



University of Salahadin  
College of Engineering  
Electrical Engineering Dept.



# **Distributed Generation**

## **Chapter One**

# **Introduction**

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# Introduction

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- **Distributed generation**, also called **on-site generation**, involves generation of electricity from sources **located near the consumer**.

# Introduction

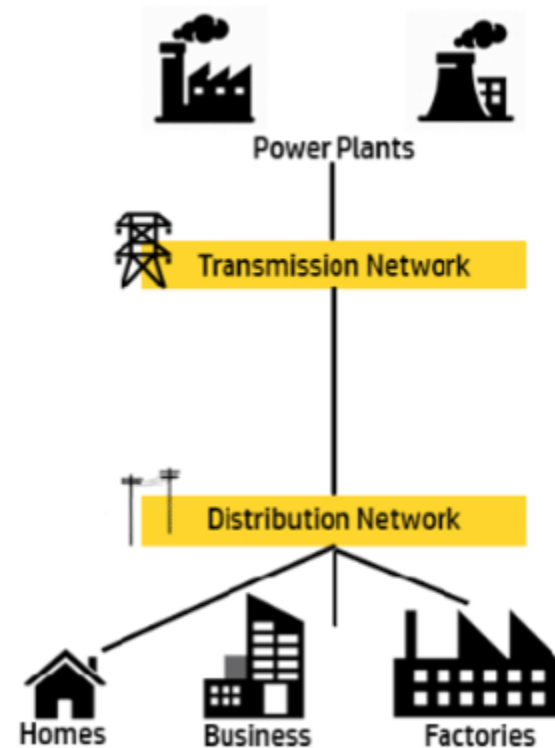
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- Distributed generation **reduces the amount of energy lost** during transmission because the electricity is generated near the point of consumption.
- They meet local **peak loads** and **reduce the size and amount of power lines** that need to be built.

# Central Power Generation

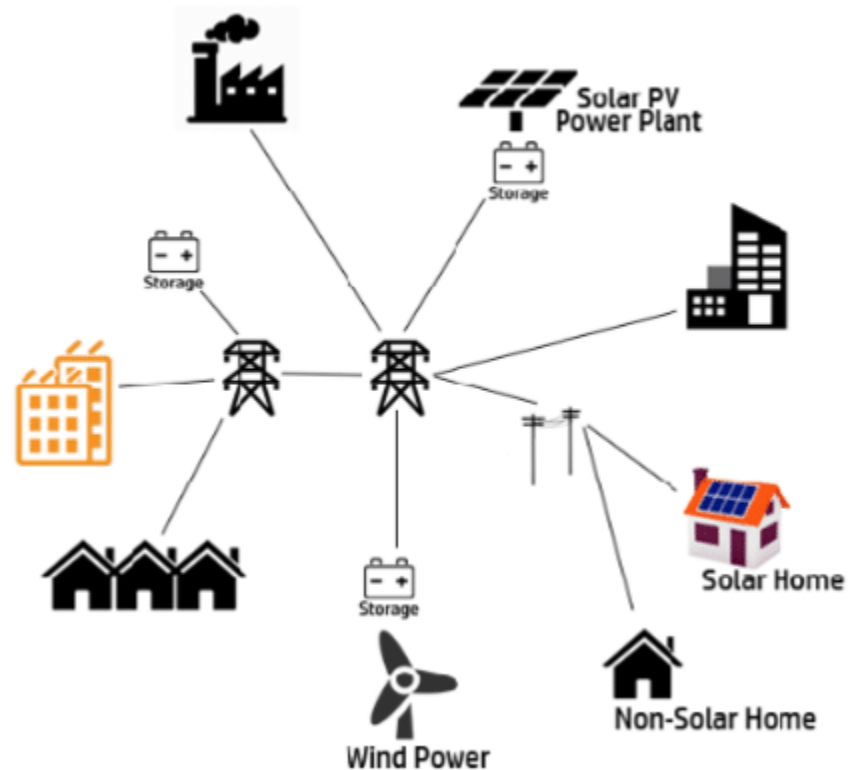
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**Centralized generation sources** are large power plants to produce electricity to the consumers.



