- **Fast forward to 2024**
  1. Electricity sector of Pakistan is still primarily state owned, and power sector model of the country in its present configuration of installed base, energy mix, capacity payments to IPPs, and unchallenged power pilferage is not sustainable.
  2. The level of power distribution companies' losses and pilferage is not sustainable and requires enforcement of writ, charging actual cost based tariff and giving targeted subsidies to establish RE units in areas with high losses and resulting in revenue based load shedding.
     i. In May 2024, boards of nine power distribution companies, *other than two operating in Sindh with Rs 112 billion losses,* were sacked. The government has attributed the Rs 589 billion losses this fiscal year of all 12 DISCOs, to independent directors
     ii. However, bureaucrats from the energy and finance Ministries also served on these boards, remaining unaffected. They will return as ex-officio members.
     iii. The Government has also decided to enlist the services of the military and intelligence agencies to enhance governance in these power distribution companies, invoking Article 245 of the Constitution and the Anti-Terrorism Act and approved the establishment of the Distribution Companies Support Unit (DSU) to mitigate losses in the future.
     iv. The first DSU will be set up in the Multan Electric Power Company (MEPCO), as per the decision.
  3. Average per-unit power purchase price of Discos before the adjustment of allowed transmission and dispatch losses of Discos due Capacity charges works out as Rs17.66 per unit whereas energy charges are Rs9.69 per unit totaling Rs 27.35 per unit for 2024-25 for national average power purchase price of around at Rs27 per unit.
     i. After adding losses and distribution margins, the average tariff goes up to Rs35.50 per unit against Rs27.78 for last year.
     ii. Addition of 18pc general sales tax, the average base tariff for next year jumps to Rs42 per unit excluding other taxes, duties and surcharges.
     iii. Real applicable average tariff would now stand between Rs65 and 72 per unit after inclusion of surcharges, taxes, duties and levies. This figure does not include any adjustments related to monthly fuel and quarterly tariff adjustments
  4. Surprisingly export sector of Bangladesh has implemented a 50% cut from July 1, 2024 in cash incentives for exports across 43 products in a country where a substantial 65% of the cash incentives primarily

sihaque@imransenergyinsights.com

benefit the garments and textiles industry. This is part of plan to prepare the private sector for LDC graduation in 2026.

i. As per the WTO Rules, these cash incentives are considered as Subsidies contingent upon Export Performance.
ii. According to the Agreement on Subsidies and Countervailing Measures (ASCM), no subsidy/cash incentives will be allowed after graduation from the LDC status.
iii. Peak rates remain unchanged.

5. It is also important to shift consumption to nondomestic consumers. As per State of Industry Report 2023
    a. Total number of electricity consumers in the country reached 38,249,950 and consumed 121,852.01 GWh.
        i. Out of which 43.92 % was consumed by 33,115,996 domestic consumers
        ii. 7.3 % was consumed by 4,095,967 in commercial category
        iii. 25.51% was consumed by 397,685 industries,
        iv. 7.91% was by 377,255 agriculture consumers
        v. PM on July 10, 2024 is quoted as saying that Rs 500bn has been lost over 8-10 years on account of tube wells in Baluchistan
        vi. And shifting of 1m tube wells to solar energy starting with 28,000 tube wells in Baluchistan at cost of Rs 55bn.
        vii. And 15.38% by other 263,047 consumers
6. Bangladesh has 16.2 m lifeline consumers and analysis shows that 26.45m ie 69.15% consumers in Pakistan pay below cost
    a. 15.5 million "protected consumers" using up to 50 and 100 units per month pay Rs. 3.95 and Rs. 7.74 (lifeline) respectively and Rs 10.06 using up to 200 units per month.
    b. 5.95 million "unprotected category" pay Rs 16.48 per unit for the first 100 units
    c. Another 5 million consumers fall pay Rs 22.95 for the next 101-200 units and Rs. 27.14 for 201-300 slab
        i. For those surpassing 200-unit limit, consumers must wait 6 months before reverting to the protected category.
    d. The consumers of the next five household categories from 301 units and above pay Rs 32.03 - 42.72 per unit.

