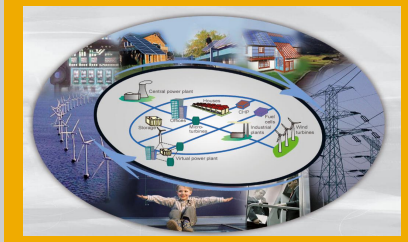

SMARTGRIDS

eBusiness Watch

Roundtable discussion: ICT and e-Business Implications for Energy Consumption

Brussels, Feb 5th 2008

Dr Maher Chebbo

Vice President, Head of Utilities for EMEA – SAP
Chairman Demand & Metering – EC SmartGrids Advisorcy Council
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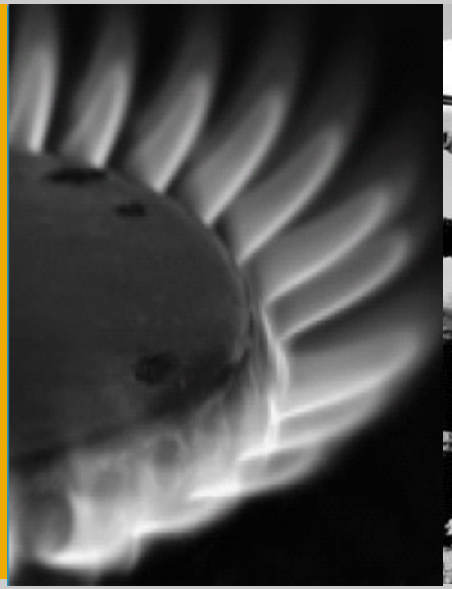
THE BEST-RUN BUSINESSES RUN SAP

Agenda

1- Top ICT priorities for Energy efficiency

2- SmartGrids vision 2020 for Energy efficiency

3- Conclusion



1- Top ICT priorities for Energy Efficiency

What are the trends and challenges of Energy ?

Energy trends

1. **Overall compliance** (Finance, environment, standards, HR, etc)
2. **European SmartGrids "internet like"**
   - internal markets
   - security of Supply
   - climate changes
   - 20/20/20 European Energy policy goals
3. **Market liberalization**, **competition, lower barriers to entrance**, **Unbundling** & Supplier Switch
4. **Growth and Mergers & Acquisitions**
5. **Productivity & Operational excellence** through best practices
6. **Global Market Leadership** at least in one service
7. Coverage across the **value chain**
8. **Customer retention** and **recruiting**
9. Quality of Service, **Value Added Services**, **Demand Side and Response Management**
10. **Effective investments** and better **return on Assets**
11. **Multi-Utilities Services**
12. **Tailored tariffs**, **flexible contracts** and **new targeted products**
13. **Increased channels to market**

IT Challenges

A. From 1 Customer administration to multiple roles for multiple players

- ✓ Across Gencos, TSOs, DSOs, Suppliers, retailers & market
- ✓ Unbundled System Architecture compliant with regulations
- ✓ Flexible Business Process Platform
- ✓ Service Oriented Architecture role based
- ✓ Intercompany Data Exchange

B. From stable service demand to changing needs and regulations

- ✓ Automated Metering Infrastructure and DSM

C. From a simple uniform information flow to multiple external communications

- ✓ Bi-directional Transmission communication
- ✓ Event management and Volume of Meter Data Exchanged

D. Tremendous pressure on the 'cost to serve'

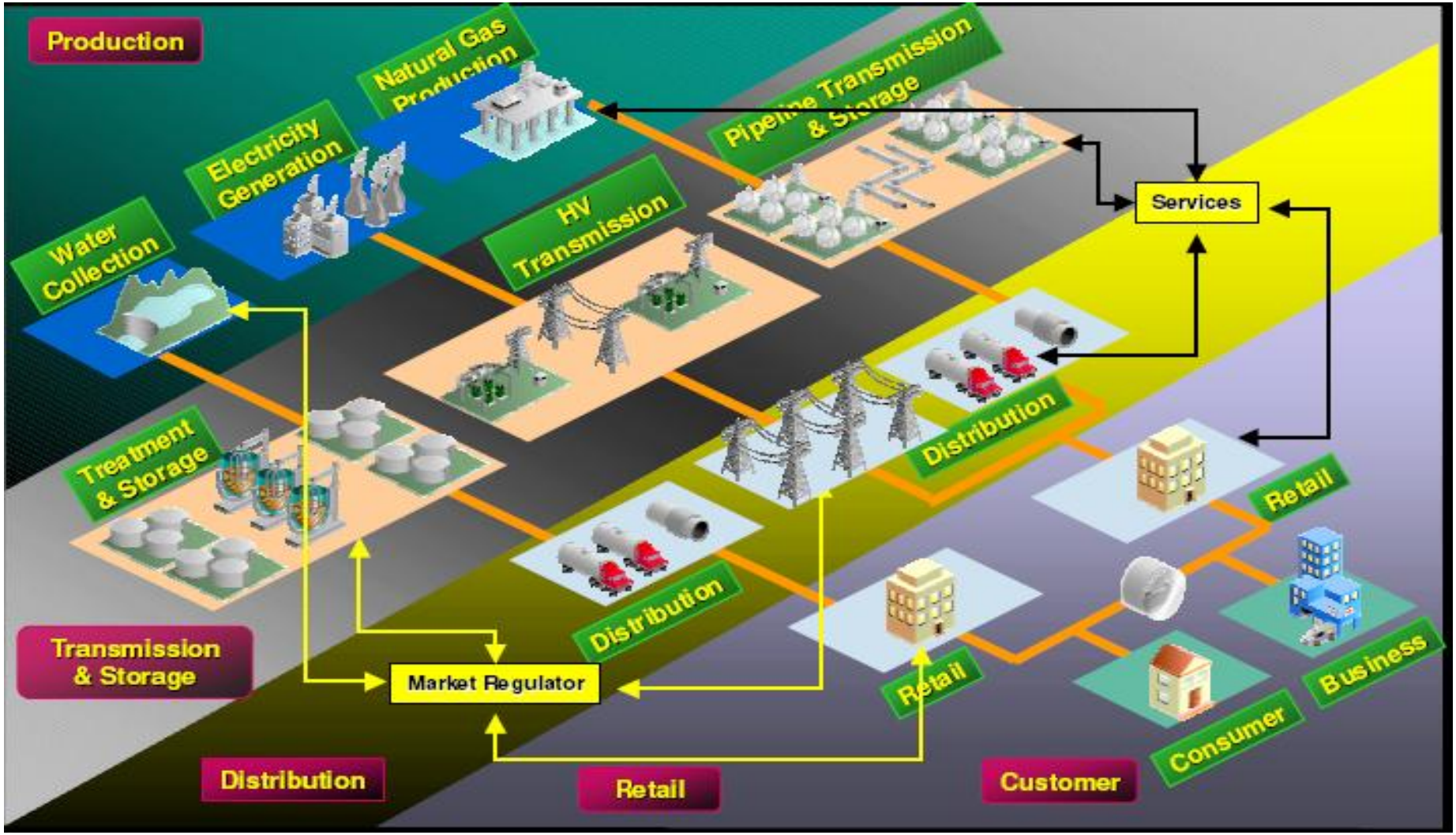
- ✓ Integrated Metering and Energy Data Lifecycle Management
- ✓ Minimal cost of services, support and customer management

E. Many external suppliers

- ✓ Energy Data Management
- ✓ Retailing and Trading

It is a major transformation …

Unbundling of infrastructure Assets & Energy services in a traditionally regulated market moving towards deregulation



Agenda of the Energy Industry

		Impact on Information Technology
1	Compliance	++
2	Energy Sources	+
3	De-Regulation	++
4	Globalization	+
5	New Technologies	++
6	Profitability	++
7	Reliability & Safety	++
8	Energy Politics	O

Energy Efficiency

Agenda of the Utilities Industry Deregulation

		Impact on Information Technology
1	Compliance	++
2	Energy Sources	+
3	De-Regulation	++
4	Globalization	+
5	New Technologies	++
6	Profitability	++
7	Reliability & Safety	++
8	Energy Politics	o

- Enterprise unbundling
- Increasing importance of Retail
- Competition
- Market model
- Regulatory market rules
- Non-Discrimination
- "**Energy Capital Management"**
  - Evaluation of energy data
  - Procurement/Trading
  - Energy portfolio management
  - Reconciliation & settlement
  - Risk management
- New role of Energy Retail Company
- **SmartGrids Energy Efficiency goals (20/20/20)**

Agenda of the Utilities Industry
New Technologies

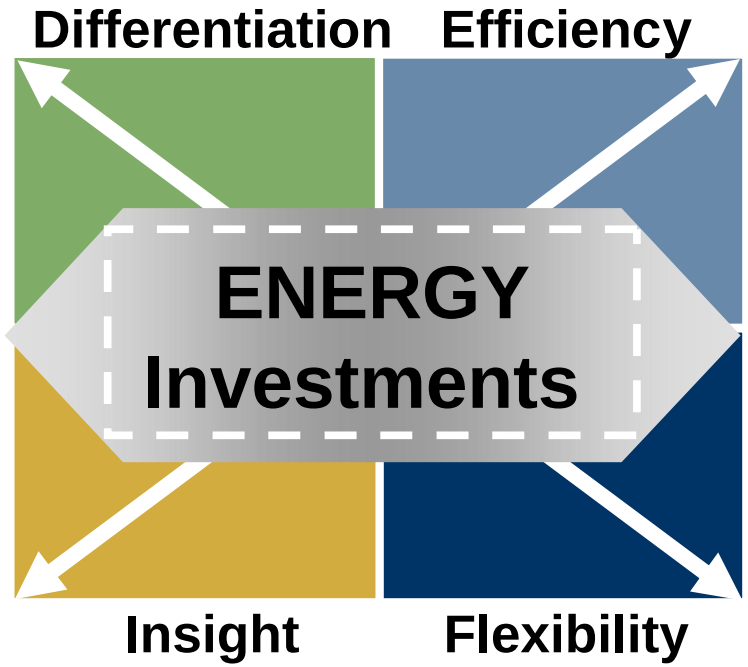
		Impact on Information Technology
1	Compliance	++
2	Energy Sources	+
3	De-Regulation	++
4	Globalization	+
5	New Technologies	++
6	Profitability	++
7	Reliability & Safety	++
8	Energy Politics	o

