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DEPARTMENT: CHEMICAL ENGINEERING

COURSE NAME: ALTERNATIVE ENERGY RESOURCES

COURSE CODE: CHE 574

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ASSIGNMENT 1 Question

Kindly resubmit first assignment for CHE 574. Use all available literatures to answer the following over the weekend. 1. (a) With adequate mathematical relations, explain the various forms of energy (b) distinguish between the sustainable energy and resources and non-sustainable energy and resources 2. With the aid of appropriate pie chart or bar chart briefly discuss the typical energy resource mix for sustainable energy development and provide your own view the case for the Nigerian environment.

ASSIGNEMENT 3 Question

1.Monitor the average ambient temperature between on Monday, 17th and Friday, 21st of February 2020 and estimate the average daily thermal energy from the sun reaching land

2. With the aid of a beautiful diagram ONLY, describe anemometer.

ASSIGNMENT 4 Question

How much energy is being produced from the dams in Nigeria? Compare with the energy produced from crude. All the assignments can be submitted in one PDF

ASSIGNMENT ONE

1a. With adequate mathematical relations, explain the various forms of energy.

There are two major forms are Kinetic Energy and Potential Energy.

A. KINETIC ENERGY: is the energy in moving objects or mass. Its mathematical relation is shown as;

$kinetic\ energy = \frac{1}{2}\ x\ m\ x\ v_i^2$

Where m = mass

V_i = velocity

Examples of kinetic energy include mechanical energy, electrical energy etc.

i. Mechanical Energy: Mechanical energy is the energy a substance or system has because of its motion. For example, machines use mechanical energy to do work.

ii. Electric Energy: Electrical energy is the energy carried by moving electrons in an electric conductor. It is one of the most common and useful forms of energy. Example – Lightening. Other forms of energy are also converted to electrical energy. For example, power plants convert chemical energy stored in fuels like coal into electricity through various changes in its form.

B. POTENTIAL ENERGY: is any form of energy that has stored potential that can be put to future use. Examples include nuclear energy, chemical energy, etc.

$$potential\ energy = mxgxh$$

Where m = mass

g = acceleration due to gravity

h = height

i. Chemical Energy: Chemical energy is energy stored in the bonds of chemical compounds (atoms and molecules). Chemical energy is released in a chemical reaction, often in the form of heat. For example, we use the chemical energy in fuels like wood, coal by burning them.

ii. Nuclear Energy: Nuclear energy is the energy that is trapped inside each atom. Nuclear energy can be produced either by the fusion (combining atoms) or fission (splitting of atoms) process. The fission process is the widely used method.

Advantages of nuclear power

- Nuclear power generation does emit relatively low amounts of carbon dioxide (CO_2). The contribution of nuclear power plants to global warming is therefore relatively little.
- It is possible to generate a high amount of electrical energy in one single plant.

Disadvantages of nuclear power

- The problem of safe disposal of radioactive waste exists
- There exist high risks and the consequences of damage is great when accidents happen
- The raw material Uranium is a scarce resource. Its supply is estimated to last only for the next 30 to 60 years, depending on the actual demand.

iii. Gravitational Energy: Gravitational energy is that energy held by an object in a gravitational field. Examples include water flowing down a waterfall.[1]

1b. Distinguish between renewable and nonrenewable sources of energy

Renewable resources are those that can be replaced as they are used. Examples are

i. Solar energy
ii. Wind energy
iii. Biomass
iv. Water energy

Solar energy is the energy available from the sun. the sun is the ultimate energy resource available to man

Wind energy is driven by thermal energy of the sun and is used by sailing ships and for turning windmills.

Water energy provides the source of energy in modern dams, hydroelectric plants etc.

Biomass is the energy gotten from cornstalks, garbage, sugarcane, sea weed etc.

Nonrenewable resources are depleting; they cannot be replenished as they are used
Examples are;

