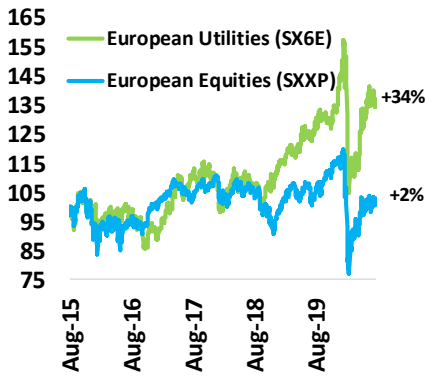
Renewables:

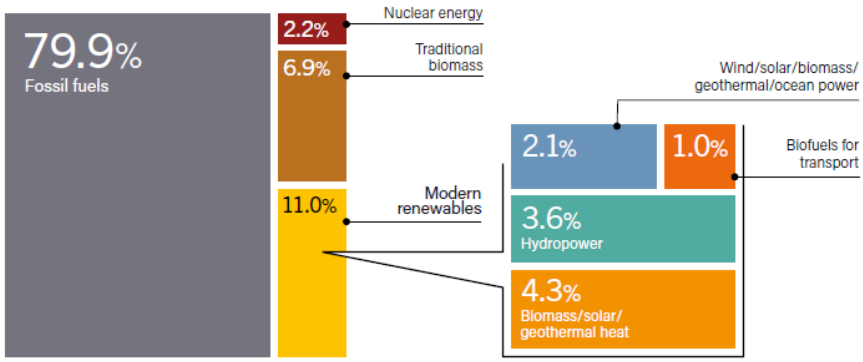
Investors have been very excited with the renewables sector, as companies outperform the market and green bonds achieve low yields due to very high demand. Some argue, that this is an overreaction, and that the theme is excessively hyped. The fact however is, that renewables only account for 11% of global energy consumption (in 2018), so we are still in a very early phase of the energy transition and there is still plenty of room for investment and growth. It is important however to beware of some market players that invest in unprofitable projects just to gain exposure to this theme and/or counterbalance other parts of the business in terms of carbon emissions.

Utilities vs European equity:



Source: BiG Research

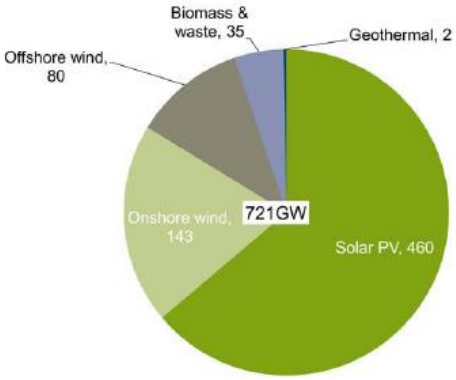
Total Energy consumption in 2018:



Source: REN21, based on IEA data

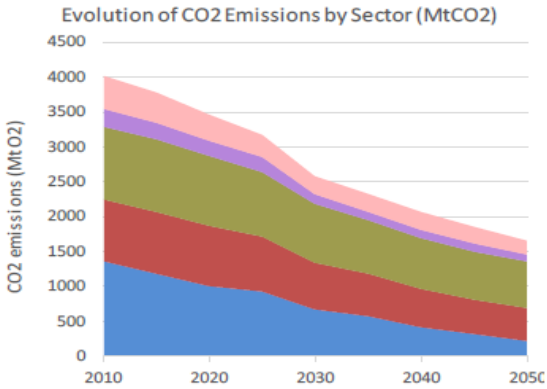
Greenhouse gas emissions have been responsible for the overheating of the planet and society's concern has been increasing, pressuring governments to take action. EU plans to achieve net zero greenhouse gas emissions by 2050. In order to reduce emissions, more energy has to be produced by renewable sources. Until 2030, it is estimated that we need 721 GW of renewable capacity investments, in order to fulfil governments' goals of reducing carbon emissions:

Capacity needed to achieve governments' goal of reducing carbon emissions:



Source: UNEP, BloombergNEF

Estimates of European CO2 emissions in 2018 EU plan:



Source: EU; PRIMES

Constraints of renewables: the main constraint is the intermittent energy production, especially in wind and solar. As such, there is a major need for technologies that are capable of storing the energy and making it available in periods of less production. Batteries and other forms of storage are being developed but are still in early stages. One of them is hydrogen, but according to EU, the technology should only be viable after 2030.

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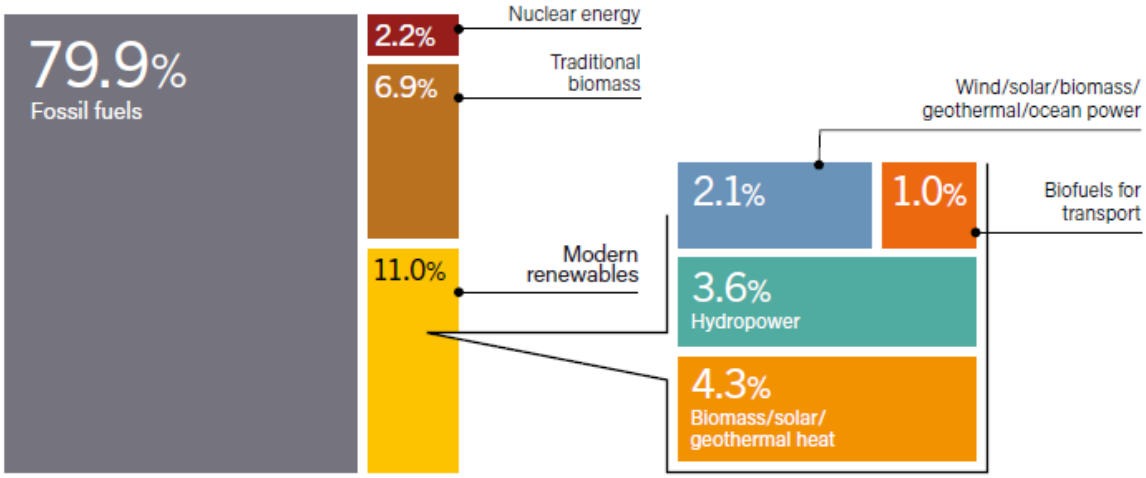
Industry overview:

According to REN21 (an agency for sharing of renewable energy information), renewables only accounted for 11% of global total final energy consumption in 2018 (vs 9.6% in 2013).
Total Energy Final Consumption (TEFC) is 17% of electricity (excl. heating, cooling and transport), transport 32% and thermal 51%.
In terms of investments, in 2019 more than USD 300 bn were dedicated to renewable power and fuels.



Source: REN21, based on IEA data

There is a long way ahead in renewables utilization as a % of total demand:

- **Buildings:** Renewables only accounted for 14% of total energy demand in buildings in 2017. More than ¾ is for heating and cooling which uses mainly fossil fuel-based energy, for which renewables only accounted for 10.1% in 2018.

- **Industry:** Renewables represented only 14.5% of industrial final energy demand (of which half was bioenergy).

- **Transport:** Represents 1/3 of TEFC but renewables were only 3% of this demand.

- **Power:** Renewables contributed to 27% of global electricity generation at end of 2019. Installed renewable capacity increased by 200GW in 2019 (mostly solar photovoltaic).

Update on different sources of renewable energy:

- **Bioenergy:** (5.1% of TEFC in 2018, or half of renewable energy consumption) use of bioenergy for heating in industry has been growing at around 2% per year but declining for heating in buildings. Mostly is concentrated in bio-based industries such as pulp and paper. Biofuels, like ethanol and biodiesel only provide 3% of total transport energy. In electricity sector, biofuel production increased 9% in 2019 to 501 TWh, being China the lead producer. Global biofuels production increased 5% in 2019.

- **Geothermal Power and Heat:** in 2019 reached 95 TWh of electricity generation. Total capacity increased by 0.7 GW to 13.9 GW in 2019. Direct usage of this type of energy for thermal applications grew by 8% in last years. China, Turkey, Iceland and Japan represented around 75% of geothermal direct use. The development activity is dependent on government supports, given that there are high projects costs and front-loaded project risks.

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- **Hydropower:** New capacity growth of hydropower is fading, achieving only +15.6 GW in 2019 to a total capacity of 1,150 GW. Generation increased by 2.3% to 4,306 TWh. Hydropower faces some challenges such as climate vulnerabilities and social impact.

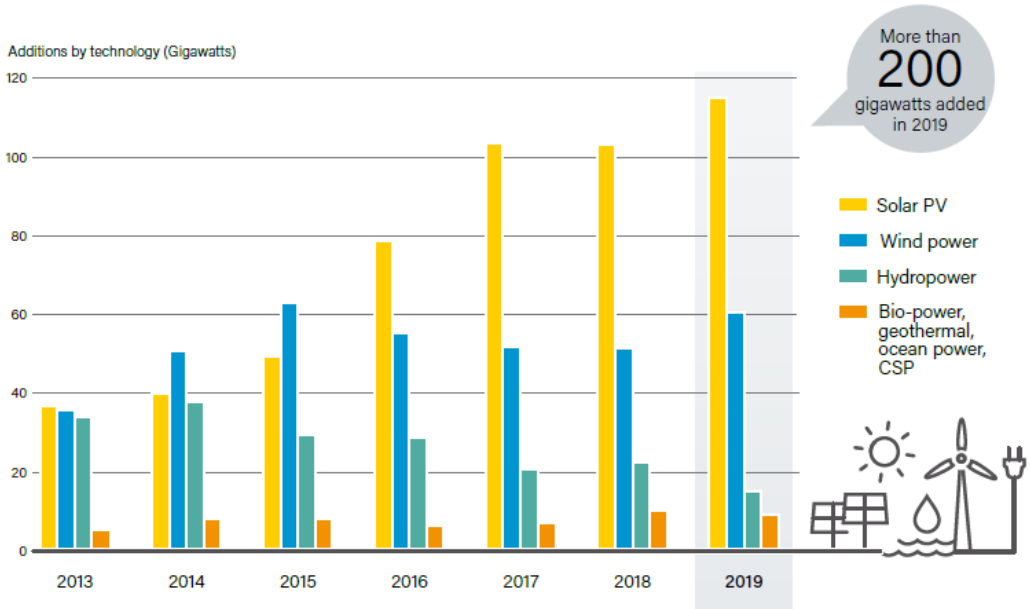
- **Ocean Power:** With only 535 MW of installed capacity this energy is still underdeveloped, mainly composed with small and pilot projects. Still, Canada, US and China offer financial support for R&D programs in this area.

- **Solar Photovoltaic:** In 2019 there was an increase of 115 GW capacity to a total of 627 GW, enough to produce an estimated 2.8% of global electricity generation. China registered a substantial decline of demand, despite the rest of the world growing by 44%. Still, China continues to dominate the market and manufacturing. Government support and adequate regulatory framework is important, however there are a number of large projects under construction without these incentives. Corporate demand and even self-consumption are increasing (some with battery storage), especially in Australia and Germany. This is a highly competitive industry which has driven margins in recent auctions to substantially low levels. There are several companies entering the market, trying to develop new solutions and technology.

- **Concentrating Solar Thermal Power:** Grew by 600 MW to 6.2 GW (+11%), but mainly in emerging markets.

- **Solar Thermal Heating and Cooling:** Global capacity declined by 1% in 2019, with China accounting for 69% of the 479 GW thermal capacity.

- **Wind Power:** In 2019 registered the 2nd highest annual increase, of 10% (60GW) to a total of 650 GW, of which 621 GW onshore, and the rest offshore. Falling prices are opening new markets but worldwide transition to auctions resulted in intense price competition. The sector is trying to develop new technology to reduce costs. Offshore is growing in importance as it is the combinations with solar and energy storage projects. Denmark already produces 57% of its electricity from wind energy, followed by Ireland (32%), Uruguay (29.5%) and Portugal (26.4%).



