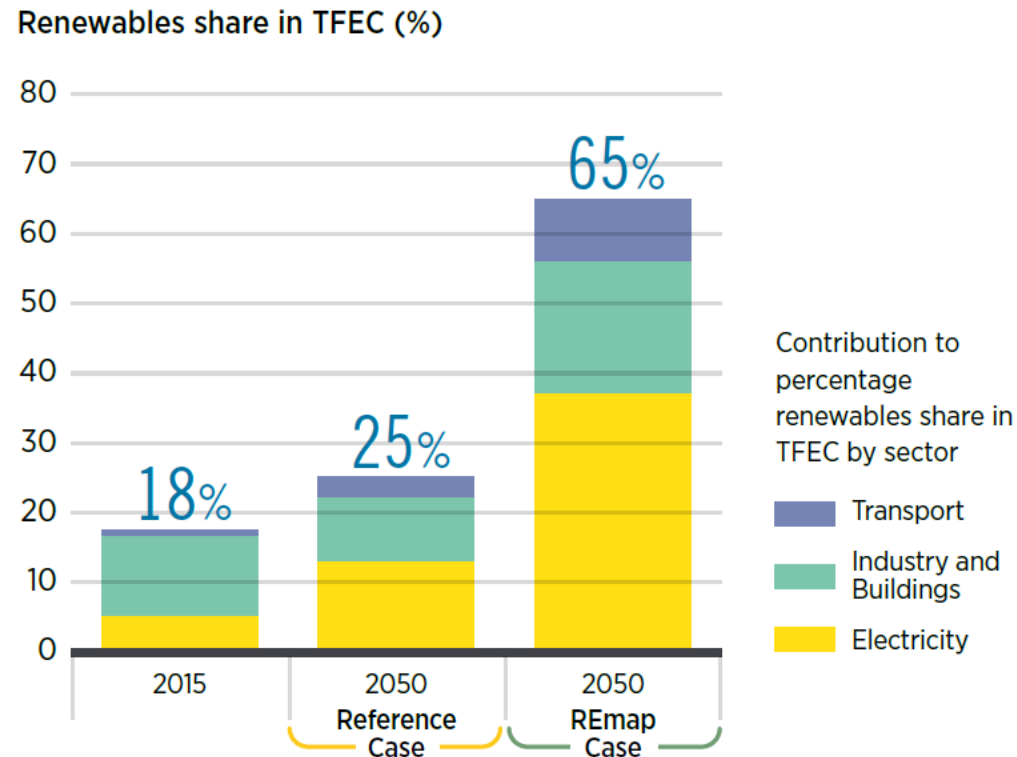
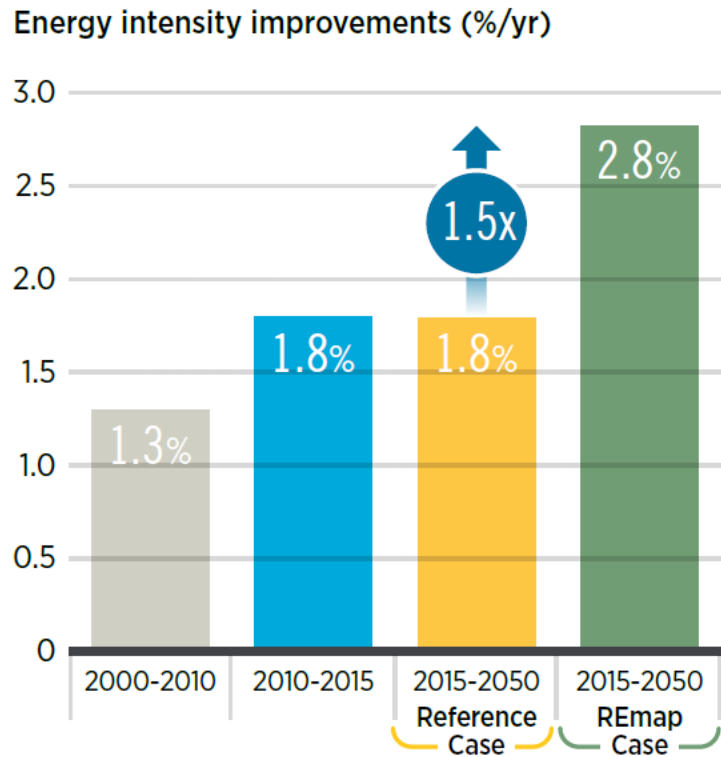




