Digitalization in the water industry

Alin Ene, Guest speaker of Grundfos Hellas

Water conference 02/12/2019, Marousi Plaza - Athens

be
think
innovate

GRUNDFOS

Agenda

1. Introduction
2. Benefits of digitalization
3. Digital Products

Grundfos is …

#1
Pump manufacturer
in the world

4
Turnover
(billion USD)

83
Companies across
the world

18,000
Employees
worldwide

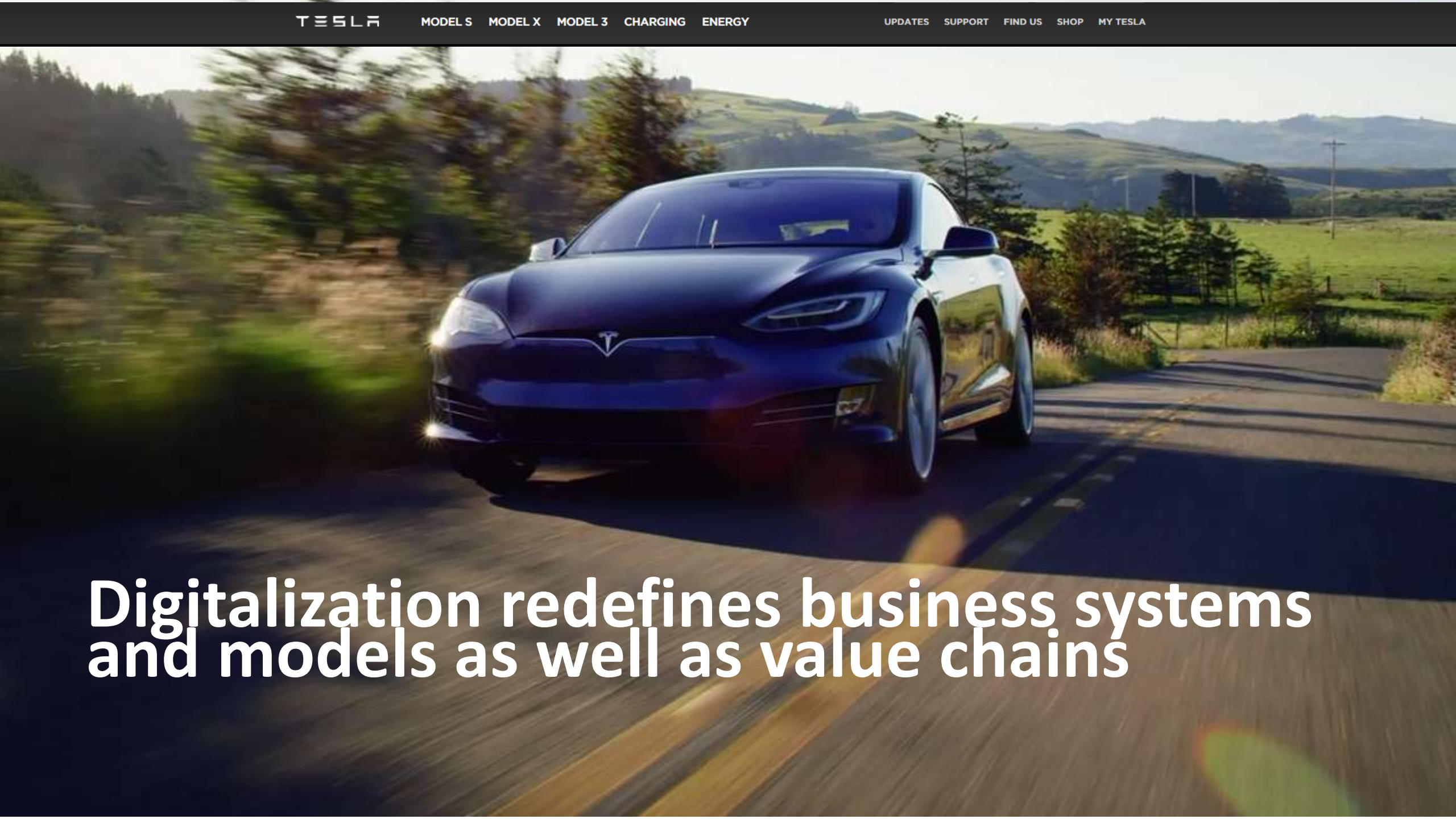
16
Million units produced
every year

74
Years old
(founded in 1945)

(1)
Owner

“Digitalization is the transformational force in humanity that supports value creation by connecting people, companies, products or literally anyone and everything”

Mads Nipper
CEO & Group President
Grundfos



Digitalization redefines business systems and models as well as value chains

Digitalization is about the way companies interact and connect directly to customers and end-users in more relevant, simple, seamless and effective ways

PARTNERSHIP

KPIS IMPROVEMENTS

FINANCIAL BENEFITS

BENEFITS

Connect your data on one platform

Reduce your water & energy losses

Maximize your returns in data acquisition

Optimize your strategy on pipes replacement

Reduce your operational costs and boost your service levels

Different apps for different users

All upgrades included

WASTEWATER CHALLENGES

GRUNDFOS iSOLUTIONS CLOUD FOR WASTEWATER NETWORKS

GRUNDFOS iSOLUTIONS

be think innovate

GRUNDFOS

Provas | Water utility in Haderslev, Denmark

Strategic Collaboration

Co-creation solutions for a water utility to find new ways to deal with energy savings, infiltration, overflow and asset management

The first five solutions launched are based on shared insights and real time data from a part of the Provas wastewater network

Feedback from Provas

"Using the system to find infiltration flow makes sense. Today, we use EUR 4-7,000 for a single test, and because we are not certain of the exact location, we can end up doing multiple tests."

Stafan,
Project Engineer

"What's new is getting data of this quality. We get a good overview, which we can use as input when calibrating our models."

Claus,
Planning Engineer

"This offers a faster way of finding infiltration flow. It's fixed in position, so we can follow developments over time. We will be able to see the effect when we are renovating or separating."

Tommy,
Project Engineer

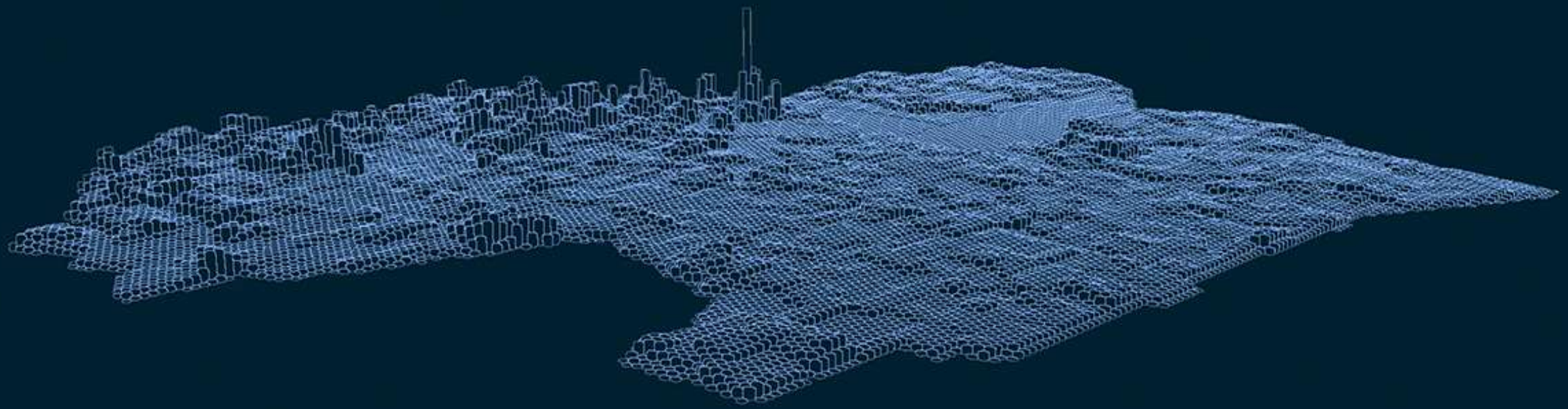
"Previously, we could only see whether the pumps ran a little or a lot and use this as an indication of infiltration flow. Now we have something that identifies the most critical areas."

