

Attempt proper question for evaluation; so that mistakes can be pointed and marks awarded.

Topic:

Energy Crisis in Pakistan

These are just notes

Energy Crisis:

"Energy Crises are not just about shortages of power, but also the power of shortages to disrupt economies, societies, and environments."

Introduction:

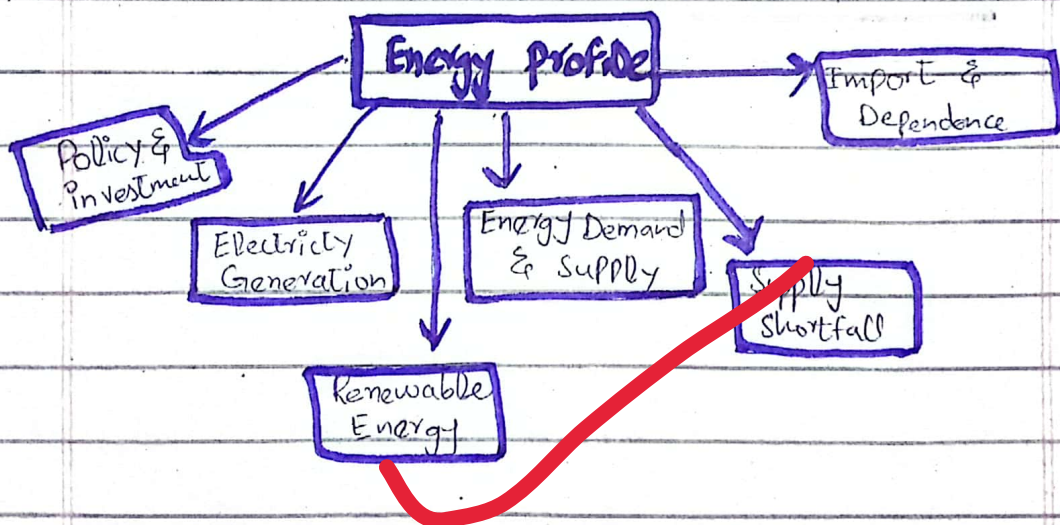
Pakistan faces a myriad of internal and external challenges posing threats to its national security. In the

modern era, all economic vistas are highly dependent on energy, hence energy security has become a vital factor that influence a state's economy, foreign policy and security policy.

Pakistan heavily relies on foreign energy supplies which put huge burden on its fragile economy.

Inadequate policy measures, global and domestic energy politics, short term planning, Lack of political will and unsustainable energy mix are major grey areas in the energy security of Pakistan.

Pakistan's Energy profile:



↳ Electricity Generation:

- **Thermal:** Contributes around 64% to the electricity mix.
- **Hydroelectric:** Accounts for approximately 27% of total electricity generation.
- **Renewable:** wind and solar energy.

gaining traction, with renewable sources contributing about 9% to energy mix.

↳ Energy Demand and Supply Gaps

• **Demand growth:** Energy demand is growing at an average rate of 5-7% annually.

• **Supply shortfall:** The demand-supply gap results in power outage affecting businesses and households, with estimate suggesting a shortfall of up to 5,000 MW during peak demand periods.

↳ Import and dependence:

• Petroleum Product:

Pakistan imports about 75% of its crude oil requirements and 50% of refined petroleum products.

• LNG:

Dependence on imported LNG is increasing to meet the growing demand for natural gas, with LNG imports

according to a significant portion of the country's energy mix.

↳ Renewable energy development:

• **Installed Capacity:** Pakistan has installed renewable energy capacity of approximately 2,400 MW, with plans to increase this to 50% of the total energy mix by 2020.

• Investment:

The government aims to attract \$6 billion in investments in renewable energy projects by 2025.

↳ Environment Concerns:

• Air pollution:

Fossil-fuel based energy generation contributes to air pollution, with urban areas like Lahore and Karachi facing significant pollution levels.

• Climate changes:

Pakistan is vulnerable to the impact

of climate change, including extreme weather events, which can disrupt energy infrastructure and supply.

