



ADVANCING  
PUBLIC  
TRANSPORT



**O.SY. S.A. (ROAD TRANSPORT S.A. - ODİKES SYGKOİNONİES S.A.)  
ELECTRIC VEHICLES DIVISION**

# **THE GREEK WAY ATHENS OVERHEAD WIRES AND SUBSTATIONS; PLANNING MAINTENANCE AND OPERATIONS IN TIMES OF TIGHT BUDGET CONSTRAINTS**

**Dimitrios Lykos  
Electrical Engineer  
Director of Electrical Vehicle Division**

**September 2015**

# The strong economic crisis in Greece has created numerous challenges in the functioning of the Electric Vehicles Division

**Since 2010, Greece is facing a strong economic crisis...**

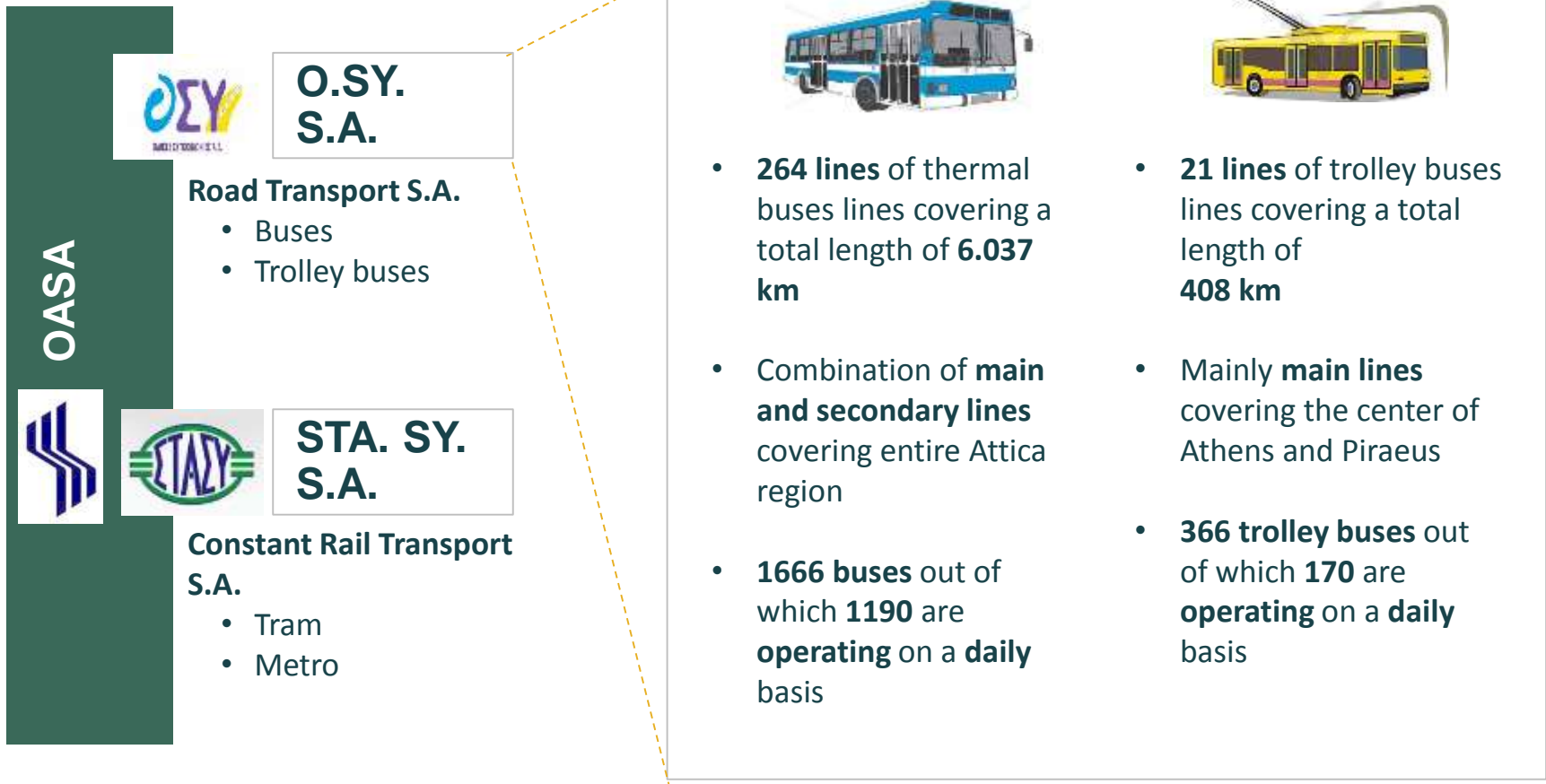
- **Cease of economic activities**
- **Slowdown in production**
- **Emergence of social changes**



