

Eficiencia operativa en redes de abastecimiento.

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Índice

- Schneider Electric
- Ejemplo aplicación Telemando
- Introducción Eficiencia Operativa
- Gestión de fugas
- Modelo hidráulico

Our **Brand Positioning**

We are the *Architects of Efficiency*SM.
Your global partner that can solve the efficiency equation.



Telemando de estaciones remotas



PLANTSTRUCTURE™

Nuestra propuesta

Telemando de estaciones remotas

- Objetivos de nuestra propuesta

- Definir una **arquitectura de control** basada en hardware moderno, escalable y con garantía de continuidad en el tiempo
- Diseñar una **infraestructura de comunicaciones confiable** reaprovechando recursos de red existentes





PLANTSTRUCTURE™

Controladores Modicon M340

Controladores Modicon M340

- Plataforma **segura y confiable** para emplazamientos remotos
 - Diseñado para entornos **extremos, modular** y de **elevada compacidad**
 - Reduce las intervenciones on-site ya que **no requiere mantenimiento** alguno
 - Facilita el **diagnóstico remoto** aprovechando la infraestructura de comunicaciones existente



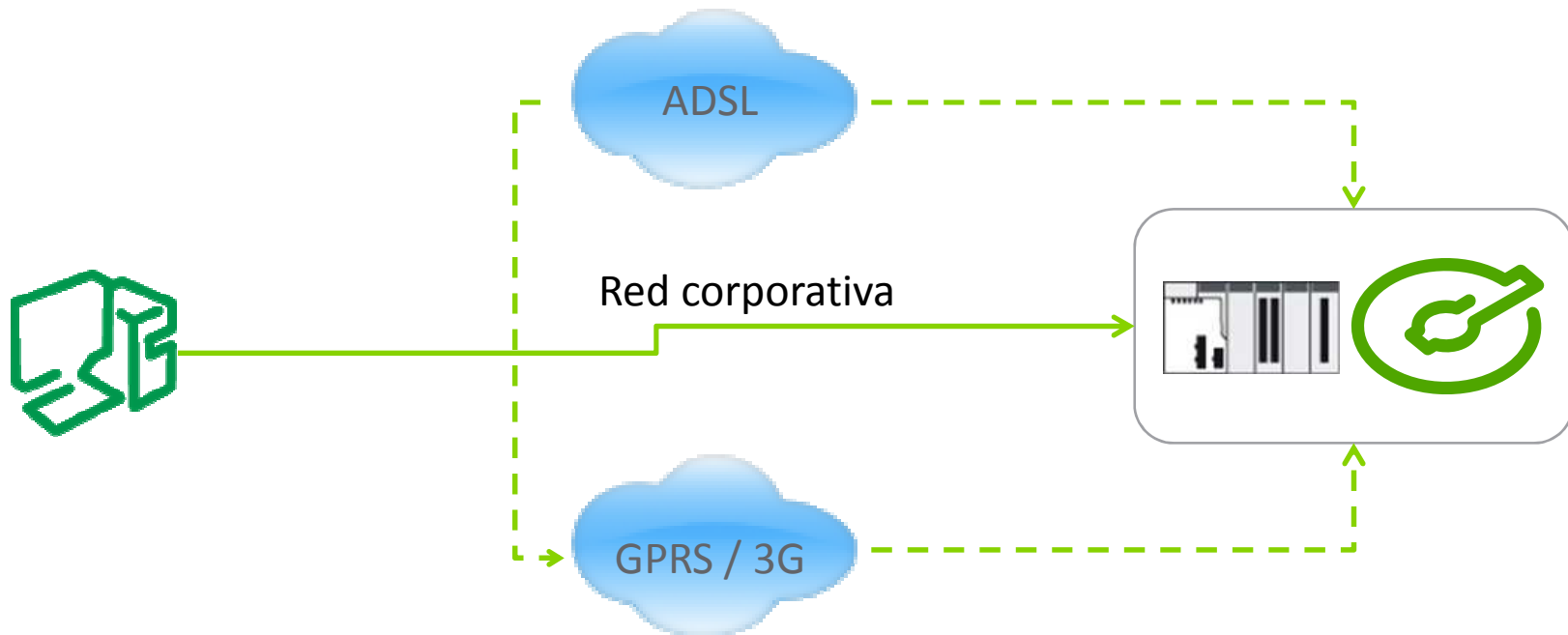


PLANTSTRUXURE™

Infraestructura de red

Infraestructura de red

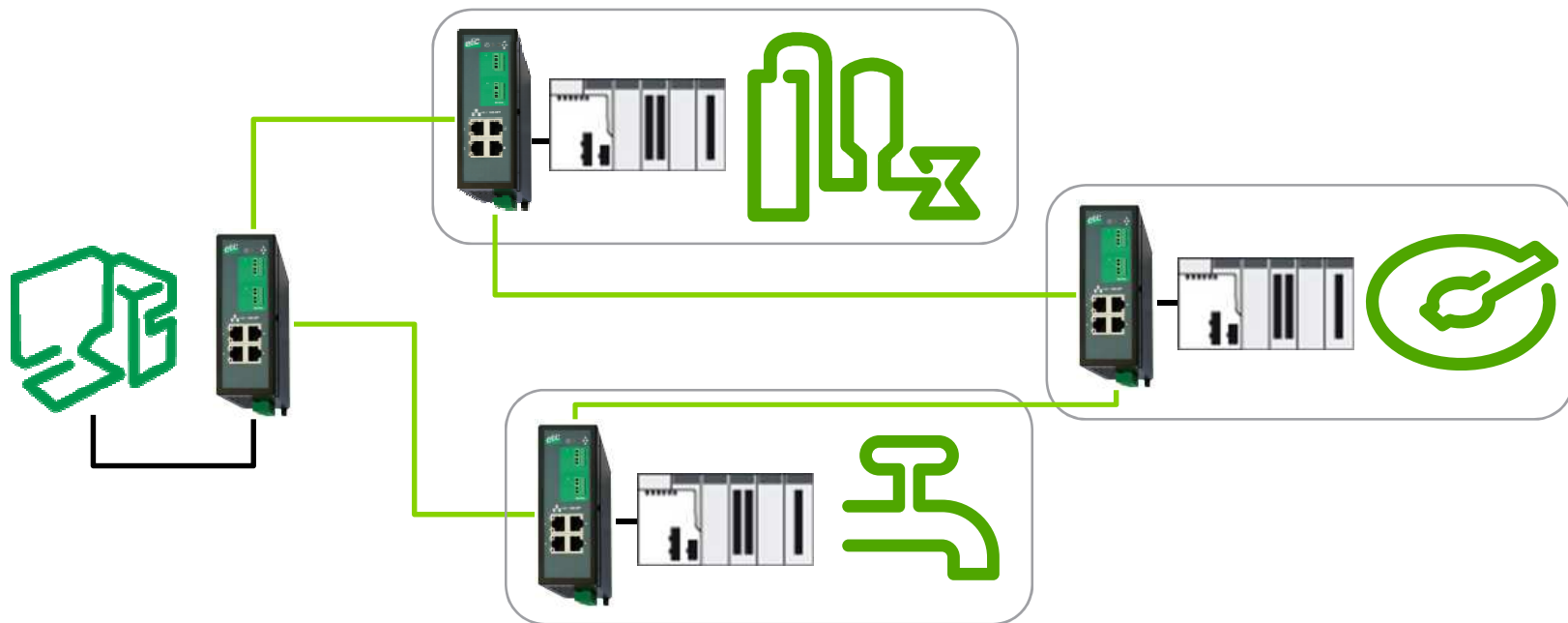
- Garantiza la **disponibilidad de los datos** del proceso
- Dispone de **múltiples y simultáneas opciones de comunicación**, para garantizar la redundancia entre el puesto de control y el controlador remoto



Infraestructura de red

- Extensores Ethernet

- Moderniza las instalaciones, **construyendo en una red Ethernet** a partir de **cables de par trenzado** existentes
- Permite **cualquier tipo de datos** sobre Ethernet, protocolos industriales, video sobre IP, transferencia de ficheros...

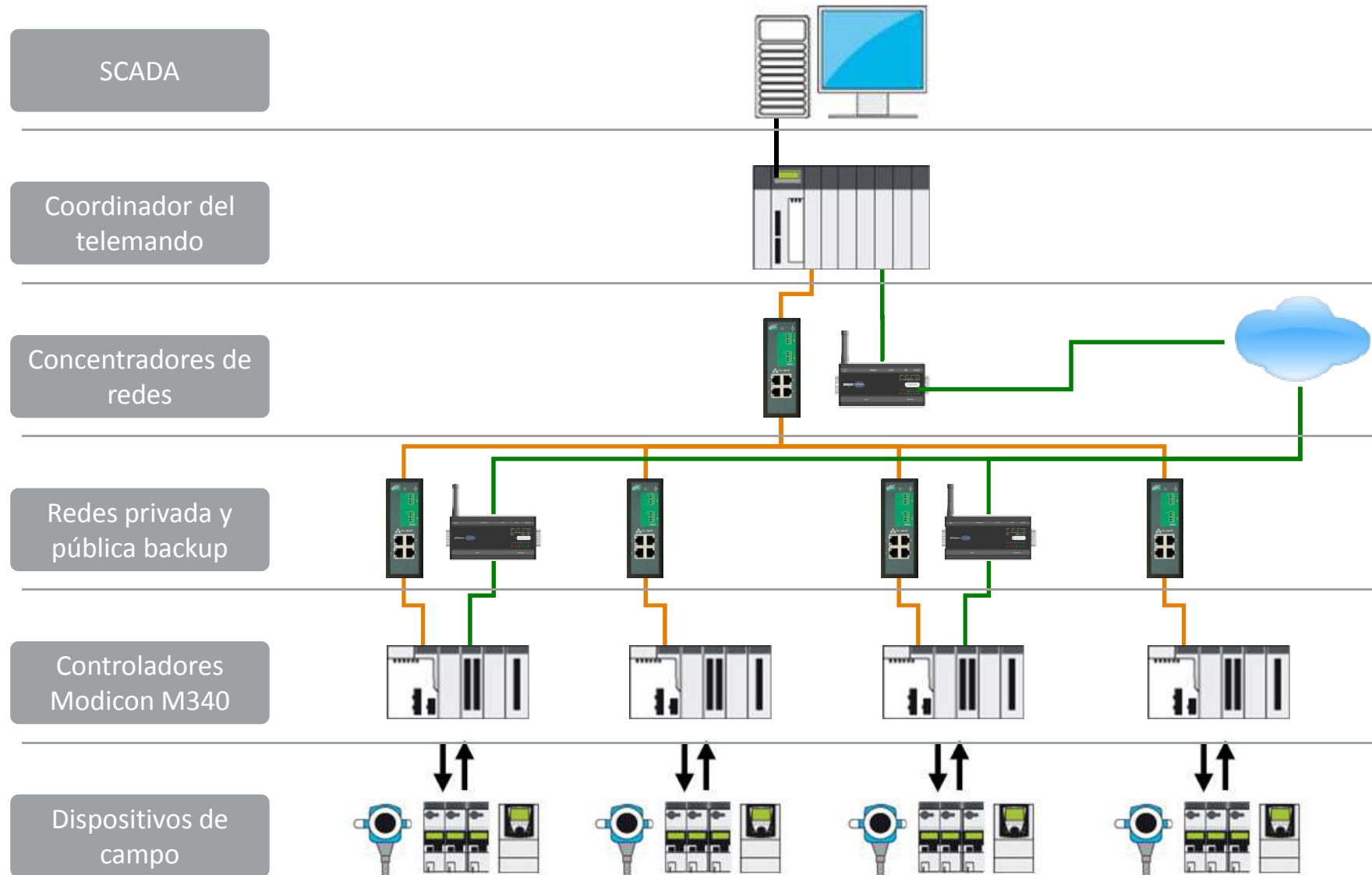




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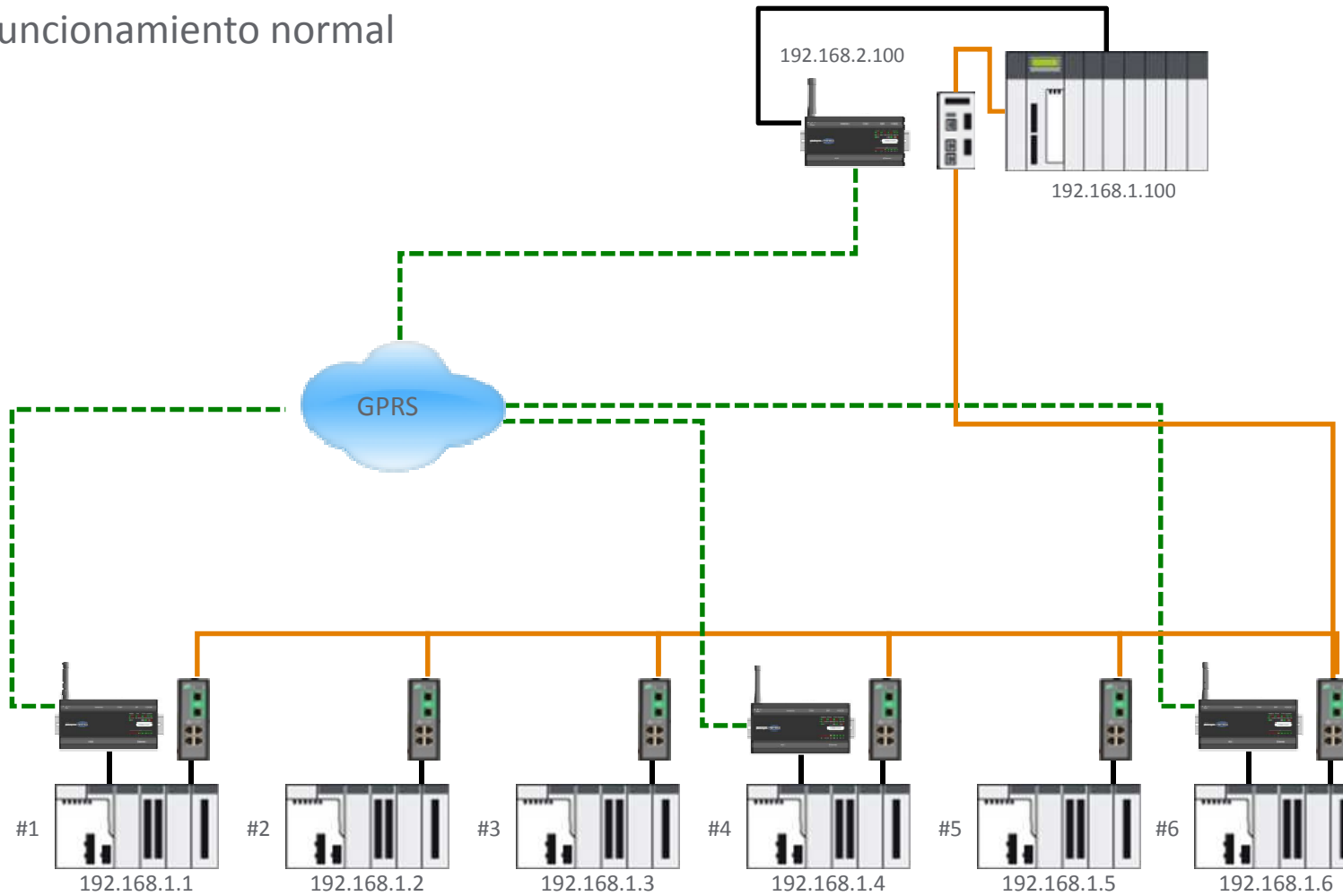
Ejemplo de arquitectura

