Leveraging Big Data for Intelligent Water Utility Management

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Data Is Your Most Important Resource

Barrick Gold
Digital mine $700 gold
Improving water quality

White House UD
Saved $900,000 reducing leaks

IBM
Reduced water and power costs by $10 million in semiconductor fab

Thames Water
Reduced energy usage by 10% and saved millions in fines

Water Industry Challenges

Energy Efficiency

Pumping and Treatment Energy Costs

Meter Data Management

Process Productivity

Non-Revenue Water (e.g. Leaks)

Pipe Bursts

Infiltration

Costs & Optimization

Asset Health

Downtime

Condition-Based Maintenance

Aging Infrastructure

Quality / Safety

Water Quality

Secure Supply

Contamination

Regulatory Reporting

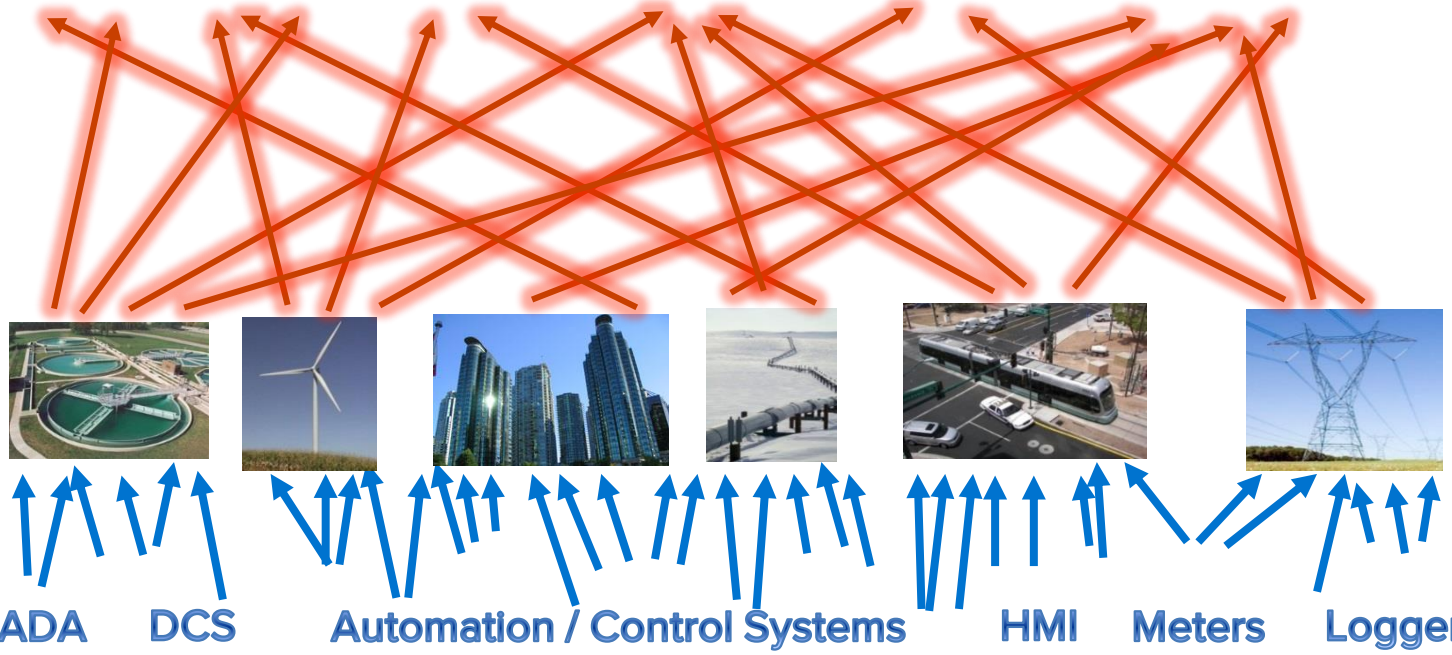
Water Quality Testing

Environmental Regulations

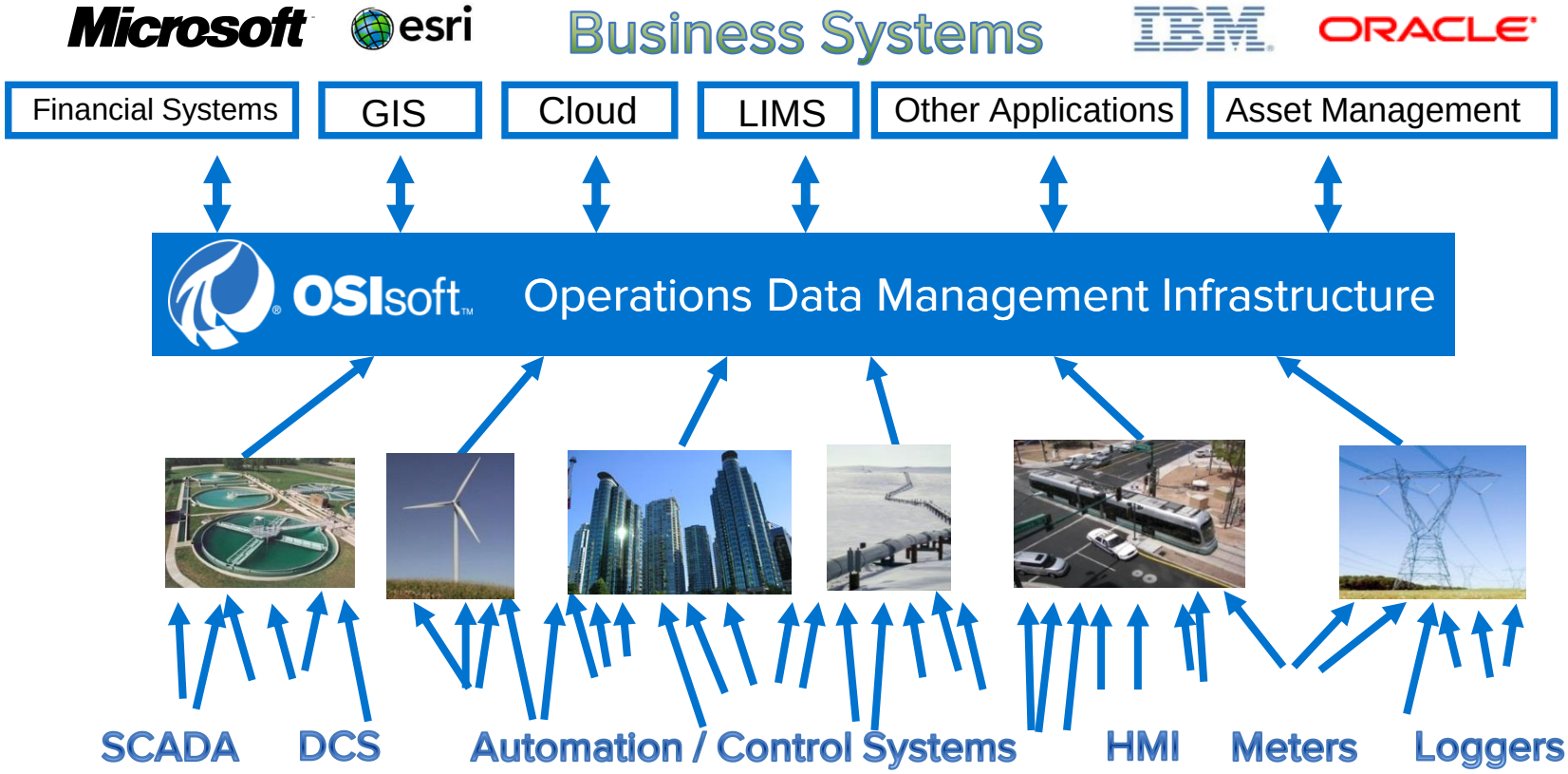
Opportunity or Integration Nightmare

Microsoft esri Business Systems IBM ORACLE

Financial Systems | GIS | Cloud | LIMS | Other Applications | Asset Management



A Data Infrastructure Strategy



Impact of a Data Infrastructure Strategy

"Every front page news event Water Corporation can avoid saves them $1M."

-Ian Scott, Asset Management Lead at Water Corporation

Halifax Water manages water loss in real time with the PI System to save $600,000 per year.

-Carl Yates, GM at Halifax Water

"The PI System is an important part of the information system of Veolia Eau d'île de France. It has become the repository for all real-time measurement."

