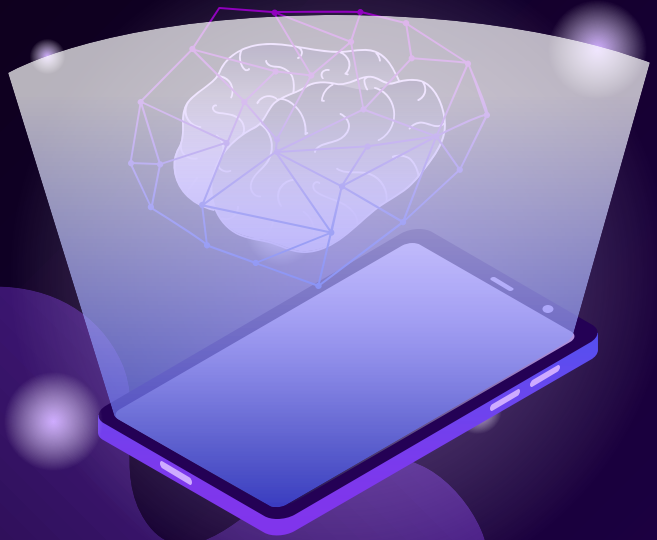


01

INTRODUCTION

CONTENTS

ABSTRACT

Recently, due to concerns about the liberalization of electricity supply, deregulation, and global impact on the environment, securing a reliable power supply has become an important social need worldwide. To ensure this need is fulfilled, detailed investigations and developments are in progress on power distribution systems and the monitoring of apparatus. Intelligent system techniques may be of great help in the implementation of area power system controls. Most of these applications require large quantities of system information, which can be provided by modern telecommunications and computing technology, but require new processing techniques able to extract salient information from these large sets of raw data. Importantly, such large data sets are never error free and often contain various types of uncertainty. Finally, control actions may be based on operating strategies specified in qualitative form, which need to be translated into quantitative decisions.

POWER SYSTEMS:

An electric power system is a network of electrical components used to supply, transmit and use electric power. Power systems engineering is a subdivision of electrical engineering that deals with the generation, transmission, distribution and utilisation of electric power and the electrical devices connected to such systems like generators, motors and transformers.

ARTIFICIAL INTELLIGENCE:

Commonly, artificial intelligence is known to be the intelligence exhibited by machines and software, for example, robots and computer programs. The term is generally used for developing systems equipped with the intellectual features and characteristics of humans, like the ability to think, reason, generalize, distinguish, learn from past experience or rectify their mistakes. It generally refers to machines or programs with ability to think on an independent level from their operator to make decisions.

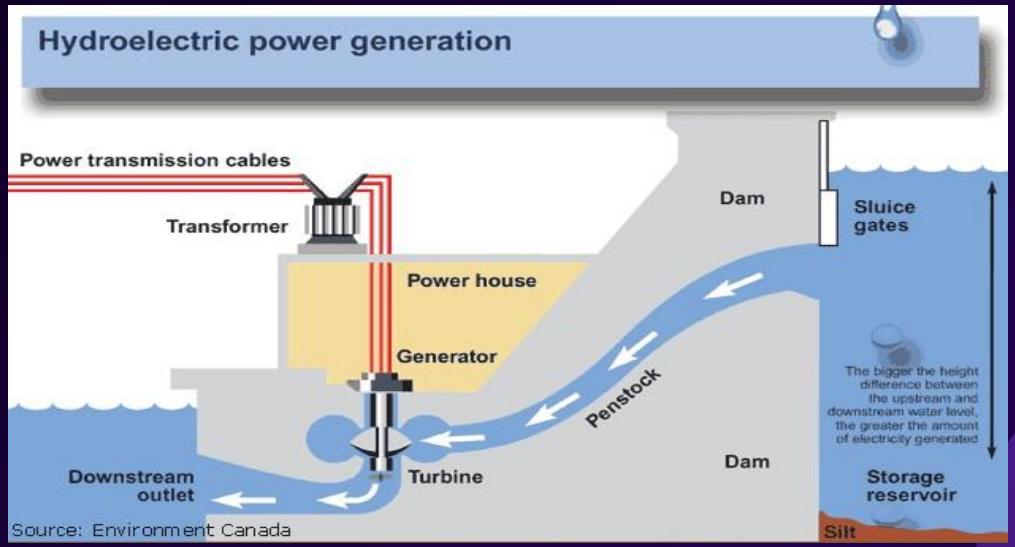
TYPES OF POWER STATIONS

Nuclear power plants. ...
Hydroelectric power plants. ...
Coal-fired power plants. ...
Diesel-fired power plants. ...
Geothermal power plants. ...
Gas-fired power plants. ...
Solar power plants. ...
Wind power plants.

