

# **ENEL's Metering System and Telegestore Project**

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L'ENERGIA CHE TI ASCOLTA.

# Situation in Italy (1)

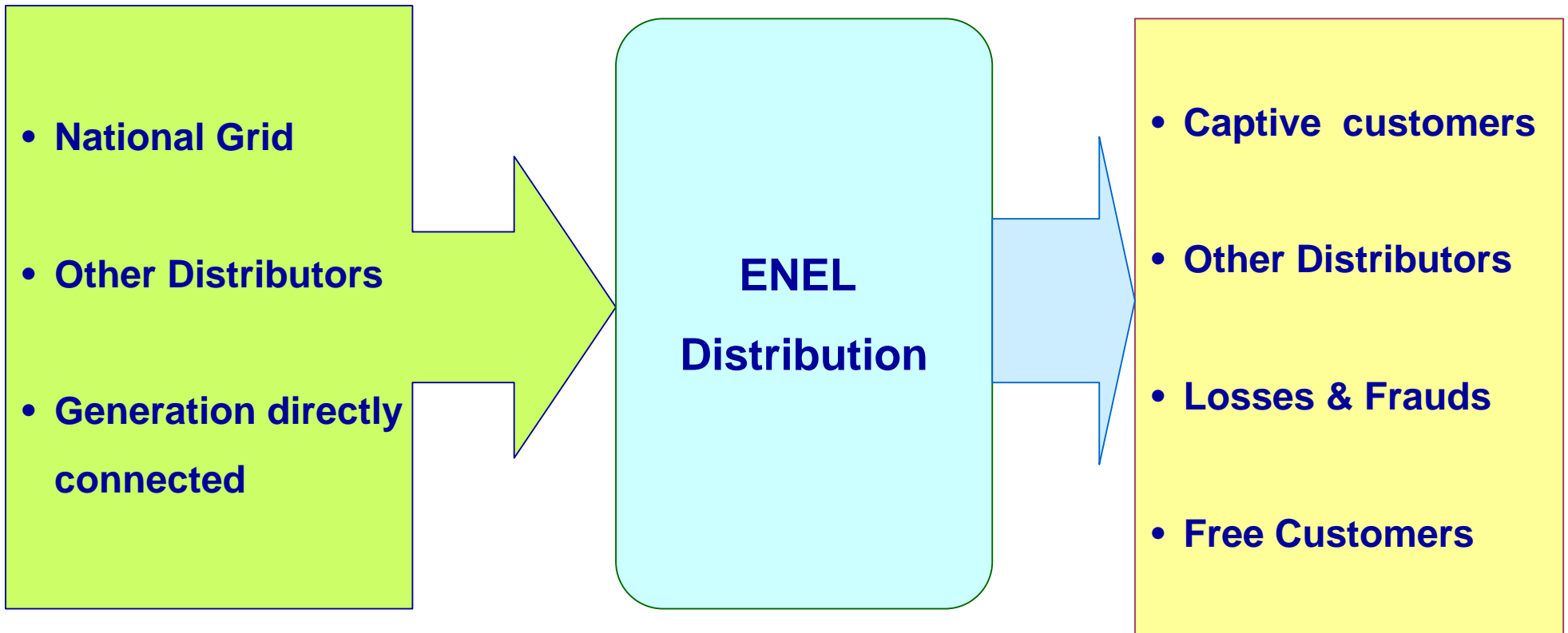
- **Liberalization in progress pursuant to Government Decree n.79 of 19<sup>th</sup> March 1999 - More than 20% customers already free to chose their own supplier**
- **Fully liberalised market as from July 2007 - All customers will be free**
- **Automatic Metering Infrastructure mandatory pursuant to AEEG's (the Italian Regulator) resolution n. 292 (issued 18<sup>th</sup> December 2006)**
- **Meters are owned by distributors and customers are not allowed to buy their own meter**