- **Pakistan's Power Sector**
    a. As of June 30, 2023 Pakistan's *installed* capacity stands at 45,885 MW (CPPA-G 42,362 MW), *dependable* generation capacity is 43,749 MW (CPPA-G 40,628 MW and (KE 3,121 MW).
        - This capacity consists of 25,490 MW of thermal generation (GENCOs, IPPs, and SPPs), hydroelectric of 10,635 MW, wind

sihaque@imransenergyinsights.com

power 1,838 MW, solar energy 530 MW, biomass (bagasse) generating 249 MW, and nuclear power adding 3,620 MW.
    - KE's own thermal generation capacity is 2,816 MW falls short to meet current demand of its system. KE procures electricity: 366 MW from thermal IPPs, 100 MW from solar potential, 139 MW from SPPs/CPPs, and approximately 1,100 MW sourced from the CPPA-G System to bridge the gap.

b. Our *generation capability* is 30,574 MW in CPPA-G with peak demand of 23,679MW (6,895 MW surplus); in KE System it is 3,409 MW and 3,654MW, respectively (deficit 245MW).
    - Globally, target for reserve margin, which is the amount of unused available capability of an electric power system (at peak load for a utility system) as a percentage of total capability, is ~20 percent, according to experts.
    - Lackluster economic growth of 0.29% in FY 2022-23 vs generation planning based on over 5% GDP growth on peak summer demand did not help.
    - Risk analysis may smoothen the curve to some extent but more important is how planning basis is timely rectified
c. Gap between installed capacity and projected demand, like in the past, will continue due to changing growth indicators and RE induction, indicating need to better manage the moving target and execution cycle for power plants of 5-7years for thermal and 10+ years of nuclear and hydel
d. This month, Federal Secretary Power Rashid Langrial stated country's installed capacity being 44,980MW of which effective operational capacity is of 22,879MW
    a. Consists of hydel 7,315MW, RLNG 4,499MW, Coal 4,909MW, Nuclear 2,965MW, Gas 1,317MW, RFO 1,234MW, Wind 435MW, Solar 104MW and bagasse 99MW.
    b. Furthermore, out of 44,980 MW installed capacity, degraded capacity is 37,951MW, capacity discounted for high summer @ 40 degrees is 36,849 MW, capacity discounted for permissible and forced outages is 32,576 MW, capacity discounted for seasonal and daily variation, 28,736 MW, capacity discounted for exorbitant marginal cost (Energy Purchase Price) results in operational capacity is 23,718 MW
e. In 2023-2024, indigenization ratio of energy is 74.2% that is expected to increase to 76.5% by 2027 due to inclusion of hydro, wind and solar based power plants and to 87.13% by the year 2034
    - Provided we invest funds per IGCEP 2024 to meet demand and installed capacity of 37,224 MW and 56,046 MW, respectively by 2034

sihaque@imransenergyinsights.com

- Indicates 63.31 billion US$ NPV investment requirements both in terms of CAPEX and OPEX of electric power generation by 2034
- 2019 June Dollar Rate was Rs 156.7 vs IGCEP 2023-24 based on Rs. 289.1 (Oct 2023)

f. IGCEP 2023-34 and TSEP be redrafted as an integrated document
   - Peak demand be based on next 3 years of GDP growth projections of IMF including for 2024-25 and that be taken as basis for 1+ 3 year revolving plan; 5+10 year revolving plan be based on loner term projections
   - Consumer tariff (CPP+EPP) projections be made part of the document based on impact of investment planned
   - Incorporate only committed projects which have achieved financial close; be revised post early retirement of expensive power plants; increase in utilization factor then critically assess need and timing of 24 new hydel power generation projects (7,460 MW) planned between 2024 and 2032
   - Furthermore, the decision in respect of induction of new generation capacity to be made only after a through consideration of all relevant factors and comprehensive analysis of situation of economy, investment quantum and on basis of projected impact on consumer tariff.
     i. Shut down inefficient power generation by CPPA- G, KE including its IPPs, and GENCOs with EPP+CPP >Rs 45 per unit
     ii. Be reviewed, bought out earlier and policy framework developed for them to upgrade and operate in CTBM regime
     iii. Implement CTBM by Jan 1, 2025, facilitate development of competitive market and over a period of time.
   - Renewable Energy power plants be allowed to participate in the wholesale electricity market/CTBCM as merchant power plants
   - Expired PPAs and those expiring not be given any extensions.
     i. Their contracts be extended under "no electricity, no payment" model
     ii. NTDC's 7228 MWs are to be retired
        1. 2020MWs of GENCOs, 1300MWs of KAPCO operating due network constraints and 3908 MWs due to PPA expiry including HUBCO between 2027 and 2034
        2. And 1102 MWs of KE due PPA expiry between 2025 and 2033

