Echelon's Networked Energy Services

September 17, 2004

Introduction to Echelon

Echelon's Mission

Provide hardware and software products and solutions that enable everyday devices to be made smart and inter-connected to lower cost, increase convenience, improve service, and enhance productivity, quality, and safety

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A Global Leader in Networking Everyday Devices

- **A networking infrastructure company**
  - A pioneer in machine-to-machine (M2M) and embedded Internet technologies
- **Provider of standards-based hardware and software products**
- **Creator of the multi-billion dollar LONWORKS® industry**
  - Products and services from thousands of companies
  - Over 40 million LONWORKS devices installed
  - Multi-industry, multinational standard
  - Interoperability driven by 300+ member strong LONMARK® International organization

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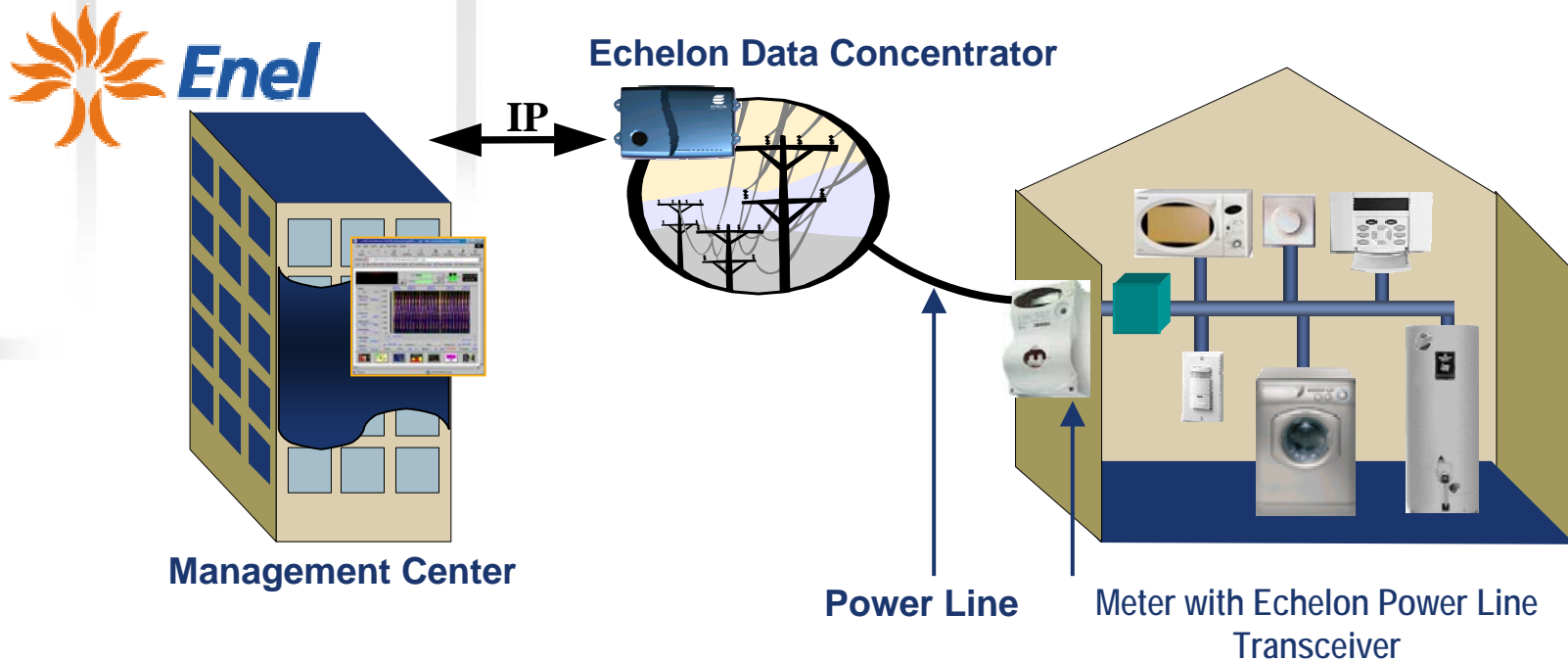# Thousands of Companies offer LonWorks Products