Source: REN21, based on IEA data

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European Union 2050 greenhouse gas neutrality goals:

Targeted policies are fundamental to incentivize and promote investments and use of renewable energy: European Union goal is to achieve greenhouse gas neutrality by 2050.

Source: European Union

Green Deal includes a reduction of greenhouse gas emissions of 50% until 2030, vs 1990 levels. By summer 2020 the Commission will present an impact assessed plan to achieve this goal. The EU will in June 2021 revise climate policies. Meanwhile below are details of the previous plan announced in 2018.

Main objectives of EU (plan of 2018):

- **Targets 2030:** 40% decrease in greenhouse gas emissions and increase share of renewables by 32%.
- **Nuclear:** remains an important component of the EU energy mix with a 2050 horizon.
- **Gas:** prevent gas supply crises and coordinate a common regional approach to ensure great flexibility of gas supply through LNG and gas storage.

InvestEU: This program aims to have a EUR 38 bn guarantee which is expected to produce EUR 650 bn of investments, of which 30% will be directed to climate objectives.

Multiannual Financial Framework 2021-27: EU intends to allocate 35% of EU expenditure (or EUR 320 bn) to climate objectives.

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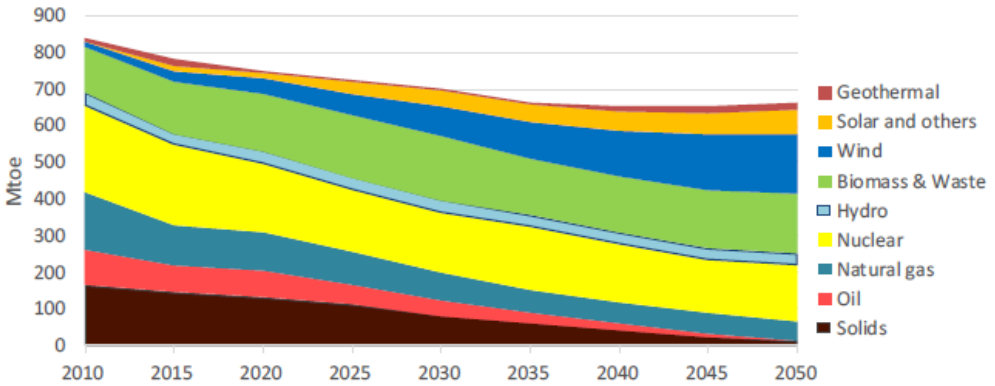
Preview of energy production in EU until 2050: This picture illustrates well the intention of EU to decrease the production of fossil fuels while increasing solar and wind energy, and maintaining nuclear and some natural gas production in order to compensate for the variability in renewables production rates:

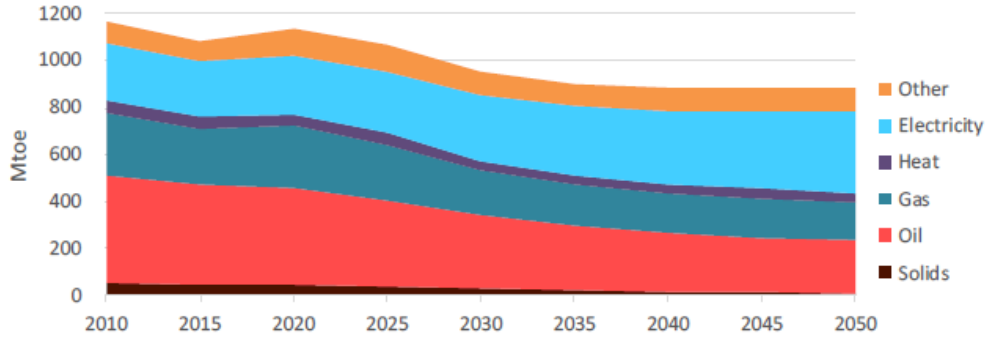
Figure 7: Primary energy production in the Baseline



Source: Eurostat

Preview of energy demand in EU until 2050: Electricity is predicted to increase its weight in energy demand, while oil should continue to decline.

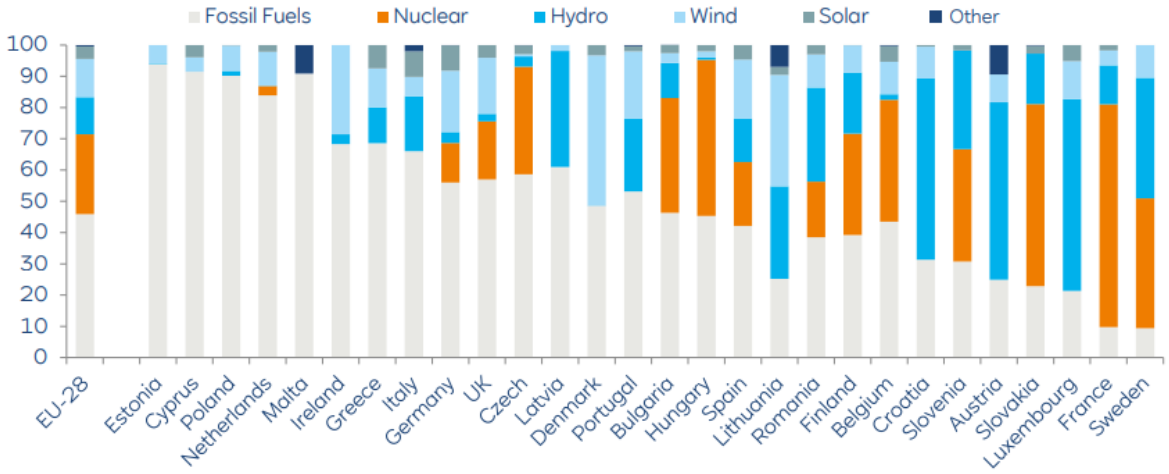
Figure 10: Final Energy demand by fuel/energy carrier



Note: "Other" includes biomass and waste.

Source: Eurostat

EU 28 Power Generation by source:



Source: Eurostat 2018

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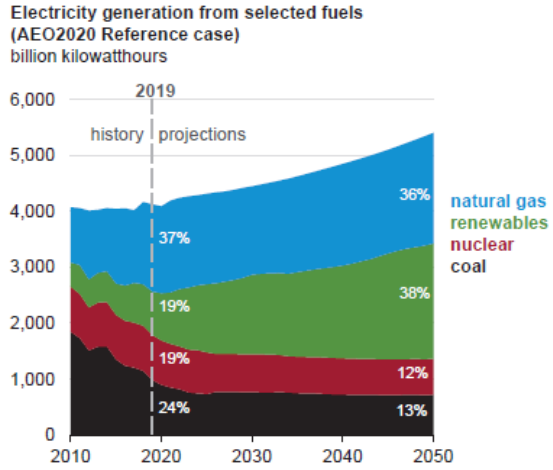
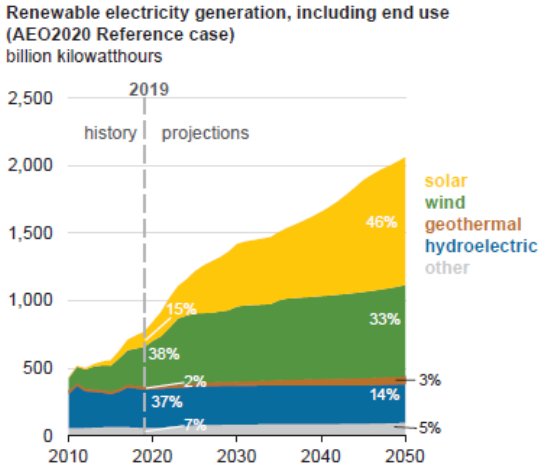
US EIA projections for renewables penetration well below Europe goals:

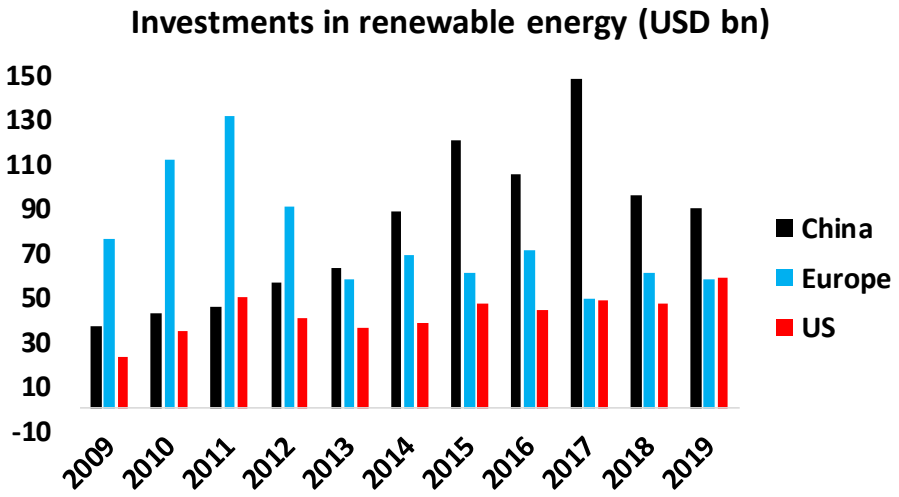
Despite assuming an increase in renewables energy production, the US Energy Information Administration still expects close to 50% of electricity production in 2050 to come from natural gas and coal, a sharp contrast with EU's plan.





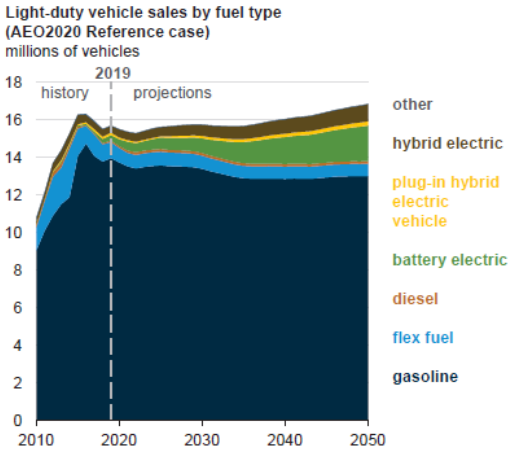
Source: US Energy Information Administration

US lags counterparts in renewables investment:



Source: BloombergNEF

US antecipates lower penetration of electric vehicles: While European Union anticipates that the share of gasoline and diesel vehicles will decline to only 38% of vehicles on the road in 2050, EIA is still very sceptical of an increase in electric vehicles in US:



Source: EIA

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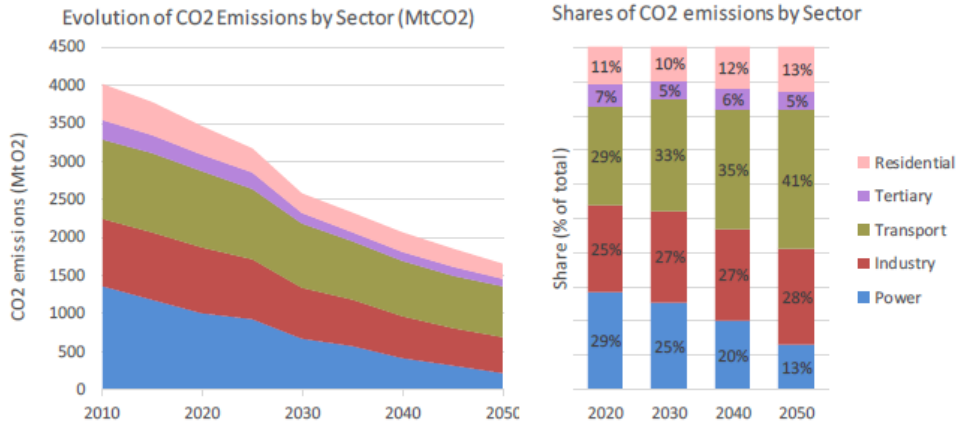
Greenhouse gas emissions:

Greenhouse gases include gases that have the capacity to absorb infrared radiation from the Earth's surface and reradiating it back to Earth, elevating this way the Planet's temperature. The main ones are CO2 and methane. The Paris agreement established the need to limit the increase of 1.5 degrees Celsius in global temperature in order to avoid major climate impacts. According to United Nations Environment Programme (UNEP) this requires net zero carbon dioxide emissions by 2050 and net zero greenhouse gas emissions by 2060 to 2080.

