# SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution

Coimbatore-35

## 23GET102 – Basic Civil and Mechanical Engineering

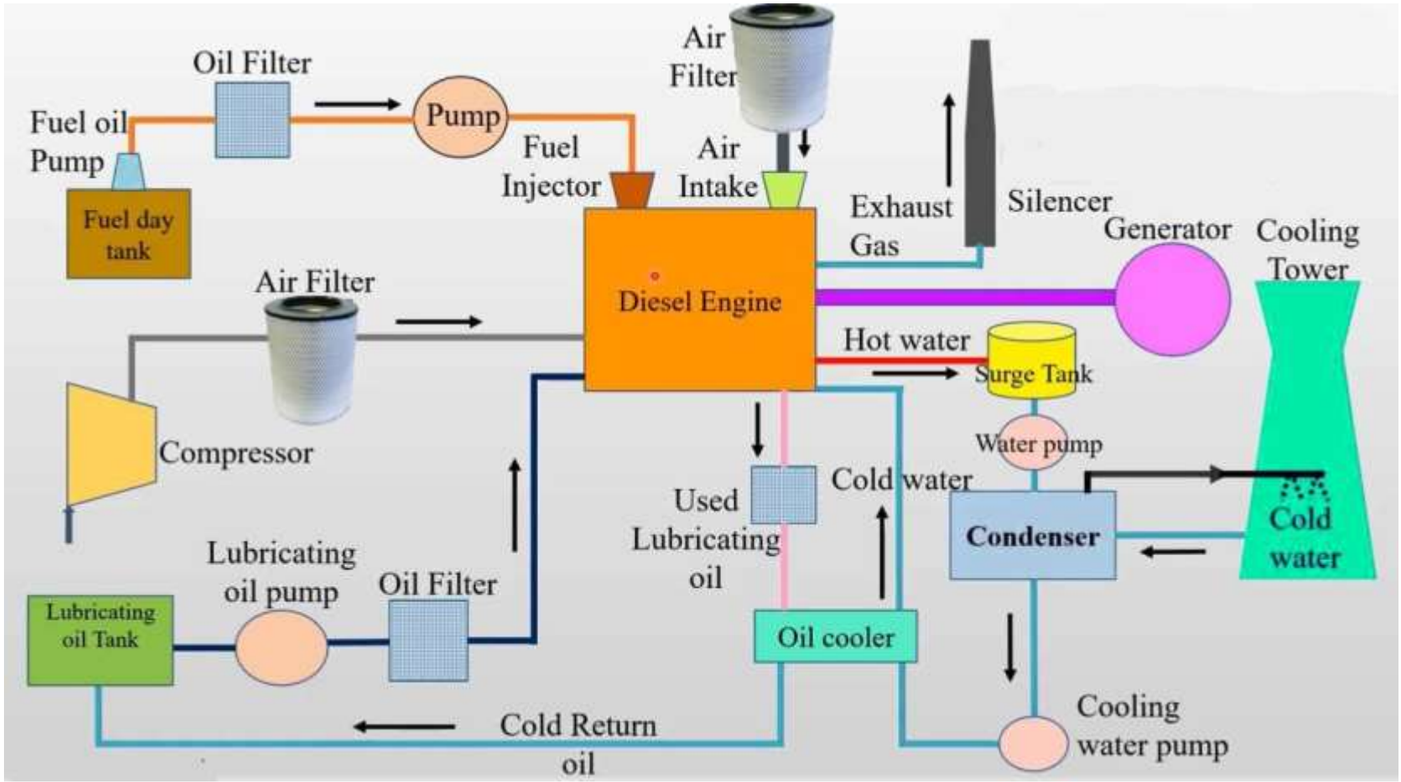
I CST/ I SEMESTER

## UNIT IV : I.C Engines and Power Plant Engineering

### Topic 7 : Diesel and Hydro-electric Power Systems

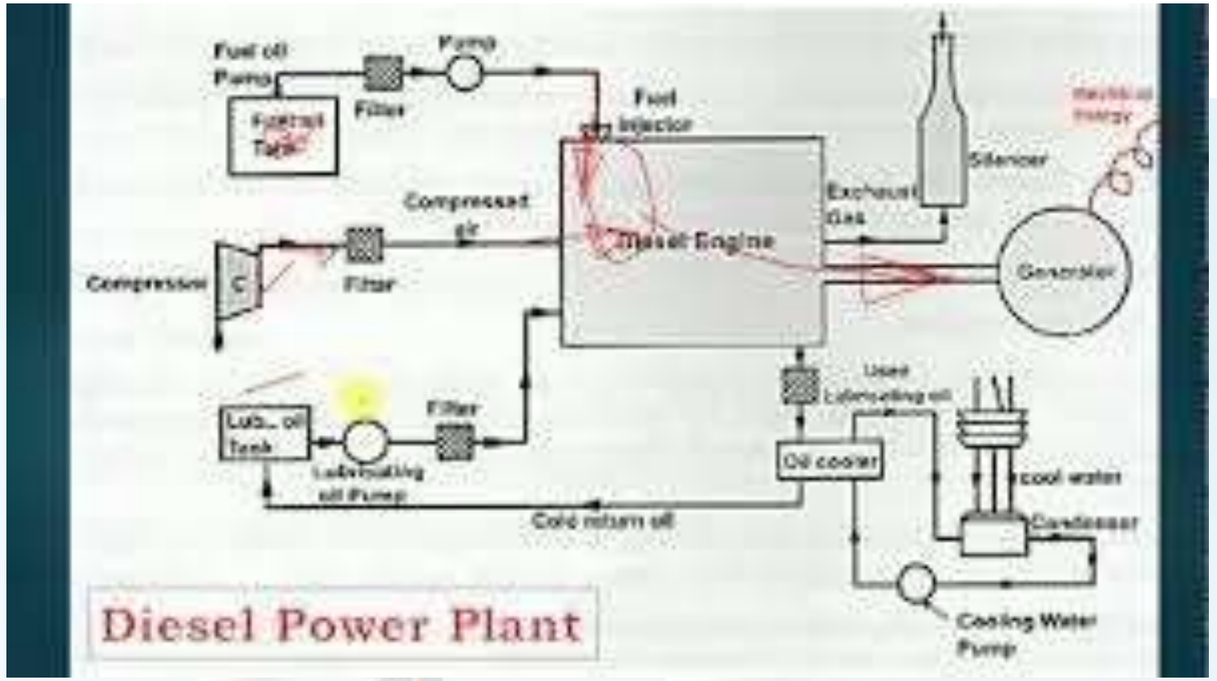
# Diesel and Hydro-electric Power Systems

This presentation explores the operational principles, benefits, and drawbacks of Diesel and Hydro-electric power plants. A comprehensive understanding of these systems is vital for evaluating their influence on energy production and environmental sustainability.



# Working Principle of Diesel Power Plants

**DT - Ideate**




## Fuel Injection

Diesel engines use high-pressure fuel injection to atomize diesel fuel into the combustion chamber, enabling more efficient combustion compared to gasoline engines.

## Ignition Process

Diesel engines rely on compression ignition, where air is compressed to a high temperature, causing the injected fuel to ignite spontaneously, resulting in a powerful combustion cycle.