## Situation in Italy (2)

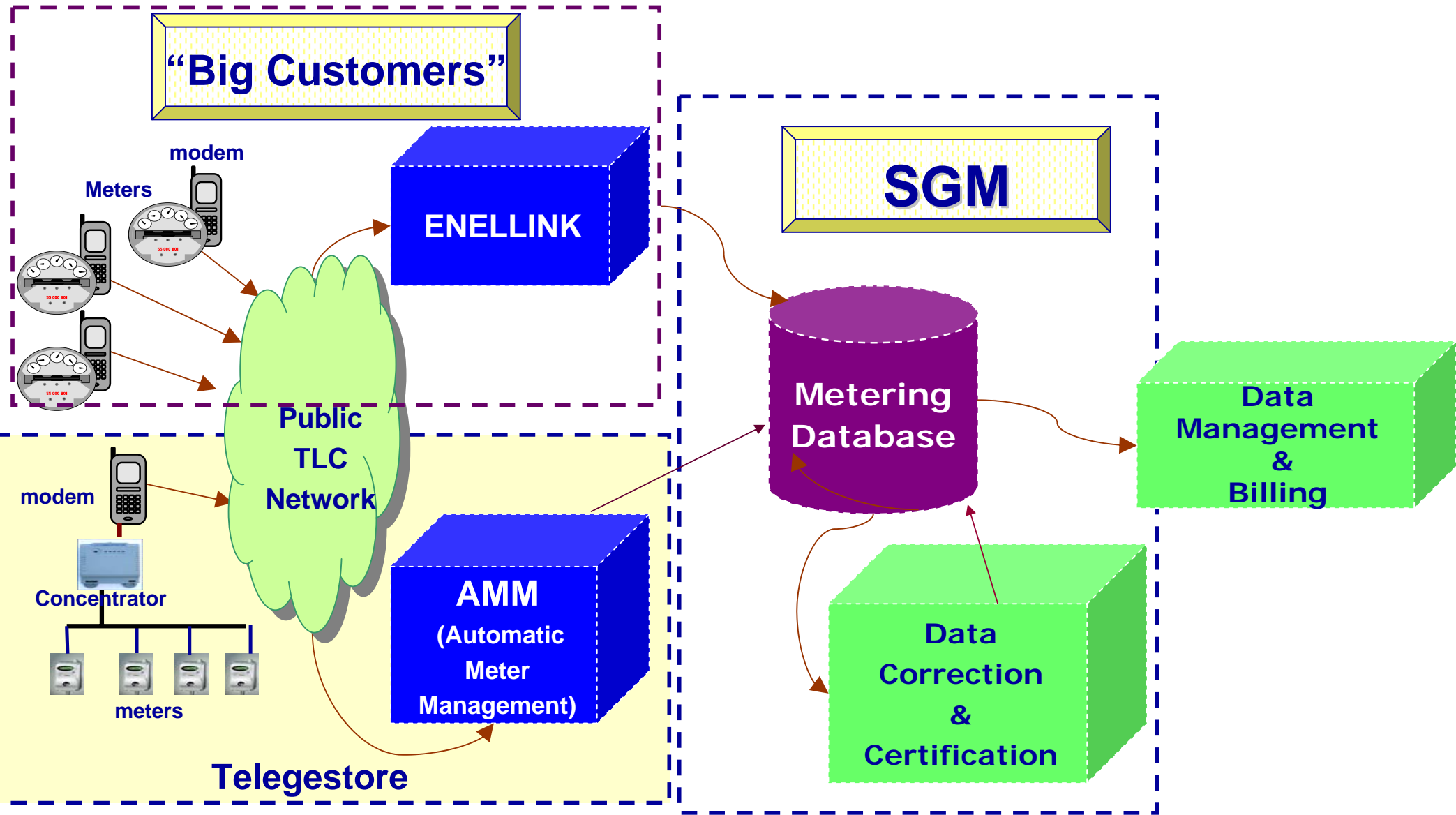
- **Generation, Transmission and Distribution are separate activities and are carried out by distinct companies**
- **National Grid (the Transmission) owned by several players**
- **One large distributor (ENEL), many medium-sized distributors owned by Municipalities (Rome, Milan, Turin, Brescia, Parma, Verona, Trieste, Bologna, etc), a lot of small local distributors**
- **Generation market fully liberalised (several operators)**

# ENEL Distribuzione's Metering System

## Energy Balance



# ENEL Distribuzione's Metering Systems



# ENEL Distribuzione's Interval Meters (Big Customers)

Interval Meters (December 2006)	95.806
Customers	92.115
HV Customers	1.070
MV&LV Free Customers	37.337
MV&LV Captive Customers	53.708
132/150 kV Substations	3.711