**....which affected key functions of O.SY. S.A. and therefore the Electric Vehicles Division**

- 1 Reduced funds**
- 2 Difficulties in obtaining spare parts for the network and vehicles maintenance**
- 3 Severe lack of personnel due to retirements and the prohibitive policy of making new hires**

# Electric Vehicles Division sits within and is supervised by the OASA S.A. ...



# ... and is responsible for the operation and maintenance of the trolley buses, network and substations

Today we own a total of 366 trolley buses, which operate ...



- Type: **NEOPLAN-KIEPE-ELVO N6014**
- **112** trolley buses
- Since 1999



- Type: **VANHOOL-ALSTOM – SFAKIANAKIS A300T**
- **112** trolley buses
- Since 1999



- Type: **NEOPLAN-KIEPE-ELVO N6216**
- **91** trolley buses
- Since 2004



- Type: **NEOPLAN-KIEPE-ELVO N6216 (articulated)**
- **51** trolley buses
- Since 2004

... in an extensive overhead and underground network

- **275km Overhead Network**, out of which approx. **12km** is **Inactive**
- **242km Underground Network**
- **93 network crossings**
- **95 mechanical and 85 electrical switches** on the network
- **40 supply substations**
- **220 pillars**



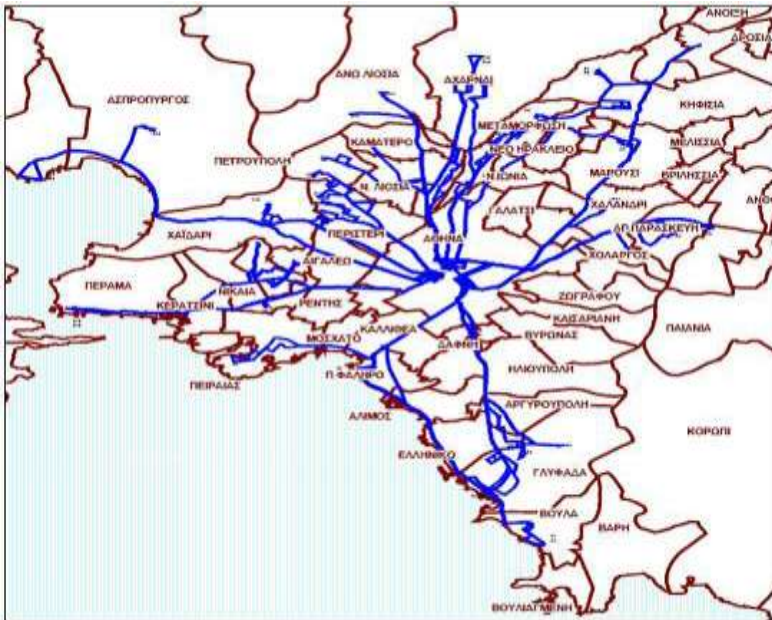
Overhead Network



Underground Network

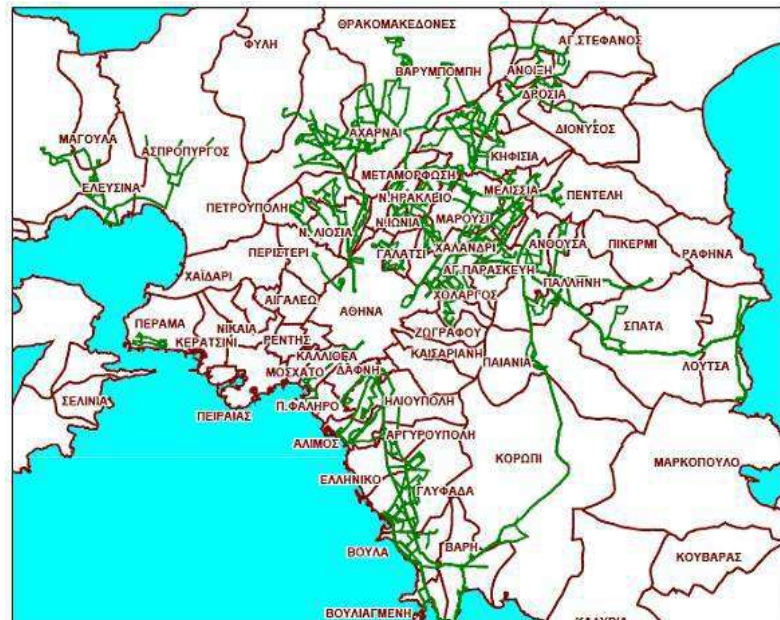
Overall, O.S.Y. S.A. network consists of 285 bus and trolley lines, covering a total length of 6.400 km

### Main lines



Main lines unite the municipalities centers with the center of Athens and Piraeus

### Secondary lines



Secondary lines travel through municipalities ending to a main line

Since the beginning of crisis in 2010, our primary challenge was to deal with the personnel reduction

**A**

**38% less trolley drivers**

**B**

**31% less operating trolleys**

**C**

**29% less trolley's maintenance technical staff**

**D**

**31% less overhead network technical staff**



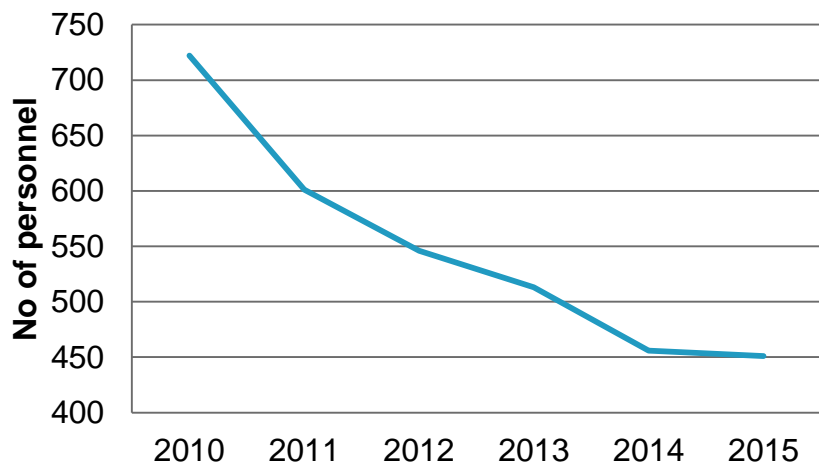
**Focus in this document**



**Operations were affected by the reduction in the drivers, resulting into a 31% decrease of the daily operated trolley buses**

