

# Demand Trends & Effect on Investments



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## **Introduction**

- Demand is a driving key in forecasts of needed networks expansion, investments and costs.
- Long term demand forecasts are under the responsibility of Nepco by Electricity Law provisions.
- The demand forecast study is usually a combined data analysis of both economic and technical nature.

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## **Introduction**

- Methodologies used are:-
  - Market survey approaches (Bulk Supply Consumers).
  - Econometric Approach (Regression Models).
- ERC is responsible for reviewing the output of these studies and to use the results for its objectives.
- The planned investments or strategies in the sector are widely affected by the actual or forecasted trends of demand.



## **Objectives**

- Showing trend development for the latest period.
- Quick summary of efforts performed during conducting demand studies.
- Explaining the relation between demand development & required investments.
- Looking at Investments associated with demand GR.



### **Objectives**

- Pointing to the effect on tariff system in general terms.
- Defining the needs / tools to proceed.
- To address some problems accompanied with short and long term Planning.
- To open discussions and exchange ideas.



#### **Demand Trends**

#### Max. Load (2000-2009)





#### Final Consumption (2000-2009)









- At the beginning of this century there was no accurate expectation of growth (mainly Load Growth) for the period (2005-2009).
- A study conducted by Nepco in the year 2001 (Electricity Demand Forecast) expected Load to be 1844 MW where the actual was 2230 MW (around 17 % difference).
- After that , modifications were included in the Forecast studies such as including dummy factors (unexpected events) and considering practical experience leading to create empirical formulas in order to make the studies more accurate.
- Master Plans have been conducted tow times (2006) and modified in 2008 by a consultant company.

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#### **Forecast Study Efforts**

- Required information is gathered including :-
  - Economical Data such as (GDP, IPC, Population Growth ,...etc).
  - Historical data of Load & Consumption.
- Actual Survey of Bulk supply consumers (mainly large industries) is performed to prepare forecast for production and consumption per ton.
- Forecast of consumption sectors is determined using single or multiple Regression,,,

(Household, Commercial, Industrial, Water Pumping ,Services & Street Lighting Sectors).



#### **Factors included in Forecasts**

| Factors   | Sector          |  |
|---|-----------------|--|
| No. of Population , IPC , Electricity<br>Prices, Dummy Factor | Residential     |  |
| GDP, No. of consumers, Electricity                            | Small & Medium  |  |
| Prices  | Industries      |  |
| GDP, No. of consumers, Electricity<br>Prices                  | Commercial      |  |
| GDP, No. of consumers   | Services        |  |
| No. of Population , GDP                                       | Water Pumping   |  |
| No. of consumers  | Street Lighting |  |



#### **Effect of demand trends on investments**

- The required investments are widely affected by demand trends.
- Utilities get used to invest normally ,but according to high non expected growth rates (mainly (2006-2008)) the need appeared for more investments and sometimes the investments were not enough or not directed thoroughly (one indicator is the losses).
- Technology development has contributed in changing the consumers culture of consumption (Consumed Energy / Person developed from (1263 kWh) in year 2000 to (2006 kWh) in year 2009.











#### Jepco Detailed Investments (2005-2008)

| Description           | Investment (Million JD'S) |        |        |        | Last three                 |
|-----------------------|---------------------------|--------|--------|--------|----------------------------|
|                       | 2005                      | 2006   | 2007   | 2008   | years<br>average<br>growth |
| Transformers          | 1.722                     | 7.408  | 3.167  | 5.234  | 44.84%                     |
| <b>Overhead Lines</b> | 1.124                     | 1.489  | 1.939  | 1.987  | 20.92%                     |
| Underground<br>Cables | 2.013                     | 4.212  | 6.523  | 8.887  | 64.05%                     |
| Transformers          | 1.947                     | 2.330  | 6.119  | 9.168  | 67.61%                     |
| <b>Overhead Lines</b> | 2.293                     | 1.895  | 4.350  | 6.521  | 41.68%                     |
| Underground<br>Cables | 3.667                     | 2.682  | 6.117  | 9.872  | 39.12%                     |
| Total                 | 12.766                    | 20.016 | 28.215 | 41.669 | 48.34%                     |
| Demand (MW)           | 924.4                     | 1112   | 1237.7 | 1336   | 13.06%                     |

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#### Jepco Max Load GR % & Energy losses %





#### Jepco Losses Study For Year 2008

#### **Low Voltage Losses**

- 4600 low voltage sample feeders were used to estimate technical losses (5.2 losses %).
- Losses in feeders from low voltage network to consumers meters around 0.4 %.
- Losses of feeders from private substations to meters around 0.18 % for 6000 feeders.
- Losses in feeders from substations to the beginning of Networks and to meters around 0.5 % for 24000 feeder.
- Total estimated low voltage losses is 6.28 %.

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#### Jepco Losses Study For Year 2008

#### **Medium Voltage Losses**

- Transformers Iron & copper losses around 1.6 %.
- Using load flow program the losses on the medium voltage network is around 3.2 %.
- Total Medium Voltage Losses is around 4.8 %.

#### **Non-Technical Losses**

- Around 19 % of the meters were checked (880,000 meters for 2008).The results appeared that 5 % are tampered.
- Total non technical losses were 2.7 % (2.5 % theft and 0.2 % meters errors).

#### Total losses are 13.8 %.

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#### All Distributors(2000-2008)





#### **Effect of High Growth Rates on Energy Cost**

- When Demand increases we need to operate high costs & less efficient generation units.
- Fuel Prices are a major drive factor for increasing the costs of Generation.
- When Demand increases rapidly the networks are congested ,losses increases and the investments required may be not enough to meet the demand.
- Fuel prices liberalization in 2008 affected the costs of generation compared to the previous periods.
- Around 17 % of generation is by HFO & Diesel, others by local & Imported NG.



- Mainly costs of generation are fuel costs.
- The following chart explains yearly average fuel cost development (2006-2009).



2006 2007 2008 2009
A sharp increase in 2008 then a decrease in 2009 because of fuel prices & quantities (415.3 thousand ton in 2008 and 484.6 thousand ton in 2009).



#### **Effect on Tariff system**

• Tariff system is not a part of all mentioned since the assumptions used in preparing the tariff and the calculations performed depends widely on :-

Demand Forecast Trends.

Expected Investments of utilities.

≻Losses figures.

≻Fuel prices.

➢Fuel Consumed Quantities.

Economic factors.



#### **Summary / Challenges**

- There is no smooth growth of demand due to changes of economy and prices.
- Investments performed by the utilities is not synchronized with demand growth.
- No enough or not on date of adding BSP by Nepco.
- There is a need to think of more powerful demand forecast methodologies.
- Organized and uniform planning is required.
- Strong procedures are required to reduce losses in parallel with directing investments.



#### **Summary / Challenges**

- ERC need to develop procedures / tools to be able to review Demand Forecast ,Transmission and Generation Plans.
- It is becoming essential to vary fuel sources especially after international prices are increasing.
- This is also important since we are facing some problems from time to time in imported NG as what happened during the first three months of this year.
- The new Energy Strategy issued by MEMR take care of varying Fuel sources.
- Renewable Energy and EE Law approved 2010 shall help in emphasizing security of supply.

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# **Conclusion**

Planning tools need to be evaluated.

Reviewing procedures of utilities plans should be effective.

Changing experience in this field will help ERC to develop in an important aspects.

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# Thank You For Listening