

Electrical Engineering II

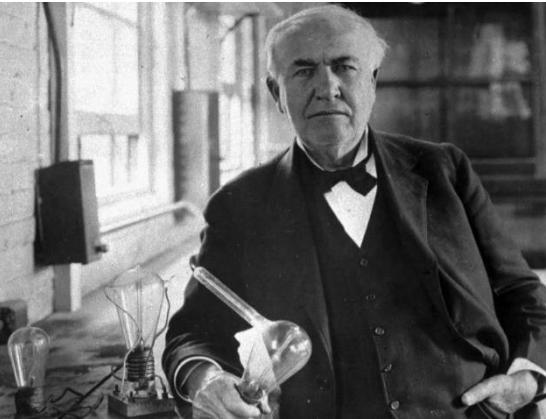
ENGL2191

An introduction to the module

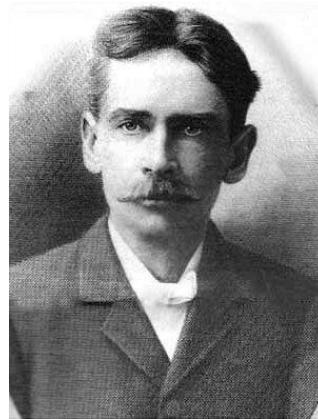
Dr Hamed Bahmani
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E108



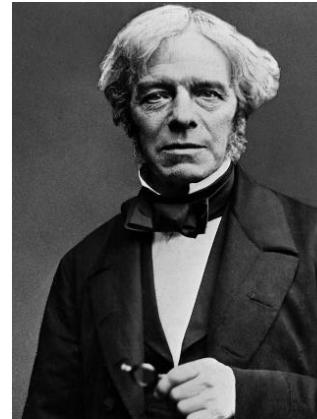
In memory of those who spent their life in engineering and physics



