

Global renewable energy trends and considerations for development of a RE Roadmap

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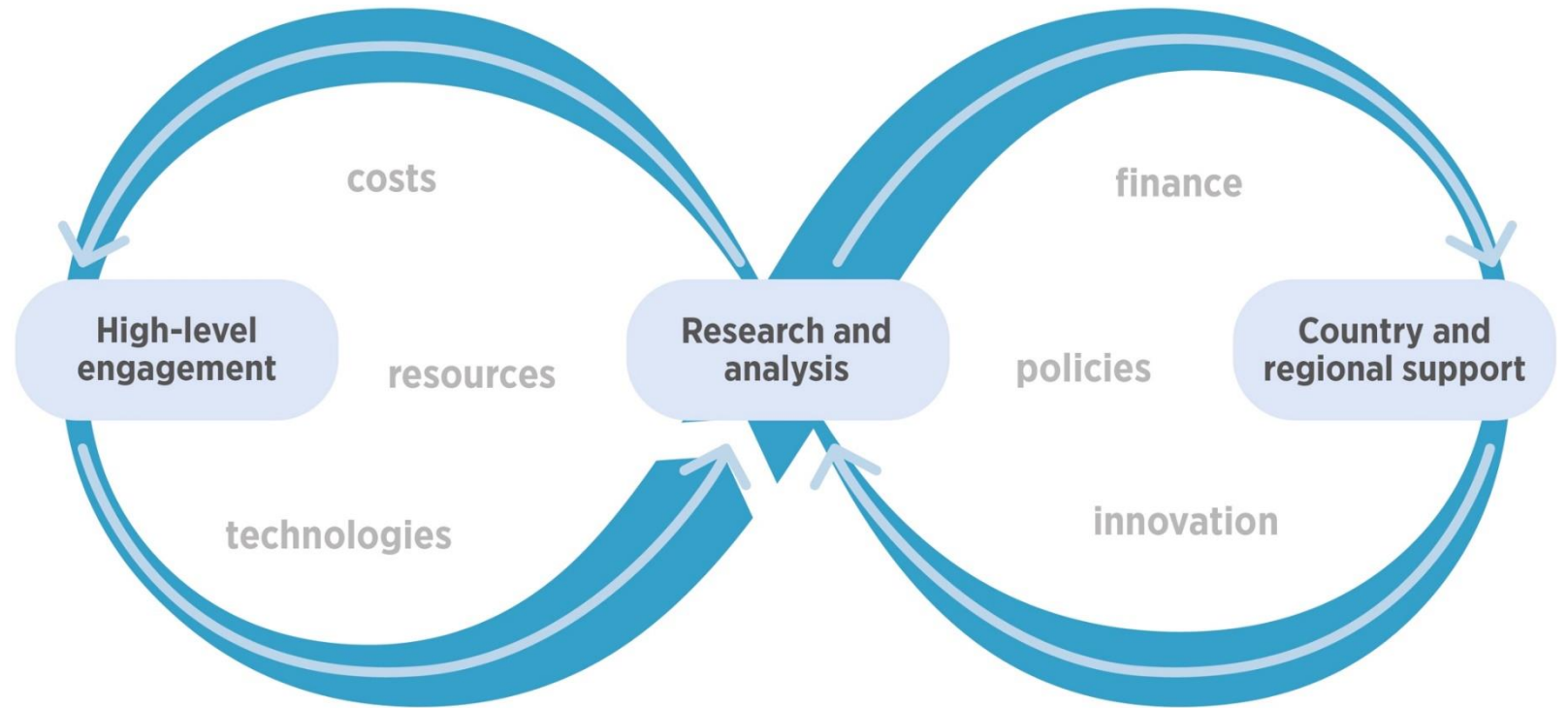
About IRENA



Established in 2011.

Headquartered in
Abu Dhabi, UAE.

