# Contribution of Applicable RE Technologies to Meet the Power Shortage and Cope with Air Pollution

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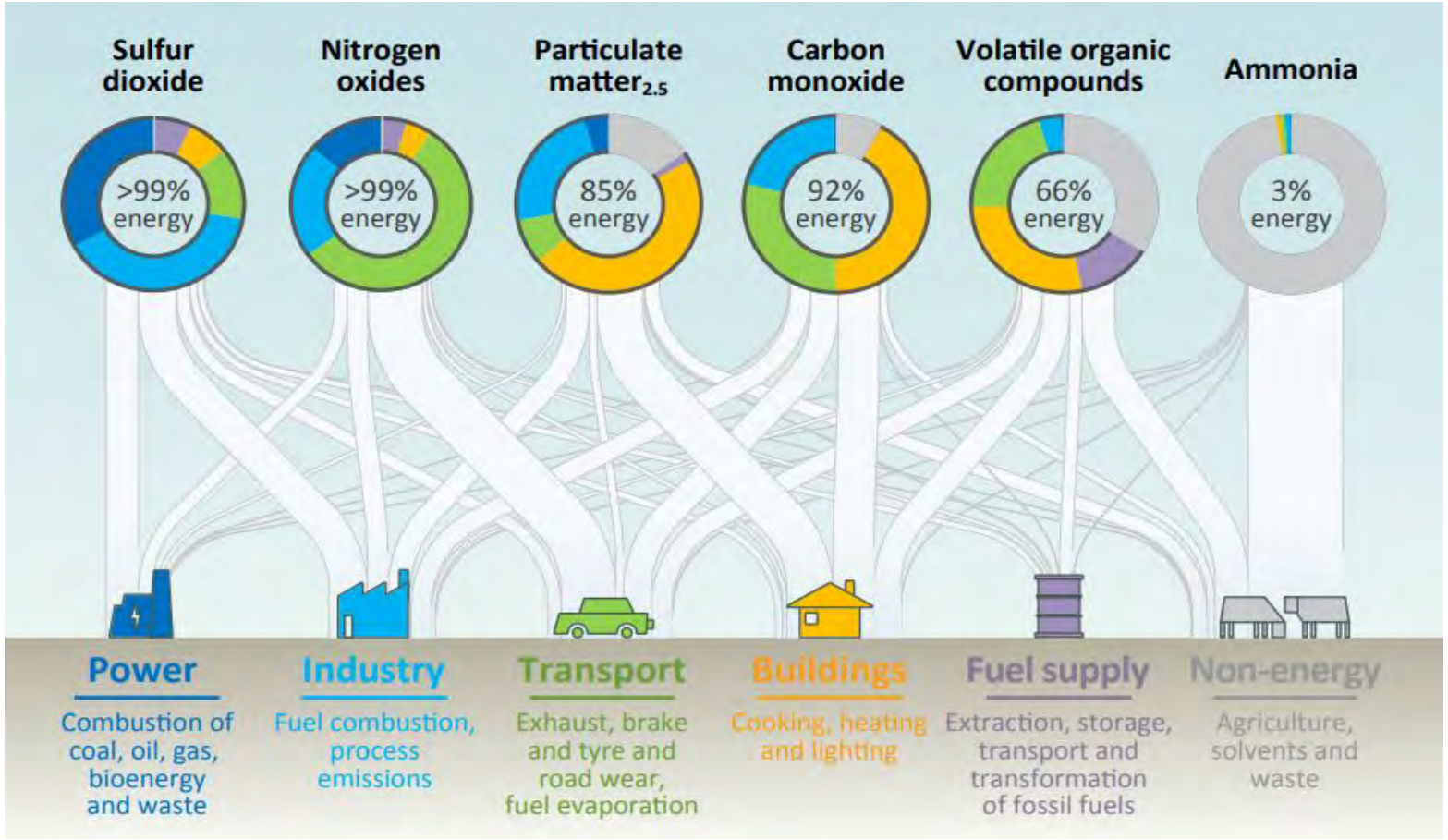
- Air pollution kills an estimated 7 million people worldwide every year and harms billions more.
- About 4 million deaths are linked to outdoor air pollution and about 3 million deaths are linked to inside air pollution.

- Particulate matter that is 2.5 micrometers in diameter or smaller seems to do the most damage.
- we may think that air pollution will only affects the human breathing system. But research shows that PM2.5 can affect every organ and every cell in our body.

## Women and children are most at risk

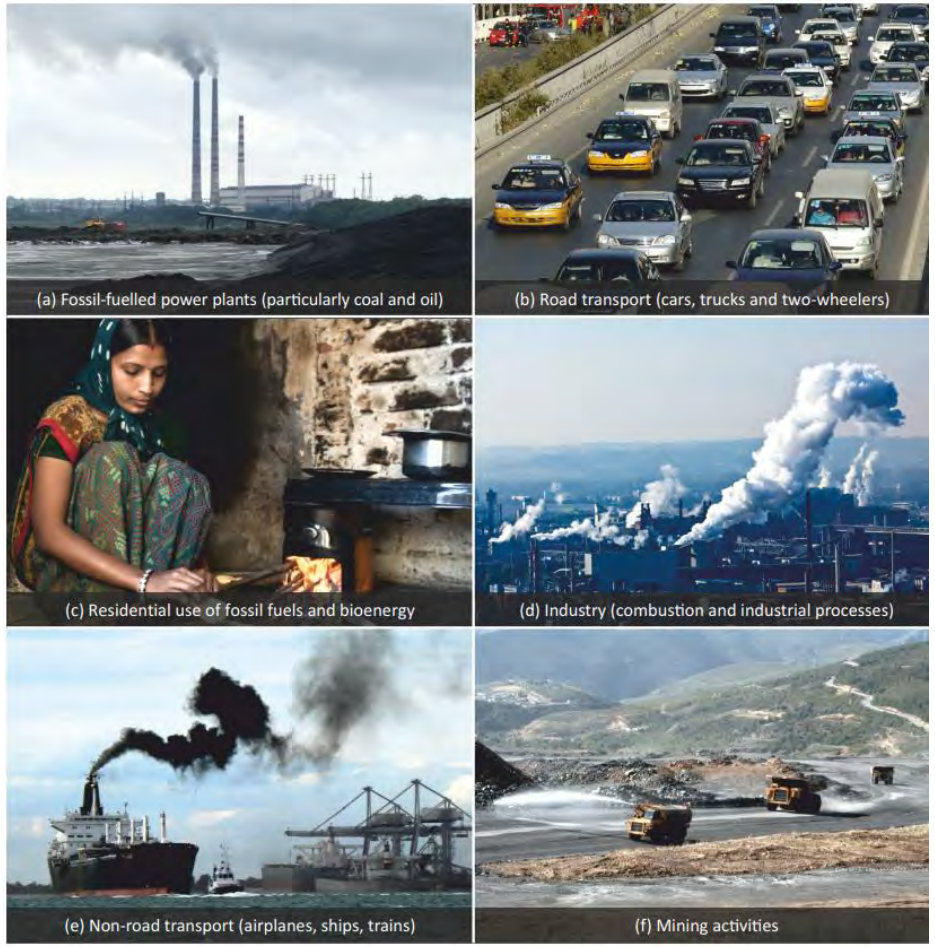
- Indoor cooking plays a part, as some families use unsafe fuels for cooking and keeping warm.
- Researchers at the WHO say that in 2016 about 600,000 children under the age of five died from disease linked to air pollution.