**A**

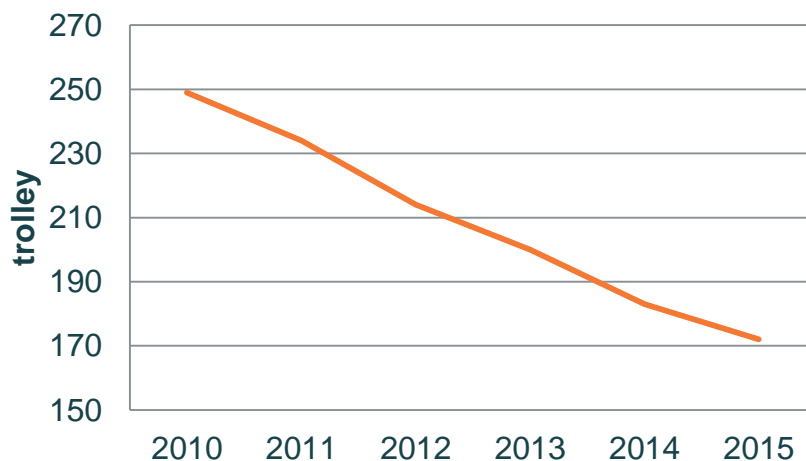
**Trolley Drivers**



**Since 2010, the number of trolley drivers was reduced by 38%, from 722 to 451...**

**B**

**Operating Trolley buses**

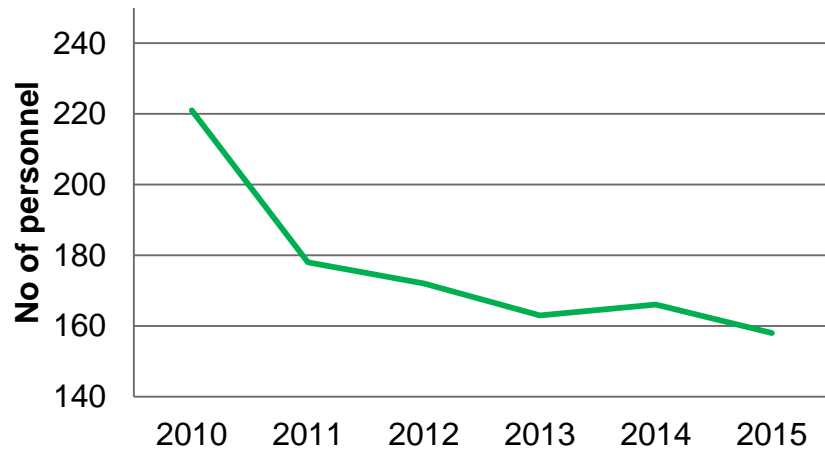


**... followed by a reduction in the daily operated trolley buses by 31%, from 249 to 172**

Likewise, maintenance has faced challenges due to the reduction in the number of technical staff available

C

### Trolley Maintenance

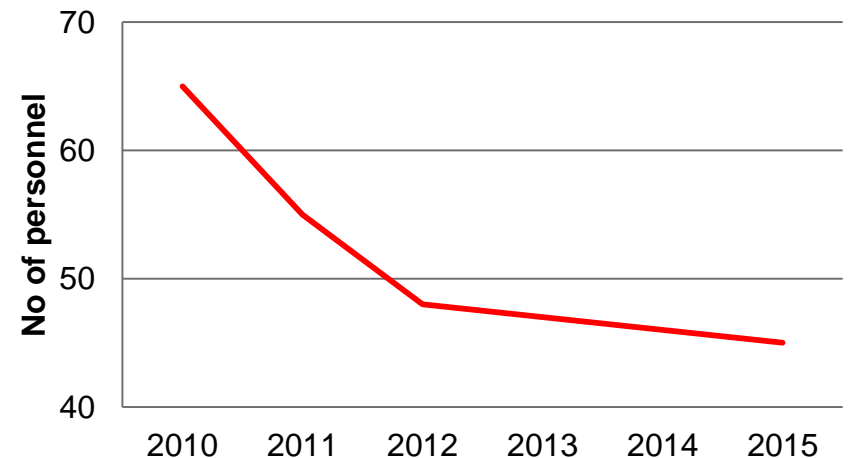


The number of technical staff used for the maintenance of the trolley buses was reduced by 29%...