Arquitectura ejemplo



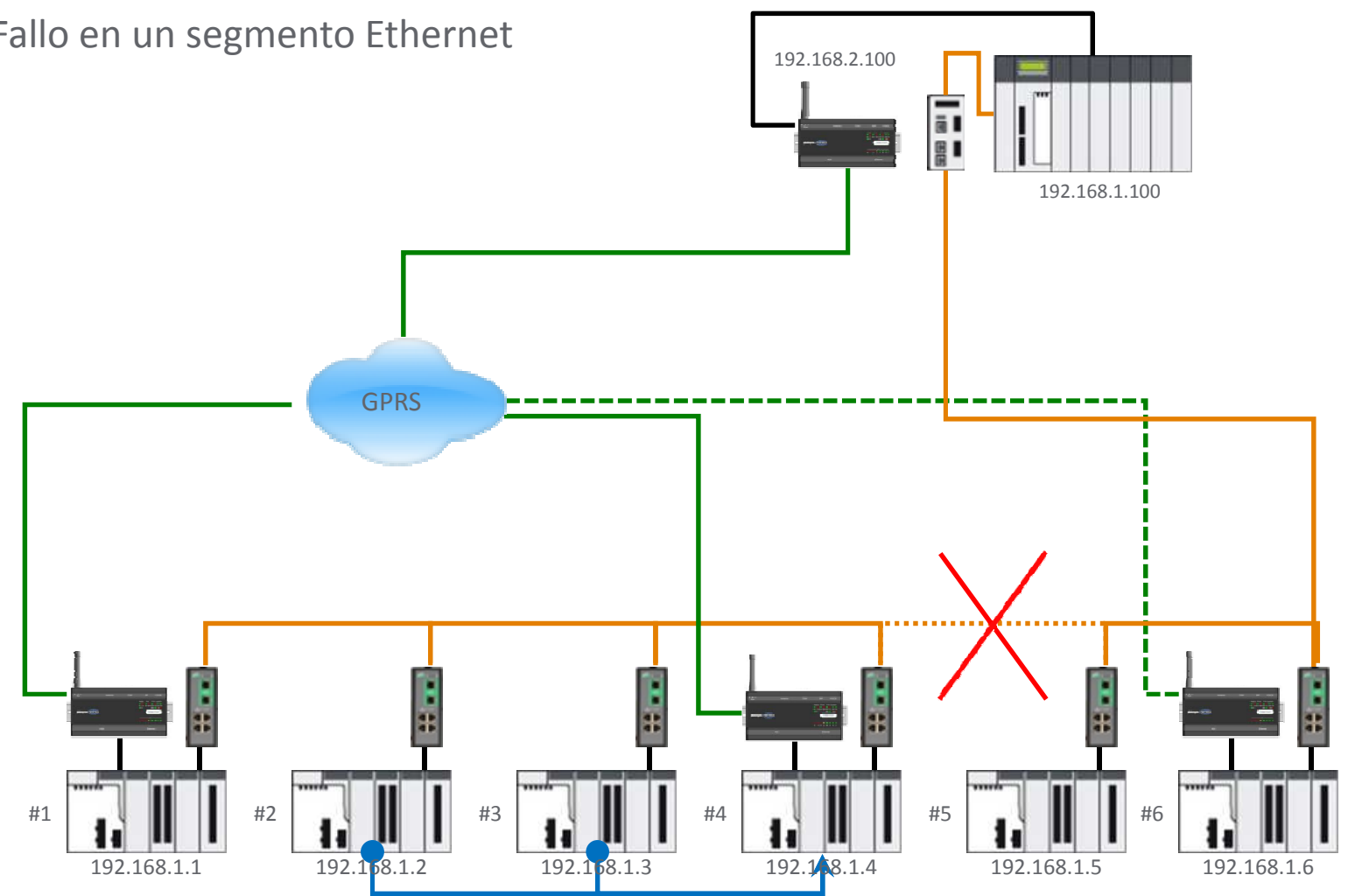
Tolerancia a fallos

- Funcionamiento normal



Tolerancia a fallos

- Fallo en un segmento Ethernet



M340 #1 conmuta a GPRS

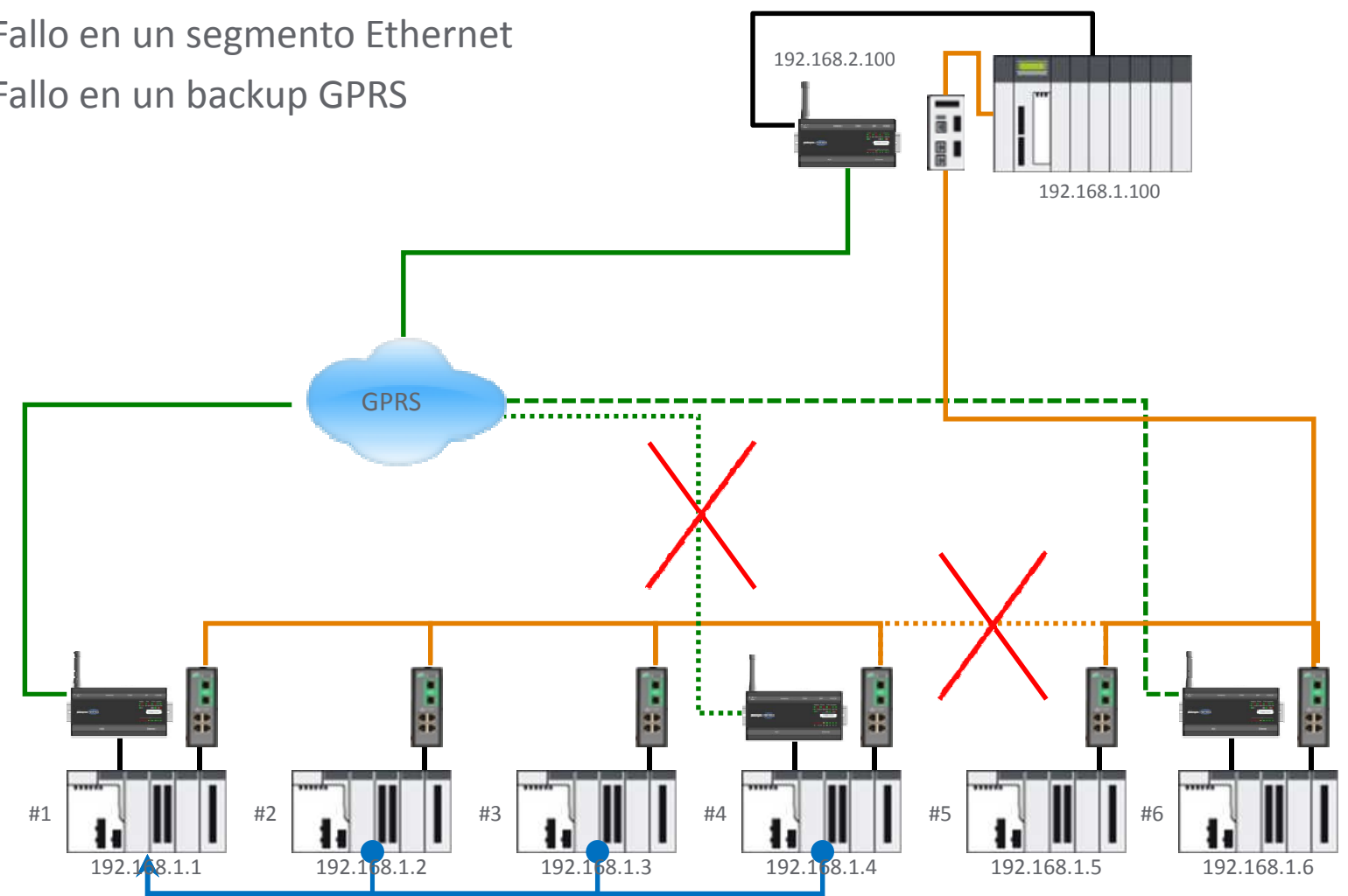
M340 #2 replica a M340 #4
M340 #3 replica a M340 #4

M340 #4 conmuta a GPRS

M340 #5 y #6 mantienen ethernet

Tolerancia a fallos

- Fallo en un segmento Ethernet
- Fallo en un backup GPRS



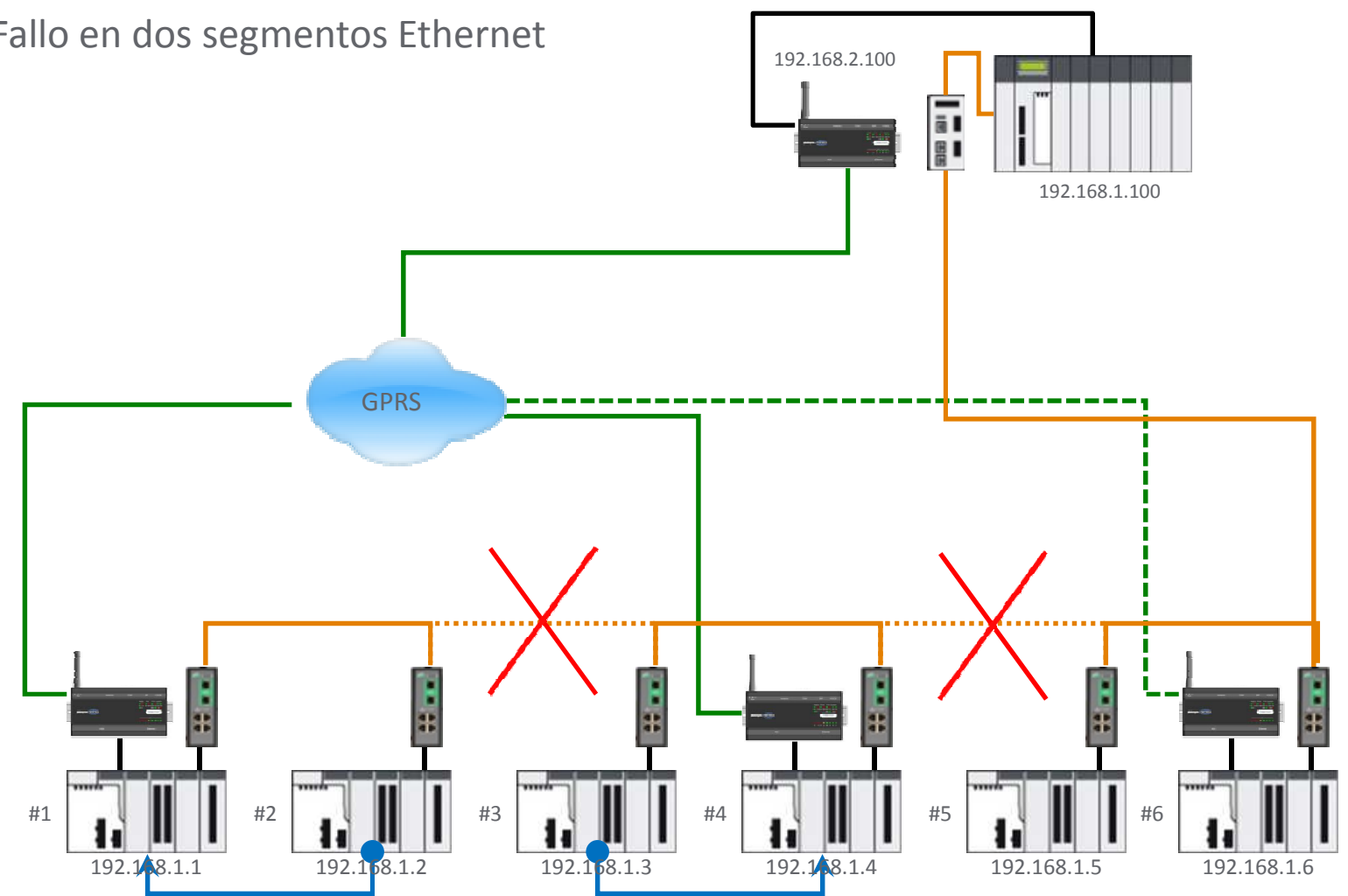
M340 #1 conmuta a GPRS

M340 #2 replica a M340 #1
M340 #3 replica a M340 #1
M340 #4 replica a M340 #1

M340 #5 y #6 mantienen ethernet

Tolerancia a fallos

- Fallo en dos segmentos Ethernet



M340 #1 conmuta a GPRS

M340 #2 replica a M340 #1
M340 #3 replica a M340 #4

M340 #4 conmuta a GPRS

M340 #5 y #6 mantienen ethernet

Introducción Eficiencia Operativa

We are a global technology player

from shop floor to top floor across the full water cycle

Products, solutions & services from field to enterprise



Plant & Network optimization

Pump optimization, pump asset monitoring, network operation optimization, temperature optimization



Plant & Network management

Energy monitoring, GIS, water network online simulation, cooling/heating network online simulation, EAM, NRW management, mobile asset management, weather services



Automation & Control

SCADA/HMI, DCS, telemetry, PAC/PLC, instrumentation, motor control, communications



Electrical Distribution

Power monitoring and meters, substation automation, LV, MV, power protection and control