To achieve Greenhouse gas emissions neutrality we have to reduce as much as possible the emissions and the remaining must be balanced with equivalent removals of emissions through carbon capture or negative emissions (for example through reforestation).

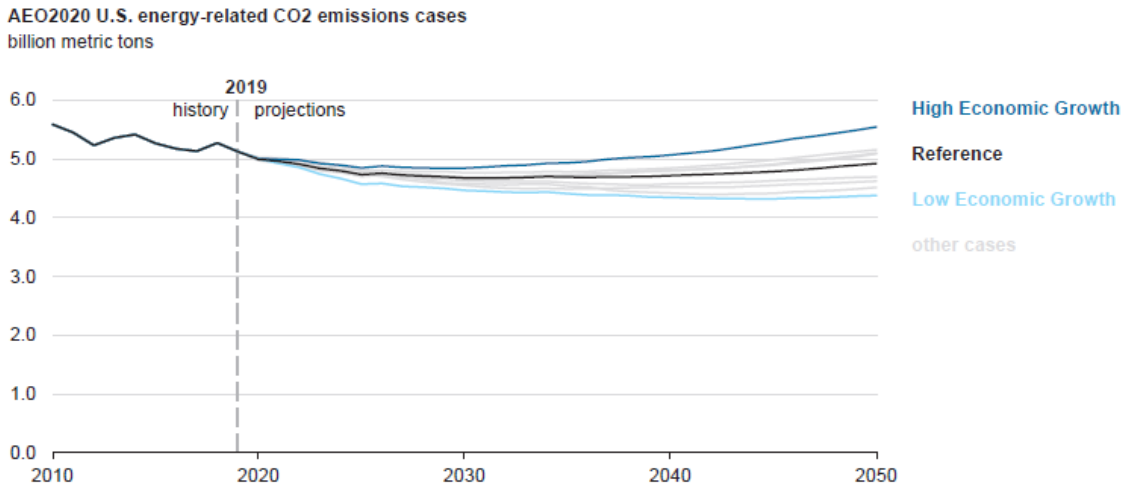
Europe CO2 emissions (estimates on the EU Plan of 2018):



Note: "Tertiary" includes the energy consumed in the agricultural sector.

Source: EU; PRIMES

It is clear that US is behind Europe in terms of CO2 planned reductions (estimates of the US Energy Information Agency):



Source: EIA

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Types of Renewable energy sources:

Bioenergy:

This type of energy is sourced from biological materials such as wood, crops or even waste, to produce heat, electricity or fuel for transport.

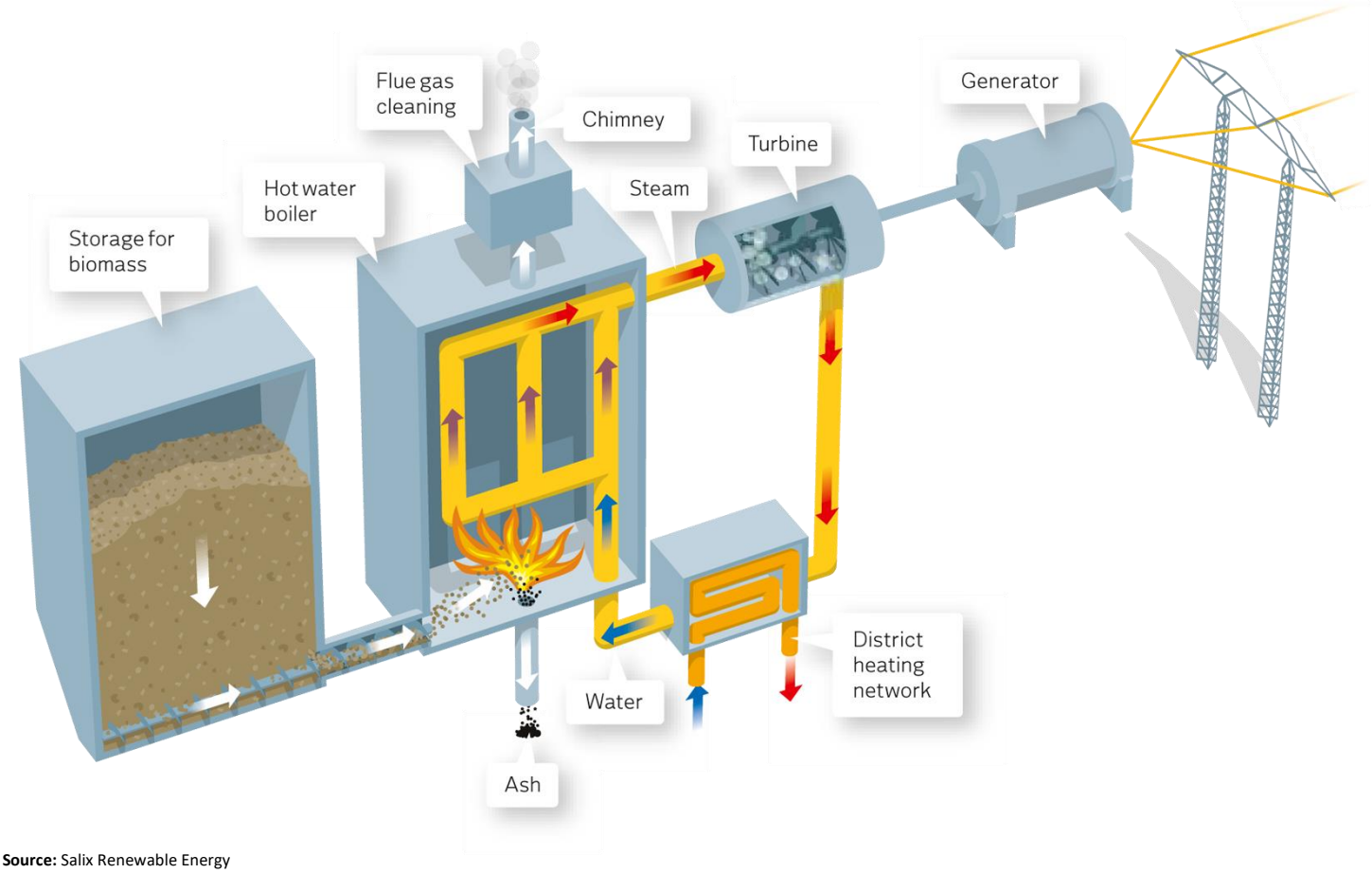
Traditional bioenergy: is considered an unsustainable application of biomass, which is used in open fires or basic stoves for cooking, hot water or residential heating. Mostly used in developing and emerging countries.

Modern Bioenergy: More clean than traditional, but needs to follow a sustainable use of biomass resources. It accounts for 50% of renewables consumption.

- **Biofuels:** In 2019 production grew by 5% to 161 bn litres, of which 41% produced in US, 26% in Brazil and Indonesia 4.5%. Main biofuels are ethanol (from sugar cane, corn and other crops) and biodiesel (from vegetable oils and fats, including waste of cooking oil).

- **Bioenergy for heat:** most of the biomass used here is wood-based, while biomethane may also be used. This type of energy is mostly used in industry and agriculture, like for example paper and board, sugar and other food products businesses.
  Examples: Brazil, was in 2018 the largest user of biomass heat from its sugar production, as was also India. US also uses bioenergy for industrial heat in its pulp and paper industry.

- **Bio-electricity:** This form of power energy grew by 6% in 2019 to 139 GW.



Source: Salix Renewable Energy

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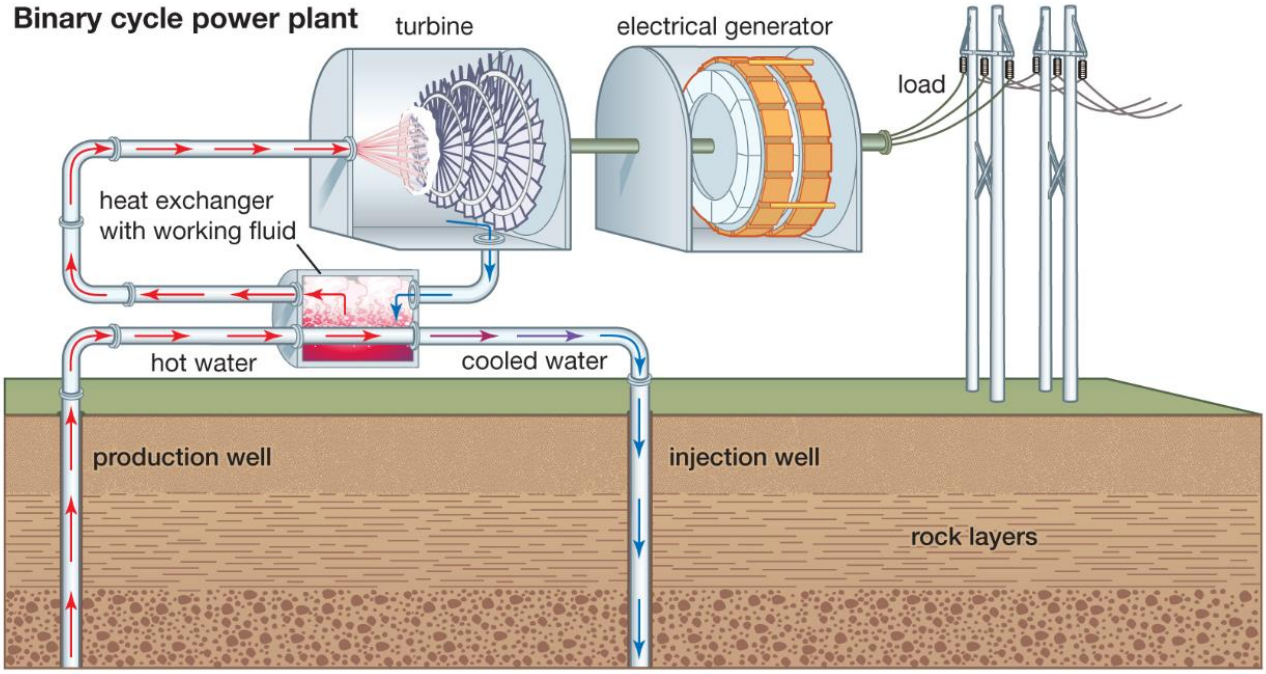
Geothermal Power and Heat:

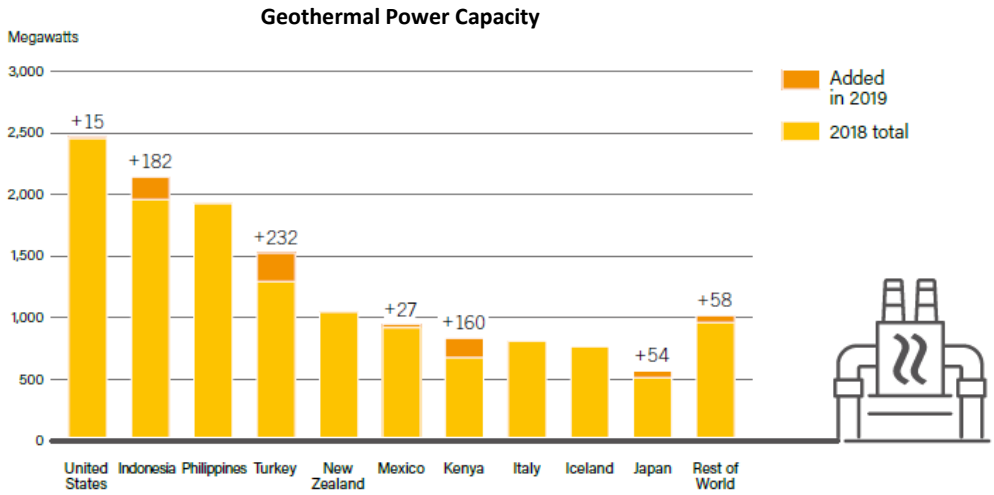
This type of energy source may generate electricity (which in 2019 amounted to 95 TWh) or heat (117 TWh). Total existing capacity increased in 2019 by 0.7 GW to 13.9GW.