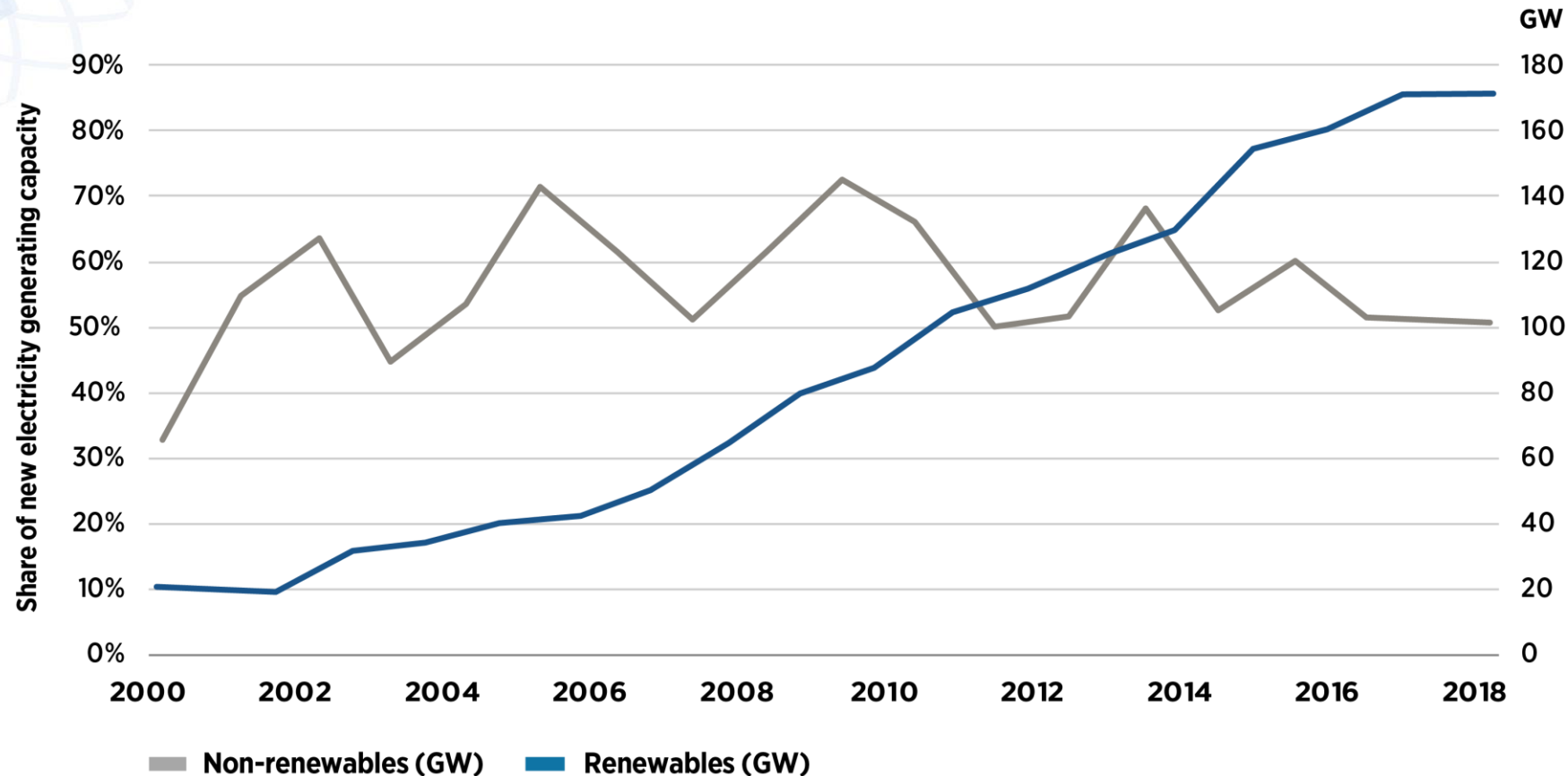
160 Members and
23 States in accession.



Promote the **widespread adoption and sustainable use**
of all forms of **renewable energy** worldwide

