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Reaching Renewable Energy and other consepts in the classroom.

Renewable energy and other consepts in the classroom- This project is about bringing various concepts and solutions of renewable energy to the classroom by using ICT and AI.

Project Background:

This project, presented by Mahendra Singh Mahar, a 10th grade student of Atal Utkrisht Government Inter College Chaumel,Champawat, focuses on renewable energy concepts. The model addresses the best uses of windmill energy,solar energy and biogas.

It also provides technical solutions for supply of electricity by use of windmill energy,solar energy and biogas. The project was recognized as an excellent innovation at the district-level science festival.

Video Link- http://surl.li/oywsah

Problem Description:

At present, human beings need energy per day. Without energy, it is extremely difficult for humans to complete their daily routine. Electricity consumption is constantly increasing. This project was developed with these challenges in mind and offers a solution. Through this project, a variety of solutions have been described to meet the increasing energy consumption.

Project Objectives:

Develop models related to energy needs.

Presenting an innovative technological solution for growing energy needs.

To develop technology for maximum use of solar energy.

To provide biogas plant information for energy needs.

Prototype Model Description:

We know that this model is related to renewable energy. Wind mill energy and solar energy have been used to meet the solution related lack production of electricity. As we know that wind mill energy converts kinetic energy into electrical energy. This active model explains how electrical energy is produced from wind mill energy. The model includes the following elements:

1.Wind mill energy model: Wind power is one of the most sustainable ways of generating electricity as no toxic emmisions are produced. It doesn't add to global warming and is one of the most available source of renewable energy and theoratically it is and infinite source of energy wind mill blades spin, creating kinetic energy. The blades rotating in this way, then also make the shaft in the nacelle turn and a generator in the nacelle converts this kinetic energy. Some of the common application of wind mill are as below –

- Pumping water
- Milling grains
- Drainage-pumping
- Machining
- Wind turbine generators

Wind turbine generators- In 1831, Michael Faraday created the first electromagnetic generator. He discovered that an electric current can be created in a conductor when it is moved through a magnetic field. Engineers continue to build upon Faraday's inventions, with new designs to solve 21st century problems. Some utility scale wind-turbine designs use induction generators to produce electricity. Induction generators use electromagnets designed into a rotor assembly to create a magnetic field. These electromagnets take a small amout of current from the power system to generate a magnetic field in the rotor, which is then rotated within the generator near stationary coils of wire. This rotating magnetic field induces a large

current in the stationary coils of wire, which can then be used to power omes,schools and businesses.

2. Biogas plant model: Biogas is a clean efficient fuel. It is a moiseture of CH_4, CO_2, H_2. Major constituent of bio-gas is methane (65%). Bio-gas is produced by the anaerobic degradation of animal waste like dung for plant wastes in the presence of water.Bio-gas is environment friendly. This is because it is a nenewable source of energy. Cow dung is popular source of bio-gas. Cow-dung is shaped and dried for later use. These are then burnt as fuel to provide heat and light. The gas pipeline carries the gas to the point of utilization. Such as a stove or lamp.

Use of ICT in biogas plants- We can increase production by using ict in biogas plant. Here are some methods-

- Sensor technique
- IoT
- Data warehousing
- Statistics
- Database and formatting
- Control units like programmable ligic controller.

3. Solar Energy Project: Solar energy refers to the energy which the sunlight contains the form of photons. It is not possible for life on earth to exist without solar energy. All kinds of microrganisms and single-called organisms same into existance with solar energys's help. Plants have been using this energy ever since the beginning. Solar energy received from the sun, where we use the heat to power our homes and appliances by transforming into thermal or electric energy.

Use of ICT and artificial intelligence in wind mill energy project-

1. Turbine Monitoring and Inspection- Inspection of wind turbines is a critical task to ensure their safe and efficient operation. AI-driven tools can be used to monitor the performance of turbines in real-time, as well as to automate turbine inspection. When combined with powerful computer vision or cutting-edge robotics, these tools often reveal defects that are easily overlooked by human inspectors, identifying potential problems while providing powerful insights that boost operational efficiency.

AI-driven tools not only enhance the safety of turbine operations, but their use also mitigates exposure to risks caused by failed equipment — avoiding costly downtime, while ensuring that turbines are operating at peak efficiency.

Project Build and Installation Recovery-

When construction of wind-energy infrastructure or turbine installation goes sideways, resulting delays can cost millions of dollars per day. AI-driven tools for construction optimization can reallocate valuable resources to circumvent spiraling delays — suggesting options for task, equipment, or labor resequencing that keep a major project moving forward. With so much at stake, and so many moving parts, maintaining progression is critical — making on-the-go scheduling adjustments and speedy project recovery backed by AI an invaluable asset.

By using AI tools like ALICE Technologies for project recovery and construction optimization, wind-energy providers can eliminate delays, minimize build cost, and improve project time-to-completion when the unforeseen occurs. They'll also boost overall performance throughout the entire project lifecycle — maximizing wind-energy output, while minimizing operational expense and risk.