Renewable Energy Targets, Policies and Benefits

Policy workshop, 17 October 2018

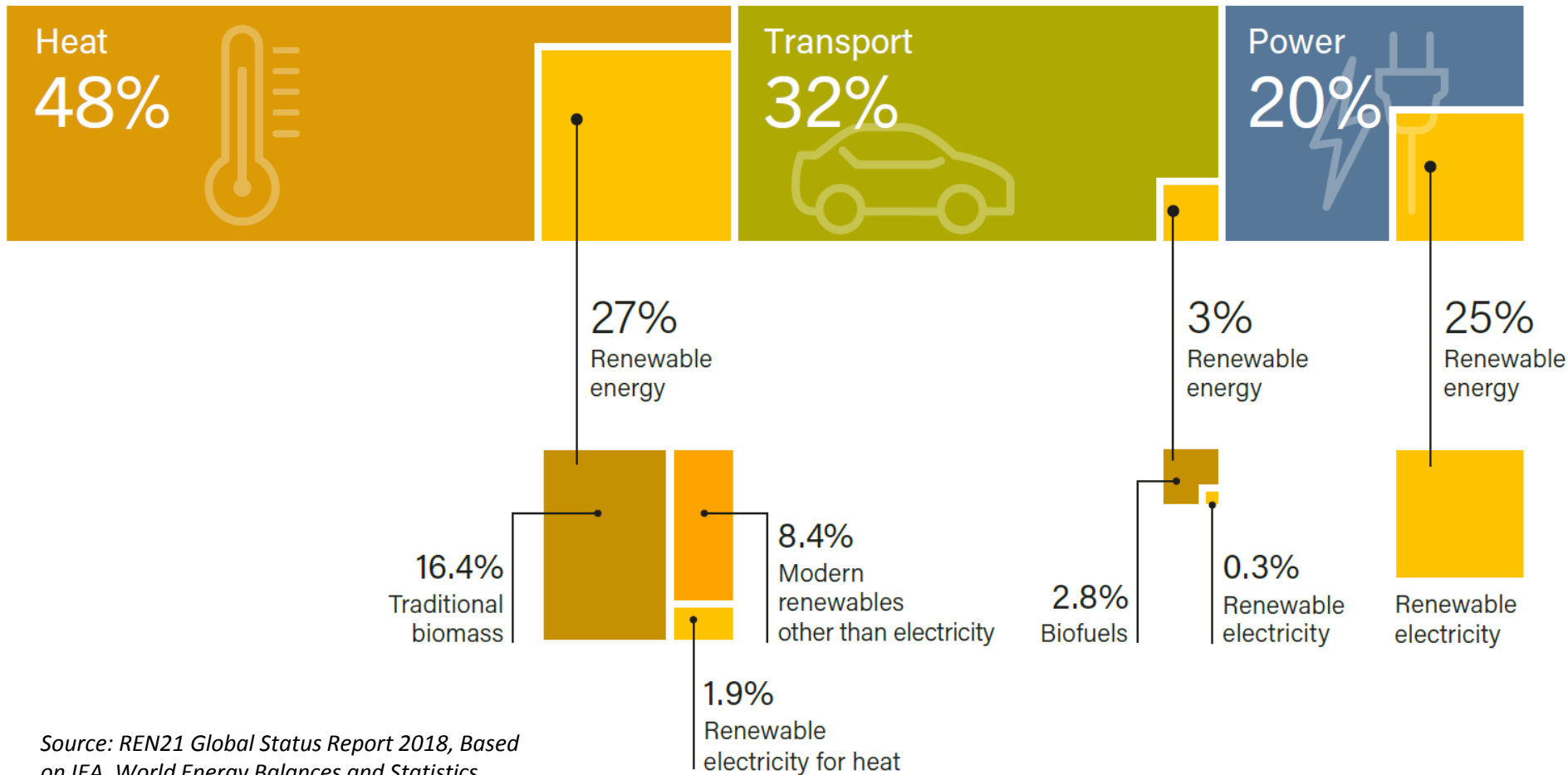
Renewable energy needs to be scaled up at least six times faster for the world to start to meet the goals set out in the Paris Agreement



Source: [IRENA, Global Energy Transformation: A Roadmap to 2050, 2018](#)

Significant improvements in energy intensity are needed and the share of renewable energy must rise to two-thirds to meeting energy-related emission reduction needs of the Paris Climate Agreement and limit global temperature rise to two degree

Renewable energy in total final energy consumption, by sector, 2015



Source: REN21 Global Status Report 2018, Based on IEA, World Energy Balances and Statistics

Heating/cooling and transport accounted for almost half and third of the global energy consumption in 2015, respectively. Policies are needed to support renewables in end-use sectors.

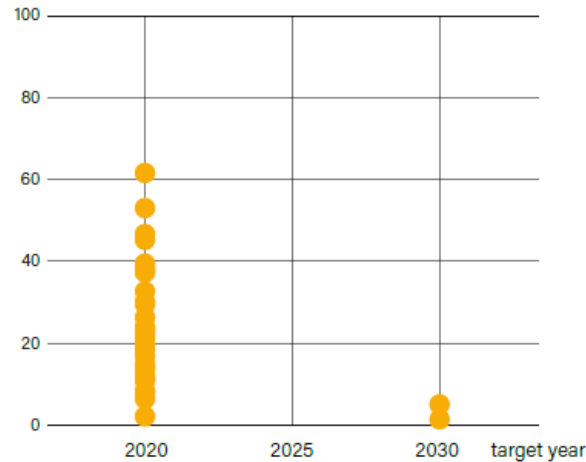
Renewable energy targets, 2017

HEATING AND COOLING

● = one target



Targets for share of heating and cooling from renewable sources in %

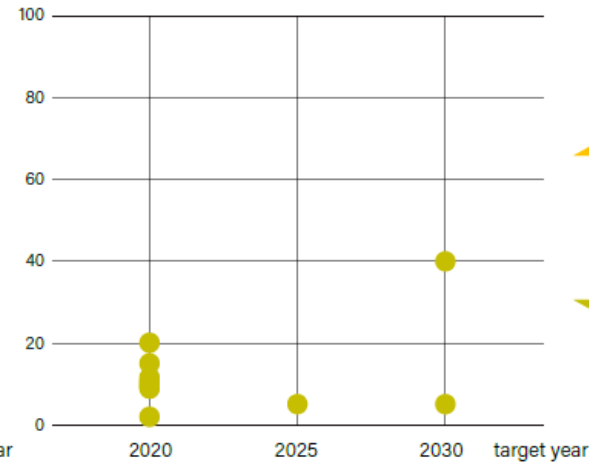


TRANSPORT

● = one target



Targets for share of transport energy from renewable sources in %



48 countries have national targets for renewable energy in heating and cooling.

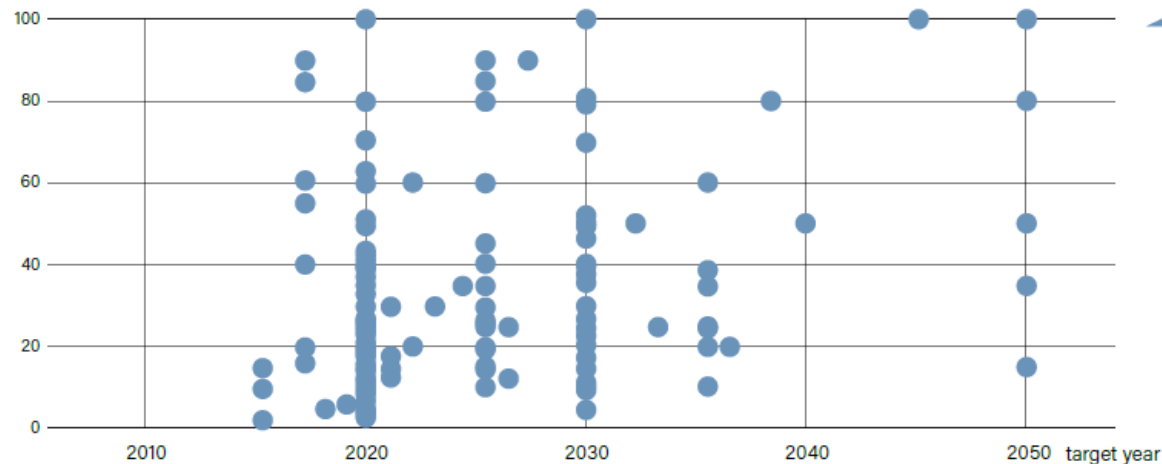
42 countries have national targets for renewable energy in transport.