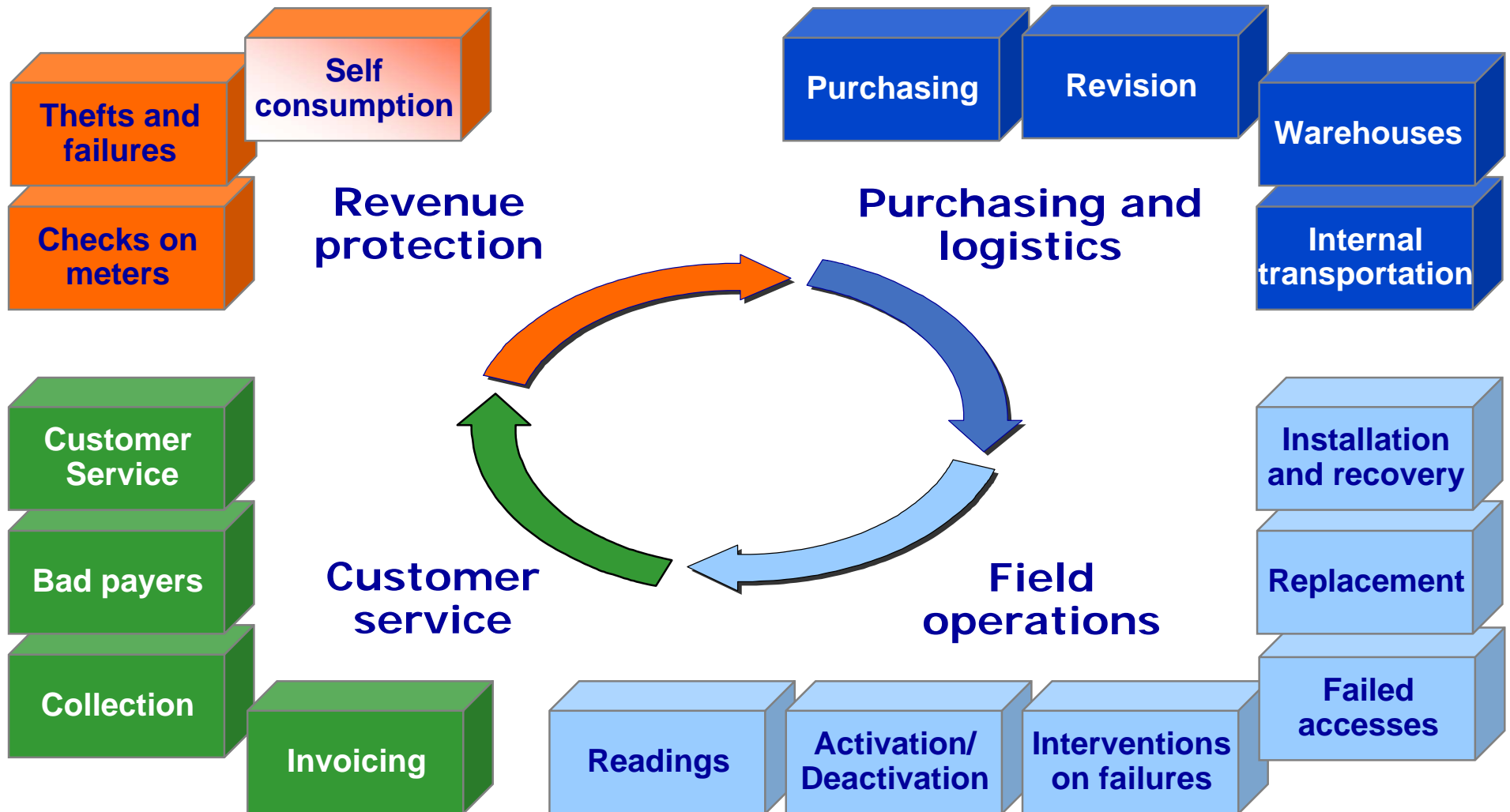
# ENEL Distribuzione's Telegestore

- **Since early '90s ENEL Distribution has been experiencing systems to manage meters remotely (not only AMR systems)**
- **Remote Management Systems were and are efficient and cost effective for industrial (energy intensive) customers. The question to be answered was: are they cost effective for mass market customers?**
- **A massive pilot test of 70000 installations (40000 in Rome) confirmed the technical viability of remote management based on the low voltage grid (Distribution Line Carrier) in the A band of EN50065-1**
- **The pilot proved that hybrid technology (electro-mechanical meter +electronic unit) is not cost effective; ENEL Distribution decided not to continue the deployment of this solution**