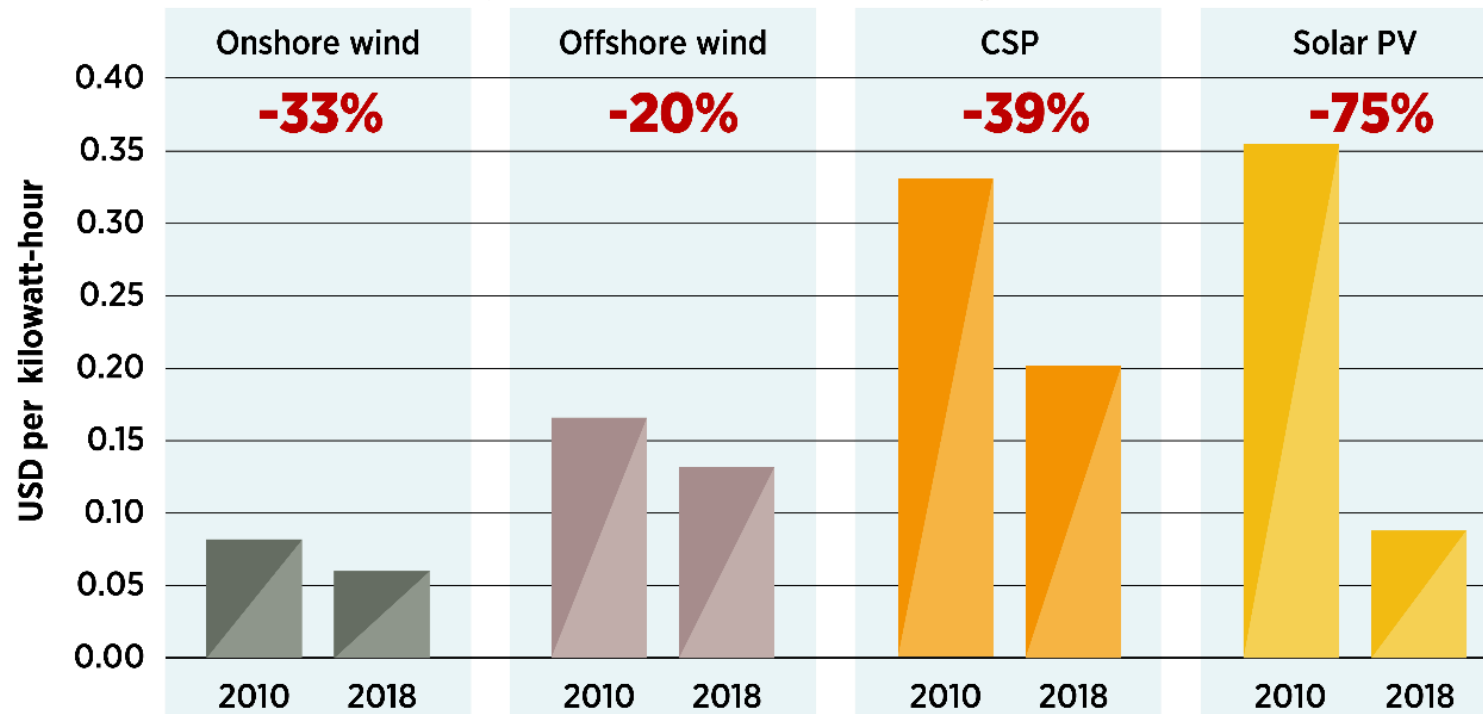


Global power capacity additions



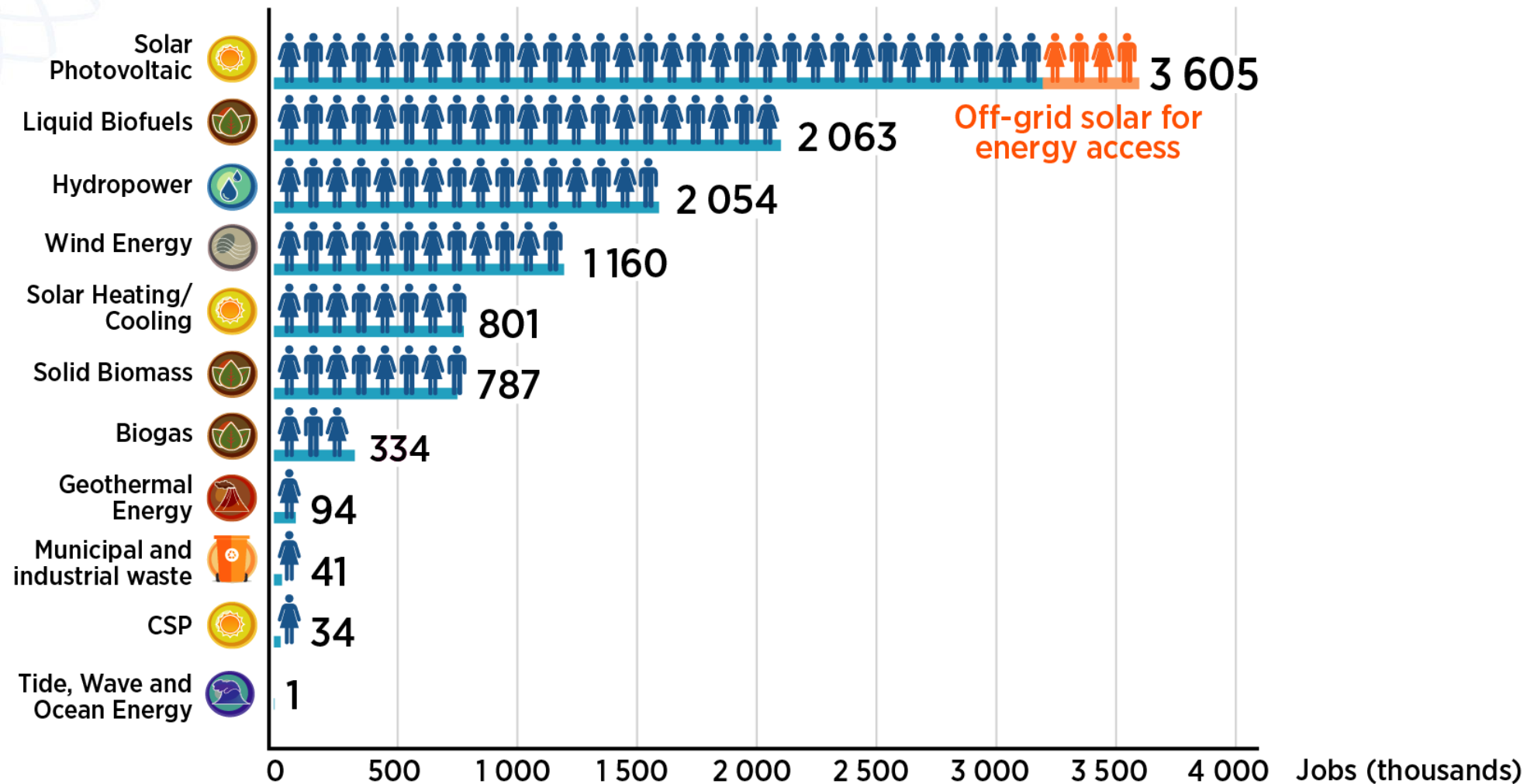
- Nearly two-thirds of all new power generation capacity added in 2018 was from renewables (171 GW)
- Wind and solar PV accounted for 84% of new power capacity in 2018
- Economies are increasingly RE-powered: 33% of generation in the UK & 40% in Germany and Spain in 2018
- Expanding electricity use is a key driver for energy transformation: EV sales surpassed 2 M units in 2018

Renewable energy costs



- LCOE from all commercially available RE technologies declined in 2018: CSP (-26%); bioenergy (-14%); solar PV (-13%); onshore wind (-13%)
- Onshore wind and solar PV are now less expensive than any fossil-fuel option, without financial assistance.
- Low and falling technology costs make renewables the competitive backbone of energy decarbonisation.

11 million jobs in renewable energy



The role and design of renewable energy targets

To explore — policy formulation

- Develops the information base by gathering data
- Complements/validates information through consultation