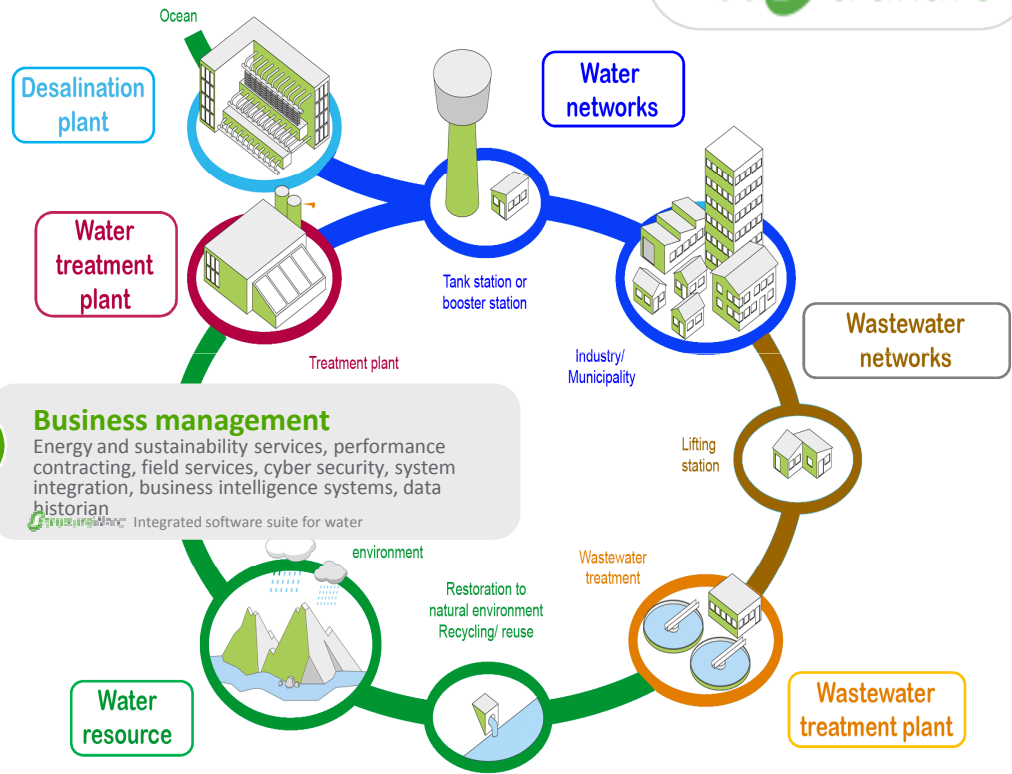
Critical Power and Cooling

Secure power, racks and enclosures, IT room management



Facility Security & Safety

Video security, access control, fire and life safety, emergency lighting



You deserve smart water



+

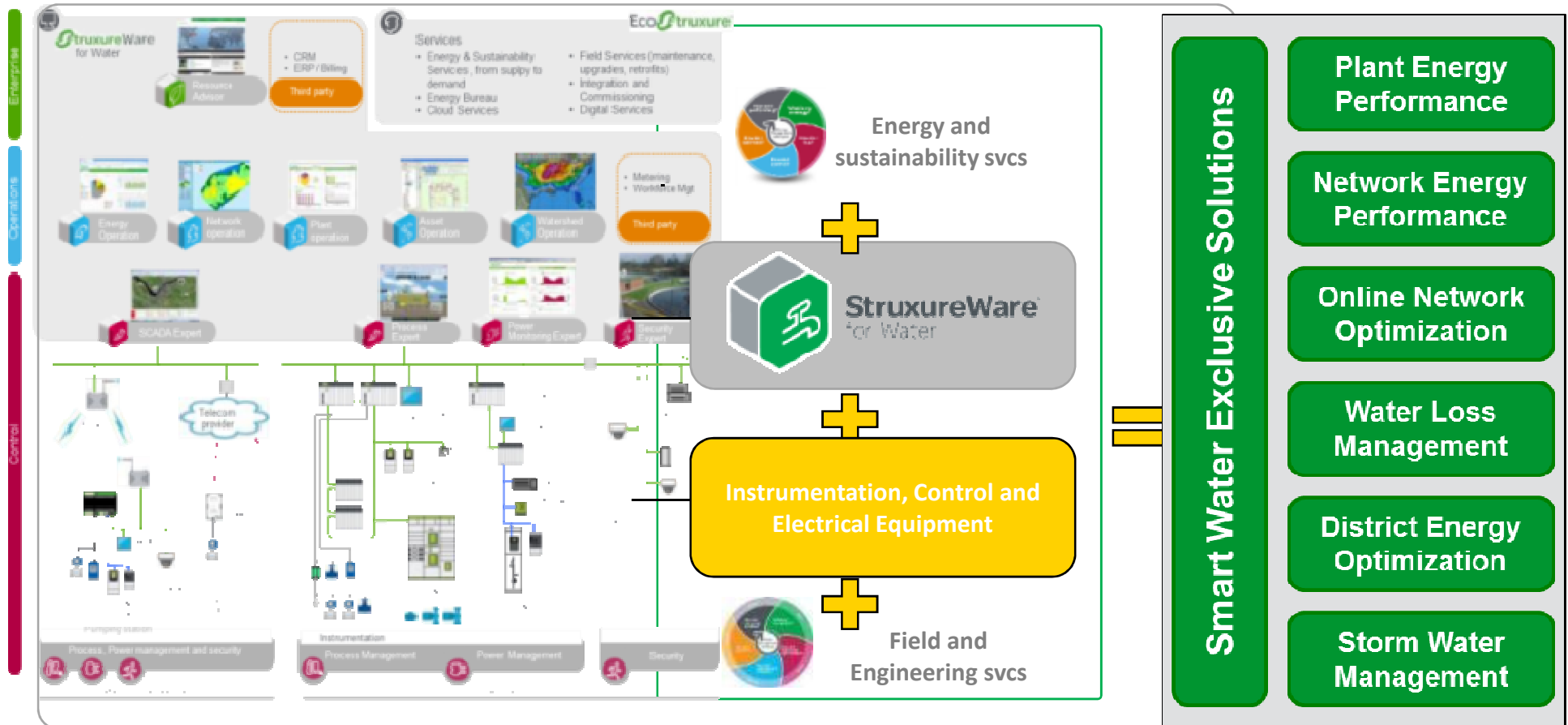


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Up to **20%** savings on OpEx & CapEx

- SCADA por si solo no es suficiente
- Miles de datos diarios a analizar
- Herramientas de modelado hidráulico
- Integración de los datos de la empresa

Smart Water – Exclusive Solutions

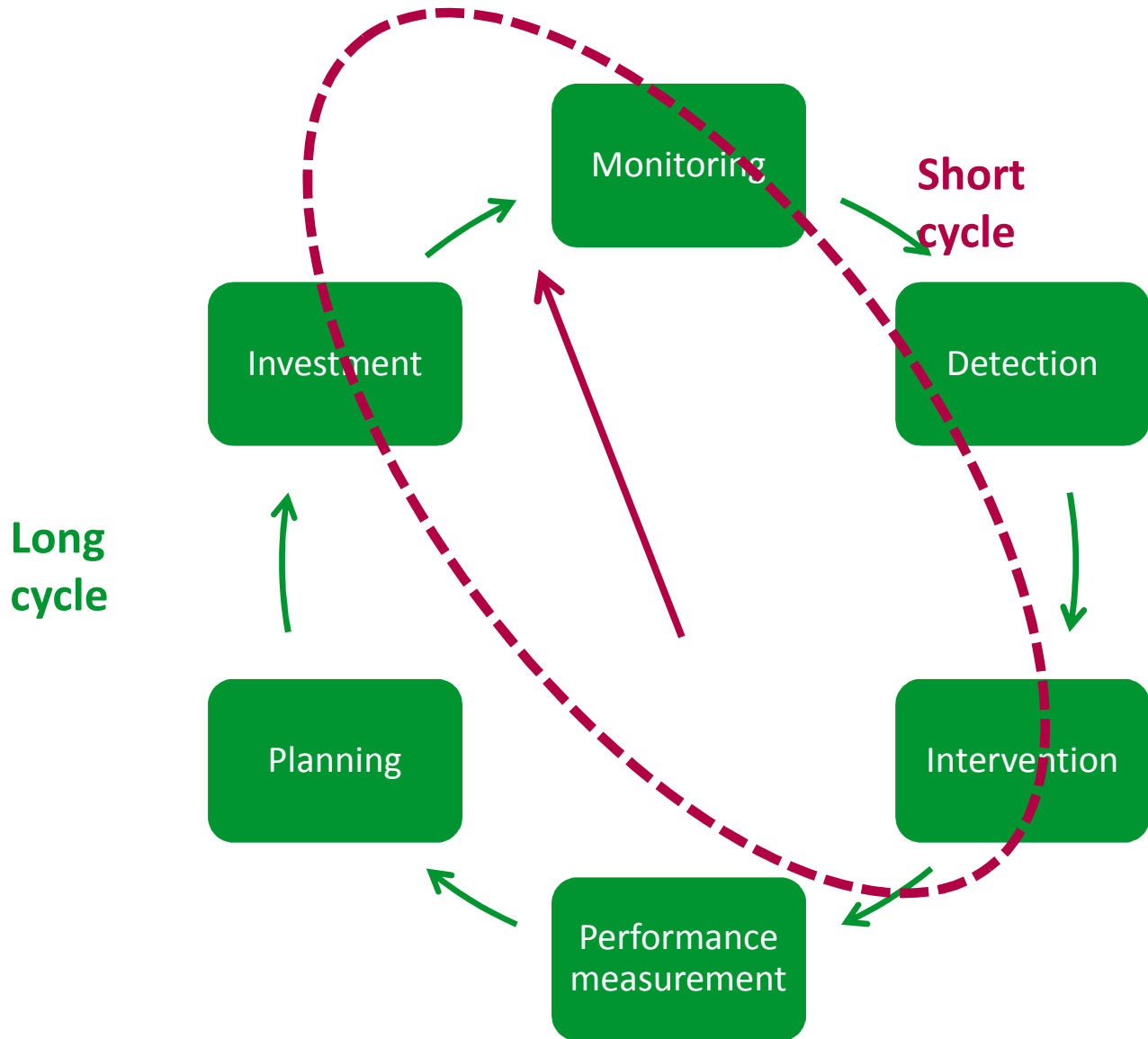


WMS Water Loss: leakage management, not just leak detection



Water Loss management

- Water loss management is a comprehensive process that must not be restricted to leak detection



Water Loss overview

Description

Optimize the company's water loss management process and resources to achieve and maintain a low Non Revenue Water (NRW) level over time

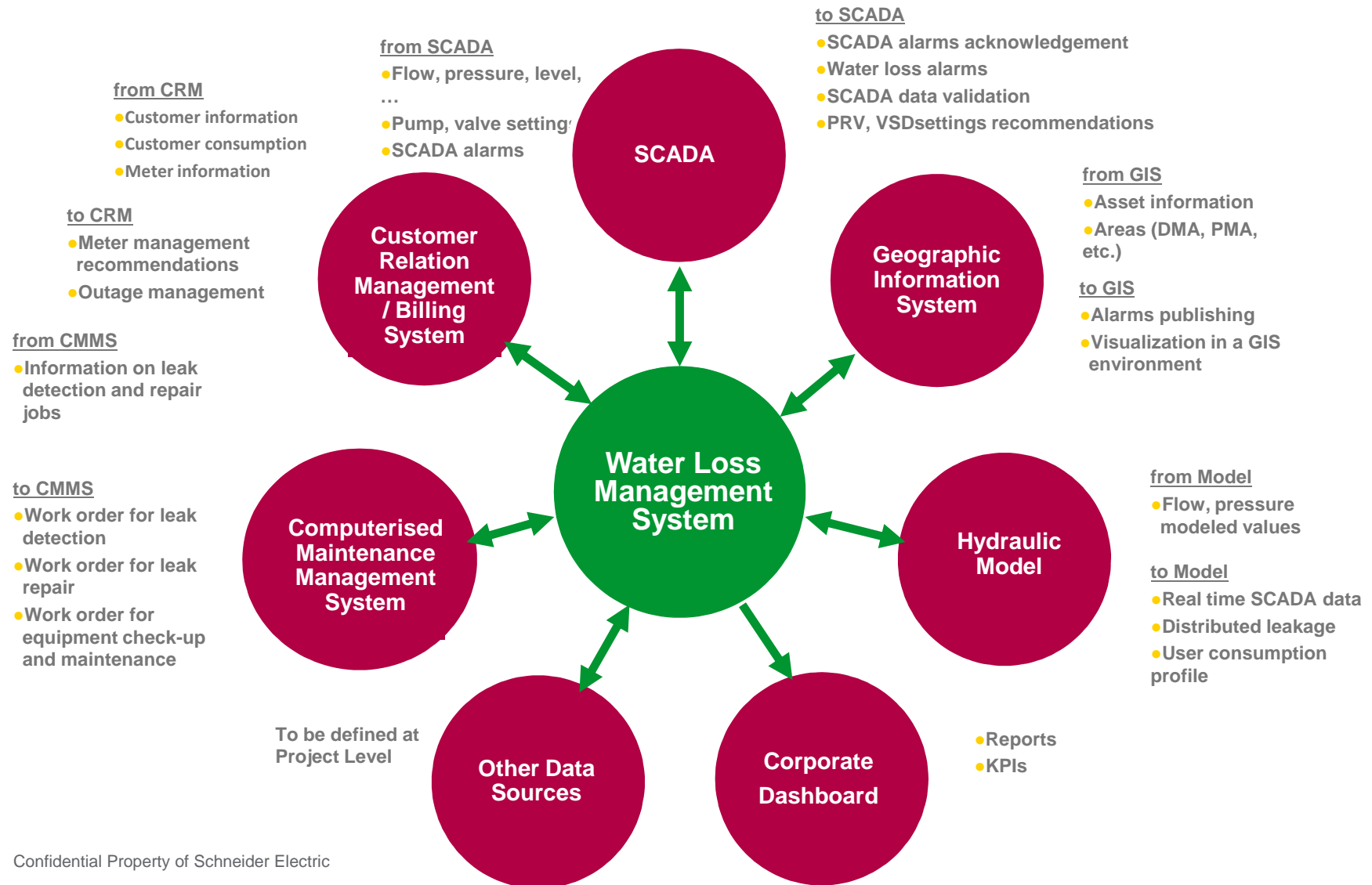
Main Functionalities

- **One integrated solution including the IWA's pillars for Water Loss reduction:**
 - **Leakage calculation algorithms** for early warning and trend monitoring
 - **Active Leakage Control** to prioritize leak detection in the most critical areas, saving time and effort
 - **Repair monitoring** to streamline leak fixing activities, minimizing the impact on customers
 - **Pressure monitoring** to identify high risk areas with space for improvement, reducing area with unnecessary high pressure, thus reducing leakage, new burst occurrence and energy consumption
- **Business intelligence** for continuous performance monitoring and regulatory compliance

Results

- **Constant monitoring allows sustainable, low Non Revenue Water levels**
- **The integrated approach provides faster detection and reaction times, saving money and resources**
- **Real time reporting and KPIs** for internal and regulatory compliance vs offline, laggy reports

Systems integration for water loss management



Leakage calculation and performance monitoring

Problem

Calculating leakage, water balance and related KPIs is a labor-intensive process. It requires access to data stored in separate systems, involves many departments. Problems and anomalies are not easily located and timely detected.

