PVKN GOVERNMENT DEGREE COLLEGE AUTONOMOUS,CHITTOOR

TITLE OF THE COURSE: **RENEWABLE ENERGY**

CONDUCTED BY : DEPARTMENT OF PHYSICS& ELECTRONICS

(A.Y 2022-2023)

FROM: 25-03-2023 **TO: 04-05-2023**

Enrolment Criteria

Student who have completed seventeen-years-old are eligible for this course.

- Any Science Students are eligible for this course.
- An admission fee for Certificate Course is purely Free of Cost.
- Time duration required to complete the course is 15 days or 30 Hours.

FROM25-03-2023 TO 04-05-2023

Our Vision

Sustainability,Innovation,Transparency,Excellence

Our Mission

Equip individuals with knowledge, frameworks and skills to advance opportunities toward a just energy transition

Principal

Dr.G.Ananda Reddy

About Certificate Course

Our Certificate Course in Renewable Energy has been designed to have the knowledge to assess the advantages and disadvantages of wind, solar, Tidal,Biomass,Geothermal and other renewable energy technologies who either wants to acquire new proficiency or enhance skills in renewable energy resources. Once you are getting certificates in Renewable Energy course, you can maximize your well-paid job getting opportunities in Local or state level companies

Course Outcomes

- *Advanced engineering skills to lead the future with sustainable energy .*
- *Understand* **the key physical characteristics of renewable energy and electricity**

Contact: Course Co-Ordinator

Dr.K.Lakshmi Prasad Reddy
Lecturer in Physics & Electronics,
Department of Physics & Electronics
PVKN Govt. College (A), Chittoor

P.V.K.N. GOVT. COLLEGE (A)
CHITTOOR
DEPARTMENT OF PHYSICS & ELECTRONICS

About the Department

The Department of Physics and Electronics, PVKN Govt. College (A), Chittoor was established in the year 1965. Right from the beginning our motto was not only to teach the subject Physics & Electronics but also to educate people and develop scientific attitude among them. The Department is having the pride possession of some rare and exclusive instruments. The entire department including Students are involved in research activities

DEPT. INCHARGE : 1.Dr.G.Sudhakar
Lecturer in Physics
Department of Physics & Electronics
2. Dr.P.Mallika Bramaramba Devi
Lecturer in Physics
Department of Physics & Electronics

COORDINATOR: Dr.K.Lakshmi Prasad Reddy
Lecturer in Physics
Department of Physics & Electronics

INAUGURATION DATE: 25-03-2023

NO OF STUDENTS ENROLLED: 21

S.No.	RESOURCE PERSONS	DESIGNATION
1	Dr.K.Lakshmi Prasad Reddy	Lecturer in Physics Department of Physics & Electronics
2	Dr.G.Sudhakar	Lecturer in Physics Department of Physics & Electronics Mail id: gudisudhakar@gmail.com
3	Sri.G.Raveendra Babu	Lecturer in Physics Department of Physics & Electronics Mail id:ravigonu35@gmail.com

Permission letter

To
The Principal
PVKN Govt.,Degree College (A) ,
Chittoor.

Respected Sir,

Sub: Requesting you to give permission for the Department of Physics to Conduct a certificate course-Regarding

With reference to the subject cited above, the Department of Physics will organize a certificate course on “Renewable Energy” from 25-03-2023 to 04-05-2023. In this regard, we request you to give the permission.

Thanking you Sir,

Yours faithfully

Lecturer in charge

PRINCIPAL
P.V.K.N. GOVT. COLLEGE,
CHITTOOR.

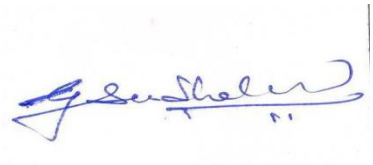
Department of Physics

P.V.K.N.GOVT.DEGREE COLLEGE(A):: CHITTOOR
DEPARTMENT OF PHYSICS& ELECTRONICS

Circular

Dear Students,

The Department of Physics will organize a certificate course on “Renewable Energy” from 25-03-2023 to 04-05-2023. All the BSc Students have to register in this course on or before 24 -03-2023.



Lecturer In-charge
Department of Physics & Electronics

P.V.K.N.GOVT.DEGREE COLLEGE(A):: CHITTOOR

IQAC -Resolution Copy

The IQAC committee along with Chairperson and Coordinator, convened a meeting on 07-02-2023 and resolved to conduct "Certificate/ Value Add-on courses'' in the month of 25-03-2023 according to the feasibility of the departments.

It is also resolved to submit the details as per the checklist well in advance by the departments who had given their consents.

Check list:

1. **IQAC Resolution**
2. **Department wise Resolution**
3. **Course structure and planning**
    a. **Date and timing schedule**
    b. **Course out comes, Syllabus and model question papers**
    c. **Testing procedure**
    d. **Feedback form**
    e. **Model Certificate**
4. **Student's enrolment list**
5. **Attendance register for 30 hours and more (Online/ Offline)**

6. **Audio visual Aids (if available), PPTs, Handouts/ Printed material**

7. **Test(Exam) and Certificate distribution**

8. **Submission of Critical Analysis Report to IQAC**

Department Resolution Copy

Department of Physics & Electronics

As per the circular issued by the IQAC dated 07-02-2023 the Department of Physics & Electronics has conducted a meeting on 10-02-2023 and unanimously resolved to conduct a Certificate / Value add-on course in the month of 25-03-2023 with the duration of a minimum of 30 hours.

Notice Board

The department of Physics & Electronics is going to conduct a certificate course on Electronics:

"Renewable Energy", from **25-03-2023** with min 30 working hours.

Interested candidates should come and register your names in the department on or before 24-03-2023

DEPARTMENT OF PHYSICS & ELECTRONICS:: PVKNGDC(A), CHITTOOR

A Certificate Course in Physics & Electronics::Renewable Energy

Course Syllabus :

Module -I

Energy sources and their availability- Conventional energy sources- Renewable energy sources- Need of renewable energy sources, Global and national energy scenario, brief descriptions on solar energy, wind energy, tidal energy, wave energy, ocean thermal energy, biomass energy, geothermal energy

Module-2

Solar Radiation, Solar cooker , Principle of Solar cell, Photovoltaic system for electric power generation, advantages and applications of solar photovoltaic systems

Module-3

Wind energy as forms of sustainable energy sources,operation of wind systems ,Application of Wind Energy

Module-4

Bio-energy Distribution and end use for a sustainable future, Bio-fuels; Biomass Resources,Bio-gas,bio-energy production

Module-5

Tidal Energy- Tides and waves as energy suppliers and their mechanics, fundamental characteristics of tidal power, harnessing tidal energy- advantages and limitations,ocean energy

Module-6

Green Energy Introduction,.Benefits of hydrogen energy, hydrogen production technologies,hydrogen as a fuel, hydrogen energy storage, applications of hydrogen energy

Time Table for Certificate Course

Monday	9.00 AM to 10.00 AM
Tuesday	
Wednesday	
Thursday	
Friday	
Saturday	

Course Description:

This course provides a comprehensive exploration of Renewable energy usage and production. It covers various energy resources,emphasizing their principles, applications, and emerging trends in sustainable energy solutions.

Learning Objectives:

- Generating energy that produces no greenhouse gas emissions from fossil fuels and reduces some types of air pollution.
- Adopting / evolving RE technologies and facilitating commercial development of the same e.g. wind, solar, tidal, geothermal etc.
- Enhance sustainability, reduce pollution, lower the costs of mitigating climate change.
- Various renewable energy resources available at a location and assessments of its potential, using tools and techniques

Course Summary:

- ✶ The Renewable Energy course will deal with the study of renewable sources like natural resources, sunlight, tidal, ocean ,bio-energy ,wind energy ,hydrogen energy.
- ✶ Students pursuing renewable energy courses will equip themselves with a comprehensive understanding of all the natural resources.

Assessment and Evaluation:

⌘ Student is evaluated through the examination at the end of the course work.