Casper,
Wastewater Operations Manager

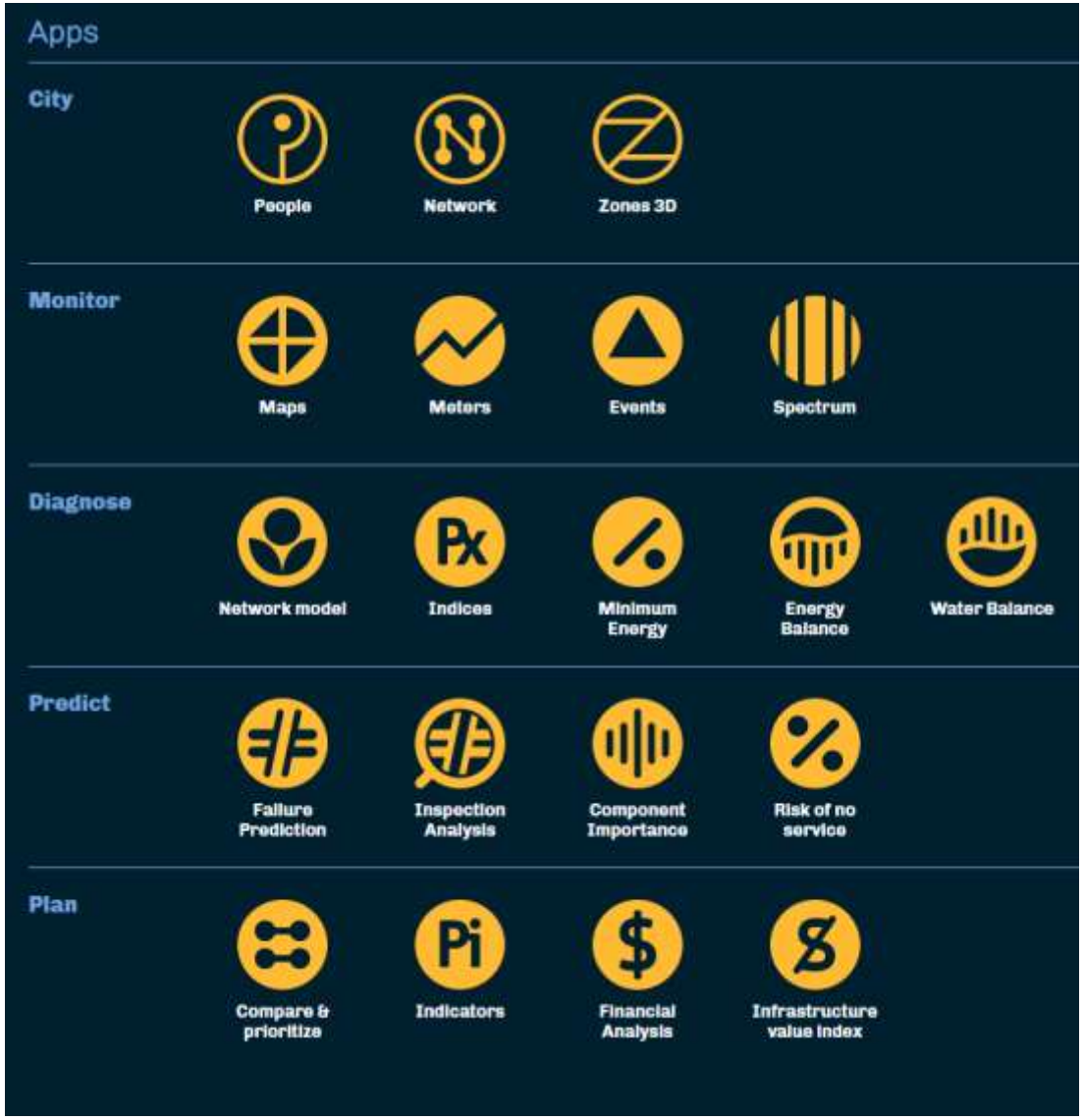
WATER DISTRIBUTION CHALLENGES

Grundfos Intelligent Water Distribution

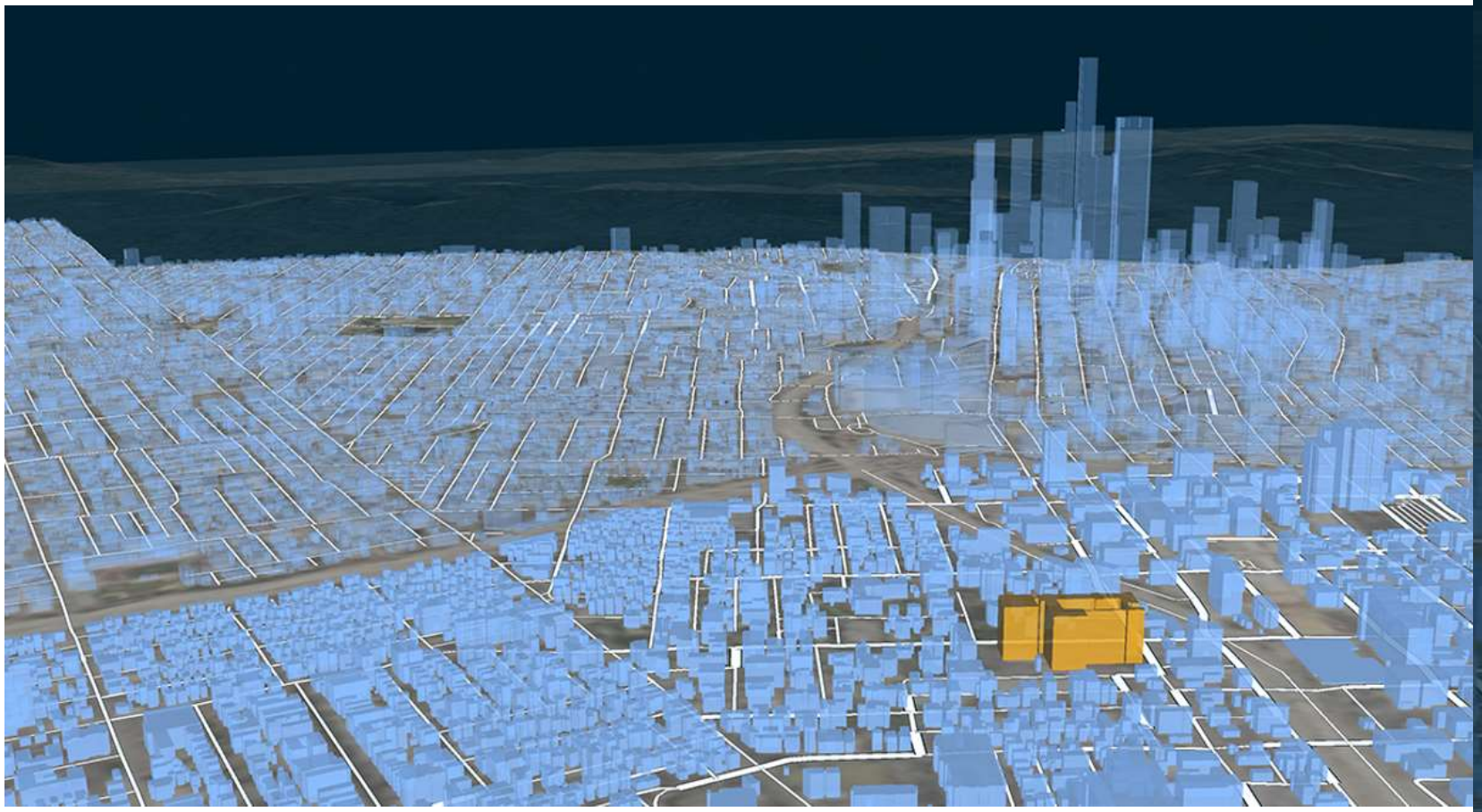
Powered by Baseform®



IWD home page

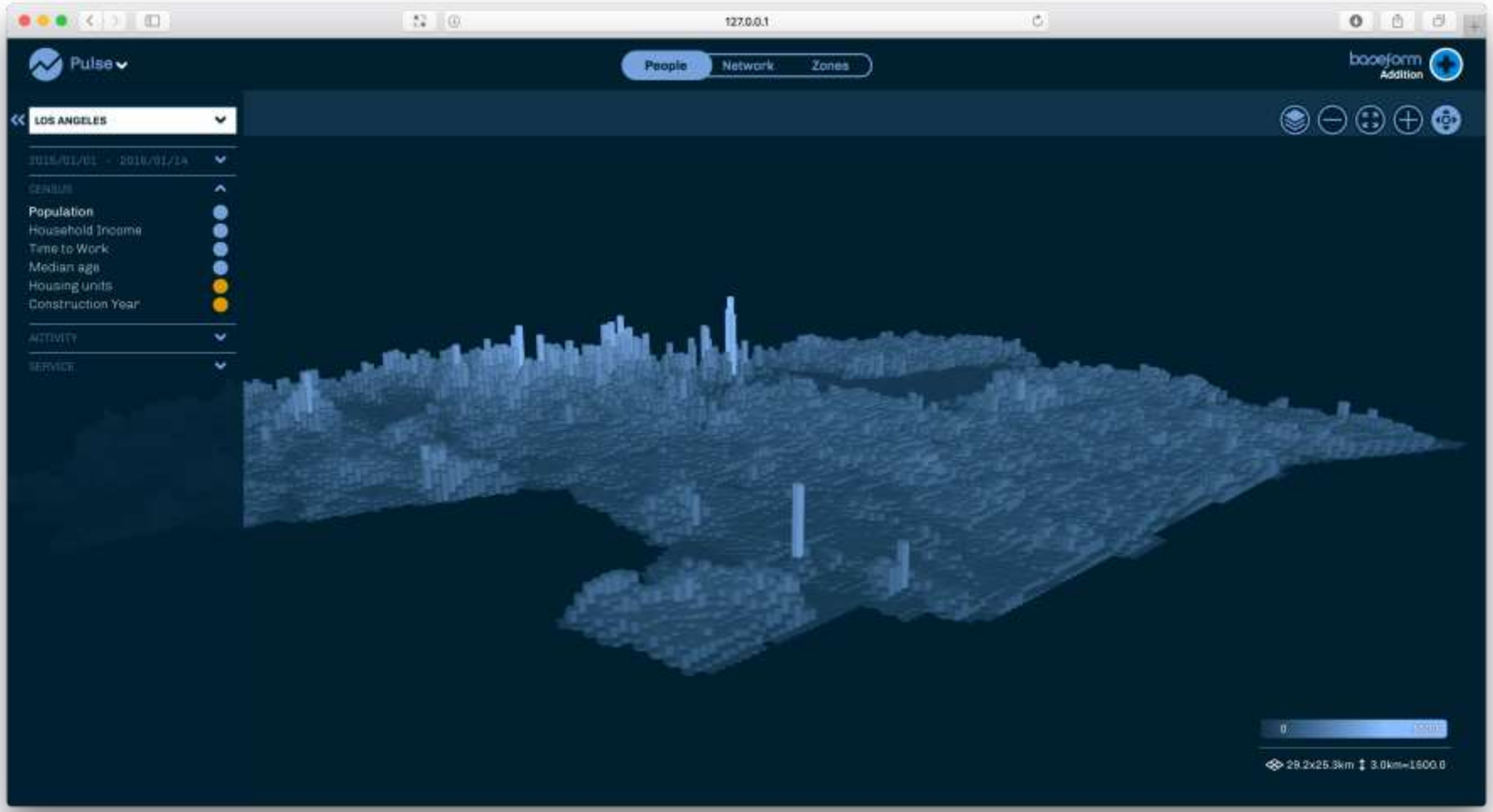


Sensorization



Network zone	Z-So-19
Building year	1964
Households	16
Avg. income	40.7k
Performance	
Pressure	34-38m
Cl^2 residual	0.35-0.40mg/l
Energy to supply/yr	1871kWh
Risk	
Supply	
Flooding from sewers	
Cost	
Revenue/yr	3235
CapEX	970
OpEX	2215
IVI	0.3
Real-time	
Consumption/24h	8.1 m^3
Flow	0.78 m^3/h
Pressure	43.5m

CITY: Dynamic 3D spatial + time analytics



• PEOPLE

- The combination of consumption & service analytics, demographics, urban occupation, social data and other sources reveals new dimensions in understanding the city.

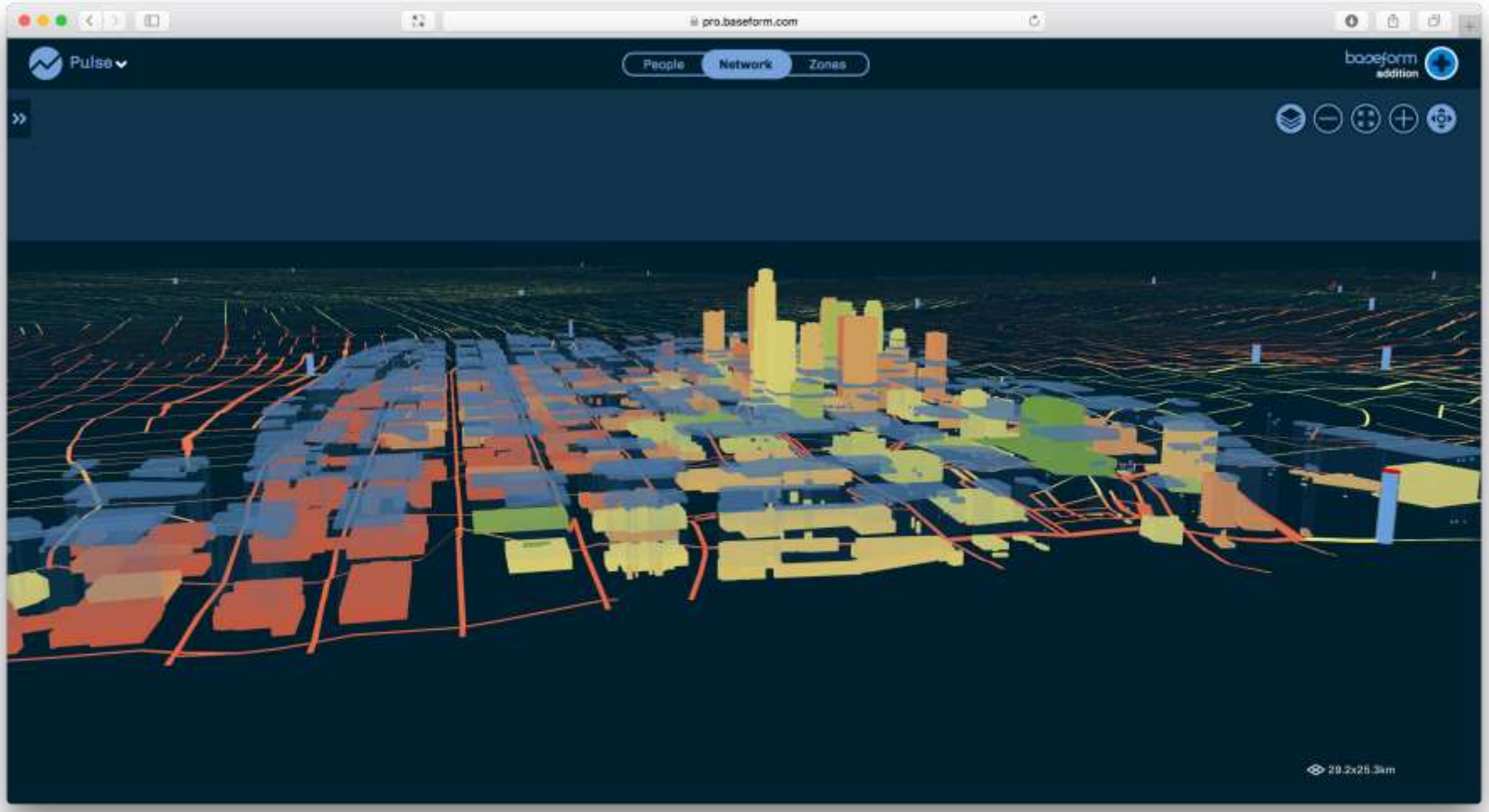
✓ city-centric, dynamic 3d space + time analytics

✓ cities are people: see them move and change throughout the day & the year, and across town

