ENERGY EFFICIENCY

THE POWER TO KNOW.

SMART CITY USE CASE, ENERGY EFFICIENCY AND IOT

ENERGY EFFICIENCY

USE CASES AND ITS CONTEXT

ENERGY EFFICIENCY, A RISING CONCERN

Deregulation

Deregulation of both production and supply of gas and electricity implies to build new business models significantly different from traditional ones

Generation capacities & grids

Huge investment ($16 trillion worldwide) is needed involving an increase in price of both gas and electricity

Declining natural resources

In the resource deficient regions of Asia & Europe, energy sourcing is becoming crucial and focuses major attention of key energy players

Demand is booming

Because of the lack of electricity generation capacity, peak prices are becoming very high and volatile

Policy & Environment

Climate change protocol implementation involves new constraints to be integrated in today's utility business model

ENERGY EFFICIENCY

ENERGY EFFICIENCY TOPICS ARE BEING ADDRESSED DIFFERENTLY BY STAKEHOLDERS

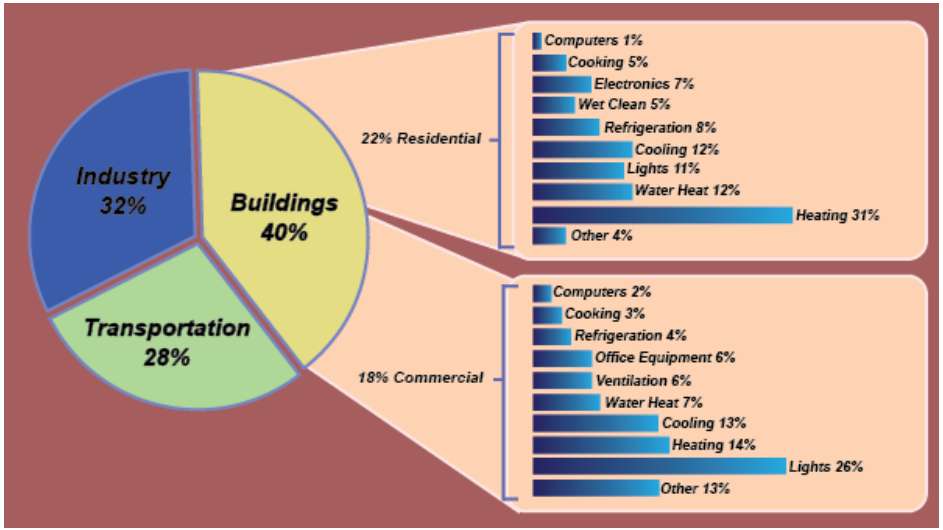
	Drivers	Efforts	Benefits
Utilities	• Economic • Regulation & Legislation • Corporate Social Responsibility • New Services	• Energy investment planning • Differential/Preferential tariff incentives • Passive energy efficiency	• Smart management of supply and demand (Forecasting & Intensity mapping • Hidden costs and inefficiencies
Councils/State	• Energy Security • Environmental • Attracting Investment	• Smart Data Strategy - Management and Governance • Implement a set of pilot programs	• Spur economic growth • Integration of green technologies • Reduce energy expenditures for citizens
ESCO's	• Energy Auditing • Benchmarking & certification • Asset Optimization	• Newer Capital Financing Models • Active & Intelligent energy efficiency through automation and regulation	• Measure and compare the profitability of project investments (retrofits) • Optimal consumer/ building operations