- The majority of air pollutant emissions comes from the energy sector, mainly from fuel combustion
- Currently only 8% of global energy production is combustion free, more than half of the rest has no effective technology in place to control emissions



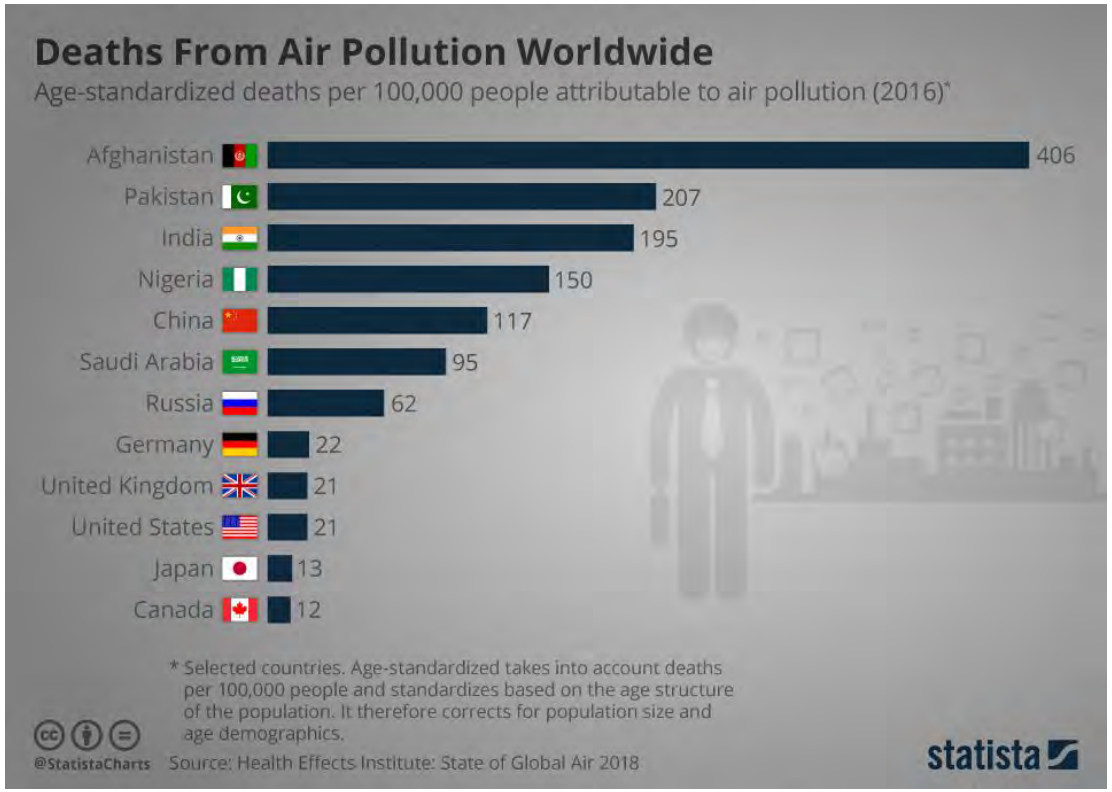

Selected primary air pollutants and their sources, 2015

- The type and level of energy-related air pollution is often linked to a country's stage of economic development.
- No country in the world has solved the air pollution problem completely, but many are taking important policy steps



A report released in the US listed Kabul among the top 10 most polluted cities in the world. On 4th Jan 2019, at 11:10 a.m. Kabul's air quality ranked worst in the world.

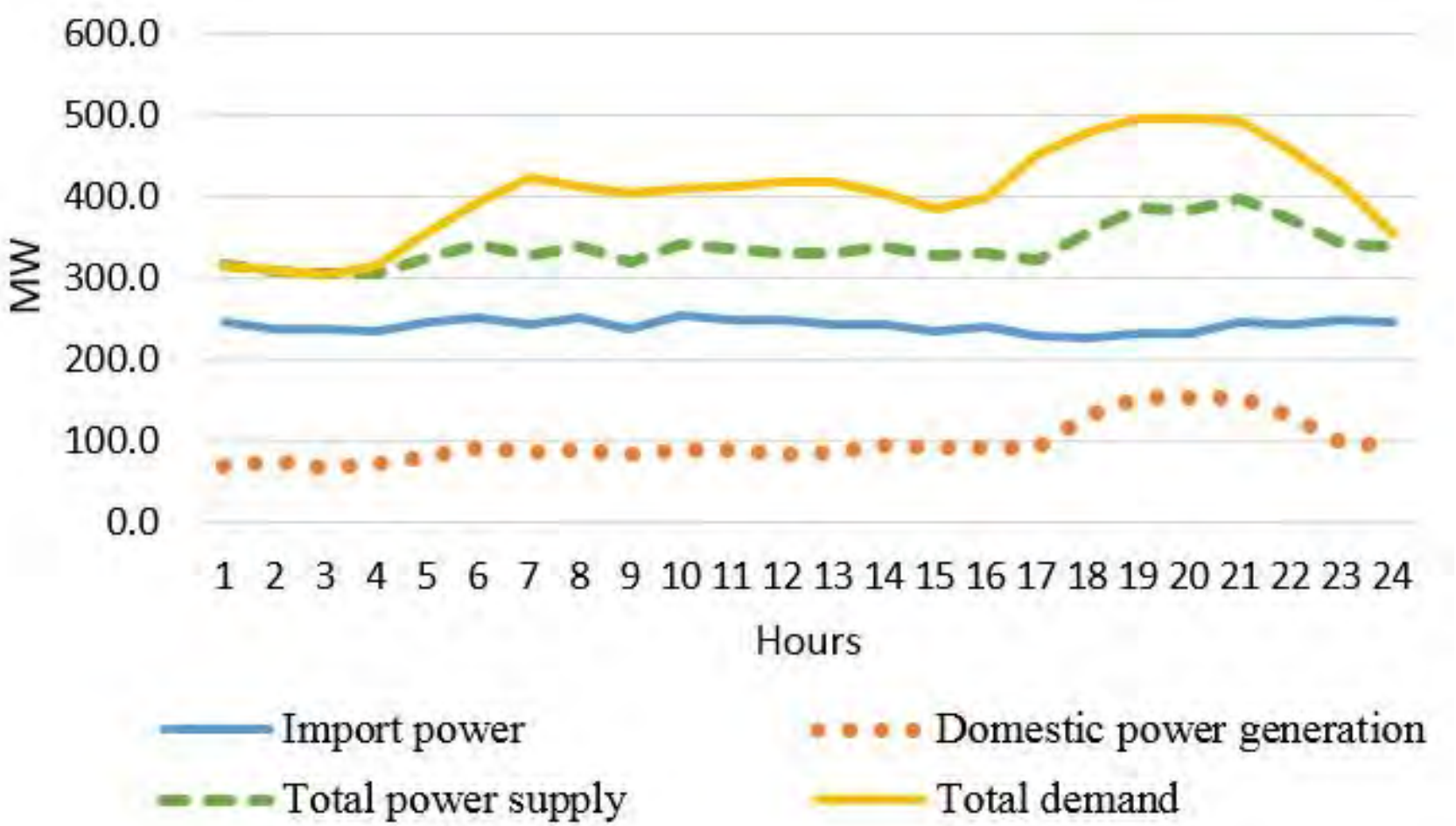
- Beside use of low-quality fuel, road dust is a significant source and release of particulate matter in Kabul