-Guillaume Gallon, IT Manager, Veolia Water

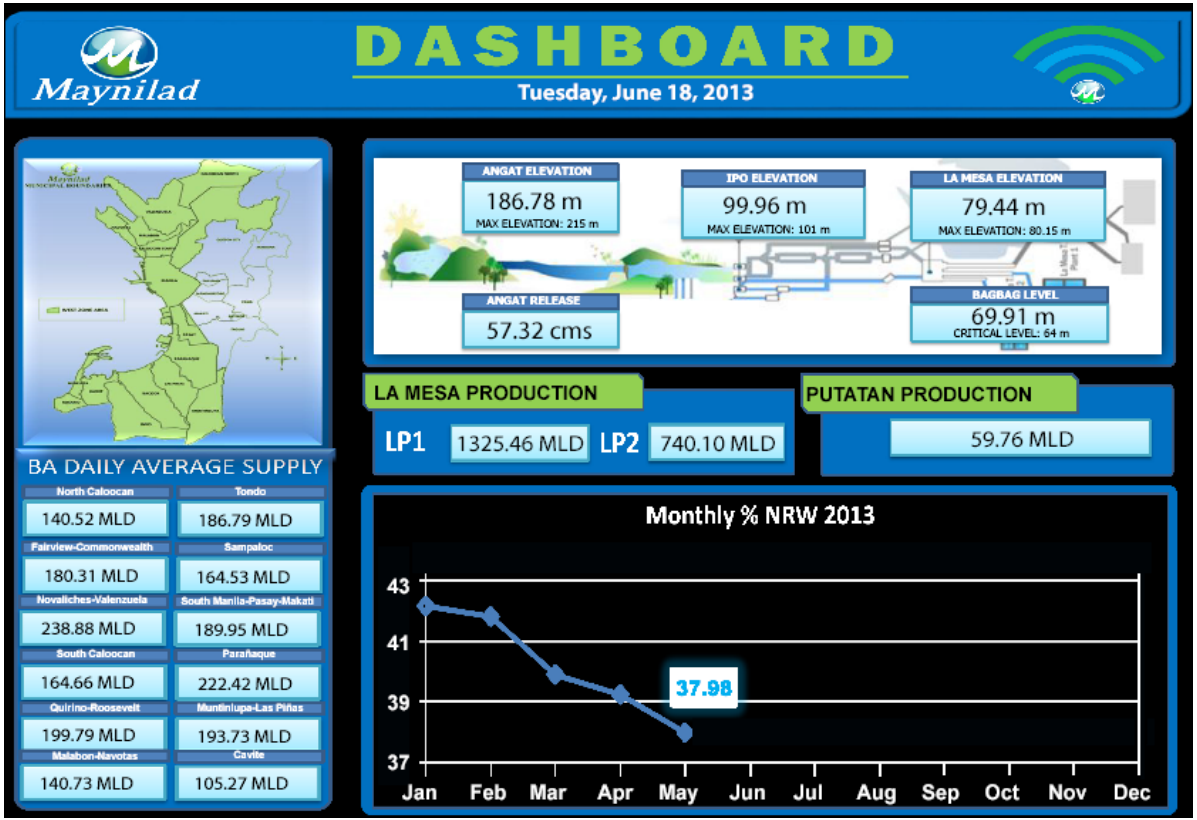
"Our industry is data driven. Without data, we are operating two meters in front of us, hoping that we don't hit a wall 10 meters away." *Max Chung, Electrical Engineer, SFPUC*

Since 2005, the PI System has enabled Metro Vancouver to save $1.5M / year on energy at one wastewater treatment plant.

-Mike Kennett, Metro Vancouver

Maynilad's Fast ROI

- Quicker response to unusual distribution network changes
- Better asset condition management
- Faster assessment on operations efficiency
- Reduced costs (labor and outsourcing)
- Reduced downtime
- More secure, scalable and redundant data management system