- Applying advanced technology standards in . . .
  - Generation (i.e. Renewable Energy Sources)
  - Transmission (i.e. Intelligent Grids ➔ Virtual Utilities)
  - **Distribution & Metering (i.e. Automated Meter Infrastructure and Demand Side Management) targeting energy efficiency**
  - Communication Technology (i.e. BPL, Wireless, RF, Satellite)
- Information Technology
  - User Interface Technology, Simplification
  - Web services/Portals
  - **Energy Capital Management**
  - Pervasive devices
  - Data security
  - Desk top integration
- **SmartGrids Energy Efficiency goals (20/20/20)**

4 dimensions for Energy investments

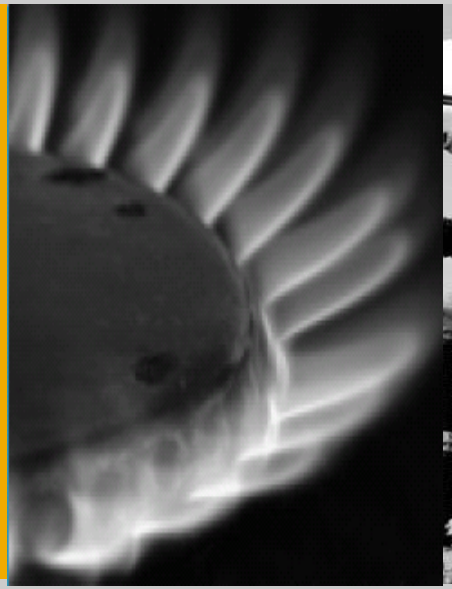
Automated meter infrastructure
Energy Data Management
Energy Ledger/Portfolio Management
Forecasting, scheduling and risk management
DER, Energy Trading, RCM

Supplier switch and payment process
Utilities Customer Electronic Services (UCES)
Business Process exception Management
Selling and Billing of energy and services
Maximizing return on Capital assets (EAM)



Analytics for Utilities
Sarbanes Oxley – Regulatory compliance
Strategic Enterprise Management / BSC
Corporate Social responsibility
sustainability

ESA Enablement
Open technology platform
Flexible reporting
Mobile Asset Management
Customer acquisition



2- SmartGrids vision 2020 for better energy efficiency

Headline Challenges

1. **€750bn** in EU power infrastructure is needed over the next 30 years

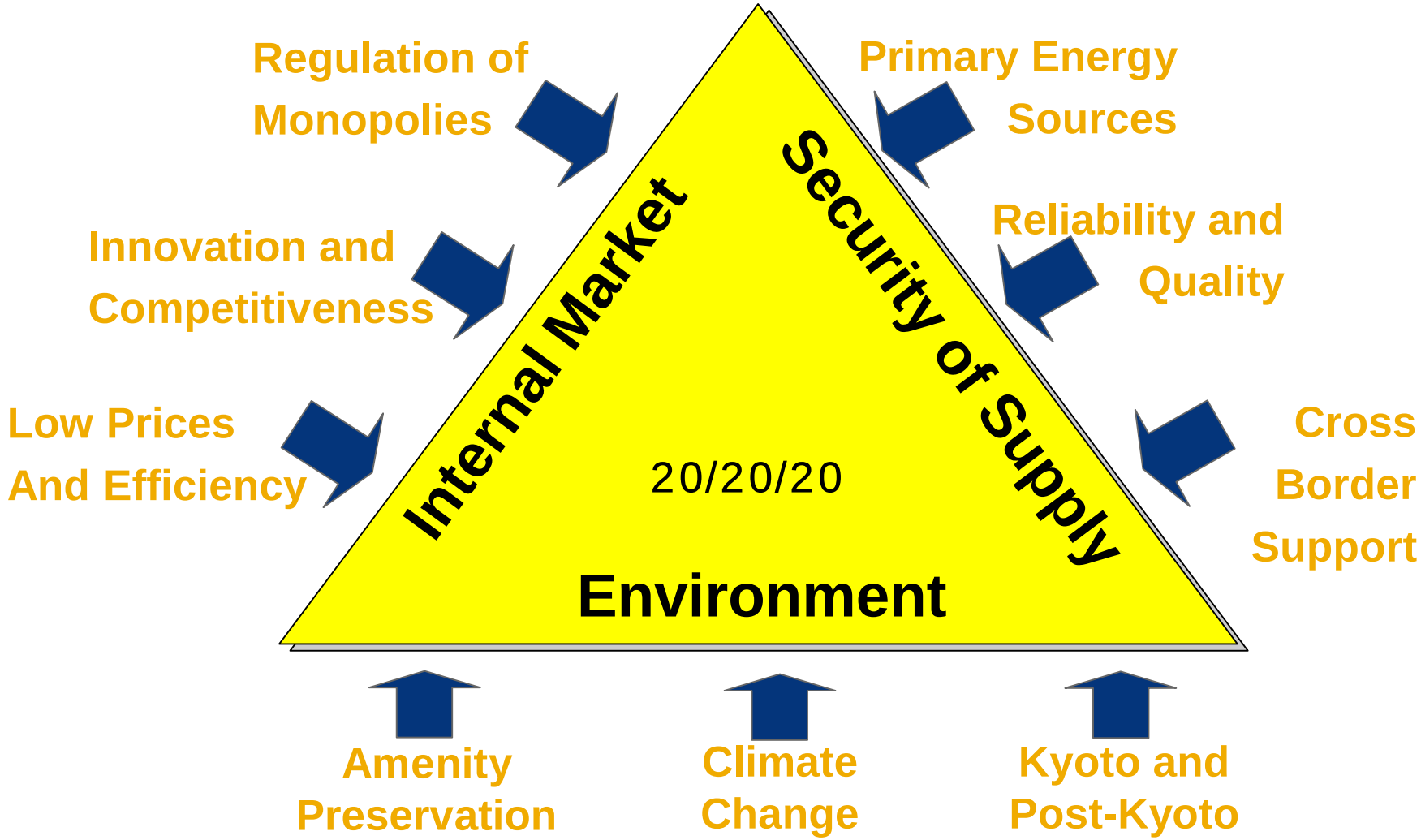
   €90bn in Transmission, €300bn in Distribution, and €350bn in generation
2. **Grids now 40 yrs old**: a massive renewal programme is unavoidable
3. **EU policies** (EU Energy policy signed in Jan 2007) for energy security and environment set demanding goals in 2020 compared to 1990

   ⇒*20% less energy consumption*

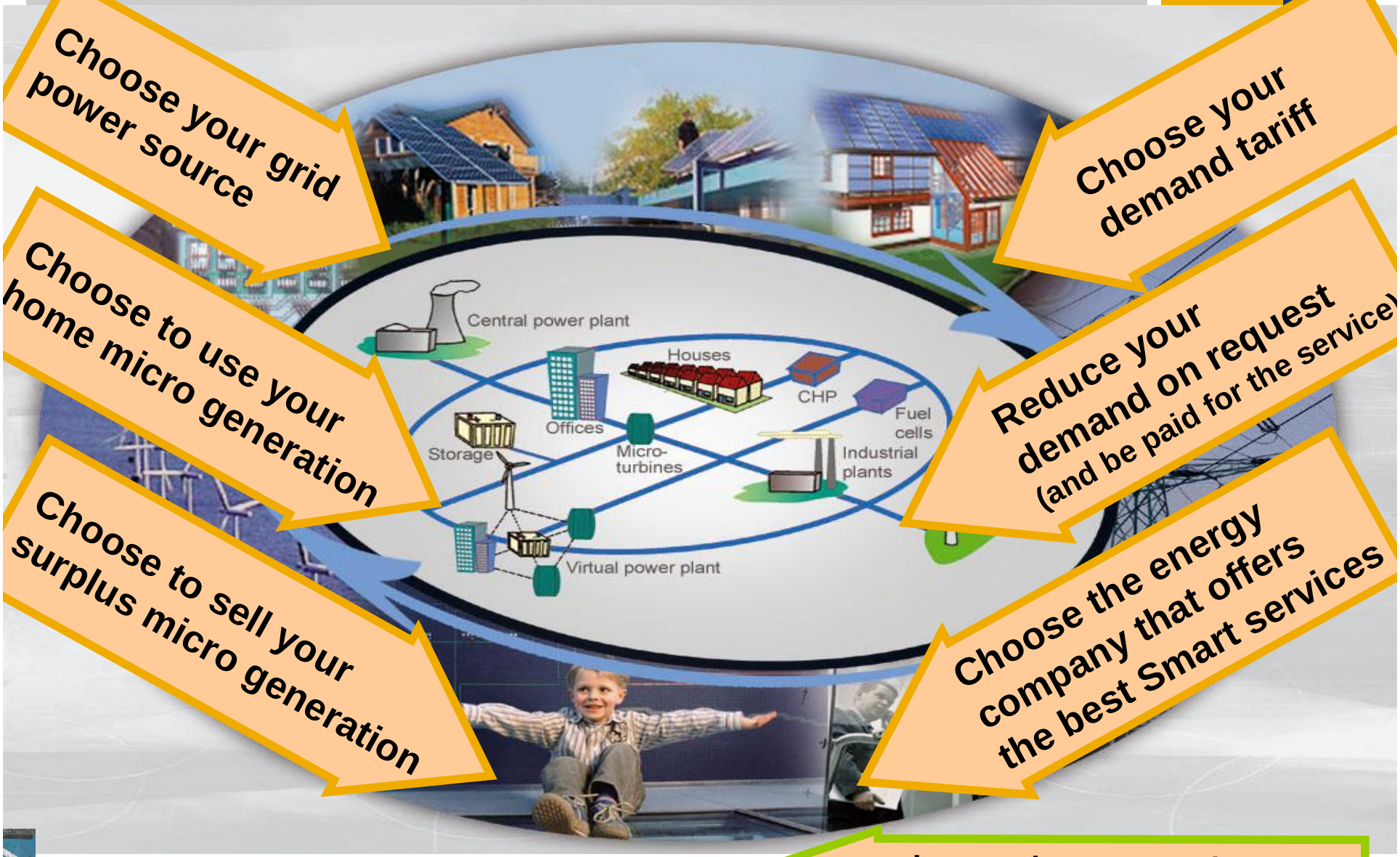
   ⇒*20% less Carbon emission*

   ⇒*20% of energy produced from renewable energy*
4. **New network architectures and customer interactions are needed**