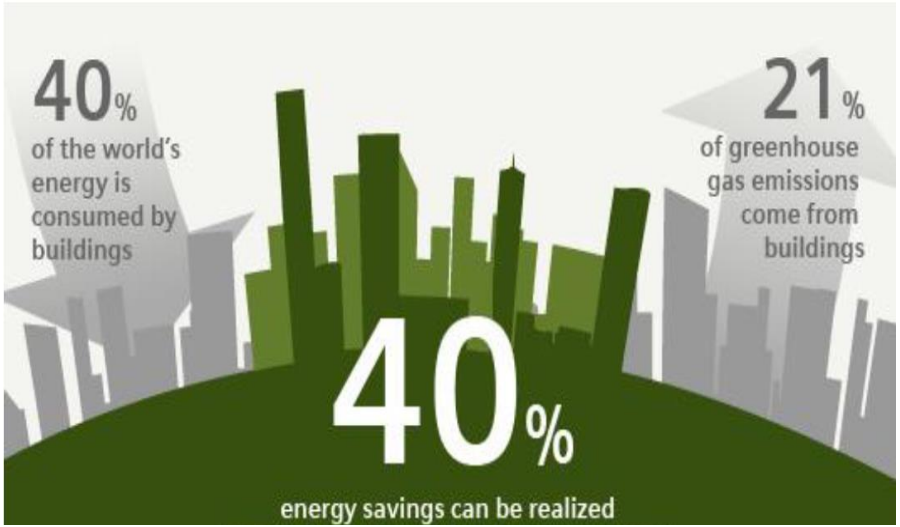
ENERGY EFFICIENCY

UNDERSTAND SMART BUILDING AND THE MAGNITUDE OF THE PROBLEM

SMART ENERGY

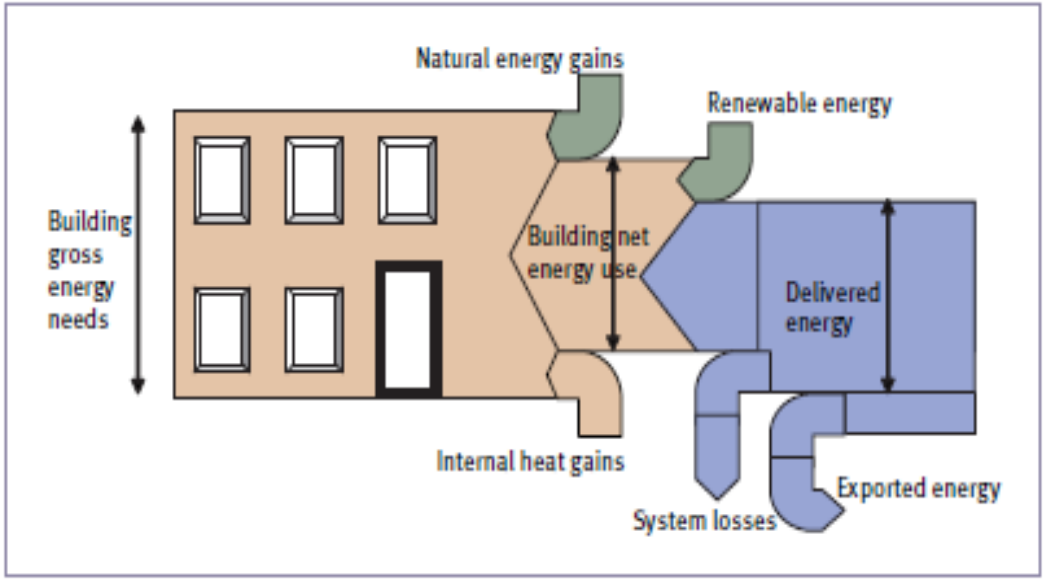
BUILDINGS CONSTITUTE 40% OF TOTAL ENERGY CONSUMPTION BUT HAVE AN EQUALLY HIGH SAVINGS POTENTIAL





ENERGY EFFICIENCY

FACTORS INFLUENCING TOTAL ENERGY USE IN BUILDINGS



Infrastructure

- Building Envelope
- Facilities
- Building Management Systems (BMS)

Usage

- Occupant behavior
- Indoor environment conditions
- Operation & maintenance

Building Performance

Energy Use

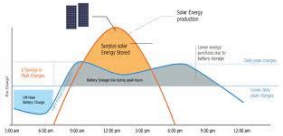
ENERGY EFFICIENCY

EXAMPLE USE CASES FOR IOT

Building energy consumption

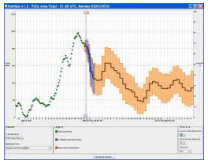
- Identifying anomalies resulting from inefficient buildings by measuring building energy intensity
- Comparing and understanding savings potential of buildings and the type of modernization requirement