✓ combine data sources to reach a better understanding of human behavior

✓ observe reality in detail and continuously evolve plans & designs

CITY: Dynamic 3D spatial + time analytics



•NETWORK

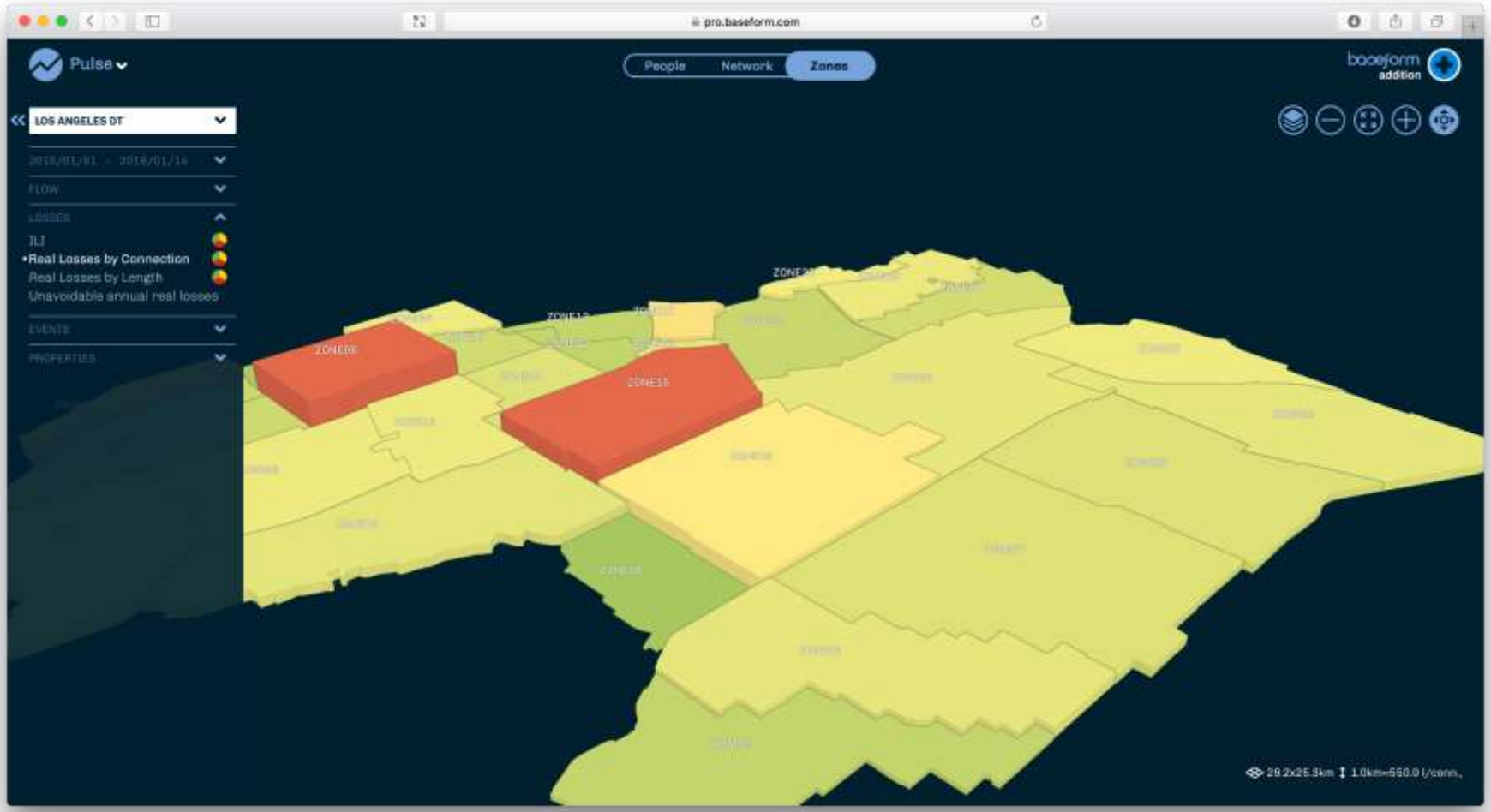
- A full 3D environment for the network, combined with a powerful, next-gen cityscape, affords even non-experts deeper insight into its behavior and analytics.

✓ service-centric, dynamic 3d space + time analytics

✓ available hi-quality buildings literally add new dimensions in service analytics display

✓ wide range of hydraulic, water quality, asset management, leakage/flow, risk, cost and other metrics

CITY: Dynamic 3D spatial + time analytics



• ZONES 3D

- The 3D counterpart to the Zones app provides a fully immersive cityscape where urban zoning becomes easier to analyze and prioritize in time and space, simplifying decision-making.

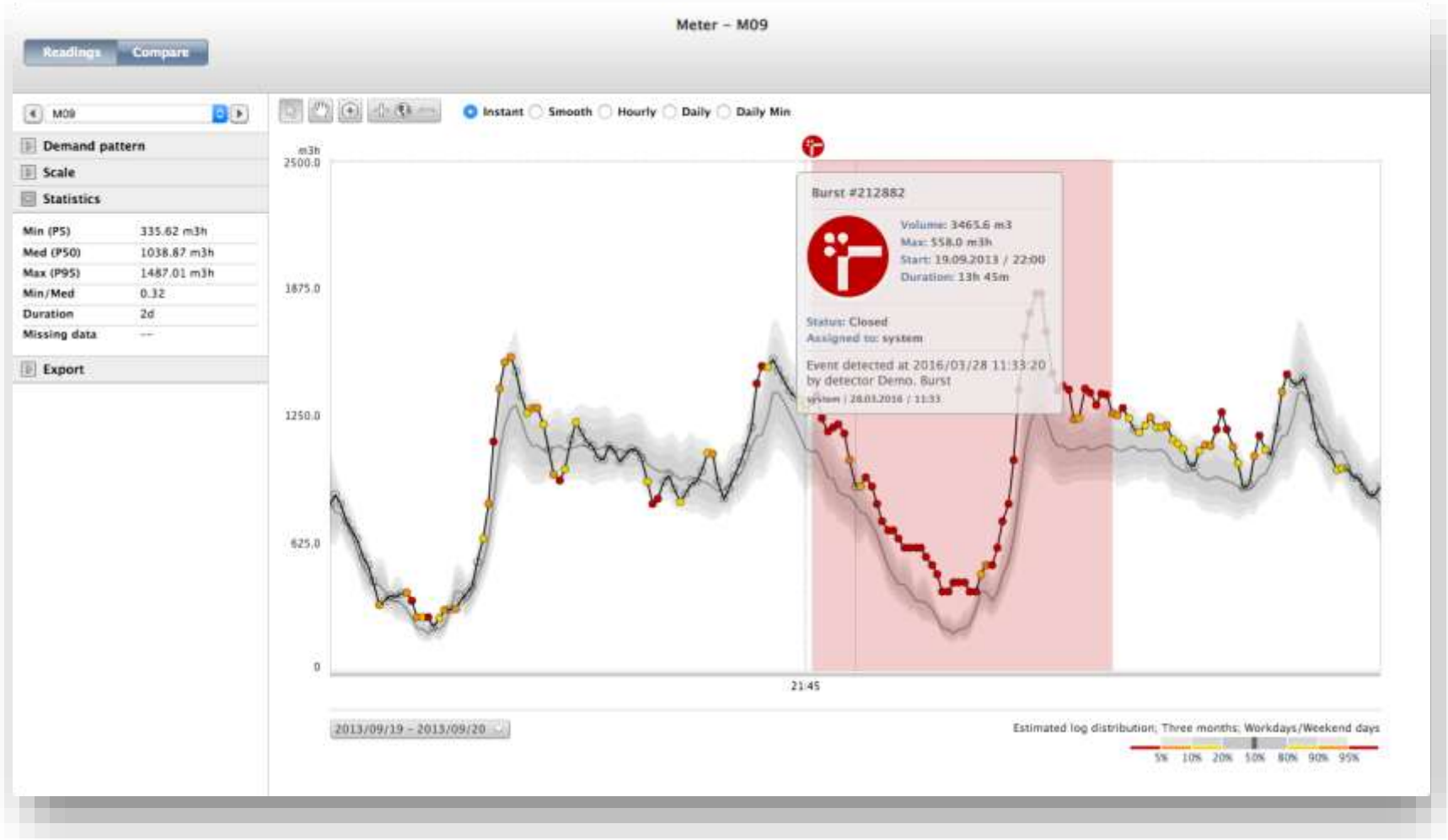
✓ planning-centric, dynamic 3d space + time analytics

✓ wide range of zone-based kPI.

✓ time tracking of zone and system diagnostics.

✓ repeatable, direct support to system prioritization

MONITOR: Real Time operational efficiency



• EVENTS

- Detects deviations to normal network behavior that may translate leaks, pipe breaks, unusual demand or a variety of network issues.

✓ Active, fast detection of leaks, bursts and other network events, as well as metering and communications malfunctions.

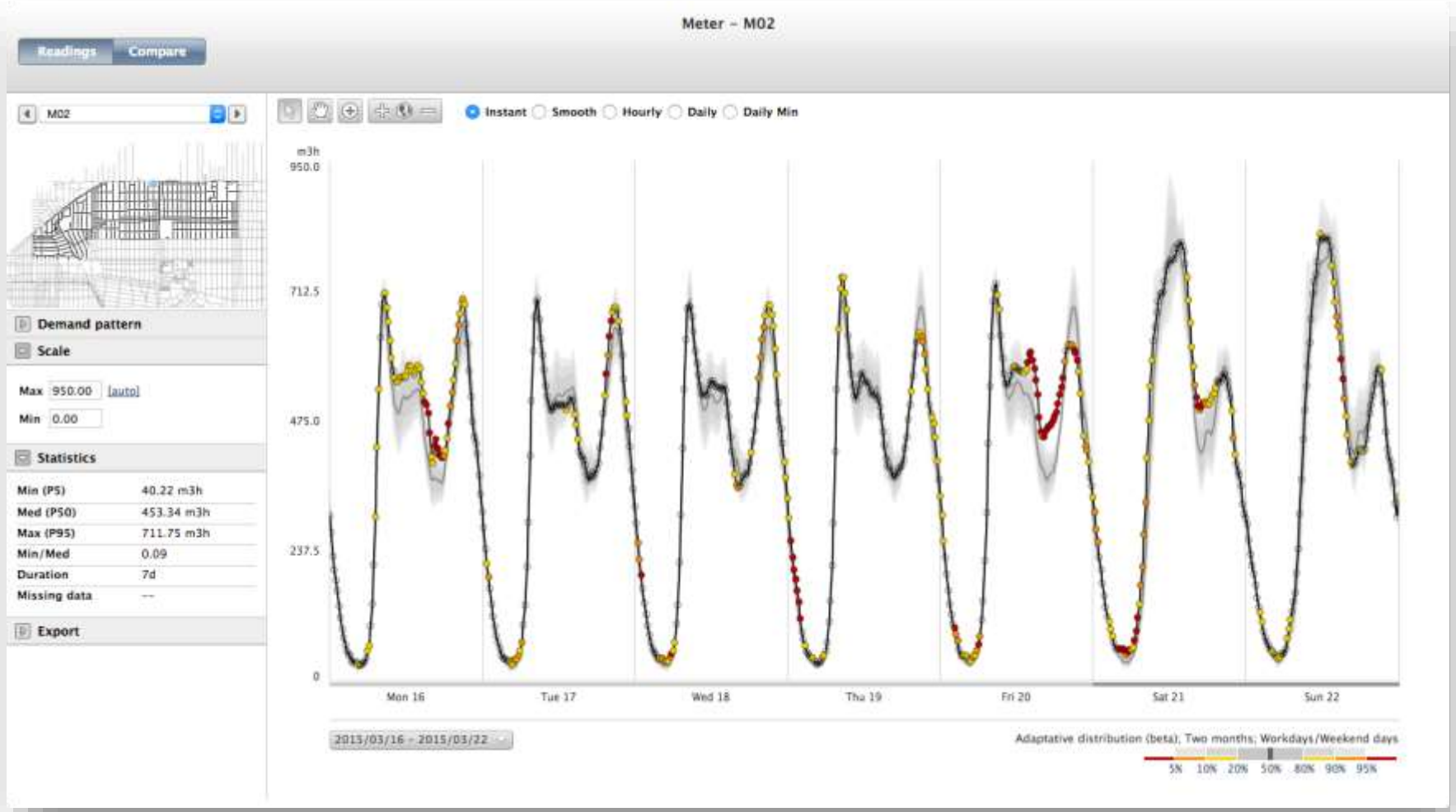
✓ Reduced response times to field events.

