ENEL Telegestore Project

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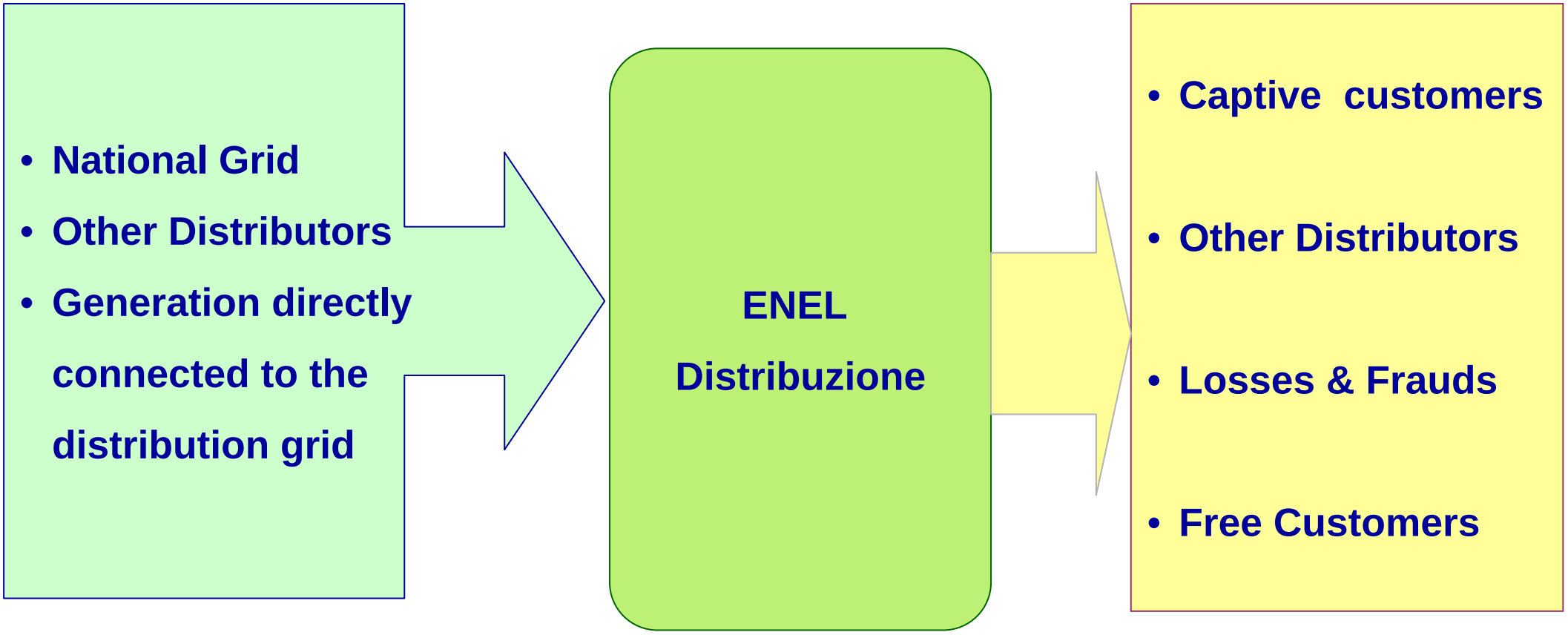
ENEL Distribuzione SpA

ECONOMIC COMMISSION FOR EUROPE
COMMITTEE ON SUSTAINABLE ENERGY
Steering Committee of the Energy Efficiency 21 Project
Ad Hoc Group of Experts on Energy Efficiency
Investments for Climate Change Mitigation