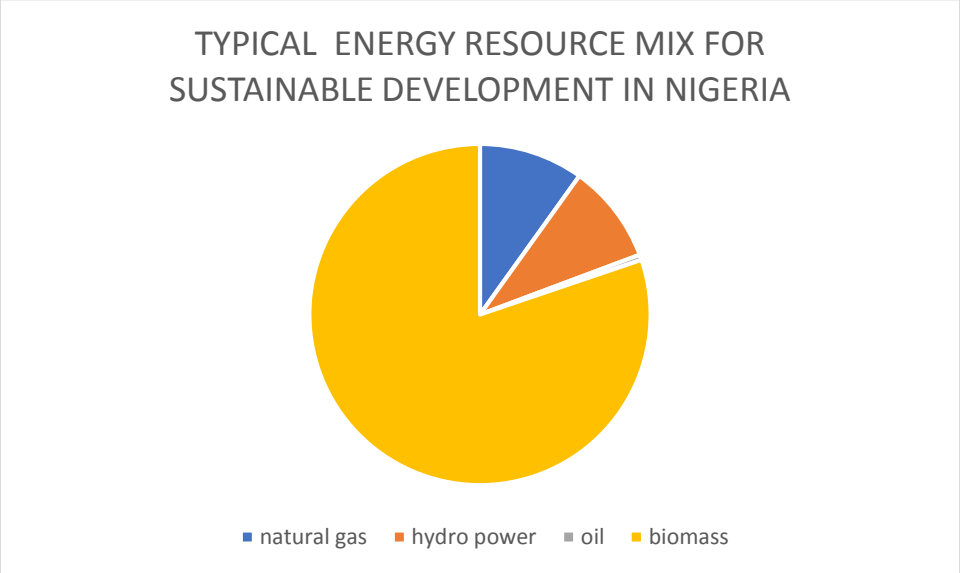
i. Nuclear energy
ii. Petroleum and Natural gas

Nuclear energy from radioactive materials: this produce enormous heat to operate turbines and drive ships and aircrafts. Fission and fusion energy are examples of nuclear energy

i. Petroleum and natural gas: these often occur together and they are currently constituting the world major resources. Such fuels are known as fossil fuels are a depleting energy resource. Other examples of fossil fuels are coal and wood [2]

2. With the aid of appropriate pie chart or bar chart briefly discuss the typical energy resource mix for sustainable energy development and provide your own view the case for the Nigerian environment.

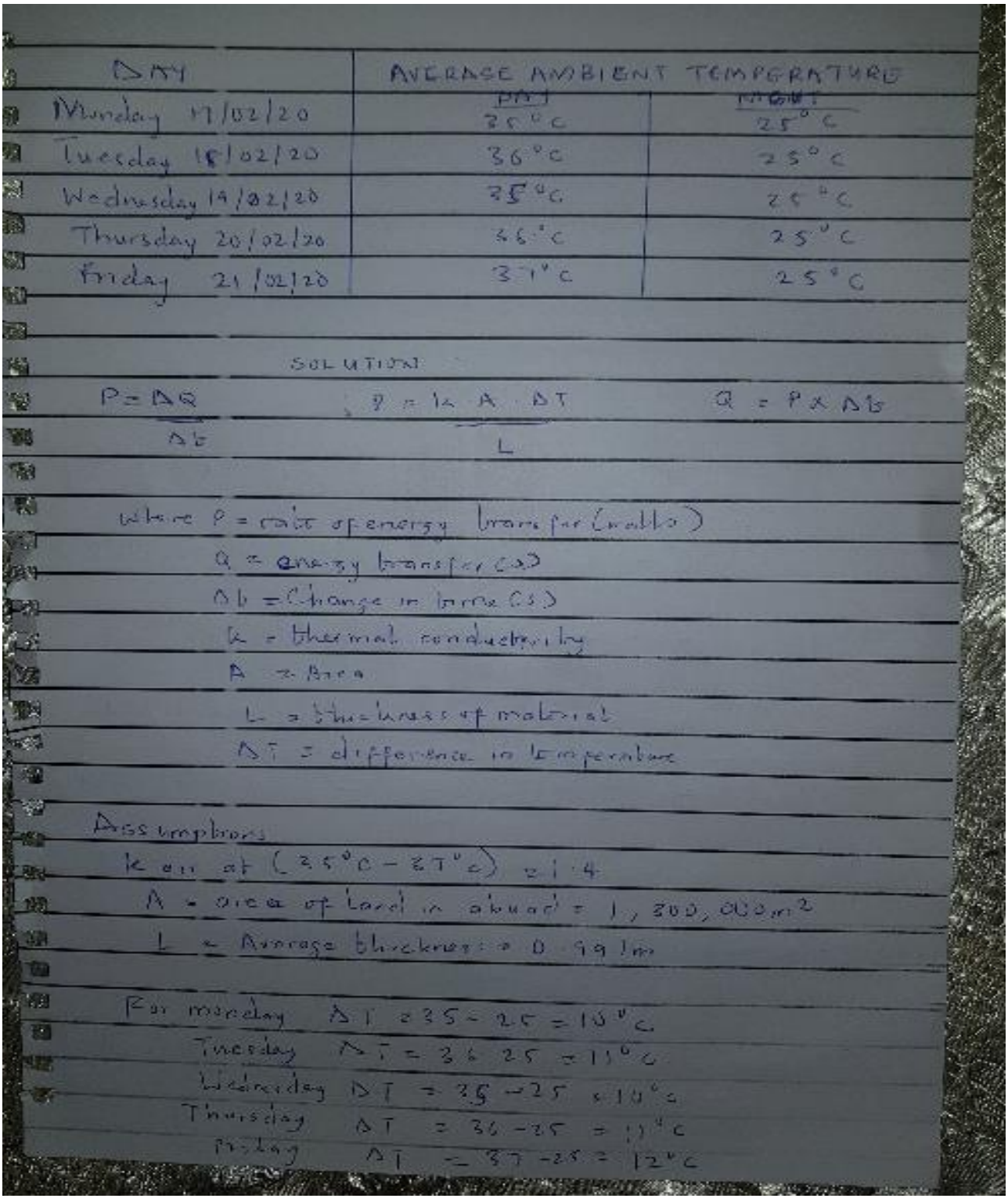
The main areas of energy utilization in Nigeria are transportation and conversion of energy resources to electricity for household and industry. In the prevailing energy crisis, Nigeria's energy consumption mix is dominated by over- dependence on biomass, particularly fuel wood as shown in 0-1 PIE CHART OF TYPICAL ENERGY RESOURCE MIX FOR SUSTAINABLE DEVELOPMENT IN NIGERIA Combustible renewable firewood inclusive has a record 80.2%, followed by natural gas 9.9% and oil 9.4%. Hydroelectricity has only 0.5%. In spite of the fact that oil is the mainstay of the economy, its contribution to the energy consumption mix is however appalling. The reason is not farfetched: less than 40% of Nigeria's population is about 150 million people.[3]