Demand Management



- Monitoring of consumption, pattern of usage and property/consumer benchmarking for demand side management programs
- Identifying significant factors contributing to the consumption and identifying possible DR/DSM programs

Forecasting & Demand Modelling



- Time series Modelling of energy demand taking into consideration weather parameters and building parameters at daily and weekly level

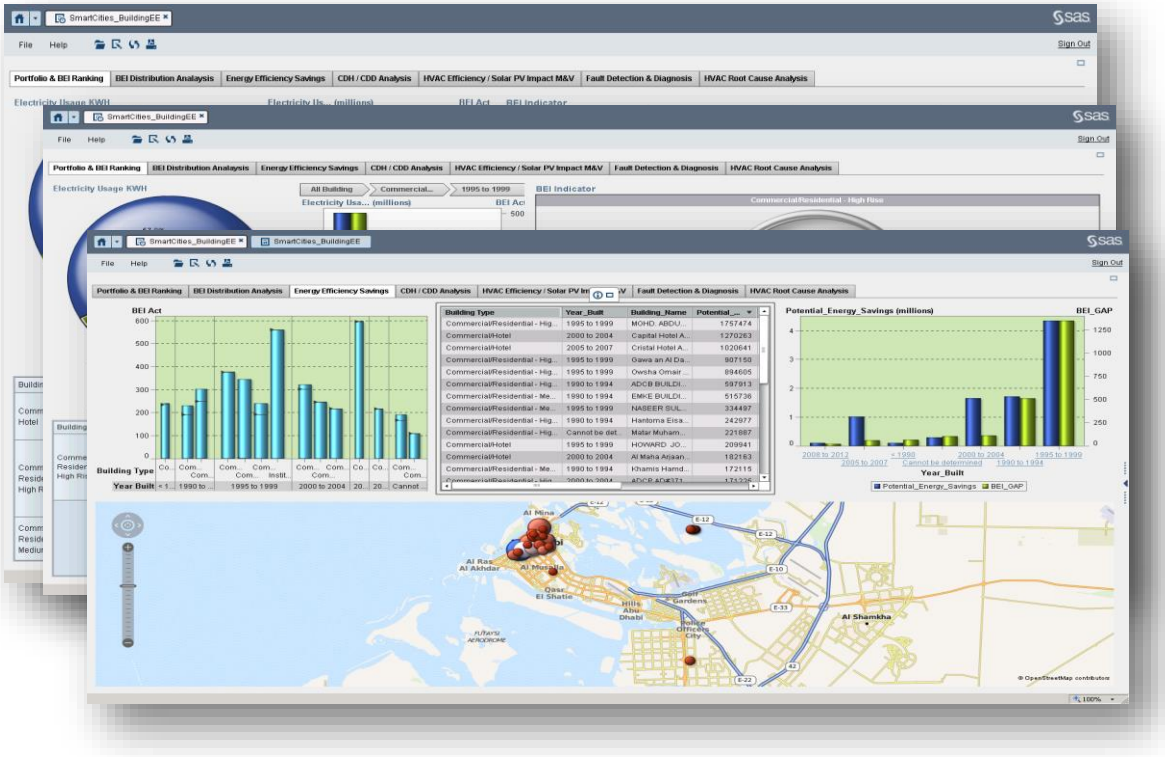
Asset Management for Buildings

- Surveillance of critical HVAC condition process performance and asset performance
- HVAC energy meter monitoring and identifying the Root cause and failure analysis