NEED FOR AI IN POWER STATION

Complex, versatile and large amount of information used in calculation, diagnosis and maintenance of systems. Increase in data handling and processing time due to the vast data generated during such processesbeen accepted, prepare it in two-column format, including figures and tables.

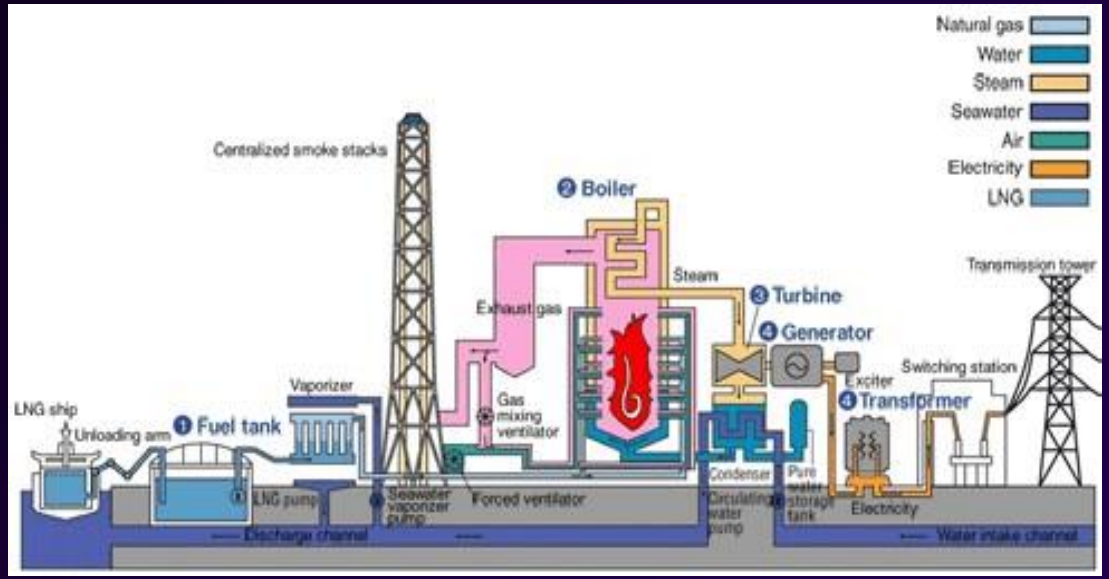
HYDRO POWER PLANT



HYDRO POWER PLANT

In **Hydro Power Plant** we use gravitational force of fluid water to run the turbine which is coupled with electric generator to produce electricity. This power plant plays an important role in protecting our fossil fuel which is limited, because the electricity generated is due to the use of water which is a renewable source of energy .The force of the water being released from the reservoir through the dam spins the blades of a giant turbine. The turbine is connected to the generator that makes electricity as it spins. After passing through the turbine, the water flows back into the river on the other side of the dam.