# ENEL Distribuzione's Telegestore

- At the end of 1998, ENEL Distribution, after having examined the total cost of metering activities and studied some interesting cases in the United States, reconsidered the cost-effectiveness of the remote management of mass market meters
- A business plan was setup with different scenarios, concluding that in a few years it would have been possible to change all residential and small business E/M meters with new electronic meters; the B.P. was conservative, i.e. without considering future functionalities, e.g. load profiles, DSM or in-home automation
- To obtain this result jointly with a sound pay-back period (about 4 years) ENEL decided to resort to contract manufacturers for manufacturing of meters: only contract manufacturers are able to supply million of meters

# Telegestore project: saving areas



# Telegestore project: total investment

R&D Costs

Production and installation  
of Electronic Meters

Production and installation  
of Concentrators

IT System development

**2,100 M€**

# Telegestore main roadmap

- **Kick-off** **October 1999**
- **Laboratory prototype (single phase)** **August 2000**
- **Industrial pre-series (single phase)** **December 2000**
- **Laboratory prototype (poly phase)** **March 2001**
- **Field test start-up (1000 meter)** **February 2001**
- **Type/life test & homologation** **June 2001**
- **Production start** **June 2001**
- **Mass installation** **January 2002**
- **Mass installation full ramp-up (700.000 meters/month)** **September 2002**

# Full *Telegestore* implementation in less than 5 years

From the  
old  
metering  
equipment  
...



...to the  
new one



2001:

2003:

2004:

2005:

2006:

	2001:	2003:	2004:	2005:	2006:
Equipment Installed	150.000	13.000.000	21.000.000	27.000.000	29.800.000
Remotely managed	N/A	10.000.000	18.800.000	26.000.000	28.800.000
Bimonthly read	N/A	1.000.000	4.300.000	25.000.000	28.700.000

- More than 7.000 people involved in production and installation
- 20.000 meters produced and installed every day