ANALYTICS AND ANALYSIS DONE

SMART BUILDING

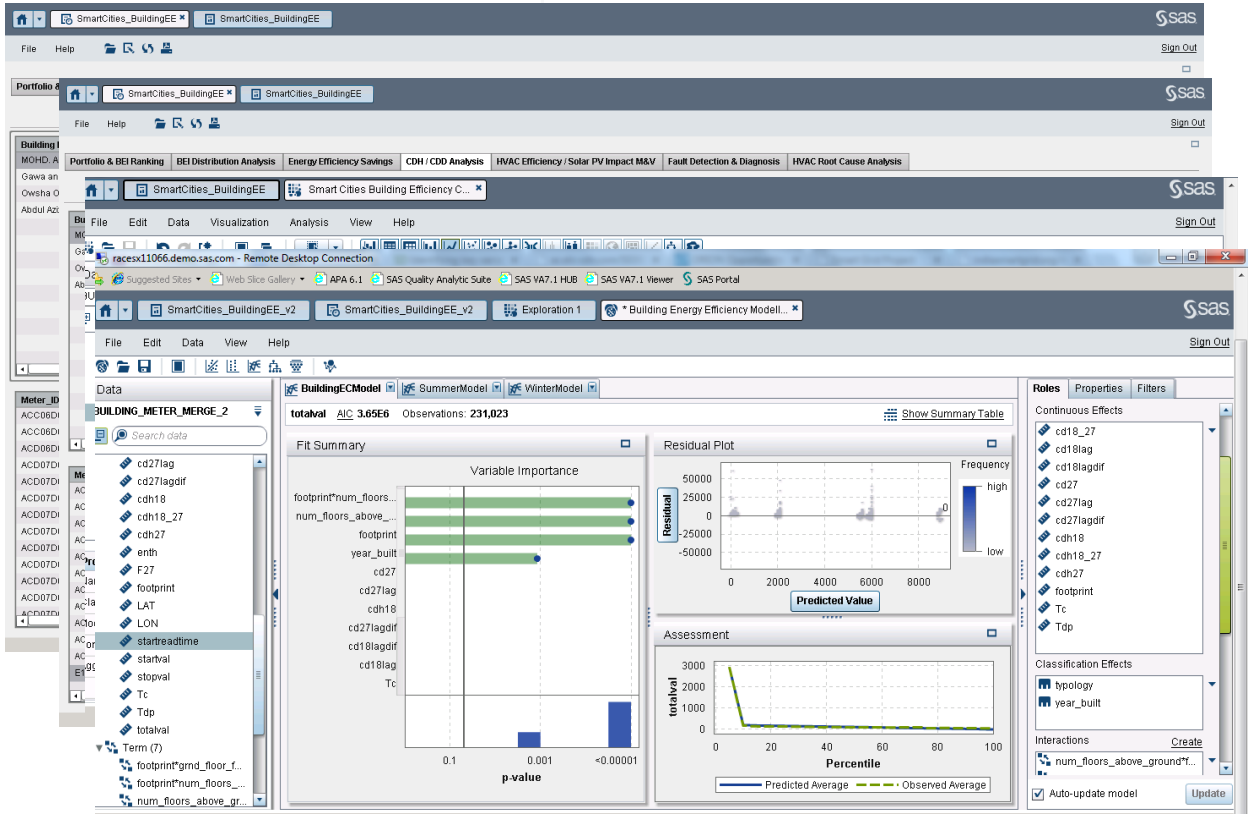
MONITORING AND SURVEILLANCE OF KPI'S, QUALITY PARAMETERS AND ASSET / PROCESS PERFORMANCE



- Monitoring of consumption, pattern of usage and property/consumer benchmarking for demand side management programs
- Understanding patterns of weekly consumption, holidays and working day patterns
- Identifying anomalies resulting from inefficient buildings by measuring building energy intensity
- Comparing and understanding savings potential of buildings and the type of modernization reqmt
- Surveillance of critical HVAC condition process performance and asset performance
- Monitoring the Energy consumption of the HVAC system and monitoring of indicators such as PUE
- Monitoring the environment, quality and generation of alarms in the HVAC, Security system

SMART BUILDING

CORRELATION OF WEATHER PARAMETER AND DEMAND FORECASTING INTEGRATING BUILDING PARAMETERS



Usage Segmentation of Customer to understand behavior and identifying the patterns and forecasting demand at hourly, daily, monthly, yearly level looking at peak and off peak patterns