Thomas Alva Edison
1847-1931



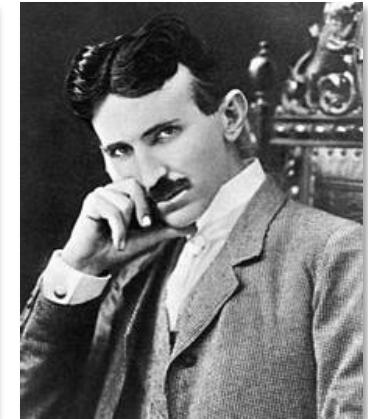
William Stanley
1858-1916



Michael Faraday
1791-1867



Joseph Henry
1797-1878



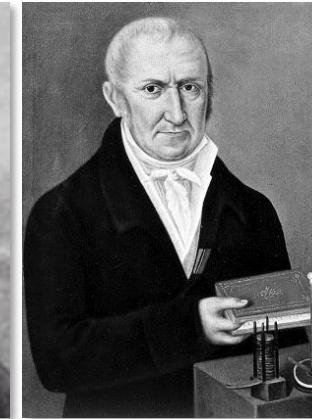
Nikola Tesla
1856-1943



Marie Curie
1867-1934



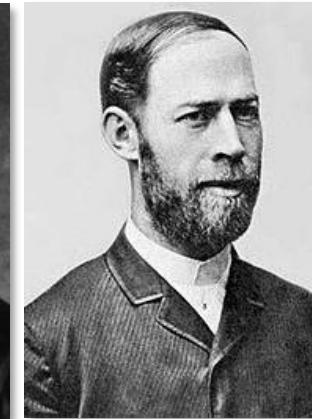
André Ampère
1775-1836



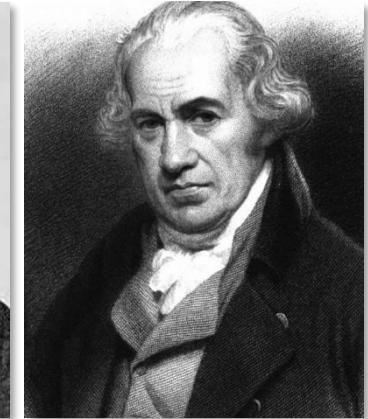
Alessandro Volta
1745-1827



Georg Ohm
1789-1854



Heinrich Hertz
1857-1894



James Watt
1736-1819

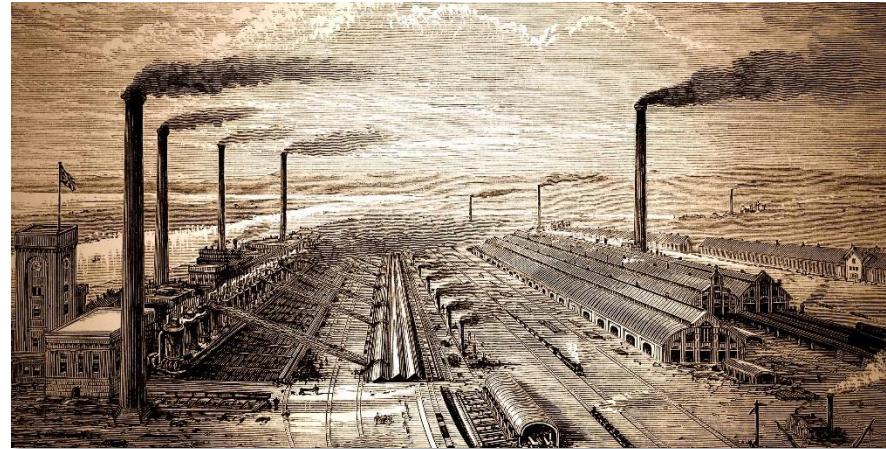


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Fossil fuels:

Since the industrial revolution, fossil fuels have been the main energy resources for industry and transportation.

17th century



21st century



19th century



21st century



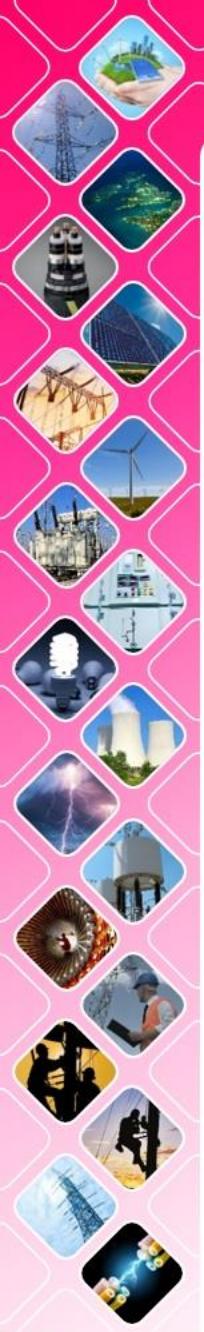


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21300000000000

kg of carbon dioxide (CO₂) per year

21.3 billion tonnes of carbon dioxide (CO₂) per year





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Fossil fuels:

- The use of fossil fuels raises serious environmental concerns.
- The burning of fossil fuels produces around 21.3 billion tonnes of carbon dioxide (CO₂) per year. It is estimated that natural processes can only absorb about half of that amount, so there is a net increase of 10.65 billion tonnes of atmospheric carbon dioxide per year.
- Carbon dioxide is a greenhouse gas that contributes to global warming and climate change.



Climate change is not coming, climate change is here!

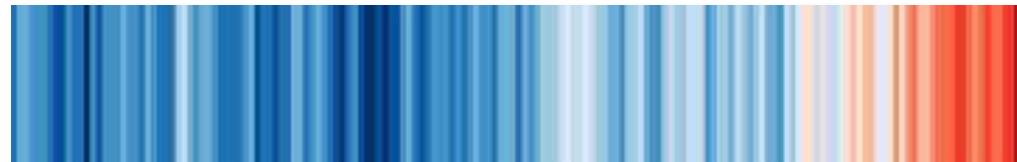


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When scientists confirmed July 2023 was the hottest month on record, the UN secretary general stated that:

▶▶▶ “***The era of global warming has ended, and the era of global boiling has arrived***”.