**Electronic meters**

**33 Millions**



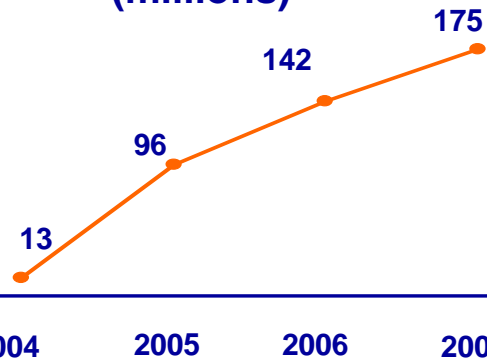
**Central System**

Data processing, invoicing & remote management

**Concentrators**

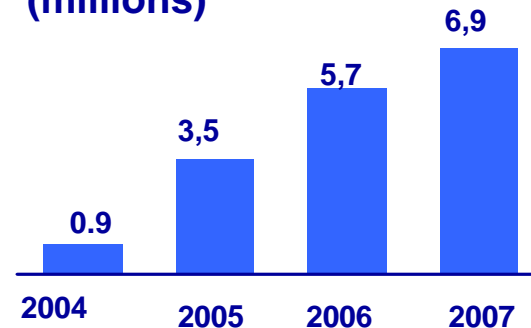
**350.000**

**Remote Readings (millions)**



- ▶ Customer Care Improvement
- ▶ Fraud Reduction
- ▶ Diagnostic Acquisition

**Remote activities (RdA) (millions)**

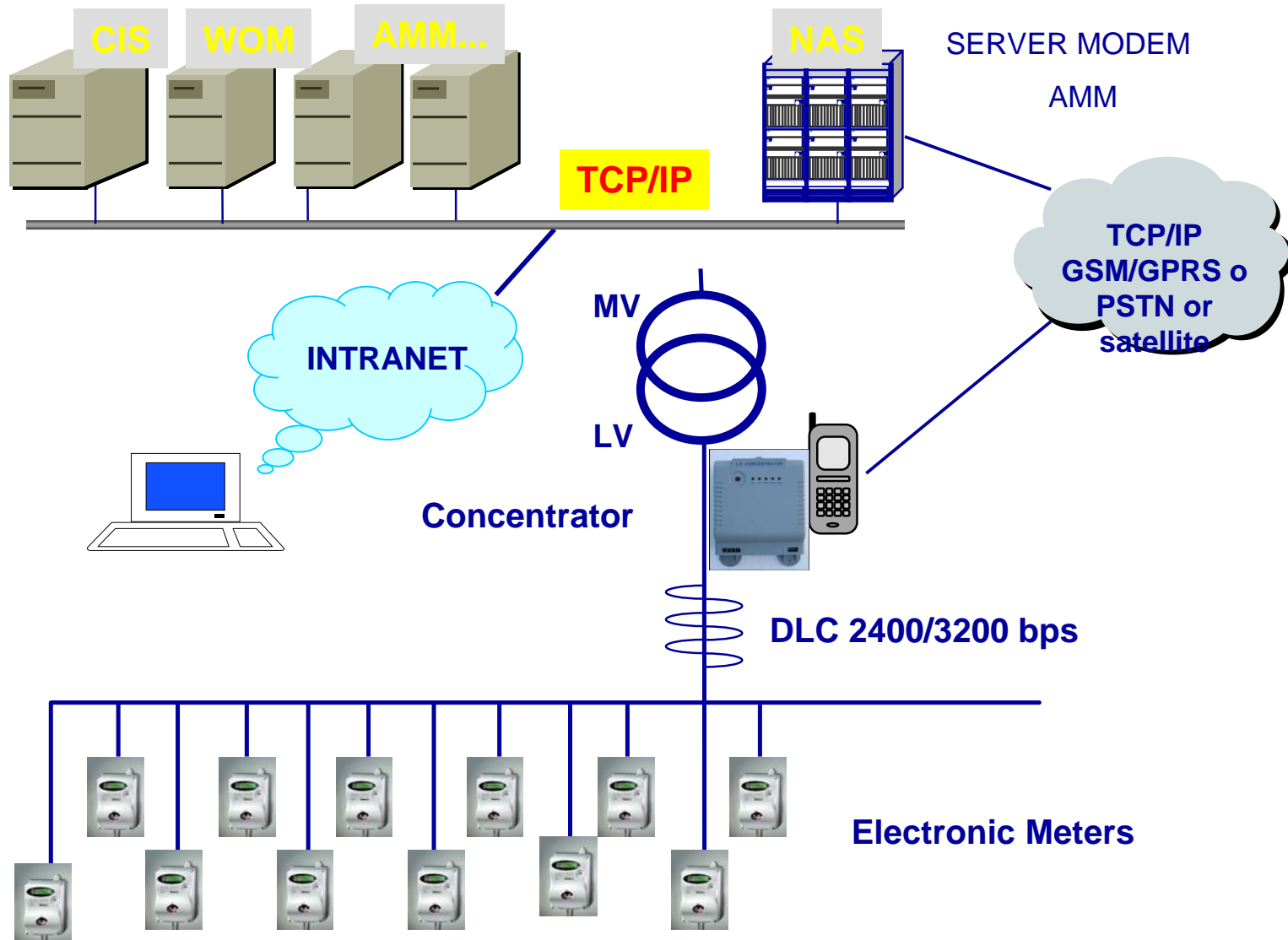


- ▶ Contractual activities
- ▶ Bad payer
- ▶ Tariff management

**End of December 2006 (millions)**

Installed Meters	29,8
Remotely Managed Meters	28,8
Bimonthly read meters	28,7

# Telegestore Architecture



# Telegestore General Architecture

- **Integrated (i.e. equipped with breaker or disconnectors) electronic meters (CE), providing metering, contract management and PLC communication functions**
- **The Automatic Meter Management communicates via public telecommunication networks (GSM, GPRS, PSTN & satellite) with LV concentrators (CBT) installed in every MV substation (one concentrator per transformer)**
- **LV Concentrators are able to manage the communication in both directions: to/from the Remote Metering Central System (via public telecommunication network) and to/from Electronic Meters (private Distribution Line Carrier communication, half-duplex mode, net speed rate of 2400 bit/s)**
- **TCP/IP support is used in communication between concentrators (C-BT) and Automatic Meter Management System (AMM)**

# Telegestore Main Features

- Remote reading of energy consumption and power
- Elimination of estimated billing thanks to bimonthly readings
- Multi-tariff structure programmability with possibility of daily, weekly, monthly and seasonal modulation
- Remote change of contractual parameters (i.e. subscribed power demand)
- Remote disconnection and remote “authorisation” of circuit-breaker manual reclosing (by the Customer)
- Monitoring of supply service quality per each individual customer (number and duration of interruptions)
- Fraud detection and prevention

# Telegestore Main Features *(continued)*

- **Active and reactive energy measurement**
- **Load profiles for active and reactive energy with 1 to 60 minutes sampling time; storage capability of 38 days @ 15 min sampling time**
- **Balance per each MV/LV transformer for network planning and to detect fraud areas**
- **Detecting of illegal tie-in or unauthorised access to the meter (tamper)**
- **Transmission of messages to customers about energy consumption and technical-commercial information**
- **Real time broadcasting of data to the customer in order to support load management algorithms and multi-tariffs, curtailment global or targeted**