- Reveals gaps in knowledge
- Increases the transparency of policy making
- Stimulates debate, raises awareness and acceptance

To guide and motivate - implementation

- Provides clear direction of policy to stakeholders
- Signals political commitment
- Motivates stakeholders to take action
- Anchors strategic priorities and scenarios
- Fosters accountability

To regulate — policy evaluation

- Supplies concrete milestones for evaluation and adjustments
- Shows deficiencies in current operations
- Provides opportunities to take action to correct deviations
- Exposes data needs and discrepancies

Long-term or Short-term

Mandatory or Aspirational

Technology-neutral or Technology-specific

By Sector: Electricity, Heating, Transport

Share of energy demand (%) or Fixed amount (GW, GWh)

RE integrated into energy system planning



How much electricity demand will there be?



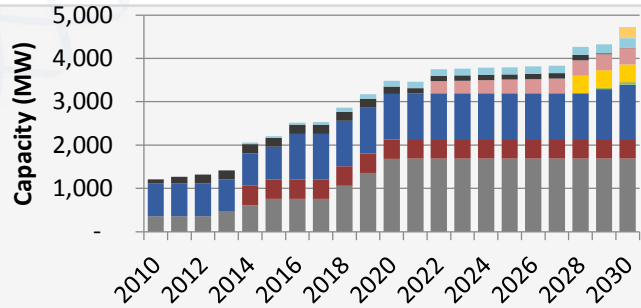
How much and what type of generation is needed to serve this demand and the contribution of different RE technologies as per targets set?