↳ Policy and investment:

• Energy Policies: Pakistan has introduced policies such as the Alternative and renewable energy vehicle policy to promote renewable energy and energy efficiency.

• Foreign investment:

The government is seeking foreign investment and partnerships to modernize the energy sector, improve infrastructure and enhance energy security.

Energy Sector of Pakistan:

Energy plays a key role in the economic development of any nation and it is one of the most important commodities for humans. However, Pakistan severe crises of energy in the form

of electricity and fuel in all major sectors.

Problems in energy sector are majorly two, first load shedding and secondly expensive electricity generation.

1: Load shedding in Pakistan:

The energy ^{sector} of Pakistan is facing severe loadshedding.

• Summer 2023

Short fall: The shortfall in 2023 is 7000MW

Loadshedding in Urban centres:

Loadshedding in the urban centres varies from 4-5 hrs day while,

Loadshedding in rural areas:

Loadshedding in rural areas 10-12 hrs a day.

• Summer 2022

Short fall: The short fall was more than 10,000MW

Loadshedding in Urban: The loadshedding in urban was around 8hrs a day.

Loadshedding in rural:

In rural areas the loadshedding is 16-18 a day

2:

Expensive electricity generation is the major problem of Pakistan:

As the country generates the most expensive electricity in Asia and 3rd most expensive electricity generated in the world (PM, Pakistan)

Domestic unit charges vary from 24 to 65 PKRs. The price of per unit decided on the basis of SLABS being introduced by NEPRA.

→ **Below 100 units (1-100 units)**

the cost is almost 28 PKR including all the taxes and other charges.

↳ **From 100-300 unit:**

the price is 44 PKR per unit including all the taxes and other charges.

↳ **From 300-600 unit:**

The cost price is about 56 per unit.

↳ **Above 600 unit:**

The minimum price per unit is 72 PKR.

In commercial (market, industry, agriculture)

it varies from 48 to

90+ PKR per unit cost. Slabs are

also varying the price per unit.

The price got almost more than 3-times

in the last two years. The cost

of domestic unit of SDab 300-600

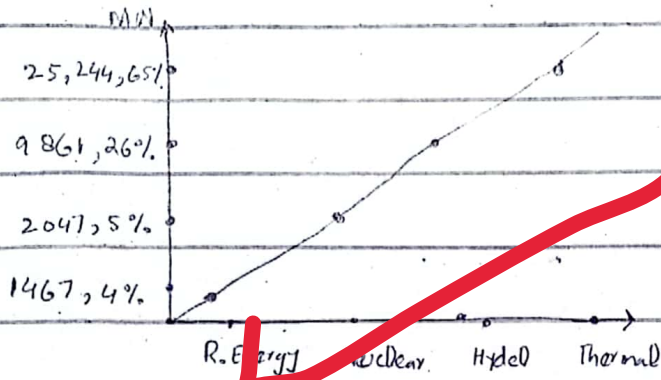
unit, 18 PKR, now the price rises

more than 56 PKR.

Pakistan's Energy Resources:

As June 30, 2020 installed power generation capacity in Pakistan stands at 38,719 MW, of which 35,735 MW is connected with National Transmission & Dispatch Company (NTDC) system whereas 2,984 MW is connected with K-Electric Limited (KEL) system.

The installed capacity distribution is,



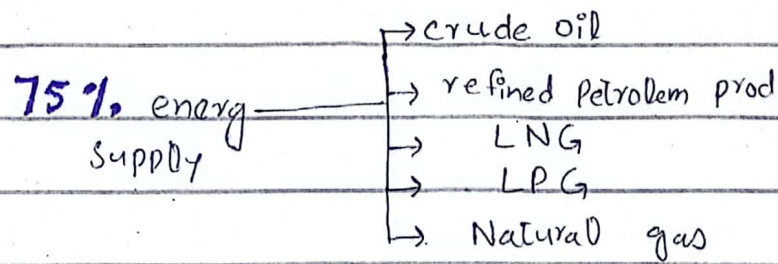
(Energy installed Capacity)

Resources:

(a) Oil and gas:

Oil and Gas are the main energy sources of Pakistan.