⌘ The students can be awarded only if he/she scores 40% marks in the assessment given by the Department of Physics. The Assessment is the objective type and it carries 25 Marks.

⌘ Certificates will be issued based on the performance of the students.

Course Outcomes:

- CO1- Create awareness about the financial and environmental benefits as a result of renewable
  energy generation and optimum energy utilisation
- CO2 -Understand the use of solar energy and the various sources of energy
- CO3 -Understand the principles of wind and tidal energy
- CO4- Understand the concept of biomass energy resources and green energy.
- CO5- Acquire the basic knowledge of energy conversion and hydrogen energy.

Department of Physics & Electronics

List of Registered Candidates for Certificate Course

AY:2022-2023

Department of Physics & Electronics
List of Registered Candidates for Certificate Course
AY:2022-2023

S.No.	Hall Ticket No.,	Name of the Student	Course & Group	Year	Signature of the Candidate
1	220306505	E. Charan	BSC MECs	II	E.charan.
2	220306506	G. Prabhu	BSC MECs	II	G.Prabu
3	220306508	K. Vishnuvardhan	BSC MECs	II	K.Vishnuvardhan
4	220306509	K. Jagadeesh	BSC MECs	II	K.Jagadeesh
5	220306510	M C Vinod Kumar	BSC MECs	II	M.C Vinod Kumar
6	220306511	M. Jaya Kumar	BSC MECs	II	M.Jaya Kumar
7	220306513	N. Venkatesh	BSC MECs	II	N.venkatesh
8	220306516	P. Sai Pavan	BSC MECs	II	P.Sai pavan
9	220306517	P.Vamsi	BSC MECs	II	P.Vamsi
10	220306521	P. Ashok Kumar	BSC MECs	II	P.A
11	220306522	S. Manoj Kumar	BSC MECs	II	S.Manojkumar
12	220306523	S. Surya	BSC MECs	II	S.Surya
13	220306524	S. Vishnu Vardhan Reddy	BSC MECs	II	S.Vishnu
14	220306525	T. Amarnath	BSC MECs	II	T.Amarnath
15	220306528	T. Nagaraja	BSC MECs	II	T.Nagaraj
16	220306529	V. Dilli Babu	BSC MECs	II	V.Dilli

17	220306530	R. Seshadri	BSC MECs	II	K. Seshadri
18	210306526	V. Hareesh	BSC MECs	II	V. Hareesh
19	220303521	N. Naveen Kumar	BSC MPCs	II	N. Naveen Kumar
20	220303525	P. Raghavendra	BSC MPCs	II	P. Raghavendra
21	220301504	M.S. Sridhar	BSC MPC	II	M. S. Sridhar

Signature of the Convener

Prasad Reddy.

Students Attendance Report

Students Attendance ::2022-2023

S. No.	Name of the Student	Date and Month									
		25/3	27/3	28/3	29/3	31/3	1/4	3/4	4/4	6/4	8/4
1	E. Charan	/	a	/	/	a	/	/	/	/	/
2	G. Prabhu	/	/	/	/	/	a	/	/	/	/
3	K.Vishnuvardhan	/	/	/	/	/	/	/	/	/	/
4	K. Jagadeesh	/	a	/	/	/	/	a	/	/	a
5	M C Vinod Kumar	/	/	/	/	a	/	/	/	/	/
6	M. Jaya Kumar	/	/	/	/	/	a	/	/	/	/
7	N. Venkatesh	/	/	/	/	/	/	/	a	/	/
8	P. Sai Pavan	/	/	/	/	/	/	/	/	a	/
9	P.Vamsi	/	a	/	/	/	/	a	/	/	/
10	P. Ashok Kumar	/	/	/	a	/	/	/	/	/	/
11	S. Manoj Kumar	/	/	/	/	/	/	/	/	/	/
12	S. Surya	/	/	/	/	a	/	/	/	a	/
13	S. Vishnu Vardhan Reddy	/	/	a	/	/	/	a	/	/	/
14	T. Amarnath	/	/	/	/	/	/	/	/	/	a
15	T. Nagaraja	/	/	/	/	/	/	/	/	/	/
16	V. Dilli Babu	/	/	/	/	/	/	/	/	/	/
17	R. Seshadri	/	a	/	/	/	/	/	/	a	/
18	V. Hareesh	/	/	/	/	/	/	/	a	/	/
19	N. Naveen Kumar	/	/	/	/	/	/	/	/	a	/
20	P. Raghavendra	/	/	a	/	/	/	/	/	/	/
21	M.S. Sridhar	/	/	/	a	/	/	/	/	/	a

Signature of the Convener

Prasad Reddy

Students Attendance ::2022-2023

S. No.	Name of the Student	Date and Month									
		10/4	11/4	12/4	13/4	15/4	17/4	18/4	19/4	20/4	21/4
1	E. Charan	/	/	/	/	/	a	/	/	/	a
2	G. Prabhu	/	/	/	/	a	/	/	/	/	/
3	K.Vishnuvardhan	/	a	/	/	/	/	/	/	/	/
4	K. Jagadeesh	a	/	/	/	/	/	/	/	/	/
5	M C Vinod Kumar	/	/	/	/	/	A	/	/	/	/
6	M. Jaya Kumar	/	/	/	/	/	/	a	/	/	/
7	N. Venkatesh	/	/	/	/	a	/	/	/	/	/
8	P. Sai Pavan	/	a	/	/	/	/	/	/	a	/
9	P.Vamsi	/	/	/	/	/	a	/	/	/	/
10	P. Ashok Kumar	/	/	/	/	/	/	/	/	/	/
11	S. Manoj Kumar	/	/	/	/	/	/	/	a	/	/
12	S. Surya	a	/	/	/	/	/	/	/	/	a
13	S. Vishnu Vardhan Reddy	/	/	a	/	/	/	/	/	/	/
14	T. Amarnath	/	/	/	/	/	/	/	/	/	/
15	T. Nagaraja	/	/	/	a	/	/	/	/	/	/
16	V. Dilli Babu	a	/	/	/	/	/	a	/	/	/
17	R. Seshadri	/	/	/	/	/	/	/	/	/	/
18	V. Hareesh	/	/	/	/	/	/	a	/	/	/
19	N. Naveen Kumar	a	/	/	/	/	/	/	/	/	/
20	P. Raghavendra	/	a	/	/	/	/	/	/	/	/
21	M.S. Sridhar	/	/	/	/	/	/	/	/	a	/

Signature of the Convener

Prasad Reddy

Students Attendance ::2022-2023

S. No.	Name of the Student	Date and Month									
		24|4	25|4	26|4	27|4	28|4	29|4	1|5	2|5	3|5	4|5
1	E. Charan	/	/	/	a	/	/	/	/	/	/
2	G. Prabhu	/	/	/	/	/	/	/	/	/	/
3	K.Vishnuvardhan	/	/	/	/	/	/	/	/	/	/
4	K. Jagadeesh	a	/	/	/	/	/	/	/	/	/
5	M C Vinod Kumar	a	/	/	/	/	/	/	/	/	/
6	M. Jaya Kumar	/	A	/	/	/	/	/	/	/	/
7	N. Venkatesh	/	/	/	/	A	/	/	/	/	/
8	P. Sai Pavan	/	/	/	/	/	A	/	/	/	/
9	P.Vamsi	/	/	/	/	/	/	/	/	A	/
10	P. Ashok Kumar	/	/	/	/	/	/	/	/	/	A
11	S. Manoj Kumar	/	/	/	/	/	/	/	/	/	/
12	S. Surya	/	/	/	/	/	A	/	/	/	/
13	S. Vishnu Vardhan Reddy	/	/	/	/	/	/	A	/	/	/
14	T. Amarnath	A	/	/	/	/	/	/	/	/	/
15	T. Nagaraja	/	/	/	/	/	/	/	/	/	/
16	V. Dilli Babu	/	/	/	/	/	/	/	/	/	A
17	R. Seshadri	/	/	/	/	A	/	/	/	/	/
18	V. Hareesh	/	/	/	/	/	/	/	A	/	/
19	N. Naveen Kumar	/	/	/	/	/	/	/	/	/	/
20	P. Raghavendra	/	/	/	/	/	/	/	/	/	/
21	M.S. Sridhar	/	/	/	/	✓	/	/	/	/	/