Solution

- Systems integration and synchronization
- Data validation and cleaning
- Water loss related data analysis and visualization in a single dedicated platform
- Fully configurable leakage calculation based on state of the art methodologies and international best practices
- Continuous KPIs calculation for faster decision making process
- Comparison of results of different units within the organization
- Possibility to choose the time period and area on which calculate indicators

Benefits

- Identification of critical geographic zones, assets and business processes
- Faster decision making process at operational and planning level
- Easier regulatory compliance, freeing resources before dedicated to data collection and analysis

Active Leakage Control management support

Problem

Leak survey activities are generally run in an inefficient way. Crew are often used to periodically sweep a zone without a clear understanding of the leakage level in the area, inaccurate information on the network and no precise target

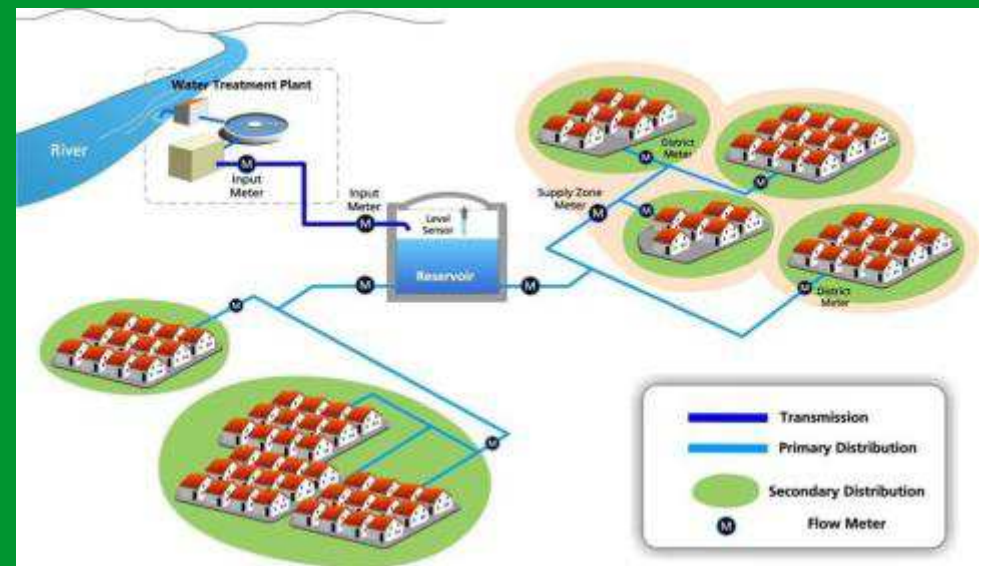
Solution

- Prioritization of zone to be surveyed based on technical and economic criteria
- Planning of leak detection activities
- Issuing of service orders to deploy leak detection
- Management of leak detection crews
- Tracking of leak survey work progress and performance
- Issuing of work orders for leak repairs
- Monitoring of leak repair activities and contractors' performance

Benefits

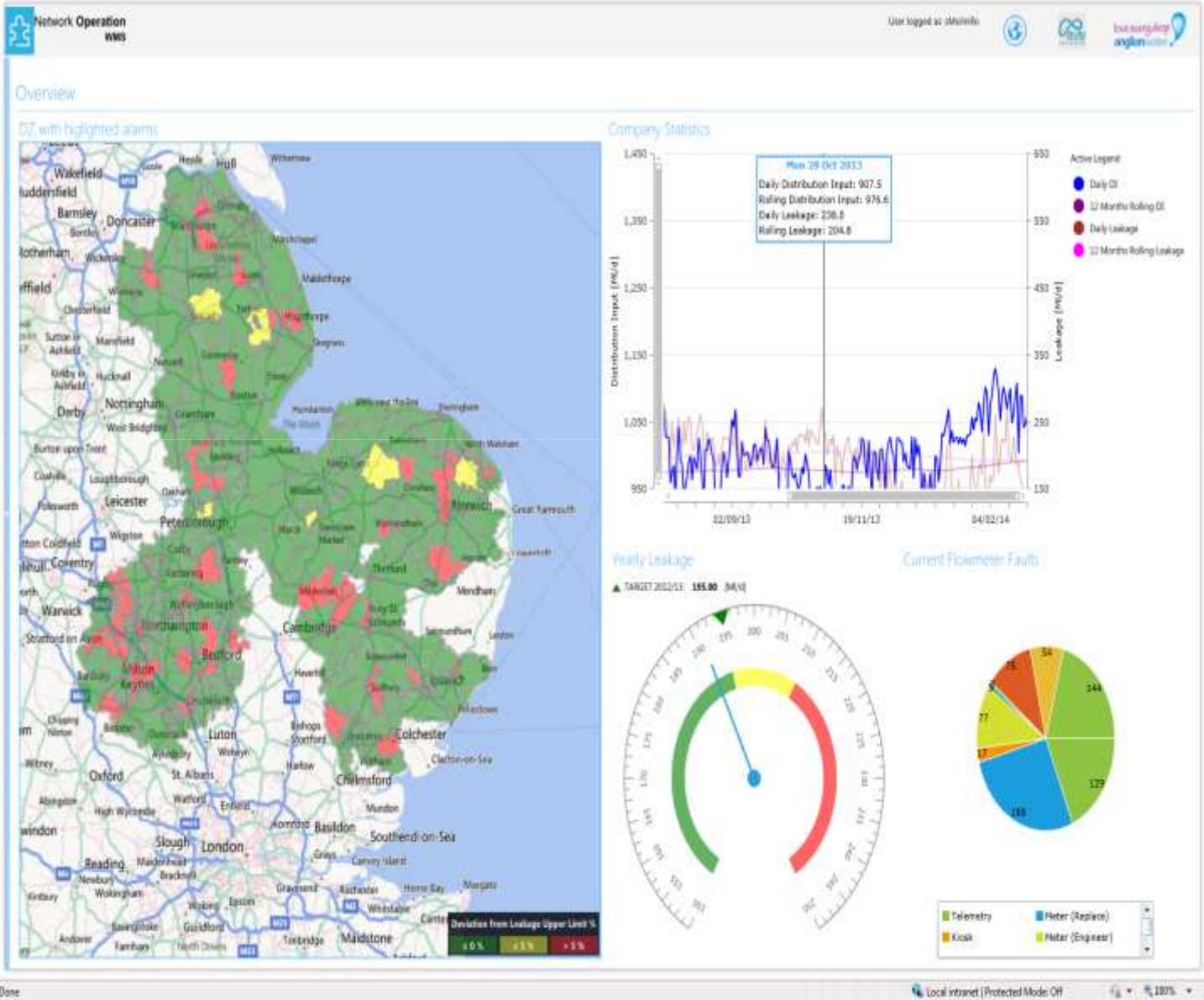
- Reduction in the cost of leak detection
- Improved leak detection outcomes
- Minimization of impact on customer caused by service interruptions or emergency network operations

Descripción funcional



Dashboard / Homepage

- Immediate visualisation of critical zones
- Daily update and presentation of Key Performance Indicators



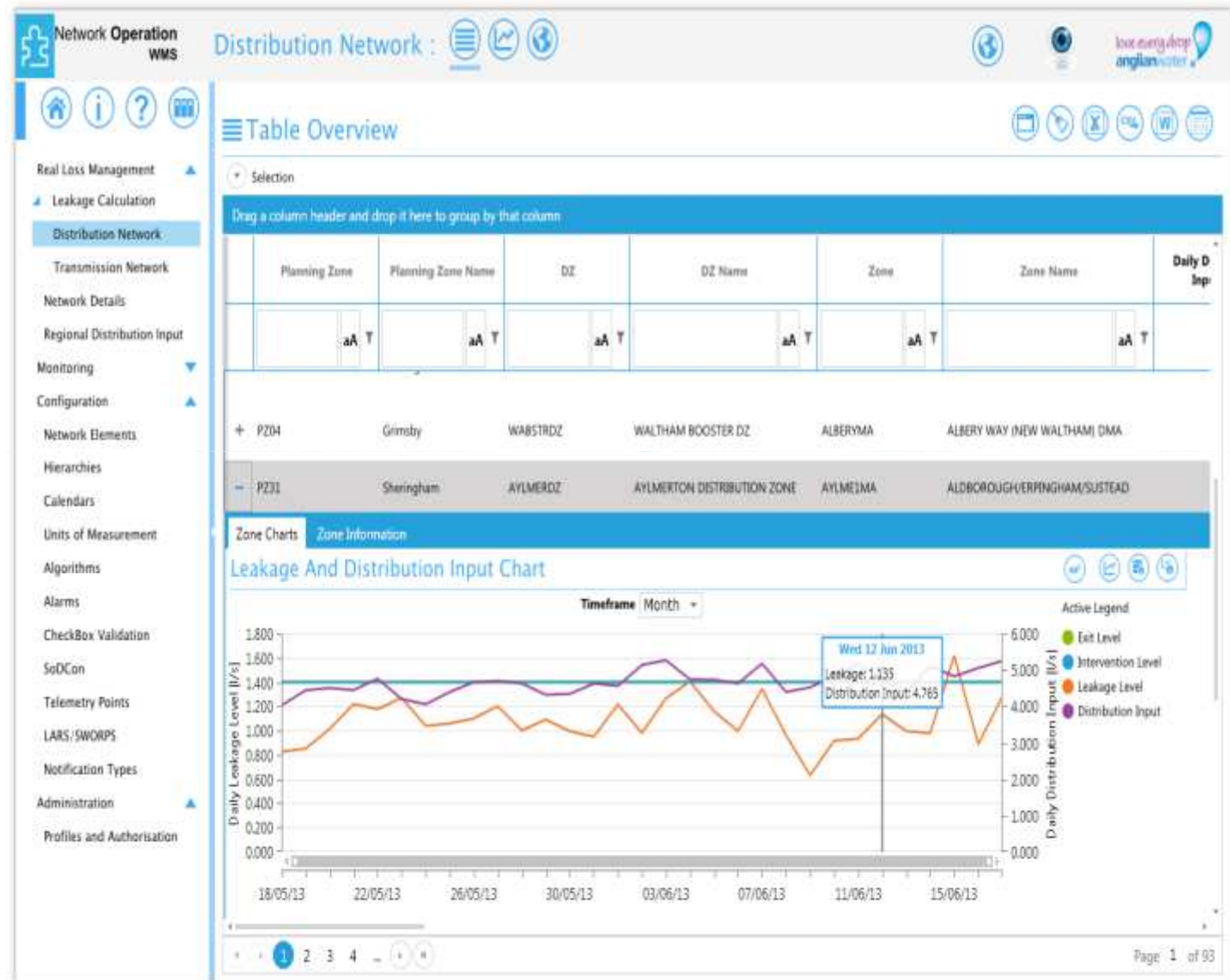
Dashboard / Business Intelligence

- Visualisation of KPIs through maps, charts, reports and other widgets
- Trends over a user-selectable period
- Timebar to select the period over which calculate KPIs



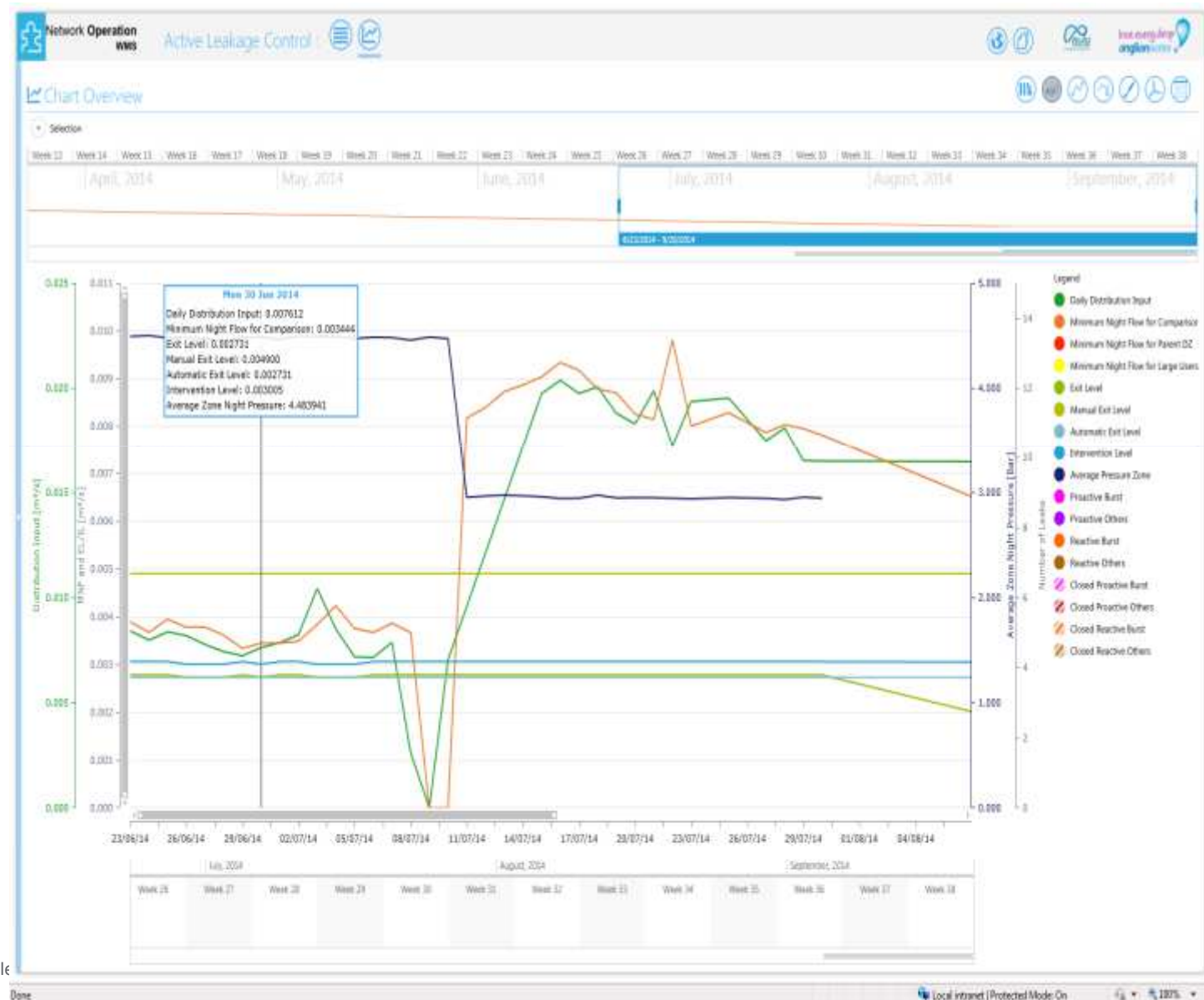
Leakage Calculation

- Leakage calculation and alarms for selected zones in tabular format
- Quick view of zone boundary and network and customers information
- Quick view of leakage and distribution input trends in mini-charts