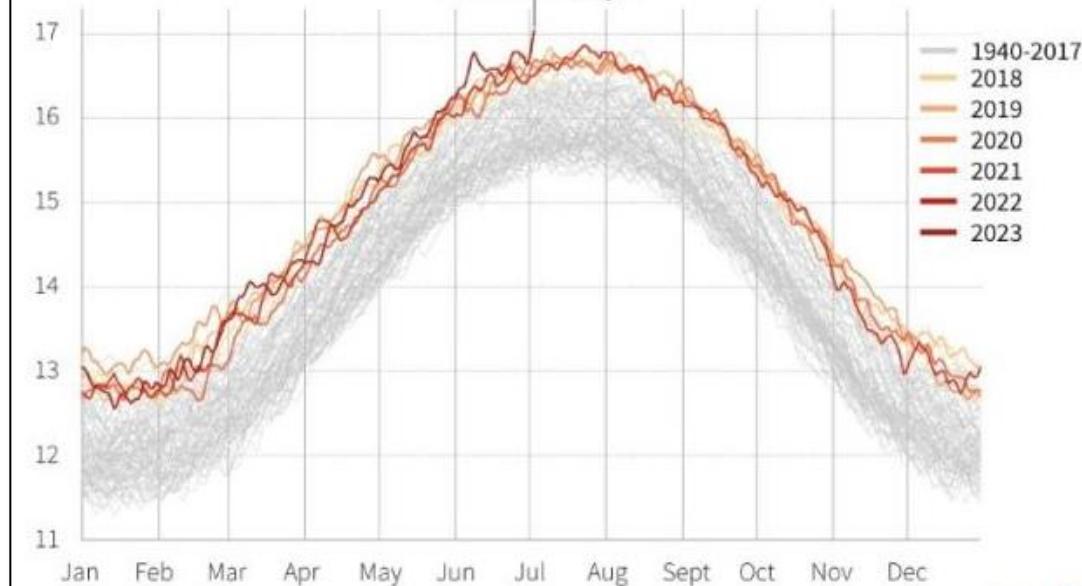
▶▶▶ This shows the seriousness of climate change and its catastrophic impacts for humans and wildlife.



Record heat in early July 2023

Average daily global temperatures per year, in °C

17.03°C July 4



Source: Copernicus C3S/ECMWF, data from ERA5

AFP



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No body wants to see floods!



No body wants to see drought!



No body wants to see wildfire!



These are the reality in 21st century, because of human activities!



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Governments Policy:

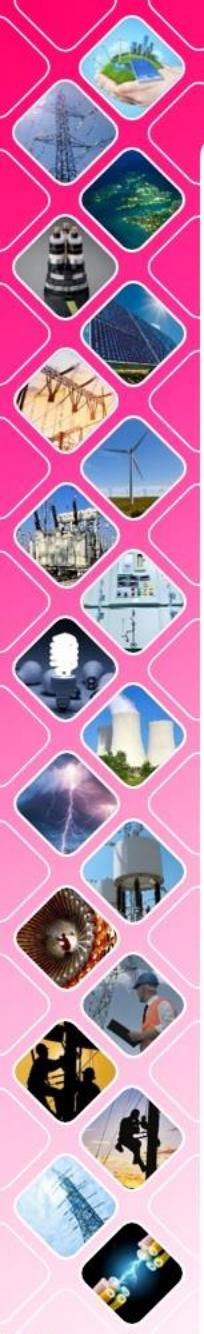
- » G-8 leaders have requested a 50 % reduction in CO₂ emissions by 2050, to prevent the most serious effects of climate change on the world.
- » The British government is aiming to ban new diesel and petrol cars by 2035, to encourage people to buy electric vehicles.
- » The British government promise to power every home in the UK with wind energy by 2030.



s-i.huffpost.com



expoknews.com



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So, an energy revolution has already started!

