" The role of Networks in Greece's power supply and their evolution in the future "

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HELLENIC ELECTRICITY DISTRIBUTION NETWORK OPERATOR S.A.

Ladies and Gentlemen,

I would like to begin my speech by thanking deeply the Maniatakeion Foundation and especially the Chairman, Mr. Dimitris Maniatakis for his invitation and to congratulate him for his initiative to organize such an interesting event in a beautiful and historical city as Kalamata. We would like also to thank the Municipality of Kalamata for the hospitality and its support.

Greece during the post war period, showed characteristics similar to the ones we are experiencing nowadays, whereas then, we managed to reverse the adverse predictions and to achieve amazing growth rates for several decades that changed our lives. I wish and hope that this will happen today as well.

In today's event we will make a historical review that will take us back but, at the same time, will give us optimism so as to move forward. All of our achievements within these years are the best omen for our future. It is guaranteed that with hard work, responsibility and devotion we will manage to achieve even more.

During the last 60 years, Public Power Corporation has been the main axis of development, the backbone of our economy; the Corporate-model for the country, operating under the principles of private economy-when allowed-pertaining to Greek people, has been the bright example of principles, know-how and system administration that, unfortunately, were not easily accepted by the supporters of the "narrow" public sector who, from time to time, either with the identity of a politician or syndicalist or bad executive and employee, have put obstacles to its course.

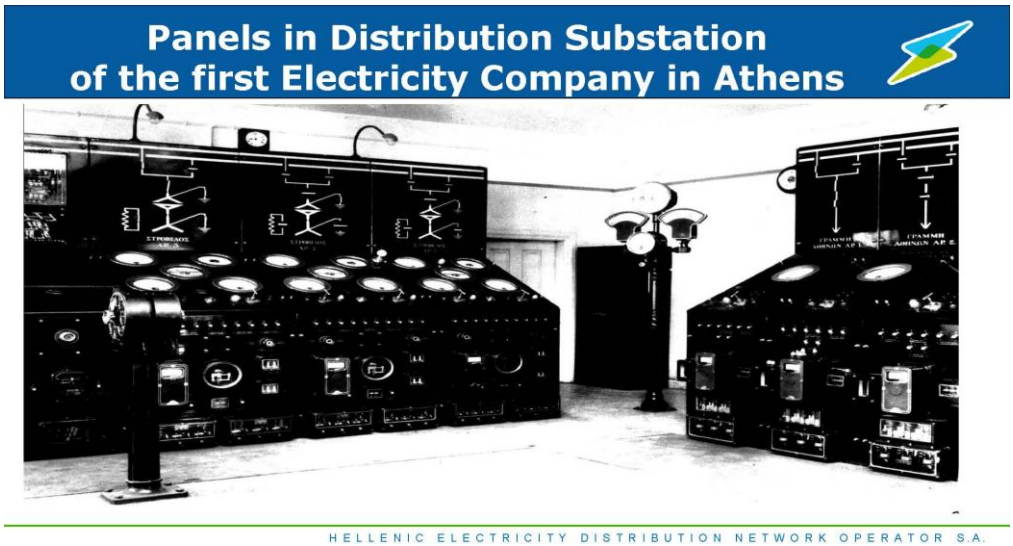
Representing the Hellenic Distribution Network Operator, subsidiary of PPC S.A., and responsible for the development and operation of electricity grids in the whole country, I will try to describe in brief, one of the main PPC's activity sectors, the Electricity Networks, their history and future.

The first cables were installed in the sewage network in the center of Athens, when the General Contracting Company undertook in 1889 the electricity supply and generation in Athens and particularly within the "triangle" that included the boundaries of Omonoia Square, Panepistimiou str., Ermou str. and Athinas str.. In the areas where there was no sewage network, the company was able to install overhead cables which, with the expansion of the sewage network, was obliged to place them underground.

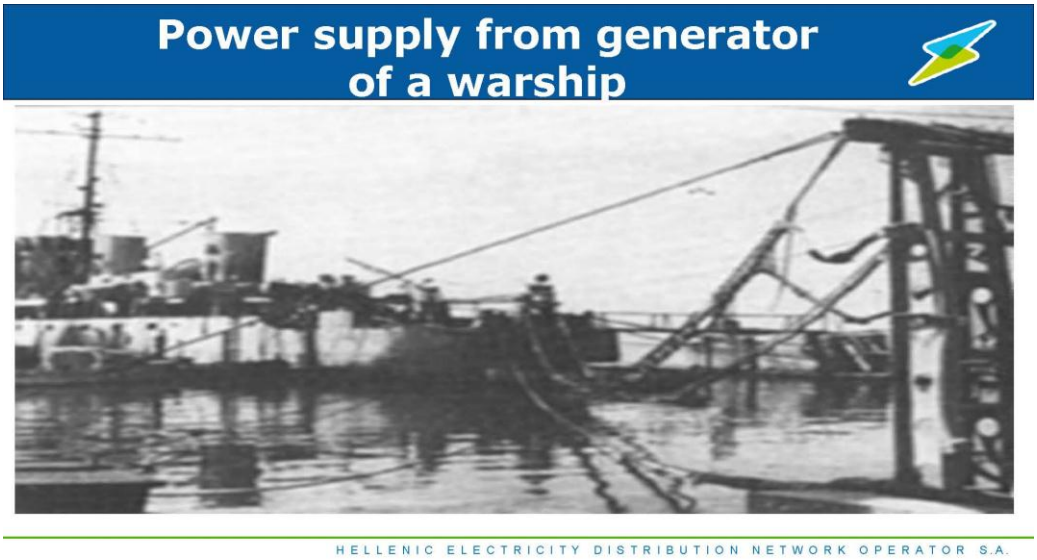
Within the following period until the '50s, hundreds of legal and illegal companies were established within the Greek territory. These companies supplied with electricity the cities using mainly small-scale networks.