# Over view of electrical system in Afghanistan

- 30% of its population connected to the grid
- The system is consist of import power (80%) and domestic
- Power shortage in both summer and winter seasonal demand
- Per capita, power consumption is 195 kWh
- The rural electrification rate is remarkably low despite forming 75% of the population and contributing 67% of the GDP

# Demand and supply gap in Kabul city

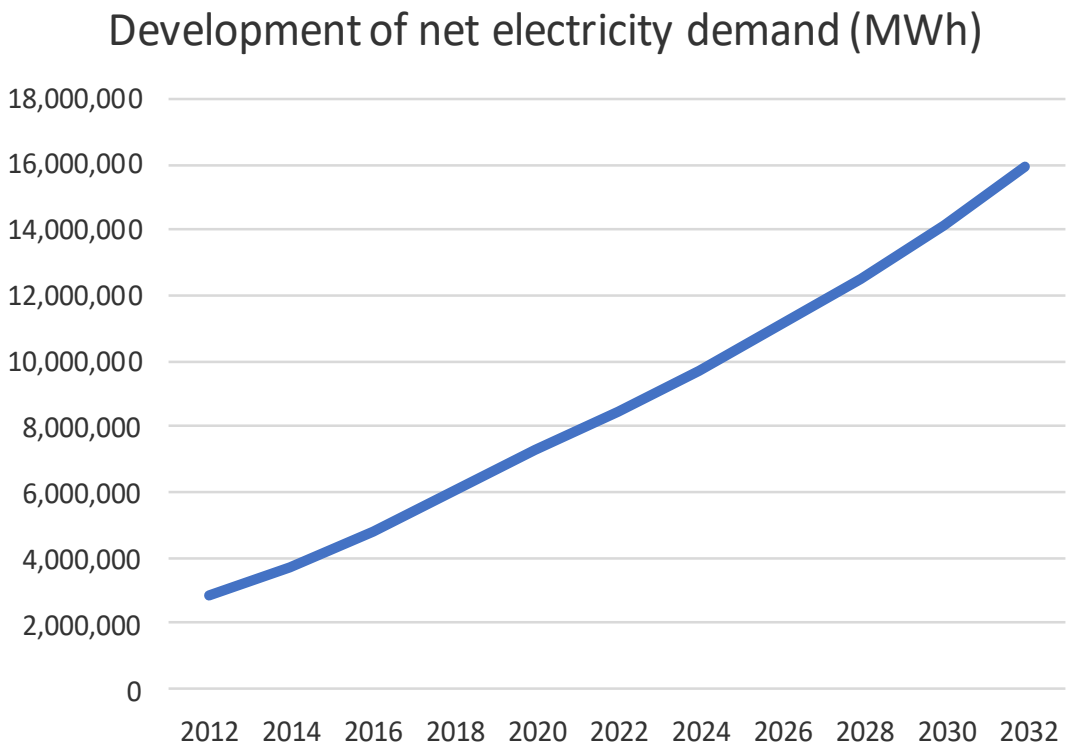


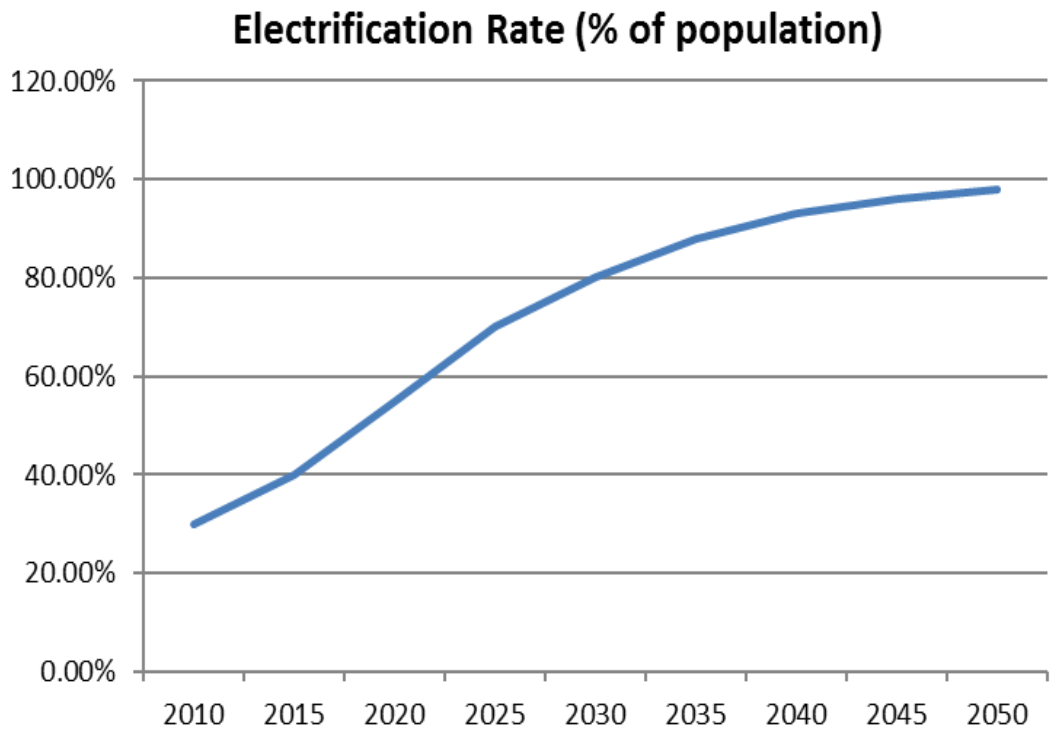
## Existed significant challenge:

The country is facing many economic and political challenges

- Energy deficit
- Insecure energy supply
- Unsustainable

# Demand growth and electrification rate

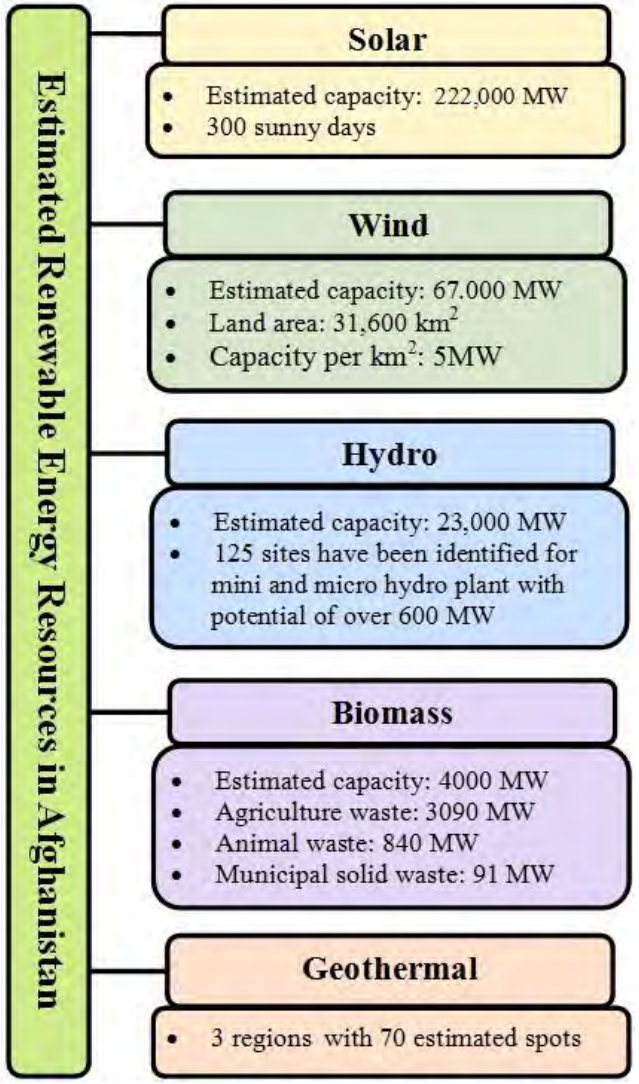


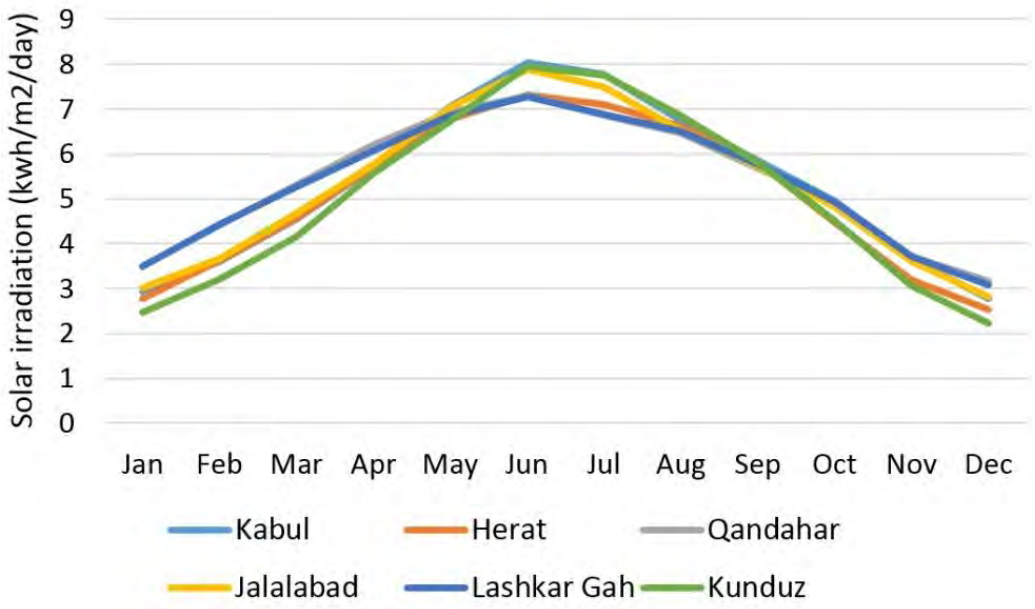
# What can be done?

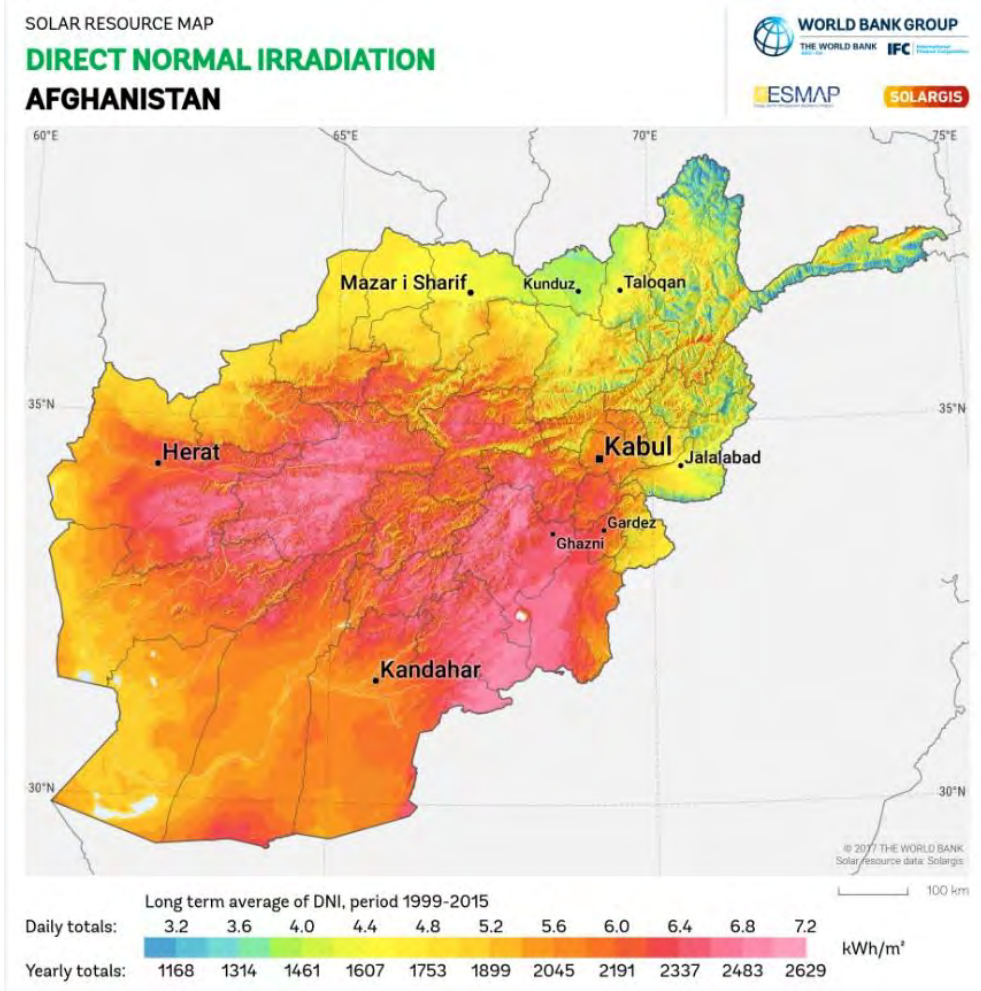
- The best way to reduce exposure to air pollution and meet the demand is to harness renewable energies.
- Provision of adequate, secure and sustainable energy supply is fundamental not only to economic development but also to health and environment.