# Telegestore Meters



**Single phase  
GEM/GISM**



**Poly phase direct  
insertion  
GET1/GET3A/GIST**



**Poly-phase indirect  
insertion  
GET4S/GISS**

# Single & Poly Phase Meter General Characteristics

- **Active energy and power according to CEI EN 61036, CEI/EN62052-11, CEI/EN 62053-21 class1**
- **Reactive energy and power according to CEI EN 61268,CEI/EN62052-11, CEI/EN 62053-23 class2**
- **Life time 15 years**
- **Failure rate less than 0,3 %/year**
- **Power self consumption less than 2 W / phase**
- **Suitable for environmental operational conditions from -25°to +55°C**
- **Environmental condition limits: -40° +70°C**
- **Bidirectional for distributed generation**
- **Daily self diagnostics on the main components and functions**
- **Protection against tampering action, e.g.**
  - **Removal of the meter from the base**
  - **Attempts to modify SW or tariff**

# Telegestore: main benefits

## For customers:

- Invoices on real consumption
- Remote contract management
- Tailored tariffs
- Savings in billing

## For the electric power system

- Peak shaving
- Energy efficiency and CO<sub>2</sub> reduction
- Reduction of commercial and technical losses

## For Enel

- Leader in AMM/AMR systems technology
- Customer satisfaction
- Operating cost savings