... while the technical staff available for the overhead network and substations maintenance decreased by 31%

D

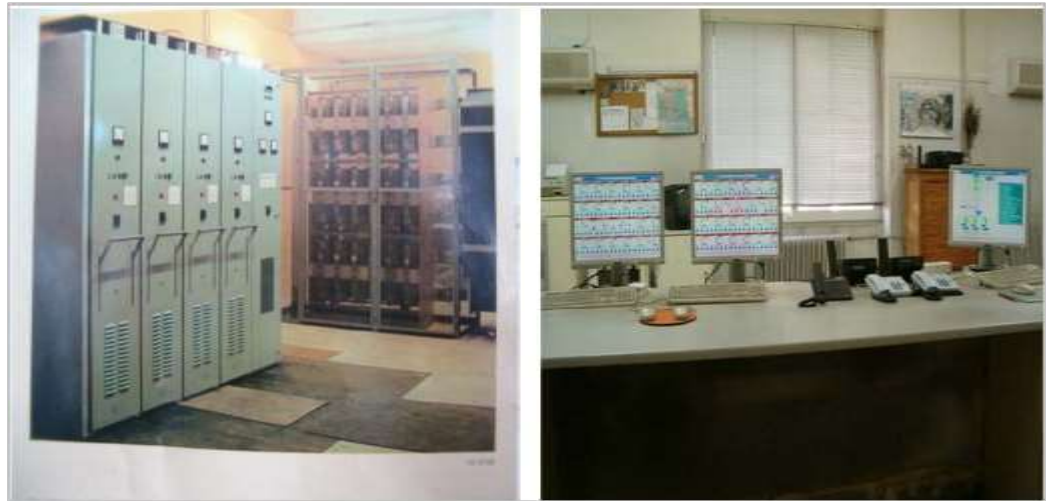
### Overhead Network and Substations



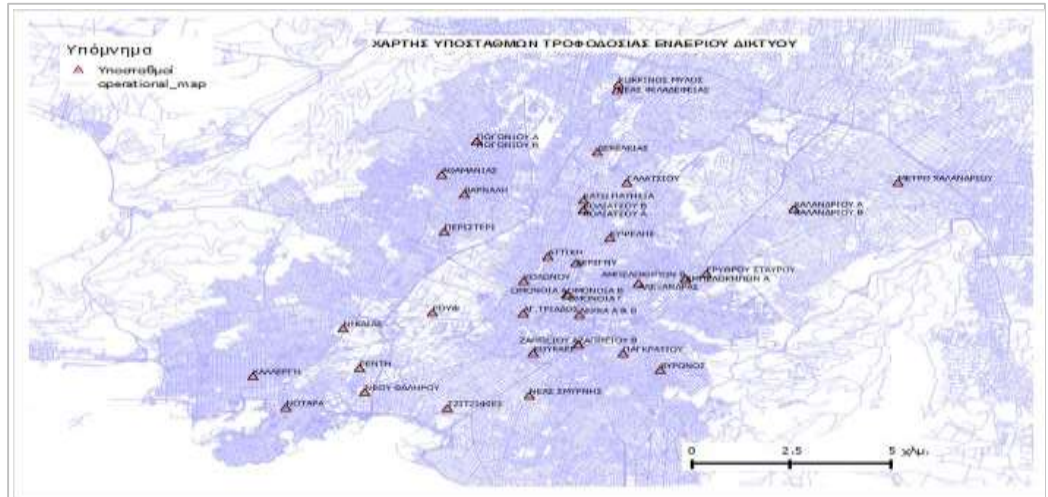


# Despite the reduced personnel and the lack of funds, the Electric Vehicles Division continues to maintain all substations

A typical substation and the Monitoring Center with an installed Skada system which provides the ability to control and monitor all the substations and each automatic switch of them



Across the area of Athens and Piraeus the Electric Vehicles Division owns a total number of 40 substations



# However we faced a great challenge in our operational planning in regards to the overhead network maintenance

**The technical staff of the overhead network are responsible for the:**

- **Constructions of new lines (more than 20km)**
- **Displacement of old lines due to the expansion of the TRAM network in Piraeus**