Signature of the Convener

Prasad Reddy

Timing schedule

S.NO	Date	Time	Topic
1.	25-03-2023	9-10AM	Energy sources and their availability
2.	27-03-2023	9-10AM	Conventional energy sources
3.	28-03-2023	9-10AM	Renewable energy sources
4.	29-03-2023	9-10AM	Need of renewable energy sources
5.	31-03-2023	9-10AM	Global and national energy sources
6.	01-04-2023	9-10AM	Solar energy,wind energy
7.	03-04-2023	9-10AM	Tidal energy,wave energy
8.	04-04-2023	9-10AM	Ocean thermal energy
9.	06-04-2023	9-10AM	Biomass energy,geothermal energy
10.	08-04-2023	9-10AM	Solar radiation,Solar cooker
11.	10-04-2023	9-10AM	Principle of solar cell
12.	11-04-2023	9-10AM	Photovoltaic systems
13.	12-04-2023	9-10AM	Advantages &applications of solar pv systems
14.	13-04-2023	9-10AM	Wind energy as a form of sustainable energy sources

15.	*15-04-2023*	*9-10AM*	*Operation of wind systems*
16.	*17-04-2023*	*9-10AM*	*Applications of wind energy*
17.	*18-04-2023*	*9-10AM*	*Bioenergy distribution and end use for a sustainable future*
18.	*19-04-2023*	*9-10AM*	*Biofules,biomass resources*
19.	*20-04-2023*	*9-10AM*	*Biogas,bioenergy production*
20.	*21-04-2023*	*9-10AM*	*Tidal energy*
21.	*24-04-2023*	*9-10AM*	*Tides and waves as energy suppliers and their mechanics*
22.	*25-04-2023*	*9-10AM*	*Char., of tidal power,harnessing tidal energy*
23.	*26-04-2023*	*9-10AM*	*Adv., &limitations of tidal energy,ocean energy*
24.	*27-04-2023*	*9-10AM*	*Green energy introduction*
25.	*28-04-2023*	*9-10AM*	*Benefits of hydrogen energy*
26.	*29-04-2023*	*9-10AM*	*Hydrogen production technologies*
27.	*01-05-2023*	*9-10AM*	*Hydrogen as a fuel*
28.	*02-05-2023*	*9-10AM*	*Hydrogen energy storage*
29.	*03-05-2023*	*9-10AM*	*Applications of hydrogen energy*

30.	*04-05-2023*	*9-10AM*	*Revision*

Renewable energy Material:

The sun is the main source of energy on Earth. Other energy sources include coal, geothermal energy, wind energy, biomass, petrol, nuclear energy, and many more. Energy is classified into various types based on sustainability as renewable sources of energy and non-renewable sources of energy.

The three major categories of energy for electricity generation are fossil fuels (coal, natural gas, and petroleum), nuclear energy, and renewable energy sources. Most electricity is generated with steam turbines using fossil fuels, nuclear, biomass, geothermal, and solar thermal energy

Sources Of Energy

Sources of energy can be classified into:

- Renewable Sources
- Non-renewable Sources

Renewable sources of energy are available plentiful in nature and are sustainable. These resources of energy can be naturally replenished and are safe for the environment.

Examples of renewable sources of energy are: Solar energy, geothermal energy, wind energy, biomass, hydropower and tidal energy.

A non-renewable resource is a natural resource that is found underneath the earth. These type of energy resources do not replenish at the same speed at which it is used. They take millions of years to replenish. The main examples of non-renewable resources are coal, oil and natural gas.

Examples of non-renewable sources of energy are: Natural gas, coal, petroleum, nuclear energy and hydrocarbon gas liquids

Difference between Renewable and Non-renewable Sources of Energy

Renewable	Non-renewable
The resources that can be renewed once they are consumed are called renewable sources of energy.	The resources that cannot be renewed once they are consumed are called non-renewable sources of energy.
These resources do not cause any environmental pollution.	These resources cause environmental pollution..

Renewable resources are inexhaustible.	Non- Renewable resources are exhaustible.
Renewable resources are not affected by human activities.	Non- Renewable resources are affected by human activities.
Examples of Renewable resources- Air, water and solar energy.	Examples of Non-renewable resources- natural gas, coal and nuclear energ

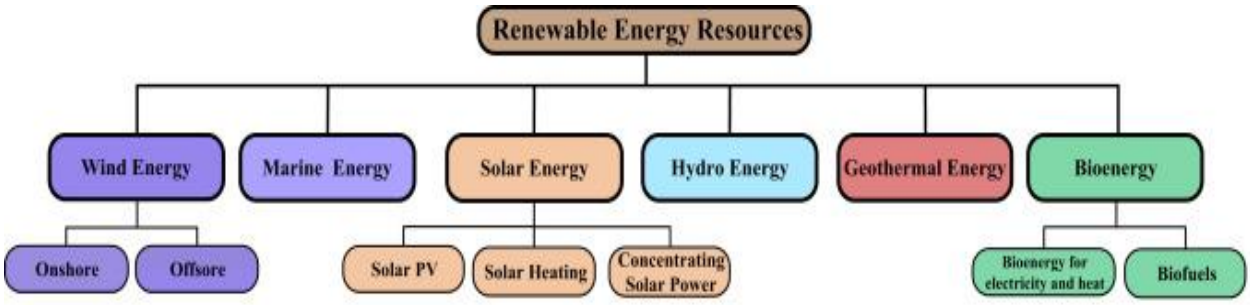
Types of Natural Sources of Energy

There are two types of natural sources of energy classified by their popularity and use,

- Conventional Sources of Energy
- Non-Conventional Sources of Energy

Difference between Conventional and Non-conventional Sources of Energy

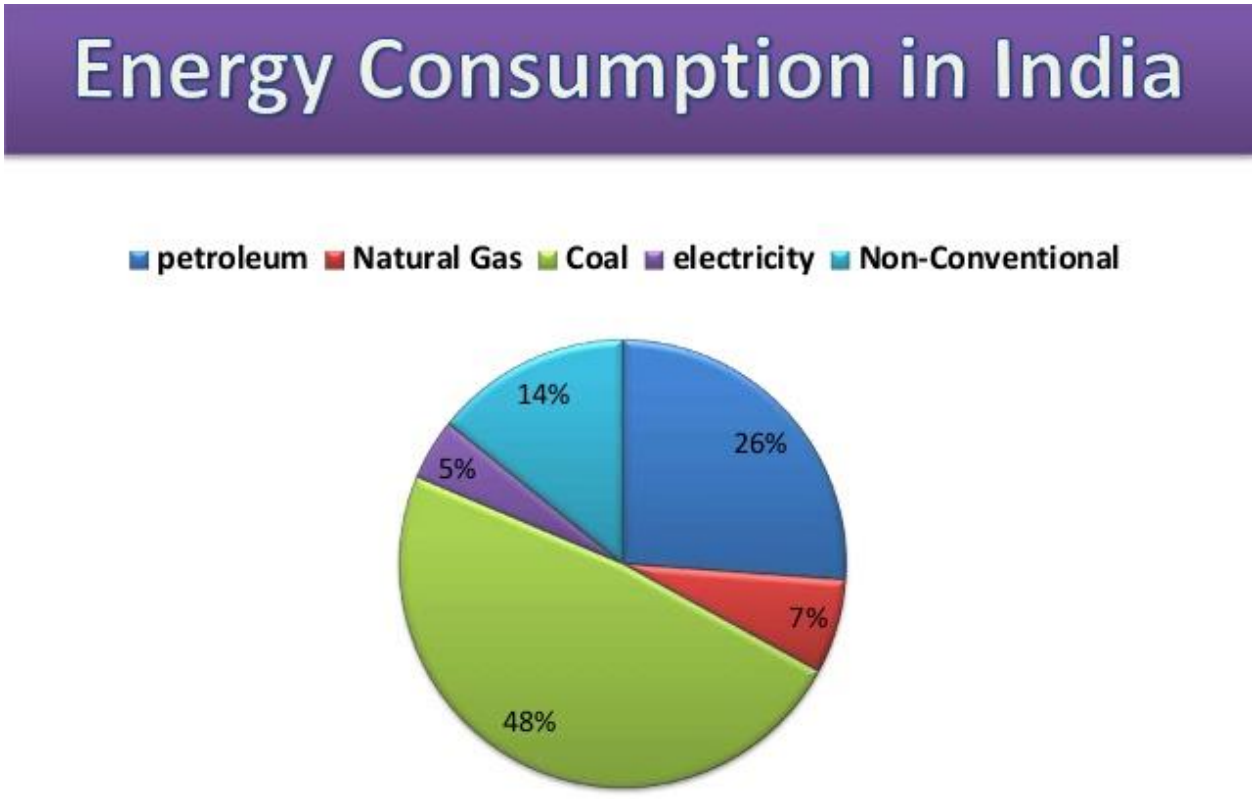
Conventional	**Non-conventional**
These resources are exhaustible.	These resources are inexhaustible.
These resources cause pollution as they emit smoke and ash.	These resources are usually pollution-free.
These resources are very expensive to be maintained, stored and transmitted.	These resources are less expensive for local use and can easily be maintained.
Examples- coal, natural gas, petroleum, and water power.	Examples- solar, biomass, wind, biogas, and tidal, geothermal.