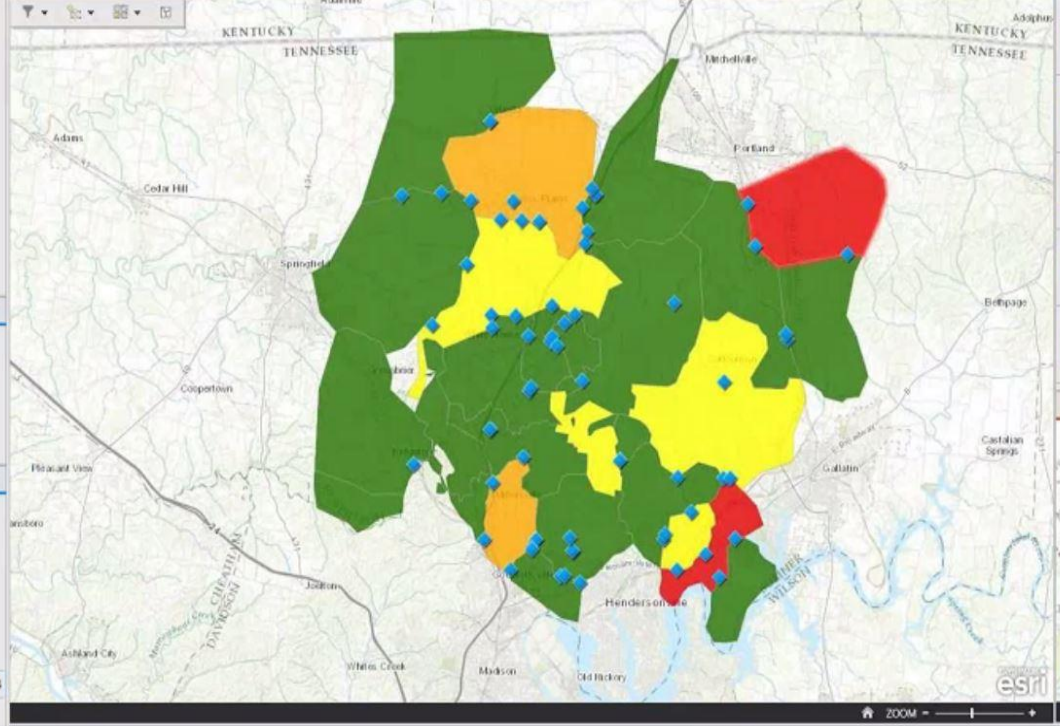


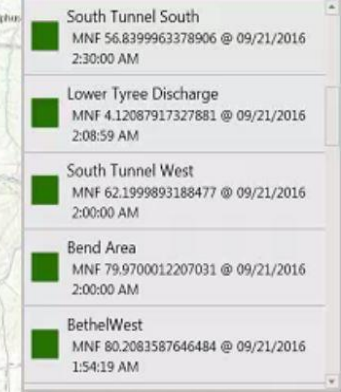
Video: CIO @ Maynilad Water

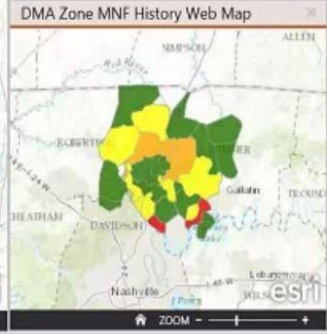
WHITE HOUSE UTILITY DISTRICT

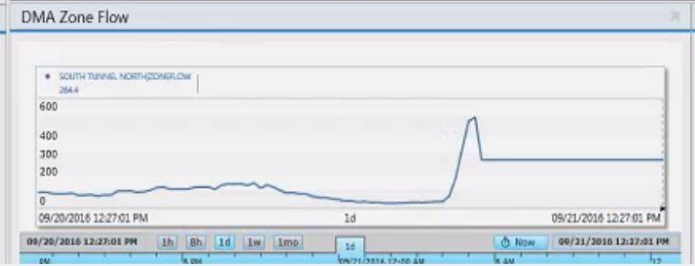
90,000 people served

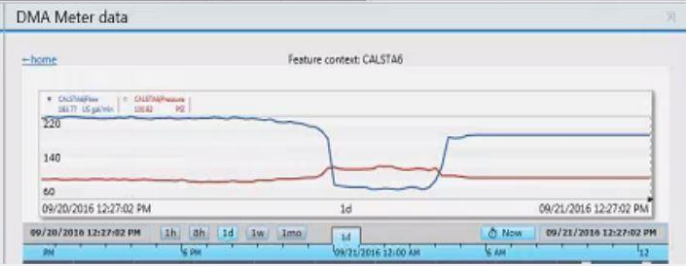
Water loss savings over the past 2 years: $900,000