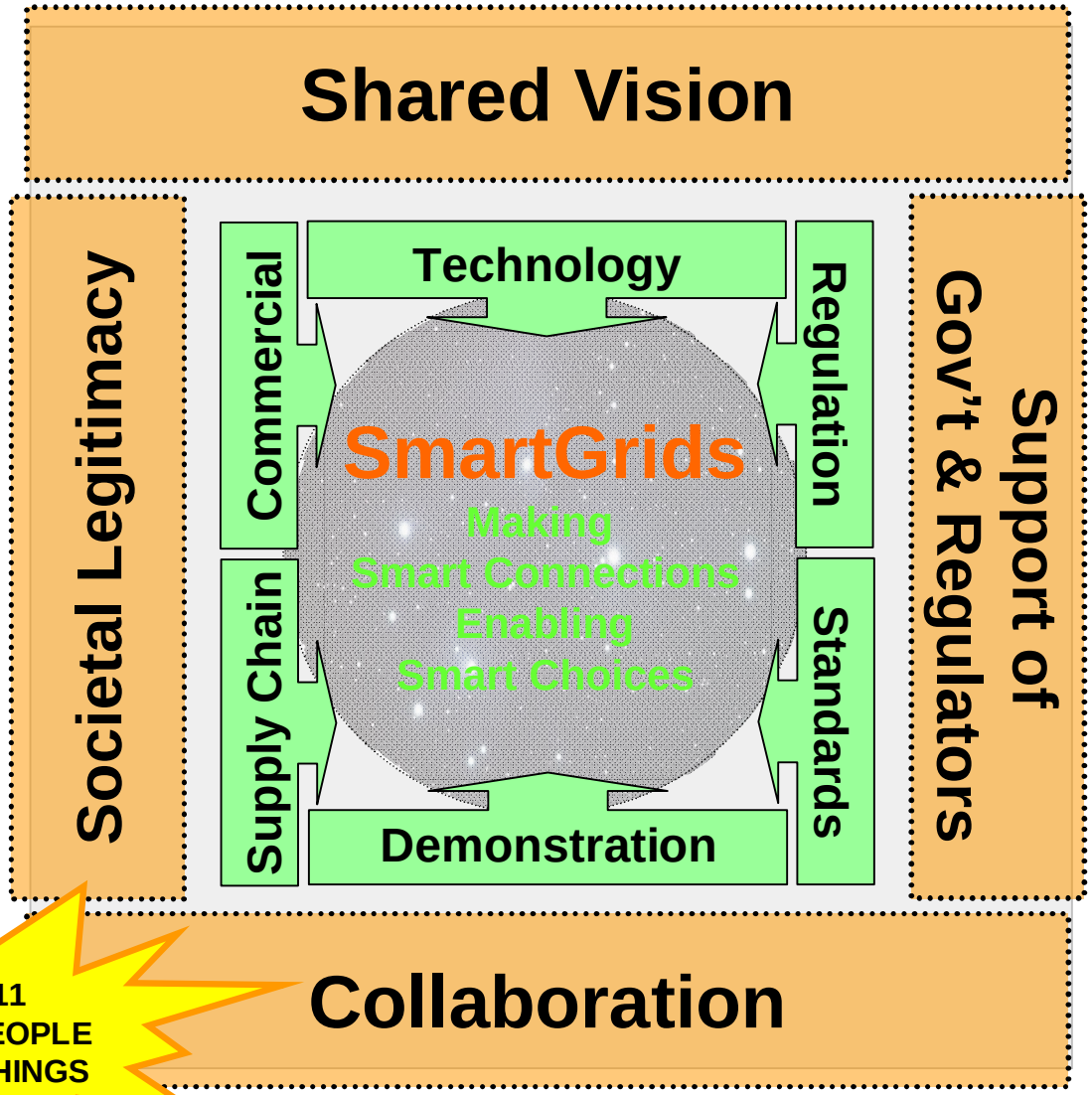
Drivers towards SmartGrids : 20/20/20 goals



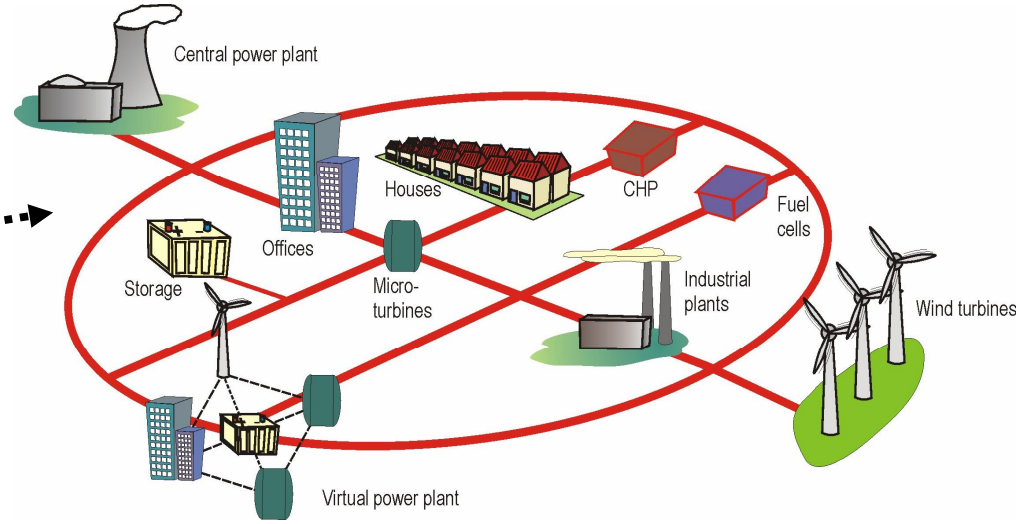
Think Efficient homes of the future …

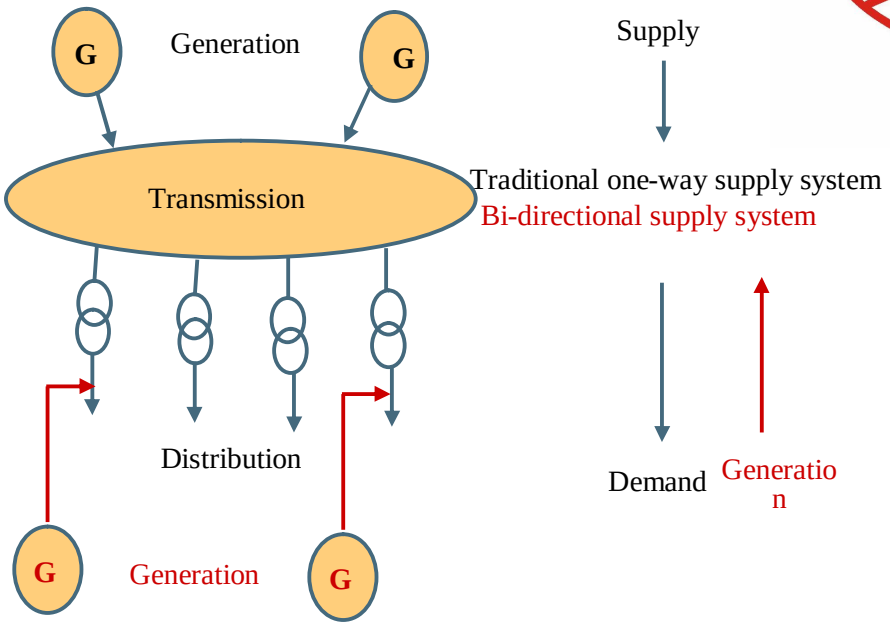


The 10 Elements of success of SmartGirds for better Energy Efficiency



The SmartGrids design becomes internet like





Future requirements

Flexible: user-centric, service oriented & designed for future

Accessible: connect all users

Real Time: Adaptive Demand and Supply

Reliable: security of supply in a digital age

Economic: best value -> innovation, efficiency & competition

The SmartGrids move for energy efficiency and role of ICT

20th Century Grid	21st Century Smart Grid
Electromechanical	Digital
Very limited or one-way communications	Two-way communications every where
Few, if any, sensors – "Blind" Operation	Monitors and sensors throughout – usage, system status, equipment condition
Limited control over power flows	Pervasive control systems - substation, distribution & feeder automation
Reliability concerns – Manual restoration	Adaptive protection, Semi-automated restoration and, eventually, self-healing
Sub-optimal asset utilization	Asset life and system capacity extensions through condition monitoring and dynamic limits
Stand-alone information systems and applications	Enterprise Level Information Integration, inter-operability and coordinated automation
Very limited, if any, distributed resources	Large penetrations of distributed, Intermittent and demand-side resources
Carbon based generation	Carbon Limits and Green Power Credits
Emergency decisions by committee and phone	Decision support systems, predictive reliability
Limited price information, static tariff	Full price information, dynamic tariff, demand response
Few customer choices	Many customer choices, value adder services, integrated demand-side automation

How customer participation will evolve ?