Geothermal plants are usually located in regions with volcanic activity or hot springs, where a well can be drilled into 1 or 2 miles deep in earth in order to pump hot water to the surface. This water will become steam as the pressure drops in the surface and will spin a turbine to generate electricity. Then this steam is cooled again and condenses back into water and into the subsurface through another well.



Source: Britannica

Turkey is one of the countries with more geothermal capacity installed due to government subsidy implemented in 2011, which is now being reviewed for a possible renovation. However, there has been increasing community concern due to adverse impacts of air emissions and groundwater contamination. The emissions are created due to the high level of greenhouse gases below the surface of the Earth that with this process end up in the atmosphere.



Source: REN21

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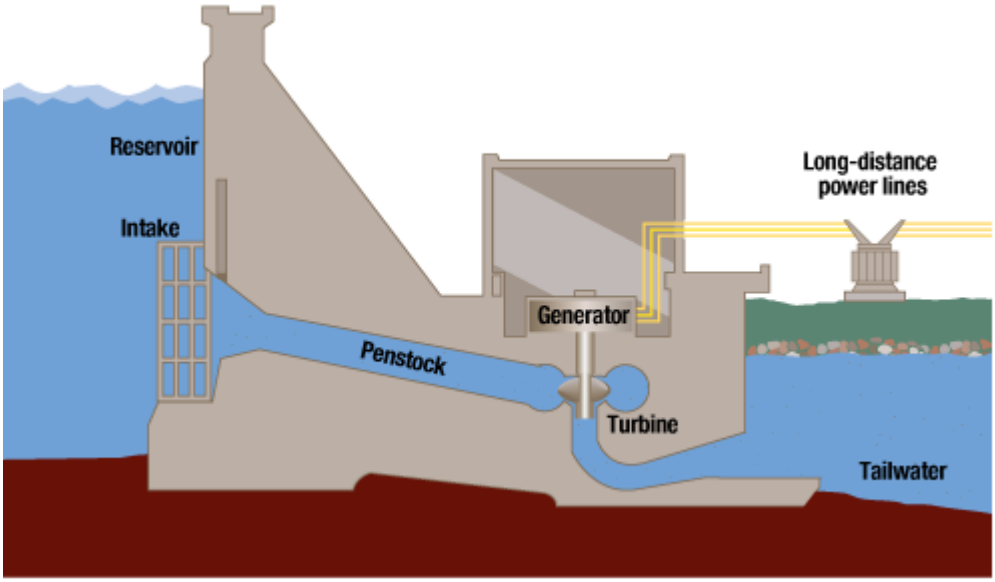
Hydropower:

Through the construction of a dam (in most cases) it is possible to generate a constant high pressure flux of water that will turn a turbine in order to produce electricity through a generator.

Total capacity installed of hydropower reached 1,150 GW in 2018, of which the majority in China (28%), followed by Brazil (9%), Canada (7%) and US (7%). Growth however has been fading in recent years as the industry faces challenges from climate impact (like droughts for example), and its economics become less attractive vs other renewable sources of energy.



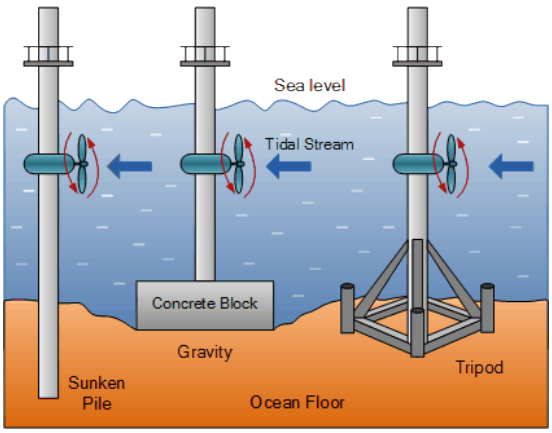
Source: TVA

Ocean Power:

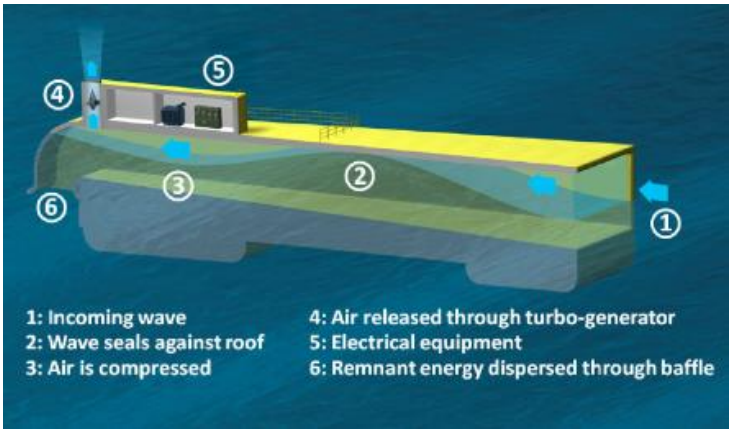
Despite the enormous potential, this source of energy still represents a very tiny part of renewables market, as the technologies are still in early stages of development. Several companies underestimated the technical challenges and costs of this source of energy, but lately costs and amount of investment needed is declining.

Tidal Stream: this is one of the main technologies being developed and is similar to wind turbines as it draws energy from flows of water (vs wind in the latter). As water has a higher density, it is capable of generating more energy proportionately to wind.

Wave Power: still underdeveloped; tries to use the movement of waves that pressurizes air into a turbine.



Source: Alternative Energy



Source: Renewable Energy Focus

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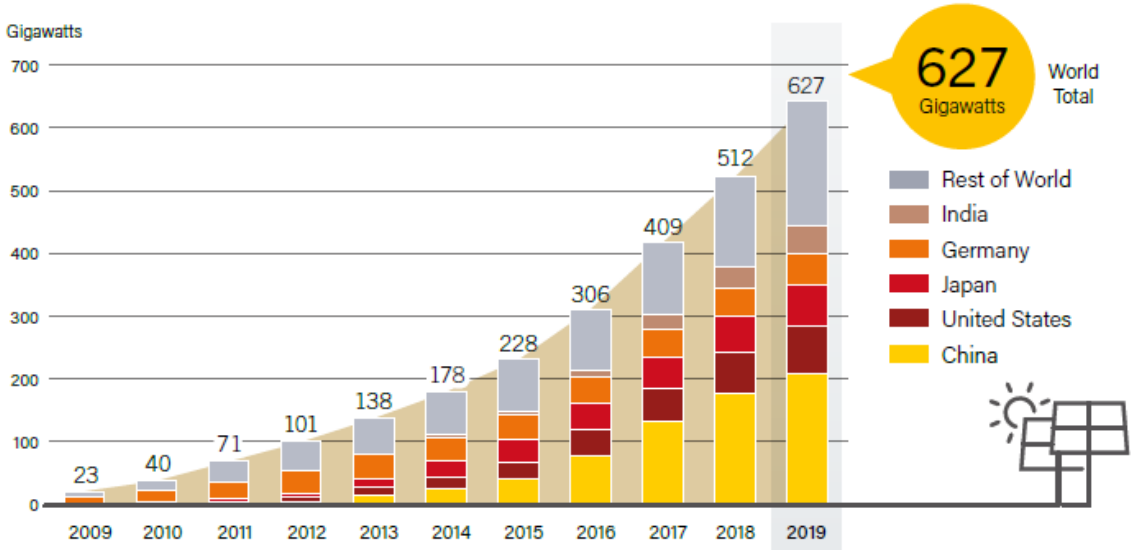
Solar Photovoltaics:

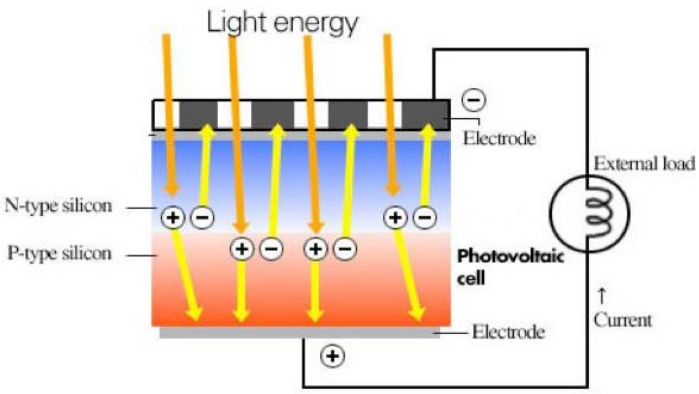
Solar panels receive light and separate the electrons from atoms, generating a flow of electricity. In 2019 the solar capacity increased by 115 GW to a total of 627 GW, since it is becoming one of the most cost effective options for electricity generation.

In 2019 China growth in Solar PV declined as the country gets ready to restructure its renewables energy market. It wants to shift from a high speed capacity growth funded by subsidies to growth controlled by auctions and subsidy-free deployment. The government ceased approvals for new subsidised projects in may 2018.

Solar Photovoltaics capacity



Source: REN21



Source: Photovoltaic

Prices and cost: In 2019 in tenders and auctions the price of bids declined in some countries to prices below average price of electricity. Average bid was around USD 30/MWh, but at the end of the year there were bids below USD 20/MWh. Some producers give low bids, hoping to reduce costs until the implementation of the project and sell part of the electricity in the wholesale market.