HVAC energy meter monitoring and identifying the Root cause and failure analysis

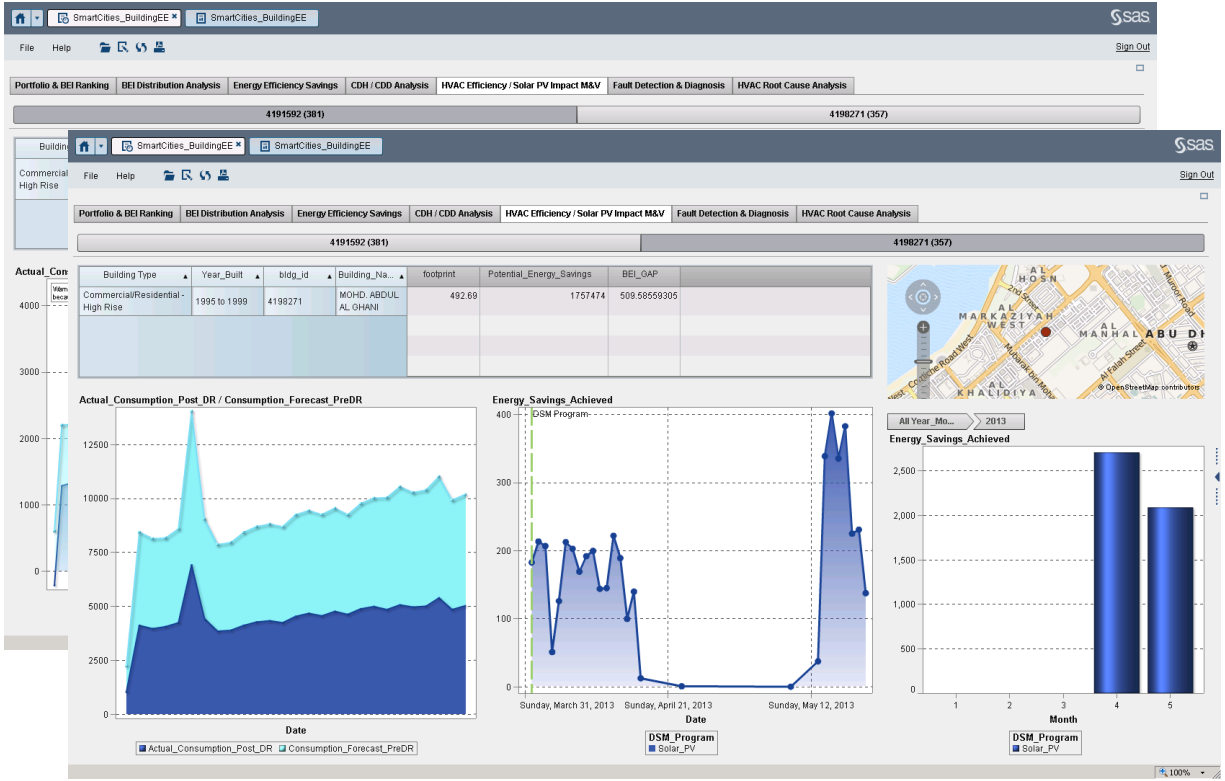
Time series Modelling of energy demand taking into consideration weather parameters and building parameters at daily and weekly level

Predictive models for energy consumption during summer, winter taking into considerations attributes of buildings and weather

Identifying the significant factors contributing to the energy consumption and looking at possible demand response / demand side mgmt programs

SMART BUILDING

QUANTIFYING THE SAVINGS POTENTIAL, MONITORING THE EFFECTIVENESS OF ENERGY SAVINGS PROGRAMS



Building wise monitoring the benefit of the programs thru demand response management across various program types

Monitoring the solar PV generation and utilization and feed in to the grid.

Quantifying the net energy savings, green house emissions and increase in sustainability index

SMART BUILDING | ENERGY EFFICIENCY IN SMART BUILDINGS

SOURCE DATA

- Meter Demand & Energy Data
- Weather Data
- Building Type Data
- Occupancy Data
- Water Consumption data
- Security Data
- HVAC Data
- Air Quality Data

Native connectivity

Web Services

Web Services

Native Connectivity

STREAMING DATA

In-Stream Sensor Data Management

- Data Cleansing
- Thresholds
- Model & Pattern
- Aggregation
- Queries

BATCH DATA

Batch or Mini-Batch Data Management

- Data Access
- Data Cleansing
- Data Preparation
- Data Aggregation

Real Time Processing Data/ Low Latency Alerting

Batch Processing

HIGH PERFORMANCE ANALYTICS

- Machine Learning
- Optimization
- Data Mining
- Forecasting
- Statistical Analysis
- Reliability Modeling
- Simulation
- Model building and deployment