Need of renewable energy :

If we could replace fossil fuels with abundant renewable energy, we would cut energy prices, reduce emissions and lower the future risks of climate change, including the impact on food production.

Generating energy that produces no greenhouse gas emissions from fossil fuels and reduces some types of air pollution. Diversifying energy supply and reducing dependence on imported fuels. Creating economic development and jobs in manufacturing, installation, and more



current global energy scenario

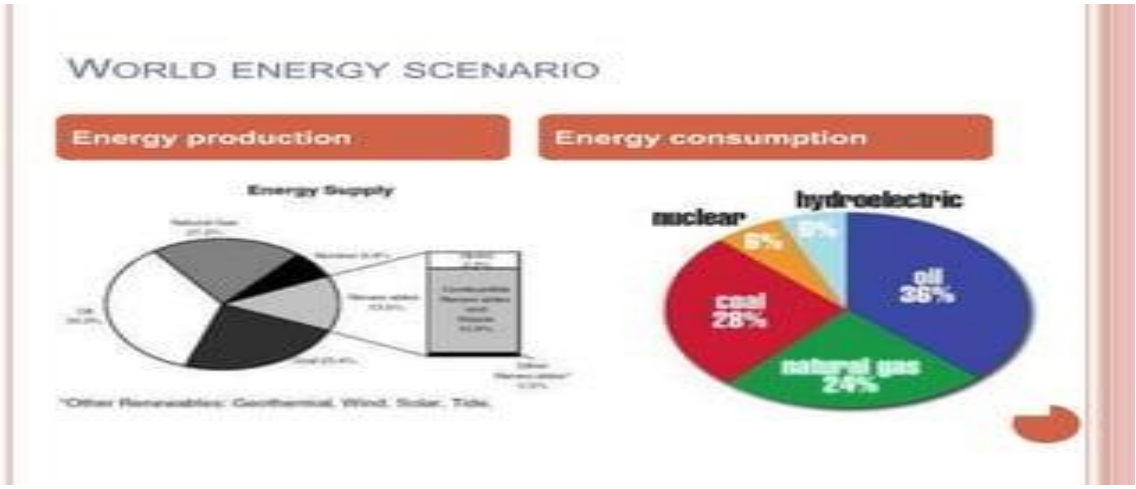
World primary energy consumption, 2010–50, 2021 EIA reference case scenario. The left-hand panel shows actual (2010–20) and projected (2021–50) consumption by fuel. This scenario shows an increase in total primary energy demand of 47% from 2020 to 2050.

The world average energy consumption per person is equivalent to 2.2 tonnes ofcoal. In industrialized countries, people use four to five times more than the world average, and nine times more than the average for the developing countries. An American uses 32 times more commercial energy than an Indian.

This is the worldwide production of energy, extracted or captured directly from natural sources. In energy statistics, primary energy (PE) refers to the first stage where energy enters the supply chain before any further conversion or transformation process.

Energy production is usually classified as:

- Fossil, using coal, crude oil, and natural gas;
- Nuclear, using uranium;
- Renewable, using biomass, geothermal, hydropower, solar, wind, tidal, wave, among others.



Solar energy

Solar energy is the radiation from the Sun capable of producing heat, causing chemical reactions, or generating electricity. The total amount of solar energy received on Earth is vastly more than the world's current and anticipated energy requirements. If suitably harnessed, solar energy has the potential to satisfy all future energy needs.

Solar energy is commonly used for solar water heaters and house heating. The heat from solar ponds enables the production of chemicals, food, textiles, warm greenhouses, swimming pools, and livestock buildings. Cooking and providing a power source for electronic devices can also be achieved by using solar energy.

Wind energy

Wind is a renewable energy source. Overall, using wind to produce energy has fewer effects on the environment than many other energy sources. Wind turbines do not release emissions that can pollute the air or water (with rare exceptions), and they do not require water for cooling. The terms "wind energy" and "wind power" both describe the process by which the wind is used to generate mechanical power or electricity. This mechanical power can be used for specific tasks (such as grinding grain or pumping water) or a generator can convert this mechanical power into electricity.

Tidal energy

Tidal energy is a form of power produced by the natural rise and fall of tides caused by the gravitational interaction between Earth, the sun, and the moon. Tidal currents with sufficient energy for harvesting occur when water passes through a constriction, causing the water to move faster.

Tidal energy is a renewable energy powered by the natural rise and fall of ocean tides and currents. Some of these technologies include turbines and paddles.

A tidal energy works via a turbine works like a wind turbine, with blades rotating 12-to-18 times a minute depending on tide strength. The turbine is connected to a gearbox that turns a generator, creating electricity.

Wave energy

Wave energy is a form of renewable energy that can be harnessed from the motion of the waves. There are several methods of harnessing wave energy that involve placing electricity generators on the surface of the ocean.

ocean thermal energy

Ocean thermal energy conversion (OTEC) is a process or technology for producing energy by harnessing the temperature differences (thermal gradients) between ocean surface waters and deep ocean waters.

Biomass energy

Biomass is renewable organic material that comes from plants and animals. Biomass contains stored chemical energy from the sun that is produced by plants through photosynthesis. Biomass can be burned directly for heat or converted to liquid and gaseous fuels through various processes.

Biomass is organic, meaning it is made of material that comes from living organisms, such as plants and animals. The most common biomass materials used for energy are plants, wood, and waste. These are called biomass feedstocks.

