New Challenges Facing an Optimum Electricity Generation Mix for Cyprus

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CERA objectives

- The main objective of the Cyprus Energy Regulating Authority is to **regulate and monitor the Electricity and Gas Markets** of the Republic in order to,
    - provide adequate and good quality services
    - ensure that the Energy Markets operate on the basis of sound competition
    - the various participants are acting with transparency
    - The interests of consumers are protected
    - The penetration of Renewable Energy Sources is promoted but following an orderly and controlled development path

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CERA competences, obligations and powers

the Cyprus Energy Regulating Authority, as all Regulating Authorities, is required to,

- Ensure adequacy in the supply of electricity for the satisfaction of the current and future need and demands
- Safeguard the continuity of supply, the quality of supply, reliability and security
- Promote the development of an economically viable and Efficient Electricity Market
- Encourage and facilitate competition avoiding discrimination
- Through competition aim at reduced prices
- Encourage the efficient use and Generation of Electricity
- Regulate tariffs, charges and other conditions to be applied by licensees.

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CERA competences, obligations and powers

- Some of the objectives may be conflicting, as is, for example, the requirement to maximise the security of electricity supply whilst at the same time maintain the lowest possible electricity prices to consumers.
- CERA is responsible for ensuring that the European Energy policy is closely monitored and followed --- and that all EU Regulations and Directives are properly addressed and adhered to.
- Through its participation in the bodies of CEER, ACER and MEDREG it ensures that the specific interests of Cyprus regarding the production transmission and distribution systems are taken into consideration during the discussions taking place from time-to-time.

Challenges

The main Challenges currently facing the Cyprus **Electricity Market** at this point of time can be grouped into four main categories:

1. Electricity Prices and Tariffs
2. Generation Mix Uncertainties
3. Network Operation and Control in the presence of high production levels by renewable energy sources and,
4. The suitability of the Market model currently adopted to respond correctly to the new developments.

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Challenges: **electricity prices and tariffs**

- There is growing pressure from circles of the Cypriot community regarding the high prices of electricity
- various aspects of the EAC electricity tariffs currently in operation are vigorously challenged
- There is a requirement to find the right balance between the need for a sensitive social policy in the difficult times ahead maintaining the general tariffs as low as possible, whilst at the same time, ensuring that the adopted prices correctly reflect on the actual production, distribution and supply costs.
- The penetration of renewables has changed the traditionally adopted reserve requirements, cold as well as hot stand-by. These new requirements need to be re-evaluated and be properly charged to those responsible for the added expense.
- the impact of the self-production at the distribution level on the daily demand cycle of consumers, distorts the basis on which the current tariffs were formed. Thus, a re-assessment is now required by taking into account the new scenarios emerging.

Challenges: **generation mix uncertainties**

- The exact timing for Natural Gas to be made available for use at the EAC power stations. Any **credible** generation expansion plan requires as input the timing and quantities of gas year-by-year.
- Do we need large, “bulky” and difficult to manoeuvre units or light, small and flexible? Is it prudent to add more base plant in the Vassilicos vicinity?
- ***What capacities and when new conventional plant are required?*** - when considering the maximum possible and economically feasible penetration of renewables
- ***What is the value of the sensitive separating line*** - for financial and technical reasons - ***between optimum natural gas use for local electricity production and maximum RES penetration***?
- ***What values of hot and cold generation reserve are required, in order to cover the unpredicted behaviour of production based on wind and the sun***? – expected to be sizable for an isolated system. The use of special types of smaller and very flexible types of generating units may be inevitable.
- ***What is the best response to the strong pressure for speeding up the penetration of renewables***? - especially the penetration through a widespread installation of photovoltaic systems of all sizes, small on households up to 7kW, medium up to 2MW and large above 2MW. There a definite need to define a maximum allowed penetration level for each year ahead.

Challenges: **networks and control**

- A widespread penetration of photovoltaic systems in the distribution network will have as a consequence serious difficulties in balancing Generation and Load, as generation will be unpredictably produced and varied at a huge number of points.
- This, will detriment the accepted standards of security of supply, possibly as a result of uncontrolled generation shortages and element outages.
- The adequacy of the existing distribution system feeder capacities and performance at medium and low voltage to handle a widespread penetration of distributed Renewable Energy needs to be carefully monitored and investigated. Protection problems and power reversal are also potential issues.

Challenges: **networks and control**

- a possible electrical interconnection between Israel-Cyprus and Cyprus-Greece-European Transmission System, when and if the results of the study currently in progress prove the project viable presents an additional challenge with important repercussions on the market system behaviour.
- This link will change in-total the way the system is now operating, with many concepts needing a new look.
- The degree of dependence on this link, as a parameter for assigning the firm generation installed capacity in the island, is a matter that CERA needs to consider when assessing the required security of supply.

Challenges: **Trading and Settlement Rules**

- As the effective Market opening has not as yet succeeded in introducing effective competition, CERA is required to look into the reasons for this and to examine the effectiveness of the current structure of the market design.
- According to the TSO, the existing Rules cannot be put in operation immediately, requiring a number of preparation time and a high cost to the extent that there will be problems in accommodating a new IPP in the immediate future.
- RES producers now expect to be given the opportunity to operate within the Electricity Market framework without the support of Government Subsidies
- The suitability of the current Trading and Settlement Rules (Market Rules) to handle the widespread penetration of Renewable Energy Sources is brought into questioning
- The existing balancing mechanism adopted in the current Market Rules, cannot handle a large portion of the total generation produced by renewables, as the balancing market, it is now dependent on small only deviations from planned allocations to generation units. It is also dependent on a reasonably accurate day-ahead forecast

RESPONSE TO CHALLENGE: electricity prices and tariffs

- The availability of natural gas in the near future, say by 2018, as well a controlled penetration of photovoltaic systems are aiming at bringing a sizeable reduction in electricity prices for the end consumer.
- Future tariffs will greatly depend on the optimum generation mix for each 24-hour period
- The Electricity Authority of Cyprus is inviting Consultants, following a request by CERA, who are expected consider these and come with suitable proposals.