STORAGE

HADOOP

INDUSTRY/DOMAIN AREA

- Building Consumption Trend
- EI Benchmarking & Ranking
- Holiday Patterns
- Faulty Meter
- HVAC Energy Consumption
- Air Quality Analysis
- Savings Potential Analysis
- Demand Modeling
- Demand Response Planning
- Energy Savings Monitoring
- Asset Performance Analytics
- HVAC Alarm Analysis
- HVAC Maintenance Analysis
- Security Breach Analysis

ACTIONS

- Operational Planning
- Maintenance Planning
- Service Planning
- Investment Planning
- Policy Simulation

RULES

- Event Response
- Strategic decisions
- Situational Awareness
- Anomalous Behavior Alerts
- Response Prioritization

INSIGHTS

- Leak Detection
- Risk Based Decision
- Simulation
- Optimization
- Ranking & Prioritization

BENEFITS AND REFERECES

ENERGY EFFICIENCY

BENEFITS USING STREAMING DATA

- **Understand energy saving potential quickly**
  - Including both previously undetected energy losses and extensions to already identified energy waste
- **Detect outliers of energy consumption and monitor efficiency of saving programs**
  - Significant improvement to detect anomalies in consumption quickly and clarify effectiveness of energy efficiencies investments
- **Real-time performance monitoring of PV systems and energy consuming equipment**
  - Understand underperformance of equipment as soon as it happens and act upon it
- **Improved efficiency for demand response programs**
  - Tailor the demand response programs according effective consumption real-time

REFERENCE | ENERGY EFFICIENCY FOR SMART BUILDING

CUSTOMER STORY

A handful of data, a lot of energy savings

SAS® helps manage demand and increase energy efficiency for the Poste Italiane Group.

Industry
Government

Business Issue
Reaching energy efficiency goals in at least 250 Poste Italiane Group facilities, including those with the highest energy consumption – such as data processing centers, executive centers and the largest branches.

Solution
With SAS® Business Intelligence solutions, Poste Italiane Group analyzes demand and provides information on users' macro behavior. Future developments involve correcting operation and maintenance behaviors for the systems and indirectly for the buildings.

Benefits
Early successes include a 1 percent decrease in consumption per year and a total 7 percent reduction in CO2 emissions.

In 2004, anyone who wanted to talk about optimizing energy costs would have had a hard time finding a sympathetic audience among a company's employees or its board of directors. At that time, Poste Italiane Group, the largest employer in Italy with approximately 150,000 employees, was also committed to continuing its transition from a typical government-run administration to that of a private organization, which follows a profit-generation approach.

The organization's proposal to examine and reduce energy costs in this climate was considerable, due to the energy distribution channels throughout the territory, a lack of information standardization among suppliers and the special nature of the assets, some of which were built in the Middle Ages.

Despite the many challenges, Poste Italiane Group made the courageous decision to start Progetto Speciale Energia (the Special Energy Project), headed by expert Energy Manager, Luciano Blasi, and with the support of the company's IT department. The goal was simply defined: monitor and optimize electric energy, fuel and water consumption at all government real estate properties.

The broader project objective would define a program – developed in three separate stages – that studied and analyzed energy consumption with a special focus on training, information sharing and full accountability for responsibilities.

Blasi's team started counting and classifying each asset and supplier type based on the energy consumption of the parent company, Poste Italiane SpA.

"We are dealing with an overall structure that includes 14,500 buildings, half a terawatt per year in electric power, 8.5 million liters of heating oil and other heating fuels, and gas consumption of more than 20 million cubic meters," specifies Blasi, "with a procurement policy involving various players."

Furthermore, the buildings can be classified into three macro groups in terms of energy consumption. The vast majority, such as administrative offices, have much less of an impact on consumption than automated facilities, such as postal centers, which operate 24/7.

The automated facilities are where Blasi will concentrate his efforts going forward. So far, the Post Italiane Group has decreased its energy consumption by 1 percent per year, in addition to reducing its overall carbon dioxide (CO2) emissions by 7 percent. These are significant results for the company, but Blasi still sees a lot of room for improvement.