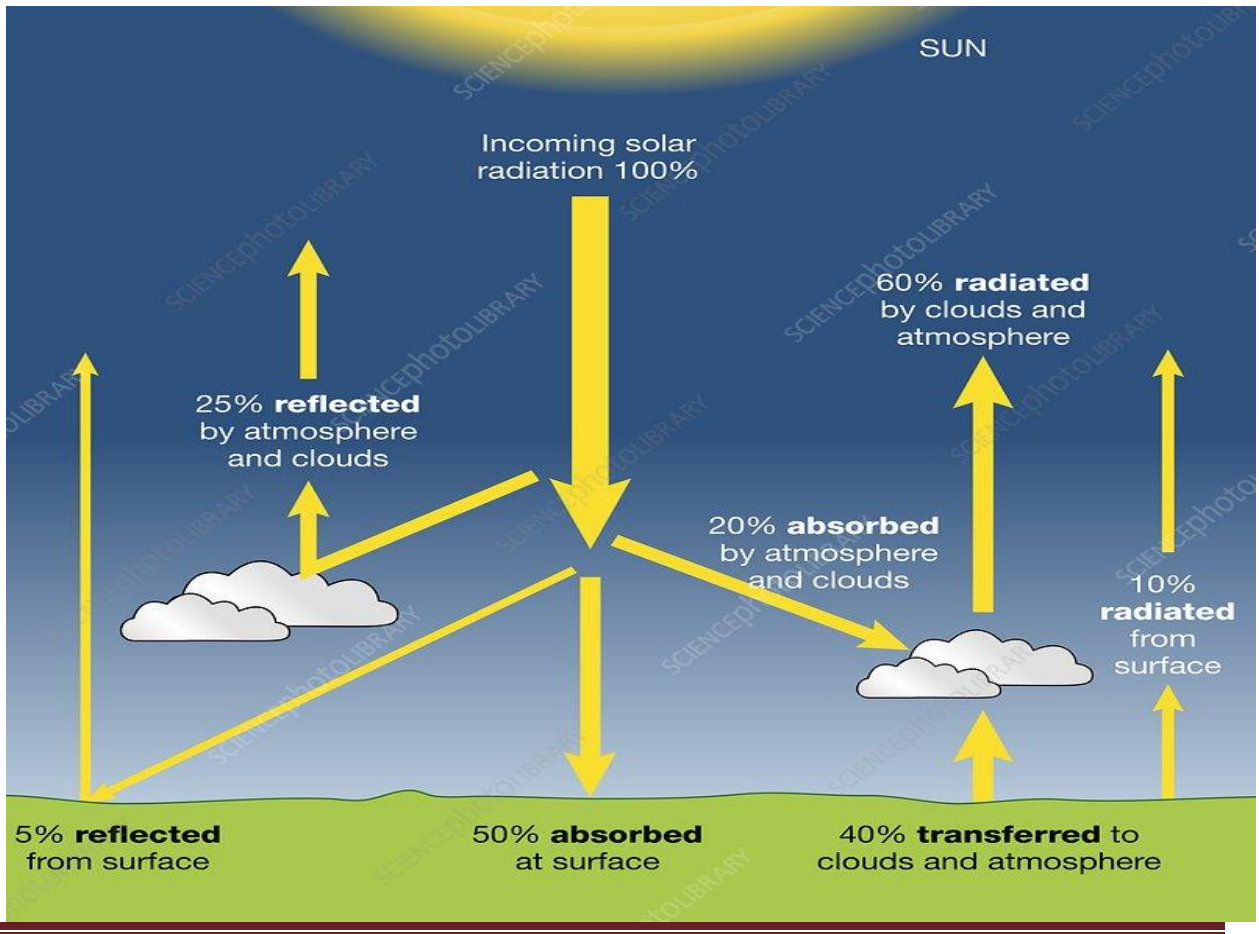
Geothermal energy

Geothermal energy is heat energy from the earth—Geo (earth) + thermal (heat). Geothermal resources are reservoirs of hot water that exist or are human made at varying temperatures and depths below the Earth's surface.

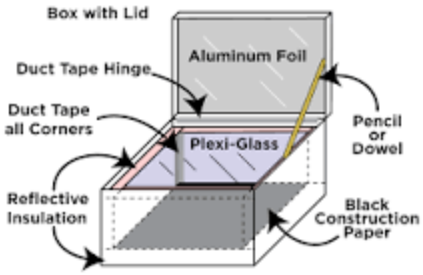
Magma exists in the mantle and lower crust, and sometimes bubbles to the surface as lava. Magma heats nearby rocks and underground aquifers. Hot water can be released through geysers, hot springs, steam vents, underwater hydrothermal vents, and mud pots. These are all sources of geothermal energy.

Solar radiation

Solar radiation is the energy emitted by the Sun, which is sent in all directions through space as electromagnetic waves. Emitted by the surface of the Sun, this energy influences atmospheric and climatological processes.



solar cooker

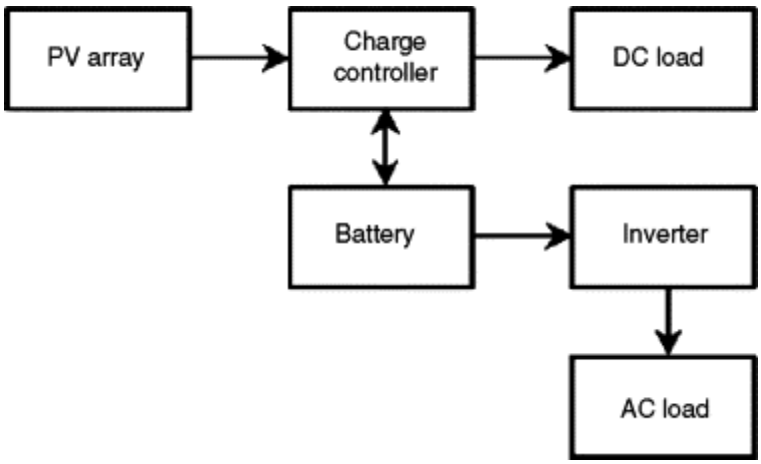


A solar cooker is a type of solar thermal collector. It "gathers" and traps the Sun's thermal (heat) energy. Heat is produced when high frequency light (visible and ultraviolet) is converted into low frequency infrared radiation.
Solar cell

When sunlight strikes a solar cell, electrons in the silicon are ejected, which results in the formation of "holes"—the vacancies left behind by the escaping electrons. If this happens in the electric field, the field will move electrons to the n-type layer and holes to the p-type layer.

Photovoltaic cells convert sunlight into electricity

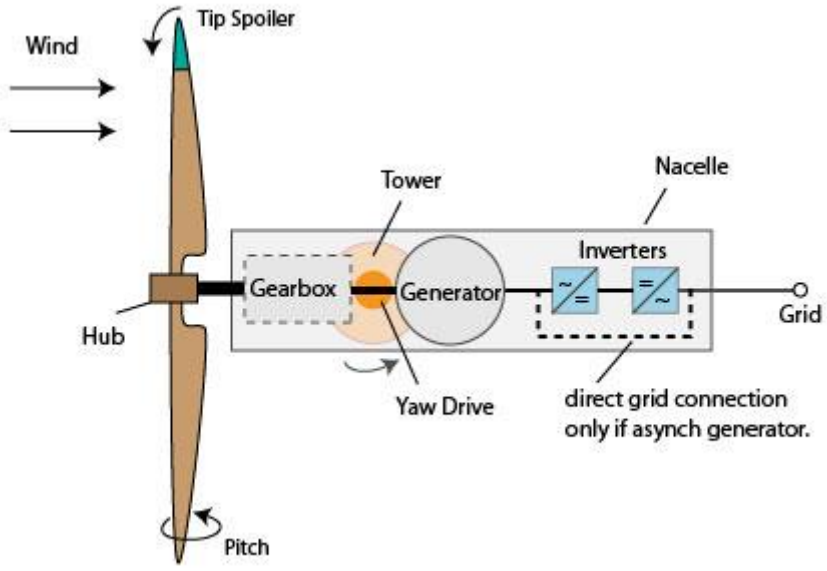
A photovoltaic (PV) cell, commonly called a solar cell, is a nonmechanical device that converts sunlight directly into electricity. Some PV cells can convert artificial light into electricity. Sunlight is composed of photons, or particles of solar energy.



Electricity produced by solar cells is clean and silent. Because they do not use fuel other than sunshine, PV systems do not release any harmful air or water pollution into the environment, deplete natural resources, or endanger animal or human health. Photovoltaic systems are quiet and visually unobtrusive.

Wind power is a clean and renewable energy source.Wind turbines harness energy from the wind using mechanical power to spin a generator and create electricity. Not only is wind an abundant and inexhaustible resource, but it also provides electricity without burning any fuel or polluting the air.