sihaque@imransenergyinsights.com

ii. Implement solar, coal, nuclear repowering initiatives for expensive GENCOs e.g Lakhra, Jamshoro, Multan, Muzaffargarh, and Faisalabad under 3P
iii. Encourage through policy incentives production of green hydrogen and ammonia

g. Load duration curve reflects base load, intermediary load and peaking load.
   a. Our load Factor is 44% and by reducing industrial tariff from September to April (8 months), this LF can jump to 74%, thus reducing overall tariff.
   b. Still there will be a few plants that will operate from 0 to 10%
   c. There is need to study NEPRA publications, hearings, PSS NTDCL and understand Load Duration Curve
h. The power purchase price (PPP) includes (Energy Purchase Price (EPP) fuel and variable O&M (operation and maintenance) costs and Capacity Purchase Price (CPP) capacity charges including the use of service charges, market operator fee, impact of T&D losses, Distribution & Supplier Margin, and Prior Year Adjustment) needs detailed understanding in revised IGCEP/TSEP as percentage of CPP in the overall tariff is an increasing trend.
   - In FY 2022, EPP constituted around 60% of the tariff, while CPP accounted for about 40%.
   - During FY 2023, the percentage of EPP and CPP was around 50% each, while for FY 2024, it was projected to be around 67% and 33%, respectively.
   - Capacity charges work out as around 65pc of the total projected PPP whereas energy cost is around 35pc in FY25

i. The increase in CPP percentage is due to the augmented capacity of power generation plants and the addition of the HVDC line in the system
j. Power generation
   - Based on imported fuel is planned to be reduced to 13%, RFO has no contribution at all in the energy mix. Imported coal (due contractual binding) and RLNG is contributing just 9% and 4% in the total energy requirements, respectively
   - Share of indigenous fuels stand at 31%, i.e. 9% of local coal, 5% of local gas and 17% of nuclear in the overall energy mix
   - Increase of variable renewable energy to 56% (46% of hydropower and 10% of variable renewable energy) vs 6.5% of total current installed base requires evaluation of
     - Battery vs pump hydel and green hydrogen needs understanding given due different costing, subsidy need and environmental considerations.

sihaque@imransenergyinsights.com

- Clarity that most battery technologies are dirty and wasteful. Solar and wind turbines disposal is a challenge
- And that "Green hydrogen" throws away 70% of the electricity in production whereas in an electric vehicle only 20% of the electricity is wasted. That hydrogen as a fuel is incredibly complex with cost approximately x10 more than electric vehicles.
- Maximum value of solar generation does not occur when solar production is at its peak needs consideration of vertical panels

- The total installed capacity of renewable energy sources including hydropower, wind, solar, and bagasse/ biomass, in Pakistan's power system exceeds 13,000 MW.

k. As of June 30, 2023, the total number of net-metering consumers in the CPPA-G system was 56,427, compared to 37,769 as of June 30, 2022.
   1. Furthermore, the accumulated generation by net-metering connections during FY 2022-23 amounted to 481,863,365 kWh, in contrast to 150,669,148 kWh during FY 2021-22.
   2. In the FY 2022-23, 1,596 Net-Metering Licenses were issued, representing cumulative installed capacity of 221.05 MW.
   3. Net-Metering Import in KE was 102 MW in 2022-23 vs 60MW in 2021-22

l. Current projects show addition of 1.1TWH of Solar Energy through Solar IPPs for next FY at PKR 37 per unit. This is the reason, many countries are encouraging batteries to allow people to self generate and consume while opening up the ancillary services market to manage the variations through utility scale BESS and other existing plants.
   a. EPP for FY25 is at Pkr 9.69per unit (USc 3.49 per unit). Will we add large scale solar below this rate?