Shifting from fossil fuel economy to low-carbon or decarbonised economy is a common goal for the developed and developing countries to avoid catastrophic impacts of climate change on the planet



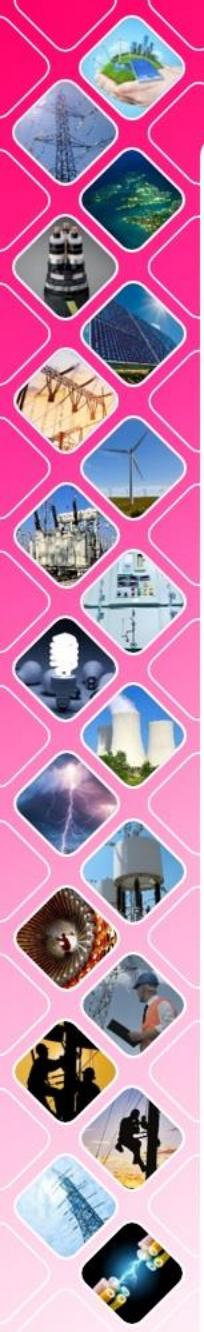
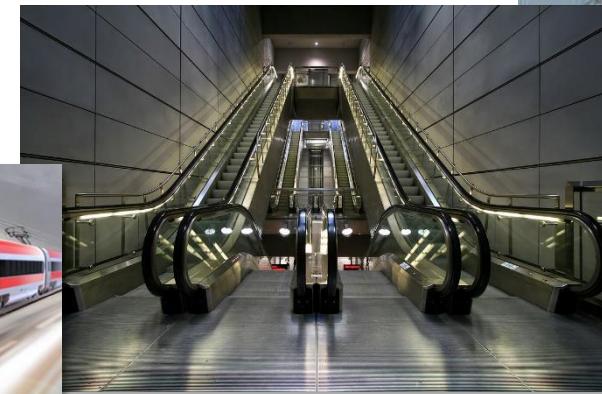
Grist.files.wordpress.com

In this revolution, electrical engineers play a significant role.



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We use electricity in our daily life.





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We use electricity in our daily life.



Let's see what do we have behind this socket.

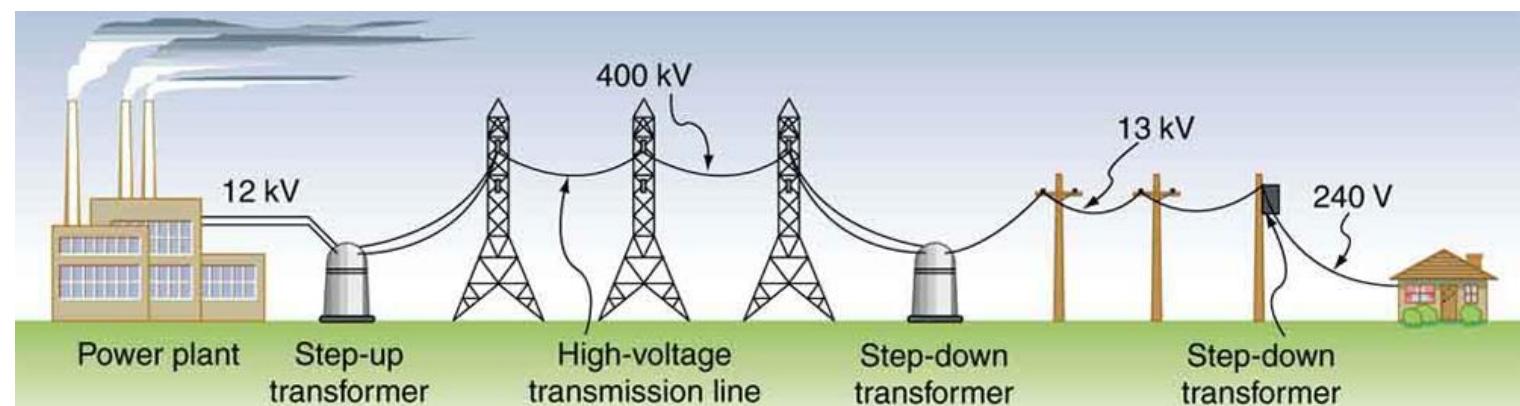


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A power system consists of:

- Power station
- HV substation
- Transmission line
- Major distribution network
- Distribution network



Electrical engineers or power engineers could work in each part of a power system.