Products that are deployed all over the World

- ● **Le Musée du Louvre**
  Paris, France

- ● **Municipal Power Plant**
  Graettinger, IA

- ● **Glass Container Factory**
  Dominican Republic

- ● **New York Subway**
  New York, NY

- ● **Capitolo di S.Pietro**
  Vatican, Rome, Italy

- ● **San Jose International Airport**
  San Jose, CA

- ● **And thousands more…**

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Enel's Project In Italy
World's largest device networking deployment

Echelon Data Concentrator

IP

Management Center

Power Line

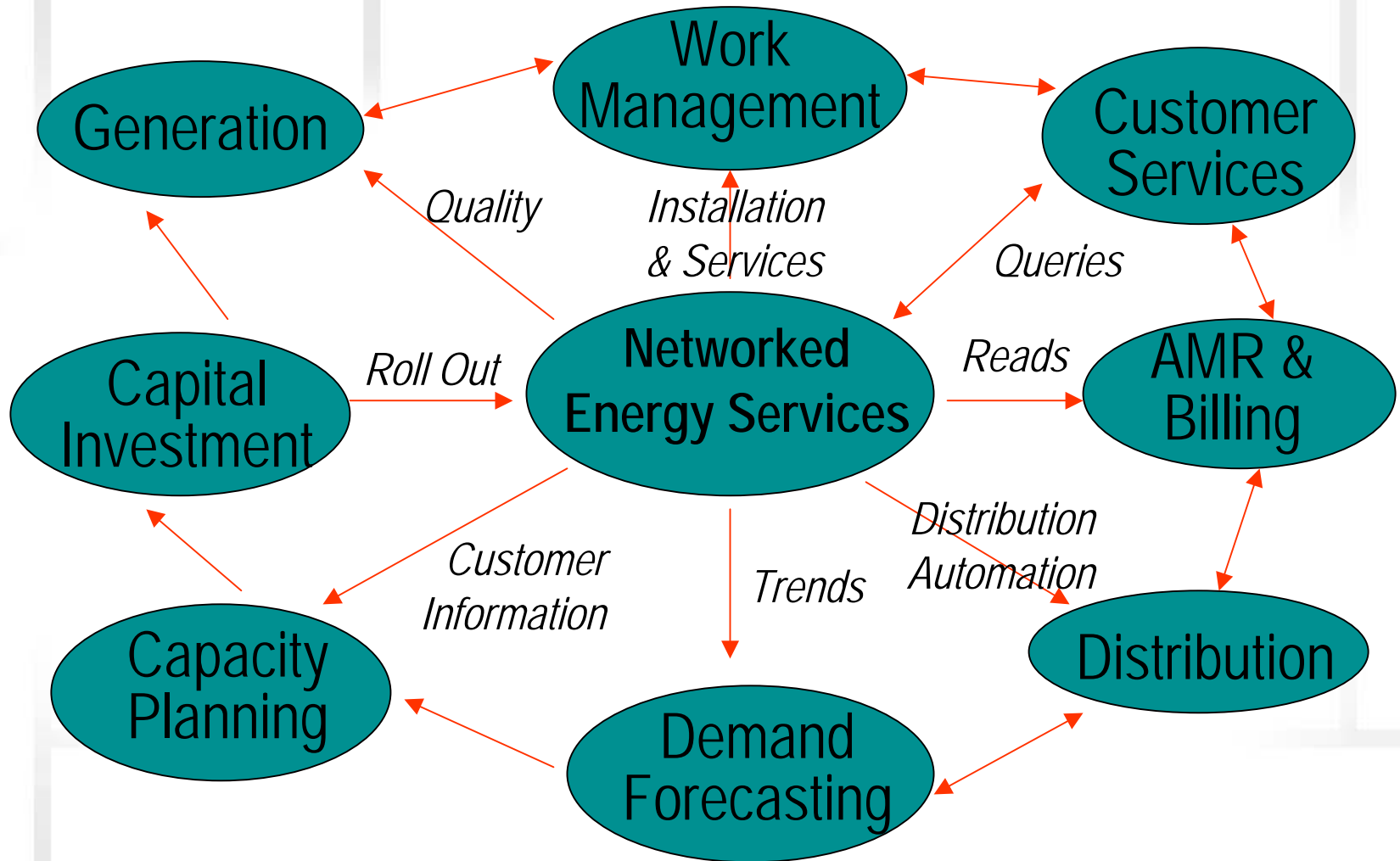**Meter with Echelon Power Line Transceiver**