Upon its establishment, in 1950, PPC acquires the exclusive privilege of generation, transmission and distribution of electricity in Greece. However, in the distribution sector, **a limitation was applied in this privilege** referring to those areas where the service provision was granted to municipal, communal or private companies. However, **the efficient organization of distribution was determinative not only for the good operation of PPC and the power supply of the country, but also for Greece's economic growth as well as for the whole investment plan in agricultural, industrial and touristic sector**.

The Distribution Sector was the main pillar and the basic infrastructure on which the investment and development planning of the country was relied.



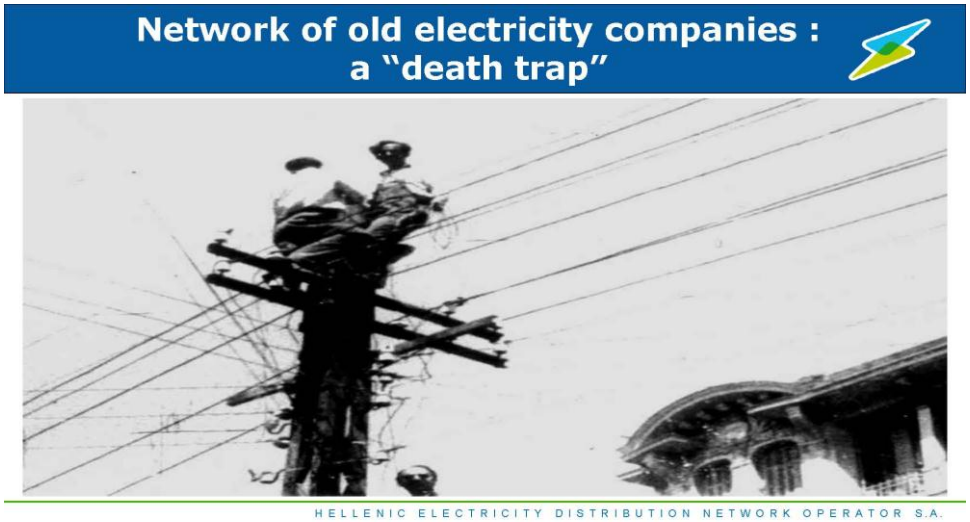
In 1956, PPC started to buy off the private electricity companies. Based on the regulations imposed by the Law 3523 of the same year, PPC was invited to undertake the responsibility of the distribution networks.



At first, several different administrative units were established in the region, numbering in total 13 regional offices included into four Regions, Northern Greece, Thessalia, East Sterea-Evia and Peloponnese-Epirus.

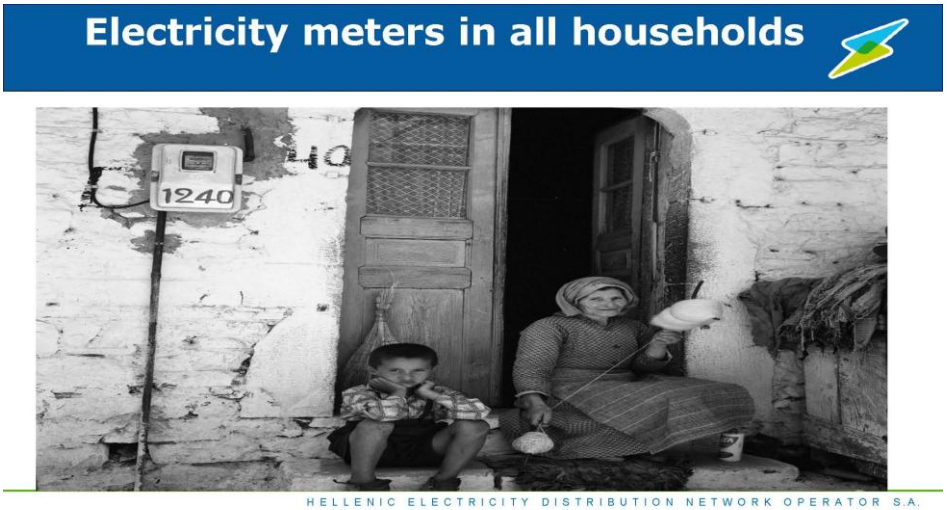
During this period, with the guidance of the American EBASCO, the organization of the Distribution services followed the organizational structure and the principles of the American administration which were not adapted so as for the PPC to undertake exclusively the responsibility of Networks for the whole country.