✓ Reliable, automated estimation of volumes lost.

✓ Streamlined workflow for operational events.

✓ Operational feedback validates flow data, work orders.

MONITOR: Real Time operational efficiency



• METERS

- Sensor-based monitoring drives system usage analytics, learning and predicting demand patterns & trends, and consumer behavior.

✓ Dynamic, predictive demand patterns.

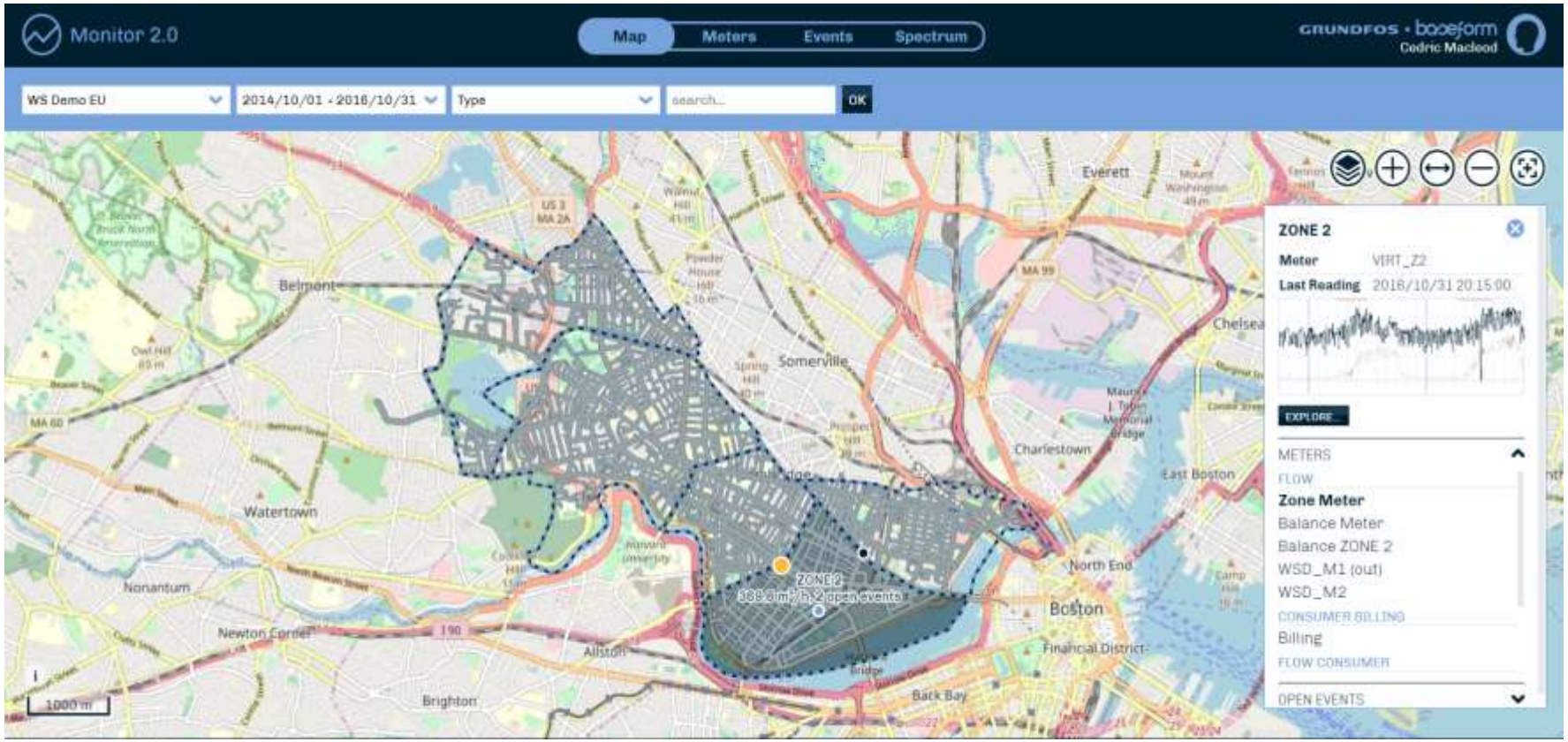
✓ Advanced flow analysis of trends, behaviors, consumers, network.

✓ Individual meter validation and reliability analysis.

✓ A monitoring-based, direct depiction of network behavior.

✓ Integrated feed of demand patterns and data to simulation models.

MONITOR: Real Time operational efficiency



- MAPS
- Interactive map-for quick overview of meters and associated events in the selected zone, with direct access to a specific meter or event.

MONITOR: Real Time operational efficiency

- SPECTRUM
- Meters activity and heath overview

DIAGNOSE: Spatial & system behaviour analytics

- NETWORK
- MODELLING

- Efficient, Java-implemented Epanet simulation engine for full-range hydraulic and water quality simulation, with 3D visualization and Google Earth integration.

✓ Full-range hydraulic simulation available in an internet browser, using Epanet .inp files

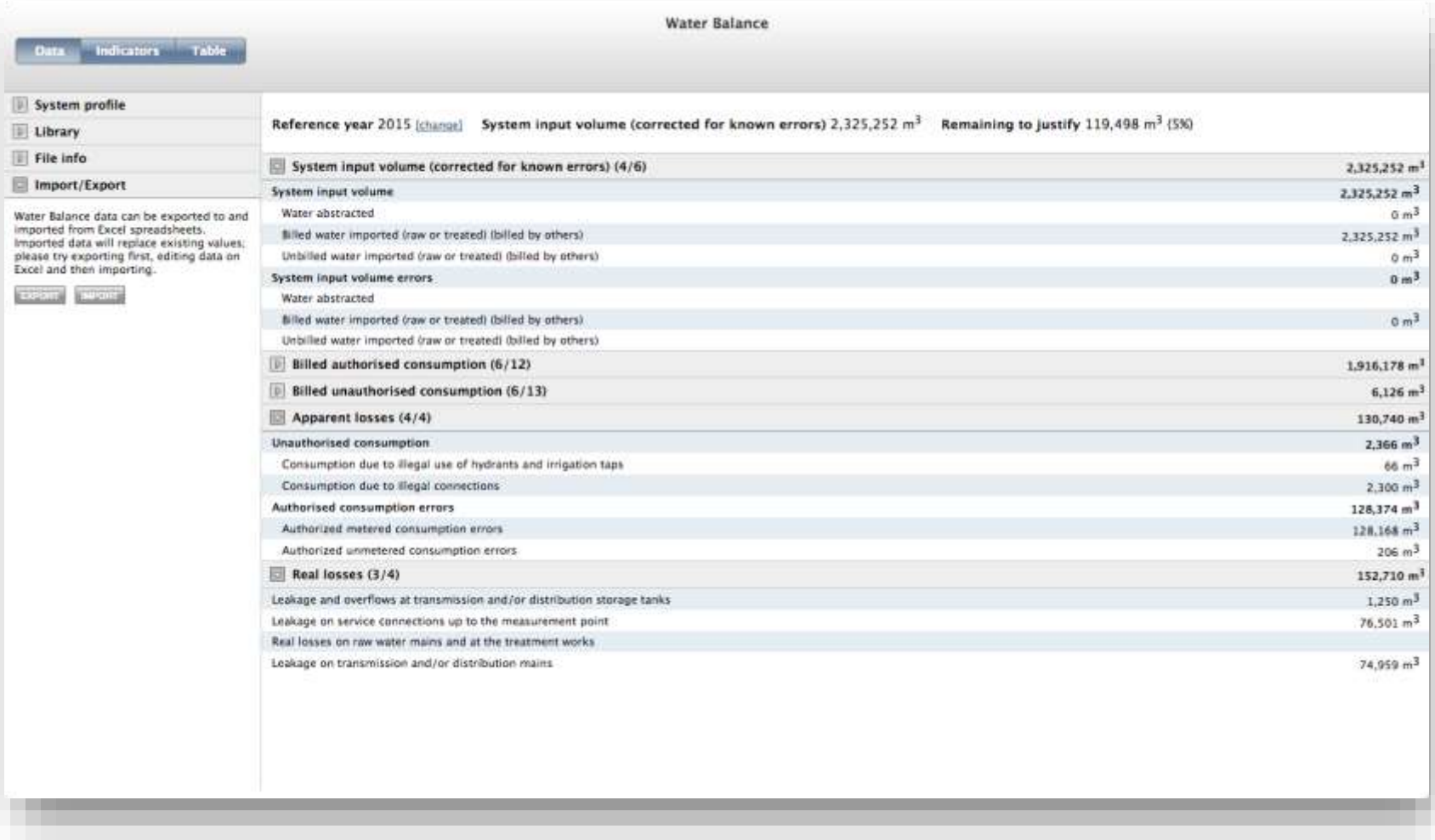
✓ Native inclusion of the MSX advanced water quality simulation library

✓ Powerful result visualization helps bridge gap to non-expert users

✓ Full Excel® export/import of model data and results

✓ Integrates results from all other network-related apps [eg., failure analysis, geo analysis)

DIAGNOSE: Real Time operational efficiency



•WATER BALANCE

- Library-based, IWA / AWWA-compliant water audit standard framework for rigorous, automated diagnosis, NRW reduction and asset management.

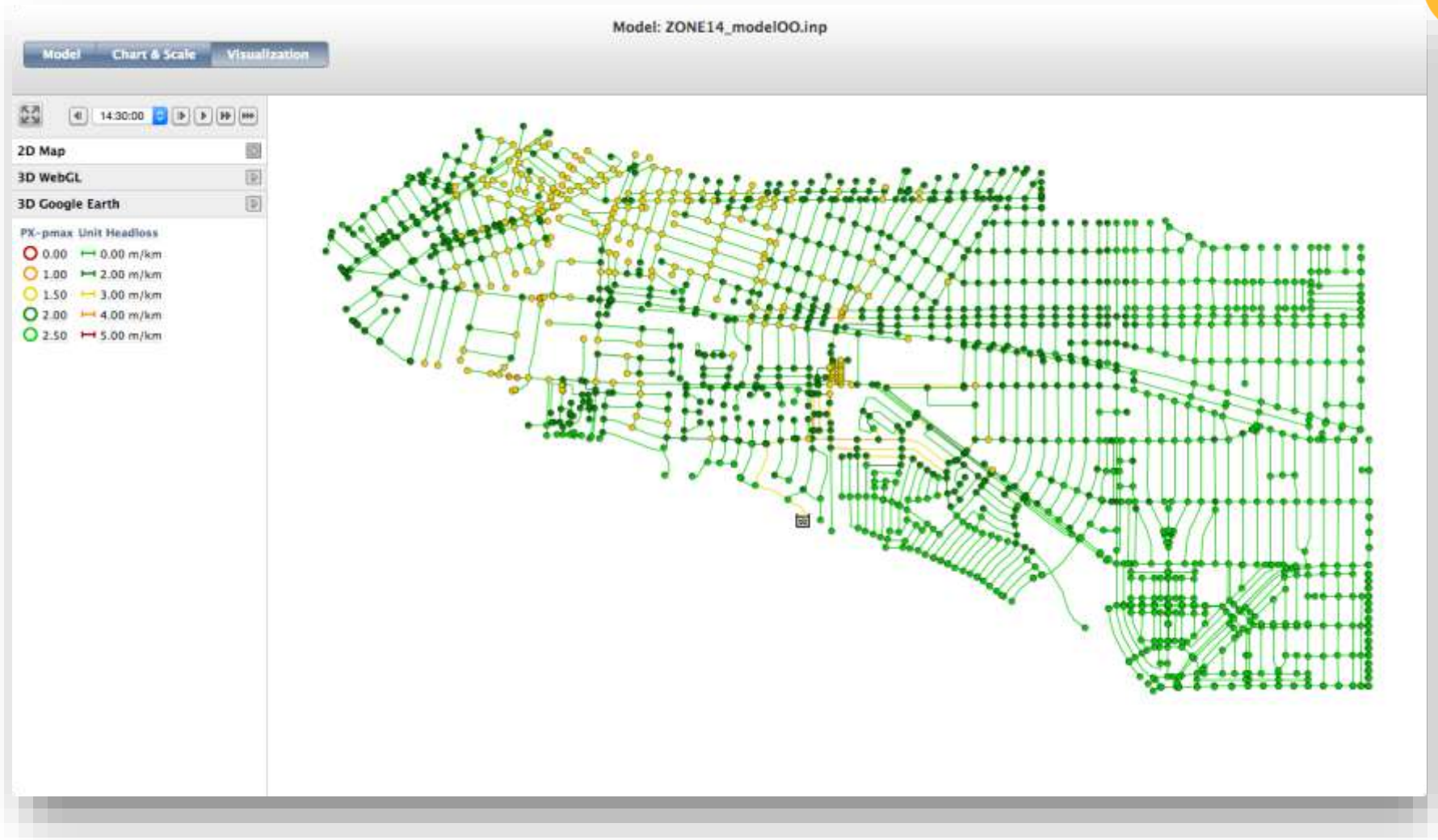
✓ Systematic calculation of water balance for system and zones.