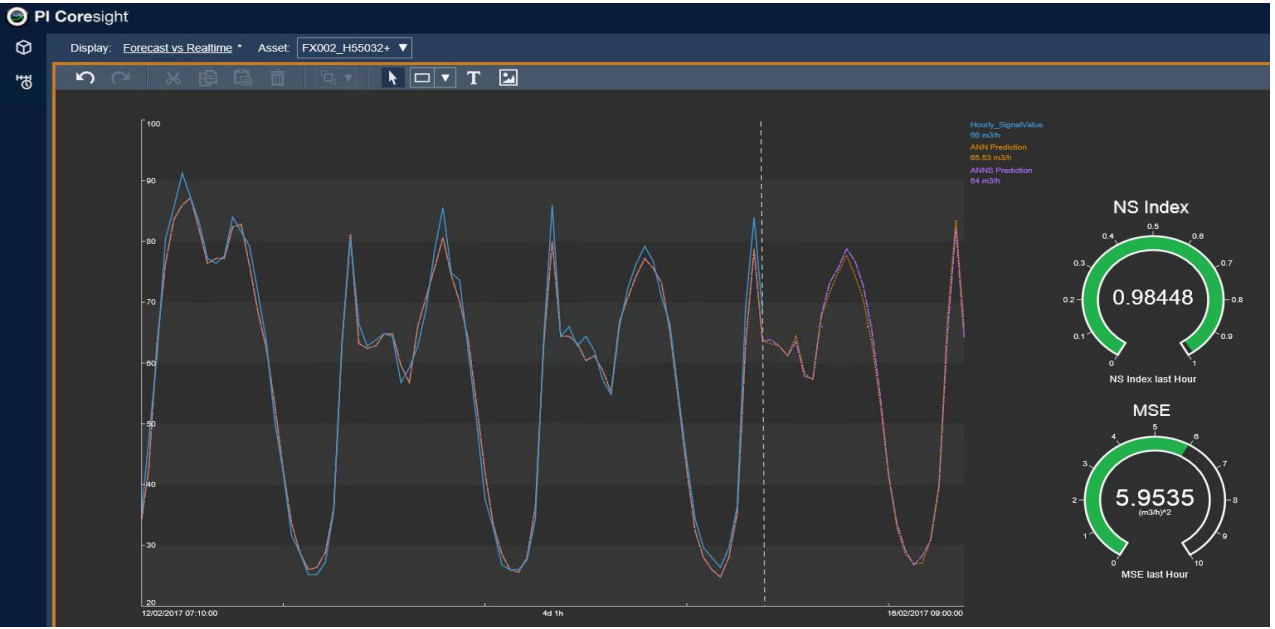
About United Utilities

Challenges at United Utilities

- Regulatory and customer commitments
- Improve key performance metrics
  - Outcomes, blockages, spills
- Increase efficiency
  - Reduce tot.ex: cap.ex and op.ex
- Leverage technology disruptors
- Apply innovation

Demand Forecasting

EANNS	
Nash-Sutcliffe index Training Set	Nash-Sutcliffe index Test Set
0.98193	0.98132



Performance Indicator: Nash-Sutcliffe index

- Normalized statistic
- Determines the relative magnitude of the residual variance compared to the measured data variance
- Ranges between $-\infty$ and 1
- Robust in terms of applicability to various models