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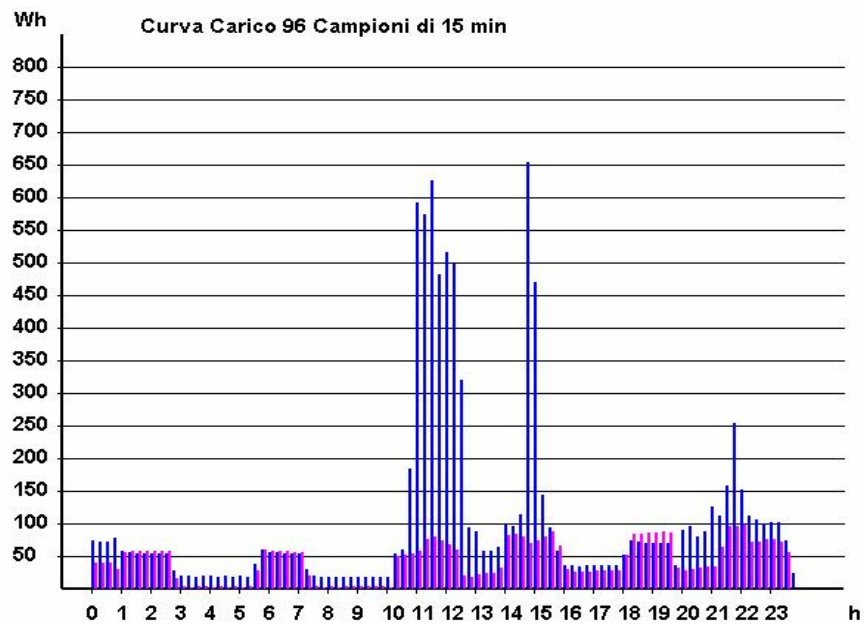
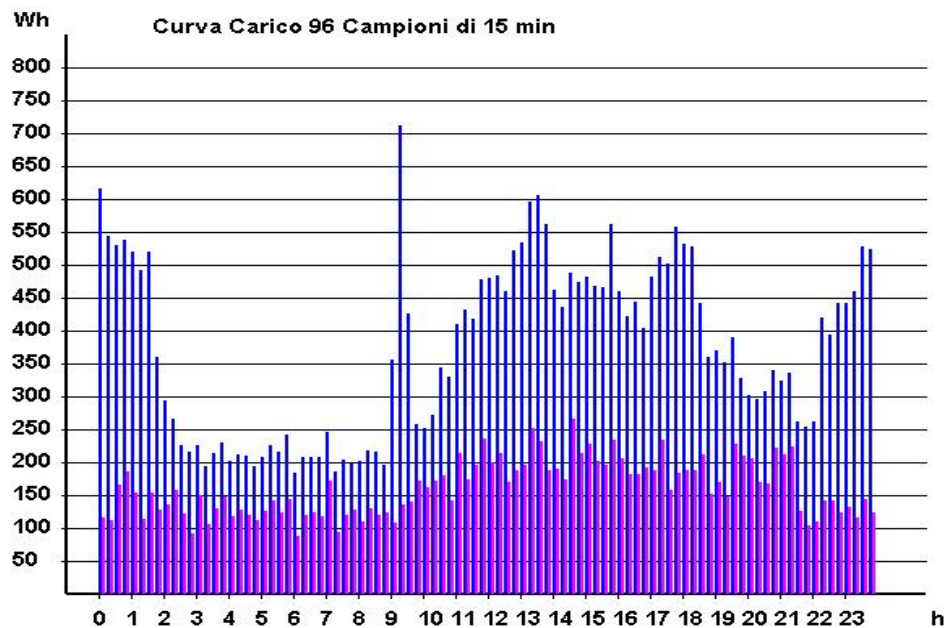
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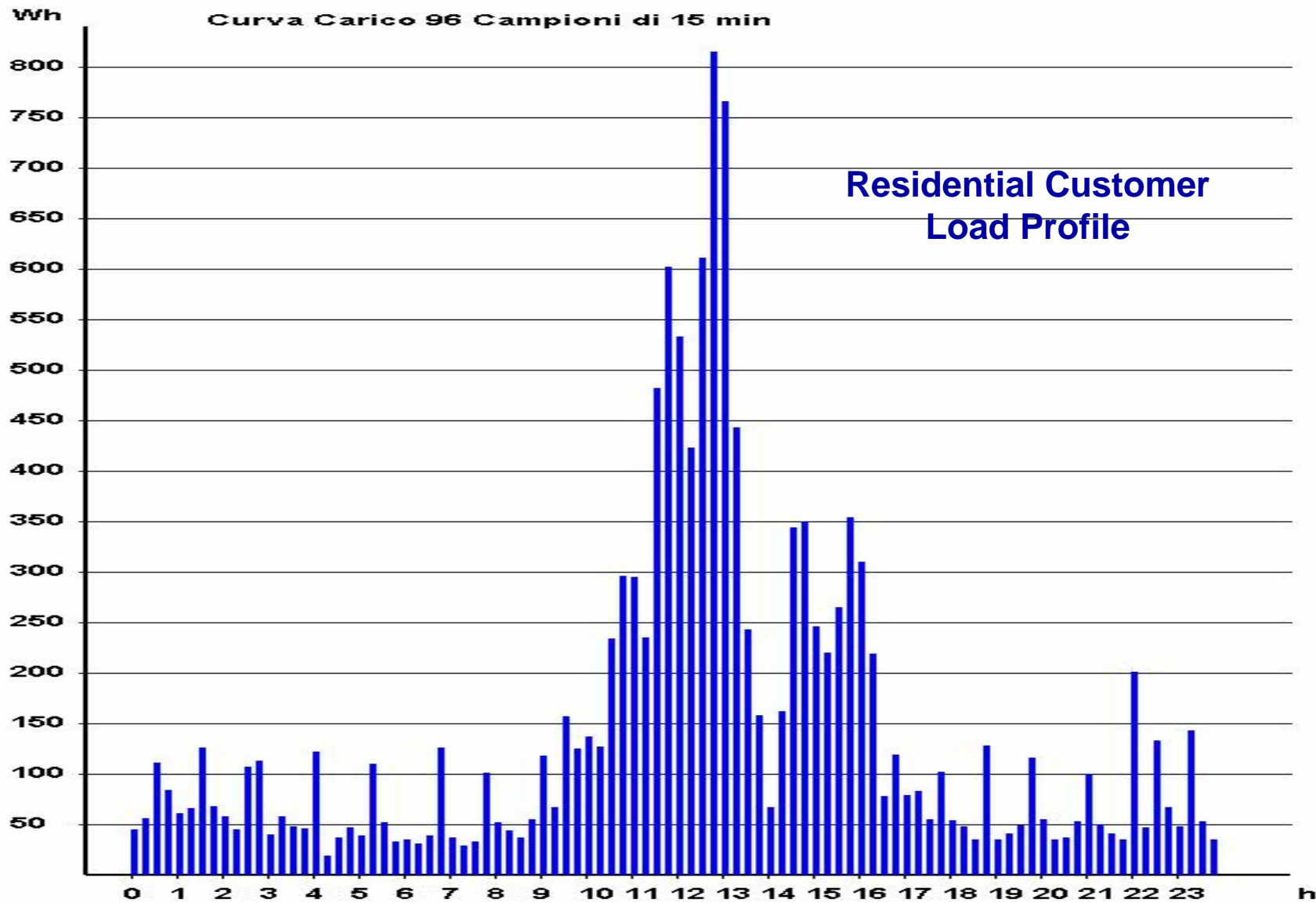
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# Progress & New Developments