- Over 27 million homes and buildings with smart meters
  - Over 17 million deployed by June 2004

- Projected cost of €2.1 billion

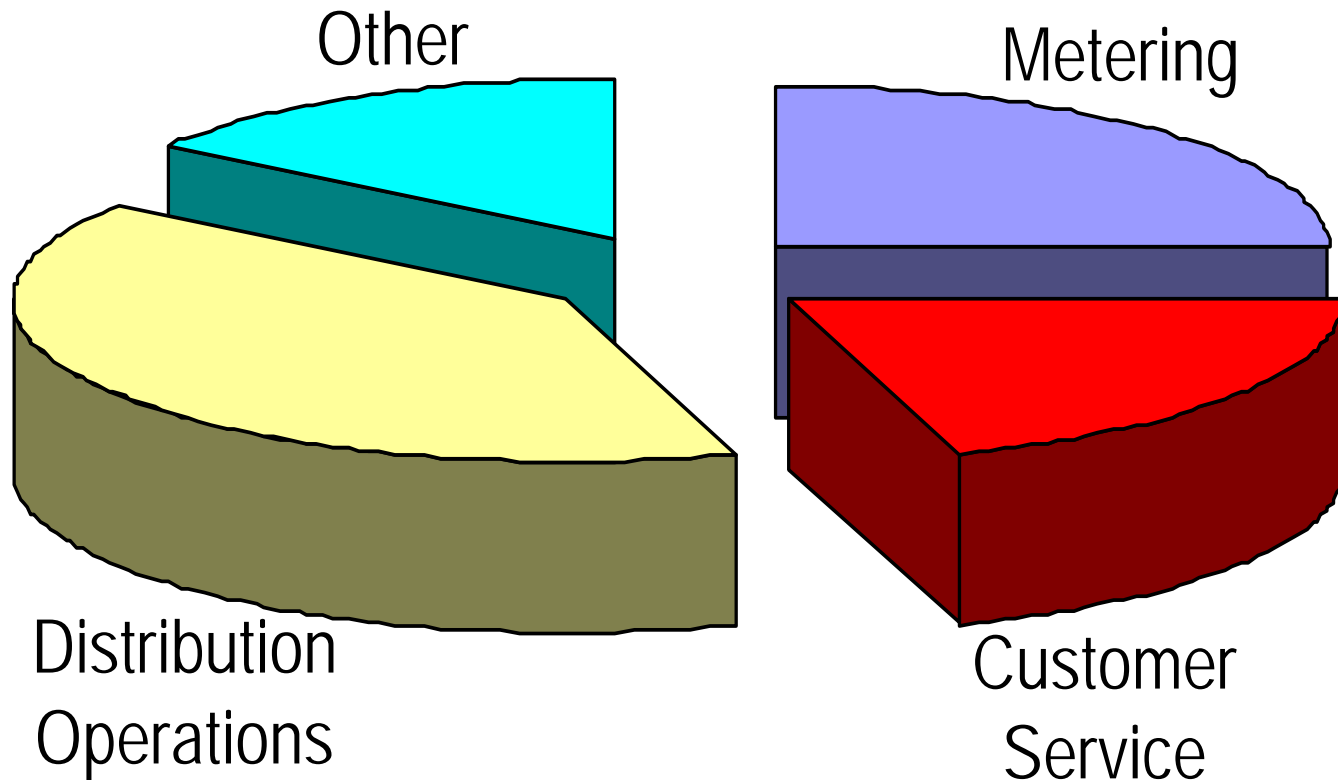- Projected annual savings of €500 million

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NES System Overview

NES Benefits Every Utility Operation

Diagram with "Networked Energy Services" at the center connected to:
- **Generation** — *Quality*
- **Work Management** — *Installation & Services*
- **Customer Services** — *Queries*
- **Capital Investment** — *Roll Out*
- **AMR & Billing** — *Reads*
- **Capacity Planning** — *Customer Information*
- **Demand Forecasting** — *Trends*
- **Distribution** — *Distribution Automation*

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NES Benefit Categories

NES Metering Benefits

NES Metering Benefits

- **Scheduled meter reads**
  - Performed automatically, bidirectionally
  - Utility-selectable (daily, weekly, or monthly)
  - Reduce costs of staff, office space, vehicles and equipment

- **On-demand meter reads**
  - Resolve billing complaints easily
  - Reduce costs of beginning-of, end-of service reads
    - Especially in high-transience areas like apartment complexes, seasonal residences, college towns
  - Reduce customer "switching costs"

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NES Metering Benefits

- Read hard-to-access meters easily
  - Indoor meters, two-income families, bad weather, remote areas, etc.