… from passive to active transactions in the marketplace to save end consumer's energy and balance the load for distributors

Stakeholders involved

EU, GO, Utilities, …

Customer - Utilities

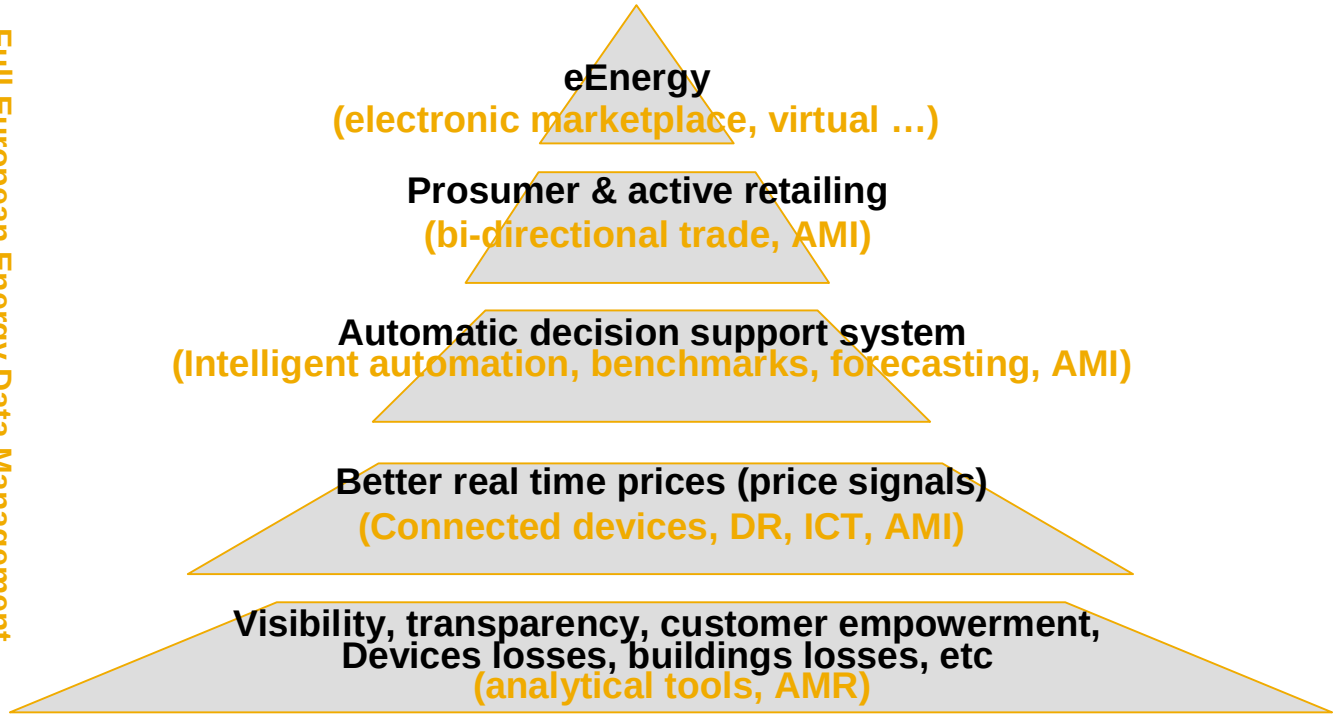
Suppliers, Customers, Technology & Services

Suppliers to Customer

Customer

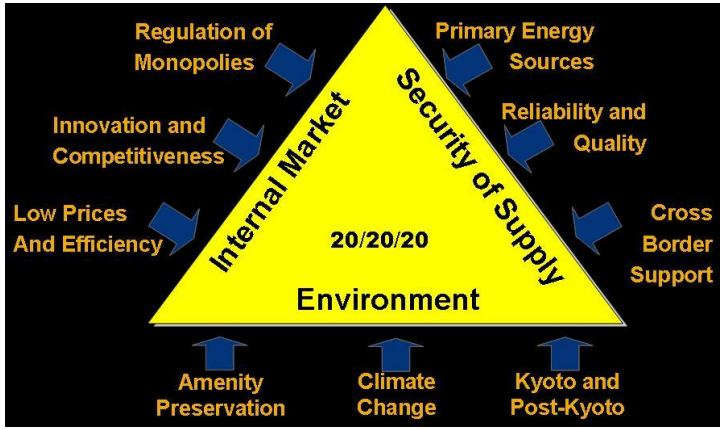
Full European Energy Data Management

Customer participation aspects (technology enabled)



SmartGrids business cases assessed to be deloyed

… Aiming at Strategic Deployment of SmartGrids Programs 2020



Business Case 1 : Infrastructure

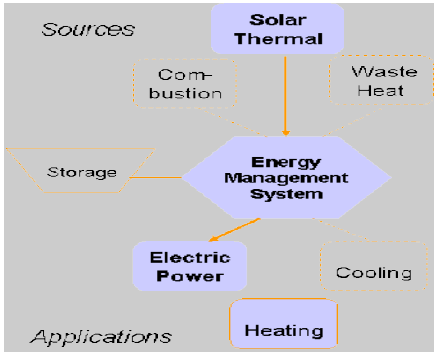
Development and Operation of Grid Infrastructure for the Efficient Electricity Market and Secure Electricity Supply

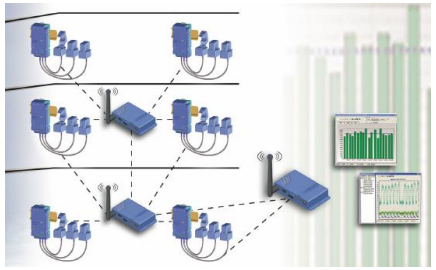
Business Case 2 : Users

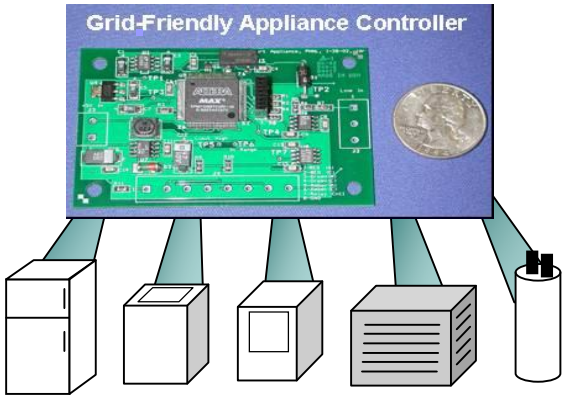
Definition and deployment of Value Added Services to customers

SmartGrids BC 2 : Development & deployment of Value Added Services to customers

Projects submitted to SmartGrids for Strategic Deployment till 2020







Project 1 : Development of Standard Customer Interface(s) providing Value Added Services to customers

(Customer Interface Technologies and standards)

Project 2 : Smart Energy Management (for Large DG) of Demand & Supply and Customer participation

(Innovative Energy Management strategies for large DG penetration, storage and demand response)

Project 3 : Development of an intelligent Smart Home Controller

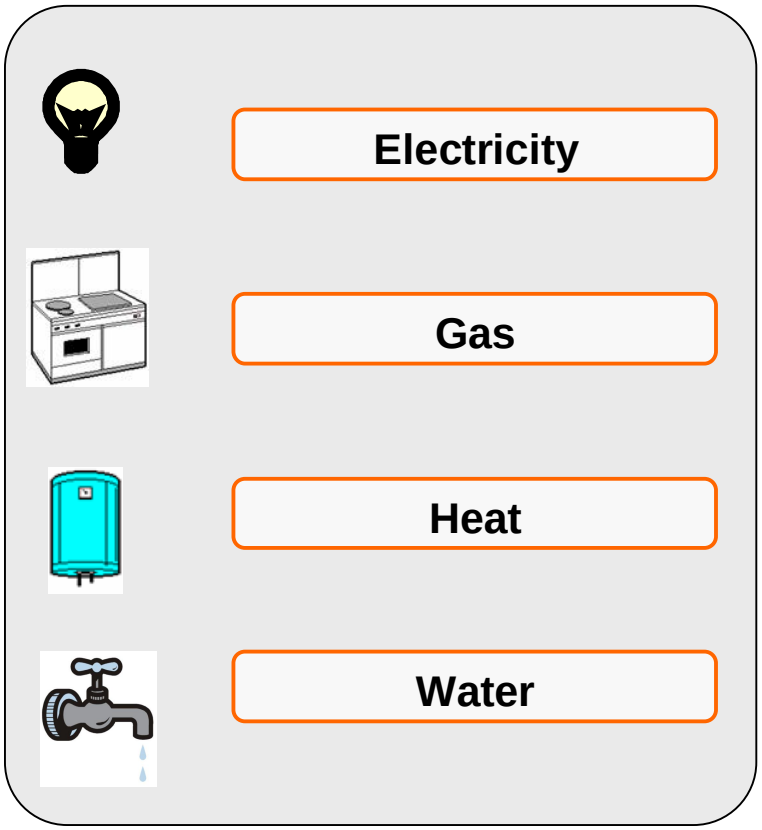
(The distribution networks of the future - customer driven markets)

Project 4 : Definition of an Organizational and legal framework for customer centric network control

(The networks of the future - a system engineering approach to study the operational integration of distributed generation and active customers)

How customers will benefit from Value Added Services ?