The existing situation mandates the expansion of a proper regulatory, financial, technical and institutional framework for establishing and implementing integrated secure and sustainable energy supply.



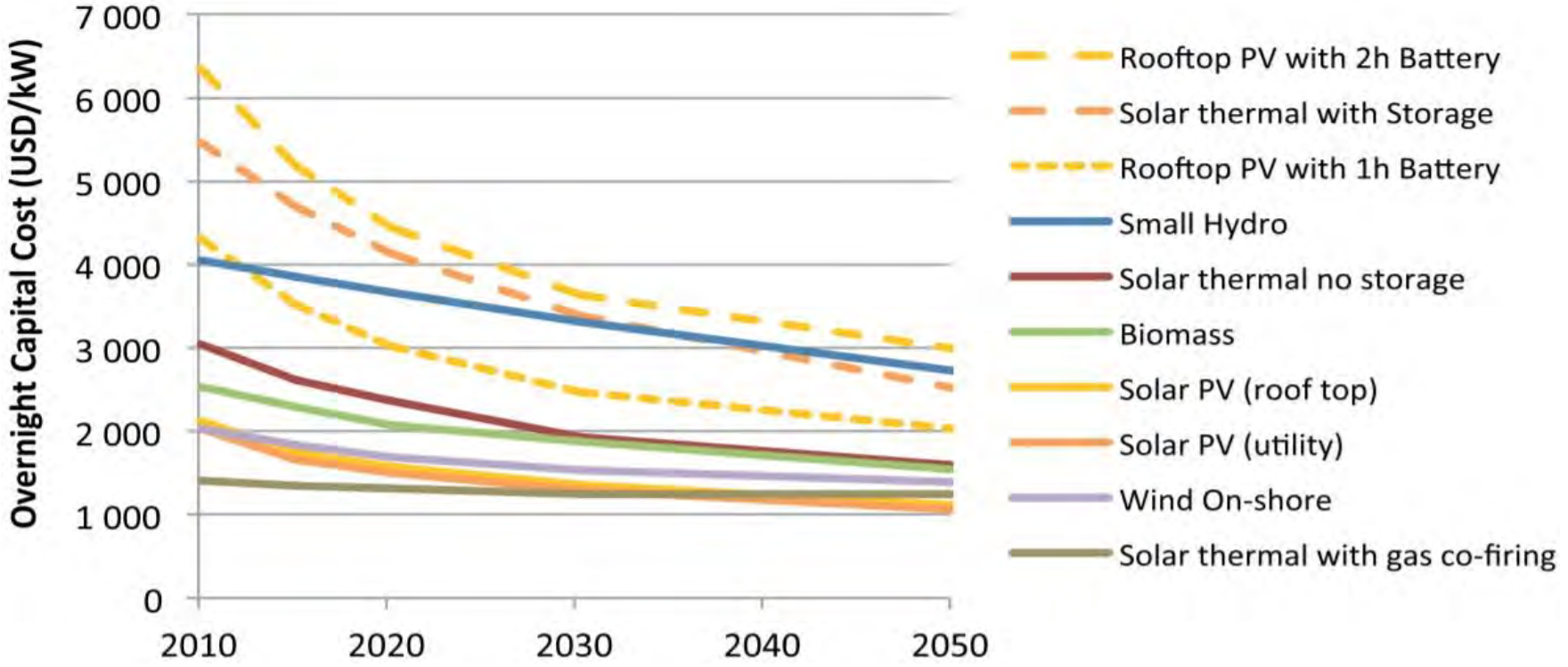
Afghanistan has a huge solar potential adequate to supply the current energy shortages and meet future demand.



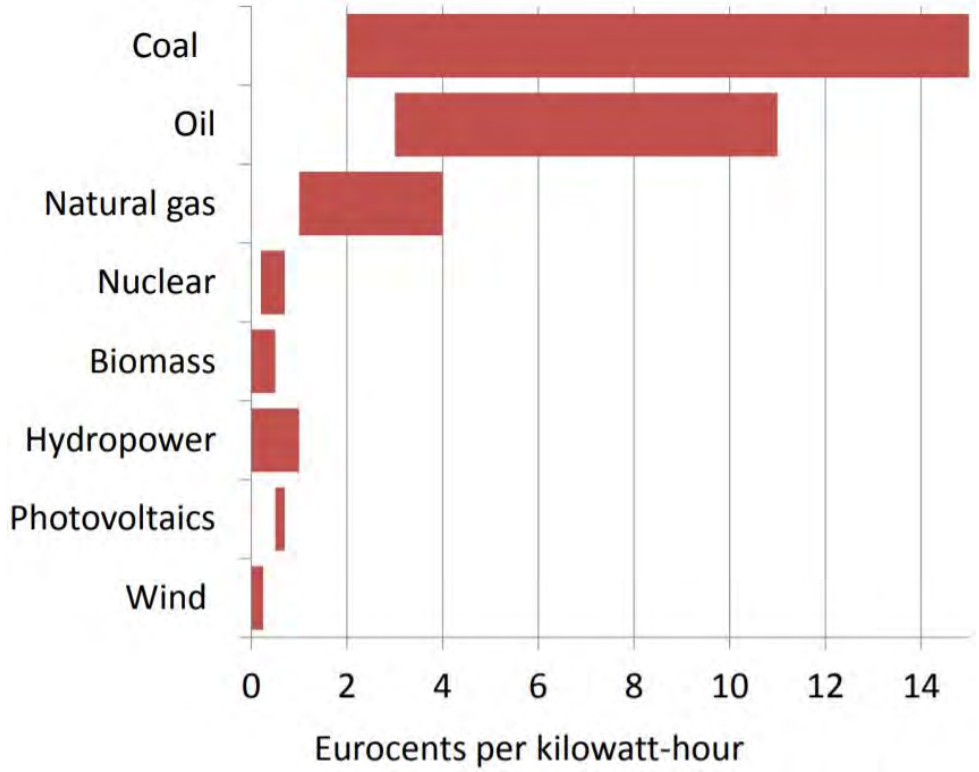
## Cost review of renewable energy technologies

Several factors, including supported policies, continuous progression of technologies as well as competitive pressures, are contributing to the costs reduction of RE technologies.