Wind turbines work on a simple principle: instead of using electricity to make wind—like a fan—wind turbines use wind to make electricity. Wind turns the propeller-like blades of a turbine around a rotor, which spins a generator, which creates electricity.



Some of the uses of wind energy are

- generating electricity.
- milling grain.
- pumping water.
- powering cargo ships (via kites)
- reducing carbon footprint.
- sailing.
- windsurfing.
- land surfing.

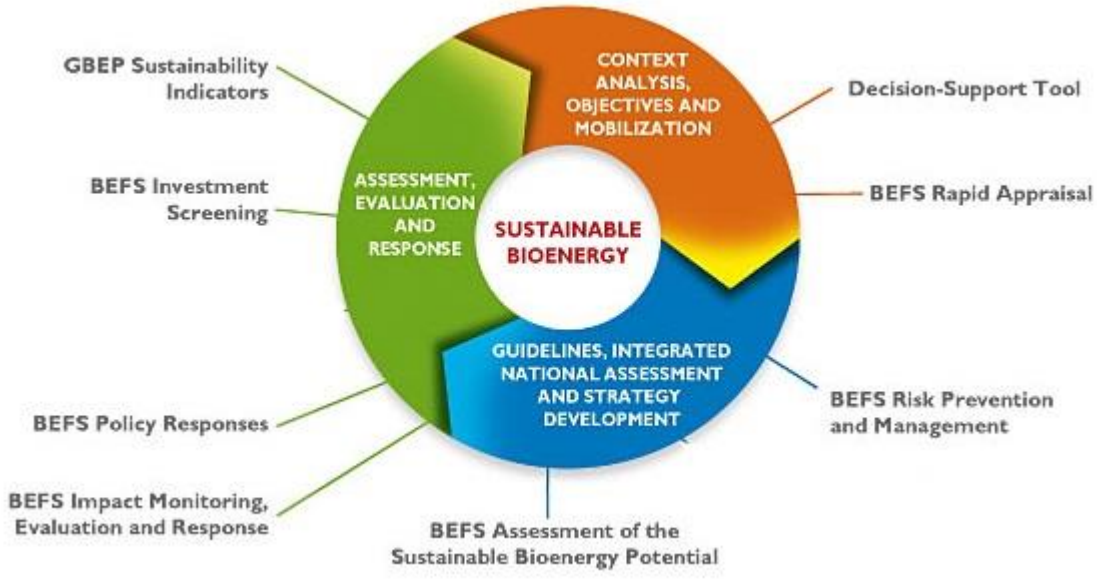
Bioenergy

Bioenergy is a form of renewable energy generated when we burn biomass fuel. Biomass fuels come from organic material such as harvest residues, purpose-grown crops and organic waste from our homes, businesses and farms.

Biomass is biological material derived from living or recently living organisms. In the context of producing bioenergy, it typically refers to agricultural byproducts and residues, woody waste products, and crops and microbes grown specifically for fuel.

Examples include burning wood to create heat, using biodiesel and ethanol to fuel vehicles, and using methane gas and wood to generate electricity. More recently, developed forms of bioenergy use materials called "biomass," such as sugar cane, grasses, straw, soybeans, and corn.

Bioenergy used for electricity generation provides dispatchable, low-emission power to complement generation from variable renewables. Its use nearly doubles, from generating about 700 TWh of electricity (about 2.5% of total demand) in 2022 to around 1 300 TWh (about 3.5% of total demand) in 2030.



Biogas

Biogas a renewable fuel that's produced when organic matter, such as food or animal waste, is broken down by microorganisms in the absence of oxygen. This process is called anaerobic digestion. For this to take place, the waste material needs to be enclosed in an environment where there is no oxygen.

There are three ways to harvest the energy stored in biomass to produce biopower: burning, bacterial decay, and conversion to a gas or liquid fuel. Biopower can offset the need for carbon fuels burned in power plants, thus lowering the carbon intensity of electricity generation.

Tidal energy

Tidal energy is a form of power produced by the natural rise and fall of tides caused by the gravitational interaction between Earth, the sun, and the moon. Tidal currents with sufficient

energy for harvesting occur when water passes through a constriction, causing the water to move faster.

Tidal barrages or dams are constructed across a narrow opening to the sea. Water rushes into the dam when the sea level rises. This moves the blades of the turbines which are attached at the opening of the dam. This results in the generation of electricity.

Tidal energy is harnessed by constructing a dam near the shores. During the high tides waterflows into the dam and during the low tides, water flows out. This flowing water rotates the turbine, present at the opening of the dam and produces electricity.

Ocean energy

Ocean energy refers to all forms of renewable energy derived from the sea. There are three main types of ocean technology: wave, tidal and ocean thermal. All forms of energy from the ocean are still at an early stage of commercialisation.

Potential. Total identified potential of Tidal Energy is about 12455 MW, with potential locations identified at Khambat & Kutch regions, and large backwaters, where barrage technology could be used. The total theoretical potential of wave energy is estimated to be about 40,000 MW.

Green energy

Green energy is energy that can be produced using a method, and from a source, that causes no harm to the natural environment. Renewable energy is also called "clean energy" or "green power" because it doesn't pollute the air or the water.

Electricity produced from resources such as solar, wind, geothermal, biomass, and low-impact hydro facilities is often referred to as 'green electricity'.

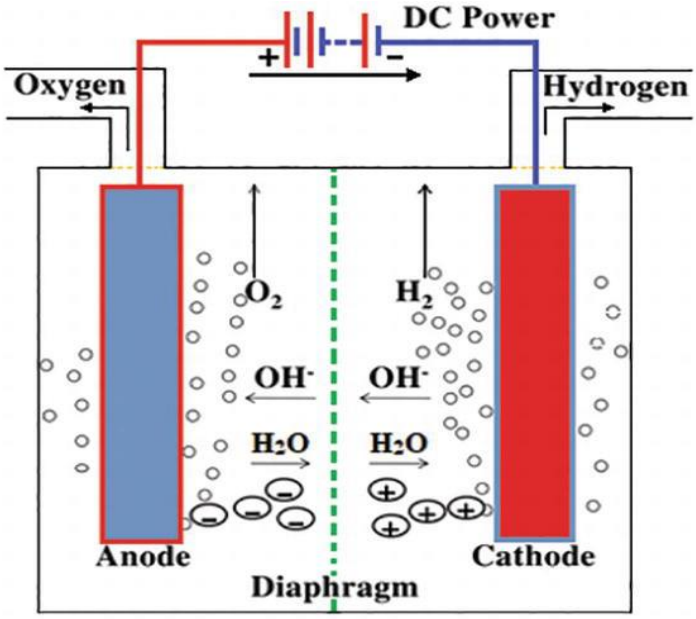
India stands 4th globally in Renewable Energy Installed Capacity (including Large Hydro), 4th in Wind Power capacity & 4th in Solar Power capacity (as per REN21 Renewables 2022 Global Status Report).The country has set an enhanced target at the COP26 of 500 GW of non-fossil fuel-based energy by 2030.

Hydrogen energy

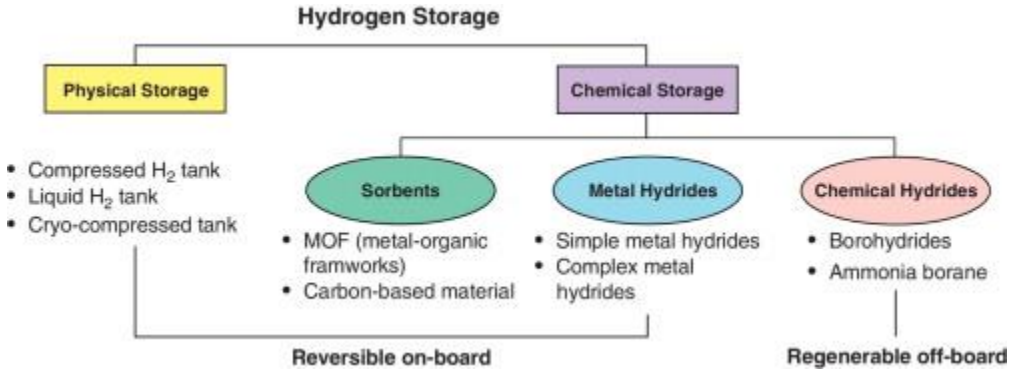
Hydrogen is an energy carrier that can be used to store, move, and deliver energy produced from other sources. Today, hydrogen fuel can be produced through several methods. The most common methods today are natural gas reforming (a thermal process), and electrolysis

Hydrogen fuel combines with oxygen from the air through a fuel cell, creating electricity and water through an electrochemical process.