0-1 PIE CHART OF TYPICAL ENERGY RESOURCE MIX FOR SUSTAINABLE DEVELOPMENT IN NIGERIA

ASSIGNMENT THREE

1.Monitor the average ambient temperature between on Monday, 17th and Friday, 21st of February 2020 and estimate the average daily thermal energy from the sun reaching land



DAY	AVERAGE AMBIENT TEMPERATURE	
	PM	MORN.
Monday 17/02/20	35°C	25°C
Tuesday 18/02/20	36°C	25°C
Wednesday 19/02/20	35°C	25°C
Thursday 20/02/20	36°C	25°C
Friday 21/02/20	37°C	25°C

SOLUTION

$P = \frac{\Delta Q}{\Delta t}$ $\quad P = \frac{kA\Delta T}{L}$ $\quad Q = P \times \Delta t$

where P = rate of energy transfer (watts)

Q = energy transfer (J)

Δt = Change in time (s)

k = thermal conductivity

A = Area

L = thickness of material

ΔT = difference in temperature

Assumptions

k air at (35°C - 25°C) = 1.4

A = area of land in abuad = 1,300,000 m^2

L = Average thickness = 0.99m

For monday $\Delta T = 35 - 25 = 10°C$

Tuesday $\Delta T = 36 - 25 = 11°C$

Wednesday $\Delta T = 35 - 25 = 10°C$

Thursday $\Delta T = 36 - 25 = 11°C$

Friday $\Delta T = 37 - 25 = 12°C$

Monday $P = \frac{1.4 \times 1300000 \times 10}{0.991}$

$= 18365287.59W$

Tuesday $P = \frac{1.4 \times 1300000 \times 11}{0.991}$

$= 20201816.35W$

$Q = 20201816.25 \times 21600$

$= 436350MJ$

Wednesday $P = \frac{1.4 \times 1300000 \times 10}{0.991} = 18365287.59W$

$Q = 18365287.59 \times 21600 = 396700MJ$

Thursday $P = \frac{1.4 \times 1300000 \times 11}{0.991} = 20201816.35W$

$Q = 20201816.35 \times 21600 = 436500MJ$

~~The average daily thermal energy from the sun reaching~~

Friday $P = \frac{1.4 \times 1300000 \times 12}{0.991} = 22038345.11W$

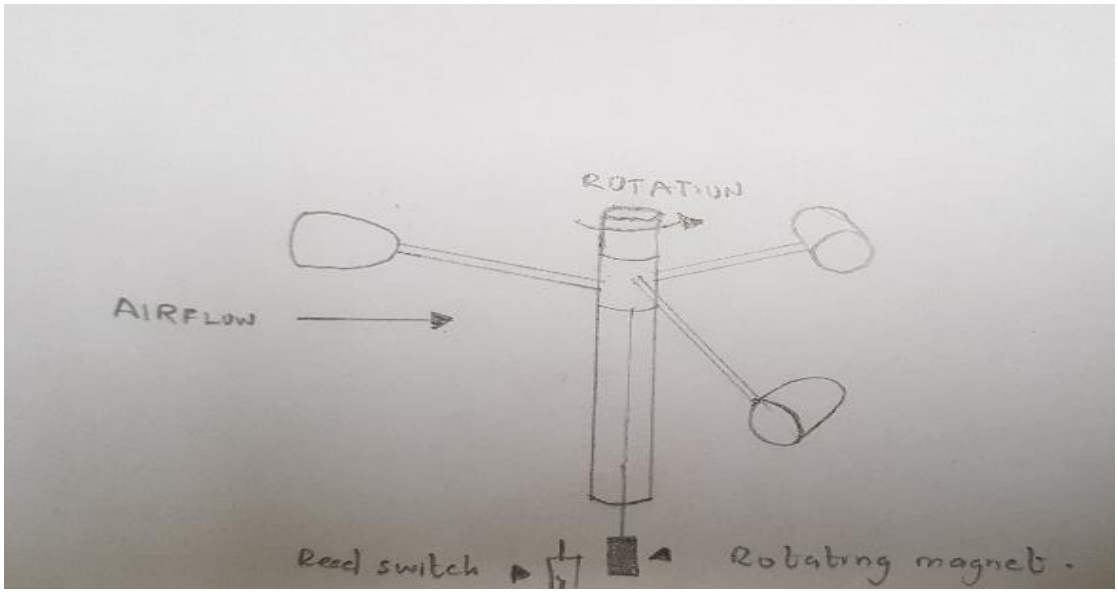
$Q = 22038345.11 \times 21600 = 476000MJ$

Average $= \frac{396700 + 436300 + 396700 + 436300 + 436500}{5}$

$= 420460MJ$.

∴ The average daily thermal energy from the sun reaching land $= 420460MJ$

2. With the aid of a beautiful diagram ONLY, describe anemometer



0-2 DIAGRAM OF ANEMOMETER DRAWN BY ME