## Energy Conversion

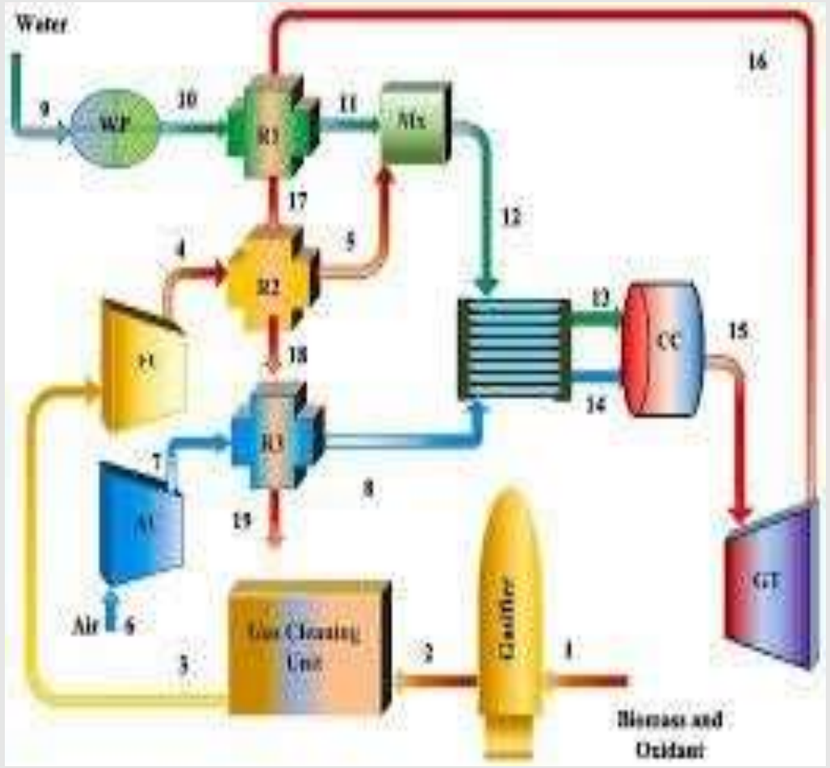
The combustion process drives the movement of pistons, converting chemical energy from fuel into mechanical energy, which is then transformed into electrical energy via a generator.

***DT* - Prototype**

# Merits of Diesel Power Plants


## High Efficiency

Diesel power plants offer high thermal efficiency, providing more output energy per unit of fuel, making them effective for base-load power generation.



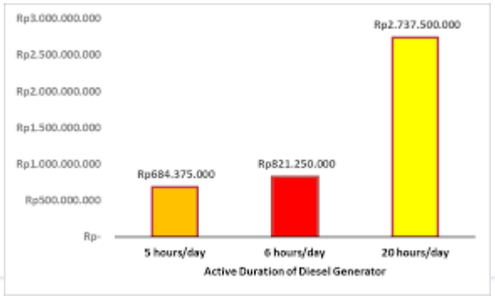

## Quick Start-Up Time

These plants can be rapidly started and operated, making them flexible and reliable for meeting sudden demand surges in energy.

## Wide Fuel Availability

Diesel fuel is widely available and can be sourced from various locations, reducing dependence on specific fuel suppliers and enhancing energy security.

# Demerits of Diesel Power Plants




1

Environmental Concerns

Diesel power plants emit pollutants like nitrogen oxides (NOx) and particulate matter, contributing to air quality issues and climate change.

2

Reliance on Fossil Fuels

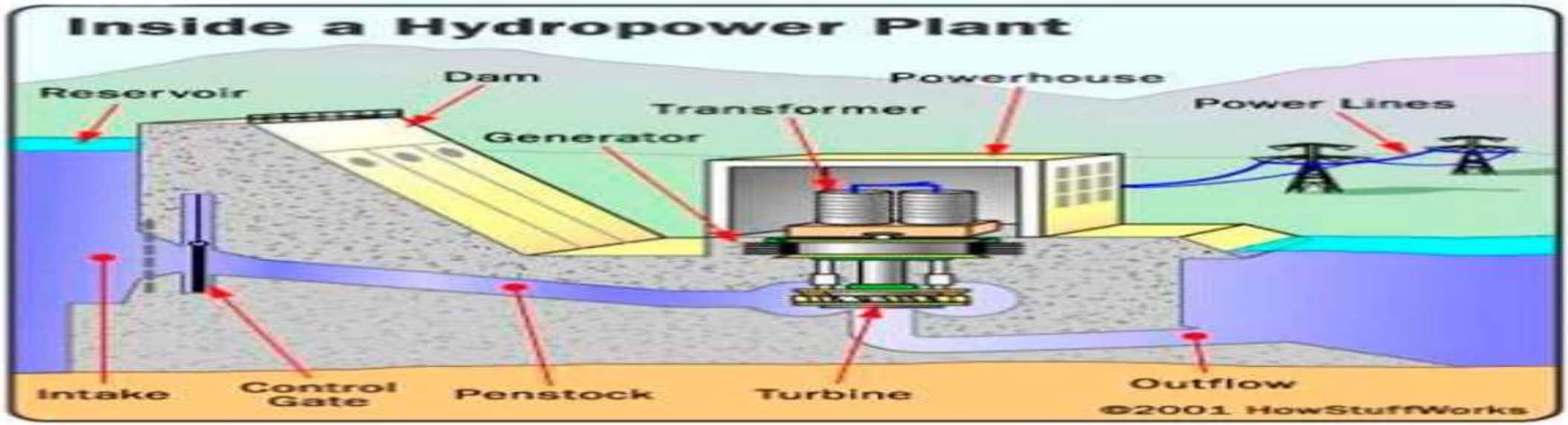
As they primarily operate on fossil fuels, diesel plants contribute to the depletion of natural resources and present sustainability challenges.