m. Effective energy storage solutions are thus essential to capture and store surplus energy for later use, especially when demand is high and supply is low.
   a. Developing or making available cost-effective and efficient energy storage technologies is crucial for maximizing the benefits of intermittent power sources.
   b. Unlike traditional power plants, intermittent sources cannot provide a continuous output, which means that excess energy generated during periods of high availability may go unused
   c. Facilitating microgrids in rural areas

sihaque@imransenergyinsights.com

d. Building a robust, extensive transmission infrastructure to transport the energy from where it is generated to where it is needed and interconnected grid is crucial for efficiently harnessing the potential of intermittent power sources.
    - Geographical location of these sources can pose logistical challenges given the land requirement e.g solar power is most abundant in regions with ample sunlight, while wind energy is more prevalent in specific geographic locations.

n. Intelligent tackling of the issues related to variability, energy storage, and transmission infrastructure will be key to realizing the full potential of hydropower, wind, and solar energy in pursuit of a sustainable energy future.
    a. Unlike conventional power plants that can provide a constant output, the availability of energy from hydropower, wind, and solar depends on weather conditions and water flow. This variability can lead to fluctuations in energy supply, making it challenging to match supply with demand in real-time.
    b. As a result, grid operators need to implement sophisticated forecasting and balancing mechanisms to ensure a stable and reliable power supply.

o. Endorsement of Clean Air Act with imposition of Green Tax immediately to control emissions and penalize the power plants, which emit excessive CO2, SOx and NOx than permitted under the Act
    - Establish CDM process to adjust/net off carbon emissions could offset some of the expenses related to power tariff by providing an alternate revenue source.

p. In June 2021, the Council of Common Interests approved the National Electricity Policy (NEP) and PPMC was also declared as designated entity to implement the benchmarks envisaged under the NEP
    - Power Planning and Monitoring Company replaces PAPCO established in October 2021, and is providing support to the Ministry of Energy (Power Division) in coordination, pertaining to Discos, Transmission & System Operations, Market Operations, Generation and leveraging IT for greater efficiency and sustainability; and on policy, technical and performance monitoring. PPMC needs to be made effective

- **Challenges can evaporate only if not ignored**

1. Sri Lanka has been able to lower electricity prices in 2024 due to a stronger rupee, lower coal prices, decisions taking including raising prices when costs went up.
    - *From July 2024, electricity prices were cut by as much as 32 percent for households, 38 percent for small domestic users and about 33 percent for industries and hotels.*

sihaque@imransenergyinsights.com

2. Fiscal Measures Outcome
    - *Sri Lanka rupee was close to 400 rupees during the economic crises and interest rates were 36 percent*
    - *Due to selling below cost, the Ceylon Electricity Board, owed money to the Ceylon Petroleum Corporation, banks, thermal and renewable power producers he said.*
    - *The central bank through deflationary policy allowed the rupee to appreciate to around 320 to the US dollar by end 2023 and it is now round 305 to the US dollar.*
    - *Borrowings had been settled from profits made in recent months and interest rates were now down to 15 percent.*
3. Fuel Cost, Weather, new Capacity helped reduce Generation costs
    - *Global coal prices were falling.*
    - *With strong rainfall the use of diesel was minimized.*
    - *New generation units and other renewables came on stream.*
4. The management of the Ceylon Electricity Board cut operational costs.
    - *In the last two years, no new staff has been recruited. Vs approved cadre of 26,000, there are only 22,000 now.*
    - *Bonuses and 25 percent three year salary increment has been halted during past 18 months;*
      salaries of technical staff salaries had to be increased but practice of giving 25 percent salary increments to all staff had stopped.
5. Minister Wijeskera "Now our electricity prices are comparable to some other countries." (Colombo/July16/2024)
6. Bangladesh Govt. recognised need to act on priority to set things right under a tight time schedule and therefore obtained authority to undertake reforms
    a. Under IMF Program
        - 5% tariff hike in each months of 1Q2023 for a total of 15%. On 29 February 2024, an average 8.5 per cent increase in average electricity tariffs to minimize subsidy to the sector.
    b. Has reduced export incentives
    c. Total Owed to IPPs
        - USD 3.5 billion (over Tk 35,000 crore) as of Sept. 2023
    d. Tariff includes
        - Demand Charge: Fixed monthly fee TK 42 for 1 Kwh.
        - VAT (Value Added Tax): 5%.
        - Monthly Meter Rent for single phase electricity meter: TK 40
        - 0.5% Rebate: For prepayment meters
    e. It has 16.5m lifeline consumers

sihaque@imransenergyinsights.com