POWER

● = one target



Targets for share of electricity generation from renewable sources in %



146 countries have national targets for renewable energy in power.

Note: Each dot can represent more than one country and is based on the highest target that a country has set at the national level. Figure includes only countries with targets in these sectors that are for a specific share from renewable sources by a specific year, and do not include countries with other types of targets in these sectors. The total number of countries with any type of target for renewable energy (not specific to shares by a certain year) is 48 in heating and cooling, 42 in transport and 146 in power.

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 — policy 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

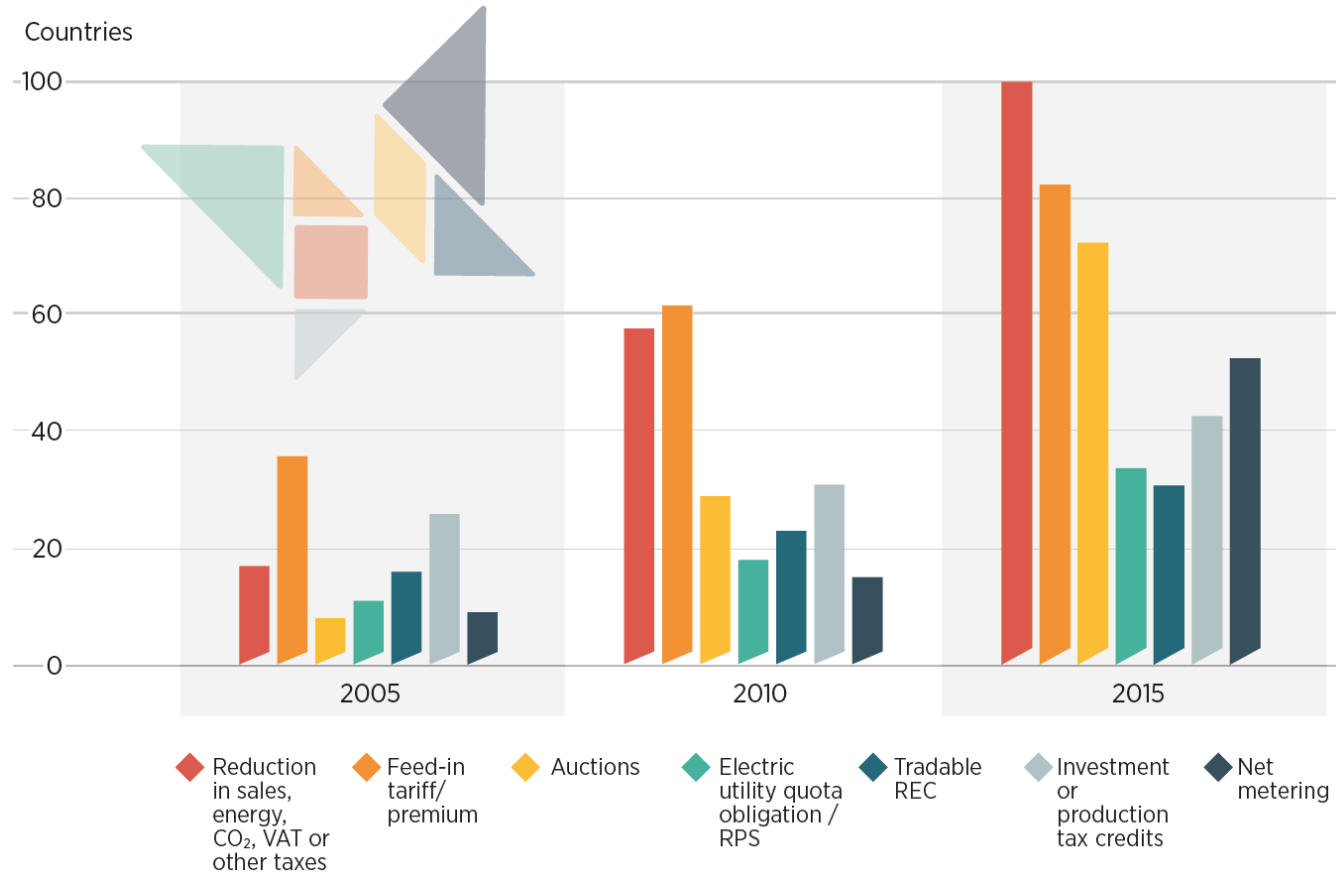
Mandatory or Aspirational

Technology-neutral or Technology-specific

By Sector: Electricity, Heating, Transport

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

Renewable power policies are evolving

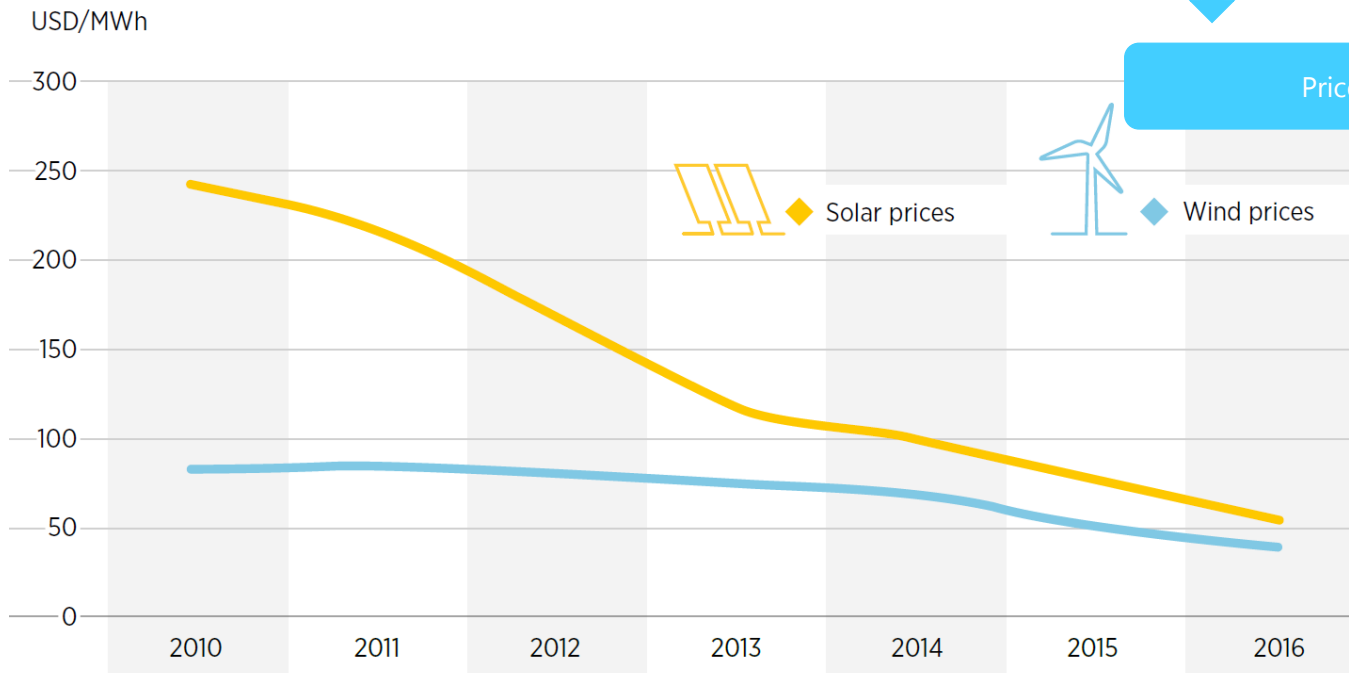


Source: REN21, *Renewables Global Status Report 2006, 2011, 2017*

A growing number of countries (both in the developed and in the developing world) are implementing auctions, although usually combined with other instruments.