✓ Automated, consistent estimates for supplied and lost volumes and for NRW and water losses kPI.

✓ Fully configurable libraries for any combination of audit items.

✓ May be automatically fed from billing/CRM, network monitoring & other sources

DIAGNOSE: Spatial & system behaviour analytics



- PERFORMANCE
- INDICES

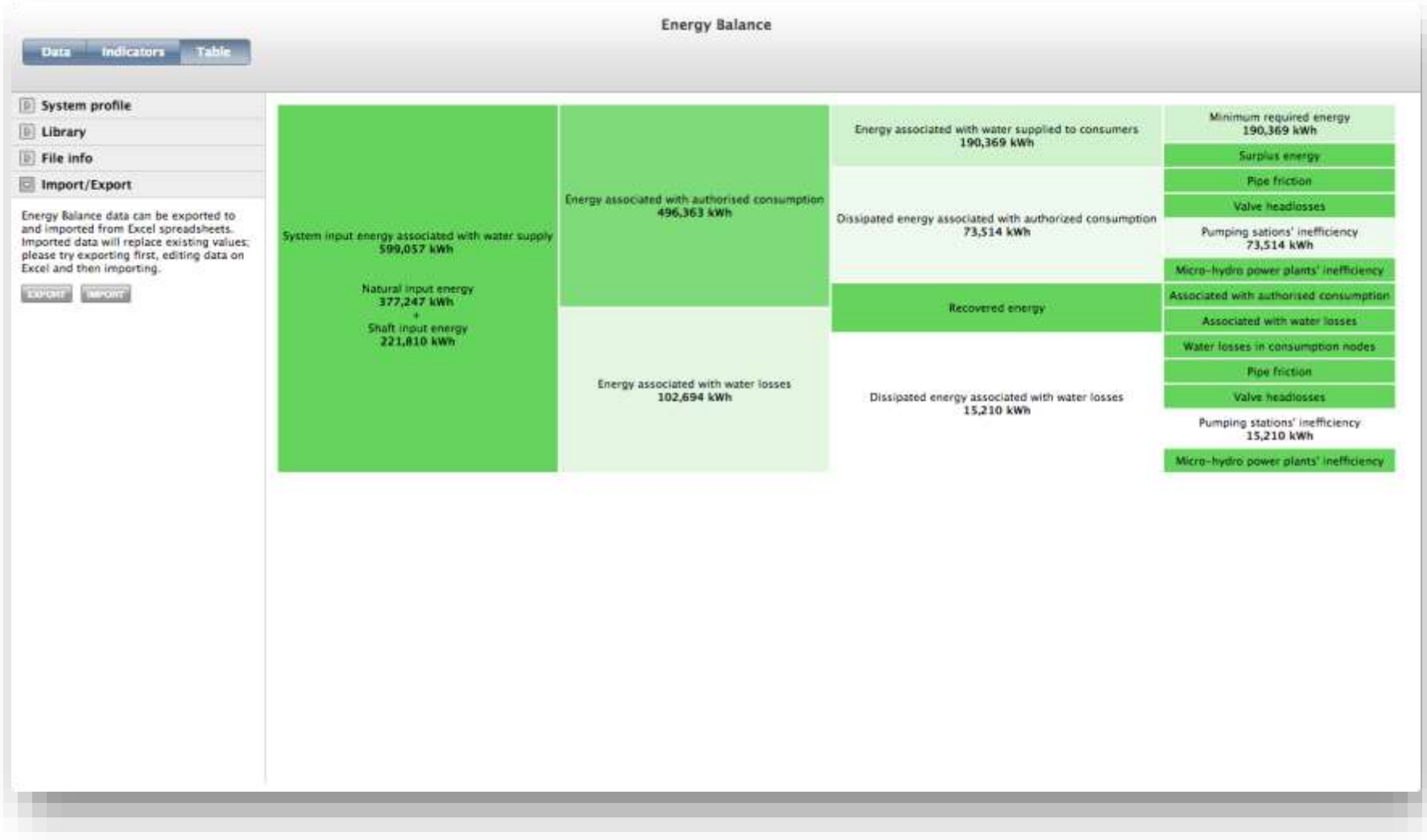
- Simulation-based, technical performance assessment of system capacity, water quality, energy use and any other system behavior.

✓ Calculates performance indices – detailed technical performance metrics based on the values of certain features or state variables of urban water networks.

✓ Indices include hydraulics [e.g., service pressure, contingency pressure, pressure variation, velocity), water quality [travel time, concentration)

✓ Performance indices selected from editable libraries updated with latest R&D

DIAGNOSE: Spatial & system behaviour analytics



• ENERGY BALANCE

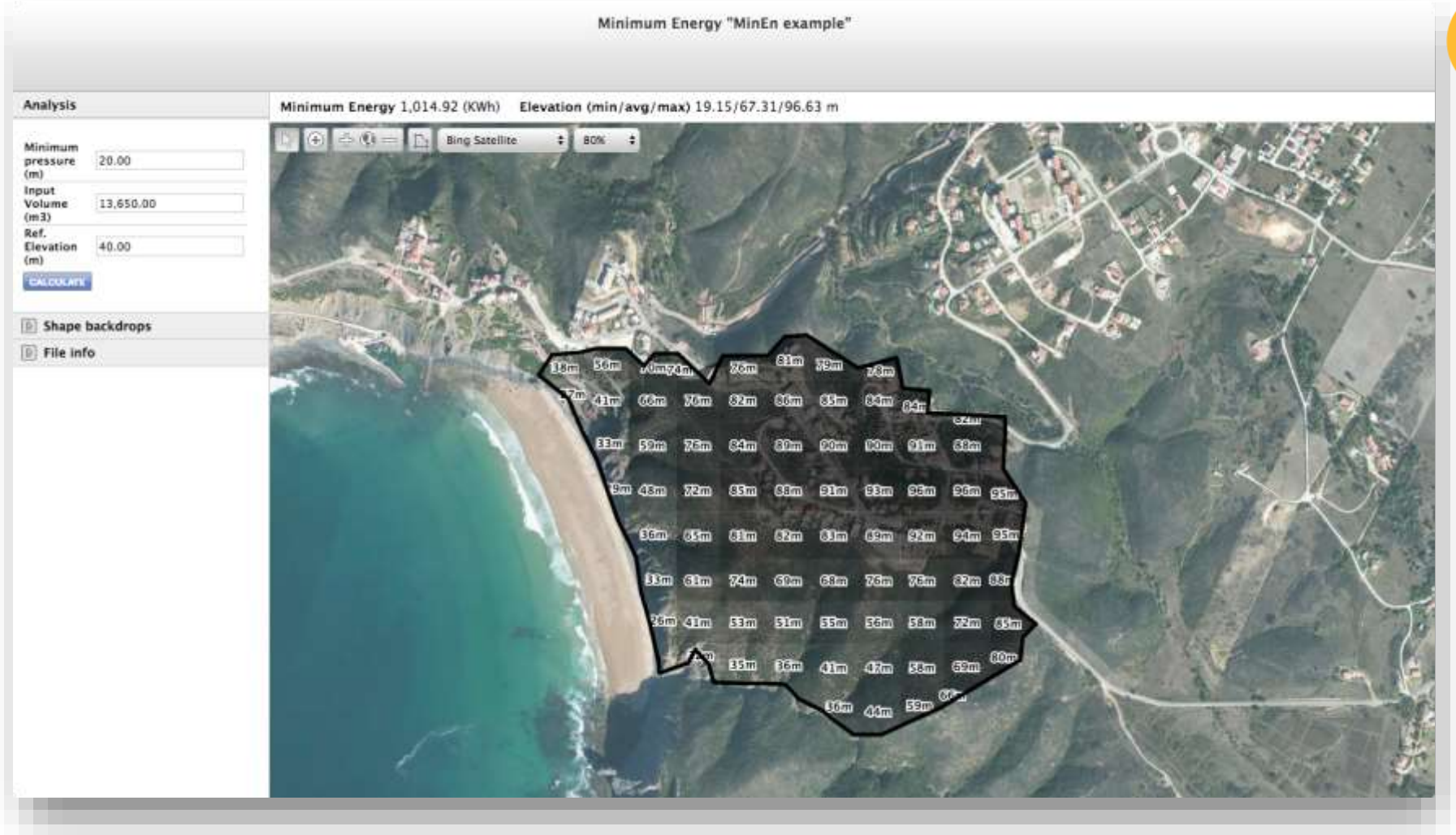
- Library-based energy balance framework for automated diagnosis and prioritization of system sectors from an energy assessment viewpoint.

✓ Systematic calculation of energy balance for system and zones.

✓ Automated, consistent estimates for delivered, dissipated, recovered and lost energy, as well as energy efficiency kPI.

✓ Fully configurable libraries for any combination of audit items.

DIAGNOSE: Spatial & system behaviour analytics



• MINIMUM ENERGY

- Automatically calculates the minimum energy needed to supply distributed demand in a water network using web-available detail geodata.

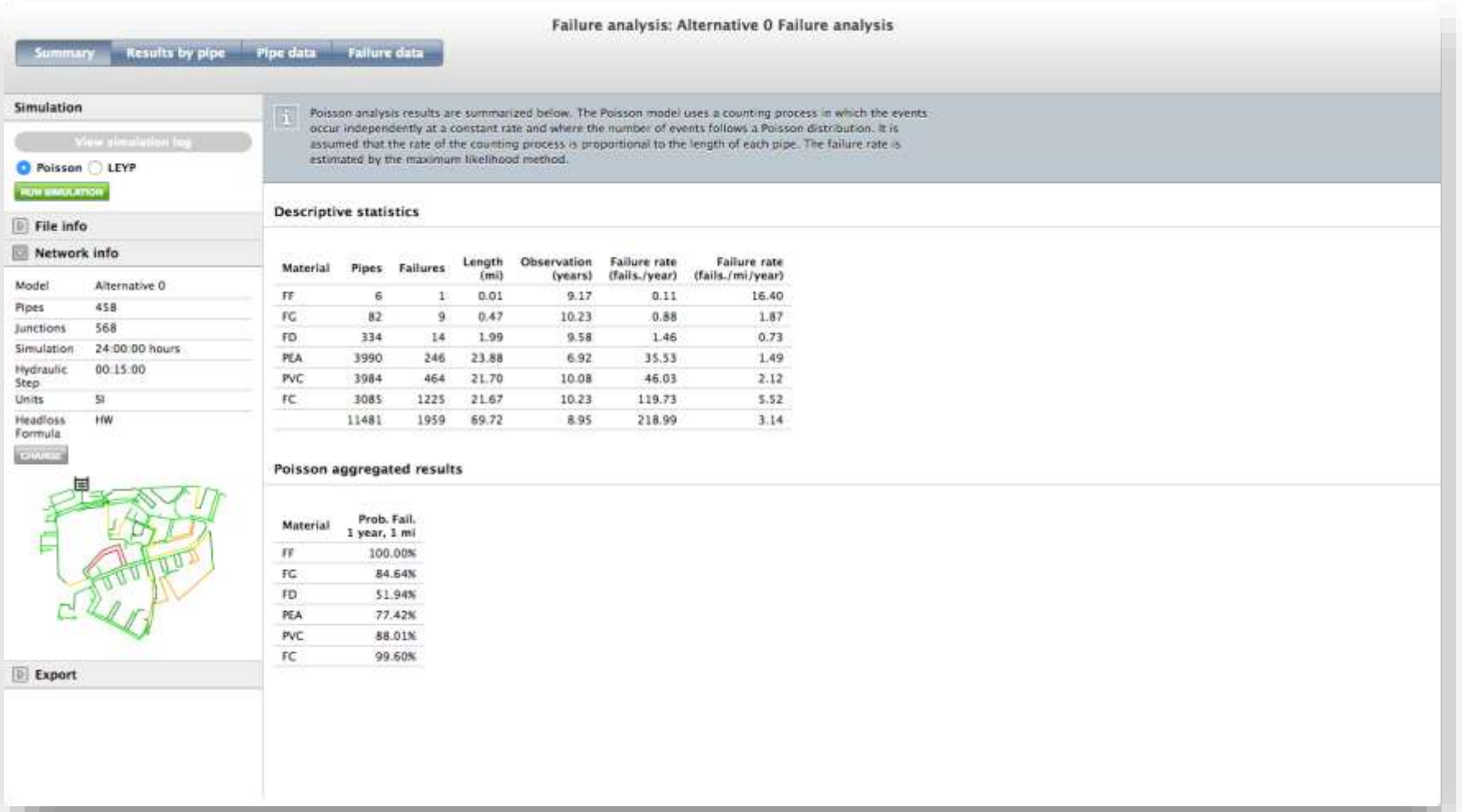
✓ Calculates the minimum energy needed to supply a given demand volume uniformly distributed across a specified geographical area.