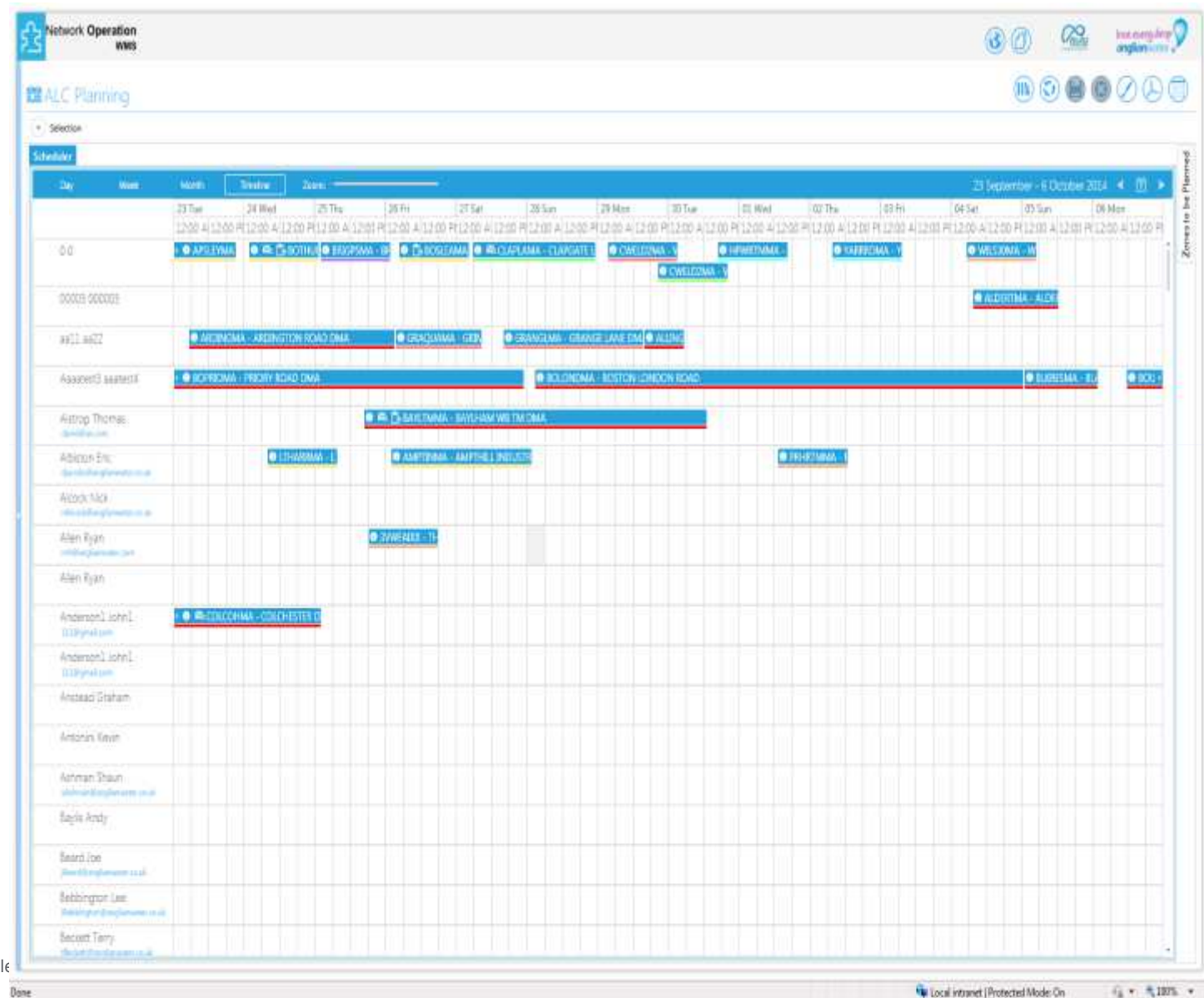
Active Leakage Control - Prioritization

- Automatic prioritization of zones where to deploy leak detection survey
- Optional operator intervention to defer/advance leak detection in a zone
- Combined analysis of flow trends and network events (bursts, repairs)



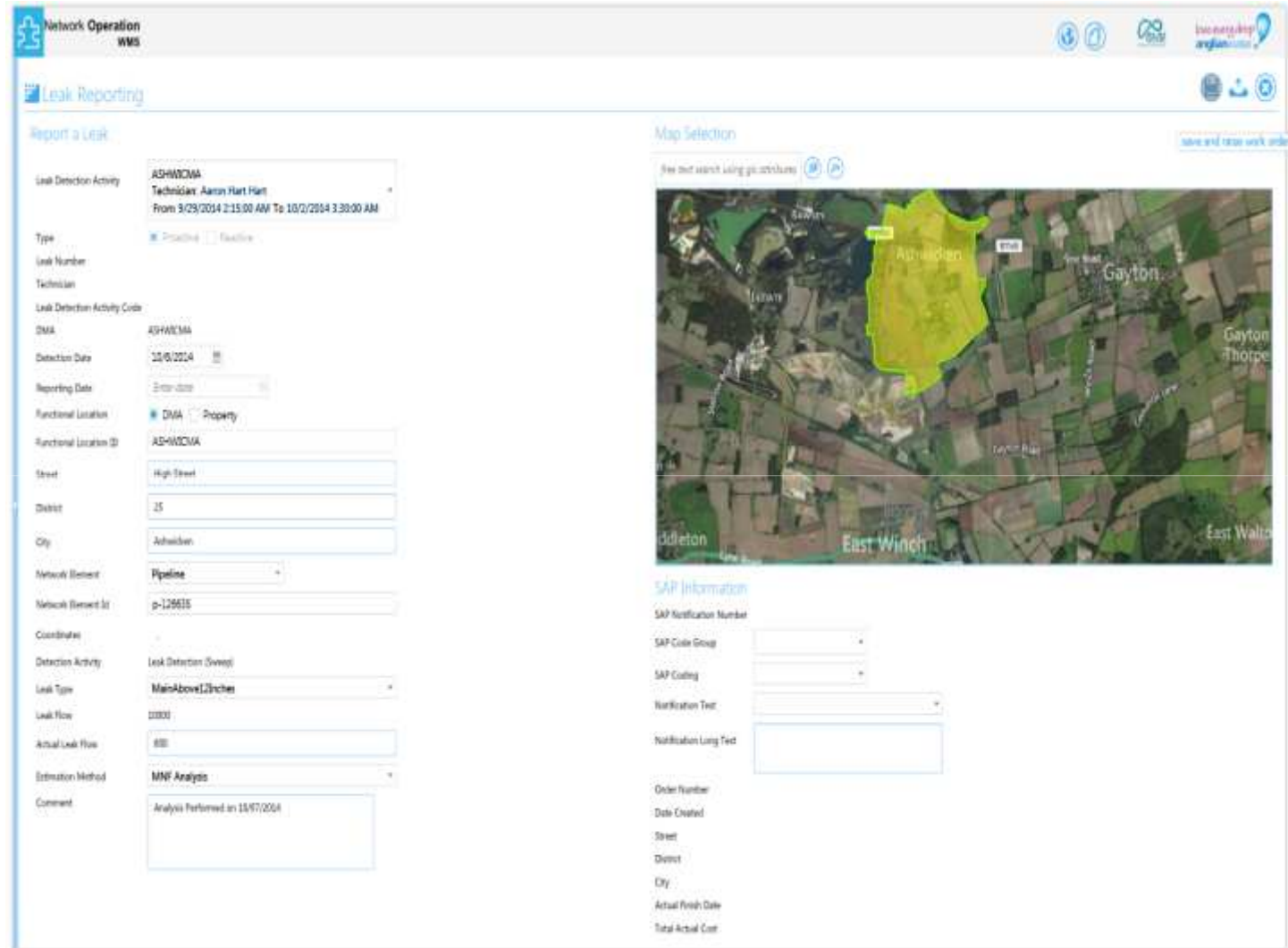
Active Leakage Control - Planning

- Planning of leak detection and survey activities based on prioritisation
- Visualization of activities planning by technician



Work Orders

- Leak detection work orders management
- Leak repair work orders issuing to external systems



Pressure Monitoring

- Pressure monitoring and alarms for selected zones in tabular format

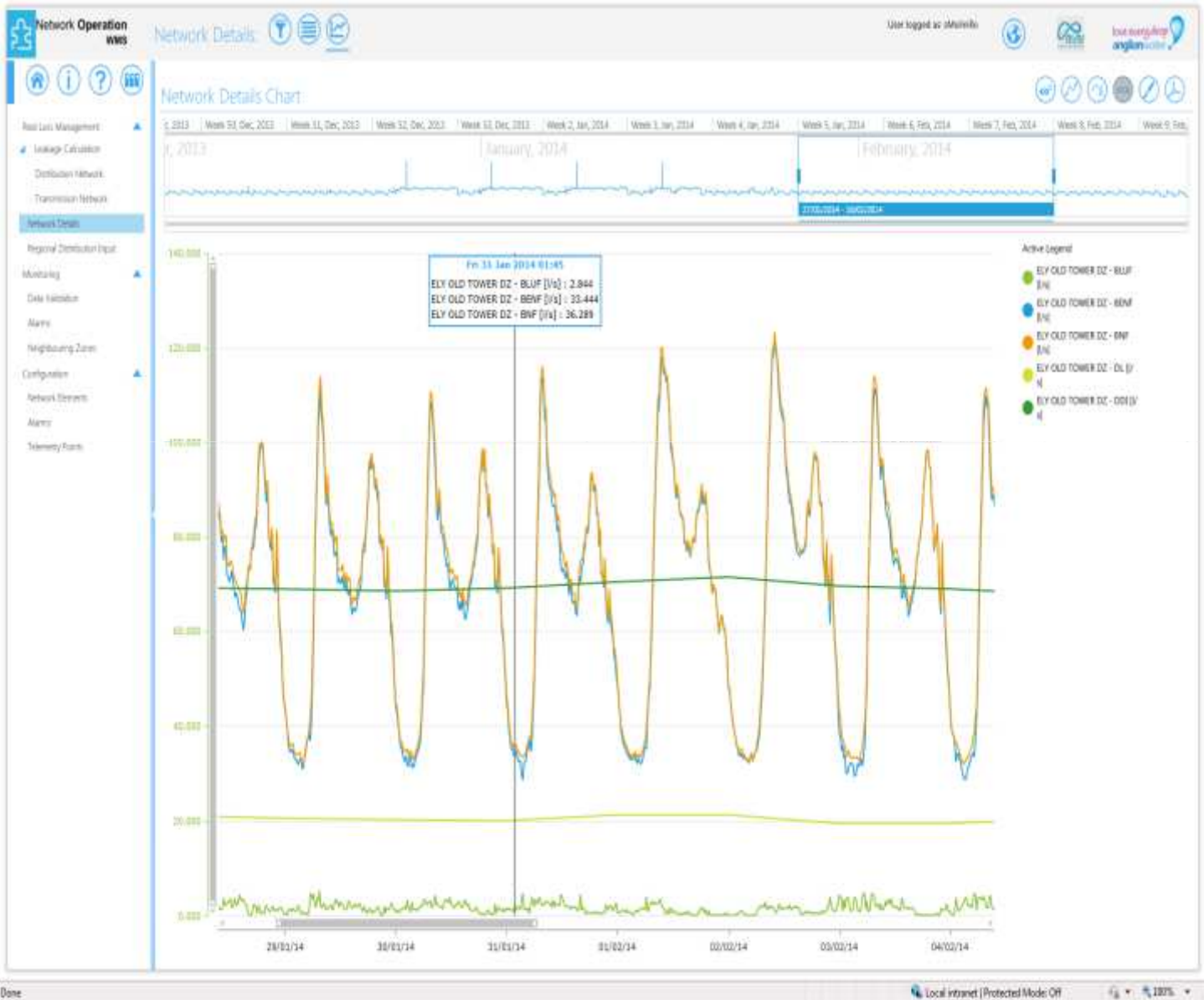
- Quick view of network pressure behaviour in mini-charts

The screenshot displays the 'DMA Pressure Monitoring' interface. At the top, it shows the 'Network Operation' header and the specific 'DMA Pressure Monitoring' title. A navigation tree on the left allows selection of organizational units, currently showing 'ABBERTON RESERVOIR DE'. The main area contains a table with columns for DMA, PSASC, Asset Type, and Pressure Field. Below the table is a 'Leakage And Distribution Input Chart' showing a bar chart of pressure values over time from 09/09/14 to 23/09/14. The chart includes a blue line for average pressure and red horizontal lines for pressure range. A legend on the right identifies the chart elements.

NMA	DE	DMA	PSASC	Asset Type	Identification Field	Pressure Field	70249460	1518138803	386971772
NMA	DE	DMA	PSASC	Asset Type	Identification Field	Pressure Field	70249460	1518138803	386971772
NMA	DE	DMA	PSASC	Asset Type	Identification Field	Pressure Field	70249460	1518138803	386971772
NMA	DE	DMA	PSASC	Asset Type	Identification Field	Pressure Field	70249460	1518138803	386971772
NMA	DE	DMA	PSASC	Asset Type	Identification Field	Pressure Field	70249460	1518138803	386971772

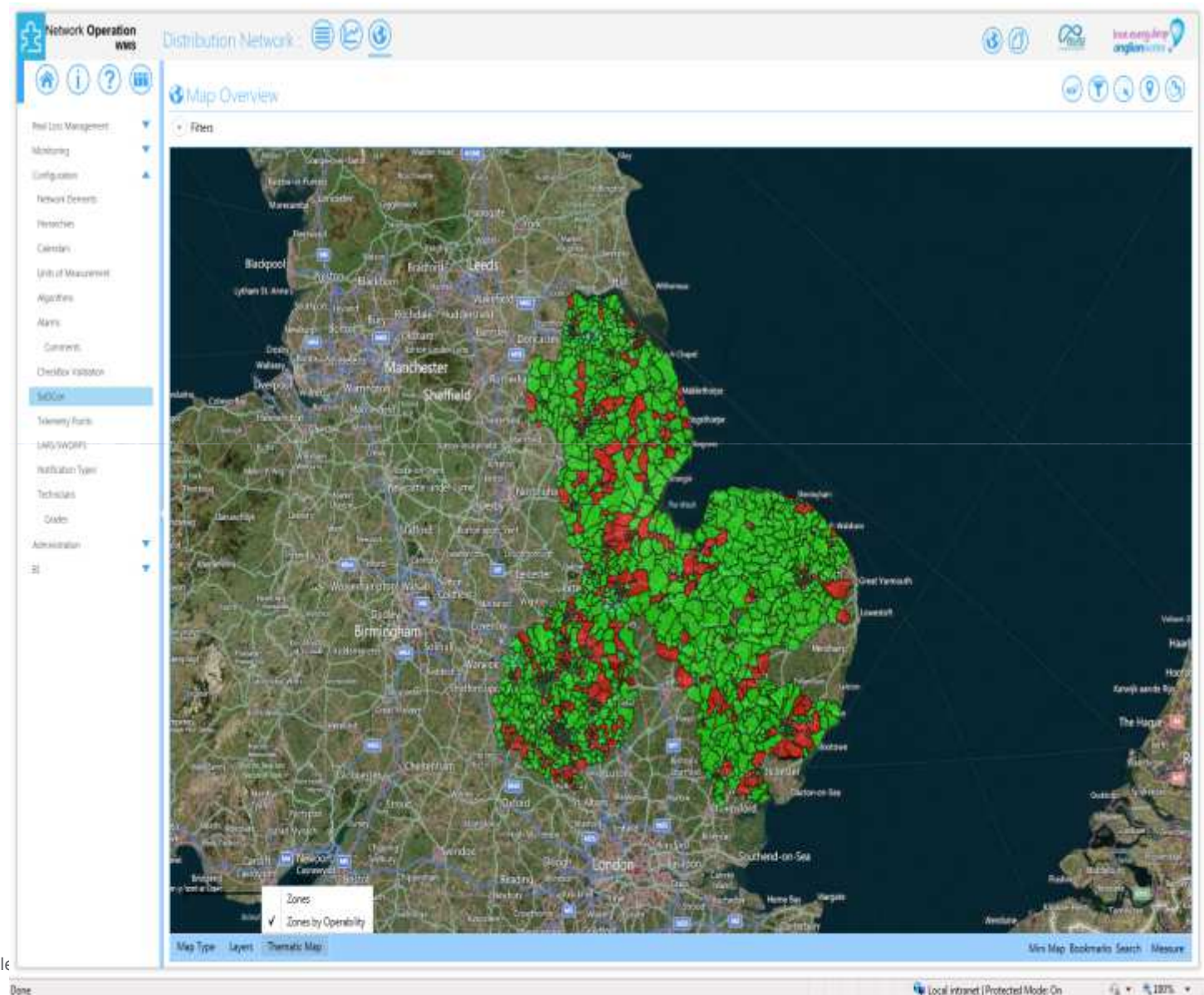
Data Validation and Analysis

- Data validation, estimation and editing capabilities
- Possibility to chart any type of raw data and algorithm result
- In-depth analysis of leakage and distribution input trends