Factors behind the falling auction prices for solar PV

Average prices resulting from auctions, 2010-2016



Source: IRENA, *Renewable Energy Auctions: Analysing 2016, 2017*

Price discovery through competitive auctions has been effective in reducing costs along the entire value chain, even in less developed markets.

Renewable heat solutions are complex and location-specific

Different heat needs, country contexts and barriers require different policy approaches:

Policy Cluster 1: District heating

Policy Cluster 2: Competing with natural gas heating

Policy Cluster 3: Industrial heat and hot water

Policy Cluster 4: Clean cooking

- Public investment
- Quotas and obligations
- Financial incentives
- Building codes
- Energy and carbon taxes
- Energy efficiency measures

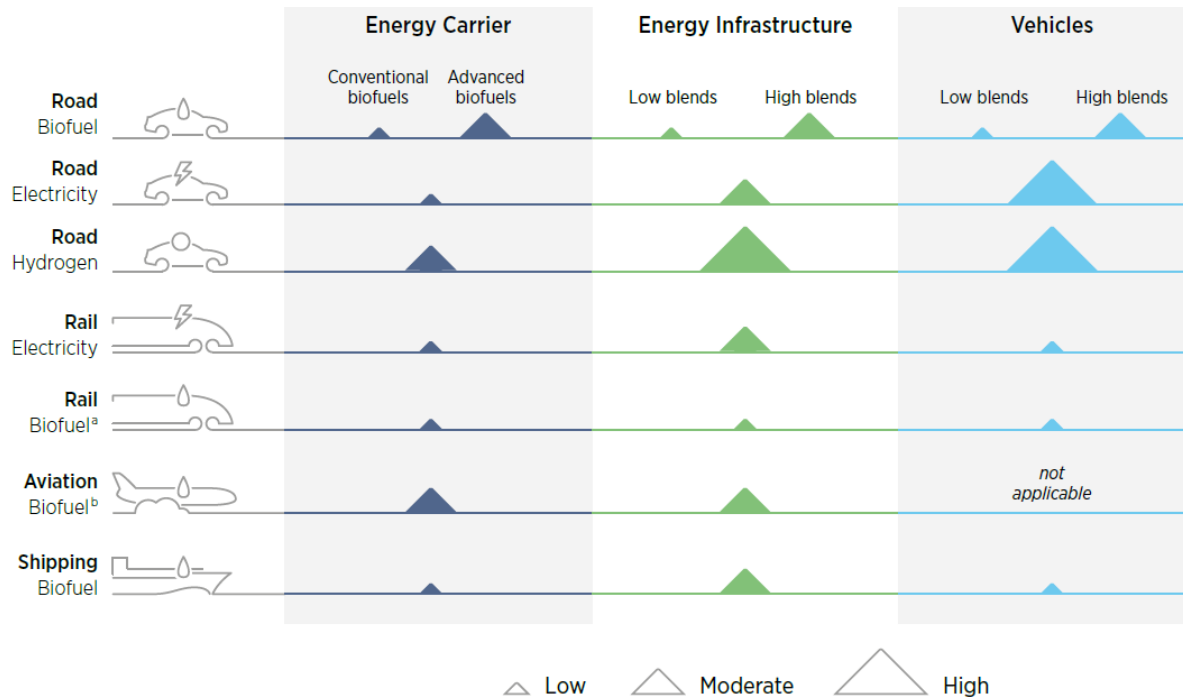
Some leading renewable heat countries:
Sweden 69%
Finland 53%
Brazil 45%



Policies to support renewable energy in transport

Renewable policy in the transport sector mainly relates to biofuels. There is a need for broader strategies

Relevance of barriers for renewable energy carriers in transport sub-sectors



Policy intervention crucial to reduce transport sector's dependence on fossil fuel:

- Removing fossil fuel subsidies essential
- Carbon price is a key tool
- These are particularly important for shipping and aviation.