✓ On-map direct freehand drawing of target area.

✓ Automatically retrieves detail elevations for the target area from web-available geodata.

✓ Shape files may be imported as guidance backdrops.

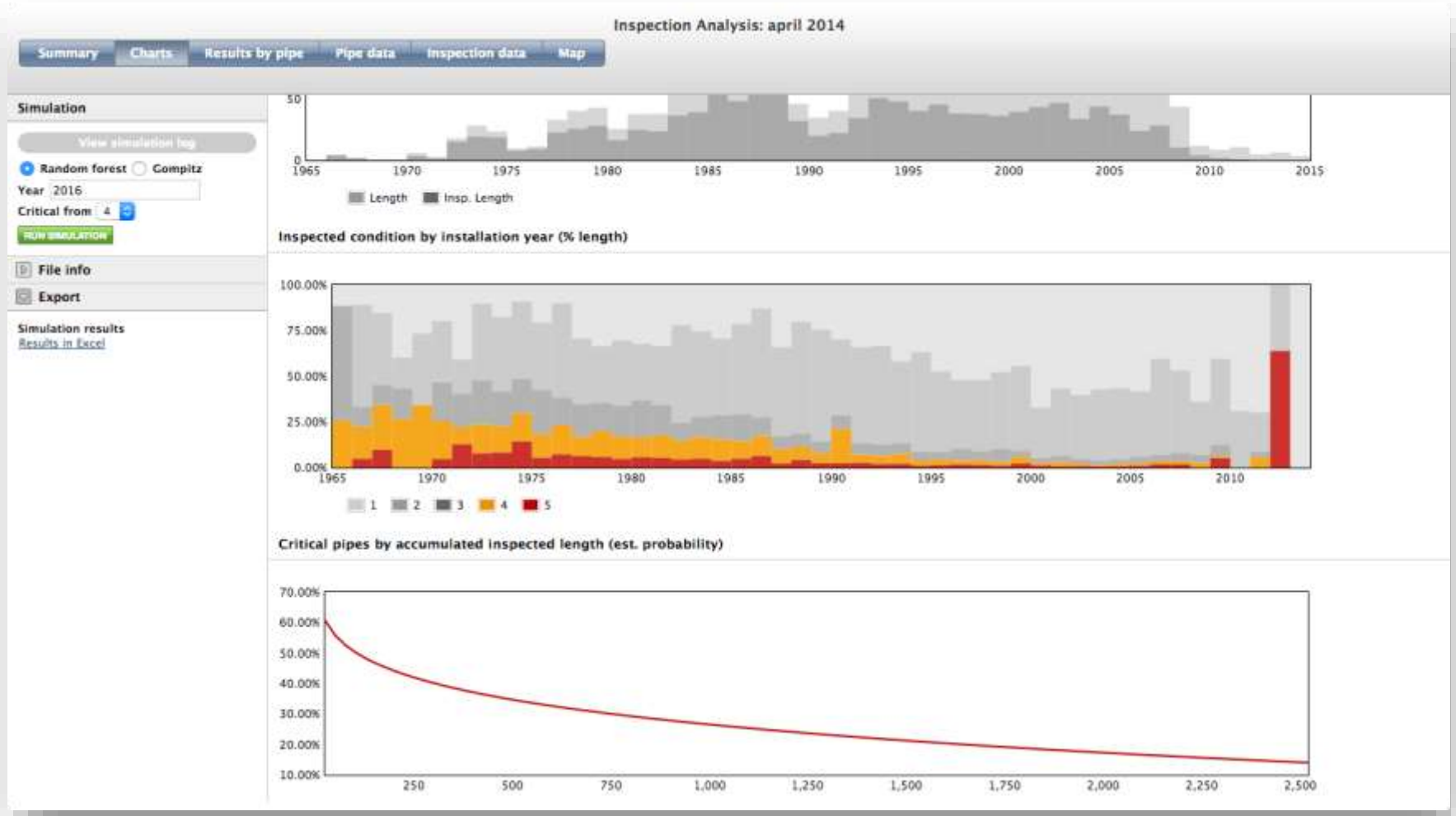
PREDICT: System & Asset Analytics



- FAILURE
- ANALYSIS

- Using system component failure records, such as work orders, predicts present and future probability of failure of pipes or sewers.
- ✓ Predicts individual pipe/sewer probability of failure and failure rate at any point in time.
- ✓ Uses pipe/sewer inventory data and asset failure records [e.g. from work orders).
- ✓ Includes two alternative predictive models: Poisson and LEYP [Linear Extended Yule Process).

PREDICT: System & Asset Analytics



- INSPECTION
- ANALYSIS

- Using pipeline/sewer inspection and condition assessment records, predicts future condition, residual life, and guide the inspection effort.

✓ Uses pipe/sewer inventory data and failure records [e.g. work orders).

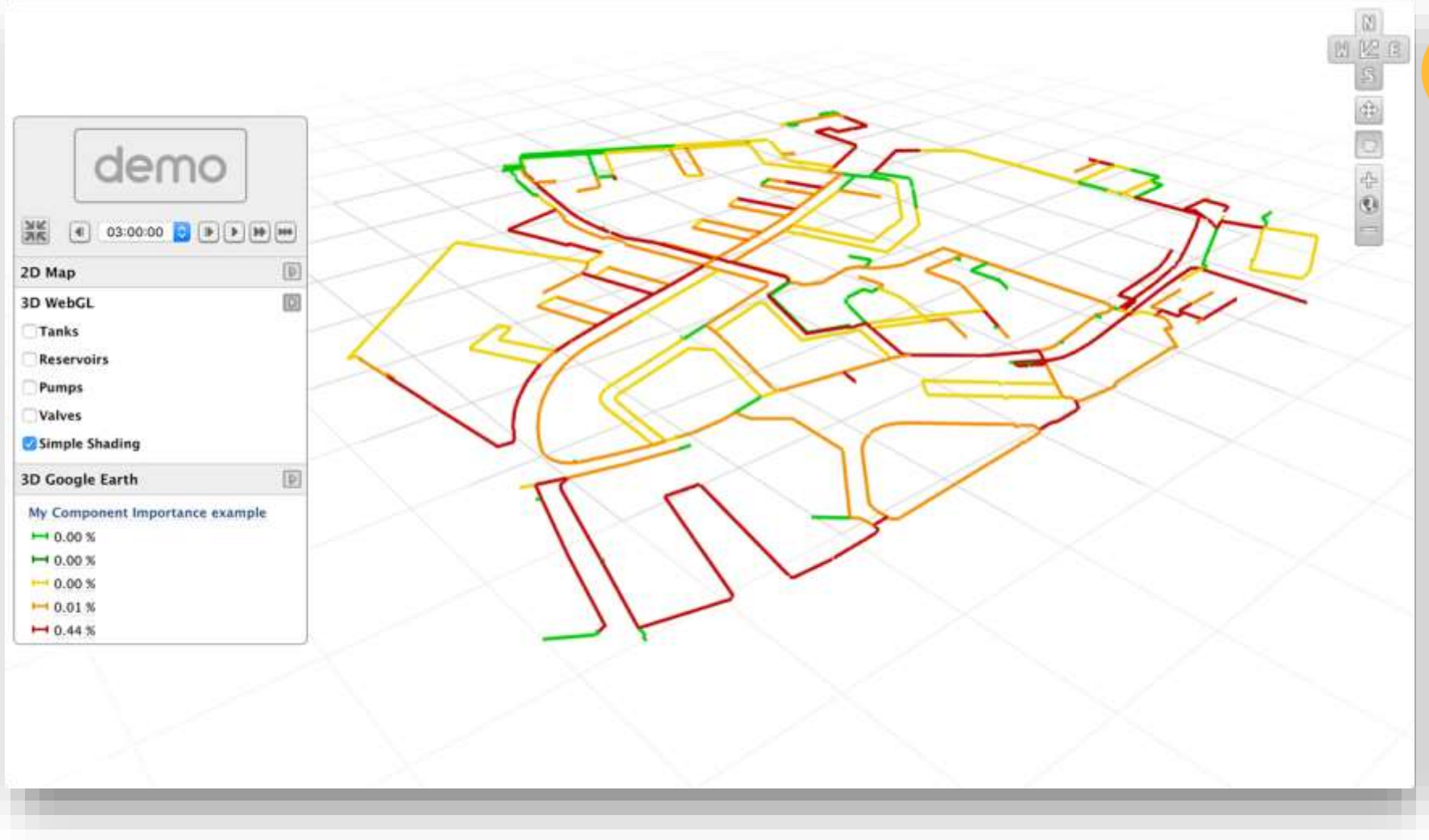
✓ Other covariates may be supplied as geodata.

✓ Projects the effect of age on condition & estimates confidence levels for the predictions.

✓ Measures the value of explanatory variables.