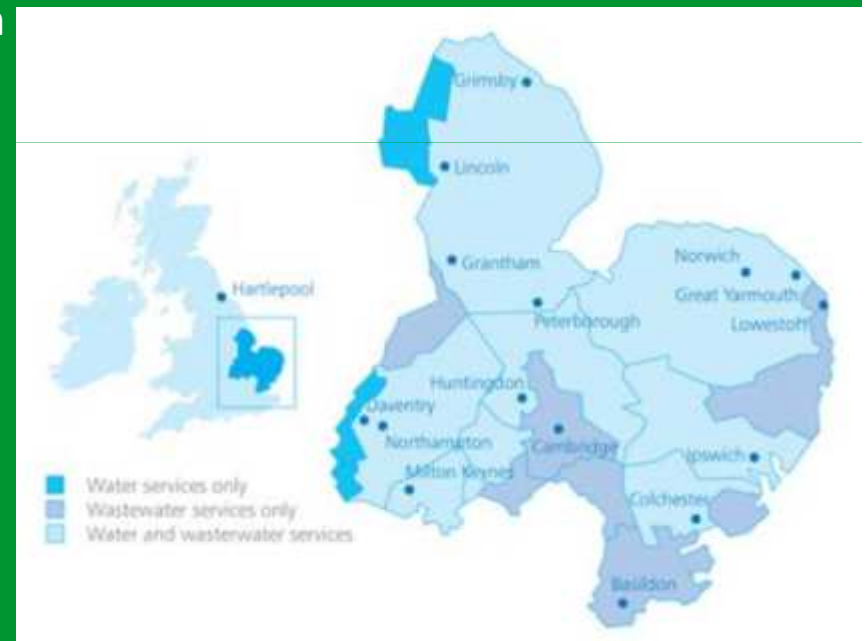
Map Visualization

- Visualization of zones and assets in georeferenced environment
- Zone information on the map
- Thematic maps



The WMS Project at Anglian Water

- Schneider Electric has implemented the Integrated Leakage and Pressure Management system for Anglian Water Services (UK)
- Anglian Water's big numbers:
 - The largest water and wastewater company in England by territory
 - Supplies water to 4,3 million customers
 - Manages a water network of 37.500 km of pipelines, divided in over 1.850 DMAs
 - Current leakage at 4,97 m³/km/day, one of the lowest levels in the UK
 - £35 million spent last year on driving down leakage
 - More than 300 staff finding and fixing leaks
 - Around 27.000 leaks fixed every year



Water Loss Management

Water Loss Management

Optimize the company's water loss management process and resources to achieve and maintain a low Non Revenue Water level over time

up to **30%** savings in energy consumption

Avoiding energy wasted in pumping NRW

up to **25%** increase in operational efficiency

Shortening event detection, reaction and action times
Providing one single version of the truth

up to **20%** reduction in total cost of ownership

Tested, validated and documented architecture
Leverages the utility's existing infrastructure

References



Aquis



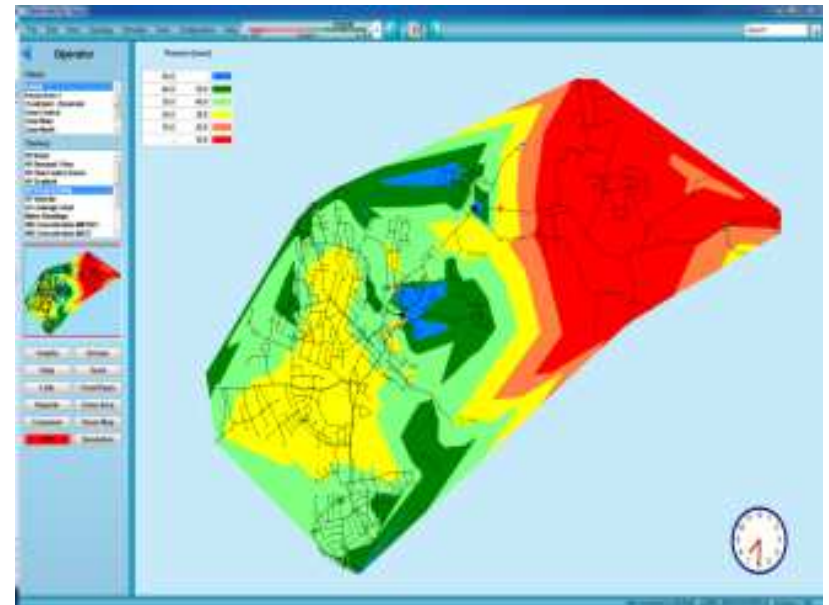
*Over 150 references
worldwide*



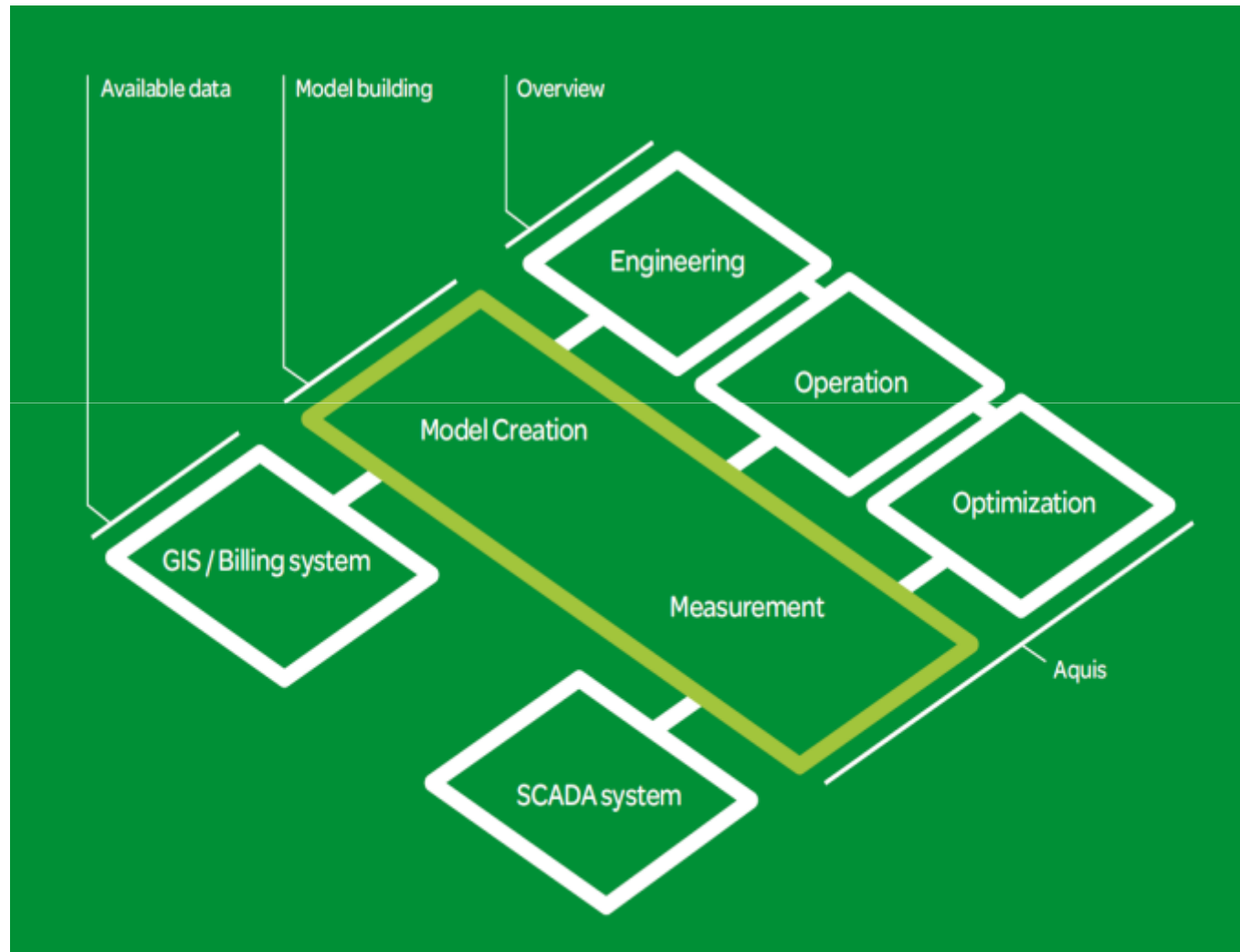
Aquis – Day to Day Operation

Reliable supply

- Online system for informing the operator about any issues in relation to supplying the right volume, quality – in the **past, present and future**
- Online system for performing **what-if analysis** to avoid errors and complaints
- Online system for simulating i.e. pressure across the network reducing the need for costly instrumentation



Aquis – IT Configuration



Fully integrated in your SCADA system

Prior knowledge of hydraulic is not necessary

Easy to get started

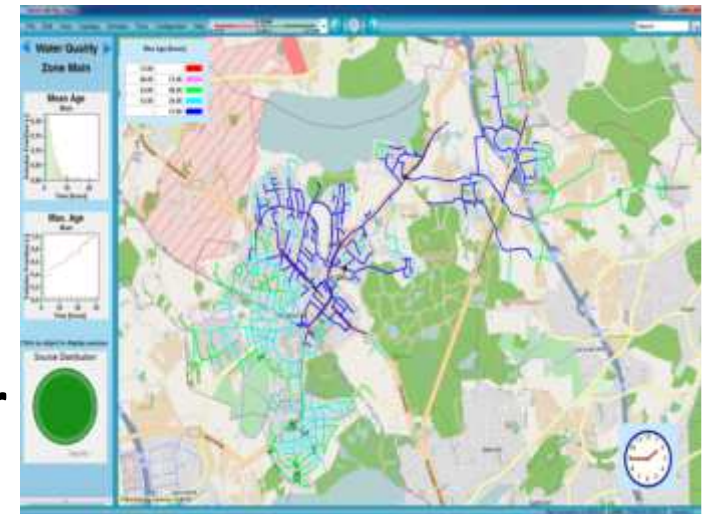
Aquis - Operating your Water Supply Network

- Better overview and improved operation
- No pre-knowledge about Aquis is required to operate the tool
- Decision making tool using live SCADA data - integrated in your day-to-day operations
- Like GPS automobile navigation, AQUIS Real Time will advise you of problems in the network, no matter which turn you take – easy to predict future consumption
- Instant and clearly identified benefits and economic advantages

Aquis – Focus on Water Quality

Tangible and measurable ROI

- Incident Management – informing the operator about pollution spreading and indentifying the source of pollution
- Enabling the operator to **optimize** the use of chemicals and **dosage of chlorine** – hence saving costs
- Full visualization of which plant supplies to which clients
- Full visualization of the **age of the water**

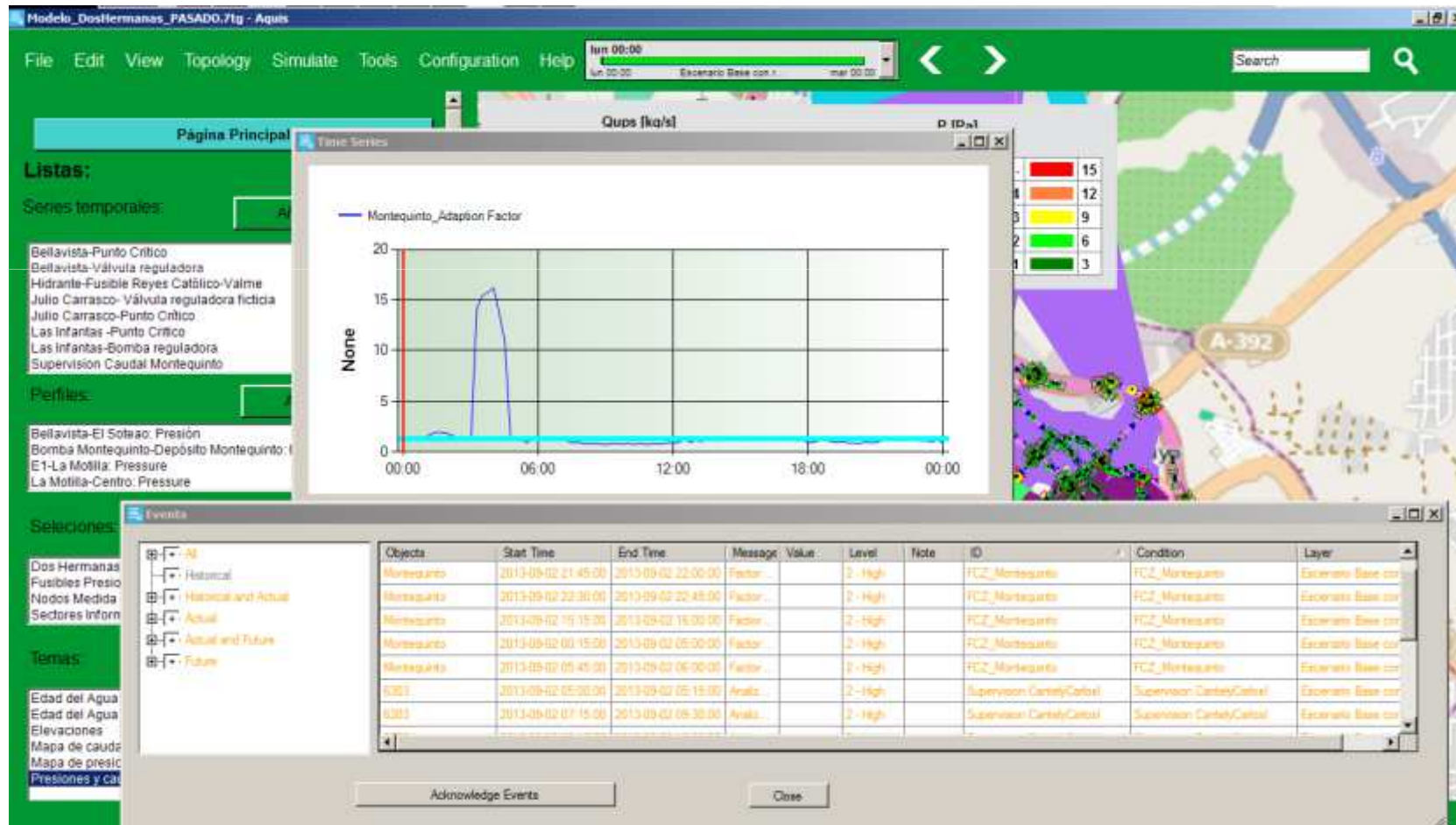


AQUIS-Data for SCADA users

- Visualization on **SCADA screens of the theoretical or expected behaviour** of the network against the real situation (measured points) → Supervision of the network.
- Visualization of the **behavior of non monitored points** in the network
- Visualization on SCADA screens of next future values for key assets. These values are generated in AQUIS performing EPS on-line simulations
- AQUIS is able to create events related to the above items and send them to SCADA.
- AQUIS can send back to SCADA **setpoints of pressure** for PRVs and VSPs to optimize the network behavior from the energy point of view