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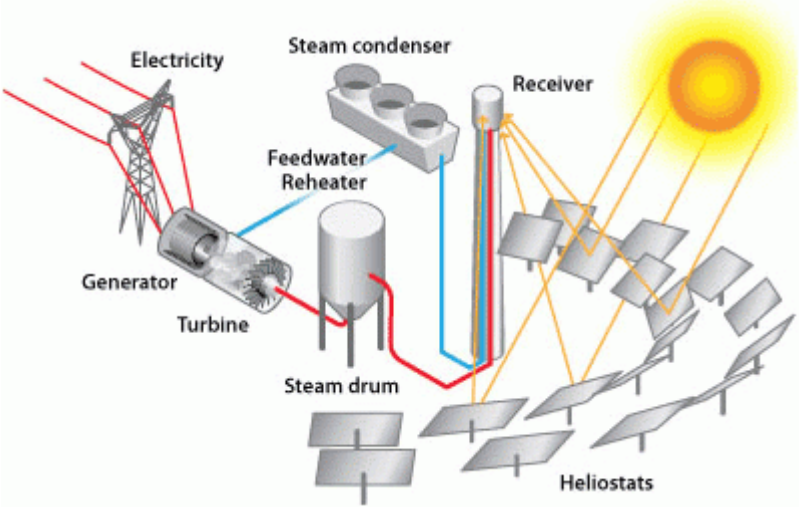
Concentrating Solar Thermal Power:

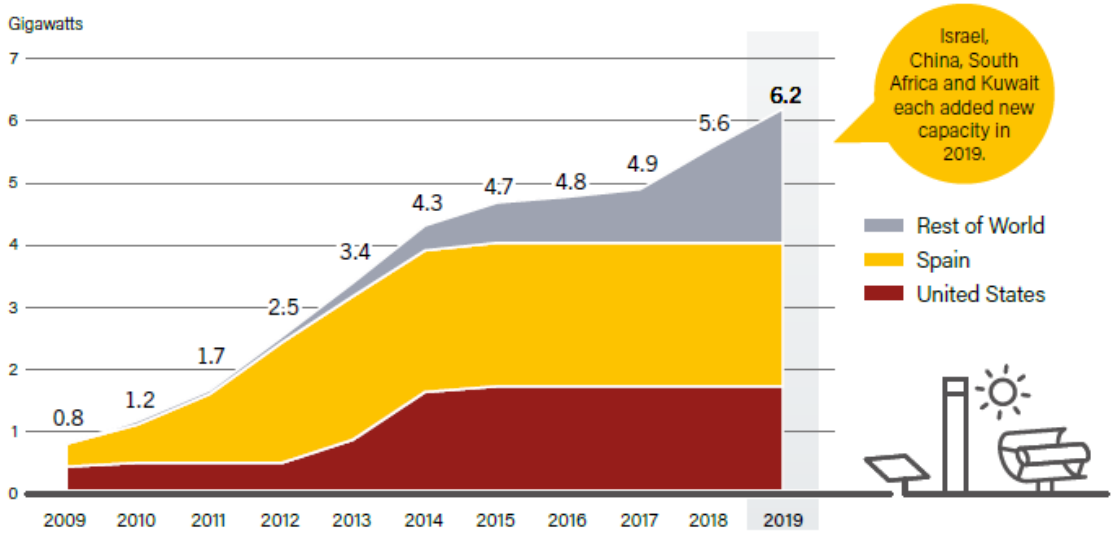
Contrarily to solar photovoltaic panels that absorb light, these reflect the light towards a specific receiver, which uses that light to heat water that will then become steam and generate electricity through a turbine.



Source: US Energy department

This technology has not yet spread as widely as photovoltaic, having in 2019 grown by 600MW to 6.2GW.

Concentrating Solar Thermal Power capacity



Source: REN21

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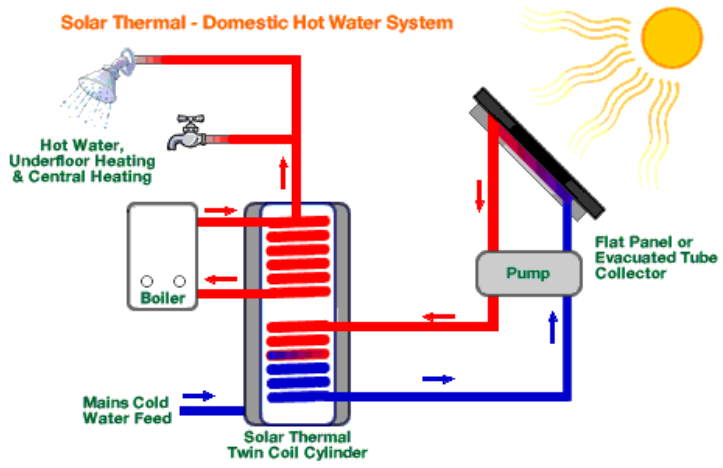
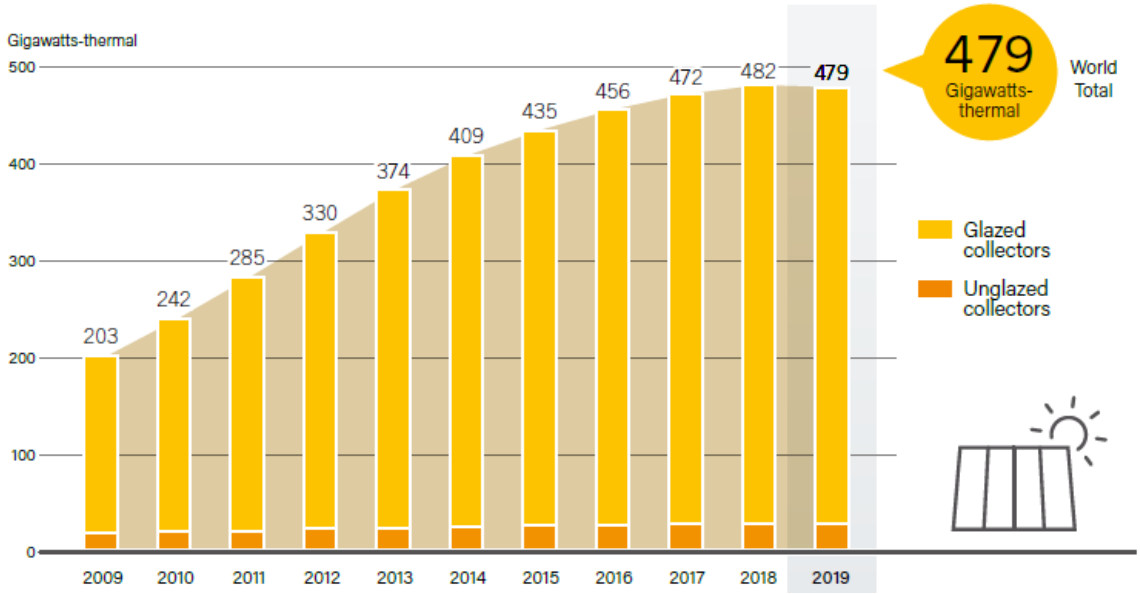
Solar Thermal Heating:

These systems are present in millions of homes and industrial complexes, with a capacity of 479 GW thermal.



Source: Solar Collector

Solar Thermal Heating capacity



Source: REN21

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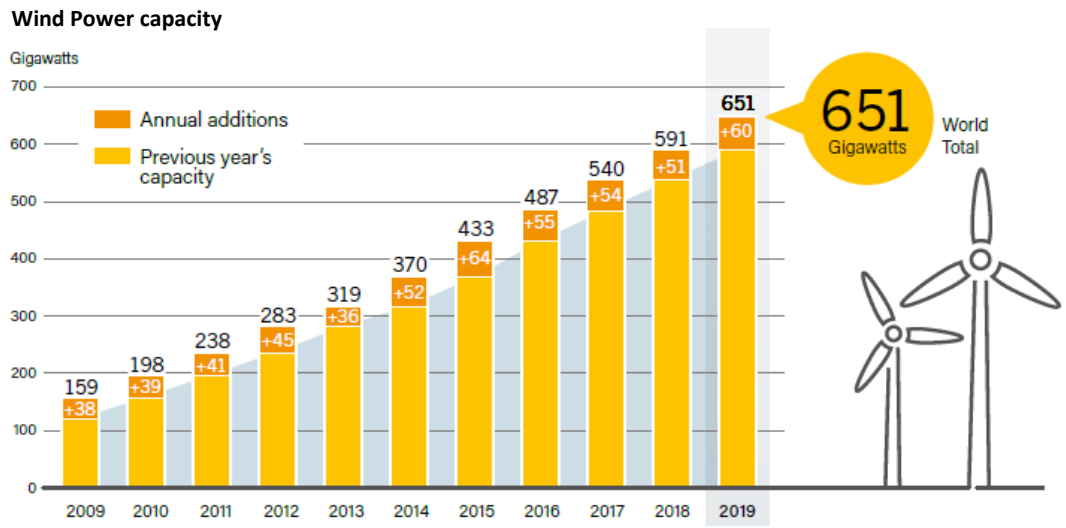
Wind Power:

Huge pads capture the flow of wind and rotate creating electricity through a generator. In 2019 this market grew by 60 GW to 651 GW, of which almost half in China.
The global transition from FITs to auction is increasing price competition challenging developers and creating tensions between turbine manufacturers.



Source: REN21

Prices and costs: In 2019, there were auction bids in Brazil at USD 20.8/MWh, in Denmark at USD 22.8/MWh and in Saudi Arabia at USD 19.9/MWh.

Raw materials: Steel and aluminium make up 70-90% of wind turbines. US tariffs on China imports increased the price of wind projects in some cases by 20%.

Leading 4 companies are Vestas, Siemens Gamesa, Goldwind and GE Renewable Energy. Companies are trying to increase the size of turbines in order to produce more energy.

Siemens Gamesa will launch an 11MW offshore turbine in 2022 and GE installed the 12 MW prototype at the port of Rotterdam, with machine blades of 107 meters. Larger turbines translate into fewer foundations, cables, labour and converters, which speeds up the project development, reduces risk and lowers grid connection and O&M costs.

As turbines grow in size, manufacturers are finding ways to reduce transportation and assembly logistic challenges by for example in the case of GE, developing a two part blade. GE's biggest onshore turbine is for 5.3MW.

As some early projects reach an advanced age and blades have to be replaced, surges the problem about what to do with old turbines. Some manufacturers are thinking about grinding the blades into small pieces and using them as noise barriers or in flooring or walls.

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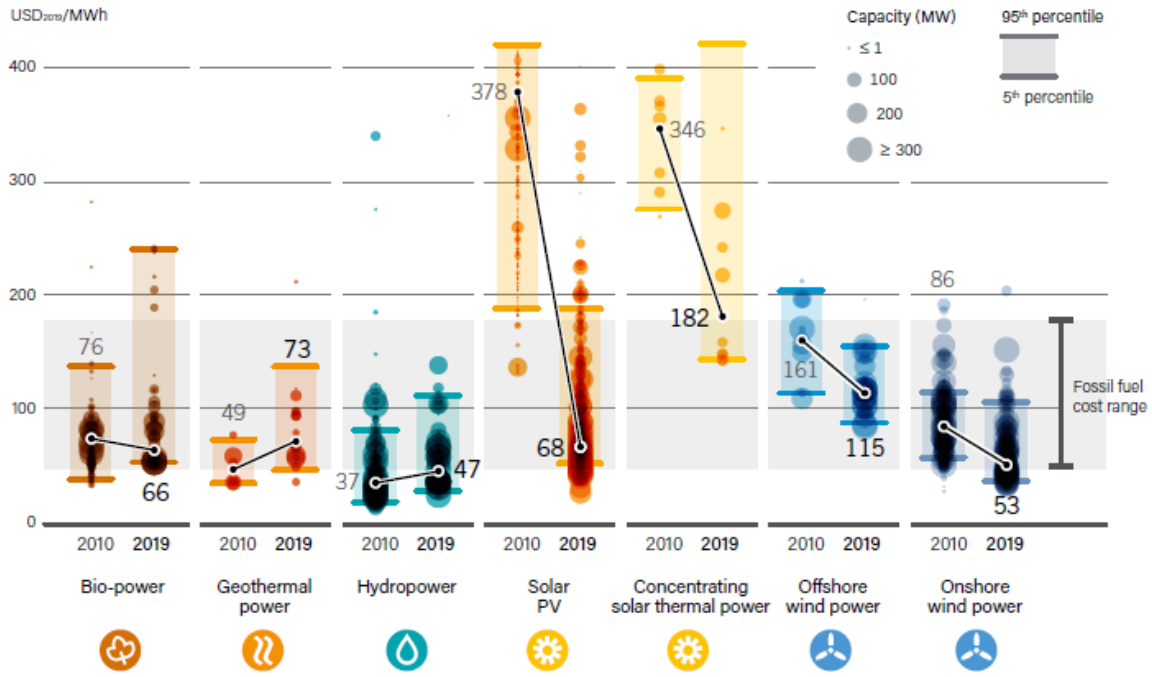
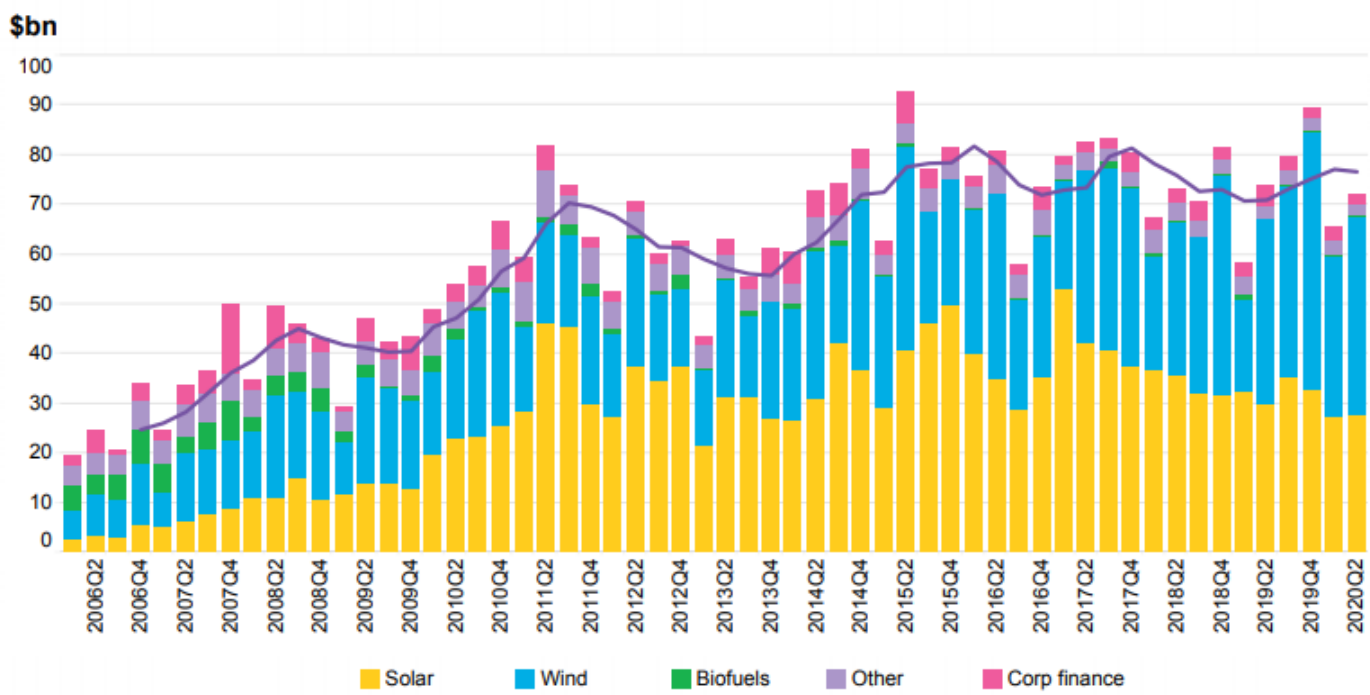
Costs per unit of energy of different renewable sources:



Source: IRENA

Global new investments in clean energy:



Source: BloombergNEF

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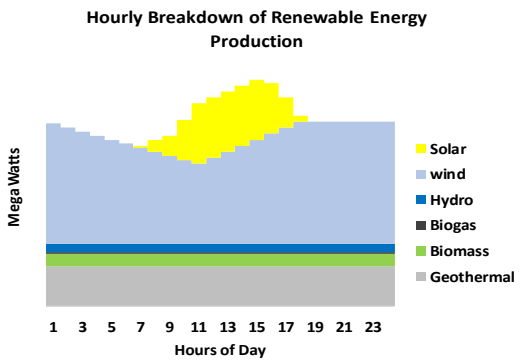
Storage:

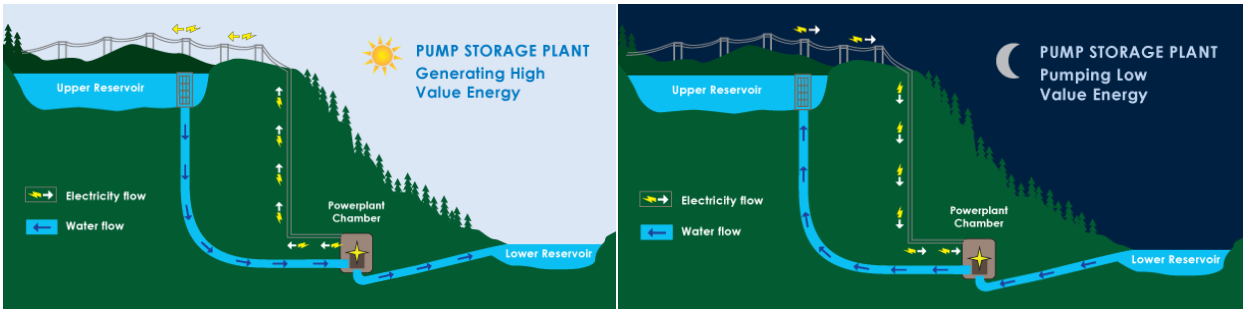
Storage is essential for the renewable energy production due to the variability in rates of production. Solar panels produce most of the energy in the middle of the day and in the summer while wind turbines generate more power in winter or fall when wind is stronger. Demand for electricity follows different paths, so in order to count with renewables for a significant majority of energy production there has to be a way to storage excess capacity which will then be used when demand for power is higher.



Source: BiG Research; approximation for illustrative purpose

Types of storage:

- **Pumped Hydro Storage:** Uses excess energy from the grid at low prices to pump water to a reservoir in a high location where it is stored. When electricity prices increase, the water is used as in hydropower dams to generate electricity and sell it to the grid at a much higher price. Despite being net consumers of energy these facilities generate revenues by buying energy at low prices when there is excess production and selling it at higher prices when demand is higher.



Source: Clean Balance Power

- **Lithium-ion batteries:** Use of batteries to store excess energy produced which can later be sold to the grid when demand increases. There are several development projects of this technology, however the main concerns are the costs, the recycling of the batteries and the durability of the storage capacity.

Source: Bloomberg NEF

Source: Tesla

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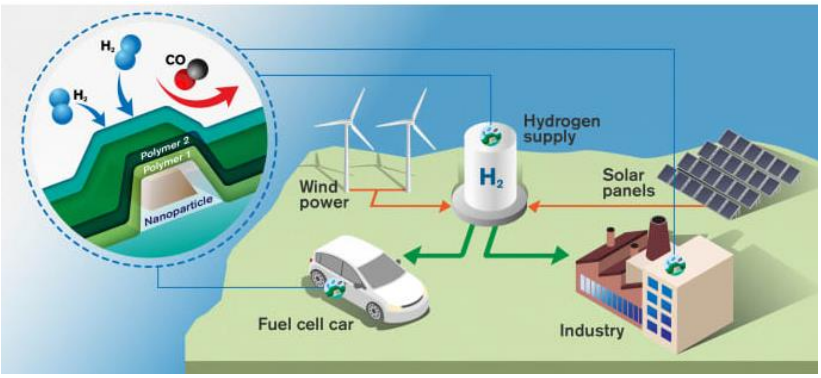
The record of capacity of a project of lithium-ion batteries was achieved in August 2020 by a project of the company LS Power in California, with a capacity to dispatch 250 MW to the grid in one hour. The company intends to achieve an increase of capacity towards 750MW in 2021. The previous record was held by the project of Tesla in Australia with a capacity of 150 MW.

- **Electrolysers (Hydrogen):** Electrolysers use electricity to break particles of water into Hydrogen and Oxygen. After producing hydrogen, the inverse reaction may be used to produce again electricity through fuel cells. This way, excess energy produced by renewables may be used for producing hydrogen which may be used when there is a shortage of electricity production or a peak in demand.



Source: Utilities Middle East

According to a report of EU, produced in beginning of 2020, until 2030 conventional power sources will be used to compensate for the lack of flexibility of renewables, as well as the trade of electricity between countries in Europe. To provide daily flexibility, the existing facilities of pumped hydro storage will be helpful. As for electrolysers the EU does not think they will be competitive solutions to provide flexibility to power systems in 2030, but with advancements in technology may become more viable in 2050, as EU expects around 550GW of electrolysers.

Technologies	Sub-technologies	Power installed capacity	Storage duration at full power	CAPEX (€/kW)	Average CAPEX (€/kWh, 2016)	CAPEX estimated 2030 (€/kWh)	Round-trip efficiency (%)
Mechanical	Pumped Hydro Storage (PHS)	100 MW-1 GW	several hours	500-1500	19	19	80
ElectroChemical	Sodium Sulphur batteries	< 10 MW	6 hours	2000-3000	330	143	75-85
	Lead Acid batteries	Some MW	several hours	100-500	220	110	75-85
	Sodium Nickel Chloride batteries	Several MW	2- to several hours	150-1000	350	143	85-95
	Lithium-ion batteries	< 50 MW	10 min to 4 hours	150-1300	520	200	86
Electrical	Superconducting Magnetic Energy Storage (SMES)	100kW-5MW	1-100 seconds	700-2000			>90
	Supercapacitor	100kW-5MW	<30 seconds	1500-2500			90
Chemical	Power to Gas (H2)	1kW -1 GW	several hours- months	2000-5000			20-40
Thermal	Molten salts	300 MW	6-10 hours	100-300	20-40		40

Source: EU data

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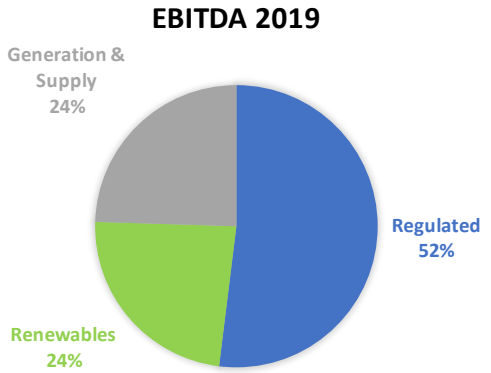
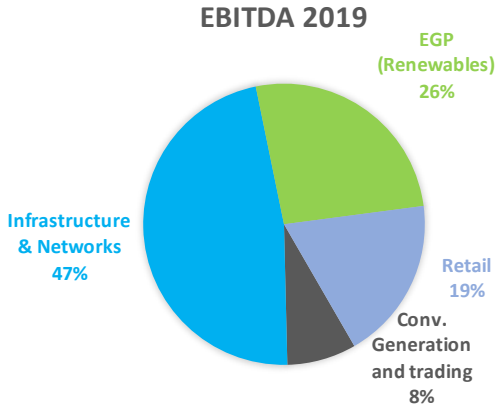
Companies exposure to renewables (in green colour):

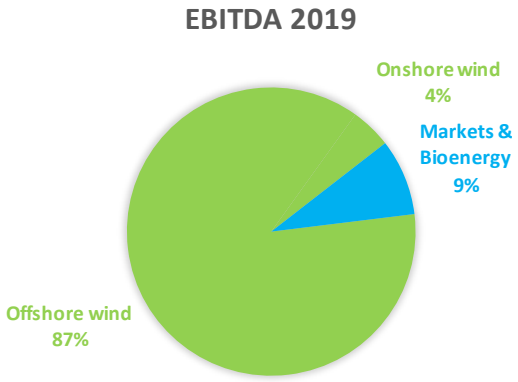
Iberdrola:



Enel:



Oersted:



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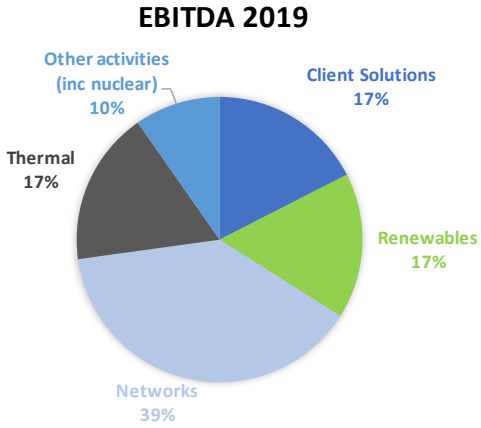
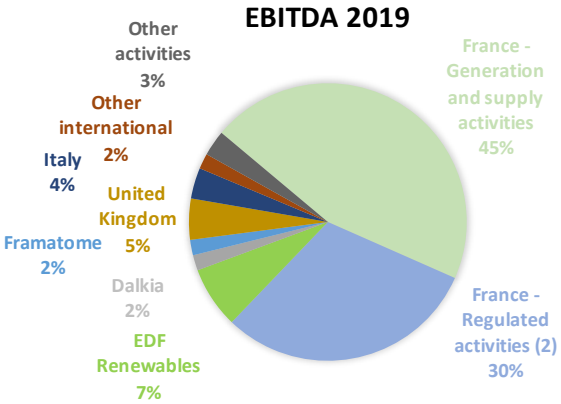


EDF:



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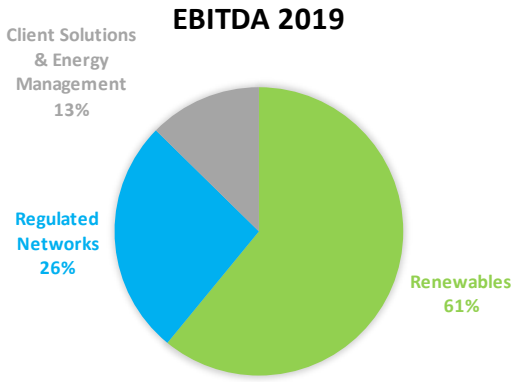

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Companies main financial data and energy generation:

Iberdrola

Market Cap	Net Debt 1Q20	Capex FY19	EBITDA FY19	Dividend FY19	Energy capacity
€ 70 bn	€ 37.5 bn	€ 7.2 bn	€ 10.1 bn	€ 2.2 bn	29.2 GW

Hydro	Wind	Solar	Coal	Nuclear	Cogeneration	Gas
12.5 GW	16 GW	0.5 GW	0.8 GW	3 GW	1.3 GW	7.4 GW

Enel:

Market Cap	Net Debt 1Q20	Capex FY19	EBITDA FY19	Dividend FY19	Energy capacity
€ 79.7 bn	€ 50.4 bn	€ 9 bn	€ 17.7 bn	€ 3.3 bn	84.3 GW

Hydro	Wind	Solar	Nuclear	Coal	CCGT	Oil & Gas
27.8 GW	10.3 GW	3.1 GW	3.3 GW	11.7 GW	15 GW	12.2 GW

Oersted:

Market Cap	Net Debt 1Q20	Capex FY19	EBITDA FY19	Dividend FY19	Energy capacity
€ 50 bn	€ 2.9 bn	€ 2.6 bn	€ 2.3 bn	€ 537 mn	9.3 GW

Offshore Wind	Onshore Wind	Bionenergy
3.6 GW	1 GW	4.7 GW

Engie:

Market Cap	Net Debt 1Q20	Capex FY19	EBITDA FY19	Dividend FY19	Energy capacity*
€ 28.7 bn	€ 25.1 bn	€ 10 bn	€ 10.4 bn	€ 2.5 bn	54.6 GW

Hydro	Wind	Solar	Nuclear	Coal	Gas
11.5 GW	4.9 GW	1.6 GW	6 GW	2.2 GW	25.7 GW

*Net Ownership

EDF:

Market Cap	Net Debt 1Q20	Capex FY19	EBITDA FY19	Dividend FY19	Energy capacity
€ 26.7 bn	€42 bn	€16.6 bn	€16.7 bn	€801 mn	122 GW

Nuclear	Renewables	Fossil Fired
73 GW	30 GW	20 GW

EDP:

Market Cap	Net Debt 1Q20	Capex FY19	EBITDA FY19	Dividend FY19	Energy capacity
€17bn	€13.9bn	€2.3bn	€3.7bn	€695 mn	26.7 GW

Hydro	Wind	Solar	Coal	Gas
8.7 GW	10.7 GW	0.145 GW	3.2 GW	3.7 GW

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Companies generation details of renewables and other:

Iberdrola:

Renewables	Spain (60% hydro, 40% wind)	UK (wind)	USA (wind)	Brazil (85% hydro, 15% wind)	Mexico (wind & solar)	RoW (wind & solar)
GWh (Year)	22,191	4,640	17,480	10,674	1,424	2,665
MW	16,526	2,520	7,521	3,546	860	965
Load factor	15%	21%	27%	34%	19%	32%
EBITDA (€ mn)	736	525	591	125	86	323
EBITDA(€)/MW	44,544	208,325	78,619	35,239	99,580	334,713
EBITDA(€)/MWh	33	113	34	12	60	121

Enel:

	Italy (45% Hydro, 23% coal, 17% CCGT; 10% Oil&Gas;)	Iberia (23% CCGT, 21% coal, 20% hydro, 14% nuclear, 10% wind, 10% oil&gas)	Latin America (50% hydro, 20% CCGT, 13% oil&gas, 7% wind, 7% solar)	Rest of Europe (71% Oil&Gas, 13% CCGT, 14% wind)	North America (83% wind, 14% solar)	Africa /Asia (54% wind, 46% solar)
Production GWh (Year) net	46,912	61,402	71,836	34,438	12,969	1,571
Capacity MW net	27,452	23,348	21,200	6,293	5,282	776
Load factor	20%	30%	39%	62%	28%	23%
Avg selling price (€/MWh)	55	68				
EBITDA €mn	1,337	1,051	2,860	358	719	62
EBITDA(€)/MW	48,704	45,014	134,908	56,892	136,129	79,909
EBITDA(€)/MWh	29	17	40	10	55	39

Oersted:

Renewables	Offshore Wind	Onshore Wind
GWh (Year)	12,000	3,500
MW	3,600	1,000
Load factor	38%	40%
EBITDA €mn	2,040	107
EBITDA(€)/MW	566,667	107,000
EBITDA(€)/MWh	170	31

Engie:

Renewables	France (80% hydro, 16% wind, 3% solar)	Rest of Europe (38% hydro, 37% wind, 24% biomass and biogas)	Latin America (88% hydro, 9% wind)	USA & Canada (64% wind, 30% biomass and biogas, 6% solar)	Middle East, Asia, Africa (52% wind, 44% solar, 4% hydro)
GWh (Year)	18,736	6,942	40,646	2,215	2,128
Capacity MW	5,853	5,144	9,914	788	1,208
Load factor	37%	15%	47%	32%	20%
EBITDA (€ mn)	421	145	1,035	70	97
EBITDA(€)/MW	71,929	28,188	104,398	88,832	80,298
EBITDA(€)/MWh	22	21	25	32	46

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EDF:

	France - Generation (70% nuclear, 23% hydro)	EDF Renewables (78% wind and 22% solar)	Dalkia (gas 56%, fuel 36%, 11% new renewables)	United Kingdom (64% nuclear, 23% coal, 12% CCGT)	Italy (77% CCGT, 16% hydro, 7% new renewables)	Other international (40% nuclear, 28% CCGT, 15% coal, 8% new renewables, 7% hydro)
GWh (Year)	429,013	14,626	4,440	59,805	21,451	22,410
MW	89,055	8,072	2,242	11,195	6,481	9,501
Load factor	55%	21%	23%	61%	38%	27%
EBITDA (€ mn)	7,615	1,193	349	772	578	339
EBITDA(€)/MW	85,509	147,791	155,635	68,959	89,184	35,680
EBITDA(€)/MWh	18	82	79	13	27	15

*New Renewables: Wind, solar, biomass and biogas

EDP:

Renewables	North America wind & solar (USD)	Iberia wind&solar (EUR)	Iberia Hydro (EUR)	Rest of Europe wind & solar (EUR)	Brazil (Wind) (EUR)	Brazil (Hydro) (EUR)
GWh (Year)	16,492	8,458	9,830	3,333	1,757	4,129
MW	5,944	3,139	7,186	1,263	467	1,599
Load factor	34%	29%	16%	26%	43%	29%
Avg selling price (/MWh)	45	78	54	78	46	39
EBITDA (mn)	688	736	465	221	139	176
EBITDA/MW	115,747	234,470	64,709	174,980	297,649	109,762
EBITDA/MWh	42	87	47	66	79	43

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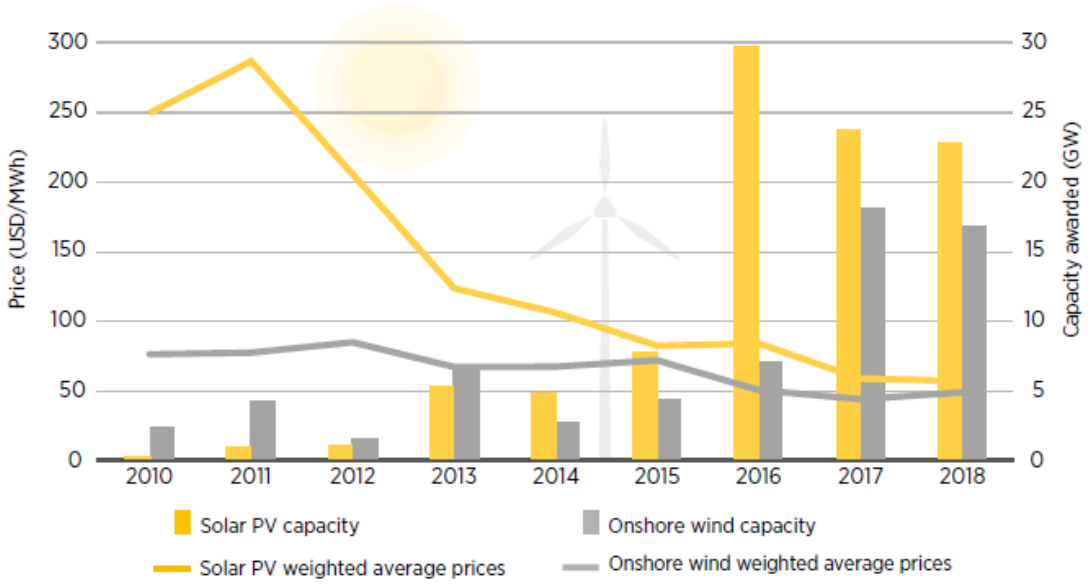
Auctions:

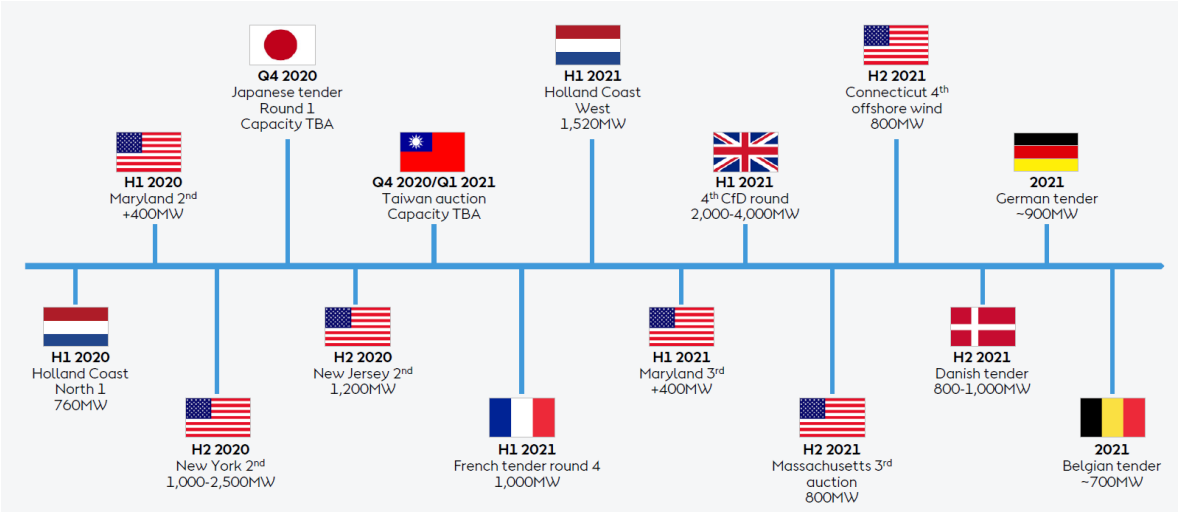
Auction prices per MWh have been falling in recent years due to more efficient and less costly energy production but also due to the high demand for these types of projects. In the last couple of years, auctions have been made at record low prices where developers agree to receive only about €11/MWh produced.