Source: IRENA-IEA-REN21, *Renewable Energy Policies in a Time of Transition, 2018*

Strategies include: transport reduction, modal shift, efficiency and fuel switch
Main options for fuel switch: biofuels; electricity; natural gas; some hydrogen

Socio-economic benefits of the energy transition



+ 1.0 %

+ 52 USD trillion

Almost 29 million
jobs in 2050

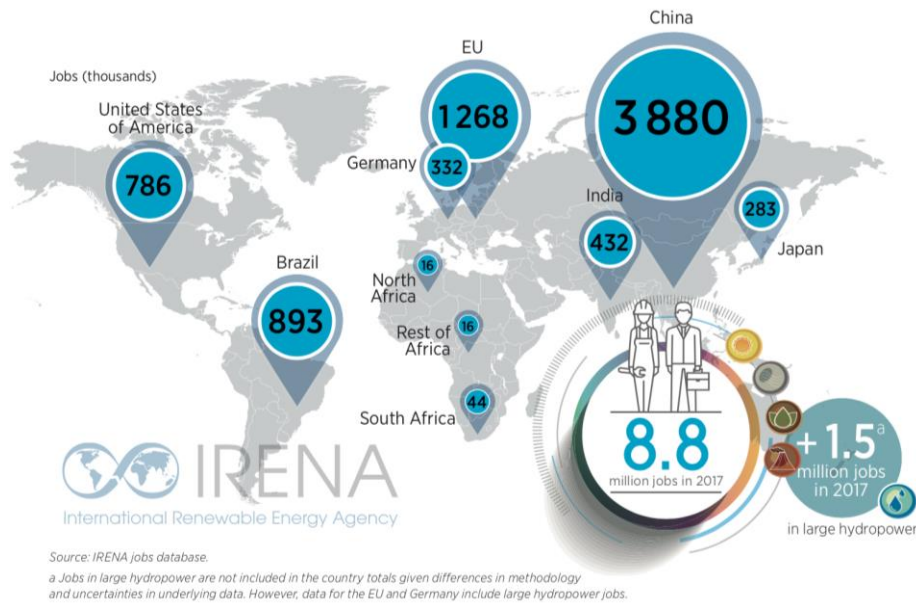


+ 15 %

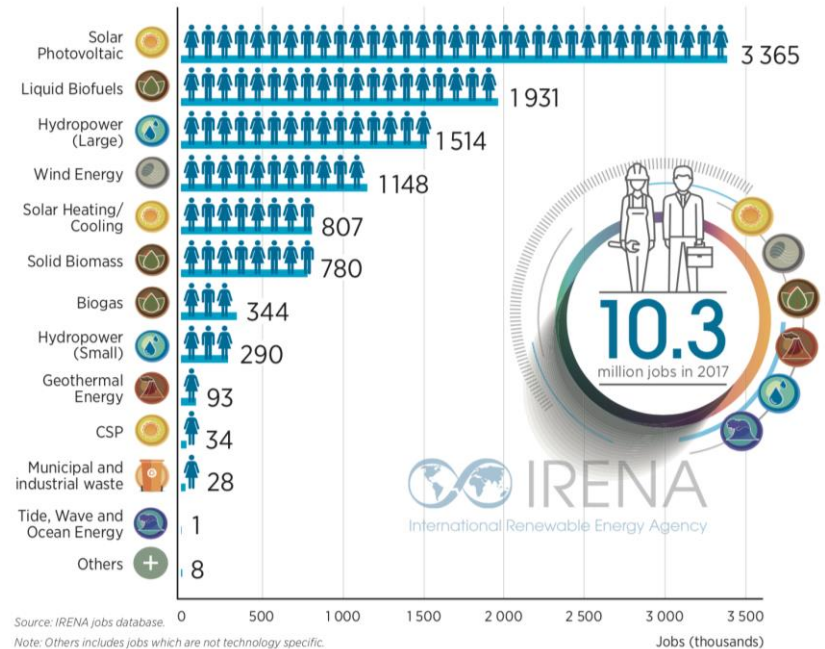


Jobs in renewable energy

Renewable energy jobs by country, 2017



Renewable energy jobs by technology, 2017



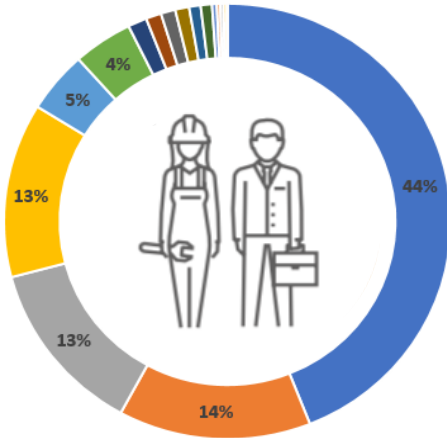
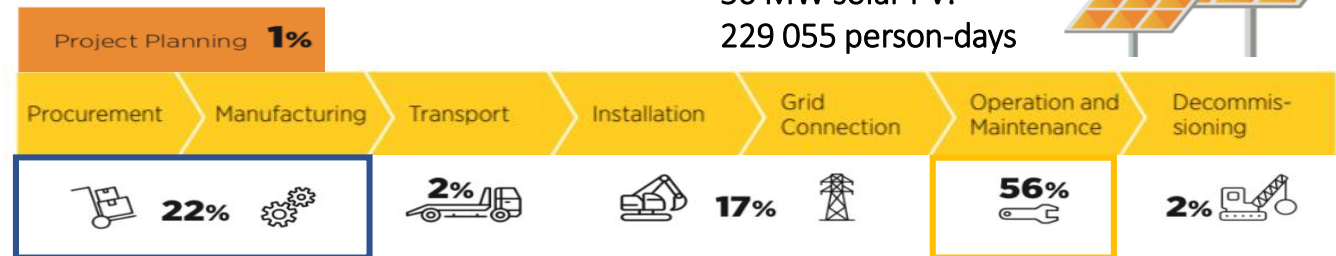
Source: IRENA, [Renewable Energy and Jobs - Annual Review 2018](#)

In 2017, there were 10.3 million jobs in renewables. Jobs are increasingly moving to Asia with concentration in China, India and Japan. By technology, solar PV is the largest employer