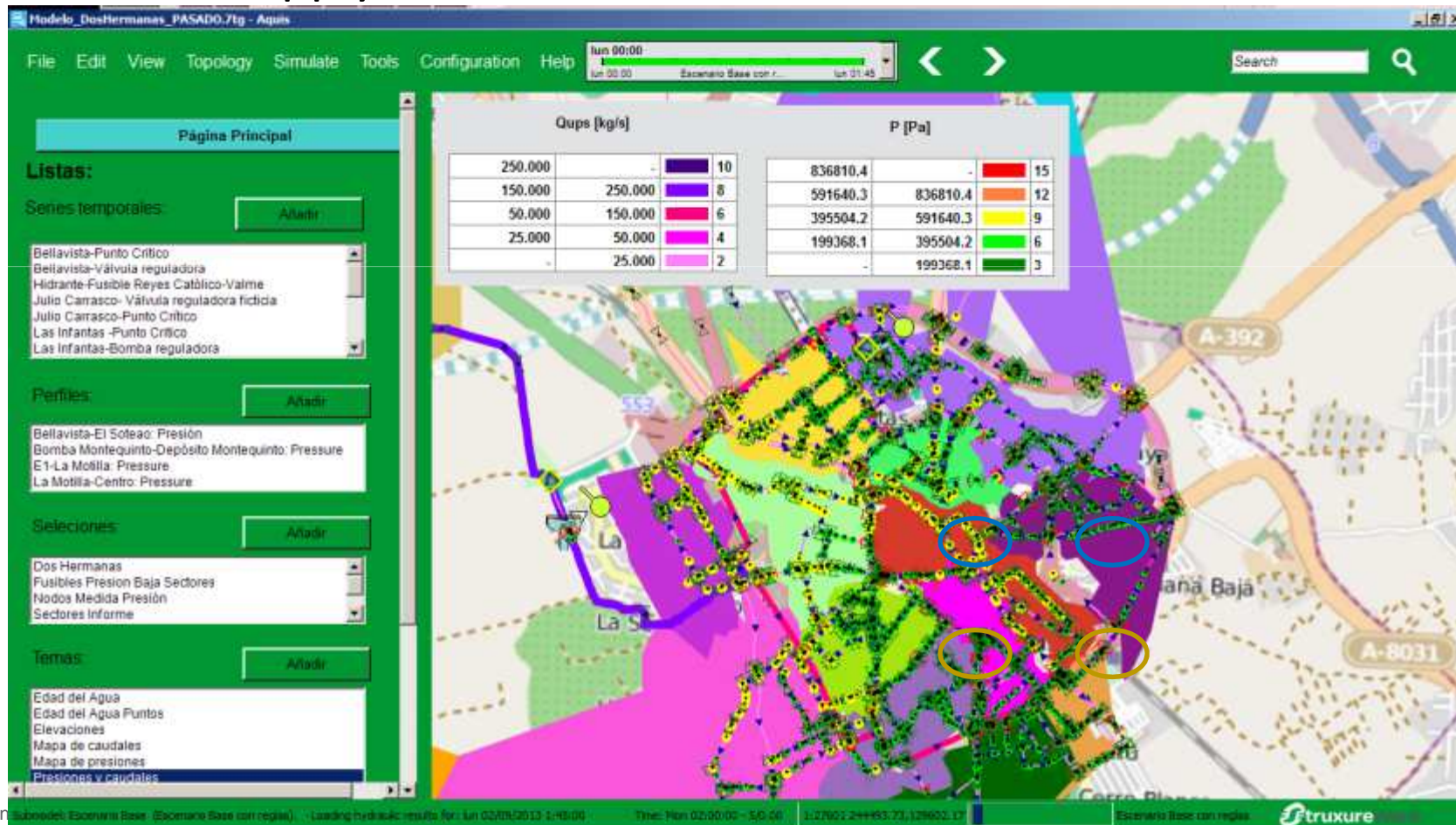
AQUIS-Hydraulic Supervision

- The user can add **new fields with formulas** to perform supervision tasks



AQUIS-On Line Demands Adjustment

- AQUIS recalculates the customers' demands based on current supply flow retrieved from SCADA.

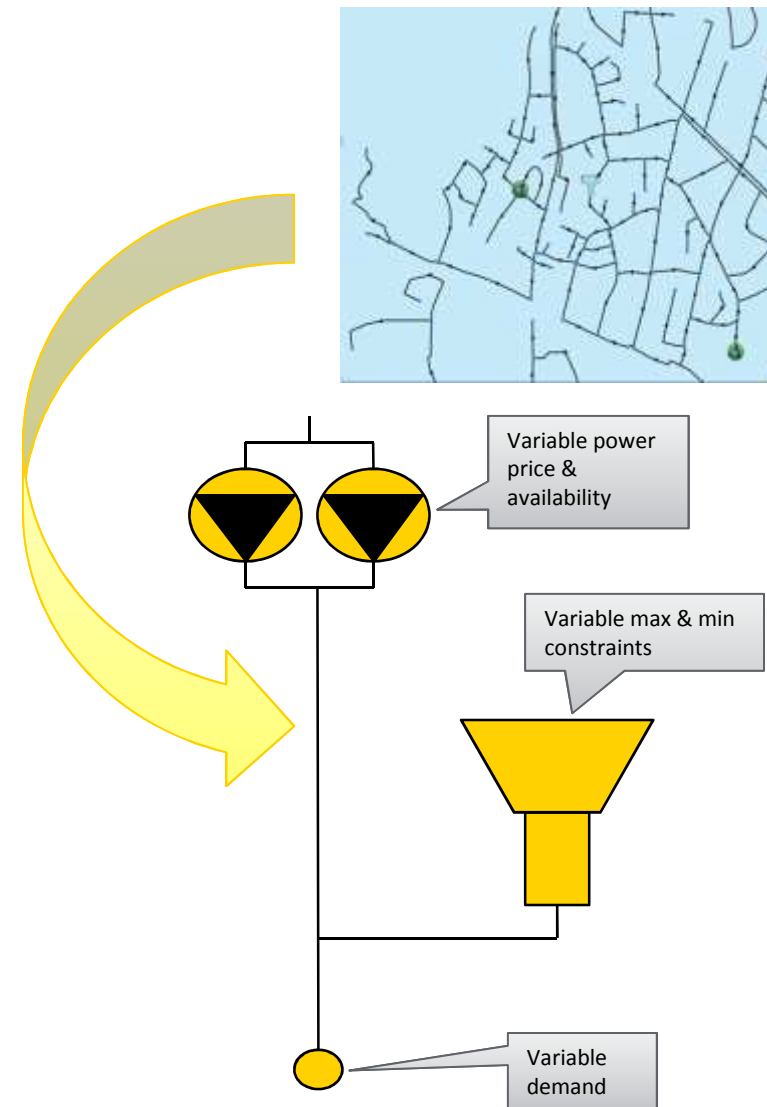


AQUIS-Pressure Optimization

- Pressure Optimization:
 - Secures the **critical low pressure setpoint** is maintained all over pressure control zone.
 - Identifies automatically pressure control zones based on net topology and pressure controlling devices as pumps and valves.
 - User defines a general minimum and maximum pressure in pressure control zone. Additional specific node pressure limits may be defined.
 - System calculates the required pump lift or pressure reduction at controlling device and returns relevant set points to SCADA.

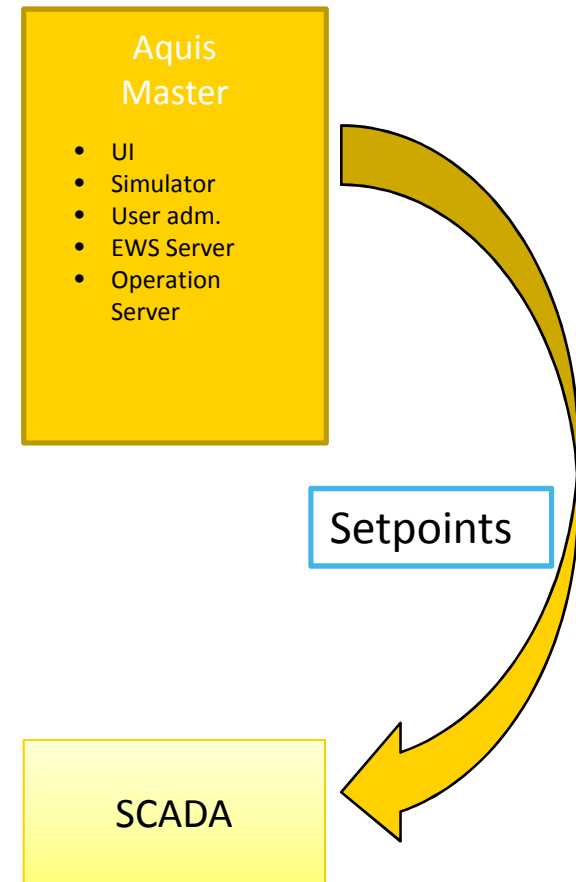
AQUIS-Pump and Reservoir Optimization

- A generic scheduling and optimization algorithm based on dynamic programming.
- Distribution model is converted to a simplified system containing of a single pump station, piping, a single reservoir and demands.
- The module minimizes the operation costs for a period. Alternatively a pressure minimization is conducted.



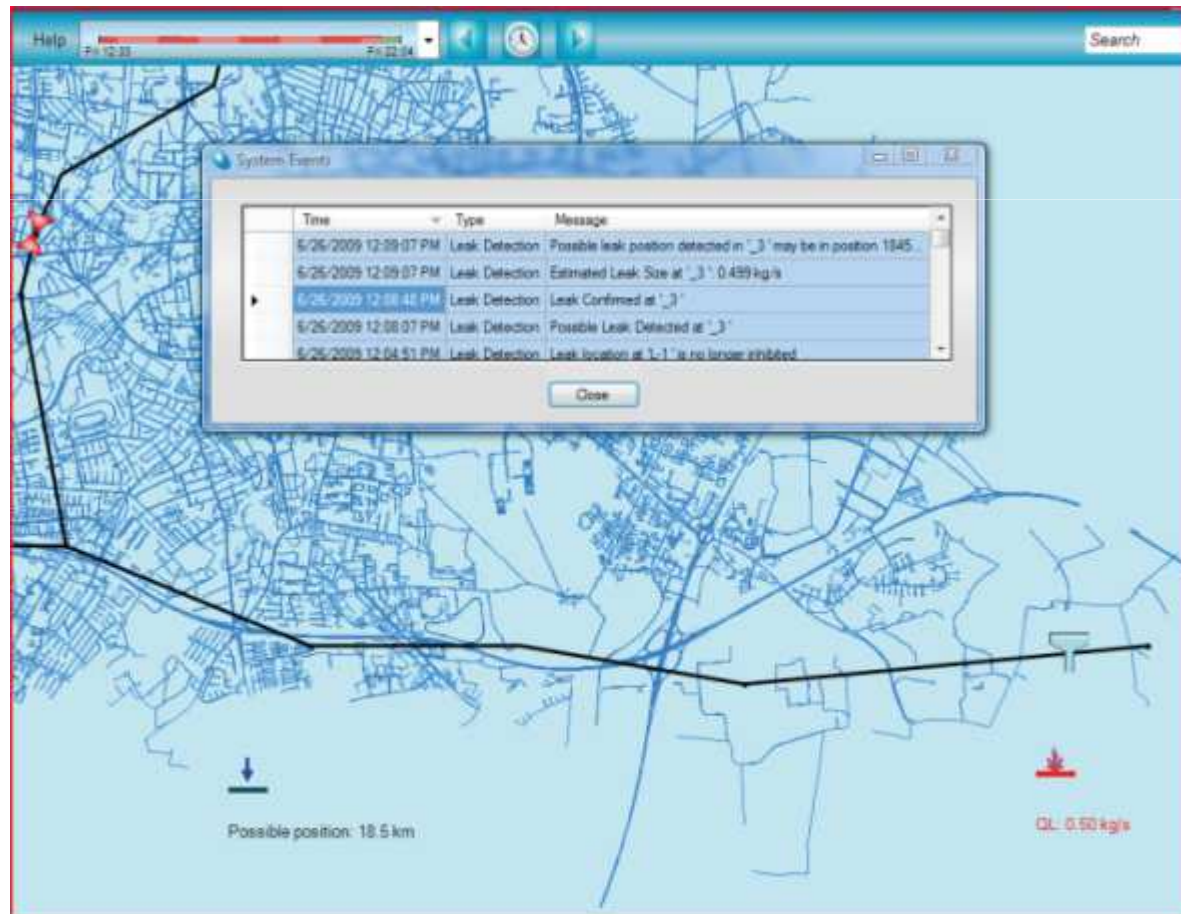
AQUIS-Pump and Reservoir Optimization

- The basic result of an optimization is a production flow time series in the major inlet of the optimized zone. This time series has typically an hourly resolution looking 24 or 48 hour ahead of simulation start time.
- Any calculated node or pipe parameter in the optimized system can be transferred to SCADA as a setpoint.