Eighth meeting
Geneva, 31 May 2006

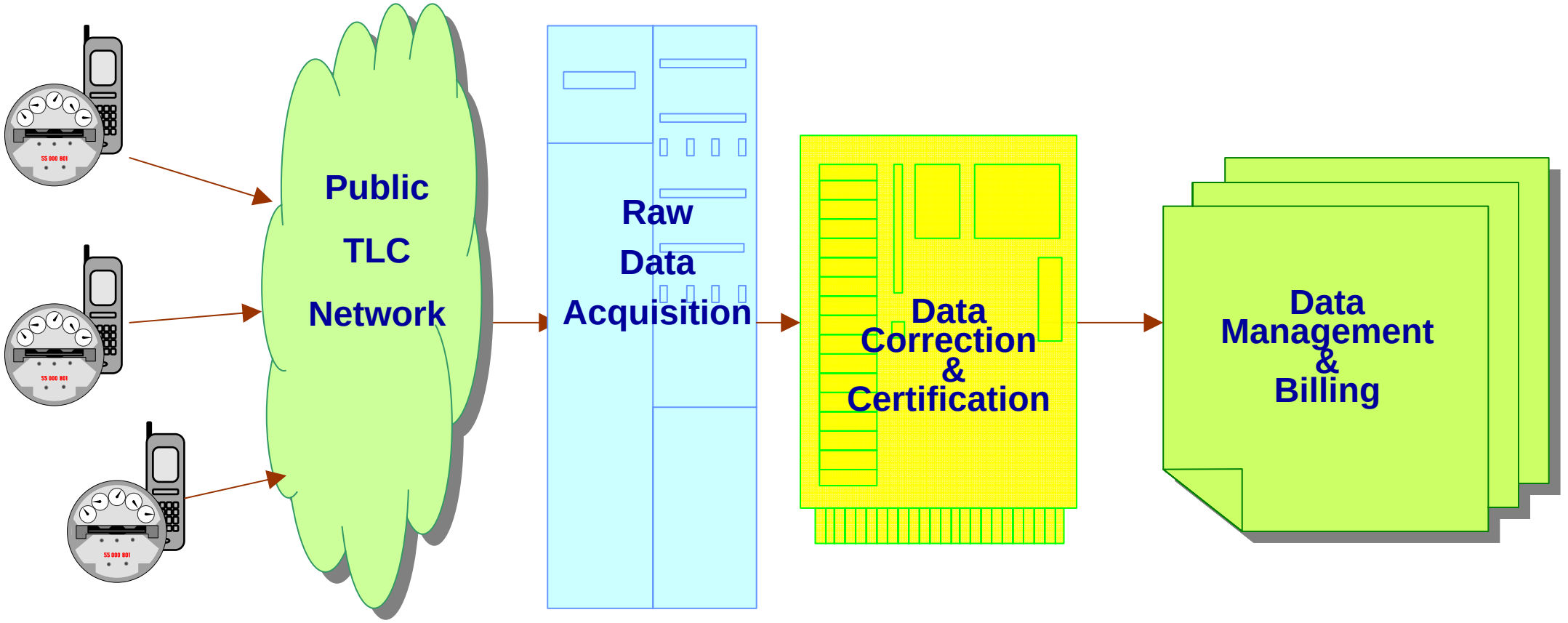
ENEL Distribuzione's Metering System

Energy Balance



“Big customers” metering system

System Architecture



“Big customers” metering system