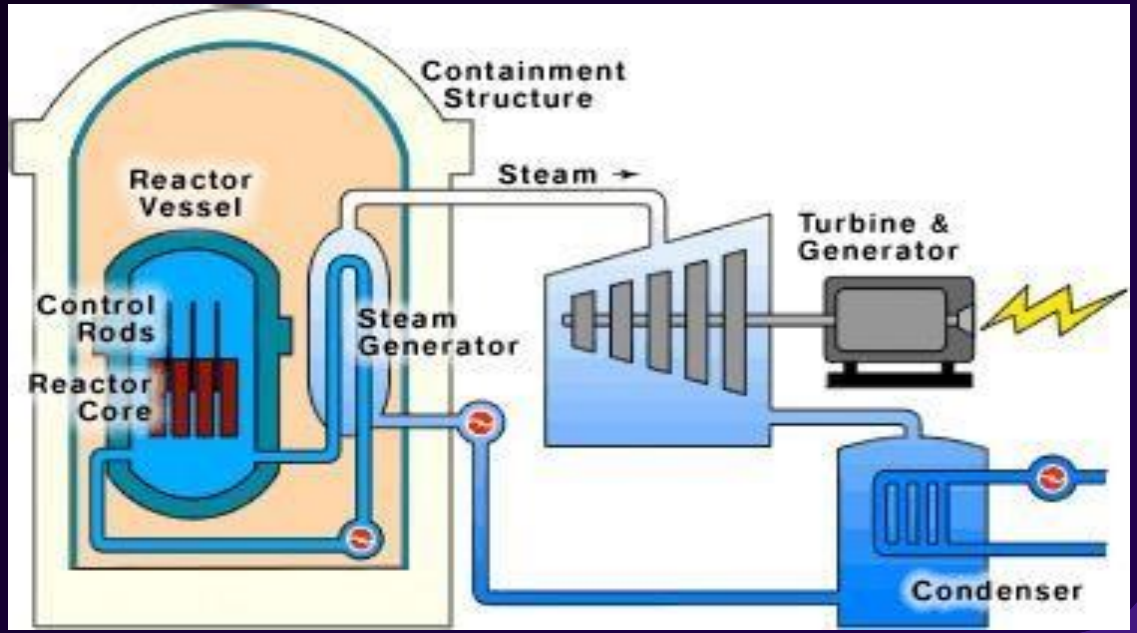
THERMAL POWER PLANT



THERMAL POWER PLANT

A **thermal power station** is a power plant in which heat energy is converted to electric power. In most of the world the prime movers is steam driven. Water is heated, turns into steam and spins a steam turbine which drives an electrical generator. After it passes through the turbine, the steam is condensed in a condenser and recycled to where it was heated; this is known as a Rankine cycle. The greatest variation in the design of thermal power stations is due to the different heat sources, fossil fuel dominates here, although nuclear heat energy and solar heat energy are also used. In a thermal power station fuel such as coal, oil or gas is burned in a furnace to produce heat - chemical to heat energy. This heat is used to change water into steam in the boiler. this drives the generator to produce electricity .i.e,kinetic to electrical energy.

NUCLEAR POWER PLANT



NUCLEAR POWER PLANT

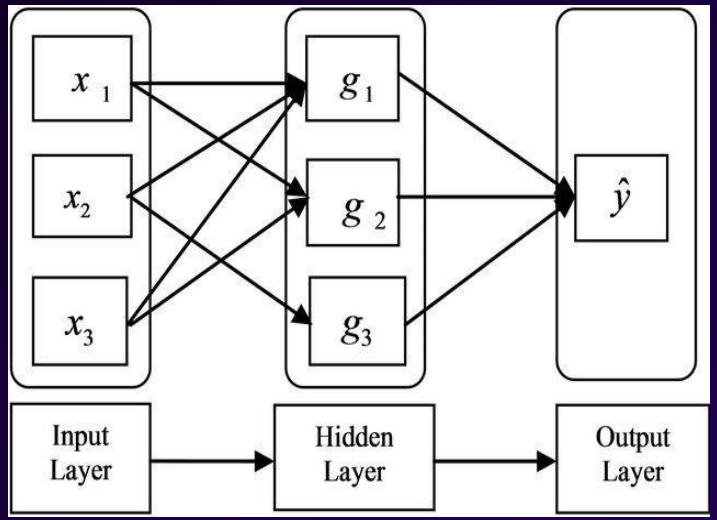
Nuclear plants, like plants that burn coal, oil and natural gas, produce electricity by boiling water into steam. This steam then turns turbines to produce electricity. The difference is that nuclear plants do not burn anything. Instead, they use uranium fuel, consisting of solid ceramic pellets, to produce electricity through a process called fission.

Nuclear power plants obtain the heat needed to produce steam through a physical process. This process, called fission, entails the splitting of atoms of uranium in a nuclear reactor. The uranium fuel consists of small, hard ceramic pellets that are packaged into long, vertical tubes. Bundles of this fuel are inserted into the reactor.

Commercial nuclear power plants in the are either boiling water reactors or pressurized water reactors. Approximately two-thirds of the reactors in the are pressurized water reactors, and one-third of them are boiling water reactors.

ARTIFICIAL INTELLIGENCE TECHNIQUES

Artificial Neural Networks:



Artificial Neural Networks are systems designed based on organic thought processes which convert a set of inputs into a set of outputs by a network of neurons. Each neuron produces one output as a function of inputs. These system are used in real world applications wherein the need for classification of patterns and pattern recognition arises.