2. Integration of artificial intelligence ito biogas plant:

In the biogas plants, organic material is converted to biogas under anaerobic conditions through physical and biochemical processes. As ai has been integrated in different areas of life, the examines the need for monitoring at the biogas plants.Anaerobic digestion is a biochemical process conducted by various kinds of microorganisms to produce biogas from complex organic materials in anaerobic conditions.Artificial intelligence, which briefly is the usage of data science to be able to create predictive and self-deciding systems and environments and provides efficient alternative for conventional methods.

Anaerobic Digestion Process:

Within the AD process, biomass is converted to biogas through complex biochemical serial reactions. The produced biogas is processed in the Combined Heat and Power Plant unit ot produce heat and electricity. A biogas plant includes a storage area for biomass, pre-treatment, digester where the biochemical process is conducted, biogas processing units and digestate processing units.
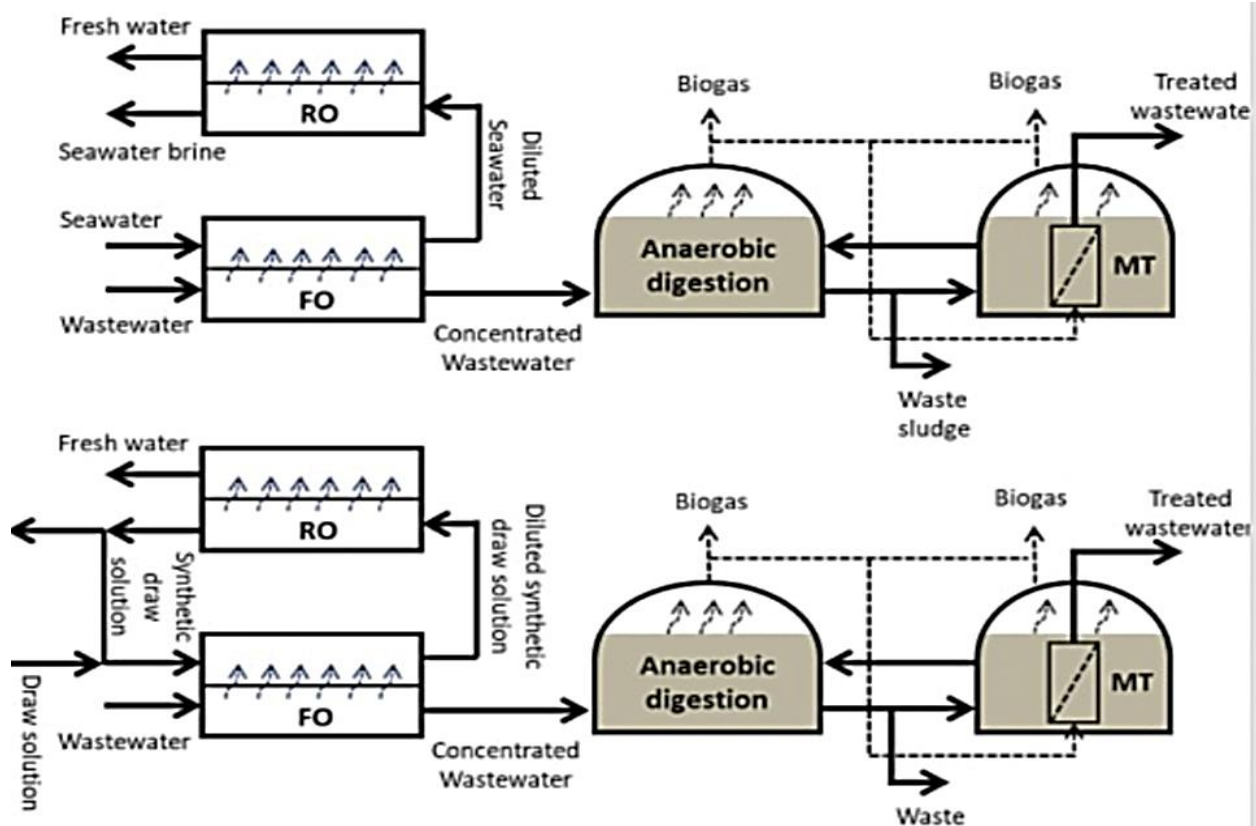
Fig 1- Anaerobic digestion

3. AI and Solar energy :

Integrating AI into solar energy can improve efficiency and offset some oth the vast energy demands that AI places on grids. With artificial intelligence dominating the news over the past two years, a new headline is emerging: the pressure these technologies place on our energy systems.AI itself might offer a solution. Advancements in renewable energy, paired with AI, could sustainably meet the increased energy demand. AI in solar energy applications presents a unique opportunity and it can help overcome certain challenges facing solar energy. For example, solar panel's reliance on the sun shining makes the a less reliable source of energy than nuclear of gas.

AI algorithms analyze meteorological data to generate precise forecasts, maximizing solar output and improving grid management. This allows solar operators to better plan and mitigate the impact of intermittent energy supply.