According to report, in FY 2018-19,



of, which

25.7 → oil

45.6 → gas including LNG

1.1 → LPG

Bulk of this is imported as indigenous exploration and production is still underdeveloped despite huge potential.

The shortfall in gas is expected to reach 6,611 Bcf/0 by FY 2029-30. In contrast, consumption is continuously rising. This gap between demand and indigenous supply is going to deepen further as local gas reserves are fast depleting while consumption is one of the increase.

(b)

Coal:

Pakistan is a coal-rich country, with total 7775.5 million Tonnes

Add source against your stats

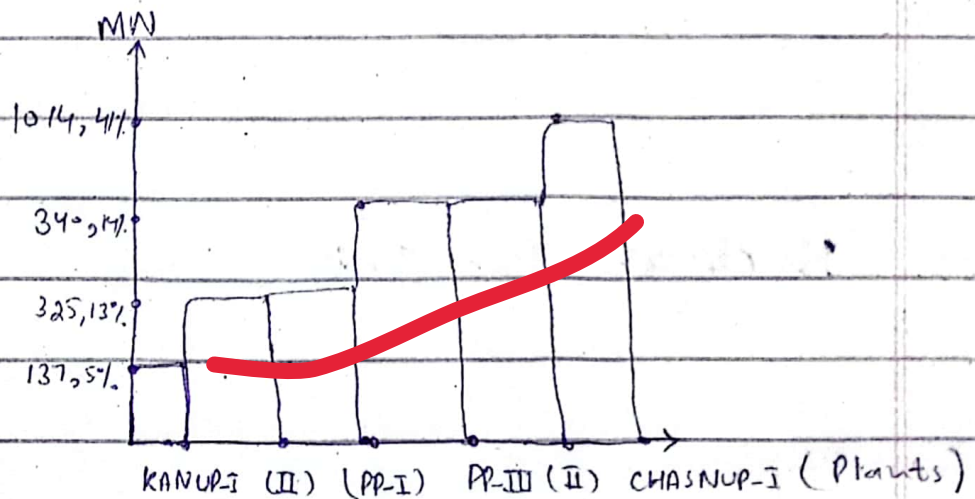
of measured reserves. Out of measured reserves, it is currently producing 4.3 million tonnes of coal. The average consumption is almost 17.9 million tonnes. The huge potential has not been harvested for decades due to insufficient financing, underdeveloped infrastructure and lack of modern technical expertise.

In addition, environmental pollution that it is going to cost will further deteriorate the already threatened safety level as coal pollutes the environment like no other fuel does.

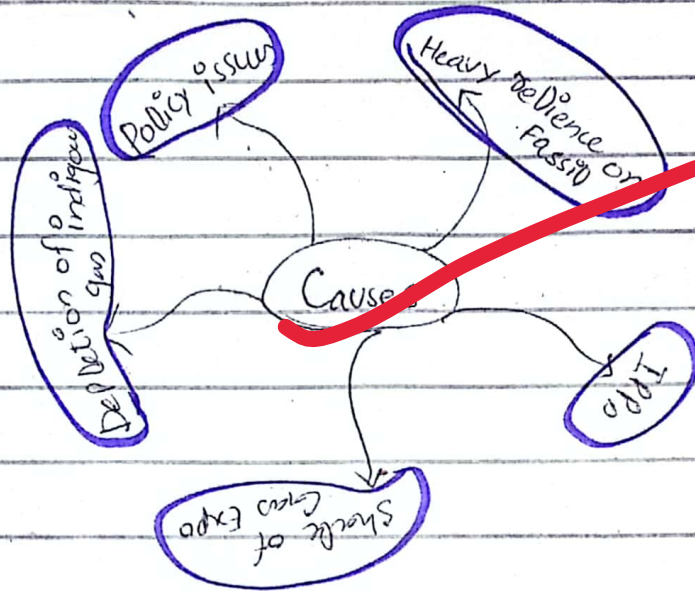
(c) Nuclear Power:

Nuclear Power is competitive compared to other electricity options, but requires high investments, huge industrial infrastructure and sophisticated technical expertise for its development and operation. Pakistan started developing nuclear energy in 1960s and currently producing 1,467 MW power 1,014 MW from Karachi N.P-II (KANUPP-II)

making total of 2,481 MW of nuclear energy, contributing around 6% to total installed power generation capacity in the country. Karachi Nuclear Power Plant - III with capacity of 1,014 MW is under construction and will be operational in 2022. However, Pakistan is targeting 8,800 MW of tangible nuclear power generation capacity by 2023.



Major Causes of Energy Crisis in Pakistan:



(a) Policy issues:

Absence of energy policy to providing guidance for improved monitoring, evaluation and decision making by the government for the secure supply of energy accentuates as there are separate body for policy making, planning, developing a legal and regulatory framework for each fuel mix.

(b) Heavy reliance on imported fossil fuels:

Heavy reliance on imported fossil fuels particularly oil and LNG has been the trend in our energy profile. Oil & LNG worth \$824.872 million, 24 were imported in FY 2020-21 which is nearly 15% of the entire import bill.

(c) Depletion of indigenous gas:

Share of indigenous gas has reduced from 43% of energy mix in 2014 to 34% in 2019 as Pakistan's depleting reserves are sufficient only to sustain current level of gas consumption of (17.2 Mtoe) for the next 25 year.

(d) Independent Power Producers:

(IPPs) issue in energy sector had considerable implications on power sector that raised the price of power and shifted Pakistan energy mix in favour of oil & gas. In addition, the expedient agreements with IPPs allowing them to set

high tariffs and inessential guarantees also aided to the power crisis in Pakistan.

(e) Transmission and Distribution Losses :

Pakistan rank 14 out of 131 countries of world in T&D losses.

T&D loss of one percent can incur deficit of approximately Twenty billion rupees over national treasury.

T&D are both technical and non-technical / commercial, both arising mainly due to poor administration and poor government.

↳ Implication of energy crises in Pakistan :

Energy crises in Pakistan have significant implications for the economy, society, and environment.

1. Economic impact :

Energy shortages lead to decreased industrial productivity,

increased production costs, and reduced competitiveness in the global market, power outages disrupt businesses, resulting in financial losses and hindering economic growth. Moreover, the government often subsidizes energy, leading to fiscal deficits and straining public finances.

Add references against your arguments

2. Social Consequences:

Power outages disrupt daily life, affecting households, businesses, and essential services like healthcare and electricity. This limits people's ability to work, study, and engage in recreational activities. Additionally, energy shortages contribute to unemployment and poverty, exacerbating social inequality and unrest.

3. Environmental Concerns:

Pakistan's reliance on fossil fuels, particularly coal and oil, for energy generation contributes,

to air pollution, greenhouse gas emissions, and environmental degradation. Inadequate infrastructure and outdated technologies exacerbate these environmental challenges, posing health risks and damaging ecosystems.

4. Investment and development:

Energy shortages deter domestic and foreign investment, as businesses are hesitant to operate in an environment with unreliable energy supply. Additionally, insufficient energy infrastructure hinders the development of renewable energy sources and clean technologies, delaying the transition to a more sustainable energy future.

Addressing energy crises in Pakistan requires a comprehensive approach that includes investment in energy infrastructure, diversification of energy sources, promotion of energy efficiency and conservation measures, and implementation of

effective energy policies and governance mechanisms.

Inlay Forward:

Pakistan despite its relevance to the energy security of the region and beyond, has not been able to solve this crisis due to different roles and policies of the multiple energy bodies and organization in the country. The current situation demands strict implementation of the following steps to achieve energy security in Pakistan.

(a) Improving Energy Government by Establishment of (NEA)

This is need to establish a single National Energy Authority (NEA) to oversee all over the institutions in the energy sector.

NEA must have the power to coordinate the efforts of all the sectors, relating to drafting and implementation of a single energy policy.