Gruppo Posteitaliane

"My main purpose is to reach our energy efficiency goals in at least 250 facilities," Blasi explains, "including those with the highest energy consumption, such as data processing centers, executive centers and perhaps the largest branches. Of course, reducing costs is a goal, but that is preceded by goals for awareness, consumption control, sustainability and reducing our environmental impact."

sas
THE POWER TO KNOW.

"We had no doubts in selecting a technology partner because its solution ensured that a balance would be struck between performance and ease of customization and management, preventing the need for long and costly consulting."

Luciano Blasi
Energy Manager, Poste Italiane Group

The IT aspect
"In 2004," recalls Blasi, "our IT structure was centered on an individual productivity platform with fully integrated databases. At the time, their purpose was mainly management control rather than energy monitoring." The billing statement served as the starting point for a preliminary analysis of consumption and subsequent monitoring, as it contained simple data elements that wouldn't require a complex, shared platform.

A billing statement contains two necessary and sufficient data items: consumption and charges. Even today, billing statement data is the basis for reporting and analyzing results. An accurate analysis of consumption can identify peaks or anomalies – and thus points of intervention – by informing the facility manager, who directly reviews energy costs. Before 2006, the calculations were made parametrically, based on occupied square footage. A further complicating factor is the large number of buildings in operation, which makes it impossible for Poste Italiane to use a traditional, off-the-shelf energy audit tool for analysis, demand management and efficiency improvement.

Therefore, Post Italiane needed a business intelligence tool that would process only the acquired data and could produce forecasts based solely on this data.

"In 2006 we started to exchange ideas with SAS to draw up a business intelligence plan, and in the spring of 2007, we completed the definition of the tender," states Blasi. "We had no doubts in selecting a technology partner because their solution ensured that a balance would be obtained between performance and ease of customization and management, preventing the need for long and costly consulting.

"At the start, we worked directly with SAS to define user needs and the required level of customization, " says Blasi. Subsequently, with the help of consulting partner Crisma in Rome, the organization started implementation.

"In this initial stage, SAS Business Intelligence analyzes demand and provides information on users' macro behavior," Blasi explains. "With SAS we should be able to get to stage two, which moves from using billing data to accurately collected measurement data. Therefore, it will be possible to correct operation and maintenance behavior for systems, and indirectly, for our larger facilities."

Future developments
Currently, the system is a virtual distributed structure where data pertaining to the individual locations is stored and analyzed. But the future intent is to allow each territory manager to directly input and receive information from SAS and monitor his own consumption by means of a Web-based tool.

This is the second stage of the SFINGE (Sistema di Flussi Integrati per la Gestione Energetica or Energy Management Integrated Flow System) project, and Blasi expects significant developments in various areas. For example, the process of instilling responsibility in the facility managers will lead to the definition of energy performance objectives, and hopefully the appointment of energy managers within each territory. Blasi says he will also continue with the policy of taking small steps that can add up to real energy savings. "Right now," he says, "90 percent of the lamps used by the group already use low-energy bulbs and the plan is to switch soon, wherever possible, to LEDs."

Blasi recommends small steps because giant strides are impossible. The problem of energy dispersion from structures, for instance, is extremely complex. Retrofitting using cutting-edge insulation technology is absolutely out of the question because of the huge investments it would require. Blasi is satisfied, in this instance, to be consulted about the finalization of guidelines and specifications pertaining to the purchase and management of energy-consuming assets. This too is a small but significant victory. Blasi concludes, "Of course, top management focuses on business objectives and also on the search for a correct balance between investments that are made and energy savings that are achieved."