In order to respond to the new challenge at that time, PPC proceeds to the establishment of two Departments, that is, the Department of Distribution Exploitation and Department of Distribution Research & Constructions, well-known until recently, that lead and supervise the whole technical and commercial development and exploitation of the Networks.



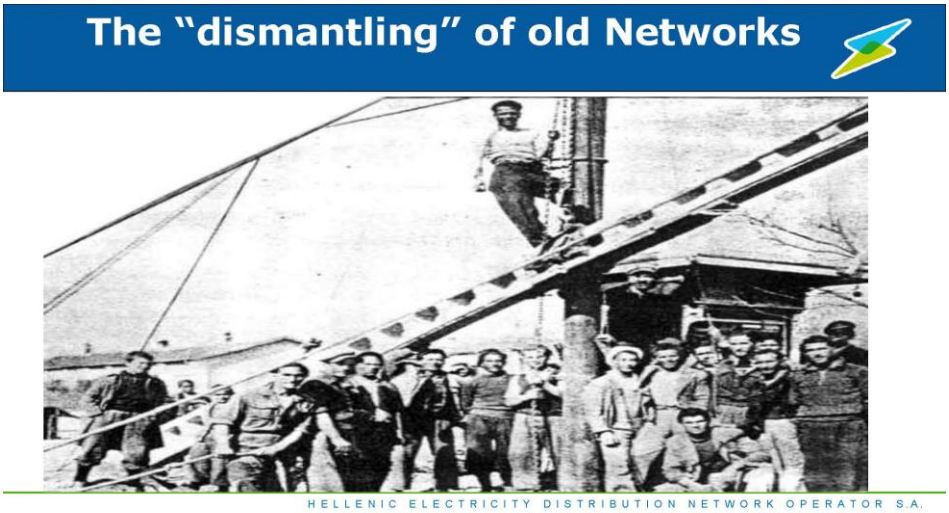
Until the end of the same year (1956), PPC's Distribution units were organized significantly and an intensive effort was initiated for the promotion of power supply in the country through the expansion of M.V and L.V. networks.

New distribution electricity networks were constructed almost from the beginning for all the regional exploitations and they were supplied with alternated current of 220/380V, while the old networks were dismantled.



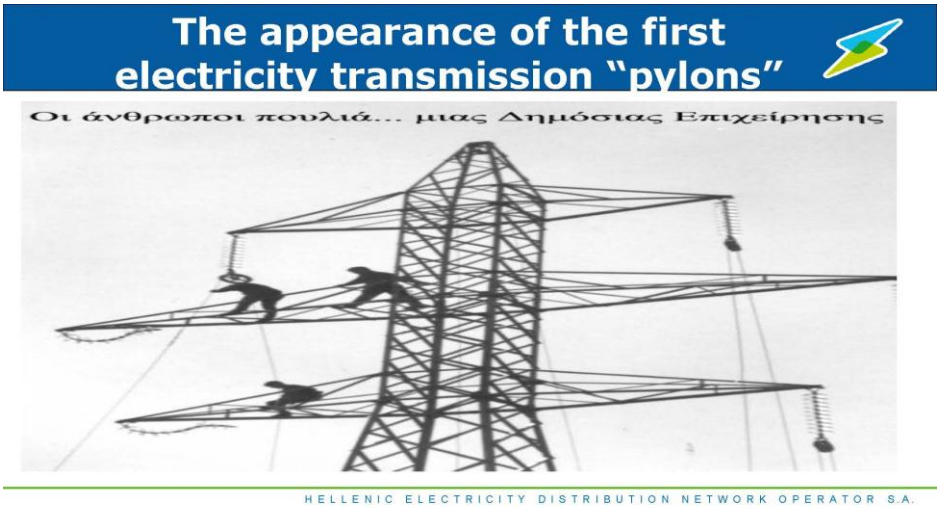
At the same time, inspections and replacement of the consumers' internal electricity installations were conducted so as to be reconstructed and to receive the new type of current that would replace the direct or alternated current of 127/220V.

It should be pointed out that for this change, PPC financed the 90% of total expenses for each installation.



In the meantime, in areas where local electricity generation plants existed, the equivalent city networks were powered progressively by the national PPC network, after the construction of the required medium voltage power lines and, gradually, the local plants stopped to operate.

In our islands, where this was not possible, the local plants were upgraded and enhanced with modern big machines capable of supplying with power not only the city, but also the wider area of the island.



Before proceeding to the networks evolution, I would like to mention that the long-term planning of MV networks was applied, that is, the planning for 15,000V lines which would later cover the whole Greece – by changing to 20,000V - so as to provide services almost to the totality of population.