- **Interval Meters (March 2006)** **82.097**

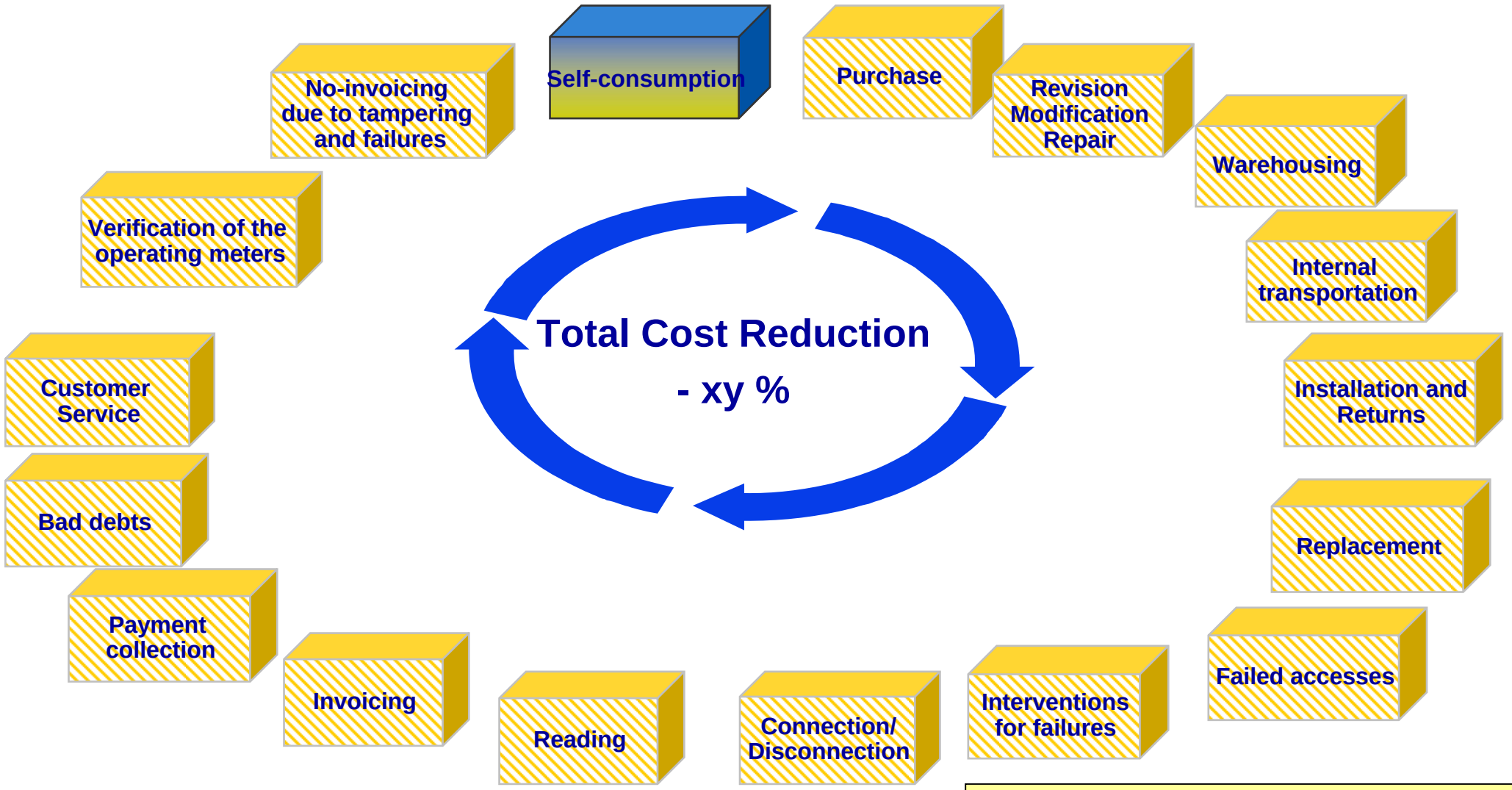
- **Customers** **78.525**
  - ✓ **HV Customers** **1.077**
  - ✓ **MV&LV Free Customers** **34.517**
  - ✓ **MV&LV Captive Customers** **42.931**