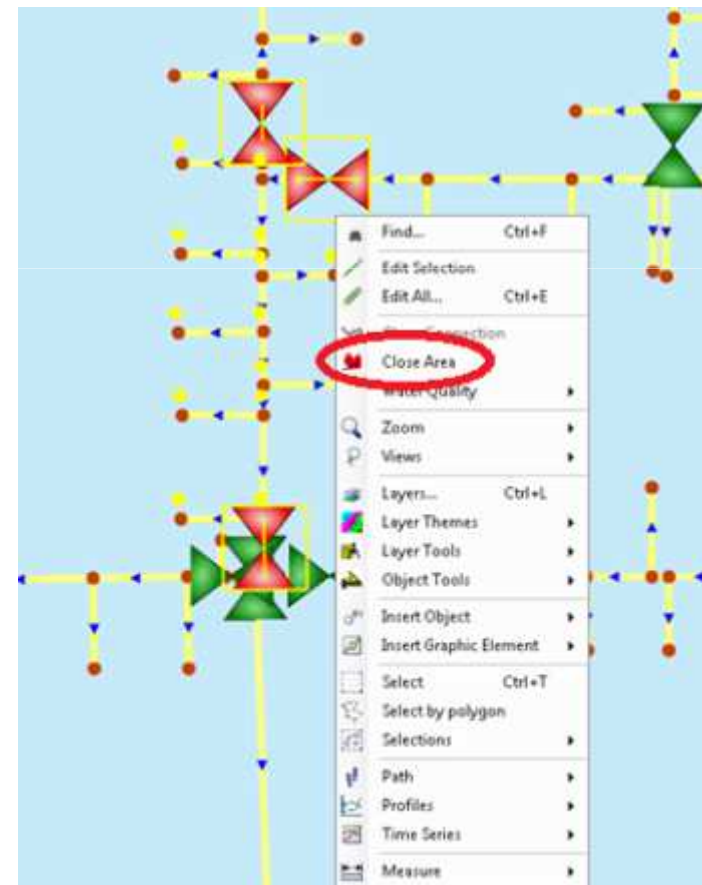
AQUIS-Leakage Detection and Location

- The on-line simulations allowed by the integration SCADA+AQUIS permits to detect and locate leaks in transmission networks



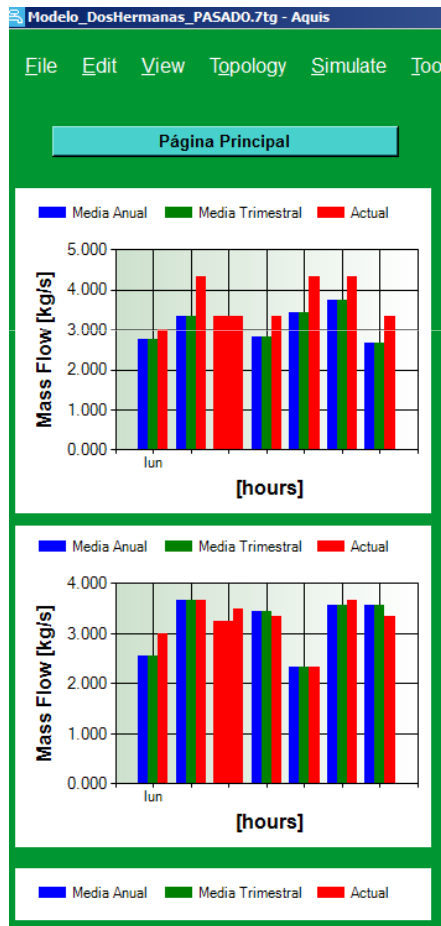
AQUIS-Area Isolation

- “Close area” tool: allows to identify valves to be closed to isolate an area and customers affected by this outage

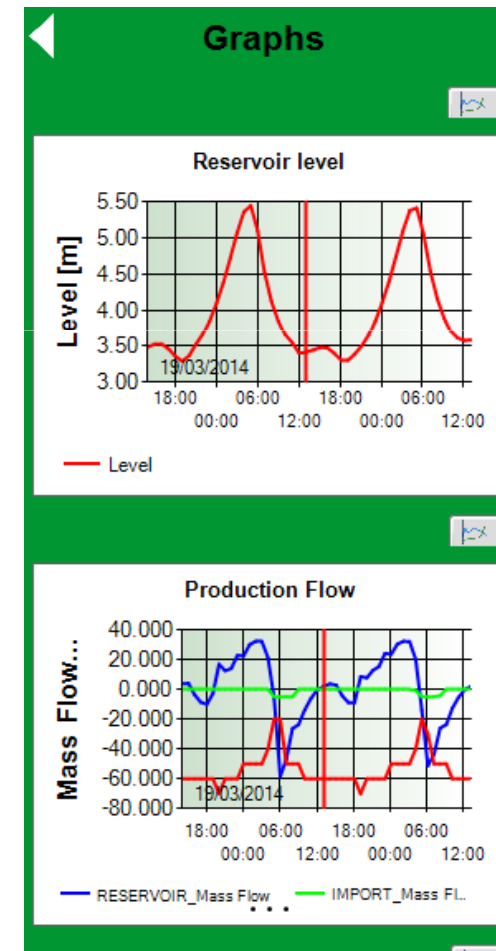
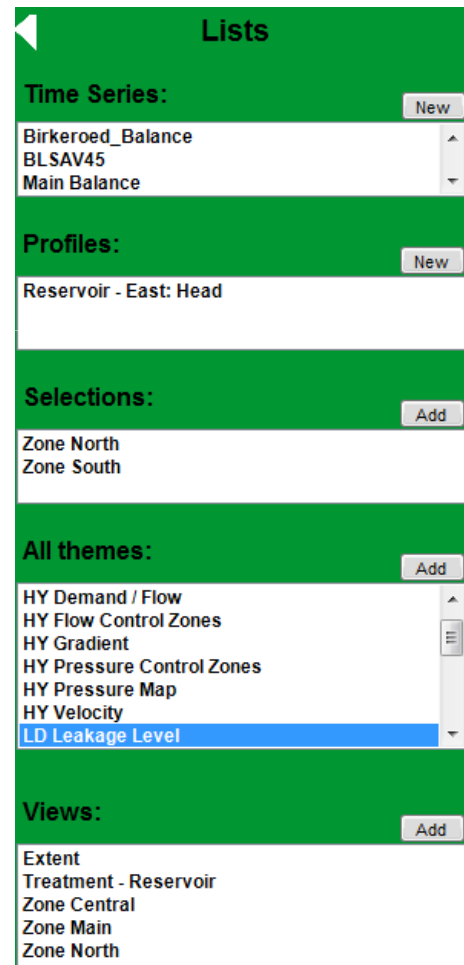


AQUIS-Dashboards

- Configurable Human-Machine interface

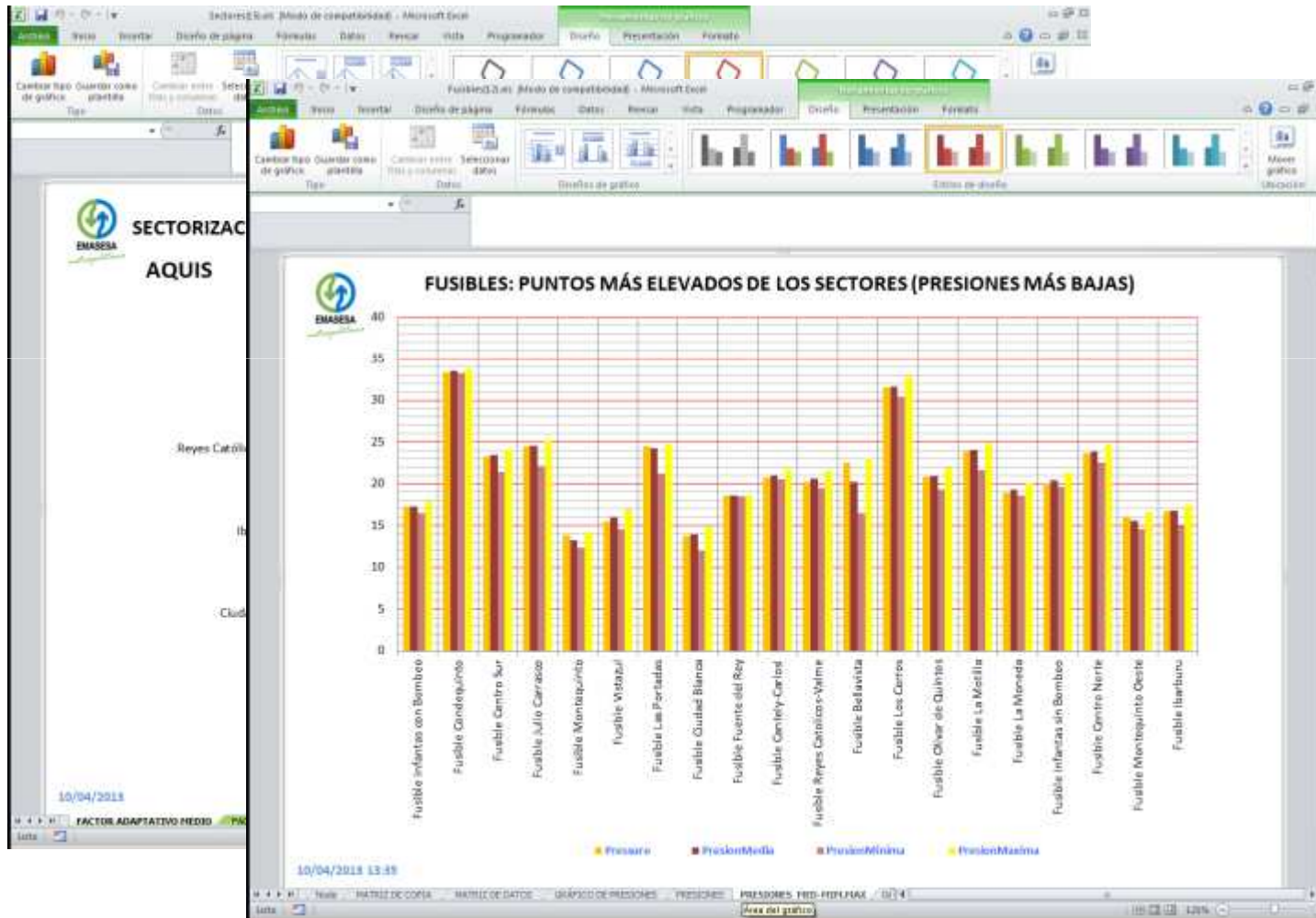


Submodel: Escenario Base (Escenario Base con reglas). - Loading hydraulic
Confidential Property of Schneider Electric



AQUIS-Reports

- Automatic Reports Creation for Managers



Model Users Benefits

- **Availability of data for pressure, flow, water quality, etc. for all points of the network in real time, past events and future events.**
- Use of the model by the operational staff autonomously
 - Operators: simple and routine tasks
 - Modellers: model update, complex task
- The automatic reallocation of the demands (on-line adjustment of the theoretical model demands) to adjust the calculated behaviour to reality.
- The Pressure Optimization tool allows the reduction of water leakage, energy consumption and CO2 emissions by up to 10-15%.
- The Reservoir and Pump Optimization tool allows the reduction of water leakage, energy consumption and CO2 emissions by up to 10-15%.

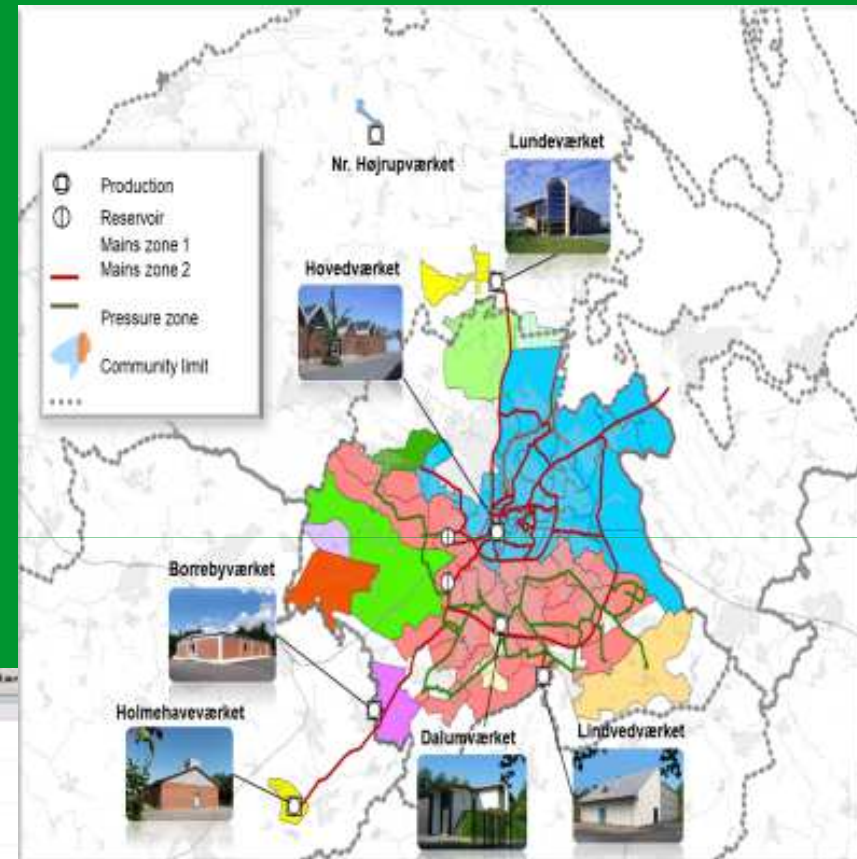
Odense: On-Line Network Optimization

Odense data:

- Sold water: 8,754,681 m³
- Pipe length: 1001 km
- Inhabitants: 155,500

Project details:

- Integrated with SCADA, Billing and GIS.
- Dynamic pressure control
- Network operation



150 Year Old Utility Boosts Network Operational Efficiency

Goals:

- Provide safe drinking water most efficiently 24/7
- Improve contingency planning
- Optimize expansion and maintenance
- Dynamic pressure control

Schneider Electric solution:

- Aquis provides data not available in SCADA system including
 - Ability to trace contaminations accurately both forwards and backwards in the network
 - Knowledge of impact of operational actions beforehand
 - Decreased man-hours for operation

Customer benefits:

- ✓ Improved water quality
- ✓ Time saved in operations
- ✓ Improved customer service



*VandCenter Syd,
Denmark*


Stats: 9,100,000 m³/year, 170,000 consumers, 35.000 km service pipes

Customer Statement: "We can trace contaminations accurately both forwards and backwards in the network and to us it is an indispensable tool."



Schneider
Electric

¡Gracias!

Schneider
 **Electric**