# Distributed Power Generation

**Distributed generation** is small-scale power generation technologies to produce electricity close to the consumers.



# Distributed generation Technologies

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1. Fossil Distributed Generation Technologies.
2. Renewable Distributed Generation Technologies.

# Fossil Distributed Generation Technologies

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**Fossil fuels** are **fuels** formed by natural processes from fossilized remains of prehistoric plants.

1. Coal
2. Oil.
3. Natural Gas.





# Fossil Distributed Generation Technologies

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## Fossil Distributed Generation Technologies are:

1. Engine Combustion generators.
2. Micro Turbines.

# Fossil Distributed Generation Technologies

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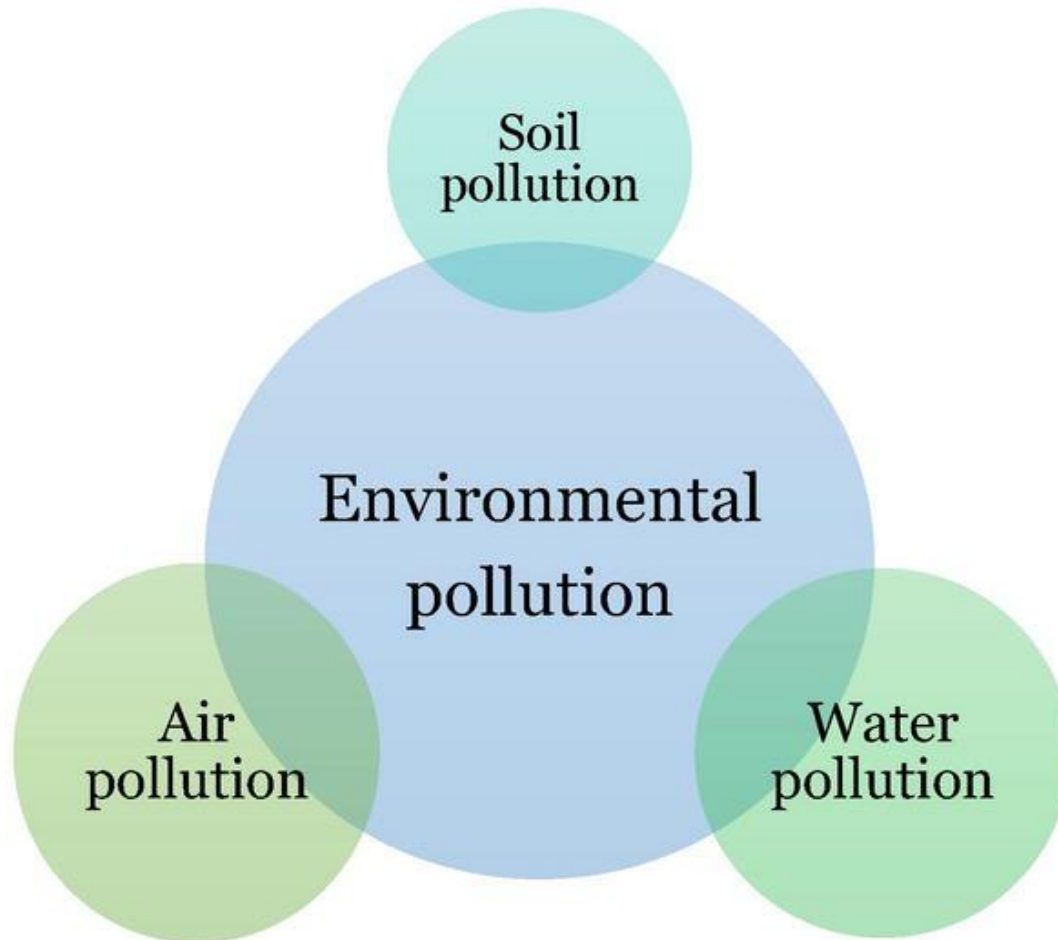
**Environmental pollution** is the contamination of the physical and biological components of the earth/atmosphere system to such an extent that normal environmental processes are adversely affected.