- **132/150 kV Substations’ Meters** **3.572**

TELEGESTORE

A Customer Remote Management System

Cost Reduction



Costs reduced by TELEGESTORE

Costs not reduced by TELEGESTORE™

Total cost analysis is strongly affected by current efficiency of the Utility

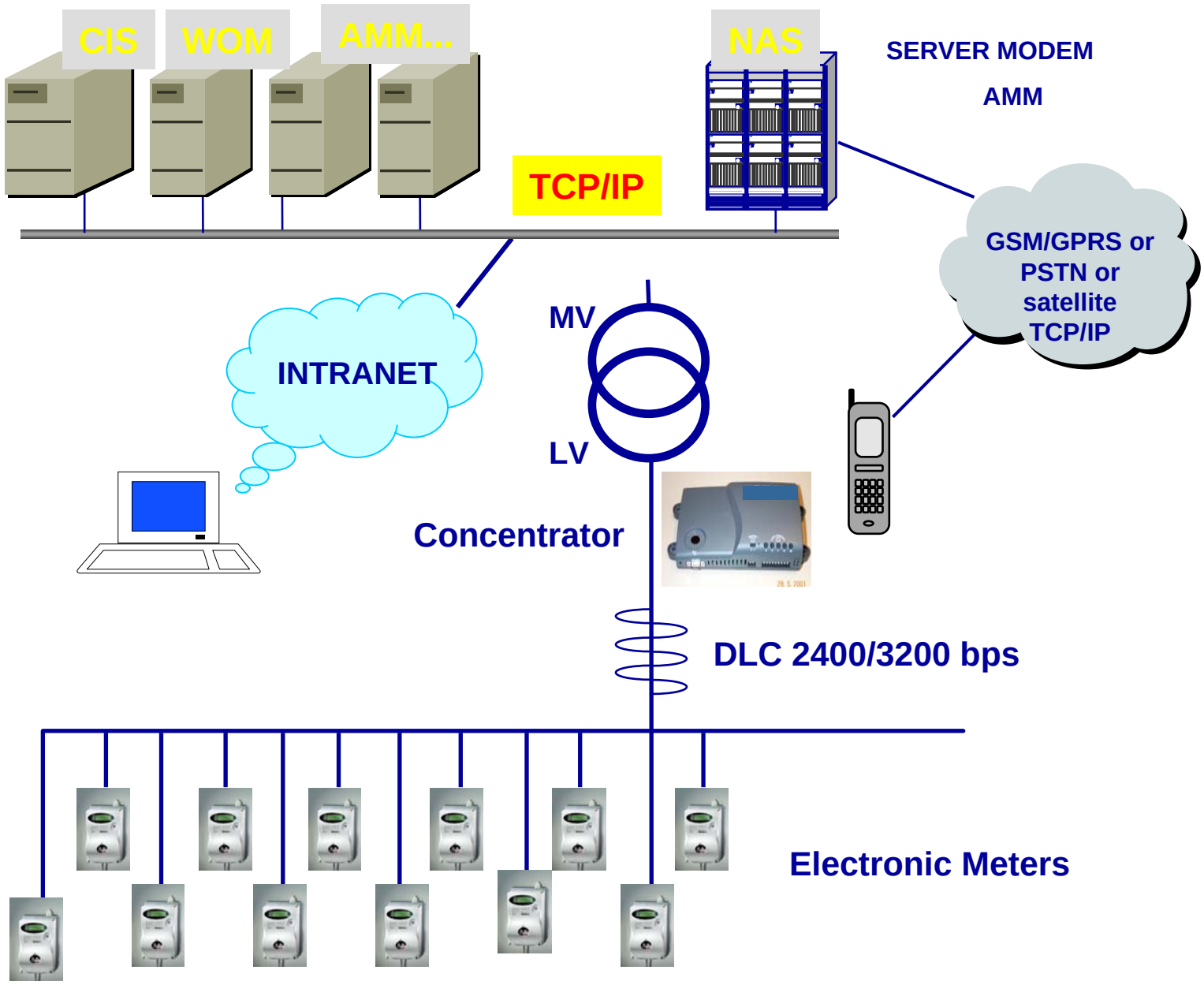
ENEL Project: main figures

Low voltage customers	30 million
Meters to install	30,1 million
Concentrators	350,000
Investment	2 billion €
Replacement Period	4 years

ENEL Project Schedule

Kick-off	October 1999
Laboratory prototype (single phase)	August 2000
Industrial pre-serie (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	January2002
Mass installation full ramp-up (700.000 meters/month)	September 2002