What enhancements to the network are needed to ensure the reliable supply of electricity?

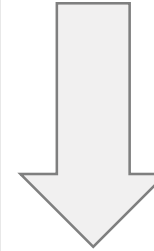
Energy/power system models are used to answer these questions while taking into account economic and technical consequences of alternative choices.

Power planning scopes for techno-economic analysis of RE penetration



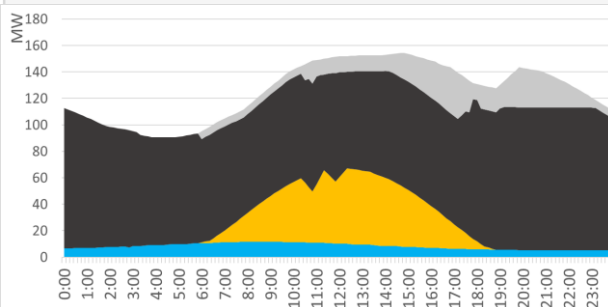
Generation expansion planning

- Ministry of Energy
- Planning agency
- Utility



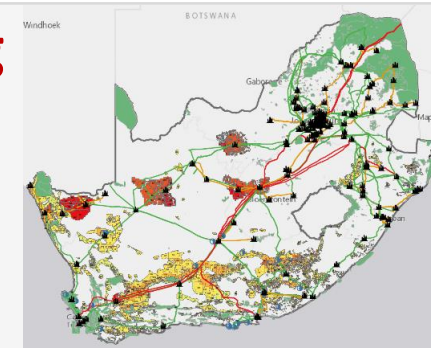
Dispatch simulation

- Utility
- Regulators
- TSO



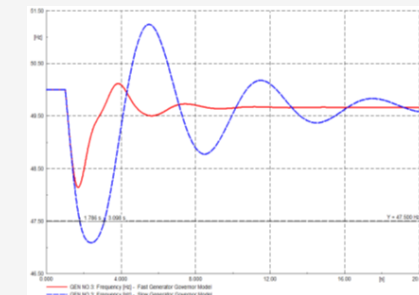
Geo-spatial planning

- Ministry of Energy
- Planning agency
- Utility
- TSO



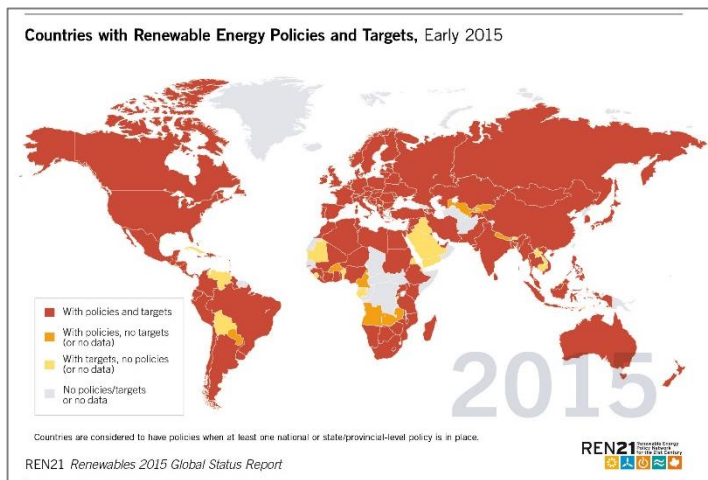
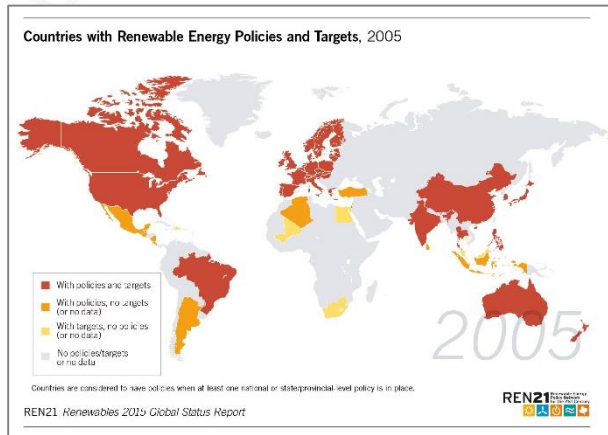
Technical network studies

