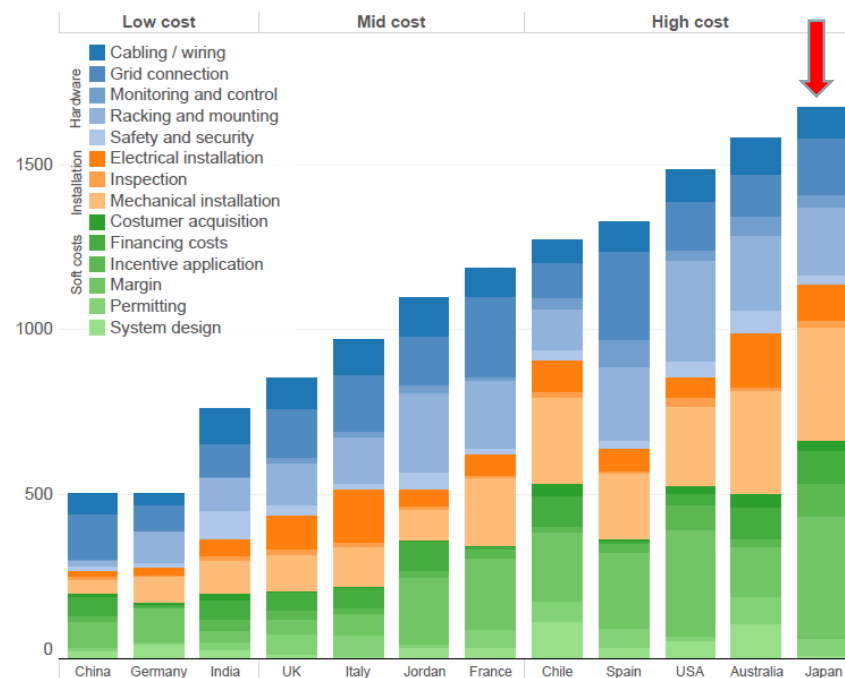
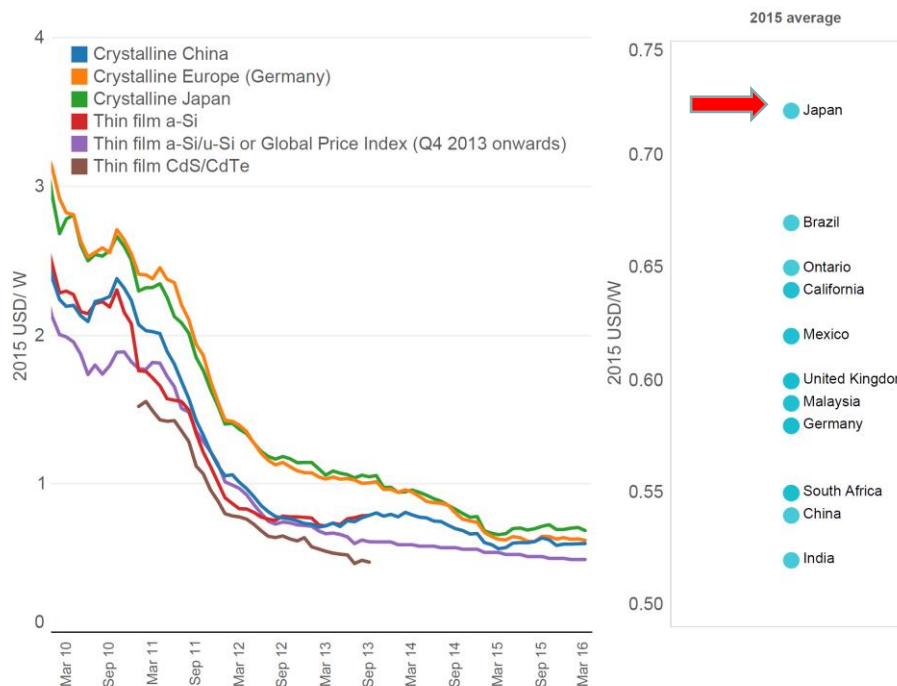
# Country prices breakdown