- **Bidirectional poly phase meters (photovoltaic and distributed generation application) available since May 2006**
- **Energy balance and network planning based on meter load profiles (pilot test for 260 transformers completed)**
- **Customers over 30 kW (~700.000) invoiced according to load profiles as from January 2008**
- **Massive GPRS introduction**
- **Multi metering (gas, water, heating, etc.)**
- **Customer VAS (Value Added Services) & Home Display**

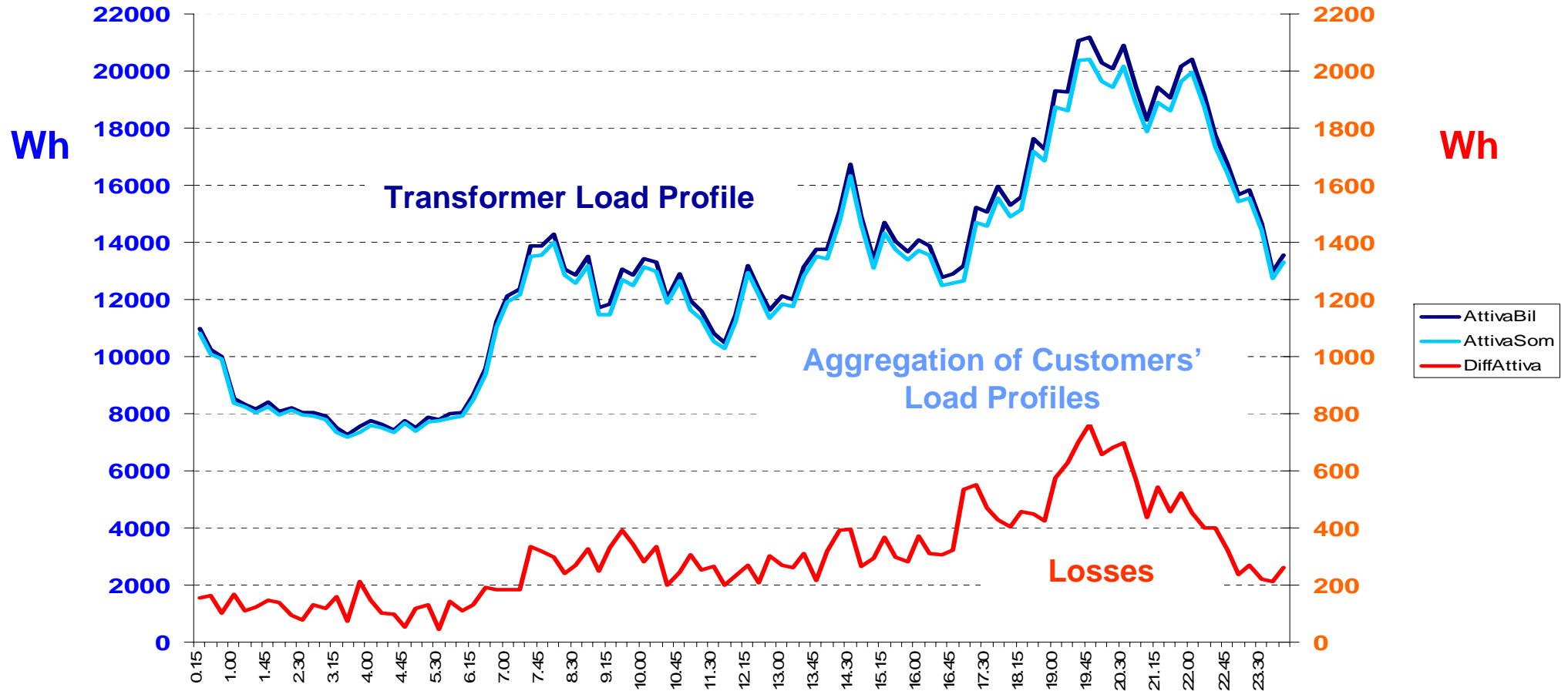
# Load Profiles





# Transformer Energy Balance

- Technical Losses & Frauds
- Network Planning
- Power Demand Forecast



# Conclusions

- **Technological & technical revolution**
- **Liberalisation support**
- **Irreversible change**
- **Opening of a new market**