… Through multi-Utilities convergent Metering and Billing



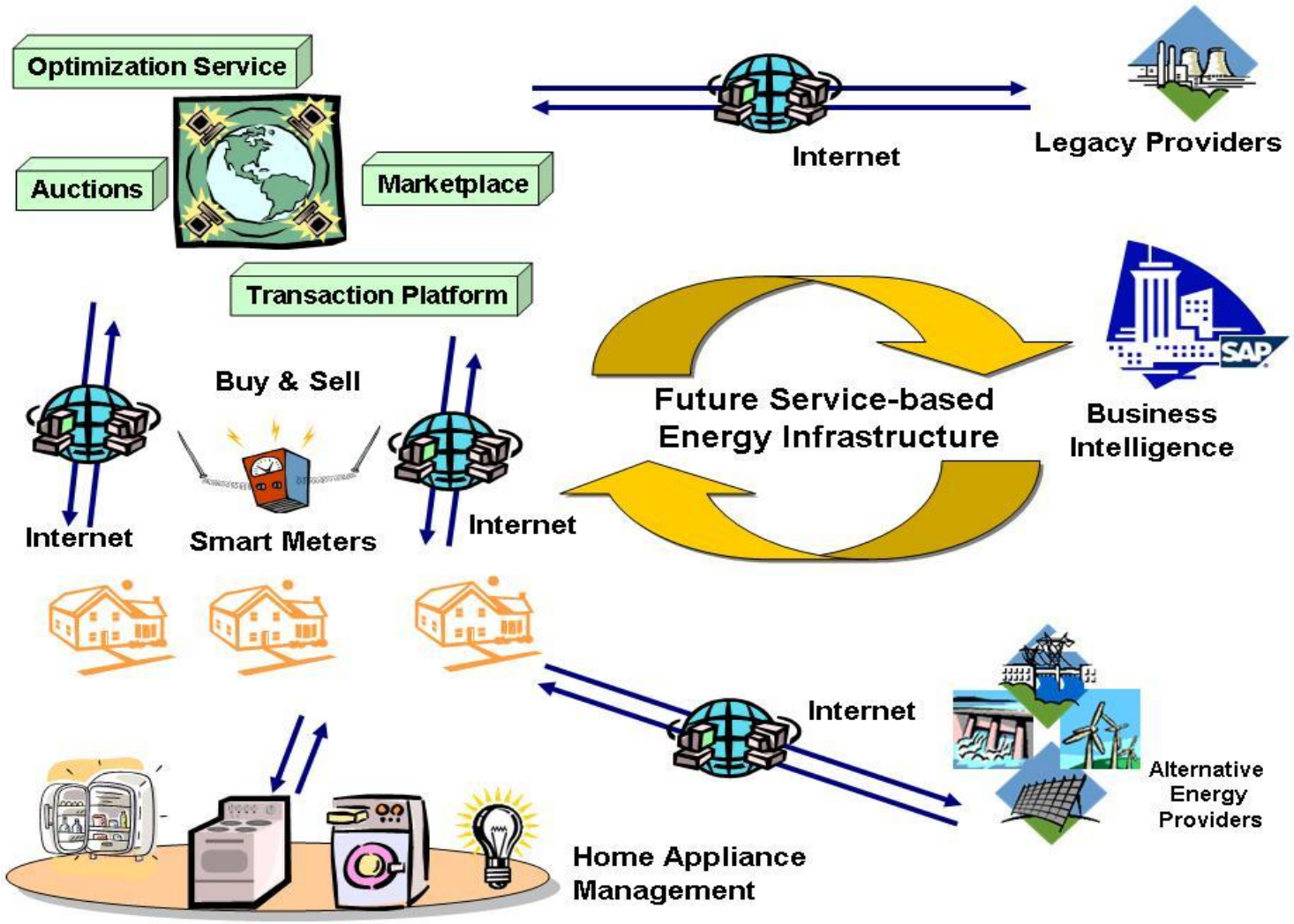
AMI
Web Services

All in one
Virtual
E-meter

- One bill
- One (virtual) metering Combined tariffs
- Optimized Costs
- Service coordination

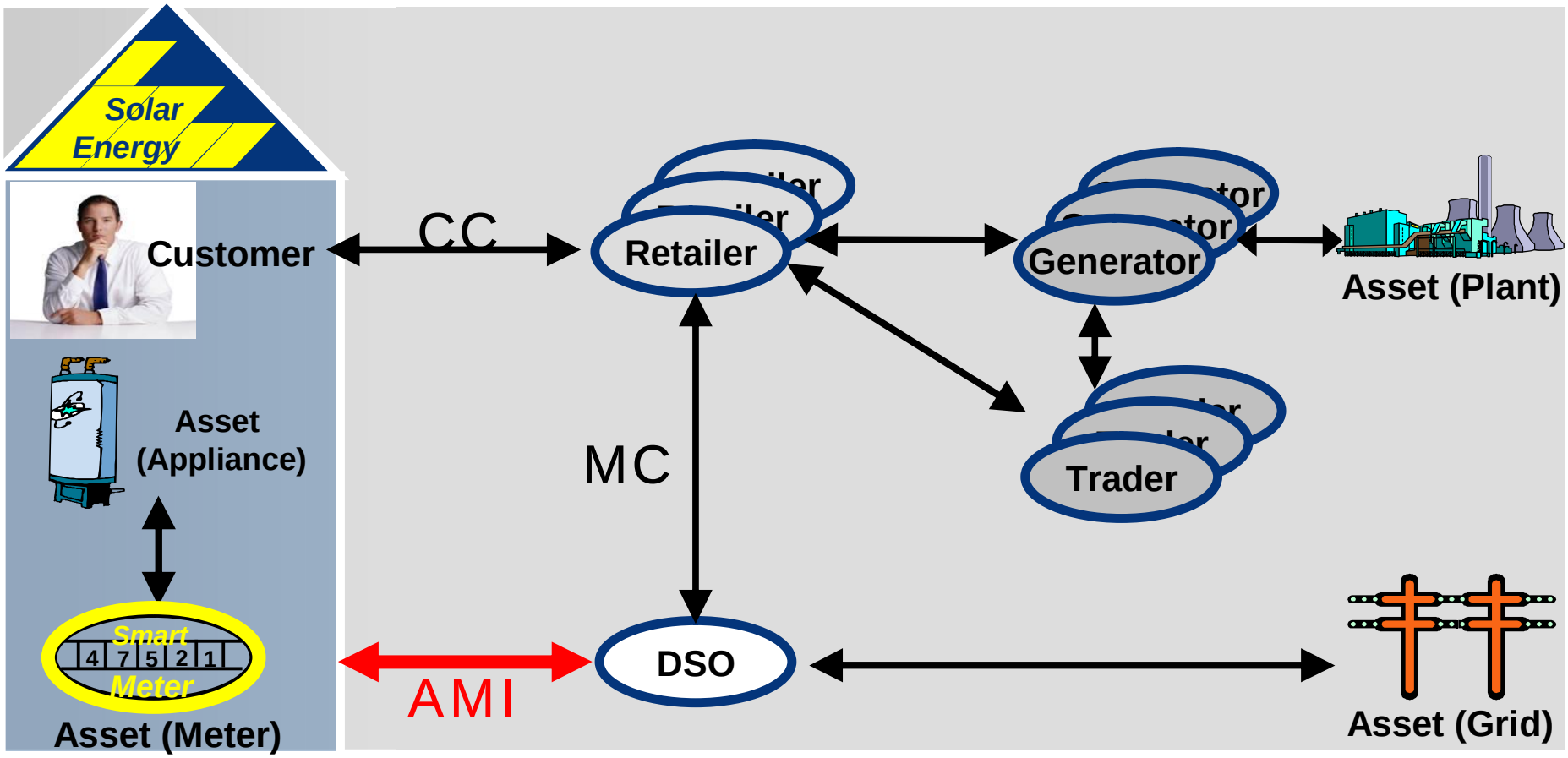
How electronic transactions will evolve in the marketplace ?

…Towards an Electronic European Energy Marketplace (eEEM)

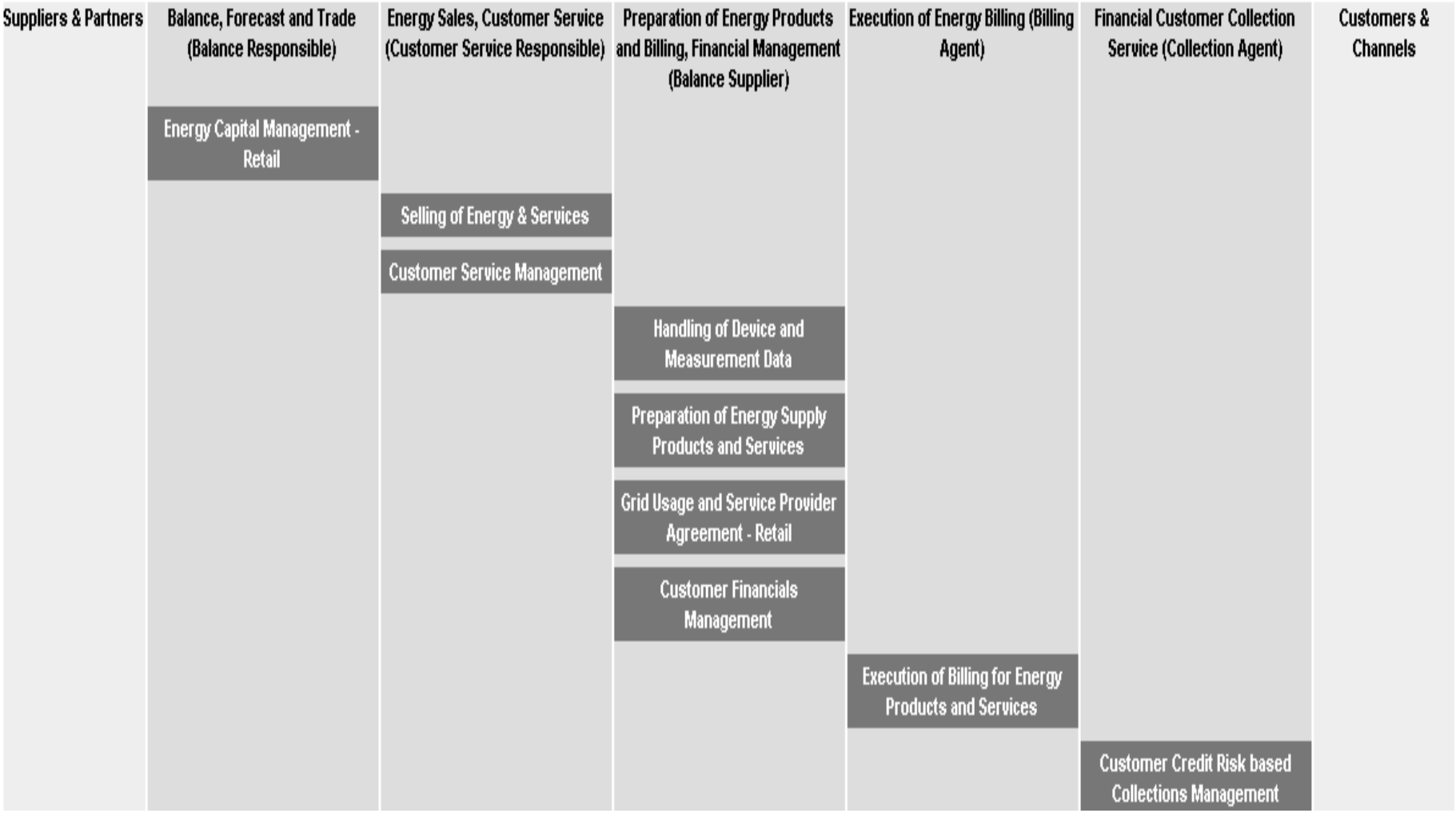


How Network will « talk » to consumers ?