System Architecture



TELEGESTORE General Architecture

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

TELEGESTORE Main Functionalities

- Remote reading
- Billing on actual reading
- Remote disconnection and remote “authorization” of circuit-breaker local reclosing by the customer (safety reasons)
- Remote change of the contractual parameters without accessing the meter
- Comparison between energy supplied by each MV/LV transformer and the energy delivered to customers
- Theft detection and prevention of unauthorized access to the meter (tamper)
- Monitoring of supply service quality per each individual customer (number and length of interruptions of the service)
- Fraud detection
- Active and reactive energy
- Load profiles for active and reactive energy with 1 to 60 minutes sampling time; storage capability of 38 days @ 15 min sampling time

TELEGESTORE Main Functionalities (continued)

- Power tesholds programmable at 0,1 kW steps according to demand contract and LV network characteristics (protection)
- Contractual demand up to 10 kW with the single phase and 400kW with the poly phase
- Power above the subscribed demand managable as:
  - ✓ immediate disconnection (according to the regulator's rules)
  - ✓ warning signal and delayed disconnection
  - ✓ consumption registered in a separate register (for appropriate billing) without disconnection (vertical tariffication)
- Customer Local Information shown on the display of the meter (basic version) simply pushing the button

TELEGESTORE meters

Meter models

- Single-phase meter (GISM): 230 V, 5-60 A
- Poly phase meters:
  - GIST: 3 x 230 (400)V, 5 – 60 A (for demand up to 30 kW)
  - GISS: 3 x 230 (400)v, for connection via Current Transformer, In=2A and Imax=20A (for demand up to 200kW or more)

Marking of meters according to EN standards is impressed on the plastic cover by means of laser techniques. Bar code are also used to record these information.

Single & Poly Phase Meter General Characteristics

- Active energy and power according to CEI EN 61036 class1 (accuracy)
- Reactive energy and power according to CEI EN 61268 class2 (accuracy)
- Life time 15 years
- Failure rate less than 0,3 %
- Power self consumption less than 2 W / phase
- Suitable for environmental operational conditions: -25° +55°
- Environmental condition limits: -40° +70°
- Bidirectional (may 2005 poly phase)
- 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

Meter production

- Meters are:
  - produced by contract manufacturers under ENEL responsibility
  - certified by Italian IMQ Institute (quality mark)
- Extensive functional tests are carried out on the production in order to verify the functionality and efficiency of each individual meter
- All the meters are calibrated and subsequently tested to check the accuracy (active and reactive energy)
- Production is subjected to QA acceptance inspection according to CEI EN 61358 strategy; this activity is carried out by means of dedicated systems equipped with a rack able to arrange tens of meters simultaneously

Results

End of March 2006 Figures

- N. of installed meters 27.394.194
- N. of installed concentrators 345.698
- N. of commissioned meters 25.535.347
- N. of commissioned concentrators 325.827

Year 2005 Remote Management

- N. of customer remote operations 1.987.218
- N. of new tariff settings 514.346
- N. of bad payers operations 1.409.452
  - ✓ N. of disconnections 870.330
  - ✓ N. of reconnections 539.122