The evolution of administrative units

YEAR	Regional Departments	Regions	Offices	Branch Offices
1959	5	33	30	18
1960	5	41	35	44
1961	5	41	36	39
1962	6	47	87	87
1963	6	47	90	97
1964	6	47	90	97
1965	6	47	101	98
2013	5	58	80	87

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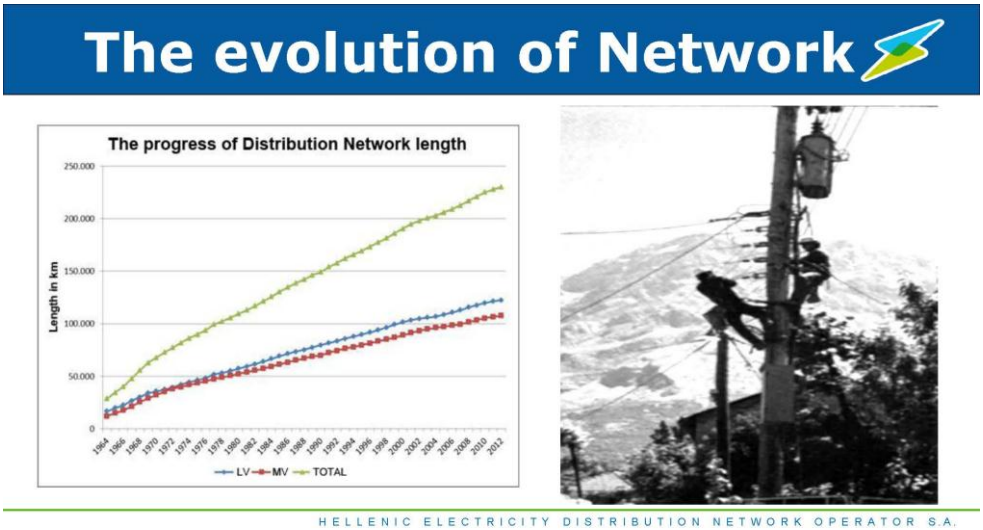
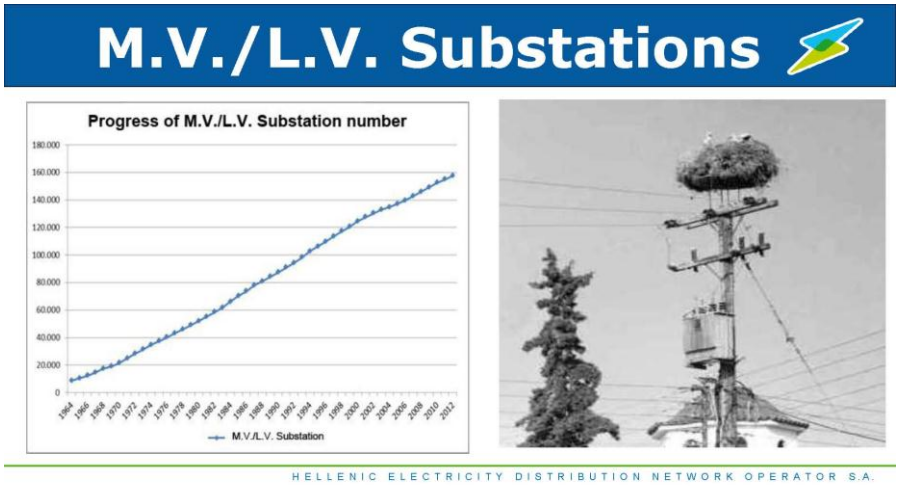
Referring to regional administrative units of distribution, I should mention that, as you can see in the table, from a total number of 30 offices and 18 branch offices in 33 regions in 1959, we reached in 1965 101 offices and 98 branch offices in 47 regions, while today, we have in total 80 offices, 87 branch offices in 58 regions that are included in five regional departments. The new five-year business plan for the period 2014-2018 foresees the reduction of administrative units from 230 points to 130, as well as the change of the way with which customer care services are provided to network users via Internet and call centers.

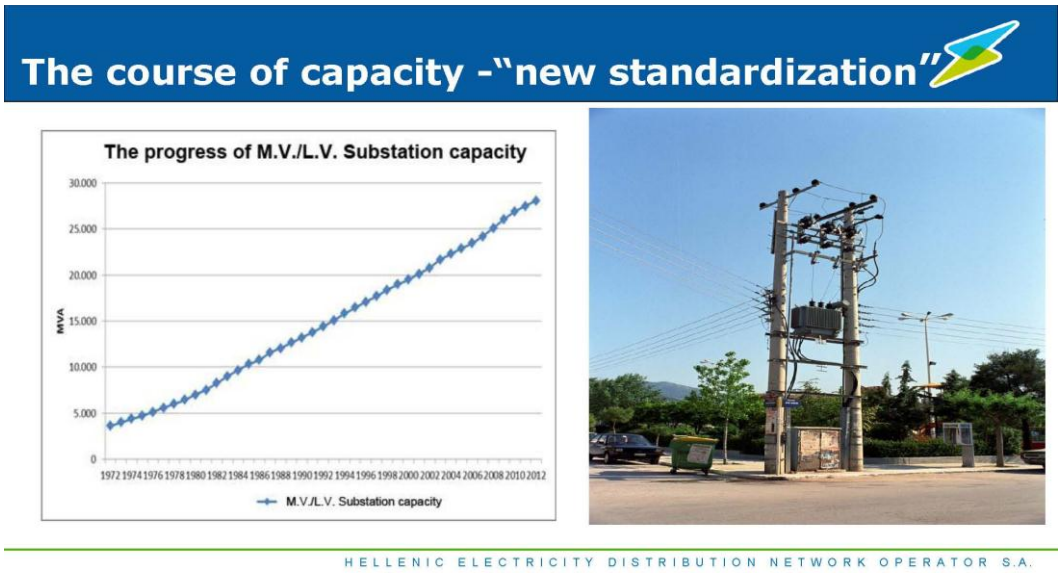


In 1964, the length of Distribution Network reached 28,600 km, that is, the 1/10 of our present network that reaches 233,000 km, a number that is almost equivalent to six times around the earth! The average rate of Network development was 4,000 km annually.