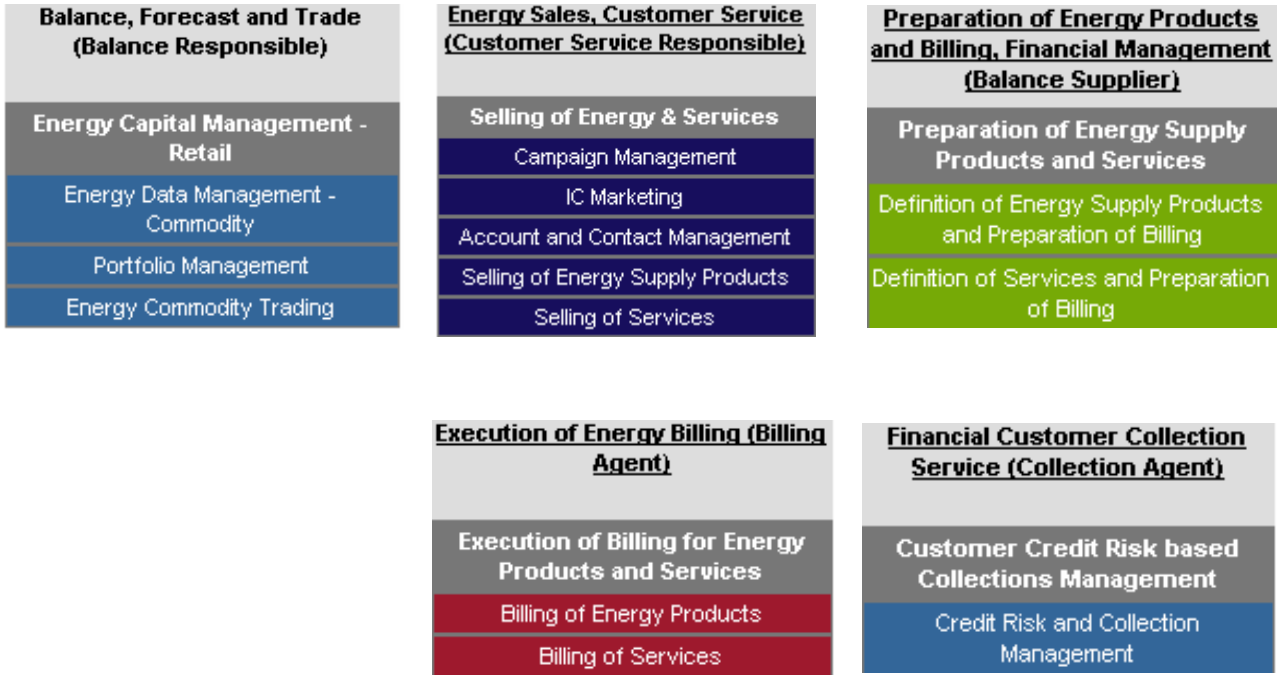
…Through Automated Metering Infrastructure (AMI) providing Value Added Services



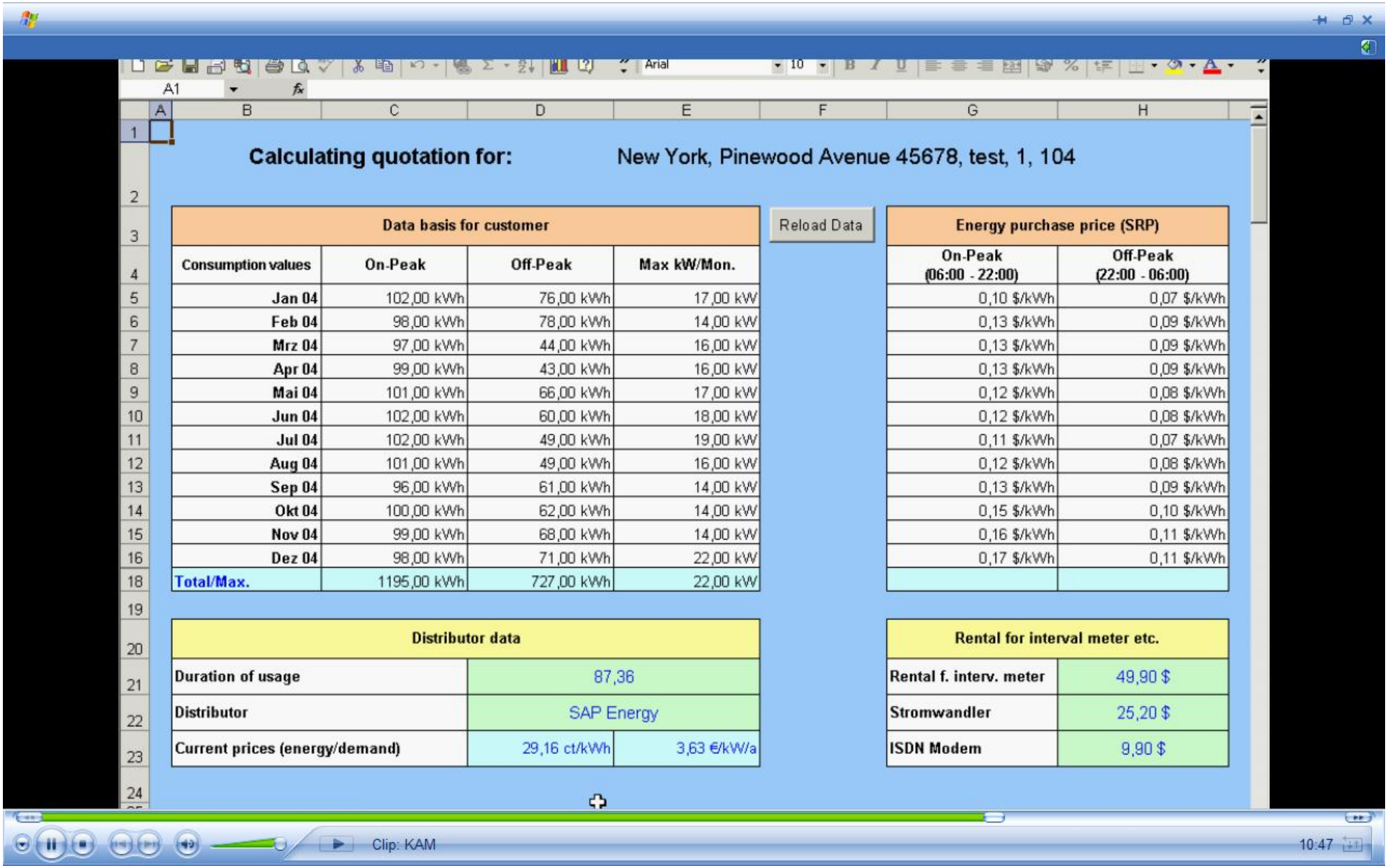
Retailer Marketing and Customer Services in liberalized Energy Markets



Processes of Retailer Marketing and Customer Services in liberalized Energy Markets