Robotics and solaer energy:

Robotics can be used in solar energy in many ways. Some examples are given below-

- Cleaning solar panels.
- Autonomous robots
- Installing solar pannels
- Maintenance
- Increase efficiency

Machine learning tehnologies for a solar plants's system-

Real life solar palant systems have complex,nonlinear dynamics due to variations in system parameters and insolation. Machine learning methods have been proposed to approximate this complex dynamic. Smart models based on machine learning thchnologies have the advantage of parallel computation through modern graphical processing units.
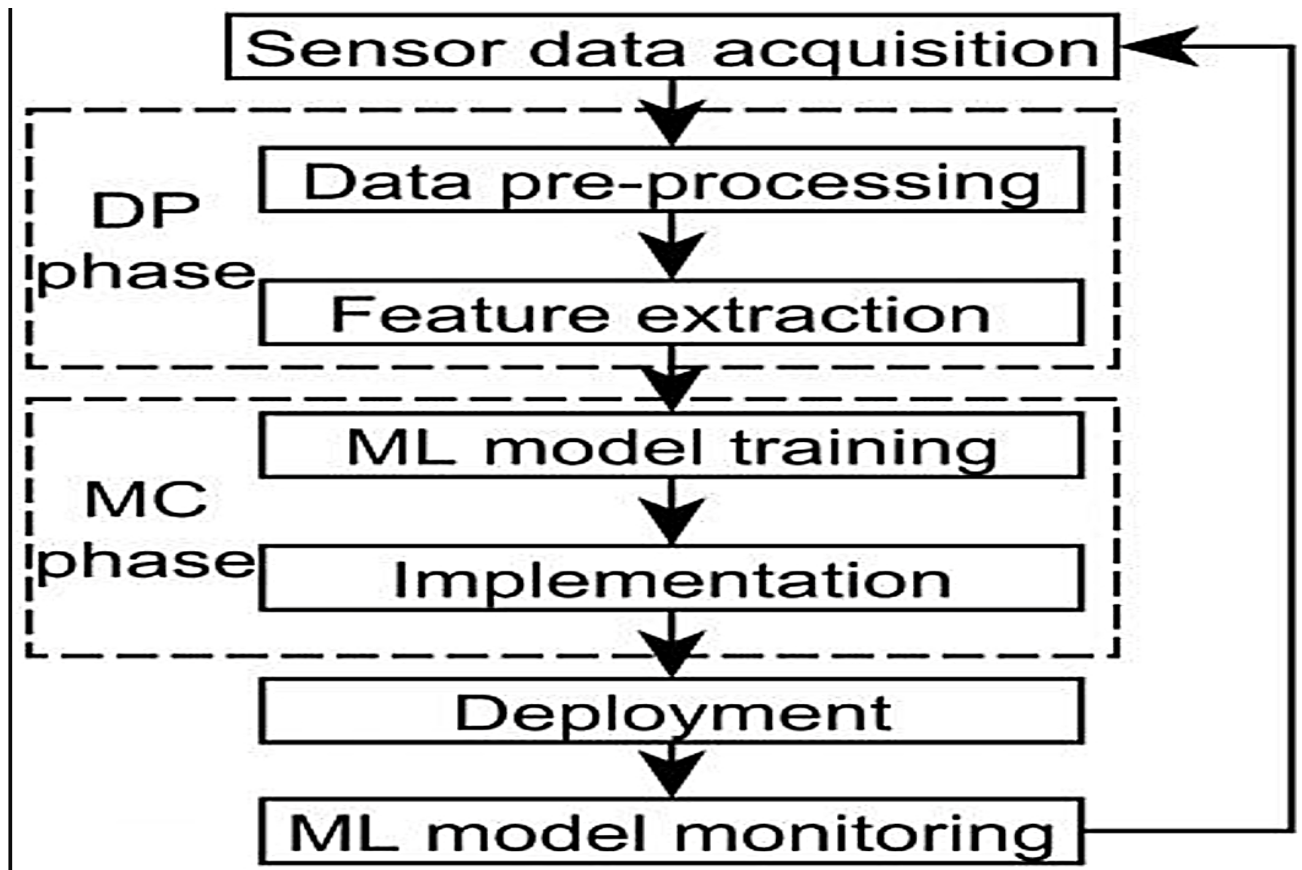

Fig 2- ML Model

AI-Based Renewable energy flow chart:

[Remote sensing -> [Optical and active sensor] -> [GIS-Digitizer and building database] --> [Environmental,social and political constraints]

[Optical data(Landsat,SPOT] -> [Radar data, LiDAR,and others] --> [Ground-based monitoring] -- > [Detection and characteristics of renewale resources]-- > [Biomas/Hot spring/Wind mill energy/Solar energy/Hydropower/Geothermal]

Final Objective:

It is very necessary to overcome the problems related to lack of energy sources. This project is based on a hypothesis of ideal conditons. Through this project, we can have an easy and simple solution to the increasing energy needs day by day. Through this, not only will the growing needs of energy be addressed, but these measures will also be environment friendly and very economical.

Demo Video-http://surl.li/oywsah

Credit: Mahendra Singh Mahar, AUGIC Chaumel,Champawat.

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