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ANONYMOUS CANADIAN POWER UTILITY

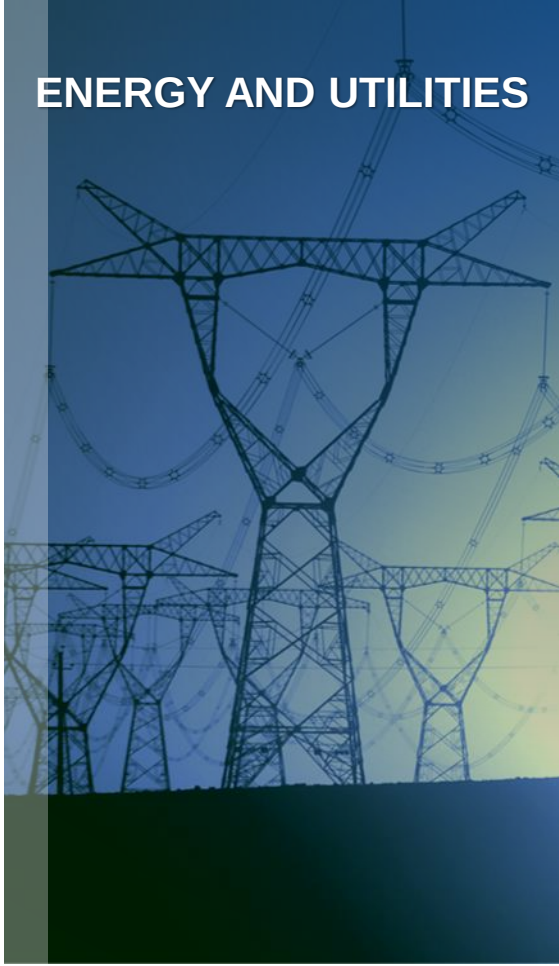
BUSINESS ISSUE

- Understanding the penetration of AC vs Central AC in the network area
- Several data sources such as GIS Asset Management, Customer Information Systems, Weather data meering and billing data not integrated
- Need to tailor energy efficiency advice and answer customer benchmark questions

RESULTS

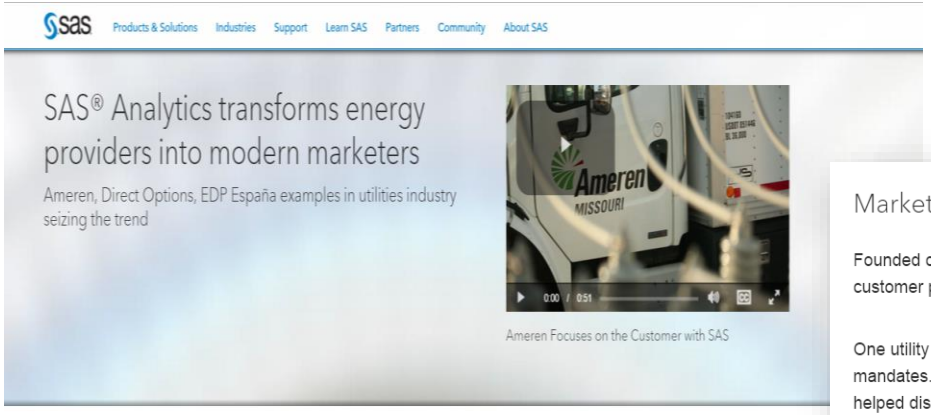
- Knowing more on the consumption patterns to plan the demand response programs but also planning the infrastructure accordingly
- Give customers a better benchmark on their consumption patterns and efficient usage of energy and plan targeted energy efficiency programs

ENERGY AND UTILITIES



sas THE POWER TO KNOW.

REFERENCE MARKETING ENERGY EFFICIENCY



Marketing energy efficiency

Founded on the conviction that data drives customer engagement, Direct Options works with utility marketers to create customer programs with goals ranging from education to energy efficiency.

One utility sought 2,000 new participants in its energy-efficiency programs to help it meet efficiency goals and statewide mandates. The company needed to discern which customers to target with what messages. Using SAS, Direct Options helped discover that customers responded positively to a "Get Something Free" message 50 percent more frequently than an "Increase Your Comfort" message. In the end, the campaign achieved 200 percent of its enrollment goal.

"We use SAS to analyze all our data, including market research and other sources. SAS is the backbone of every single campaign," said Ashlie Ossege, Vice President of Analytic Services at Direct Options. "The first thing I did as vice president was to streamline our processes by implementing SAS. Now we can organize the code and make it repeatable. Efficiencies in completing models and storing procedures enable us to quickly create turnkey solutions for our customers."

THANK YOU