Customer Relationship Management : Key Account Management



Calculating quotation for: New York, Pinewood Avenue 45678, test, 1, 104

Reload Data

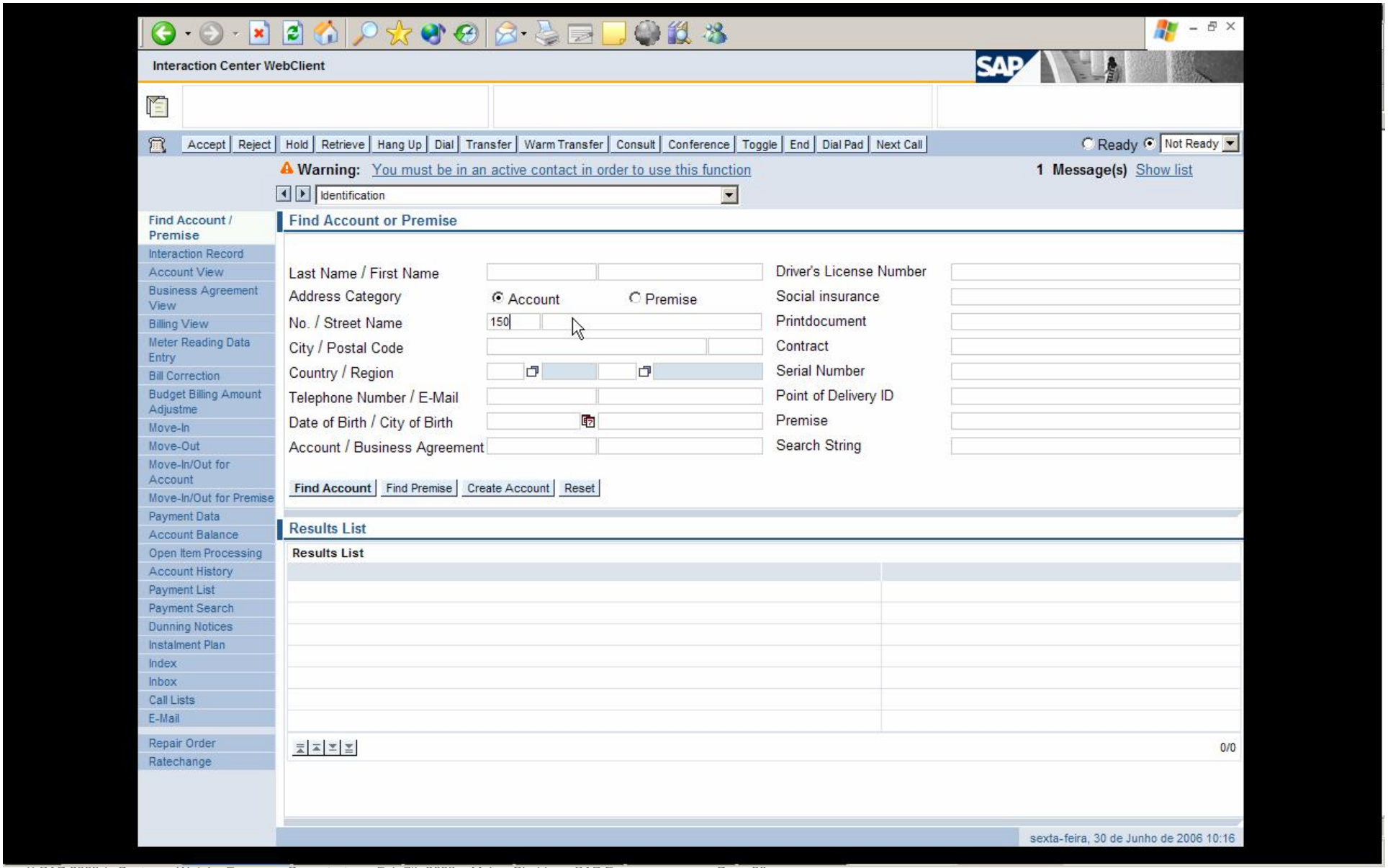
Data basis for customer			
Consumption values	On-Peak	Off-Peak	Max kW/Mon.
Jan 04	102,00 kWh	76,00 kWh	17,00 kW
Feb 04	98,00 kWh	78,00 kWh	14,00 kW
Mrz 04	97,00 kWh	44,00 kWh	16,00 kW
Apr 04	99,00 kWh	43,00 kWh	16,00 kW
Mai 04	101,00 kWh	66,00 kWh	17,00 kW
Jun 04	102,00 kWh	60,00 kWh	18,00 kW
Jul 04	102,00 kWh	49,00 kWh	19,00 kW
Aug 04	101,00 kWh	49,00 kWh	16,00 kW
Sep 04	96,00 kWh	61,00 kWh	14,00 kW
Okt 04	100,00 kWh	62,00 kWh	14,00 kW
Nov 04	99,00 kWh	68,00 kWh	14,00 kW
Dez 04	98,00 kWh	71,00 kWh	22,00 kW
Total/Max.	1195,00 kWh	727,00 kWh	22,00 kW

Energy purchase price (SRP)	
On-Peak (06:00 - 22:00)	Off-Peak (22:00 - 06:00)
0,10 $/kWh	0,07 $/kWh
0,13 $/kWh	0,09 $/kWh
0,13 $/kWh	0,09 $/kWh
0,13 $/kWh	0,09 $/kWh
0,12 $/kWh	0,08 $/kWh
0,12 $/kWh	0,08 $/kWh
0,11 $/kWh	0,07 $/kWh
0,12 $/kWh	0,08 $/kWh
0,13 $/kWh	0,09 $/kWh
0,15 $/kWh	0,10 $/kWh
0,16 $/kWh	0,11 $/kWh
0,17 $/kWh	0,11 $/kWh

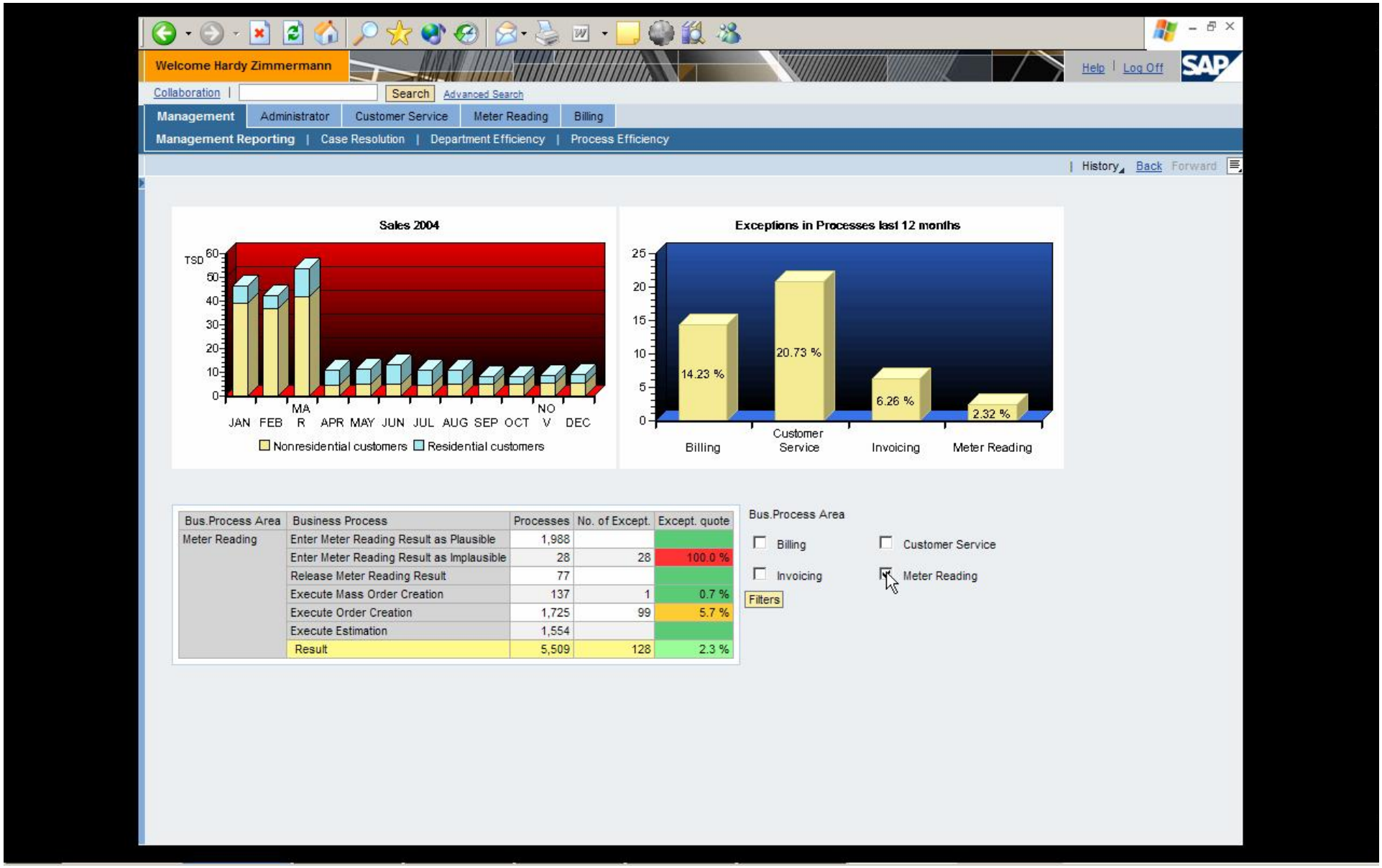
Distributor data		
Duration of usage	87,36	
Distributor	SAP Energy	
Current prices (energy/demand)	29,16 ct/kWh	3,63 €/kW/a

Rental for interval meter etc.	
Rental f. interv. meter	49,90 $
Stromwandler	25,20 $
ISDN Modem	9,90 $