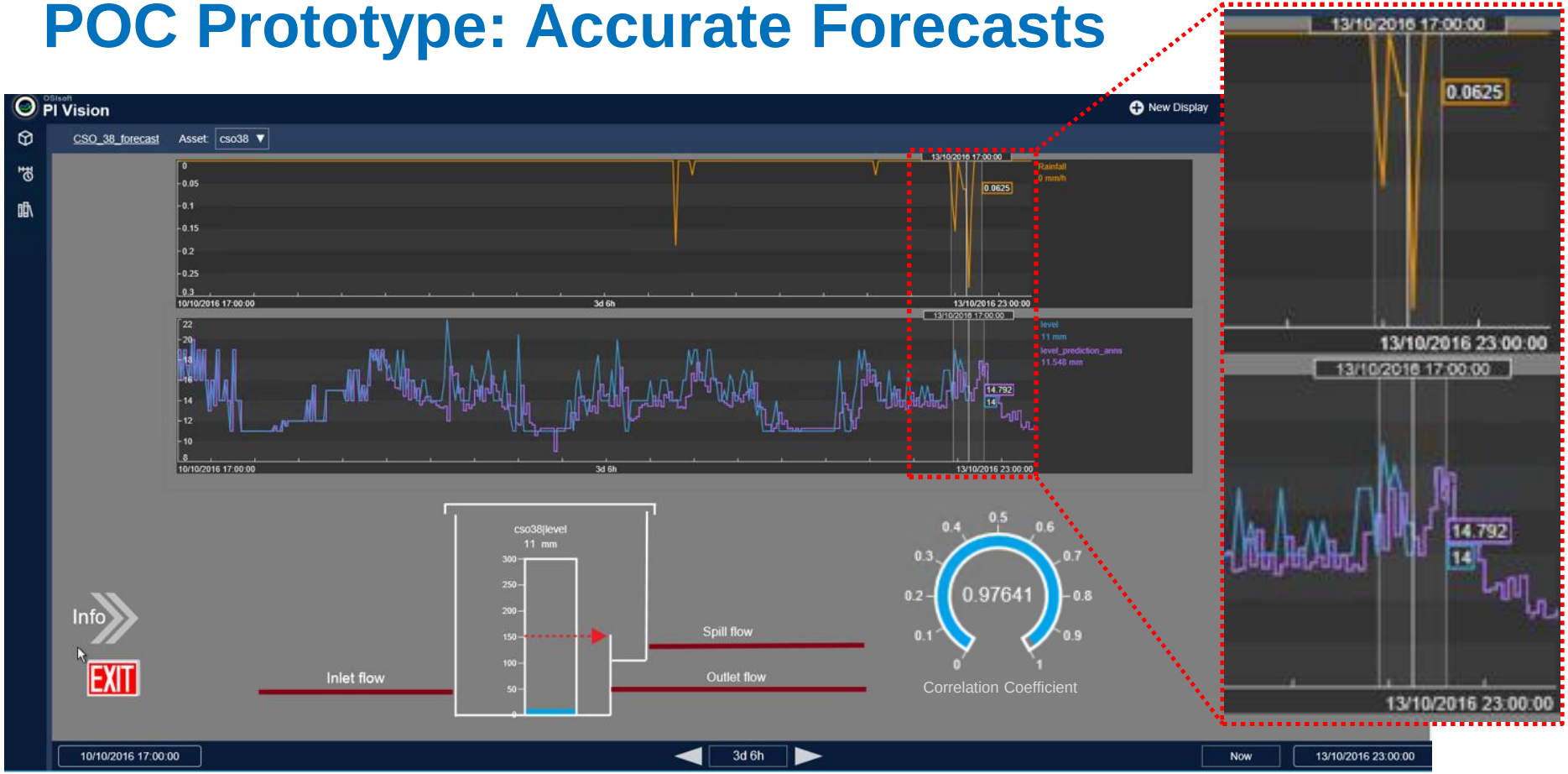
Performance levels usually categorised as:	
> 0.65	EXCELLENT
0.65-0.5	VERY GOOD
0.5-0.2	GOOD
< 0.2	POOR

Nash, J. E. and Sutcliffe, J. V. (1970). "River flow forecasting through conceptual models, Part I - A discussion of principles". Journal of Hydrology, vol. 10, pp. 282-290.

POC Prototype: Smart Alerts

- Intervene when needed: e.g., spilling during dry weather
- Reduce call-outs: e.g., wet weather spills
- Get ahead of incidents: e.g., flooding, pollution