- TSO
- Regulator
- Project developer



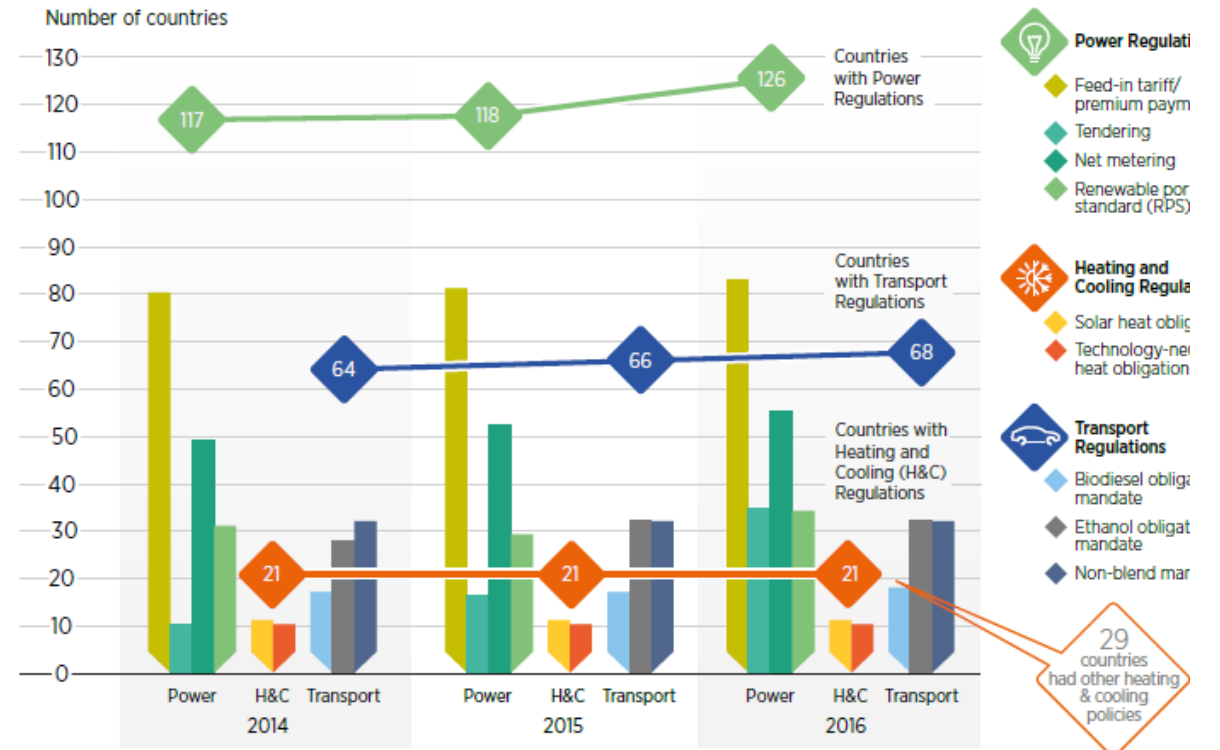
Spread of renewable energy policies

Renewable energy policies have become increasingly widespread.



Policy support focuses on power sector - heating, cooling and transport lag behind