✓ Two predictive models: Random Forest machine-learning model and Gompitz stochastic model

PREDICT: System & Asset Analytics



- COMPONENT
- IMPORTANCE

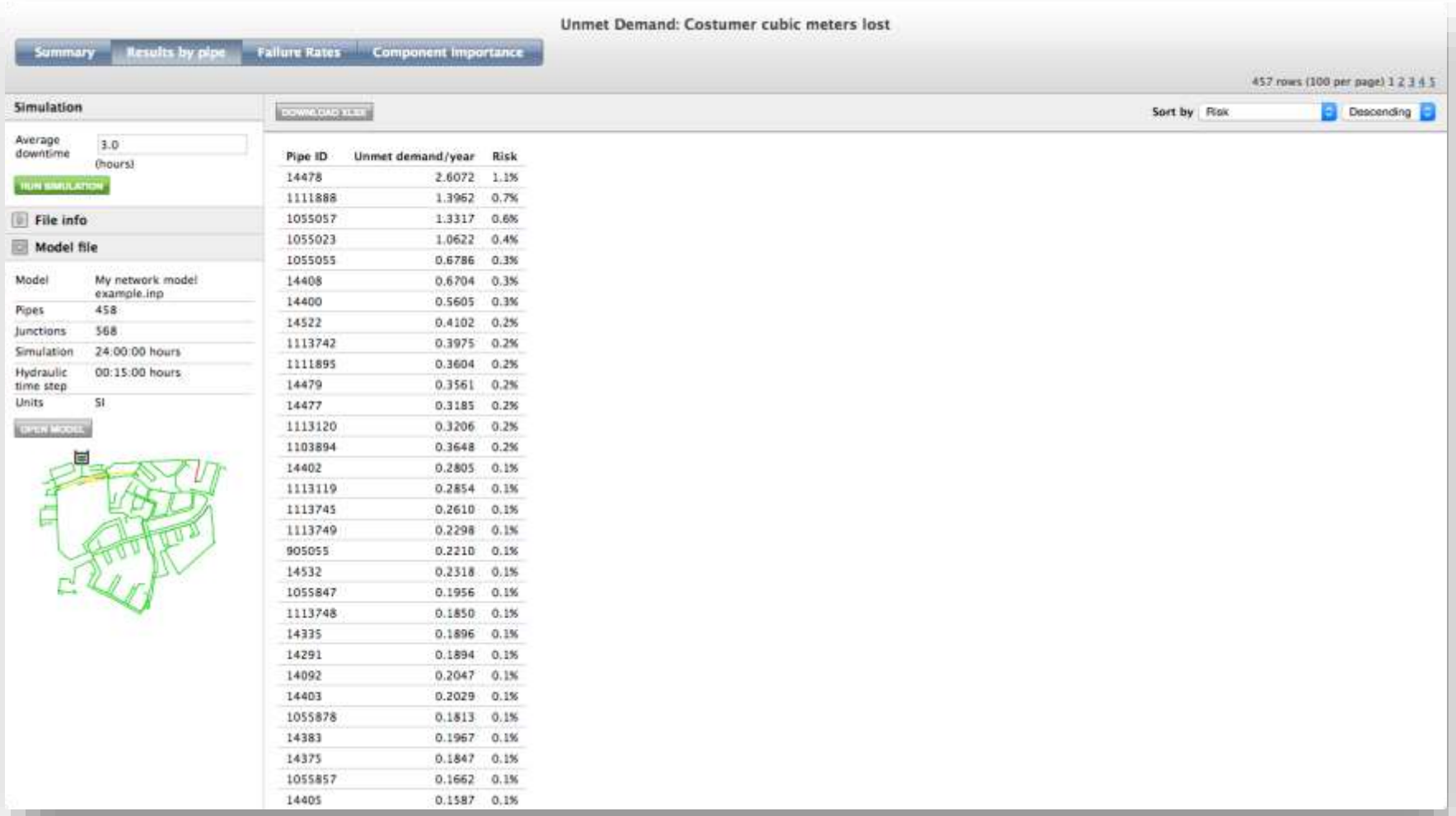
- Assesses the consequence of failure of each pipe in a water supply network, by simulating the resulting reduced service.

✓ Calculates the individual importance of each pipe by comparing the total demand that the network is hydraulically capable of satisfying when that pipe is down, with the total demand supplied by the unimpaired network.

✓ Capable of computing the effect over extended periods (e.g., the 24h cycle).

✓ Results available in 2D or 3D mapping visualization, alongside all hydraulic results

PREDICT: System & Asset Analytics



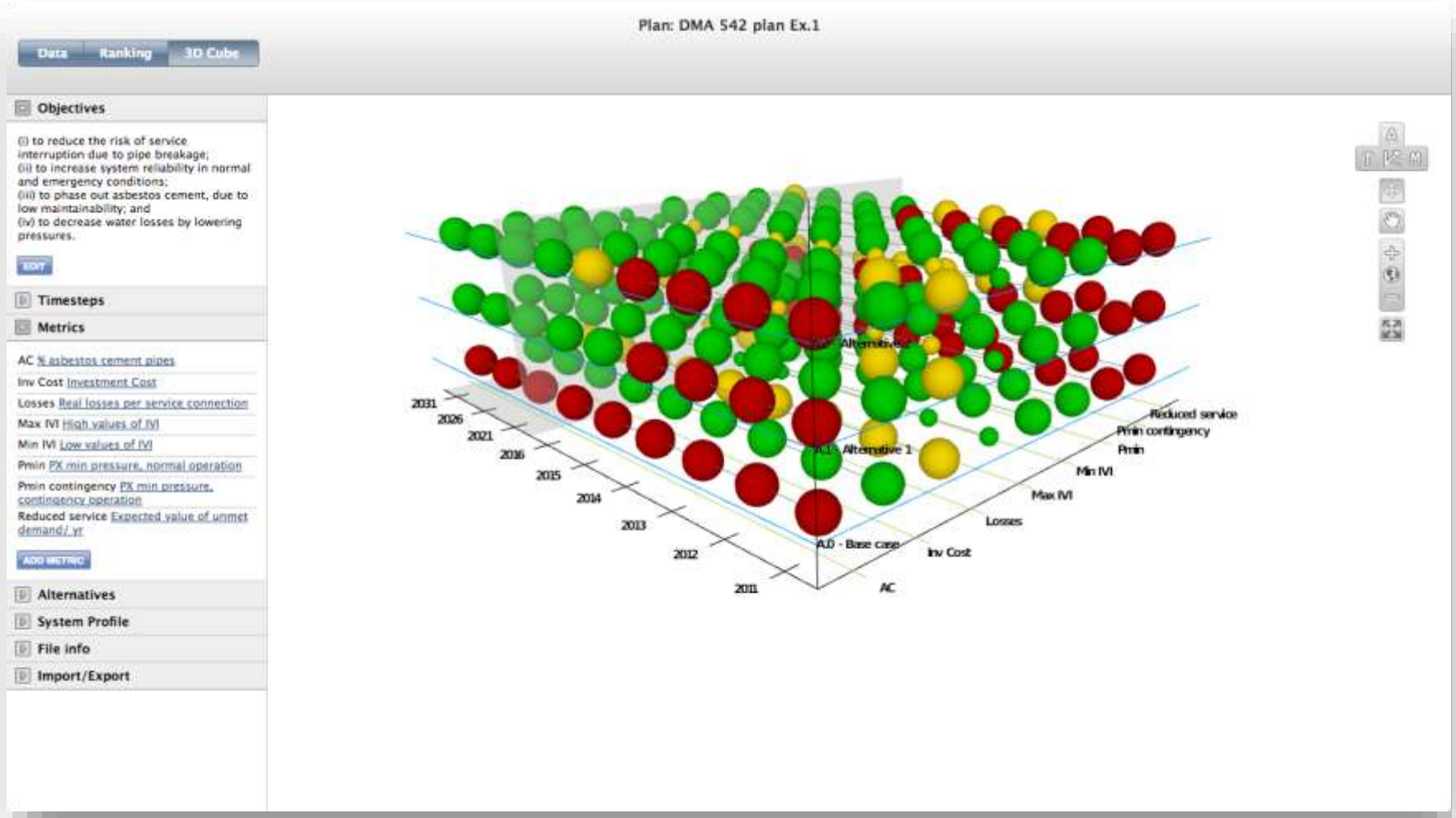
- RISK OF
- NO-SERVICE

- Quantifies supply service interruption risk through expected reduced service, based on individual pipe failure probabilities and consequences.

✓ Calculates a service interruption risk metric, expressed as the expected volume of demand that the system will be unable to satisfy over one year, caused by the failure of each individual pipe.

✓ Combines results from Failure Analysis and Component Importance.

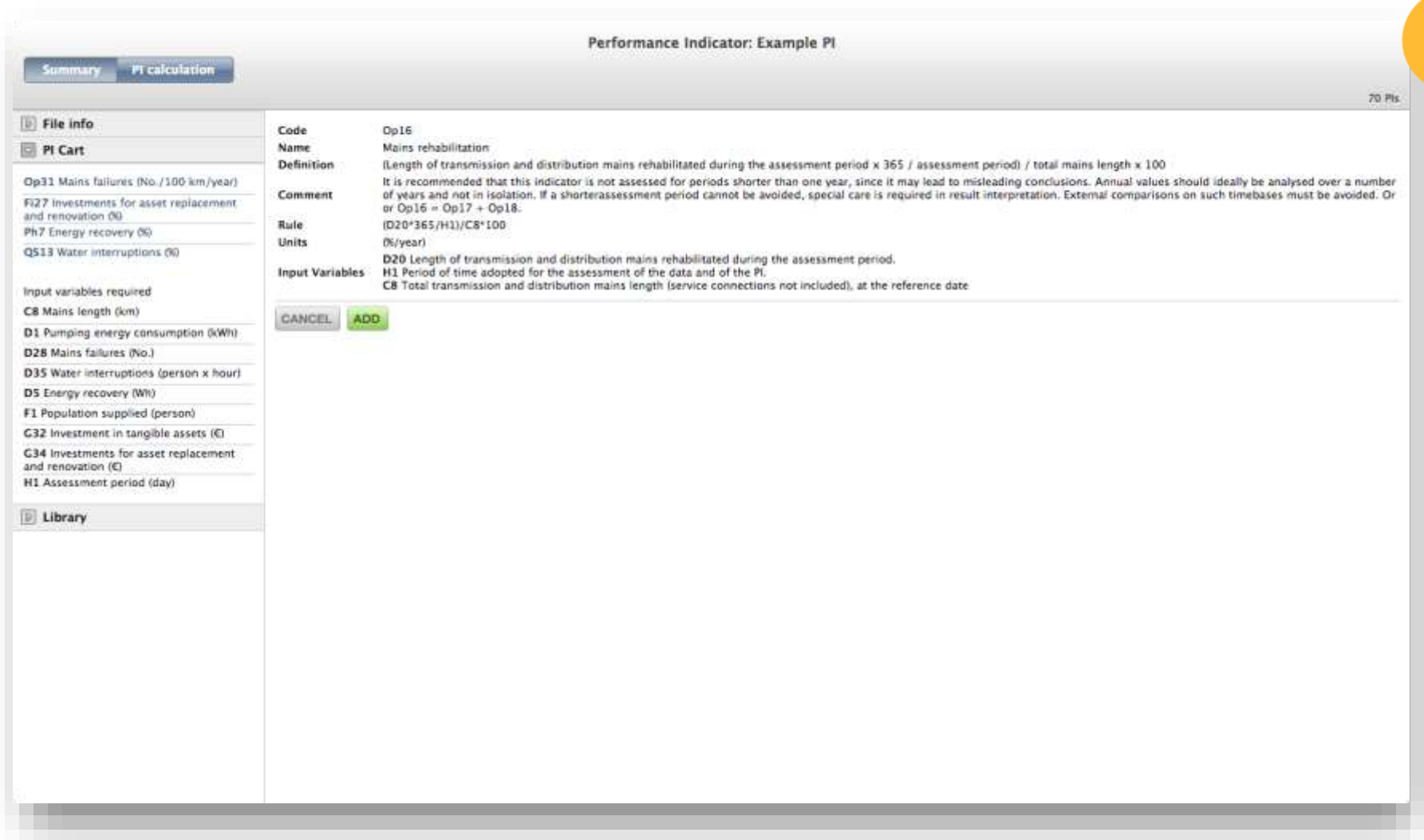
PLAN: Time & Space Prioritization



- COMPARE &
- PRIORITIZE

- AWARE-P decision-support environment where competing/strategies projects are measured up and prioritized through objectives-guided metrics.
  - ✓ Quantification of impacts over the long term
  - ✓ Ability to include the most relevant viewpoints
  - ✓ Ready to incorporate expert knowledge but engage non-technical decision-makers
  - ✓ Defendable decisions are reached through a repeatable, audible and transparent process

PLAN: Time & Space Prioritization



- PERFORMANCE
- INDICATORS

- A framework for selection and calculation of kPI based on organized libraries, including industry standards [IWA) and user-developed libraries.