3

Operational Costs

Although initial investment may be lower, ongoing fuel and maintenance costs can be significant, affecting overall economic viability over time.


# Working Principle of Hydro-electric Power Plants




## Water Flow Utilization

Hydro-electric plants harness the kinetic energy from flowing or falling water, converting it into mechanical energy via turbines.

## Turbine Mechanics

As water strikes the turbine blades, it causes them to rotate. This mechanical movement drives a generator to produce electricity.

## Energy Conversion

The process involves converting gravitational potential energy of water into kinetic energy and then into electrical energy through dual conversions.

# Merits of Hydro-electric Power Plants

## Renewable Energy Source

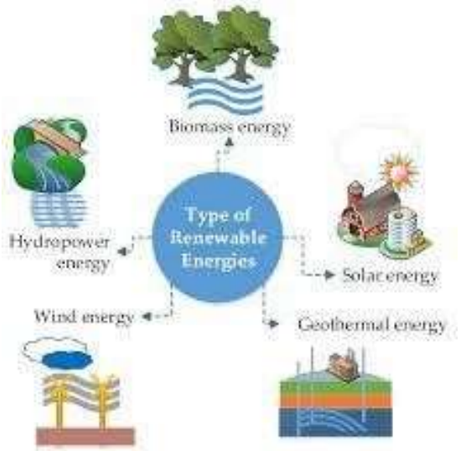
Sustainable and renewable with minimal carbon footprint.

## Low Operating Costs

Low maintenance and no need for continuous fuel purchases.

## Capacity for Large Scale Production

Can generate significant electricity to support large populations.