- Regulatory Changes
  - Cost savings v. attractive if more frequent meter reading schedule instituted
  - Incentives for actual reads

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NES Customer Service Benefits

NES Customer Service Benefits

- **Eliminate estimated billing**
  - Reduce billing errors
  - More easily understandable bills
  - Decrease complaint, inquiry traffic to call center
  - Resolve customer complaints with accurate data
  - Reduce costs to resolve complaints with on-demand reads
  - Increase customer confidence, timely payments, improved cash flow
  - Reduce staffing costs in call centers and billing centers

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NES Customer Service Benefits

- Remote service disconnect and reconnect
  - Reduce uncollectibles
  - Enables prepayment without card
  - Manage high transience areas cost-effectively

- Remote configuration of customer service level
  - Facilitates service disconnection
  - Enables prepayment without card
  - Offer service-level differentiated supply

- Time-of-use pricing
  - Promote energy conservation
  - Offer incentive rates based on seasonal & time-of-day factors

- Improved cash flow
  - Shortened read-to-bill, bill-to-pay times

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NES Distribution Operation Benefits

NES Distribution Operation Benefits

- **Improved energy conservation**
  - From TOU rates and service-level differentiated supply
  - Meet energy conservation goals set by regulators
  - Lower peak and overall load
  - Reduce expensive spot-market energy purchases
  - Avoid huge investments in new generation

- **Improved energy forecasting**
  - Precisely manage supply and demand
    - With more accurate and granular information
    - Reduce costly variances between scheduled & actual requirements, critical during peak periods

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NES Distribution Operation Benefits

- Balance phase loads
  - Through individual meter phase detection
  - Measure load per phase, optimally size distribution transformers
  - Improve generation and transmission efficiencies

- Improve individual transformer utilization
  - Match transformer loading with rating, critical during peak periods
  - "Proactive Outage Management"—identify & replace overloaded transformers before loss of power
  - Lower purchases of new transformers
  - Avoid building inventory to increase capacity

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NES Distribution Operation Benefits

- **Superior Outage Management**
  - Near real-time outage detection & restoration reporting
    - Automatically identify, locate & isolate an outage almost immediately
    - Dispatch field crews with efficiency & precision—lower costs, restore service faster
    - Service restoration verification while field crews still in area
    - Differentiate outages from customer equipment problems, reduce field calls
    - Report outages proactively—reduce customer calls
  - Reduce lost outage-related sales
  - Meet regulatory standards for overall system reliability
  - Improve customer satisfaction

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NES Distribution Operation Benefits

- **Quality of Service**
  - Improved QOS data at individual customer level
    - Power outage statistics
    - Voltage variation
    - Current variation
  - Meet regulatory standards

- **Ripple Control Replacement**
  - Replace legacy ripple control systems
  - Low incremental cost with all other benefits of NES included

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NES Distribution Operation Benefits

- Comprehensive Revenue Protection
  – Detect meter phase inversion
  – Detect tampering with meter cover
  – Record individual meter outage statistics
  – Eliminate meter lock ring purchases
  – New meters lower energy loss
    • Being accurately calibrated
    • Have lower starting watts & watt loss compared to electromechanical meters

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Other NES Benefits

Other NES Benefits

- **Lowered Capital Investment**
  - Cost-effective smart meters deliver broad functionality through the network
    - Reduced need for expensive stand-alone TOU and power quality meters
    - Disconnect switch integral to meter
    - Reduced inventory management costs

- **New meter population**
  - Reduced meter failure rates, less field investigations
  - Avoid costs of meter replacement from normal attrition