POC Prototype: Accurate Forecasts



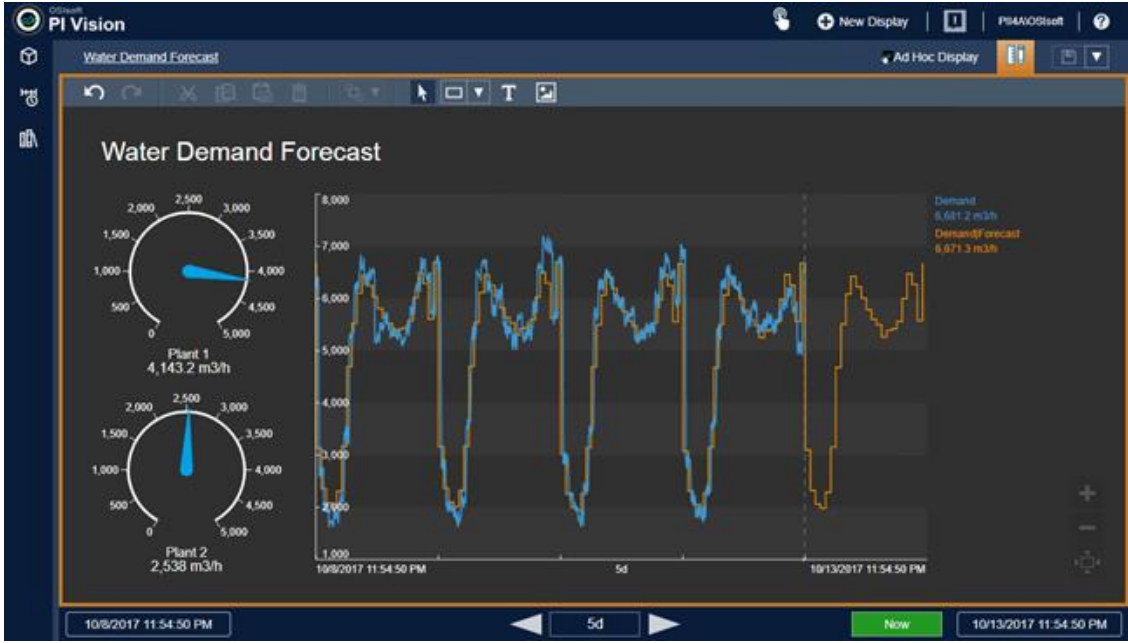
Municipal Water and Sewage Company Inc. in Wroclaw (MPWiK)

One of the biggest municipal water and sewage utilities in Poland, its steady operations have continued since 1871 when the water treatment plant “Na Grobli” was first commissioned.

Results

The Red Carpet Incubation Program (RCIP) from Microsoft and OSIsoft helped MPWiK to connect production and customer data. In particular, Azure Machine Learning:

- Forecasts water demands for future scheduling (next 24 hours)
- Provides data relations allowing creating pre d-ictive analytic models
- Improves pump scheduling an d production planning