Electrolysis: An electric current splits water into hydrogen and oxygen. If the electricity is produced by renewable sources, such as solar or wind, the resulting hydrogen will be considered renewable as well, and has numerous emissions benefits.



Hydrogen can be stored physically as either a gas or a liquid. Storage of hydrogen as a gas typically requires high-pressure tanks (350–700 bar [5,000–10,000 psi] tank pressure). Storage of hydrogen as a liquid requires cryogenic temperatures because the boiling point of hydrogen at one atmosphere pressure is −252.8°C.



It can be used in cars, in houses, for portable power, and in many more applications. Hydrogen is an energy carrier that can be used to store, move, and deliver energy produced from other sources.

Hydrogen energy applications

Hydrogen fuel cells are currently used to power the electrical systems on spacecraft and to supply electricity on earth. Small fuel cells have been developed to power electronic devices,

such as laptop computers and cell phones. Several vehicle manufacturers have developed fuel cells to power vehicles.

Photo Gallery


53VW+XWH, Greamspet, Chittoor, Andhra Pradesh 517002, India
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Andhra Pradesh
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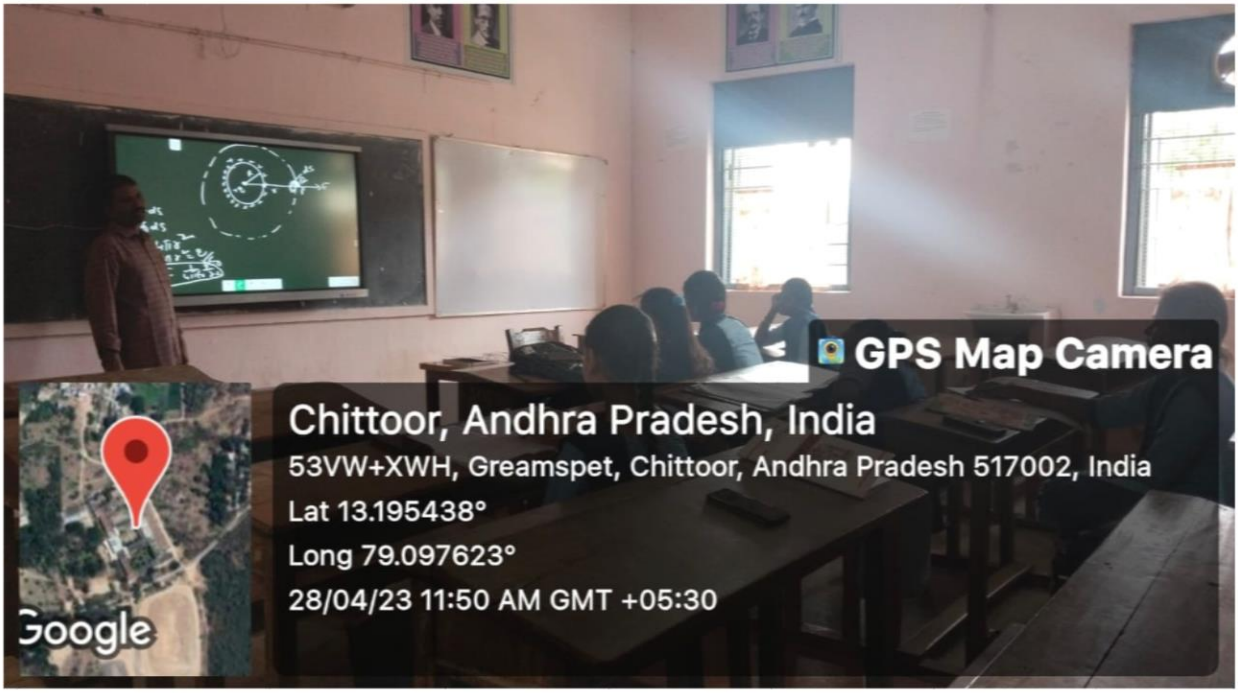
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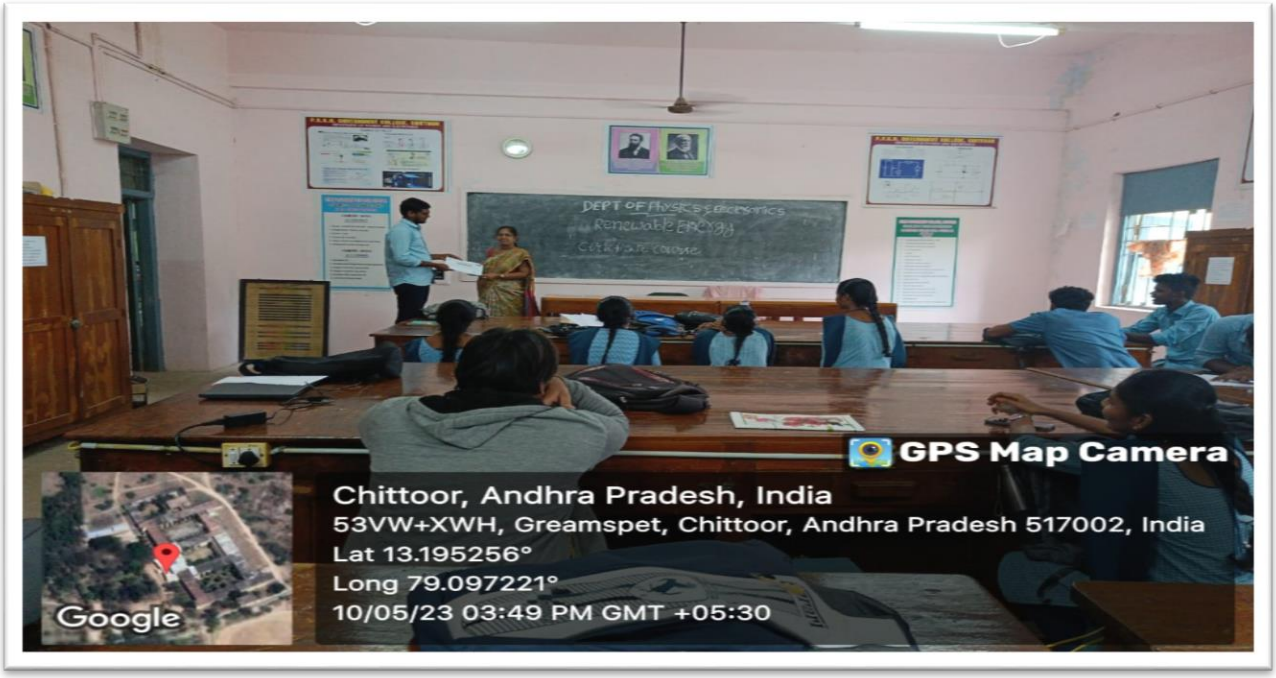
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Assessment (MCQ)

Answer all the questions each one carrier 1M Total 1x 25=25M

1.Which of the following is a non-conventional source of energy?

a.coal
b.petroleum
c.solar
d.nuclear

2.Tidal energy is energy obtained through

a. Sunlight
b. Wind
c. Ocean tides
d. Biomass

3.In a Hydroelectric power plant,the electric power is obtained from the

a. Chemical energy
b. Nuclear energy
c. Potential energy
d. Energy of water

4.Which one of the following is not a non-conventional energy source?

a. Solar
b. Tidal
c. Geothermal
d. Coal

5.Which of the following is a conventional way of generating electrical energy?