# External cost imposes by different power generating technologies

Fossil fuel may currently look with a cost advantage but if externalities are added RE would be more affordable. Externalities associated with RE is much lower, less than 1 c/kWh compare to the coal ranging between 2 to 15 c/kWh.

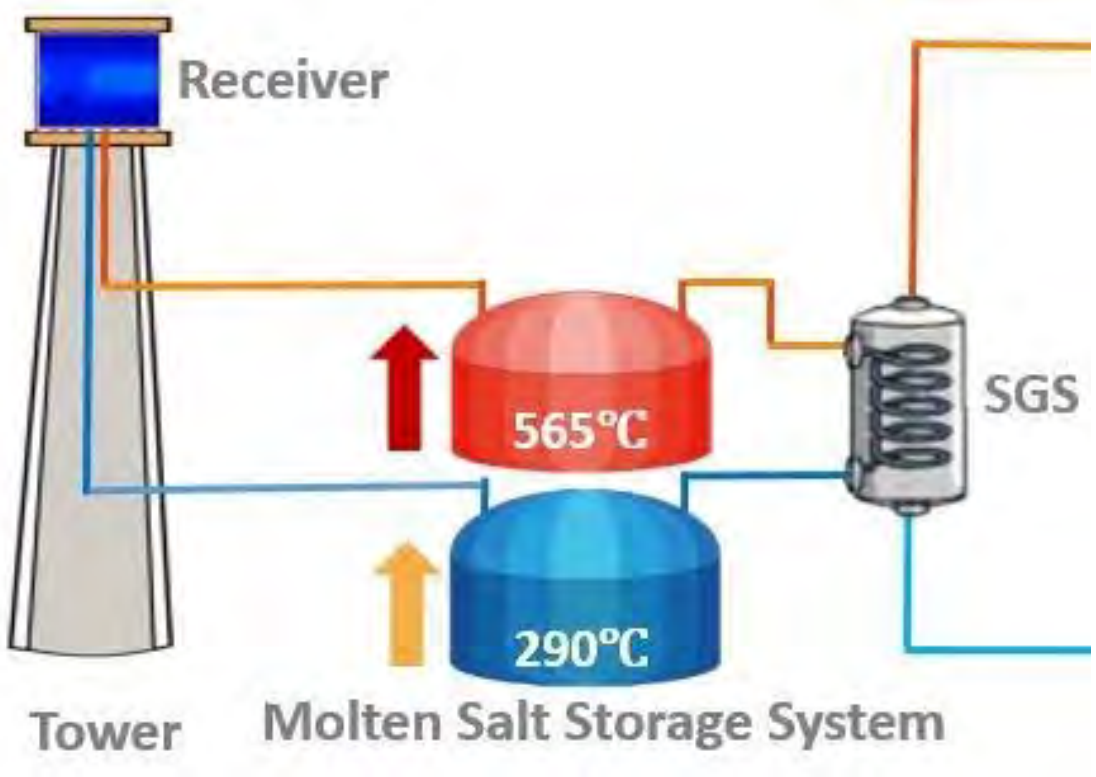


## Concentrated solar power

CSP technologies use high temperature heat from concentrating solar collectors instead of burning fossil fuel to generate electricity in a conventional power cycle.

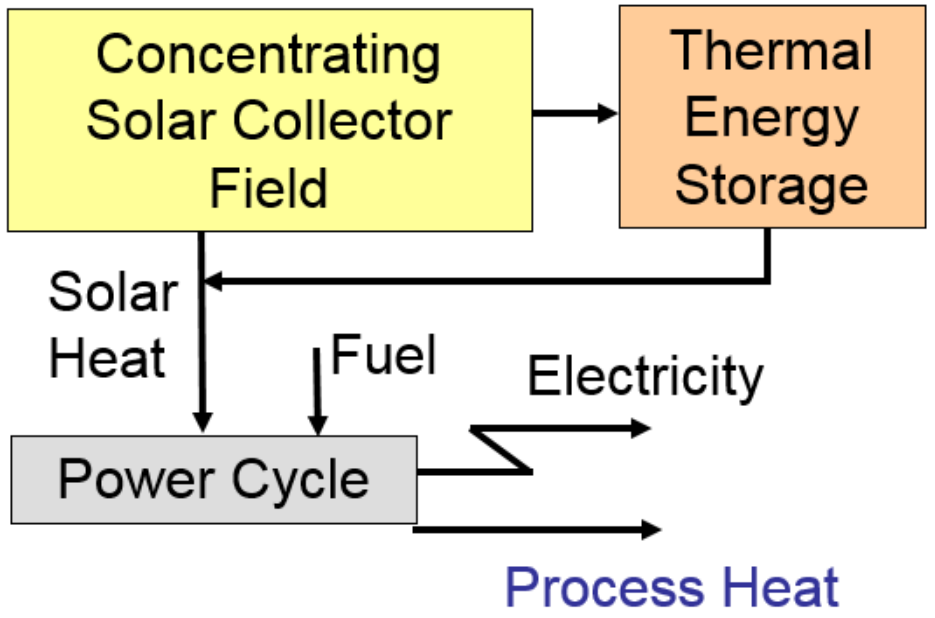
## Thermal energy storage:

The incorporation of thermal energy storage and backup systems increased CSP potential in competitiveness towards conventional energy systems.