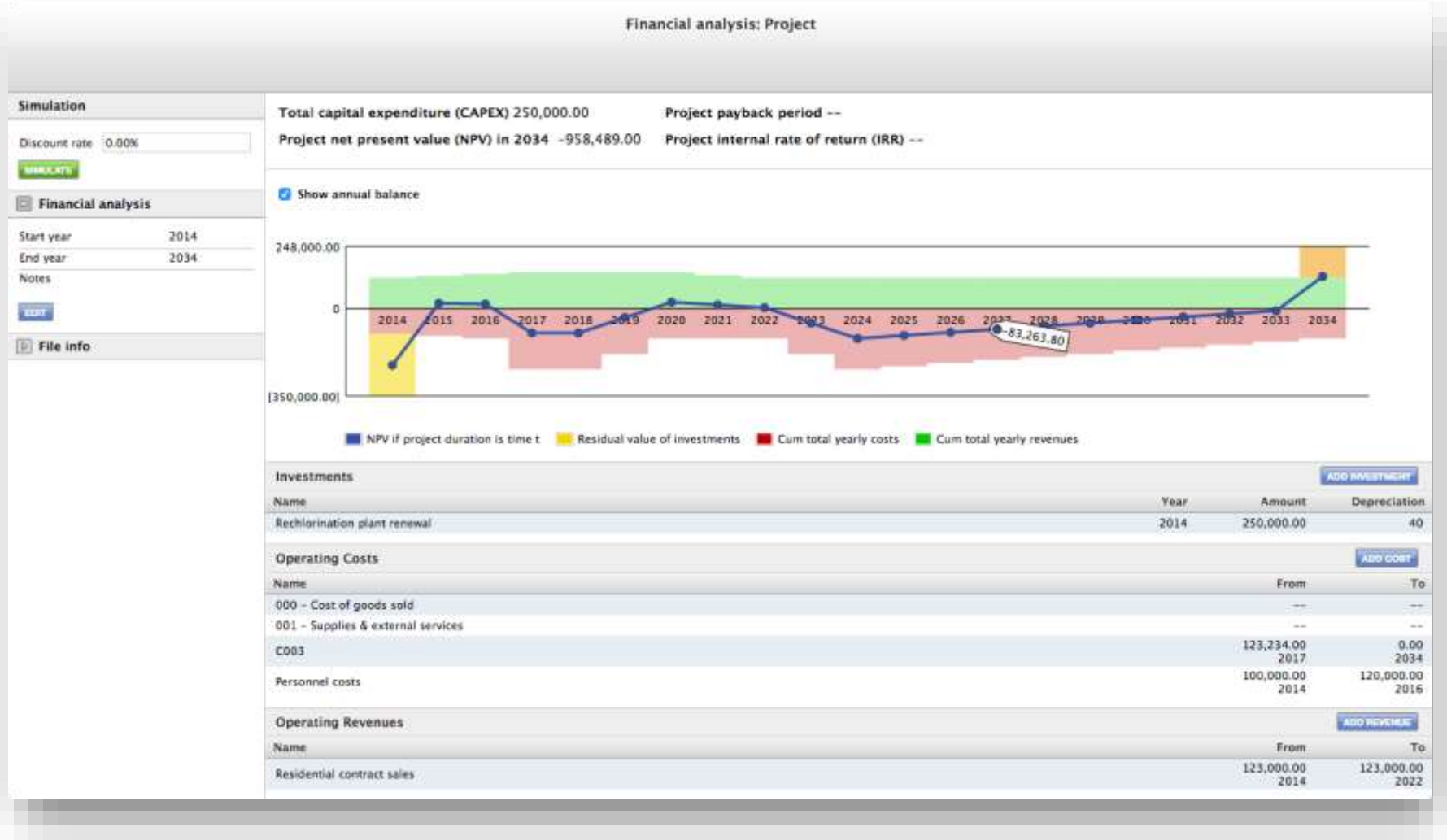
✓ Guided kPI selection process leads to informed, efficient selection.

✓ Rigorous PI definitions, base data and units.

✓ Required information clearly displayed.

✓ Includes reference kPI libraries such as IWA's for water supply and for wastewater.

PLAN: Time & Space Prioritization



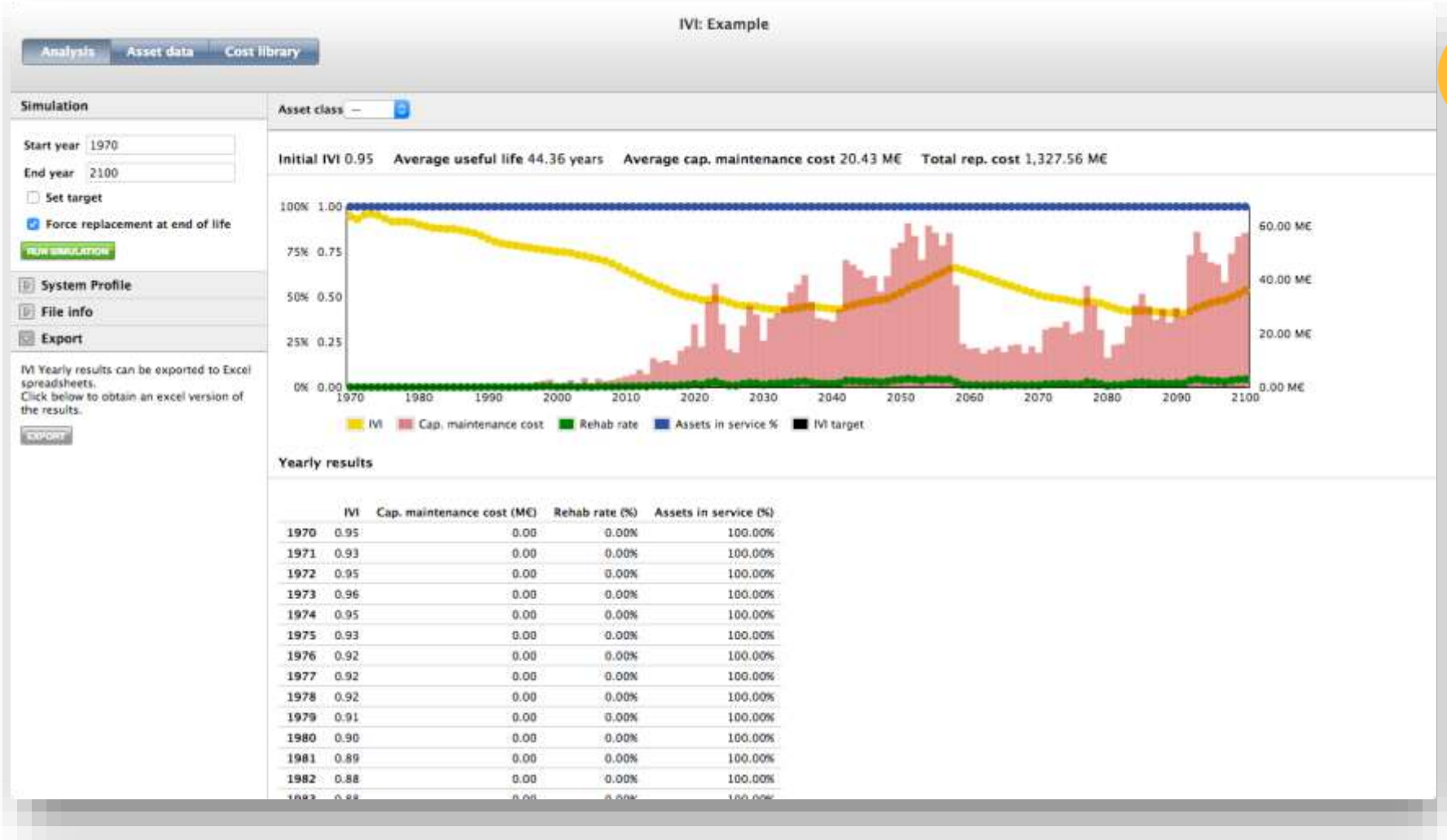
- FINANCIAL
- PROJECT ANALYSIS

- Assesses net present value [NPV) and the internal rate of return [IRR) of any financial project from a long-term perspective.

✓ A planning tool with the capability to project user-defined investments, costs and revenues over any period of time.

✓ A simplified, rapid means to explore the relationship between the duration of a given plan's projected horizon and its NPV and IRR.

PLAN: Time & Space Prioritization



	IVI	Cap. maintenance cost (M€)	Rehab rate (%)	Assets in service (%)
1970	0.95	0.00	0.00%	100.00%
1971	0.93	0.00	0.00%	100.00%
1972	0.95	0.00	0.00%	100.00%
1973	0.96	0.00	0.00%	100.00%
1974	0.95	0.00	0.00%	100.00%
1975	0.93	0.00	0.00%	100.00%
1976	0.92	0.00	0.00%	100.00%
1977	0.92	0.00	0.00%	100.00%
1978	0.92	0.00	0.00%	100.00%
1979	0.91	0.00	0.00%	100.00%
1980	0.90	0.00	0.00%	100.00%
1981	0.89	0.00	0.00%	100.00%
1982	0.88	0.00	0.00%	100.00%

- INFRASTRUCTURE
- VALUE ANALYSIS

- Analyses the ageing degree of an infrastructure comprised of any number of assets, and forecasts short- and long-term investment and rehab needs.

✓ IVI translates the aging degree of an infrastructure, calculated as the asset-value weighted ratio between the current value and replacement value of its components.

✓ An effective tool for assessing the impact of investment policies on service availability and financial sustainability.

✓ Linear and vertical assets with any degree of granularity may be included in the analysis.

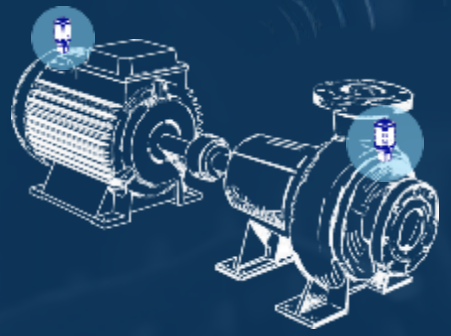
PUMPS AND OTHER HARDWARE

Condition Monitoring

be
think
innovate

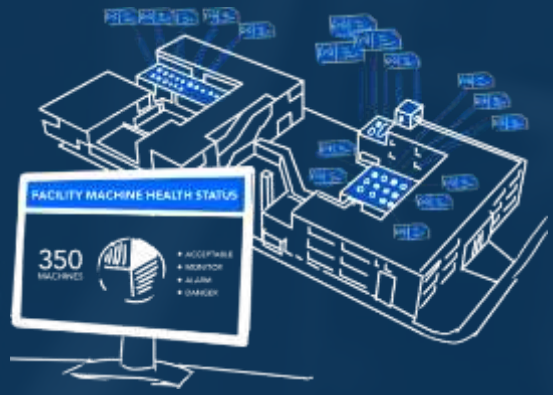
GRUNDFOS

THE NEW WAY



COLLECT
Smart sensors monitor your machines 24/7

ANALYZE
Algorithms predict malfunctions and provide alerts



VISUALIZE
Full visibility of machine health across your facility

PREDICT MACHINE FAILURES

GO THE LIMIT WITH CR PUMP MONITORING

One single solution that eliminates the risk of unexpected downtime and maintenance, improving your peace of mind at the same time. How good does that sound? With the Grundfos Condition Monitor, this is possible.

WHAT IS THE GRUNDFOS CONDITION MONITOR?

The Grundfos Condition Monitor is a smart sensor that monitors your pump and pump system for the most common failures. Compared to traditional pump monitoring solutions, it provides you with instant results instead of simply extracting data to a graph. Additionally, it can easily be connected to your internal SCADA/BMS/DCS system via ModBus, while Grundfos service technicians are available to remotely monitor and help you optimise your system.

WHAT DOES IT TELL ME?

The Grundfos Condition Monitor keeps track of a variety of parameters including motor bearings, dry-run, cavitation, unbalance and water hammer. Once it has defined where the issue lies, you will know exactly how to approach it.

BEARING | CAVITATION | WATER HAMMER | UNBALANCE | DRY-RUN | LIQUID TEMPERATURE

WHAT IS IN IT FOR ME?

The Grundfos Condition Monitor offers a wide range of benefits:

Increased system uptime
Unexpected downtime can be costly, but the Grundfos Condition Monitor allows you to fix common issues before it is too late – thus, increasing system uptime.

No more unplanned maintenance
The Grundfos Condition Monitor keeps track of what goes on in the pump. This allows you to plan ahead and carry out maintenance whenever it is convenient.

Easy connection possibilities
You can integrate the Grundfos Condition Monitor with your SCADA/BMD/DCS system keeping you updated on system activity at all times.

HOW DO I GET MY HANDS ON A GRUNDFOS CONDITION MONITOR?

You can get your hands on this unique solution right now! We offer subscription-based services with no up-front investments, meaning that you can get your Grundfos Condition Monitor whenever you want. Check out our individual leaflets to find out much more about our services.

TRACK YOUR PUMP INSTALLATIONS FROM ANYWHERE

Thank you!