# Demerits of Hydro-electric Power Plants

## Environmental Impact

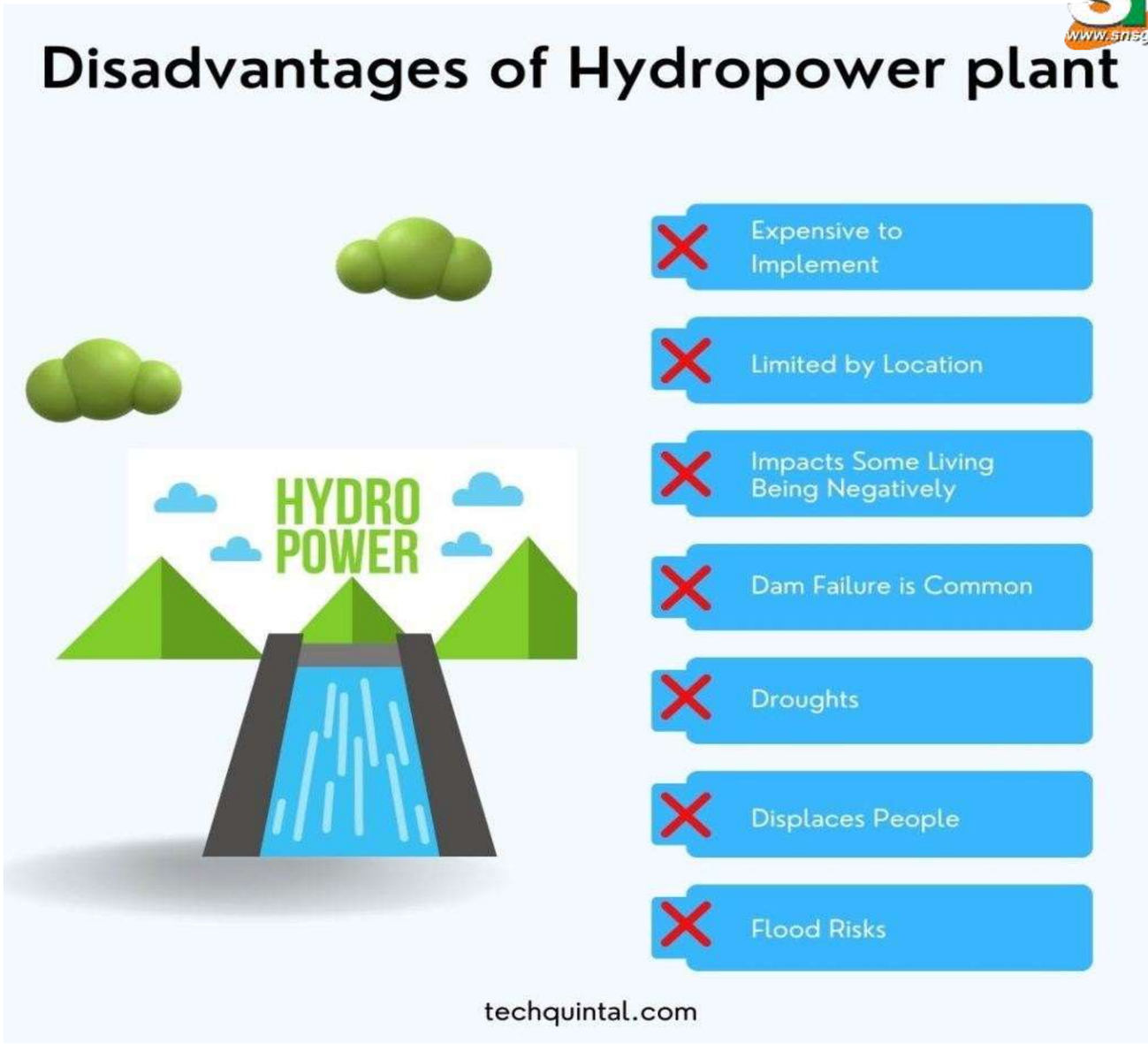
The construction of dams can disrupt local ecosystems, affect fish populations, and alter water quality and flow patterns in rivers.