Some industry experts affirm that these low prices do not make the project viable for the 15 years of the contract, however argue that developers may be expecting to sell at a higher price in the open market after the 15 years of the contract.



Source: IRENA

Expected offshore wind auctions and tenders in 2020 and 2021



Source: Oersted

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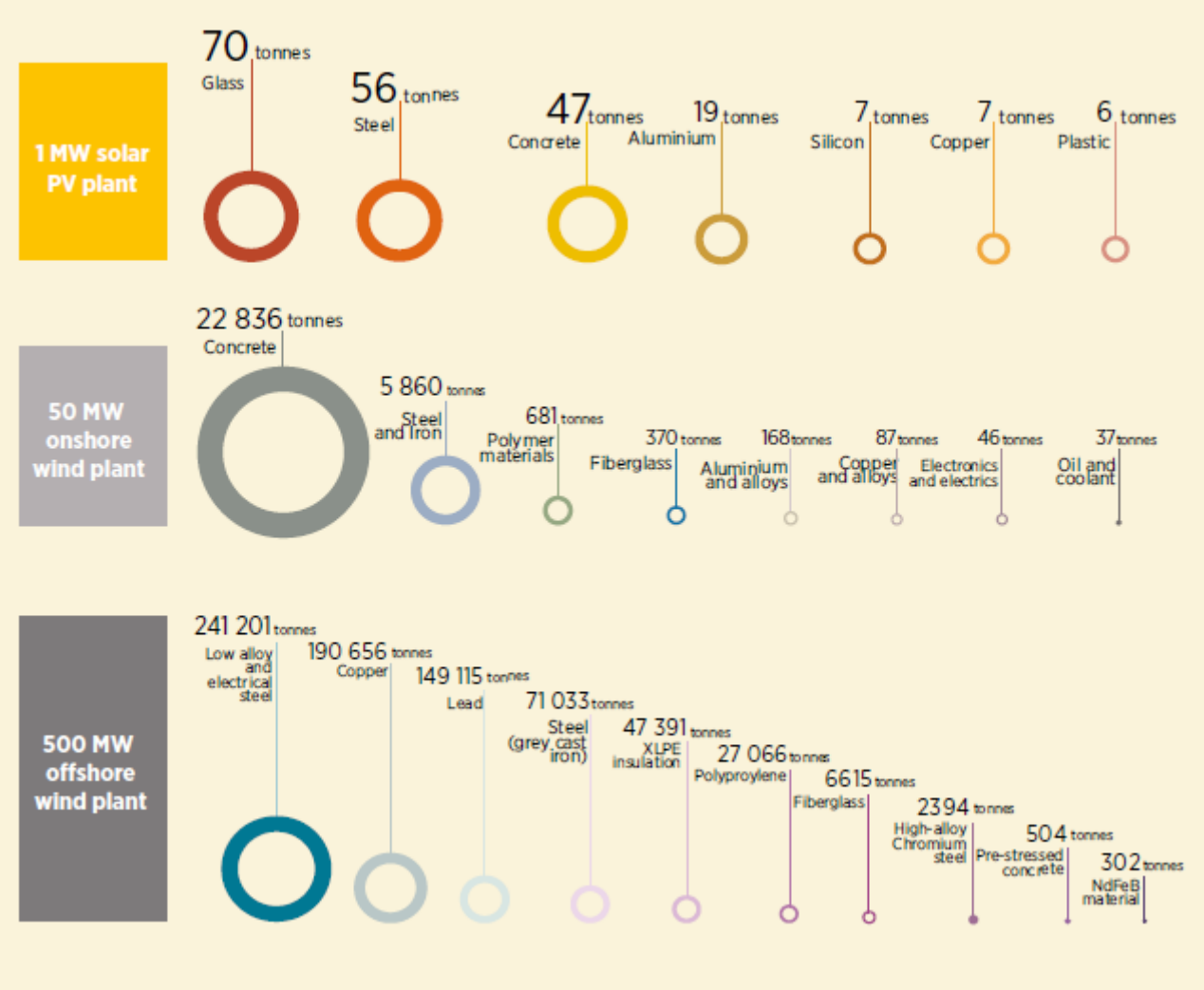
Commodities used in the industry:



Source: IRENA

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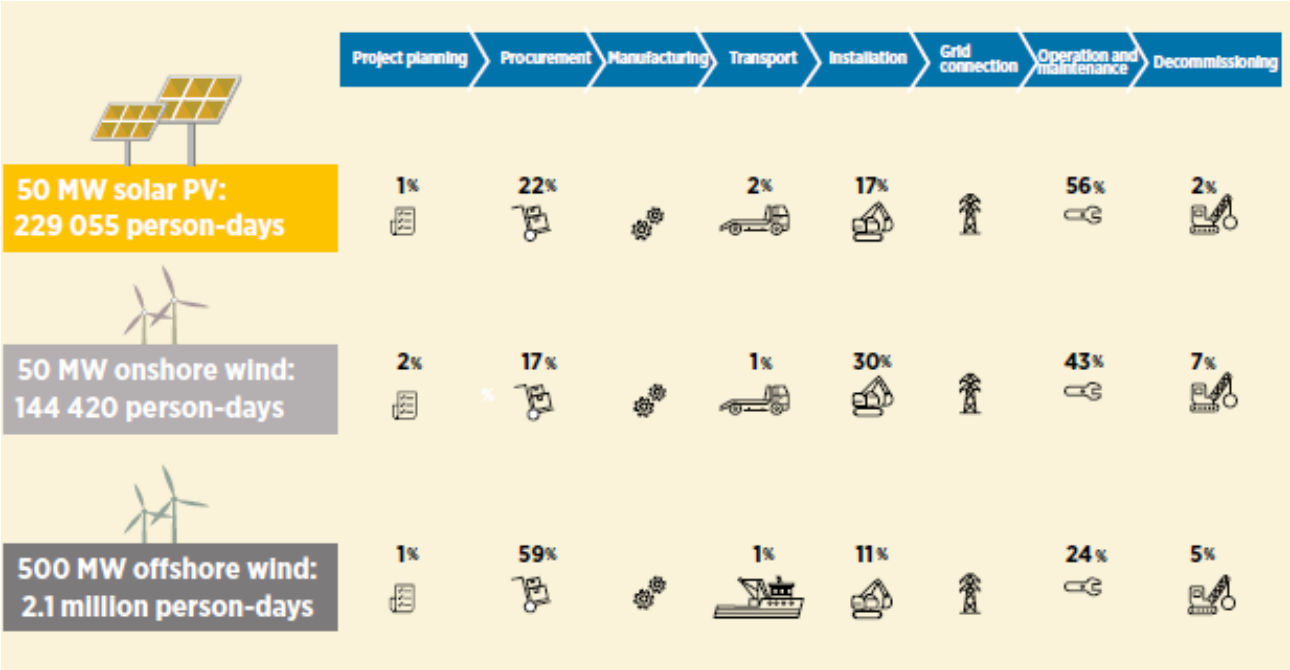
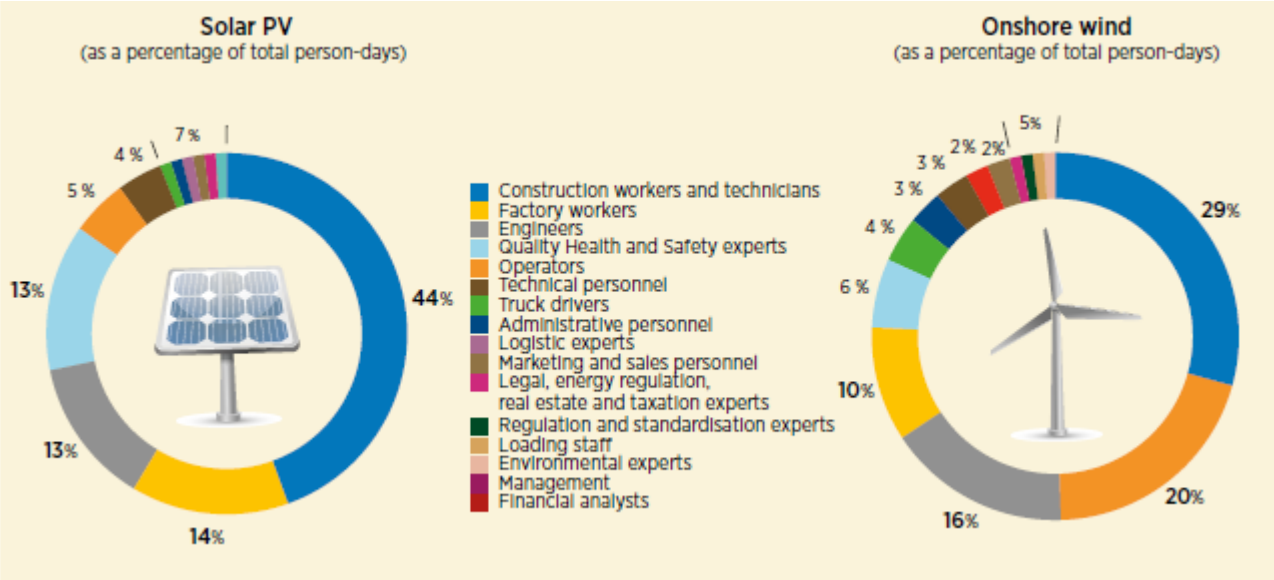
Human Resources:



Source: IRENA



Source: IRENA

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Glossary:

AC: Alternating Current
BEV: Battery Electric Vehicle
CHP: Combined Heat and Power
CNG: Compressed Natural Gas
CO2: Carbon Dioxide
CSP: Concentrating Solar Power
DC: Direct Current
EGS: Enhanced Geothermal Systems
FCEV: Fuel Cell Electric Vehicle
FITs: Feed-in-tariff: mechanism to offer long term contracts to renewable energy producers. Offer cost-based compensation and provide a price certainty.
Greenhouse gas emissions: Mostly emissions of carbon dioxide and methane.
GW: Gigawatts = 1 000 megawatts
HVAC: Heating, Ventilation and Air Conditioning
IPP: Independent Power Producer
ISCC: Integrated Solar Combined-cycle
KW: kilowatt = 1 000 watts
LCOE: levelized Cost of Energy
LNG: Liquefied Natural Gas
Load Factor: efficiency of energy produced, or ratio between energy produced to the capacity
MW: Megawatts = 1 000 kilowatts
MW to MWh: MWh = MW * hours in a year *load factor
P2G: Power to Gas
PHEV: Plug-in Hybrid Electric Vehicle
PPA: Power Purchase Agreement
PPP: Power Purchasing parity
PV: Photovoltaic
REC: Renewable Energy Certificate
TEFC: Total Energy Final Consumption
TW: Terawatt = 1 000 gigawatts
W: Watt

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- Clarification of the qualitative terms implied in the recommendations:
  - Buy, expected absolute return above 15%;
  - Accumulate, expected absolute return between +5% and +15%;
  - Hold/Neutral, expected absolute return between -5% and +5%;
  - Reduce, expected absolute return between -5% and -15%;
  - Sell, expected absolute return below -15%;

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- The update of the investment recommendations models and respective price-targets will occur, usually, in a period of 6 to 12 months.

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