## Advantages of CSP technologies

- Higher efficiency
- Lower operating costs
- Good scale-up potential

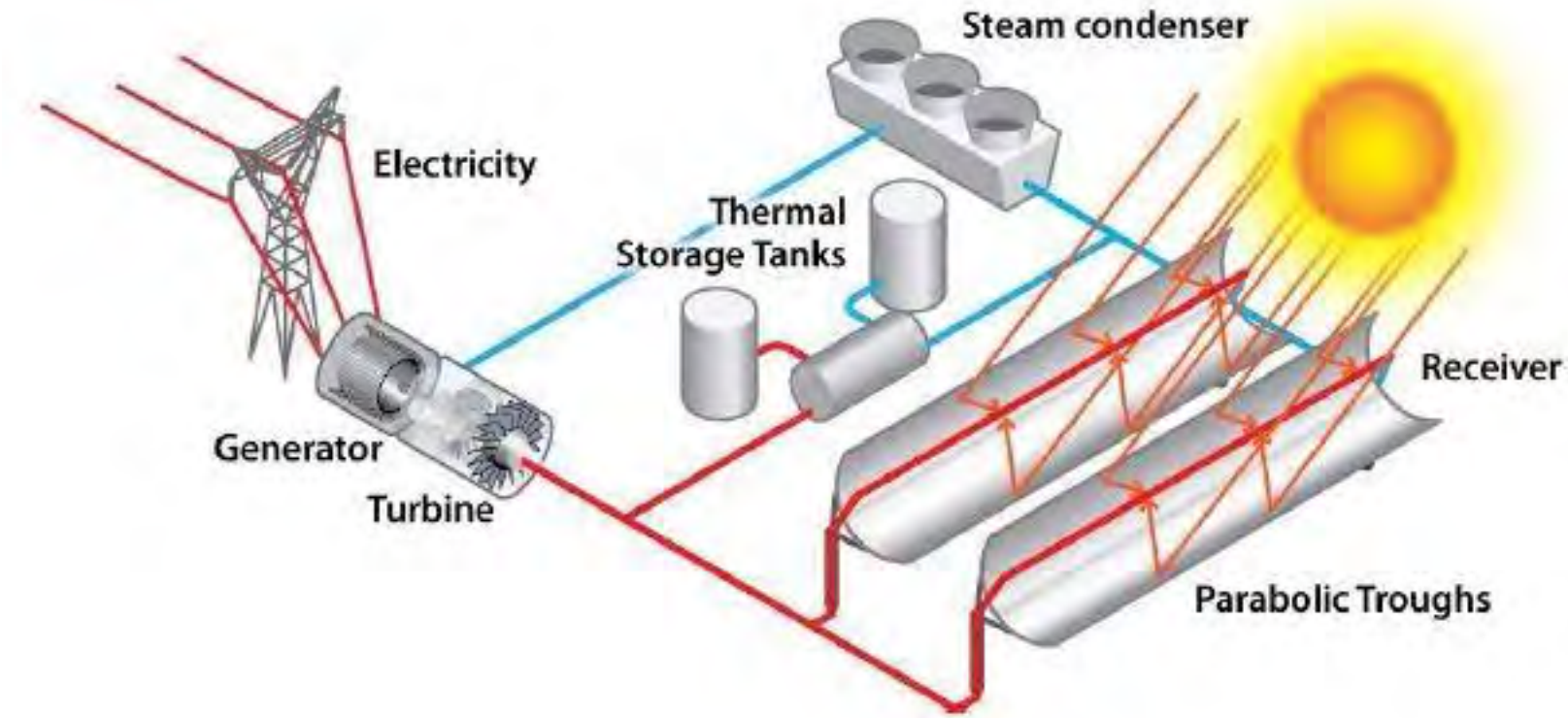


## Types of CSP technologies

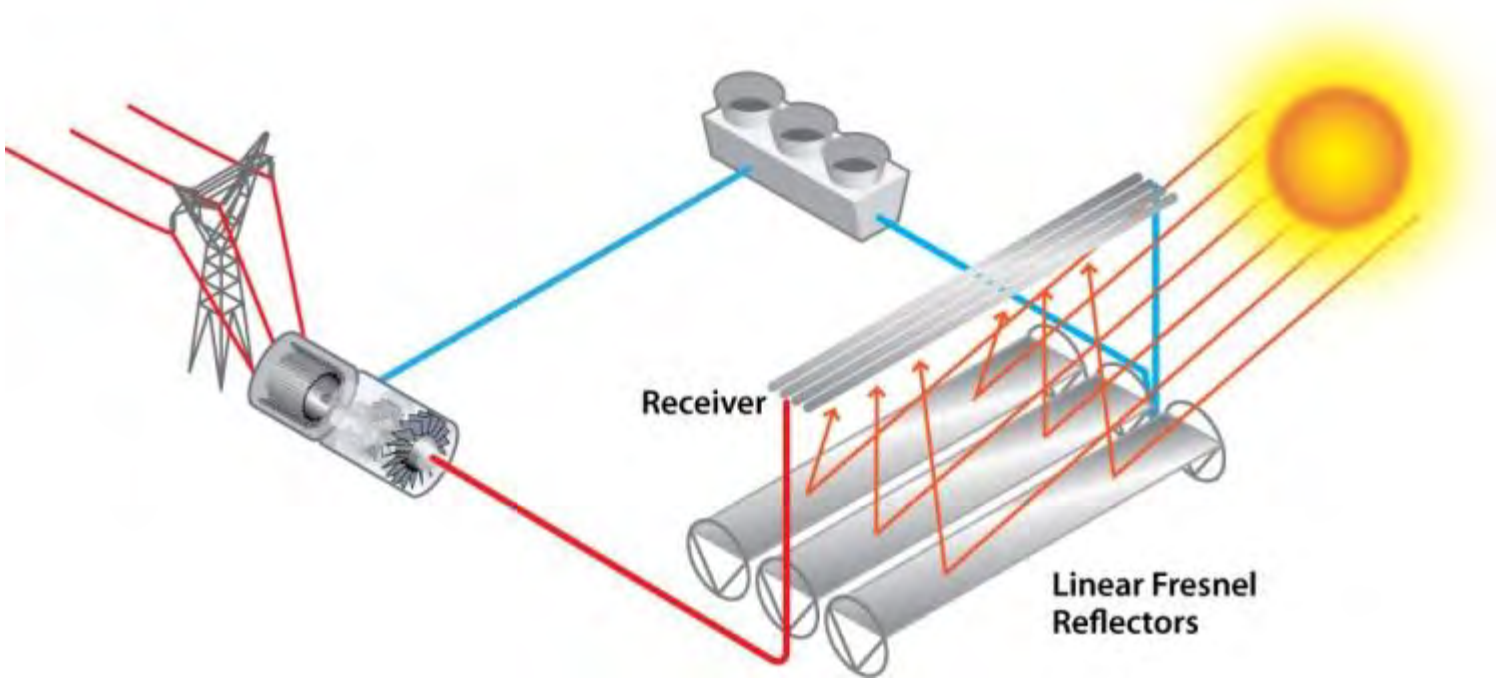
The 3 main types of concentrating solar power systems are:

1. Linear concentrator
2. Dish/engine
3. Power tower systems.

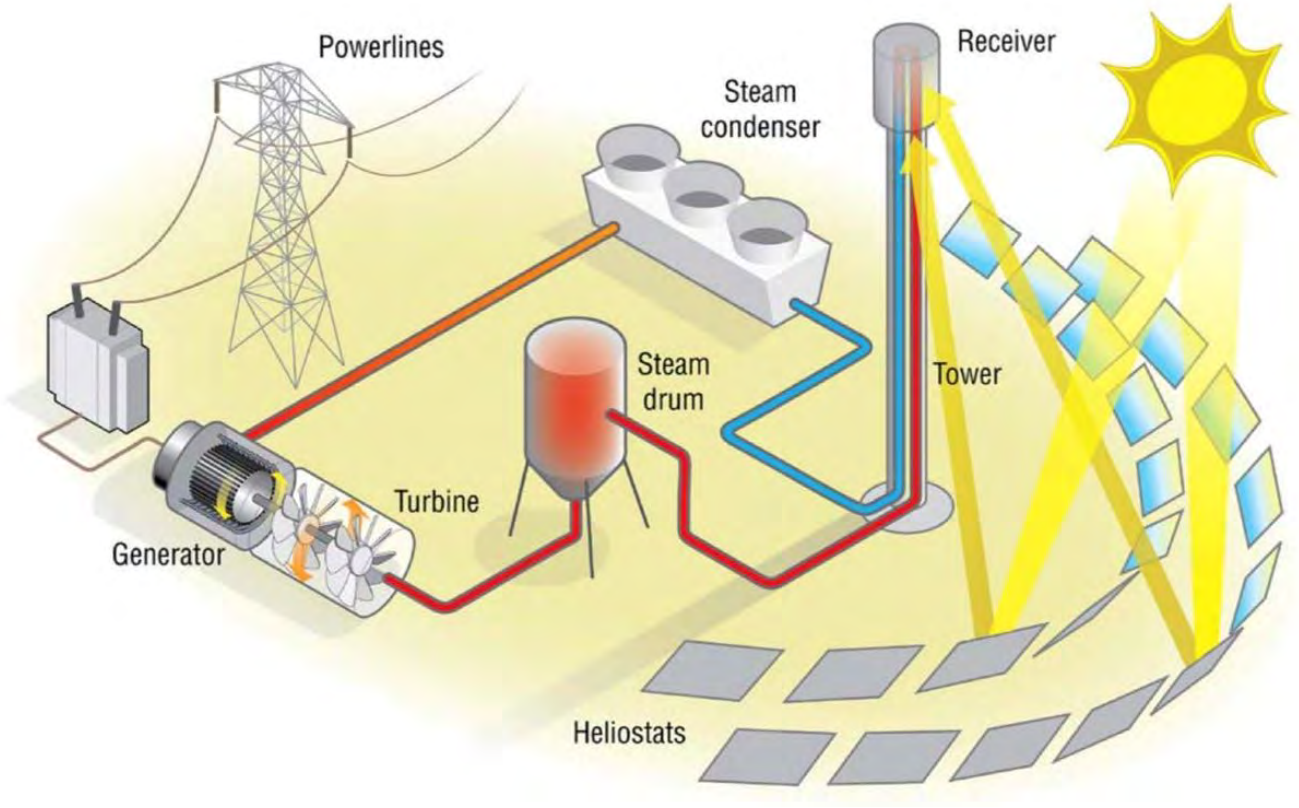
**Parabolic trough** systems, utilize parabolic mirrors to concentrate light onto a receiver that runs parallel to the mirror.



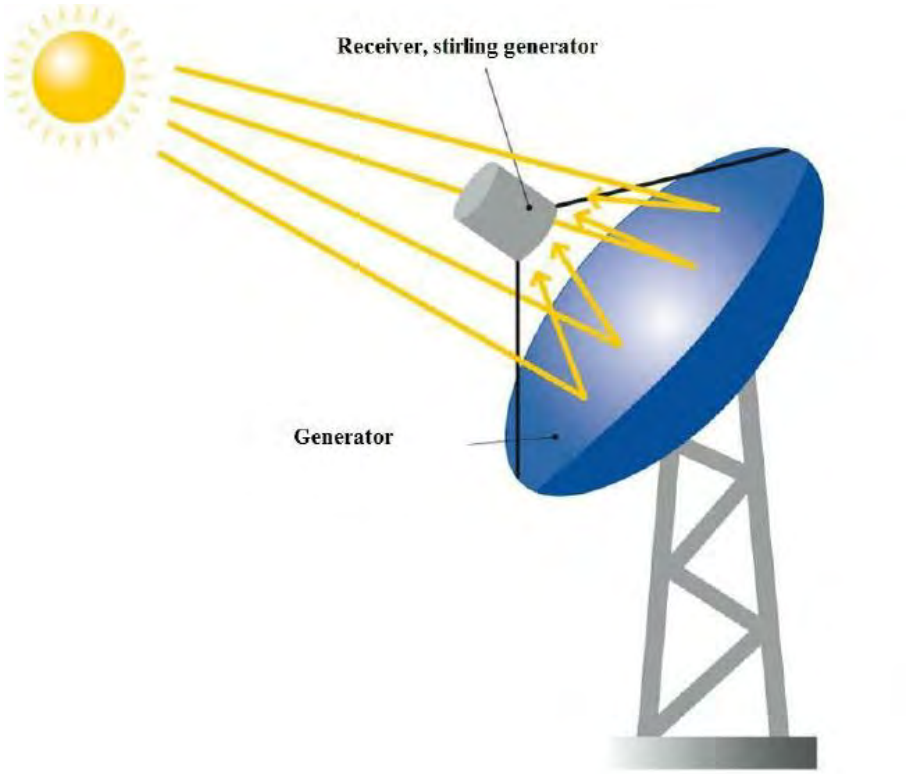
**Linear Fresnel reflector** systems, use long thin segments of mirrors to concentrate sunlight on a fixed linear absorber located at a focal point of the reflectors.



**Power tower system** uses a large field of sun tracking Mirrors, concentrate sunlight onto a receiver on the top of a tower.



**Dish type CSP** uses a mirror similar to a very large satellite dish, directs sunlight to the engine generator. The mechanical power is then used to run a generator to produce electricity.



# Electricity from CSP as share of total electricity consumption

| Countries | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|
| Australia, Central Asia,4 Chile, India (Gujarat, Rajasthan), Mexico, Middle East, North Africa, Peru, South Africa, United States (Southwest) | 5% | 12% | 30% | 40% |
| United States (remainder) | 3% | 6% | 15% | 20% |
| Europe (mostly from imports), Turkey | 3% | 6% | 10% | 15% |
| Africa (remainder), Argentina, Brazil, India (remainder) | 1% | 5% | 8% | 15% |
| China, Russia (from imports) | 0.5% | 1.5% | 3% | 4% |

# Thank you