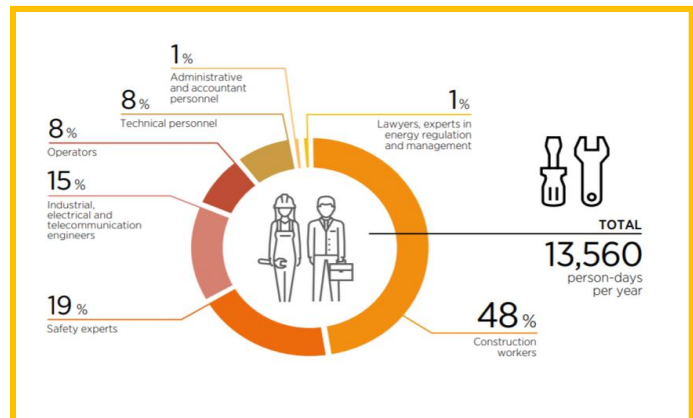
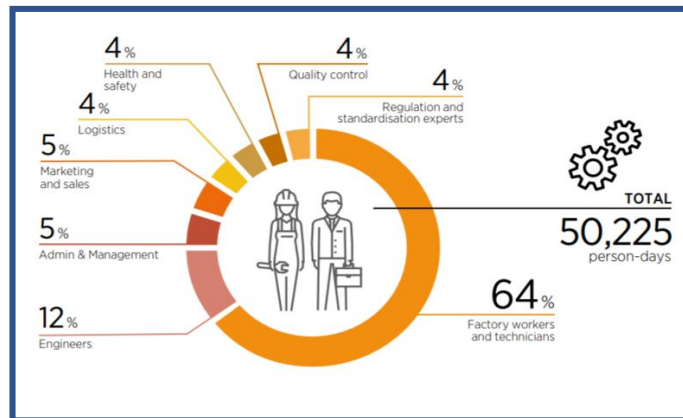
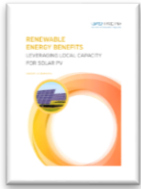
Jobs in solar PV



50 MW solar PV:
229 055 person-days



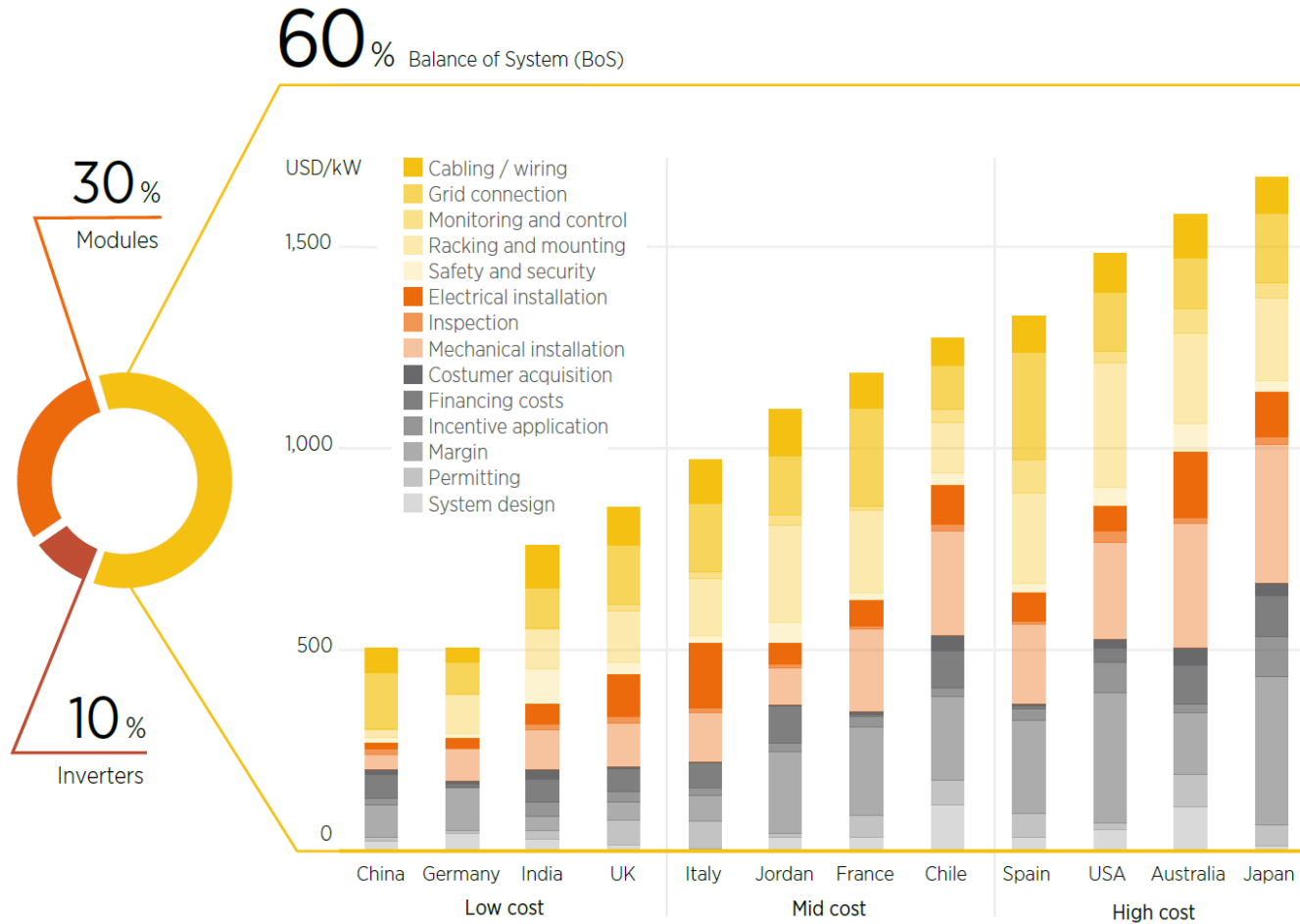
- Construction workers and technicians
- Factory workers
- Engineers
- Quality Health and Safety experts
- Operators
- Technical personnel
- Truck drivers
- Administrative personnel
- Logistic experts
- Marketing and sales personnel
- Legal, energy regulation, real estate and taxation experts
- Regulation and standardization experts
- Loading staff
- Environmental experts
- Management
- Financial analysts
- Shipping agents