ASSIGNMENT FOUR

How much energy is produced from dams in Nigeria?

Table 1: ENERGY GENERATED FROM CRUDE IN NIGERIA

NAME	FUEL TYPE	YEAR COMPLETED	INSTALLED CAPACITY (MW)	INSTALLED AVAILABLE CAPACITY (MW)	ACTUAL GENERATION CAPACITY (MW)
AES	Gas	2001	270	267	0
AFAM IV-V	Gas	1982	580	98	0
AFAM VI	Gas	2009	980	559	523
ALAOJI NIPP	Gas	2015	335	127	110
DELTA	Gas	1990	740	453	300
EGBIN	Gas	1985	1320	931	502
GEREGU	Gas	2007	414	282	138
GEREGU NIPP	Gas	2012	434	424	90
IBOM POWER	Gas	2009	142	115	92
IHOVBOR NIPP	Gas	2012	450	327	225
OKPAI	Gas	2005	480	424	391
OLORUNSOGO	Gas	2007	335	244	232
OLORUNSOGO NIPP	Gas	2012	675	356	87
OMOKU	Gas	2005	150	0	0
OMOTOSHO	Gas	2005	335	242	178
OMOTOSHO NIPP	Gas	2012	450	318	90
RIVERS IPP	Gas	2009	136	166	0
SAPELE	Gas	1978	900	145	81

SAPELE NIPP	Gas	2012	450	205	116
ODUKPANI	Gas	2013	561	70	0
TOTAL			**10,137**	**5,753**	**3,155**

Table 2: ENERGY GENERATED FROM DAMS IN NIGERIA

NAME	**FUEL TYPE**	**YEAR COMPLETED**	**INSTALLED CAPACITY (MW)**	**INSTALLED AVAILABLE CAPACITY (MW)**	**ACTUAL GENERATION CAPACITY (MW)**
JEBBA	Hydro	1986	570	427	255
KAINJI	Hydro	1968	760	180	181
SHIRORO	Hydro	1989	600	480	350
TOTAL			**1,930**	**1,087**	**786**

Therefore, The actual energy generated from different dams in Nigeria is about 786 MW while that actually generated from crude is about 3155MW. Which means crude oil produces more energy.

REFERENCES

[1] Viskaspedia, “forms of energy.” https://vikaspedia.in/energy/energy-basics/forms-of-energy.

[2] P. . M. W. ANYAKOHA, *New School Physics*. .

[3] M. Nnaji, “THE ROLE OF ENERGY MIX IN THE SUSTAINABLE DEVELOPMENT OF NIGERIA,” [Online]. Available: https://www.researchgate.net/publication/233952340_THE_ROLE_OF_ENERGY_MIX_IN_SUSTAINABLE_DEVELOPMENT_OF_NIGERIA.

[4] “List of power stations in nigeria.” https://en.wikipedia.org/wiki/List_of_power_stations_in_Nigeria.

[5] “international Analysis.” [Online]. Available: https://www.eia.gov/international/analysis/country/NGA.