They are classified by their architecture: number of layers and topology: connectivity pattern, feed forward or recurrent.

Input Layer: The nodes are input units which do not process the data and information but distribute this data and information to other units.

Hidden Layers: The nodes are hidden units that are not directly evident and visible. They provide the networks the ability to map or classify the nonlinear problems.

Output Layer: The nodes are output units, which encode possible values to be allocated to the case under consideration .

FUZZY LOGIC

Fuzzy logic or Fuzzy systems are logical systems for standardisation and formalisation of approximate reasoning. It is similar to human decision making with an ability to produce exact and accurate solutions from certain or even approximate information and data. The reasoning in fuzzy logic is similar to human reasoning. Fuzzy logic is the way like which human brain works, and we can use this technology in machines so that they can perform somewhat like humans. Fuzzification provides superior expressive power, higher generality and an improved capability to model complex problems at low or moderate solution cost.

AI IN POWER STATIONS

- Results are permanent and consistent can be easily documented. Results can be easily transferred and reproduced.
- The understanding of the working of neurons and the pattern of their interconnection can be used to construct computers for solving real world problems of classification of patterns and pattern recognition.
- Fuzzification provides superior expressive power, higher generality and an improved capability to model complex problems at low or moderate solution cost.
- Stability analysis and enhancement.
- Power system control.
- Fault diagnosis.
- Load forecasting.
- Reactive power planning and its control.
- reliability, transmission expansion planning, reactive power planning.
- Control of power system like voltage control, stability control, power flow control, load frequency control.
- Control of power plants like fuel cells power plant control, thermal power plant control.

PROS

- **Energy Efficiency**: AI-driven algorithms can optimize energy usage within power stations by analyzing historical data, identifying energy wastage patterns, and suggesting energy-saving strategies. This leads to improved overall energy efficiency and reduced operational costs.
- **Safety and Security**: AI can enhance safety and security within power stations by monitoring critical parameters, detecting potential hazards, and providing early warning systems. AI-driven surveillance systems can also help in preventing unauthorized access and ensuring compliance with safety protocols.
- **Remote Monitoring and Control**: AI facilitates remote monitoring and control of power station operations, enabling operators to manage assets from centralized control centers or through mobile applications. This remote accessibility improves operational flexibility and responsiveness.
- **Fault Detection and Diagnostics**: AI systems can quickly detect faults or abnormalities in power station components such as turbines, generators, and transformers. By identifying these issues early, maintenance teams can take corrective actions promptly, minimizing downtime and preventing costly failures.

CONS

- **Cost of Implementation**: Integrating AI technologies into existing power stations can require significant investments in hardware, software, training, and infrastructure upgrades. This initial cost can be a barrier for some organizations, especially smaller power companies or facilities with limited budgets.
- **Ethical and Social Implications**: AI applications in power stations raise ethical considerations related to job displacement, privacy concerns, and decision-making transparency. Automation and AI-driven processes may lead to workforce restructuring, affecting employment in certain roles within power station operations.
- **Long-term Maintenance and Upkeep**: AI systems require continuous monitoring, maintenance, and updates to remain effective and secure. Managing AI infrastructure, addressing software bugs, and adapting to evolving operational requirements over the long term can be resource-intensive.

APPLICATIONS

- Several problems in power systems cannot be solved by conventional techniques are based on several requirements which may not feasible all the time. In these situations, artificial intelligence techniques are the obvious and the only option. Areas of application of AI in power systems are:
- Replacing human workers for dangerous and highly specialized operations, such as live maintenance of high voltage transmission lines, has been a long standing effect in the power community.
- Operation in hazardous environments, such as radioactive locations in nuclear plants, access to tight spaces, such as cable viaducts and cooling

CONCLUSION

The main feature of power system design and planning is reliability, which was conventionally evaluated using deterministic methods. Moreover, conventional techniques do not fulfill the probabilistic essence of power systems. This leads to increase in operating and maintenance costs. Plenty of research is performed to utilize the current interest AI for power system applications. A lot of research is yet to be performed to perceive full advantages of this upcoming technology for improving the efficiency of electricity market investment, distributed control and monitoring, efficient system analysis, particularly power systems which use renewable energy resources for operation.

THANKYOU