Source: IRENA, *Renewable Energy Benefits: Leveraging Local Capacity for Solar PV, 2017*

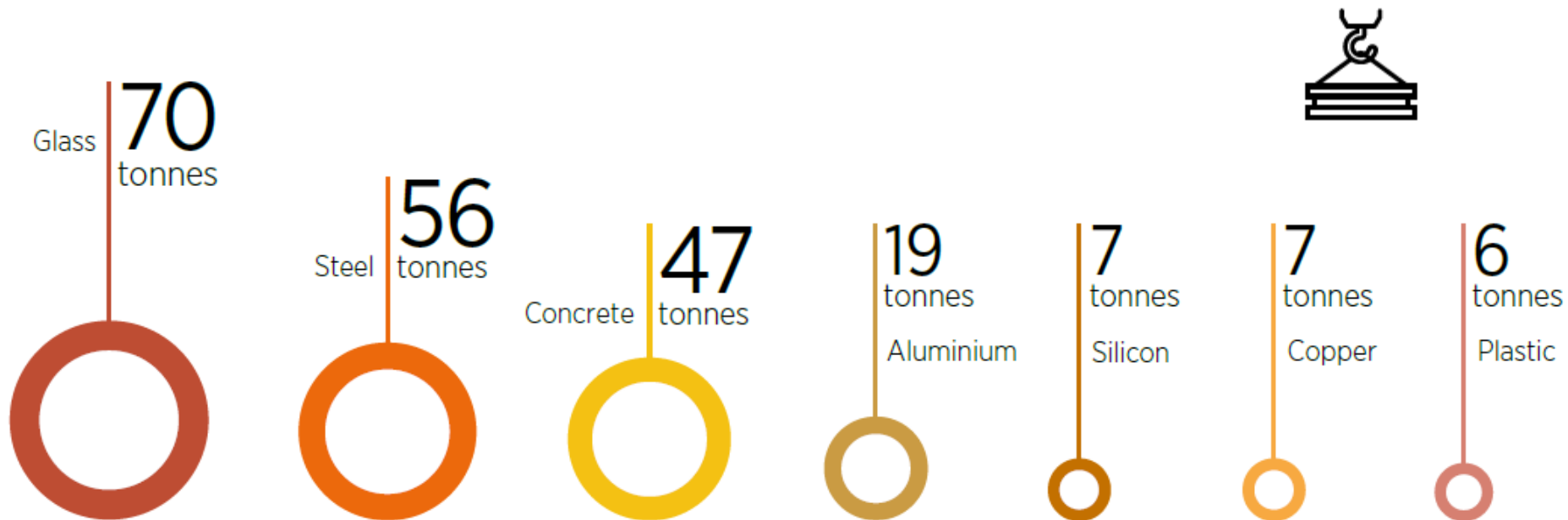
In the solar PV value chain, 56% of the human resources required are in O&M while manufacturing and procurement employs 22% of the total. The majority of labour are construction workers and technicians

Distribution of costs of a large-scale solar PV in 2015



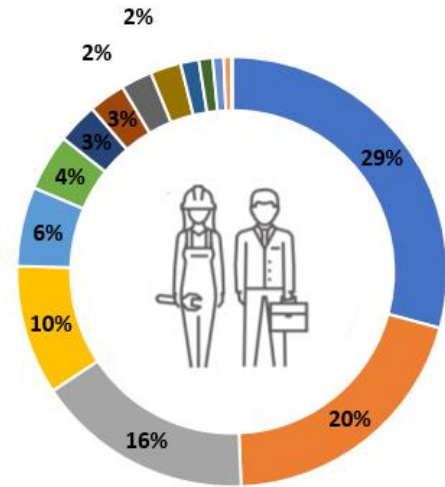
Source: IRENA, Renewable Power Generation Costs in 2017, 2018

Materials needed to develop a 1 MW Silicon-based solar PV plant (tonnes)

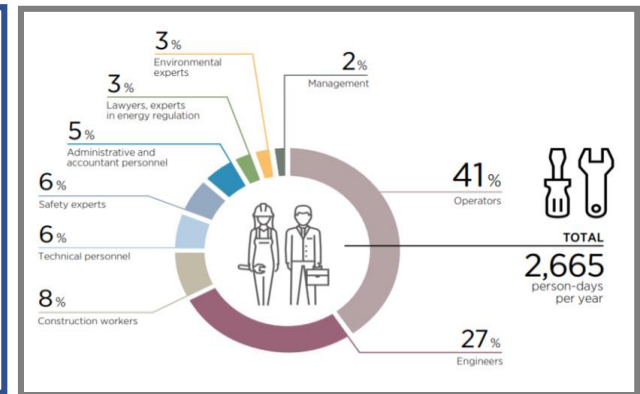
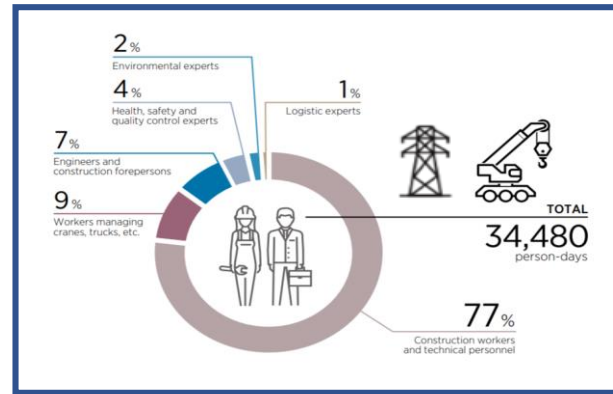
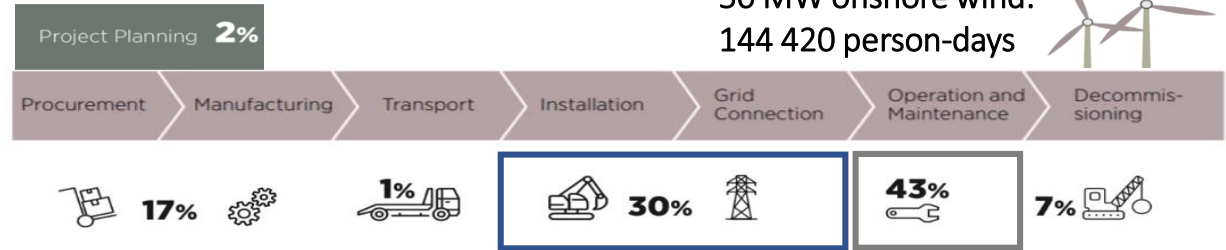
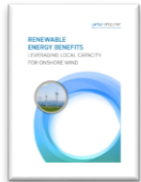