RESPONSE TO CHALLENGE: generation mix uncertainties

- Soon, with the arrival of natural gas and a higher penetration of Photovoltaics, together with wind production, the era of a single type of fuel for the production of electricity is ending.
- However, the difficult past 18 months have demonstrated and proved the usefulness and the need for smaller and manoeuvrable generating units with short start times, especially when the cost differential is not substantial. Whatever the cost is, however, it should not be passed to the consumer but it should rather be calculated carefully and burden those causing it.

• Similarly, the cost of cold reserve should be calculated and charged in this way.

RESPONSE TO CHALLENGE: **generation mix uncertainties**

- **Setting of a maximum level of permitted penetration of Photovoltaics.** The need for this limit is understood by considering the current generation and demand levels.
- Soon there will be approximately 160MW of wind turbines in operation and 80MW of Photovoltaics. It may easily be expected that their total production will approach 100MW, with a combined sun-wind effect of say 150MW.
- The current operation indicated that production from Photovoltaics may frequently approach capacity. Now, the normal demand variation during the day is between 350 to 500 MW, i.e. more than a third of the generation needs to be covered by hot (and cold) reserve, at a high cost.
- To avoid unnecessary plant for reserve, we need to determine the proportion of installed capacity of Photovoltaics that could be considered as beyond doubt available. This may range between 15 and 30 per-cent.

RESPONSE TO CHALLENGE: **generation mix uncertainties**

- The best way to provide the necessary reserve for covering the operation of renewables and to permit their highest possible penetration is the building of the **classical pumped storage scheme**.
- However, the initial costs are extremely high and the pay-back period long. Thus, it is difficult to offer incentives, even if its costs are partially covered by assessing and charging its capability to provide secondary and long term reserve to those who are linked to the requirement of such provision.
- The main cost recovery will come from the income received when supplying energy during the periods of highest demand and thus highest charges. The usefulness of such systems was proven well before the penetration of Renewables with their associated production uncertainties. Nevertheless, the current financial situation makes the raising of the high capital needed a very difficult task.
- I consider any other form of storage still at an experimental stage, in spite of the encouragement received by the European institutions for studies and research.

RESPONSE TO CHALLENGE : **changing consumer behaviour**

- Following the high prices of electricity during the past 18 months coupled with the prevailing financial crisis, an unprecedented substantial drop in electrical consumption is observed. Low demand is recording levels nearing those observed TEN years ago.
- This new consumer behaviour, coupled with the inflexible generation by renewables and especially wind, has serious effects on maintaining even system frequency control and hindering the proper use of optimal conventional generating unit commitment.
- As a result, smaller and flexible generators are needed, which, nevertheless, contribute to higher cost when compared to the larger combined cycle high-efficiency plant
- The sizable drop in system demand is also observed during the peak periods, and this has a positive impact, by delaying the requirement for additional plant in the following years. By that time, the uncertainties surrounding the penetration of renewables or the appearance of new IPPs will be better known, giving time to better study conditions and develop new suitable policies.

RESPONSE TO CHALLENGE: **networks and control**

- After a widespread penetration of photovoltaic systems in the distribution network, difficulties are to be expected in balancing Generation and Load and ensuring acceptable standards of security of supply.
- CERA plans to initiate a study to determine the highest permitted wind and PV penetration.

RESPONSE TO CHALLENGE: **Trading and Settlement Rules**

- CERA responding to the need for an investigation for the reasons which led to the difficulties in attracting competition and allowing RES to operate within the Market framework, has invited international Consultants who submitted Tenders to assess the situation.
- The Study Objectives include the following reasoning for re-examining the design of the Electricity Market bearing in mind the need for compliance with,
    - the overall requirements of the 3rd Energy Package,
    - the new conditions prevailing in the question of bringing natural gas to Cyprus, which seriously affect any investment decisions in generation capacity, and also
    - the need to facilitate the entry of new participants in the electricity market and
    - the more effective integration and participation of Renewable Energy Sources (RES) in the electricity market,
    - the preparation of the revised national plan for the integration of RES as well as the revision of the existing grants' schemes,

RESPONSE TO CHALLENGE: **Trading and Settlement Rules**

- More specifically, the Consultant will,
- evaluate the existing market model and its suitability to support the electricity system in Cyprus and function in line with the basic principles for the redesign of the electricity market in Cyprus
- compare the existing market model with other market models,
- suggest the improvement of the existing market model or the adoption of a completely new market model,
- suggest the implementation of changes to the existing model, or the implementation of a new model and relevant provisions during the transitional period.
- Regardless of the market model that will be chosen, to fully safeguard the security and reliability of the Transmission and Distribution System

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Conclusion

- The challenges and problems are recognised and an attempt was made to outline a few of the issues facing the Cyprus Electricity Market.

- As a first step, in order to reach the optimum decision, it is important to thoroughly understand all the dimensions involved in each issue and to move swiftly but yet cautiously, without been harassed by pressures exercised by those who will later not be directly affected by the consequences of bad decisions.