(b) Energy Security Policy:

Pakistan has to come up with a clear long-term, consistent and rational policy for the energy security of Pakistan; therefore, a centralised comprehensive policy to address existing energy sector issues, is required to be formulated.

There are following recommended key policy goals.

1) Realistic and objective oriented approach in formulating policy.

Policy making should be realistic based on: actual potential and affordability.

2) Ensuring efficient energy consumption policy. To reduce the demand and supply gap, the policy is to focus on both increasing supply and decreasing consumption by minimizing distribution losses and other wastages.

(c) Ensure competitive tariffs:

1) Natural gas tariffs:

Captive power plants receive selective advantage in terms of gas allocation and pricing. In current power surplus situation, captive power plants must move to national grid. Gas pricing to captive power plants must also ensure levelized cost of power generation at par with new RLNG based power plants.

2) Power sector tariff:

Reduction in T&D losses from 20% to 10% in the next 5 years can reduce the consumer tariffs by around 1-1.5 cents/kwh. DISCOs should be allowed recovery of capital investment in replacement/upgradation of technology required for reducing T&D losses.

(d) Energy efficiency and conservation:

1) Hybrid/Electric Vehicles:

Hybrid & electric vehicles should be promoted in the new Auto policy including installation of battery charging stations.

2) LED Lightening:

LED bulbs are approximately 50-80% more efficient than other alternatives. Import duties and sales tax on LED bulbs should be removed and industry be incentivised for local manufacturing.

3) Building codes and commercial shopping centres:

There is a need of creating awareness about energy conservation and using day light hours.

Pakistan can save up to 1,100 MW of energy if its industries and households - the two main energy consuming sector try to change their behaviour about energy conservation.

(e)

Revising independent power producers:

(IPPs) system.

2) Energy efficiency Tests of IPPs.

To analyse efficiency of installed IPPs, energy efficiency tests of every IPP be conducted at priority. IPPs to enhance their production and those with less efficiency may be decommissioned.

4) Use of Modern Technology:

Recently, Pakistan faced a countrywide blackout due to sudden decrease in frequency in transmission system. Pakistan still operates outdated power grids and transmission system. There is a need to utilise the latest technologies in the energy sector, i.e., automation, efficient management, fault eradication, artificial intelligence, smart computers, latest research and development tools to avoid undesired power cuts and T&D losses.

Case study:

One notable case study of energy crises in 2012, Summer Pakistan faced a severe energy crisis marked by widespread power outages and disruption in daily life. The crisis stemmed from a combination of factors, including a significant gap between electricity demand and supply; heavy dependence on imported fossil fuels for electricity generation, inadequate infrastructure leading to energy losses during transmission, and a crippling circular debt problem in the energy sector. Political instability, governance challenges, and corruptions further complicated efforts to address the crisis. The social and economic impacts were profound, with businesses experiencing disruptions, job losses, and economic instability, while households endured hours of load shedding, impacting daily routines and productivity.

Despite short-term measures implemented by the government, such as rental power plants and energy crises conservation campaigns, the underlying structural issues persisted, highlighting the need for comprehensive and sustainable solutions to ensure reliable and affordable energy access for the population.

↳ Conclusion:-

Pakistan's energy mix is undergoing significant changes in response to the country's energy needs and environmental concerns. Embracing alternative energy sources is not only a necessity but also a valuable opportunity to address the energy deficit while moving toward a sustainable future. The formulation of the ARE Policy 2020 is a tangible step in the adoption of renewable energy technologies for affordable energy to gain the momentum of sustainable economic growth and

tackle the climate challenges.

The nation's abundant solar and wind resources, along with its hydroelectric potential, position Pakistan favourably for a successful transition to alternative energy.

However, Pakistan's energy crisis is a complex and deeply entrenched problem that can be resolved only through concerted effort from the government, the private sector, and the general population.

By investing in technology, infrastructure, and supportive policies, Pakistan can harness the power of alternative energy to resolve its energy crisis, drive economic growth, and contribute to global efforts in combating climate change. This would also enable Pakistan to work towards a more sustainable and prosperous energy future.