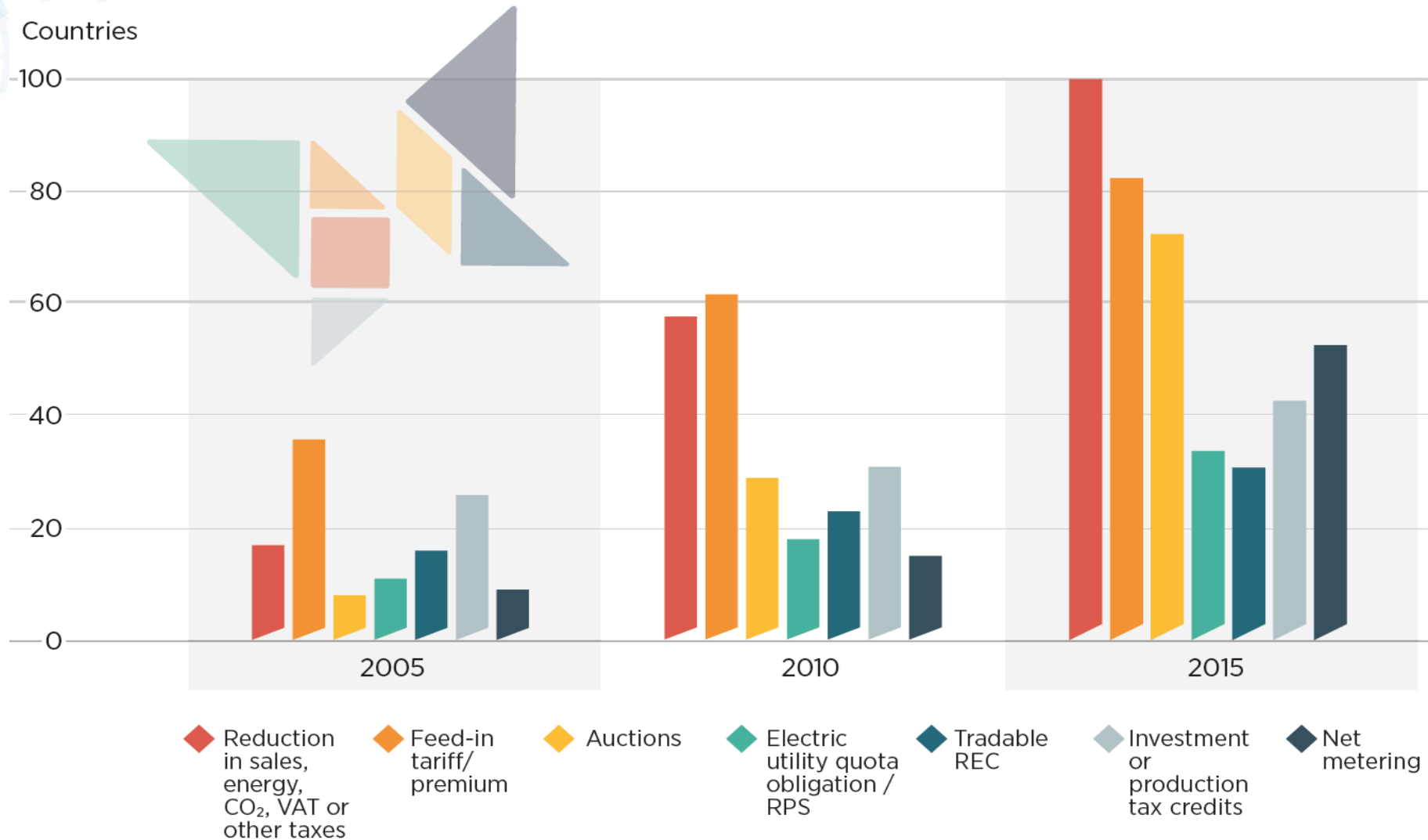
Number of countries with renewable energy regulatory incentives and mandates, by type, 2014-16



Source: REN21, Renewables Global Status Report 2015- 17

Renewable power policies are evolving

Trends in the adoption of selected policy instruments to support renewables in power



Types of RE policies and measures

NATIONAL POLICY	REGULATORY INSTRUMENTS	FISCAL INCENTIVES	GRID ACCESS	ACCESS TO FINANCE ^a	SOCIO-ECONOMIC BENEFITS ^b
<ul style="list-style-type: none"> ◆ Renewable energy target ◆ Renewable energy law/strategy ◆ Technology-specific law/programme 	<ul style="list-style-type: none"> ◆ Feed-in tariff ◆ Feed-in premium ◆ Auction ◆ Quota ◆ Certificate system ◆ Net metering ◆ Mandate (e.g., blending mandate) ◆ Registry 	<ul style="list-style-type: none"> ◆ VAT/ fuel tax/ income tax exemption ◆ Import/export fiscal benefit ◆ National exemption of local taxes ◆ Carbon tax ◆ Accelerated depreciation ◆ Other fiscal benefits 	<ul style="list-style-type: none"> ◆ Transmission discount/exemption ◆ Priority/dedicated transmission ◆ Grid access ◆ Preferential dispatch ◆ Other grid benefits 	<ul style="list-style-type: none"> ◆ Currency hedging ◆ Dedicated fund ◆ Eligible fund ◆ Guarantees ◆ Pre-investment support ◆ Direct funding 	<ul style="list-style-type: none"> ◆ Renewable energy in rural access/cook stove programmes ◆ Local content requirements ◆ Special environmental regulations ◆ Food and water nexus policy ◆ Social requirements