## *Japan at the upper end of the range*

Utility scale

Balance of systems 2015

Wholesale module prices 2010-2015

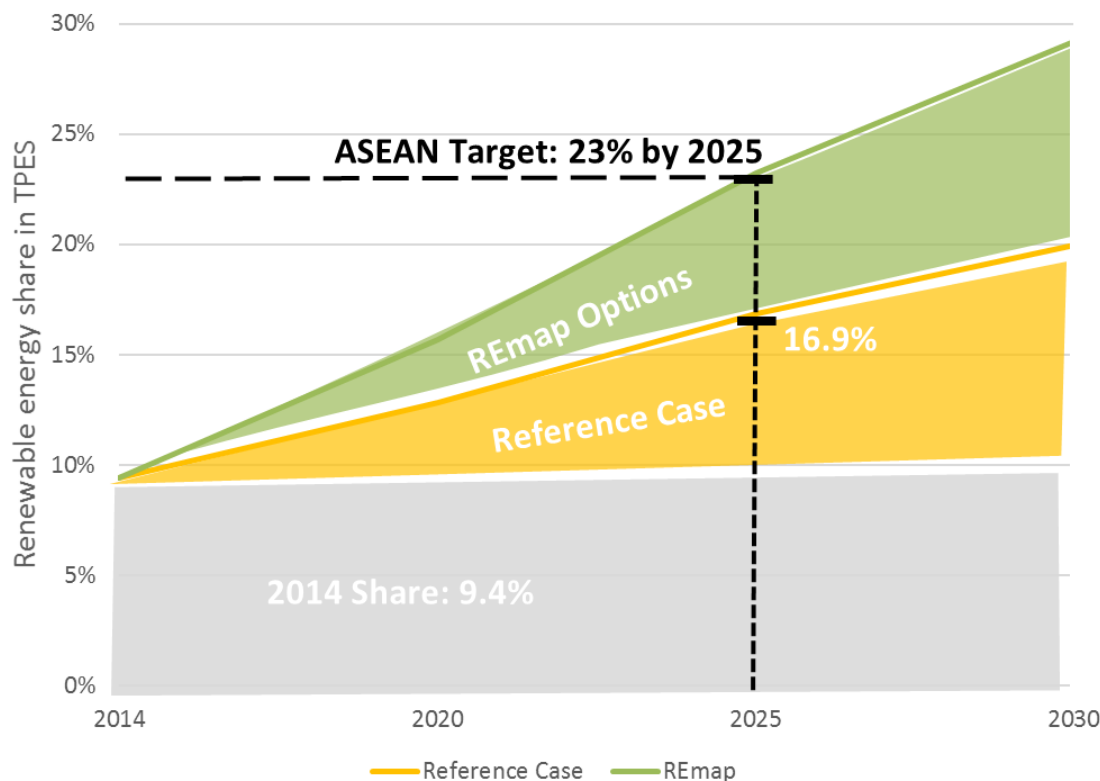


# ASEAN's 23% aspirational renewables target

*October 2015 as part of ASEAN Plan of Action for Energy Cooperation*

- 23% renewable energy share<sup>1)</sup> in total primary energy supply (TPES) by 2025
- ACE Energy Outlook (2015):
  - 2014 - 9.4%
  - 2025 BAU - 10%
  - 2025 Advanced Policy Scenario (APS) - 15.4%
- IRENA Reference Case - 16.9% (APS + latest country updates)
- 6% point gap to the 23% target