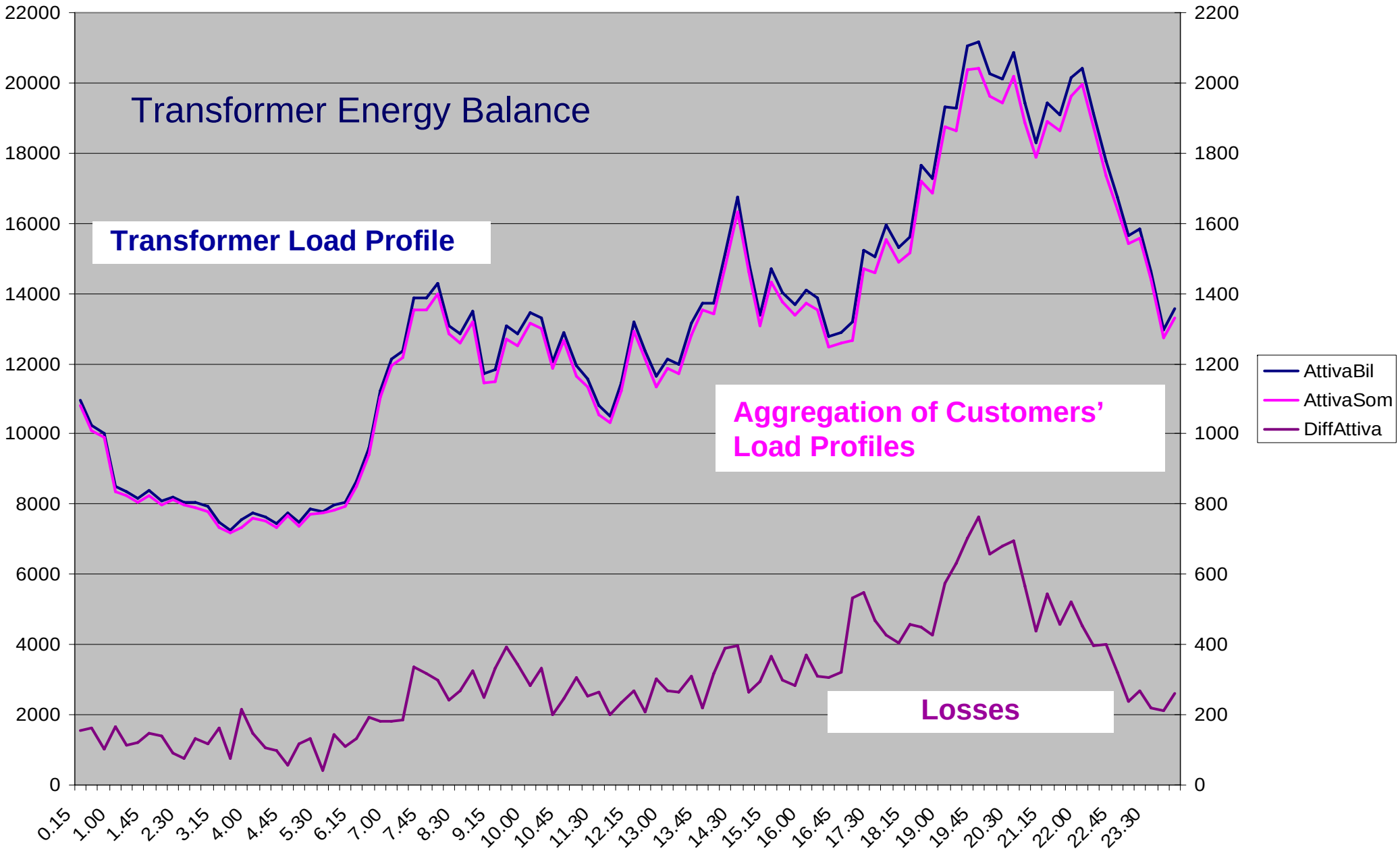
Year 2005 Readings

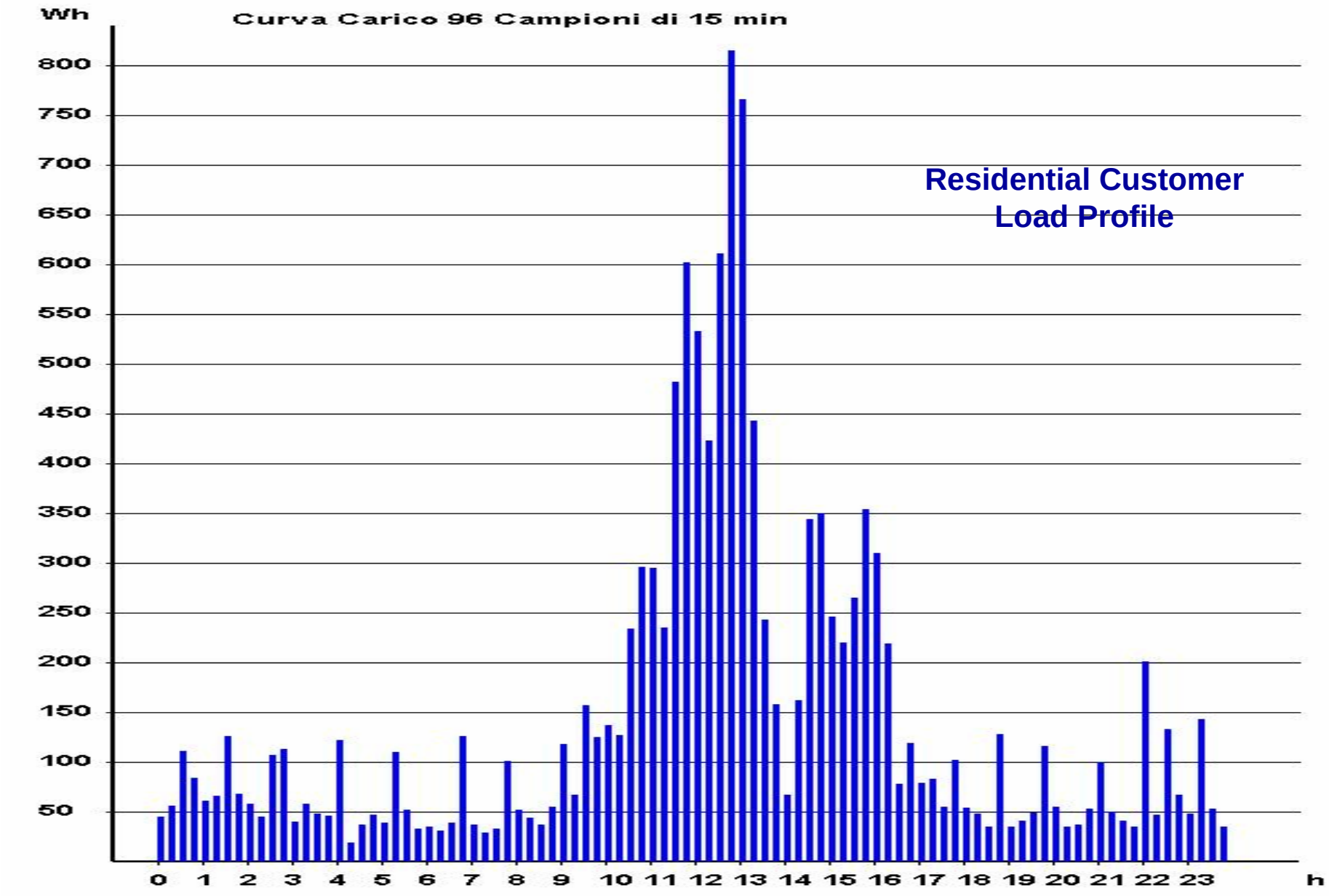
- N. of bimonthly read meters 23.934.276
- N. of bimonthly readings 91.245.768
- N. of spot readings 2.895.479

Progress
&
New Developments

Progress

- **Bidirectional Poly phase meters (photovoltaic and distributed generation application) available on May of 2006**
- **Energy balance and network planning based on meter load profiles (pilot test for 80 transformers completed)**
- **Quality of service (interruptions) pilot next year**
- **Commercial and residential customers invoiced according to load profiles**