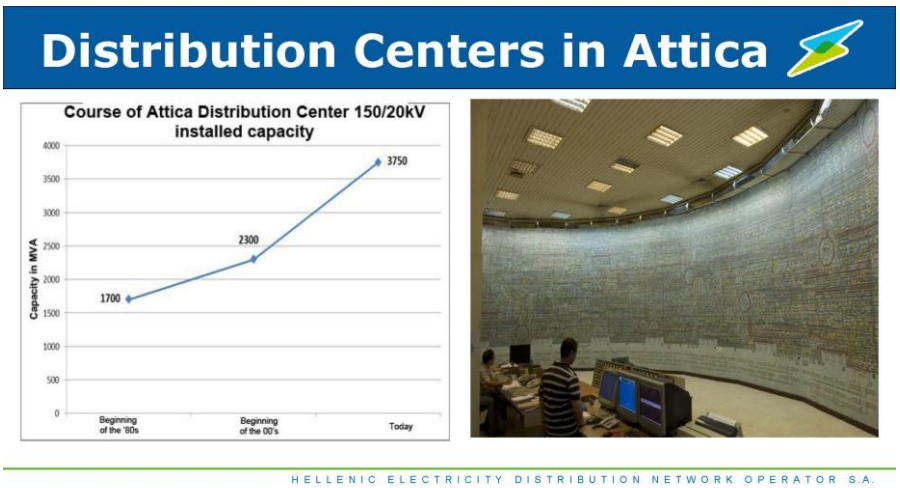


The development and the course of MV/LV substations is equally impressive because from a number of 8,600 in 1964, we reach today almost 159,000. Their average development rate reached 3,000 annually.

Apart from the evolution of Substations number, this photograph taken from a village in Thessalia is amazing because the nest of storks was built under PPC care.



The course of these Substations (M.V./L.V.) was similar, from 3,600 MVA in 1972 to more than 28,000 MVA in 2012, that is, an annual average rate of 625 MVA (625,000KW).

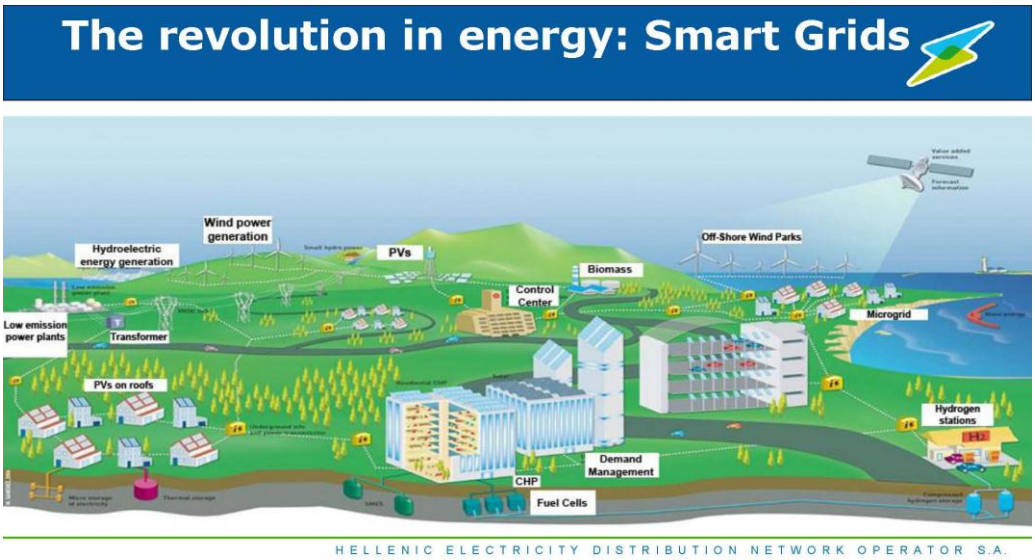


Concluding the part of development and course of Distribution infrastructures, I should make reference to the HV/MV Substations which are 240 up today with total capacity that surpasses 19,700 MVA.

At the same time, the construction of closed-type Distribution centers within the Attica basin was initiated during the ‘70s and was implemented at the beginning of the ‘80s. The initial infrastructure of 7 Distribution Centers was sufficient until the end of the ‘90s, with intermediate increase of installed capacity for some of them. During the past decade, six more centers were constructed in the occasion of the Olympic Games, numbering today up to 13 with total installed capacity of 3,750MVA from 1,700 at the beginning of the ‘80s.