<sup>1)</sup> excluding traditional uses of bioenergy, including all hydropower

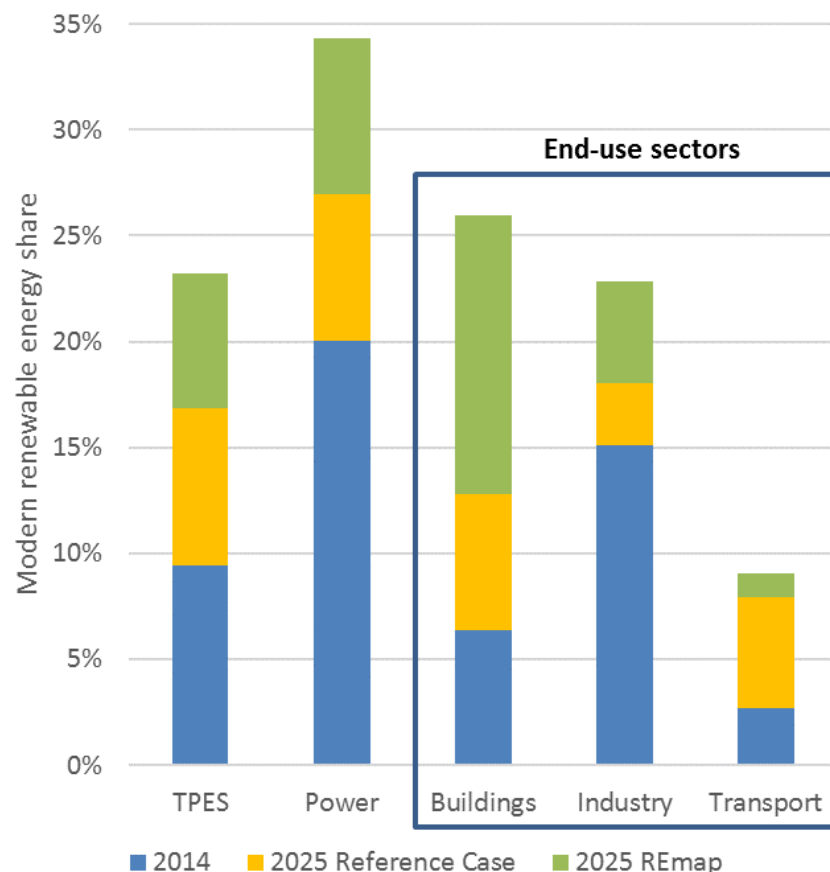




# Renewable energy share by sector 2014–2025

*Renewable shares increase in all sectors, but mostly in end-use sectors*

- Power sector - highest share of renewable energy at 34%
- Buildings - largest increase in share due to the substitution of traditional uses of bioenergy
- Industry - large untapped potential compared to the Reference Case
- Transport - largest growth in renewable energy use according to the Reference Case

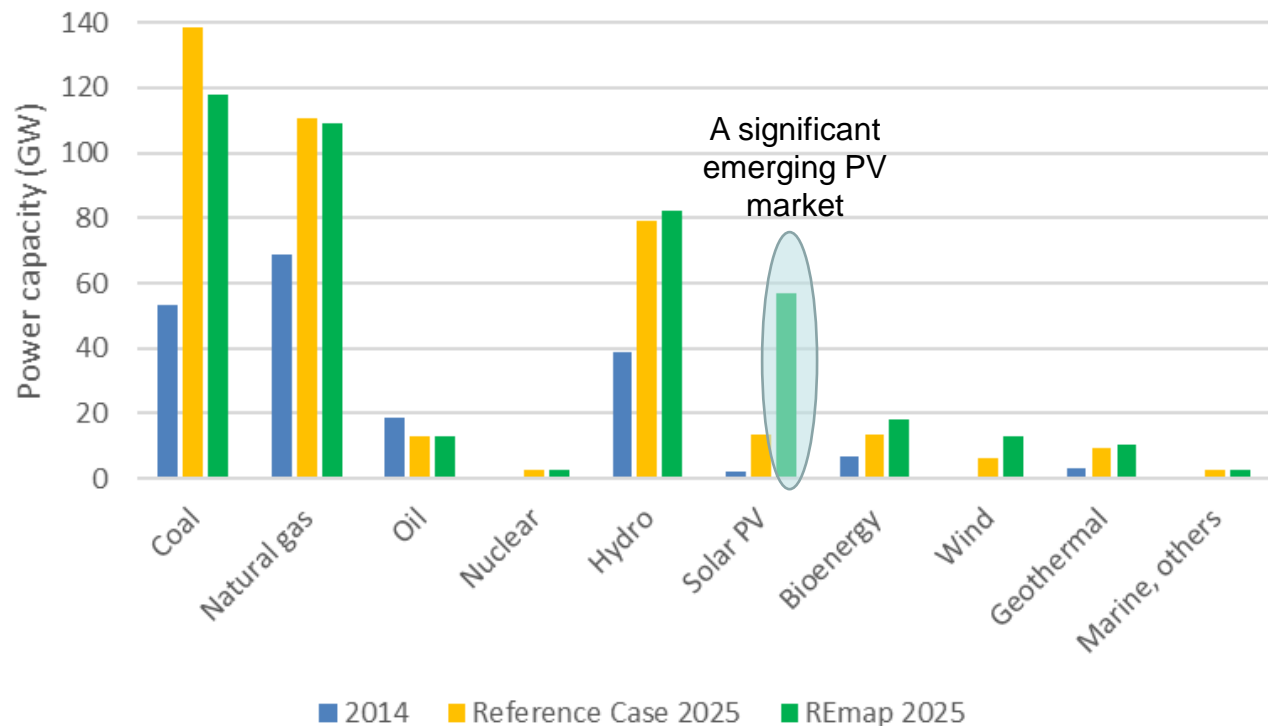


Note: End-use sectors include the consumption of electricity sourced from renewables. Shares presented in figure exclude traditional uses of bioenergy.

# Closing the gap: power sector

*In REmap, power generation capacity grows almost by 240 GW to more than 400 GW, from 20% in 2014 to 34% of generation in 2025*

- Coal and natural gas will have the largest installed capacity
- Hydropower increases significantly in the Reference Case
- Largest growth in REmap is for solar PV– REmap Options:
  - 50% solar PV
  - 20% biopower
  - 12% wind





# Thank you!



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