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Electrical energy is produced in power stations, or power plant.



Thermal power station



Hydro power station





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Electrical energy is produced in power stations, or power plant.





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The generated electricity needs to be transferred to the load centres. e.g cities, town, etc.

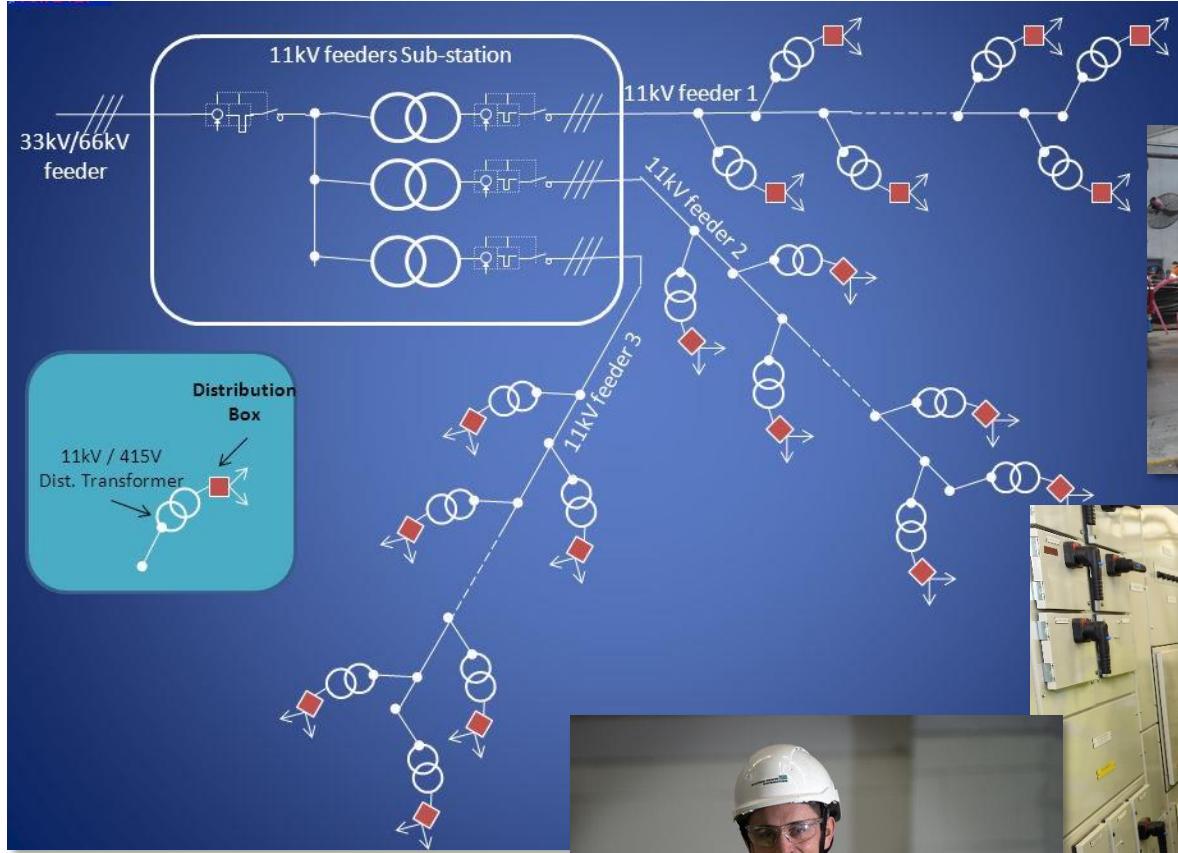
This is done by HV substations, and transmission lines.





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At the last stage, power is distributed to different parts of the city, town, etc.





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Who is an electrical engineer?



An "Electrical Engineer" is a person who uses scientific knowledge to design, supervise, construct, and maintain electrical equipment and power systems.



Power system of UK:

Power system of UK is an example of a well designed power system.