The “modern” photograph of the slide is no longer up-to-date. All of the elements figured in the chart on the wall must be integrated into a PC system.

Concluding with the Distribution infrastructures, I should mention that, today, HEDNO numbers 7,000 permanent and 500 fixed-term employees while cooperates with contractors who employ in total 5,000 people approximately. Our annual turnover is up to 1.2 billion euros.



Here, we can see a picture-vision of a local system that includes together Generation, Network and Consumption, as well as Electricity, IT systems and Telecommunications. This is the “Smart Grid”.

Today, in HEDNO, being responsible of the country’s Electricity Distribution Network, we plan intensively for the future. The development and the evolution of Networks enter into a new stage. The modernization of our Networks and the introduction of new technologies are our primary goals.

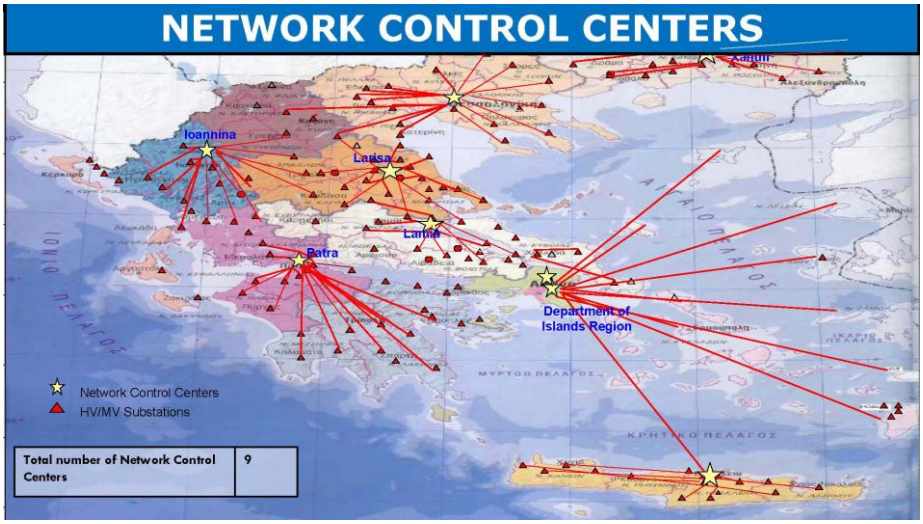
Lately, Smart Grids are the center of strategy for all major electricity corporations worldwide and particularly in Europe.

Smart Grids are substantially a modernized complete electricity system that monitors and optimizes in real time the operation of all data interconnected into it. That is, all the devices that provide services to producers, consumers and suppliers connected to it.

It is an infrastructure that automates monitoring of networks using the appropriate equipment and software, which combined with telecommunication technologies, provides many advantages compared to the existing infrastructure. The central SCADA systems (Supervisory Control and Data Acquisition) provide us with the ability of supervision and acquisition of necessary data concerning the network. With the addition of the appropriate technologies for sensors and meters, we acquire the ability of remote control and telemetering. At the same time, Smart Grids include advanced DMS (Distribution Management System), that is, power distribution management systems that constitute the main parameter for undertaking crucial decisions and actions. The advanced DMS provides the possibility of remote management through modern remote controlled switches and interactive communication devices such as smart meters.

The new Grids minimize the on-site metering, provide the possibility of immediate location and isolation of faults, as well as the improvement of our time of response to incidents that affect negatively the good operation of the Grid and, consequently, the quality of the provided services. All this infrastructure, described in brief, establishes a fully interconnected grid between consumers and electricity suppliers which is more effective, safe and reliable, allowing at the same time the smoothest integration of Renewable Energy Sources (RES), as well as the integration of electricity powered vehicles into the system.

Summarizing, the benefits of Smart Grids include improvement of energy reliability and quality , the enhancement of network authenticity concerning faults and power interruptions, the full automation of maintenance and its operation, the upgrade of services provided to customers but also, further cost control and power saving.

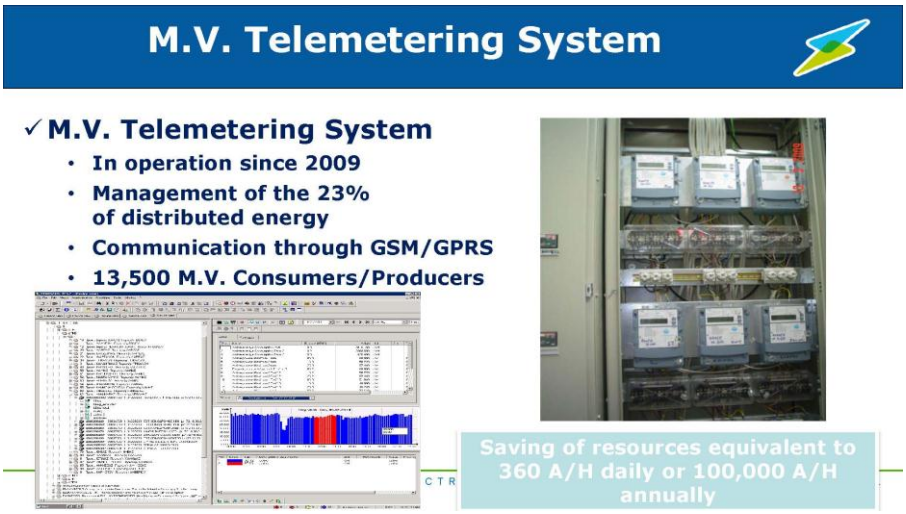


Aiming at the creation of a modern infrastructure, we have already begun the implementation of significant projects.