# Fossil Distributed Generation Technologies

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## Types of Environmental pollution



# Fossil Distributed Generation Technologies

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- **Air pollution** is the introduction into the atmosphere of chemicals, particulate matter, or biological materials that cause discomfort, disease, or death to humans, damage other living organisms such as food crops, or damage the natural environments.
- Some of the most important air pollutants are **sulfur dioxide**, **nitrogen dioxide**, **carbon monoxide**, **ozone** and **airborne particles**, with **radioactive pollutants**.

# Fossil Distributed Generation Technologies

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- **Water pollution** is the contamination of water bodies (e.g. lakes, rivers, oceans, aquifers and groundwater).
- Water pollution occurs when pollutants are discharged directly or indirectly into water bodies without adequate treatment to remove harmful compounds.



# Fossil Distributed Generation Technologies

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- **Soil pollution** is caused by the presence of human-made chemicals or other alteration in the natural soil environment.
- It is typically caused by industrial activity, agricultural chemicals, or improper disposal of waste.





# Renewable Distributed Generation Technologies

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**Renewable energy** is the energy comes from sources that **won't run out.**



# Renewable Distributed Generation Technologies

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## Energy sources are:

1. Sun
2. The planetary gravitational interaction.
3. Geothermal energy.
4. Human induced nuclear reaction.
5. Chemical reactions from mineral sources.



# Renewable Distributed Generation Technologies

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## Renewable Energies are:

- Solar
- Wind Power
- Oceans Energy : Tidal and wave
- Biomass and bioenergy
- Fuel Cell
- Geothermal
- Hydro

# Advantages of renewable energy

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1. Renewable energy will **never run out**.
2. Renewable energy facilities generally require **less maintenance** than traditional generators. This means the **reduce of operation costs**.
3. Renewable energy has **minimal impact on the environment**.
4. Renewable energy projects can also bring **economic benefits to many regional areas**, as most projects are located away from large cities.

# Disadvantages of renewable energy

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- 1. Reliability of Supply:** One shortcoming is that renewable energy relies heavily upon the weather for sources of supply: rain, wind, and sunshine.
- 2. Large Capital Cost:**
- 3. Large area of Land Required:** To meet up with the large quantities of electricity produced, large amount of solar panels and wind farms need to be set up.

# Divisions of Renewable Energies

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## 1. Mechanical:

- Hydro
- Wind
- Wave & tidal power

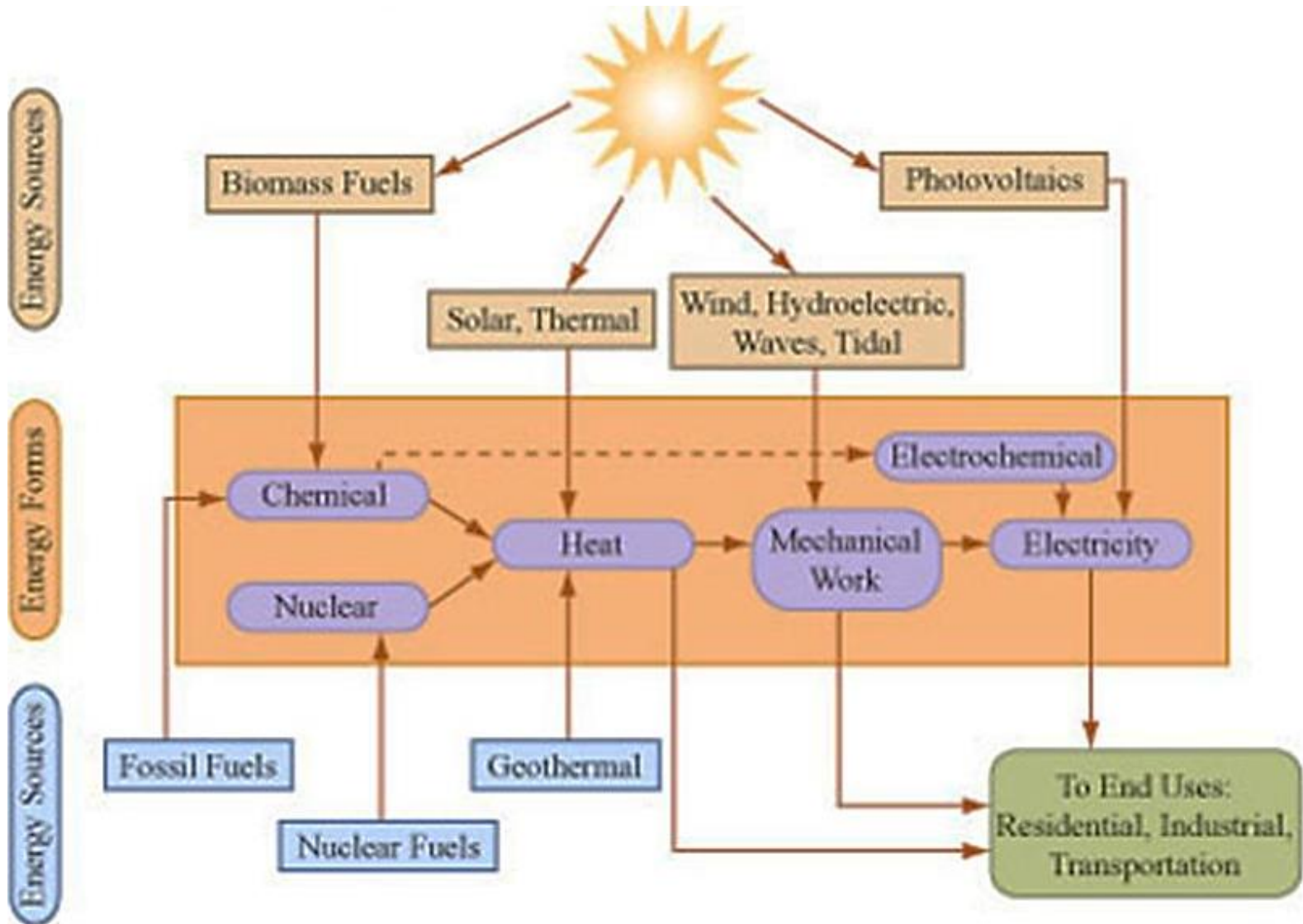
## 2. Thermal:

- Geothermal
- Biomass
- Solar collectors

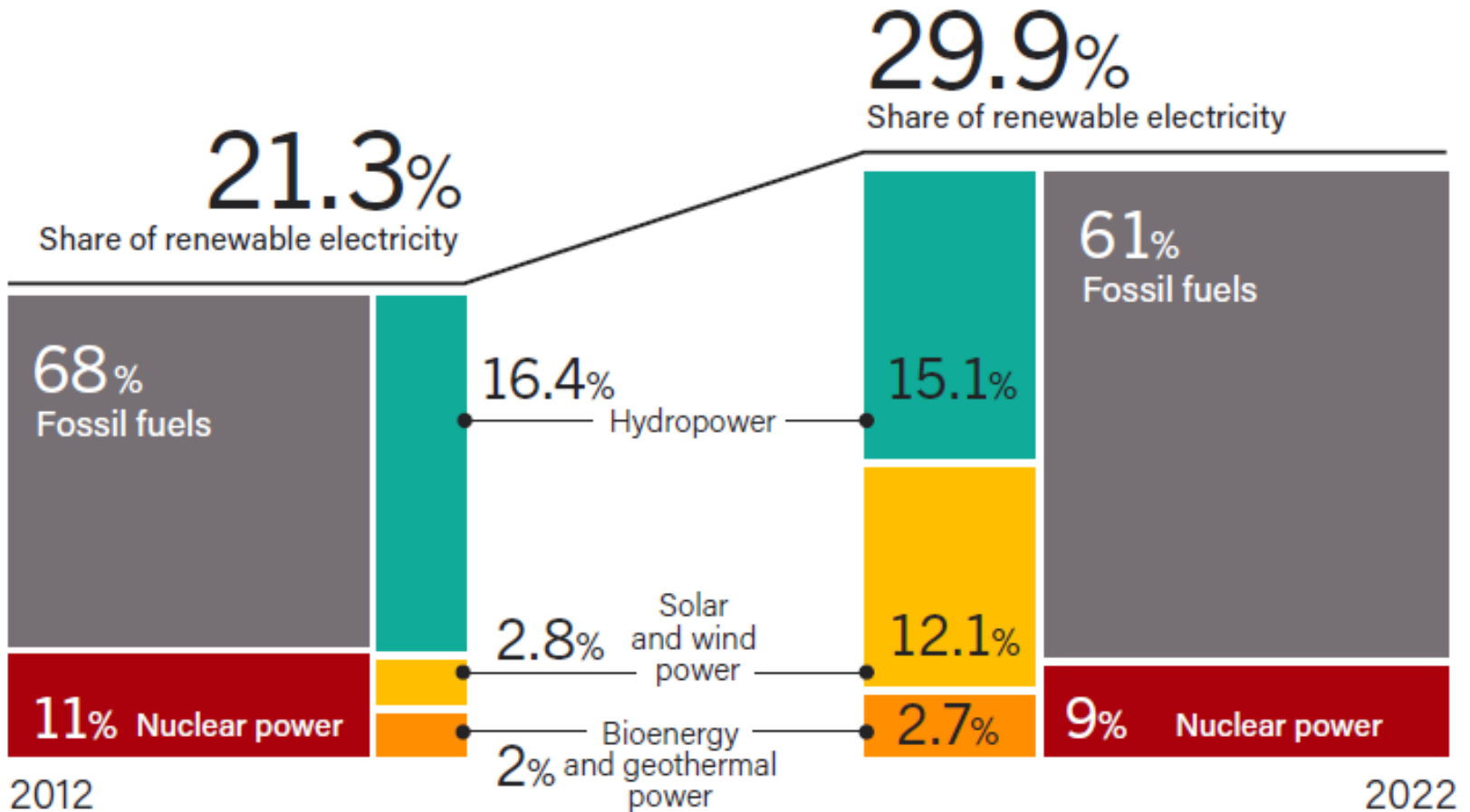
## 3. Radiation:

- Photovoltaic
- Nuclear

# Energy Sources, Conversions and Use



# Electrical Generation Share: 2012-2022



# Advantages of Distributed generation

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1. There's **more efficiency** and **less waste** involved than centralized generation sources because the generators are closer to the consumers of the energy.
2. Distributed energy generation can be used to **generate electricity at homes and businesses** using renewable energy sources, such as solar and wind.
3. Distributed generation systems are **more reliable** than centralized generation systems because multiple small microgrid units are less likely to fail simultaneously than a single large unit.

# Disadvantages of Distributed generation

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1. Distributed generation single units take up space and are located closer to the consumers, so they may cause **land-use concerns** and be **displeasing to the eye**.
2. Distributed generation systems that **involve burning fossil fuels** can produce the same types of impacts as larger fossil-fuel-powered plants on a smaller scale, but **closer to a populated area**.



# Next Lecture

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- Solar Energy.

# Questions and Thank you

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*Thank  
you*