- Potential for value-added services

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Other NES Benefits

- **Future Value-Added Services**
  - Dynamic load control
    - Thermostats, HVAC, irrigation pumps, water heaters, pool pumps, lighting, appliances, etc.
  - Street and traffic light management
  - Gas and water meter remote reading
  - Appliances and white goods
    - Remote monitoring, control, diagnostics
    - Pay-per-use
  - Security Monitoring
  - Medical Emergency Signaling
  - Vending Machines
    - Statistics, faults, out of stock

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NES System Components

NES Data Concentrator

IP

NES Meter

NES System Software
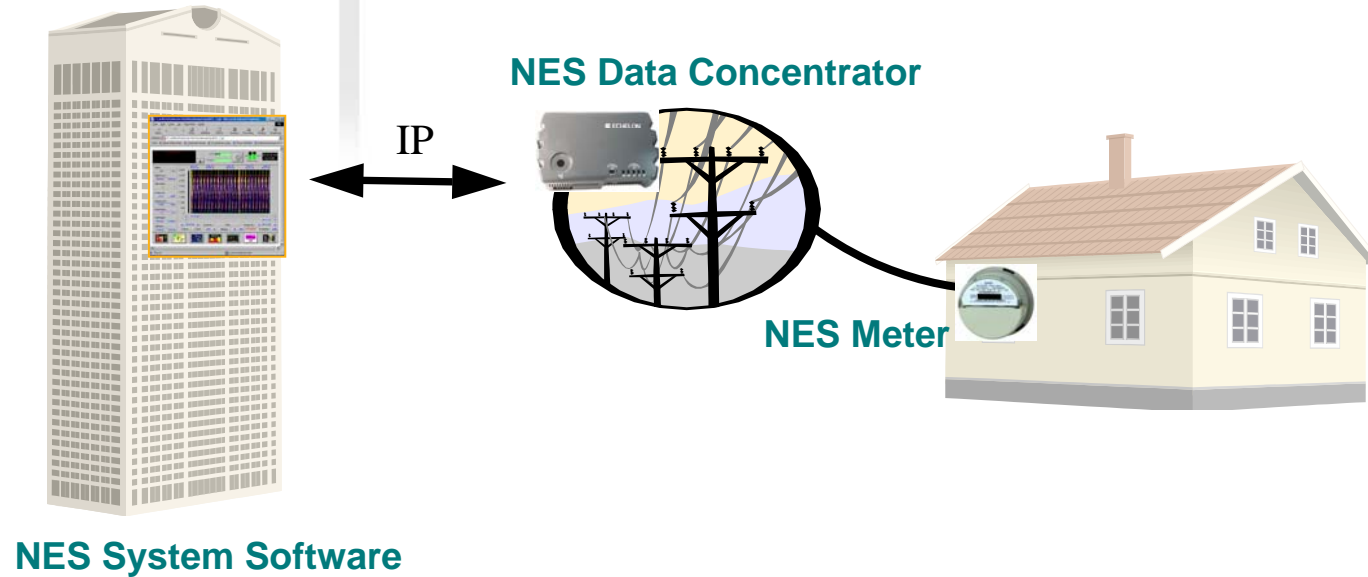
- **Three infrastructure components**
  - Meters
  - Data concentrators
  - System software

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NES System Characteristics

NES Powered™
by **ECHELON**

- Automatically managed, dynamic power line mesh network ensures reliable communications with all meters

- Scalable, failure-tolerant architecture supports millions of devices

- Integral, multi-layer security

- Extensible architecture to support expansion & enhancements

- Designed for at least 18 years operating life

- ISO 9001:2001 design and manufacturing process

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The NES System Is Open Infrastructure

- Built on top of open standards
  - ANSI, IEC, TCP/IP ….

- Connects to other systems using open standards
  - Web services and SQL for integration with enterprise systems
  - Provision for LONWORKS gateway to interoperate with in-premise devices

- Offered on the market for other companies to adopt and build upon

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NES System Value Added Resellers

- Adopting the NES system as the basis for their system offerings

- Establishing the NES system as an open, worldwide standard

- Opening and serving new markets

- Program announced in 2003
  - Telvent: premier IT provider in Spain, the Americas and Asia
  - EDMI: leading supplier of electronic revenue meters in Australia, Asia and Europe

TELVENT

EDMI

EDMI LIMITED

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