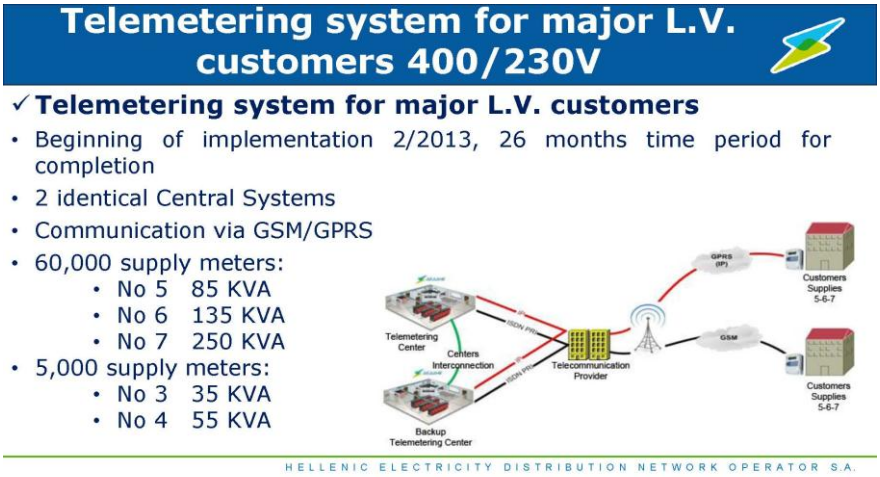
I would like to mention some of them indicatively. We proceed to the installation of **9 new Distribution Network Control Centers** through which constant monitoring of operation status and Distribution Networks management are realized not only in the High to Medium Voltage decrease Substations but also in Medium Voltage Networks.

Through the Distribution Network Control Centers, we can execute remotely controlled actions, while we acquire complete control of our Network through direct information provided via SCADA networks.

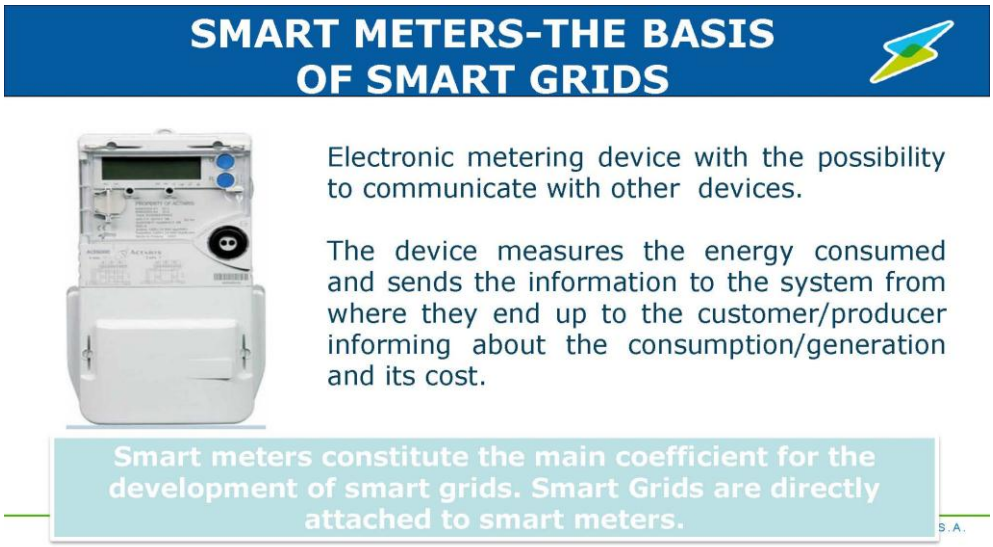
The contribution of the Distribution Network Control Centers in the improvement of electricity quality provided to our customers is decisive allowing immediate provision of information in case of fault and its rapid restoration. Also, we plan the immediate installation and operation of an operation center in Athens.