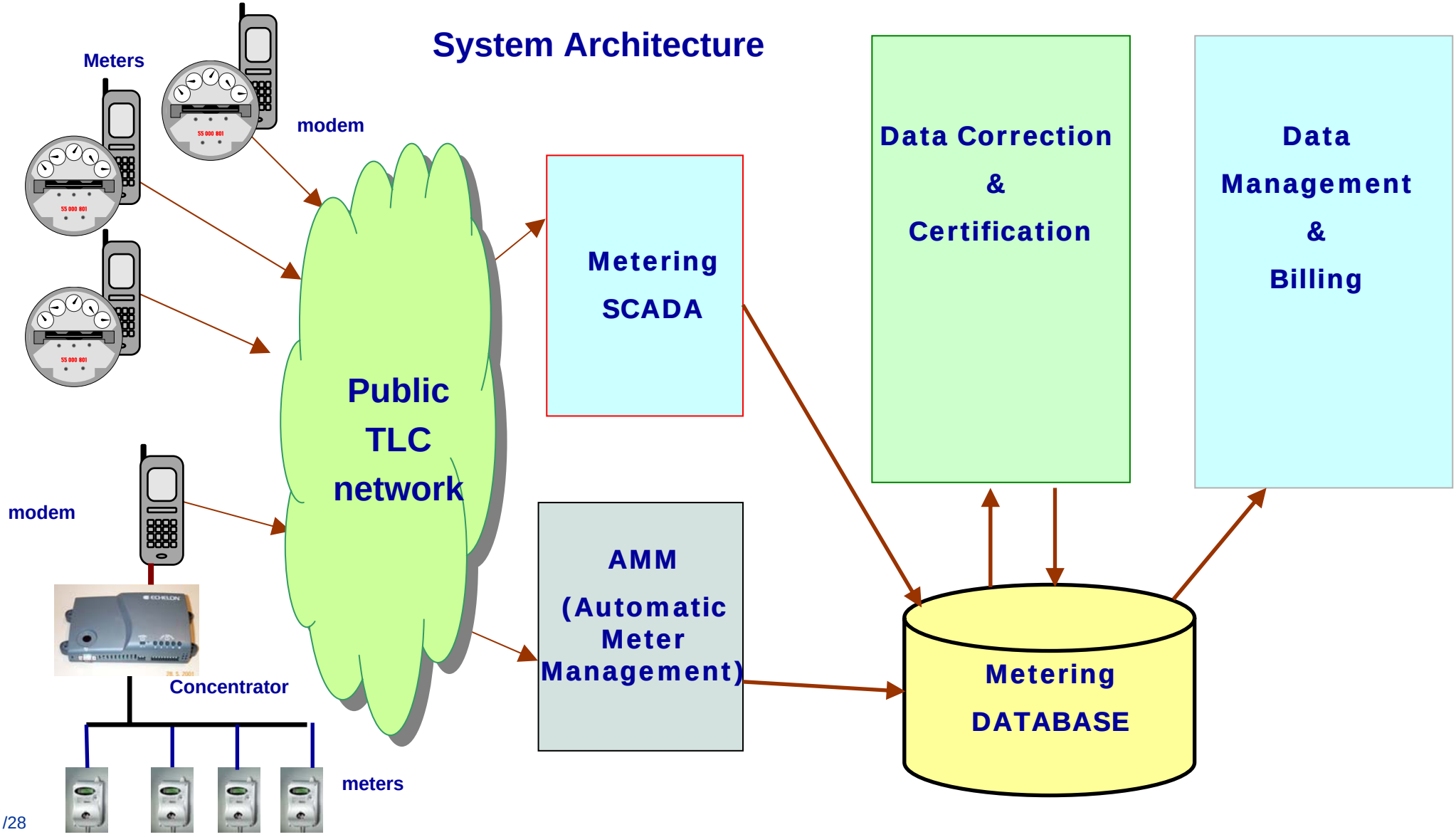
The Alliance aims to commercialize an integrated solution for managing metering assets remotely in the electric marketplace

New Developments

New Developments

- GPRS introduction
- BPL experimentation on the MV network
- Multimetering (gas, water, heat, ...) support
- Metering data integration
- Submetering
- Lighting (to be better investigated)

ENEL Distribuzione's Metering System – Integration



Conclusions

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