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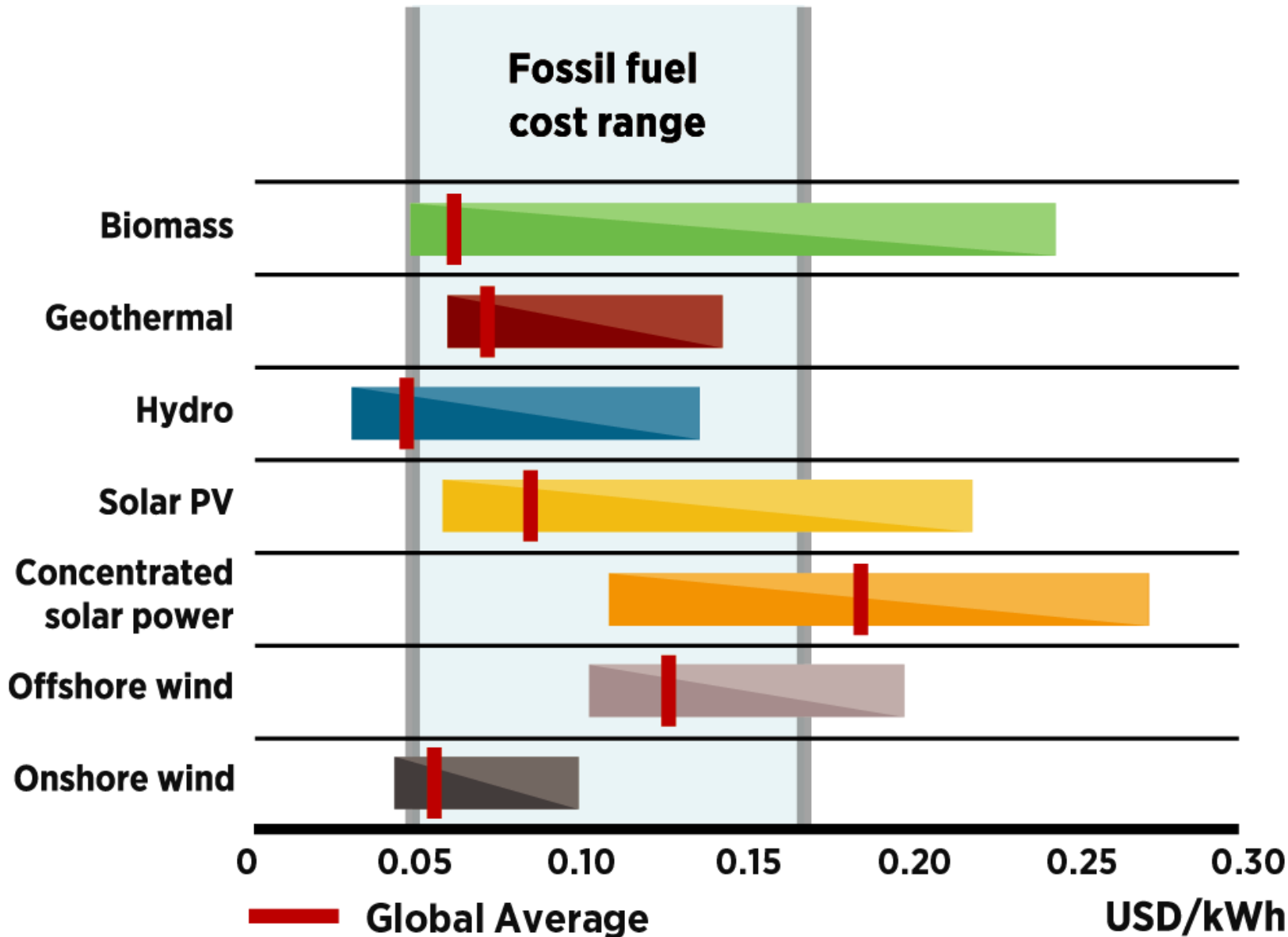


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The strong business case of renewables continues to solidify



Cost of Electricity

Global levelised cost of electricity from utility-scale renewable power generation technologies (2010-2018)

Source: IRENA Renewable Cost Database

- **Bioenergy** 0.062 USD/kWh
- **Geothermal** 0.072 USD/kWh
- **Hydro** 0.047 USD/kWh
- **Onshore wind** 0.056 USD/kWh
- **Concentrated solar power** 0.185 USD/kWh
- **Solar PV** 0.085 USD/kWh
(Solar PV projects cost has fallen 77% between 2010-2018)