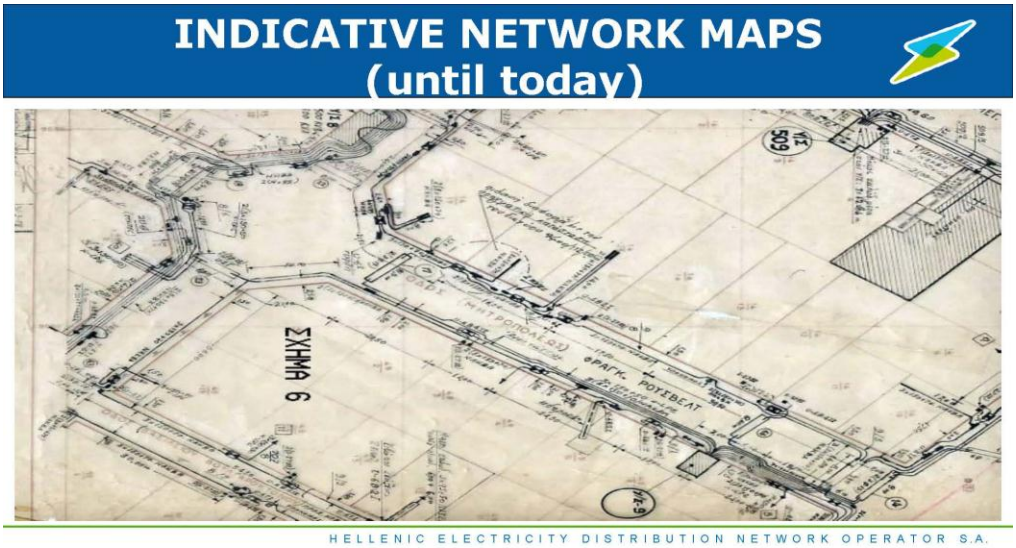
Our vision for a Smart Distribution Grid requires the simultaneous implementation and coordination of many projects. Towards this direction, the **M.V. Telemetering System (20KV)** operates since 2009 and manages the 23% of the distributed energy. Telemetering with the use of GSM and GPRS refers to 13,500 M.V. consumers and producers.



At the same time, the implementation of a Telemetering System for major LV customers was initiated and financed by NSRF. The system includes two similar Central Systems; the communication is realized through GSM and GPRS and will include 60,000 meters of 85 kVA, 135 kVA and 250 kVA supplies and 5,000 meters of 35 kVA and 55 kVA supplies.

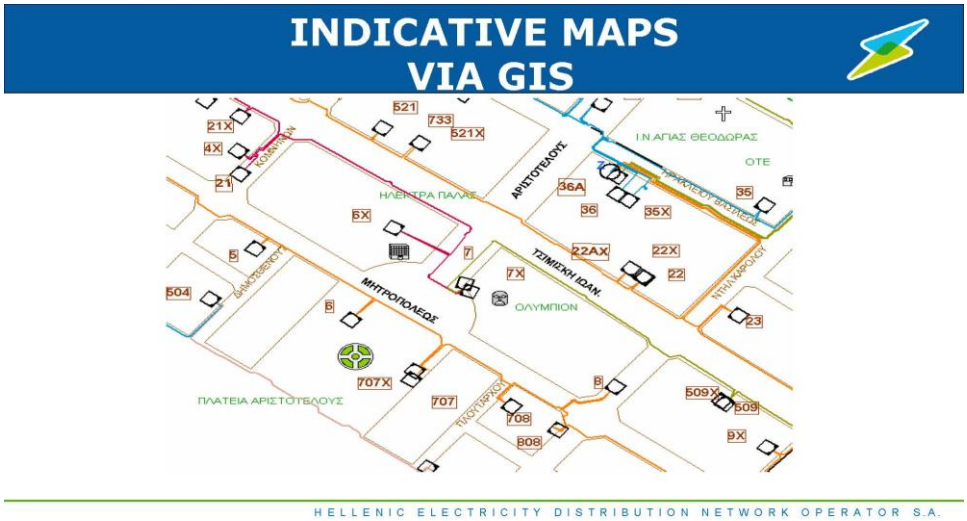


Also, we proceed to the implementation of a pilot system for **Telemetering and Management of power supply demand in residential and small business consumers** integrating 130,000 one-phase and 30,000 three-phase metering points in Xanthi, Lesvos, Limnos, Ag. Efstratios and Lefkada. The project, which is integrated into NSRF, includes two identical central systems for 160,000 L.V. telemetering meters, 4,300 metering devices and remote supervision of Distribution Substations for these regions as well as 160,000 screens. This pilot project is of decisive importance for the gradual application of smart grids in the whole Greek territory and the replacement of approximately 7 million existing meters with Smart Meters.



We introduce a new **Geographic Information System (GIS)**, that constitutes the main “pillar” of the required infrastructure for the support of many Smart Grids applications.

With this system, we aim at the representation of our network maps into digital data. These files will include descriptive information for the Network data in relation with their geographical position. The new System will provide us with the possibility to process rapidly mapping and descriptive information of our Networks which will lead to the modernization of Distribution technical activities. The benefits will be transferred to all Network users through integrated provision of services. In the slide, you can see the handwritten maps that we use today.



In this slide, you can see indicative maps via GIS.

Today and in the future, the networks will be the heart of the cities and of the economy. At the same time, they will be at the center of intense business interest in the energy sector. The networks are developed rapidly and constantly as the main elements of Smart city infrastructure, integrated into the vision of the European politicians for the protection of the environment, the reduction of emissions, power saving and upgrading the quality of our lives. In HEDNO, our ambition is to constitute a company-model,that will change the Hellenic Electricity Network, supporting our country's course towards growth.

I thank you very much.