Customer Services through 360° Customer view via the Call Centre

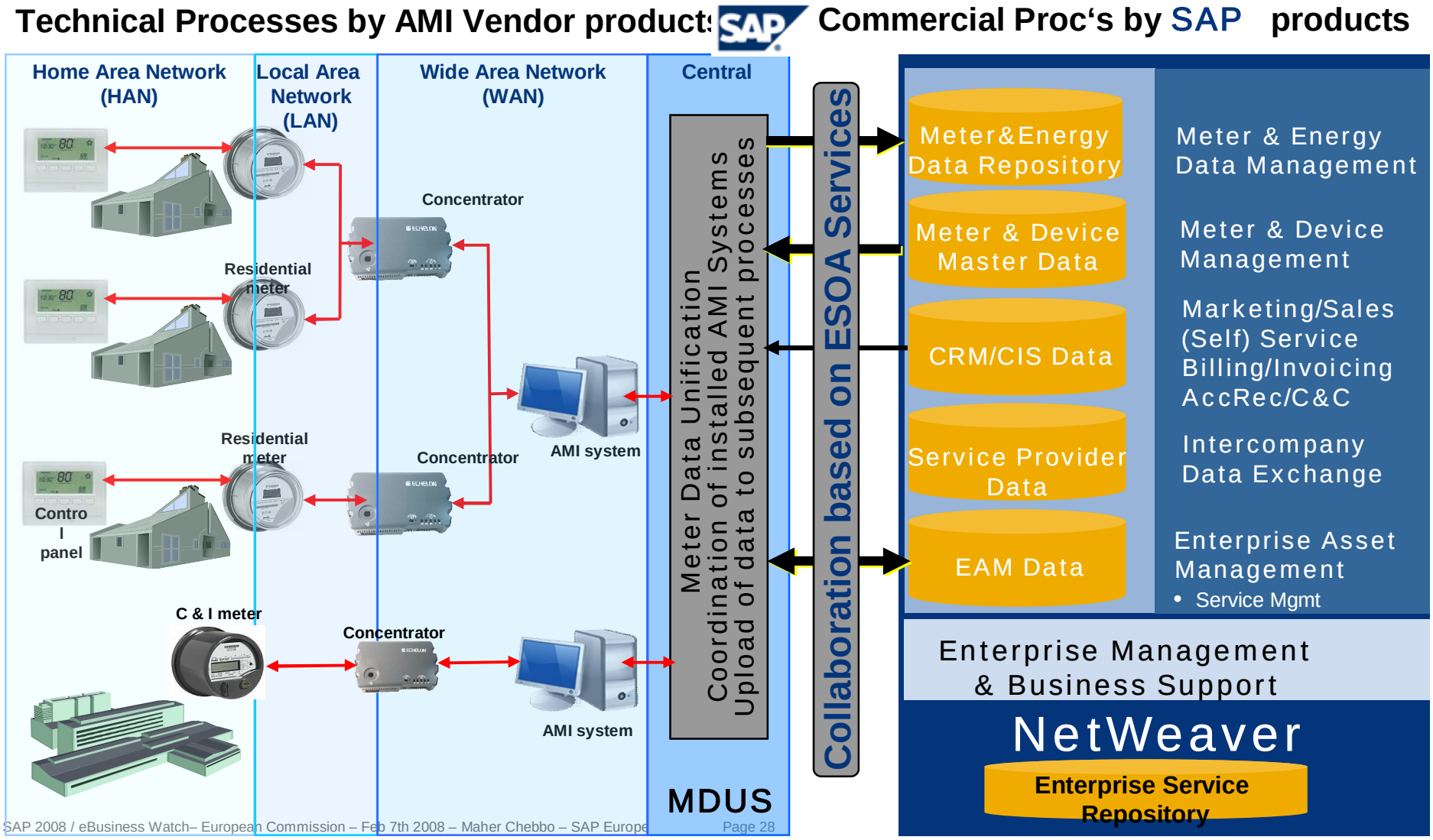


Analytics for better Decision support and predictions



How customer communication intrerface will evolve?

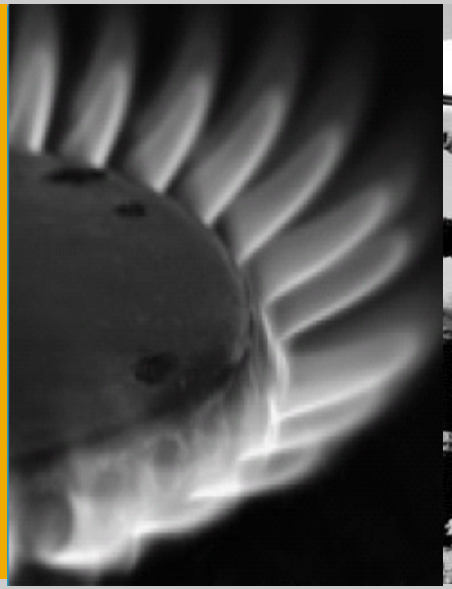
… towards Standard Meter Data Unification (MDU)



How customers will benefit from Value Added Services ?

…Through Web services scnarios enabled by Automated Metering Infrastructure (SAP AMI) and Demand Response

Billing & Customer Services	Customer Interface	Delivery	Energy Procurement	Field Services / System Recovery	Installation & Maintenance
Multiple clients read demand and energy data automatically from customer premises	Customer reduces demand in response to pricing event	Distribution operator curtails customer load for grid management	Real-time operations curtails (or limits) load for economic dispatch (ES&M)	AMI system recovers after power outage, communications or equipment failure	Utility installs, provision and configure the AMI system
Utility remotely limits or connects / disconnects customer	Customer reads recent energy usage and cost at site	Distribution operators optimize network based on data collected by the AMI system	Utility procures energy and settles wholesale transactions using data from the AMI system	-	Utility maintains the AMI system over its entire life cycle
Utility detects tampering or theft at customer site	Customer uses pre-payment services	Customer provides distributed generation	-	-	Utility upgrades AMI system to address future requirements
Meter reading for gas & water utilities	Multiple clients use the AMI system to read data from devices at customer site	Distribution operator locates outage using AMI data and restores service	-	-	-



3- Conclusion

Benchmark improvements in Customer Information Systems due to ICT (examples from SAP)

Tangible Benefits

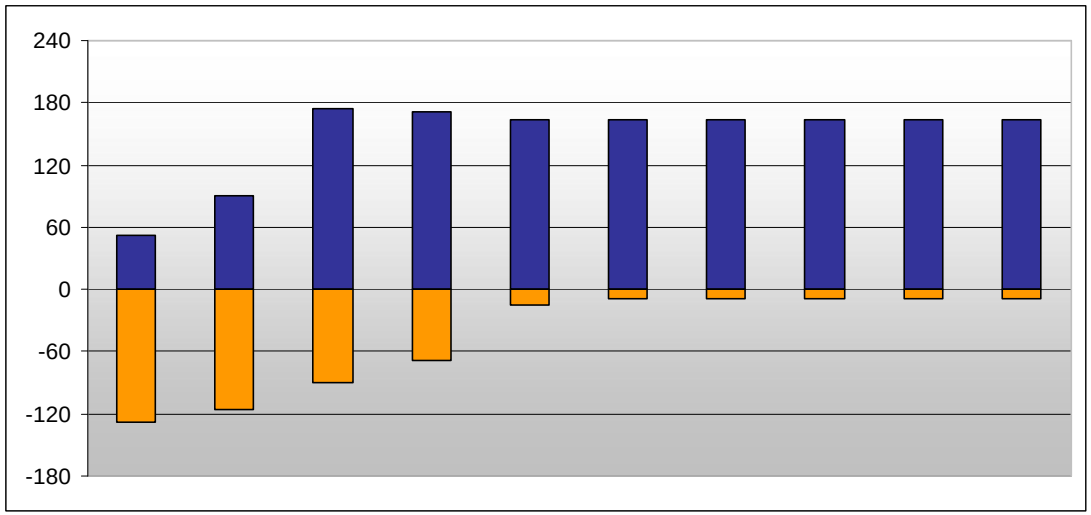
	Improvement %
Improved Call Center Productivity	2% - 5%
Reduced call volume through web- and phone self service	5% - 10%
Improved Meter Reading Productivity	2% - 5%
Improved Billing/Collections Productivity	2% - 3%
Payment Handling Efficiency Gains	1% - 2%
Cost to Serve (leading to cheaper energy costs)	**25% - 60%**
Cost Avoidance – integration between CIS and SAP systems	70% - 80%

Strategic Benefits

- Improved customer satisfaction metrics
- Ability to track and quickly report customer service and satisfaction metrics
- Better knowledge of customer base
- Improved billing accuracy
- Improved alignment and consistent execution of corporate strategy
- Improved productivity and quality through integrated business processes
- Creation of scalable processes positioned for rapid revenue and customer growth

SAP investments @ Southern California Edison returned 71% IRR and 500 M$ savings

Cash Flow Analysis- SCE Scope ($MM)

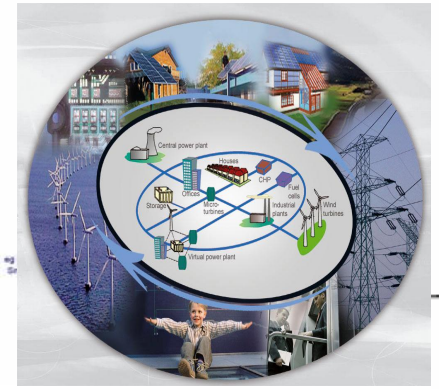


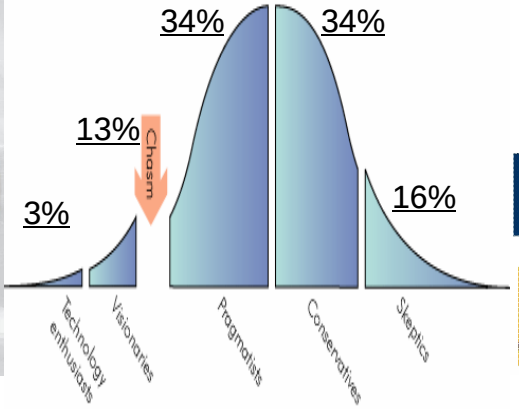
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Benefit	51.5	90.2	173.6	171.8	163.8	163.8	163.8	163.8	163.8	163.8
Cost	(127.8)	(115.3)	(89.4)	(68.0)	(14.6)	(9.6)	(9.6)	(9.6)	(9.6)	(9.6)

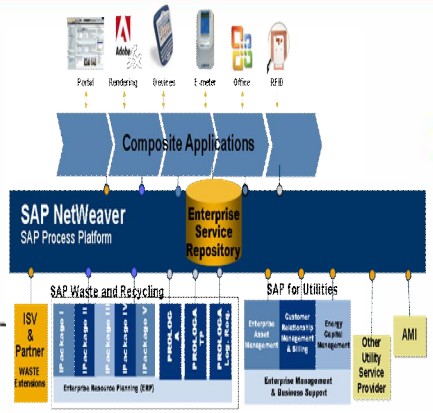
Project Economics	
NPV @ 10%	$500 MM
Project IRR	71%
Benefit / Cost	2.4

The route to Smart investments in Energy efficiency…

Wise Vision + **Smart Technology** + **Flexible Processes** = **INNOVATION**







- Automated Metering Infrastructure
- Customer gateway to market

Innovation

CORE
Focus: Differentiation

SMARTGRIDS

Technology providers