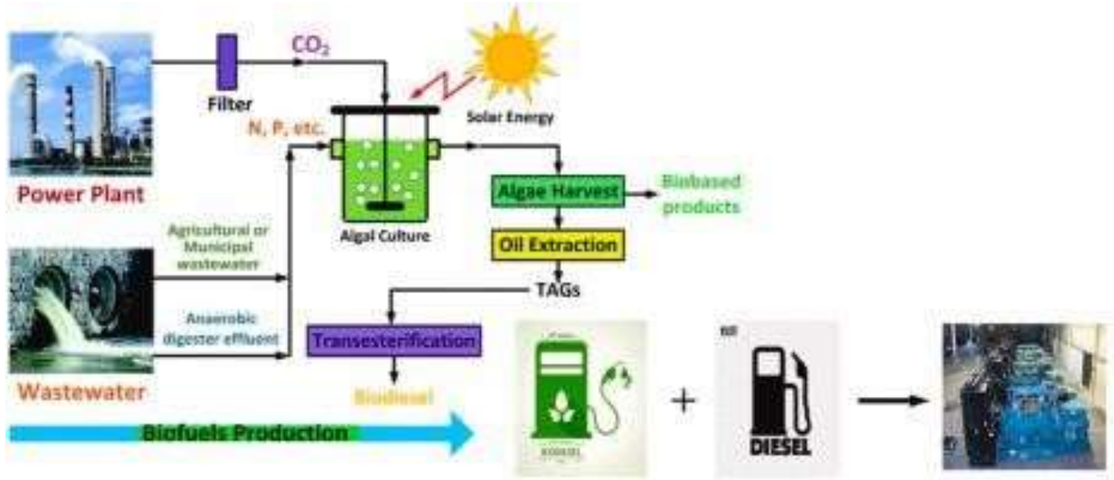
## Site Specificity

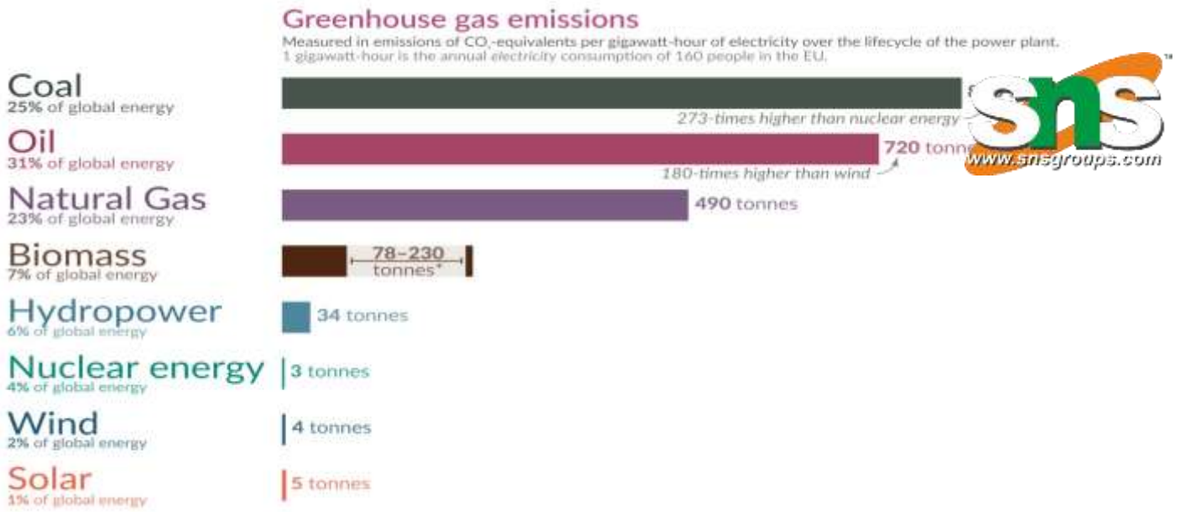
Hydro-electric power plants need suitable geographical locations with significant water flow, limiting their installation potential in some regions.

## Impact on Local Communities

The creation of reservoirs can lead to the displacement of communities and loss of arable land, raising social and ethical concerns.






# Comparison of Diesel and Hydro-electric Power Plants

Both Diesel and Hydro-electric power plants offer unique strengths and weaknesses. The selection of the appropriate energy source is crucial, balancing factors like reliability, environmental impact, and sustainability, especially as we move towards more sustainable energy solutions.

| 1 | 2 | 3 |
|---|---|---|
| Distinct Working Principles | Merits | Demerits |
| Different methods of generating energy. | Advantages such as reliability and efficiency. | Environmental impact and sustainability concerns. |

# Assessment- Quiz

Question:Why is diesel fuel injected directly into the cylinder instead of being mixed with air beforehand (like in petrol engines)?Answer:✅ Because diesel engines use compression ignition.
Explanation:Air is compressed to a high temperature, and fuel is injected at high pressure — it ignites due to heat of compression (no spark plug needed).

The Start-Up PuzzleQuestion:If the diesel engine must compress air to ignite fuel, how does it start when stationary?Answer:✅ Using an electric motor or compressed air starter.
Explanation:It rotates the engine initially to allow compression and ignition to begin.

The Cooling CodeQuestion:Why is cooling essential in a diesel engine?Answer:✅ To prevent overheating and maintain lubrication.
Explanation:Without cooling, metal parts may expand excessively, reducing efficiency and damaging components.

# References

https://www.youtube.com/watch?v=eAX_fK_c8Mc

https://www.youtube.com/watch?v=r2sxZrmvO1o

https://www.youtube.com/watch?v=q8HmRLCgDAI