**Due to the reduction in their total number by 31% in the last 5 years, we faced the dilemma of the optimal mitigating actions to follow:**

- I Increase the personnel, which as forbidden due to crisis and lack of funds**
- II Reduce / lower our maintenance standards**
- III Modernize our network, so to confront the problem with technology and lower needs of maintenance**

# **Our response to this challenge is to modernize our network, which will lower the needs of maintenance in the long run**

## **Our journey to modernize our overhead network**

---

**2008**

**ILPAP S.A. (today OSY S.A.) decided to purchase new technology components, so we secured early enough the necessary funds**

**2010**

**In the beginning of the crisis we already had changed a number of old parts of the network and we continued our effort regardless the reduction of our network technicians**

**Today**

**Nowadays our division gradually:**

- **Converts the whole network from fixed type into semi-rigid suspension (with Delta suspension) system**
- **Makes changes in the network with new type of suspension and components of the latest technology, including the replacement of all the old switches with new both mechanical and automatic**

# Since 1999, we have made major steps towards modernizing our overhead network

## State of the infrastructure until 2009

- 1999-2004: New trolleybuses operate on outmoded infrastructure
- Several antenna plug derailments have been identified in positions throughout the Overhead Network where there are:
  - Old crossings
  - Electrical and mechanical switches
- Largest Western European network with absence of basic components in digital form



## Network with the new components



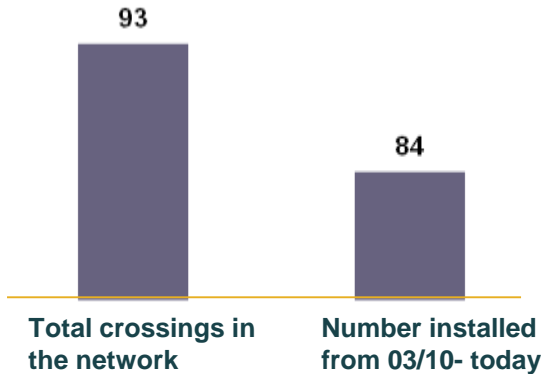
# Overhead network modernization facts

## Facts part modernization

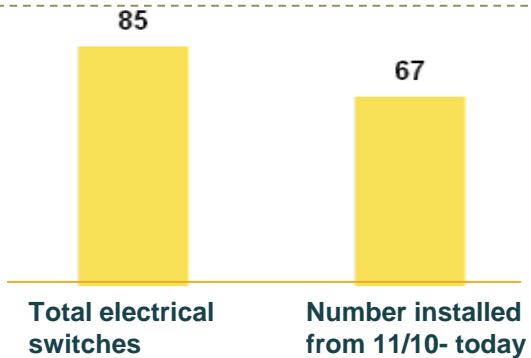
## Old types

## New types

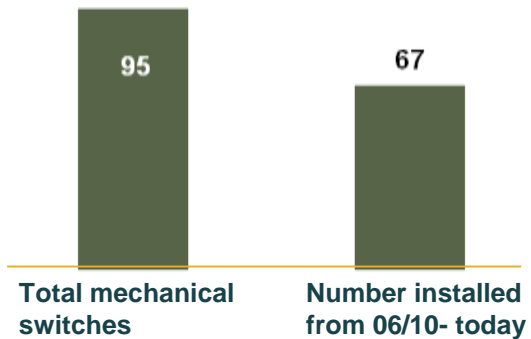
### Crossings



### Electrical switches



### Mechanical switches





***Thank you for your attention***

# BACK UP





## Crisis in numbers:

### Reduction of Personnel in Electric Vehicles Division

	2010	2011	2012	2013	2014	2015
Trolley Drivers	722	601	546	513	456	451
Max trolley buses operated per day	249	234	214	200	183	172
Depots technical staff	221	178	172	163	166	158
Overhead network & substation technical staff	65	55	48	47	46	45