a. Tidal power
b. Wind power
c. Thermal power
d. Solar power

6.In which of the following condition biogas is produced?

a. Presence of oxygen
b. action of aerobic microorganisms
c. action of anaerobic microorganisms
d. presence of fertilizers

7.Which of the following is a non –conventional resource?

a. Coal
b. Solar
c. Geothermal
d. tidal

8.The gas which is NOT produced in the process of gaseous biomass is

a. **Neon**
b. **Methane**
c. **Hydrogen**
d. **Carbon dioxide**

9.Which is the major component of CNG

a. **Ethane**
b. **Propane**
c. **Butane**
d. **methane**

10.In hydro electric power plant more electrical power can be generated if water falls from a greater height because

a. **Its temperature increases**
b. **Larger amount of potential energy is converted into kinetic energy**
c. **The electricity content of water increases with height**
d. **More water molecules dissociate into ions**

11.Which energy is converted into electrical energy by a solar cell

a. **Chemical energy**
b. **Nuclear energy**
c. **Solar energy**
d. **Magnetic energy**

12.Which of the following statements is incorrect regarding hydro power generation from river dams

a. **Dams encourage sustainable growth**
b. **It does not pollute water or air**
c. **Hydro power facilities can have large environmental impacts**
d. **Dams displace indigenous people from their river life lines**

13.Which of the following is not a source of renewable energy

a. **Fossil fuel**
b. **Hydro electricity**
c. **Wind energy**
d. **Solar energy**

14.Which one of the following is the largest source of natural energy to humans

a. **Earth**
b. **Plants**
c. **Sun**
d. **Animals**

15. A module in a solar panel refers to

a. Series arrangement of solar cells.
b. Parallel arrangement of solar cells.
c. Series and parallel arrangement of solar cells
d.circular arrangement of solar cells

16.In a fuel cell cathode is of
a. Oxygen
b.Ammonia
c. Hydrogen
d.nitrogen

17. **The current density of a photo voltaic cell ranges from**
a. 15 – 20 mA/cm
b. 40 – 50 mA/cm
c. 30 – 40 mA/cm
d.20-30 mA/cm

18. A pyrometer is used for the measurements of
a. Diffuse radiations only.
b. Direct radiations only.
c. Both direct and diffused radiations
d.Indirect radiations only

19. The function of a solar collector is of converting solar energy into
a. Radiations
b. Electrical energy directions.
c. Thermal energy.
d.Mechanical energy

20.Following is true for biomass and biofuels
a. their contribution in reduction in CO_2 emissions is limited
b. both emit large amount of air pollution when burned
c. they consume large amounts of water
d. all of the above

21.Biomass can be converted to
a. methane gas
b. ethanol
c. biodiesel
d. all of the above

22.In which of the following region winds are stronger and constant
a. deserts
b. offshore
c. low altitudes sites
d. all of the above

23.Renwable energy often displaces conventional fuel in which of the following area
a. space heating
b. transportation
c. electricity generation
d. all of the above

24.Which of the following country generate all their electricity using renewable energy?
a. Iceland
b. England
c. USA

d. China

25.Geothermal energy is

a. The energy of magma inside the earths crust
b. Energy stored as heat in the earth
c. The amount of energy obtained from coal and petroleum inside the earths crust
d. Amount of minerals obtained from the earths crust

Answers

1-c)solar
2-c)Ocean tides
3.d) **Energy of water**
4.d)coal
5.c) **Thermal power**
6.c) **action of anaerobic microorganisms**
7.a)coal
8.a)neon
9.d)methane
10.b) **Larger amount of potential energy is converted into kinetic energy**
11.c)solar energy
12.a) **Dams encourage sustainable growth**
13.a)fossil fuel
14.c)sun
15.c) **Series and parallel arrangement of solar cells**
16.c)hydrogen
17.b) **40 – 50 mA/cm**
18.c) **Both direct and diffused radiations**
19.c) **Thermal energy**
20.d) all of the above
21. d)all of the above
22.b)offshore
23.d) all of the above
24.a) Iceland
25.b) Energy stored as heat in the earth

KN GOVT DEGREE COLLEGE(A)
CHITTOOR

COURSE COMPLETION
CERTIFICATE

This certificate is presented to

K.VISHNU VARDHAN III MECs

For completing the 1-month course training in "RENEWABLE ENERGY" organized by DEPARTMENT OF PHYSICS & ELECTRONICS

From 25-03-2023 to 04-05-2023

P.V.K.N.GOVT.DEGREE COLLEGE(A):: CHITTOOR.

Department of Physics &Electronics

Student Feedback

Course Title: Renewable Energy Certificate course

Course Duration: 4 weeks

Name of the Instructor:

Date:

Student Feedback Form

S.No	Course Aspect	Rating (1-5)	Comments
1	Course Content& Coverage of Syllabus		
2	Instructor's Knowledge and Teaching methods		
3	Course Materials and Resources		
4	Hand on Activities		
5	Technological usage in delivering the lecture		
6	Over all organization of this course		
7	Clarity of Explanations and Communication		
8	Course Administration (e.g., scheduling, support)		
9	Relevance to Real-World Applications		
10	Suggestions for Improvement		

[Student Name & Signature]

In the table, you can have students rate various aspects of the course on a scale of 1 to 5, with 1 being the lowest and 5 being the highest. Additionally, there is space for students to provide comments and suggestions for improvement. The instructor's name, course duration, and date can be filled in accordingly.

P.V.K.N.GOVT.DEGREE COLLEGE(A): CHITTOOR.

Department of Physics & Electronics
Student Feedback Analysis and Action taken Report
Course Title: Renewable Energy Certificate course
Course Duration: 4 weeks

S.No	Course Aspect	Analysis	Action taken report
1	Course Content & Coverage of Syllabus	95% Good Students were satisfied with the course syllabus	Additional inputs given which helps to learn present technologies
2	Instructor's Knowledge and Teaching methods	96 % Good. Students were gained knowledge while teaching methods adopted by the teacher	Need to be provide the best ICT tools in the teaching methods
3	Course Materials and Resources	98% Good. Content is useful and Resources have been used from the open sources available in the online platform	Need to provide the Resource links
4	Hand on Activities	98% good. Virtual labs were used	Need to assess the students after demonstrating the Virtual labs
5	Technological usage in delivering the lecture	98 % students were satisfied by the usage of ICT Tools	Need to more practice on usage of ICT tools by the students
6	Over all organization of this course	98% Good .	The course organization is designed for short term
7	Clarity of Explanations and Communication	95 % of students were understood by clarifying the doubts and good interaction with the staff members	By Posting the KWL charts students can gain the knowledge easily
8	Course Administration (e.g., scheduling, support)	Course is scheduled in prescribed format and supports to the students to learn knowledge	Course is organized well with the help of Administration
9	Relevance to Real-World Applications	Students were gained knowledge the real practical applications in the present Electric vehicles	Need to conduct the field visits
10	Suggestions for Improvement	Provide the information about the advanced studies in the relevant certificate course	Motivate the students to acquire the knowledge by visiting online platform scientific tools.

Achievements and Feedback:

Throughout the course, participants actively engaged in discussions, asked questions, and demonstrated a strong commitment to learning. Practical laboratory sessions received positive feedback, as they allowed participants to apply theoretical knowledge to real-world scenarios. Guest speakers and case studies were particularly valuable in providing a holistic understanding of the topic.

Certificate Presentation:

At the end of the course, participants were awarded certificates of completion during a formal presentation ceremony. This moment marked the successful conclusion of the course and celebrated the achievements of the participants.

Future Plans:

Based on the success of this Renewable Energy Certificate Course, we plan to offer it regularly in the future. We will continue to refine the course content, incorporate the latest industry developments, and expand opportunities for hands-on learning experiences.

Conclusion:

Renewable Energy Certificate Course proved to be a valuable educational endeavor, contributing to the knowledge and skill development of the participants in the field of energy .We express our gratitude to the instructors, participants, and guest speakers who made this course a success.