Source: IRENA, Renewable Energy Benefits: Leveraging Local Capacity for Solar PV, 2017

Jobs in onshore wind



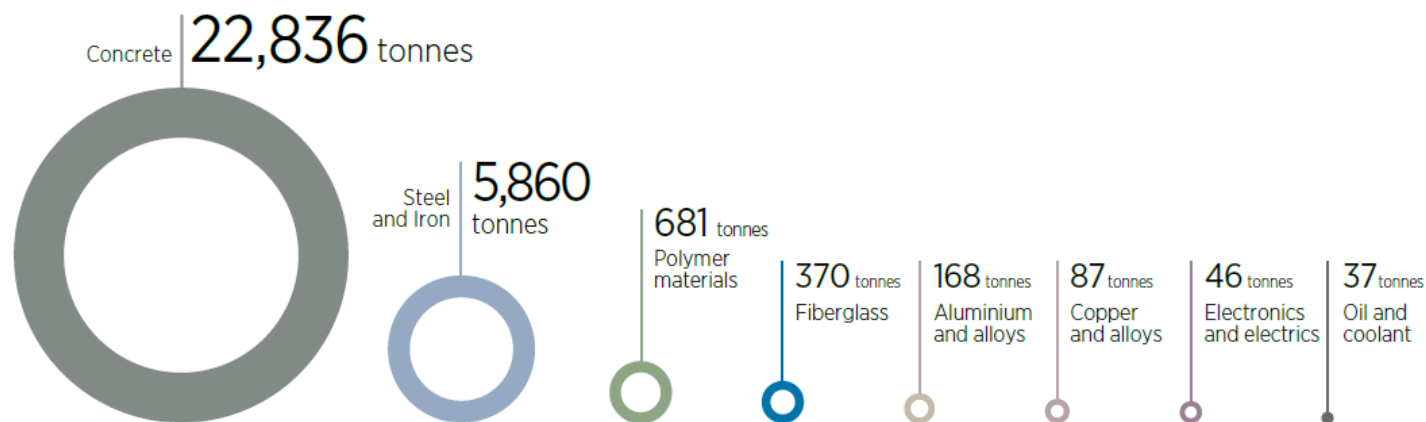
- Construction workers and technicians
- Operators
- Engineers*
- Factory workers
- Quality Health and Safety experts
- Truck drivers, crane operators
- Administrative personnel
- Technical personnel
- Environmental experts
- Legal, energy regulation, real estate and taxation experts
- Logistic experts
- Management
- Marketing and sales personnel
- Financial analysts
- Geotechnical experts
- Regulation and standardization experts




Source: IRENA, Renewable Energy Benefits: Leveraging Local Capacity for Onshore Wind, 2017

In the onshore wind value chain, 43% of the human resources required are in O&M, 30% are in installation and grid connection, while manufacturing and procurement employs 17% of the total. The majority of labour are construction workers and technicians

Materials needed to develop a 50 MW wind farm (tonnes)



Source: Vestas, 2015

 MATERIAL	Turbines	Foundations	Cables	Site switch-gears and transformers
Concrete	-	22,836	-	-
Steel and iron	4,607	1,228	-	25
Fiberglass	368	-	1	1
Polymer materials	325	1	355	-
Electronics/electrics	46	-	-	-
Copper and alloys	32	1	41	13
Oil and coolant	18	-	-	19
Aluminium and alloys	9	-	159	-

Policies for renewable energy deployment

Policies to achieve the energy transition		Deployment of renewables in the general context	Deployment of renewables in the access context	Maximisation of socio-economic development from renewable energy
Direct policies	Push	<ul style="list-style-type: none"> • Binding targets • Quotas and obligations • Codes and mandates • 	<ul style="list-style-type: none"> • Rural targets, strategies, programmes 	Deployment policies designed to maximise benefits and ensure a sustainable transition (e.g., communities, gender) including requirements, preferential treatment and financial incentives provided to installations and projects that help deliver socio-economic objectives
	Pull	<ul style="list-style-type: none"> • Regulatory and pricing policies • Tradable certificates • Instruments for self-consumption • Support voluntary programmes 	<ul style="list-style-type: none"> • Regulatory and pricing policies (e.g. legal provisions, price/tariff regulation) 	
	Fiscal and financial	<ul style="list-style-type: none"> • Tax incentives • Subsidies • Grants 	<ul style="list-style-type: none"> • Tax incentives • Subsidies • Grants • Concessional financing • Support for financial intermediaries 	
Integrating policies		<ul style="list-style-type: none"> • Measures to enhance system flexibility 	<ul style="list-style-type: none"> • Integration of off-grid systems with main-grid • Coupling with efficient appliances and services 	
		<ul style="list-style-type: none"> • Policies for infrastructure, sector coupling and R&D <ul style="list-style-type: none"> • Better alignment of energy efficiency and renewable energy policies • Incorporation of decarbonisation objectives into national energy plans • Adaptation measures of socio-economic structure to the energy transition 		
Enabling policies		<ul style="list-style-type: none"> • Policies to level the playing field • Policies to ensure the reliability of technology 		<ul style="list-style-type: none"> • Industrial, trade policy and environmental and climate policies
Enabling and integrating policies		<ul style="list-style-type: none"> • National renewable energy policy • Access to finance, Education, Labour, Land-use, RD&D and innovation, Urban and Public health policies • Supportive governance and institutional architecture • Awareness programmes • Social protection policies to address disruptions • Measures for integrated resource management 		



The importance of the broader policy context goes well beyond the energy sector and includes integrating and enabling policies

Source: IRENA-IEA-REN21, Renewable Energy Policies in a Time of Transition, 2018