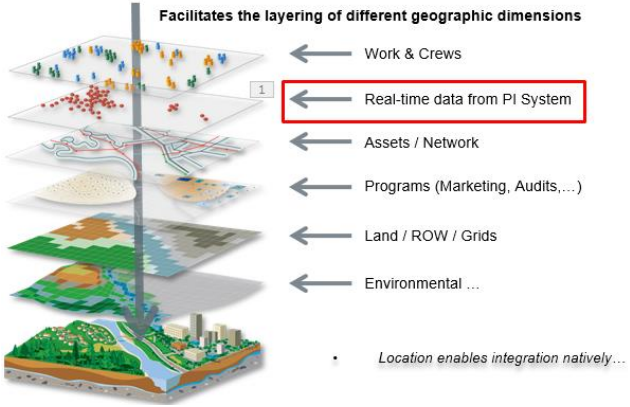


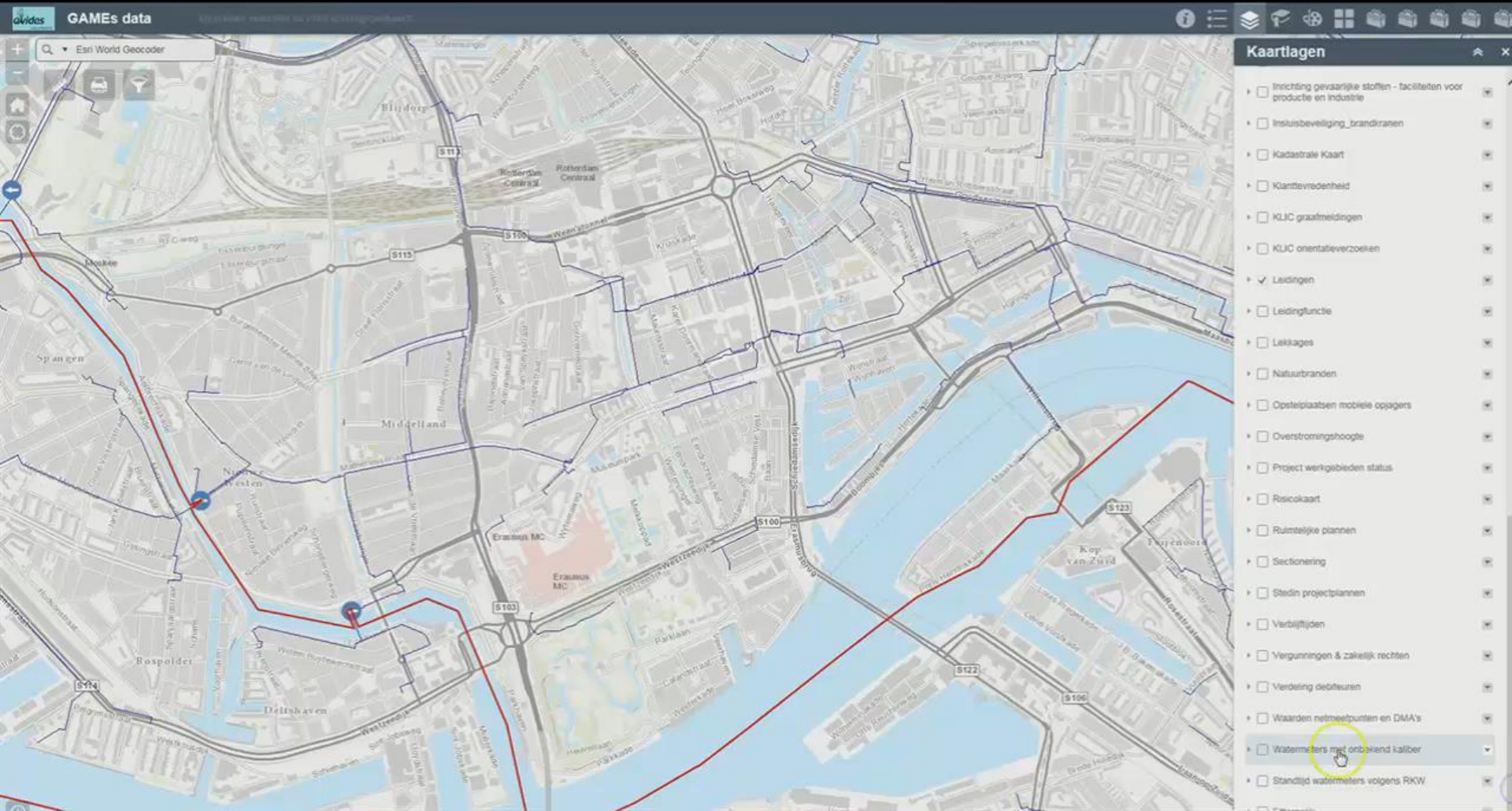
Evides waterbedrijf

- Research project H2020
  - GAMEs Playground
    - ✓Geographic Asset Management @ Evides
  - Don't interfere with other important ICT-projects

- "**Serious GAMEs**" = production version
  - 20 mature functionalities

- Keep on developing in the Playground
  - PublicSonar (social media) – "*human*" sensors
  - GlobeSpotter (resembles street view)
  - More "tactical" functionalities e.g. Asset Management, Water Quality Index




GAMEs data
Esri World Geocoder
Kaartlagen
Inrichting gevaarlijke stoffen - faciliteiten voor productie en industrie
Insluisbeveiliging_brandkranen
Kadastrale Kaart
Klantlevredenheid
KLIC graafmeldingen
KLIC orientatieverzoeken
Leidingen
Leidingfunctie
Lekkages
Natuurbranden
Opstelplaatsen mobiele opgagers
Overstromingshoogte
Project werkgebieden status
Risicokaart
Ruimtelijke plannen
Sectionering
Stedin projectplannen
Verblijftijden
Vergunningen & zakelijk rechten
Verdeling debiteuren
Waarden netmeetpunten en DMA's
Watermeters met onbekend kaliber
Standtijd watermeters volgens RKW
Rotterdam Centraal
Erasmus MC
Middelland
Spangen
Bospolder
Delfshaven

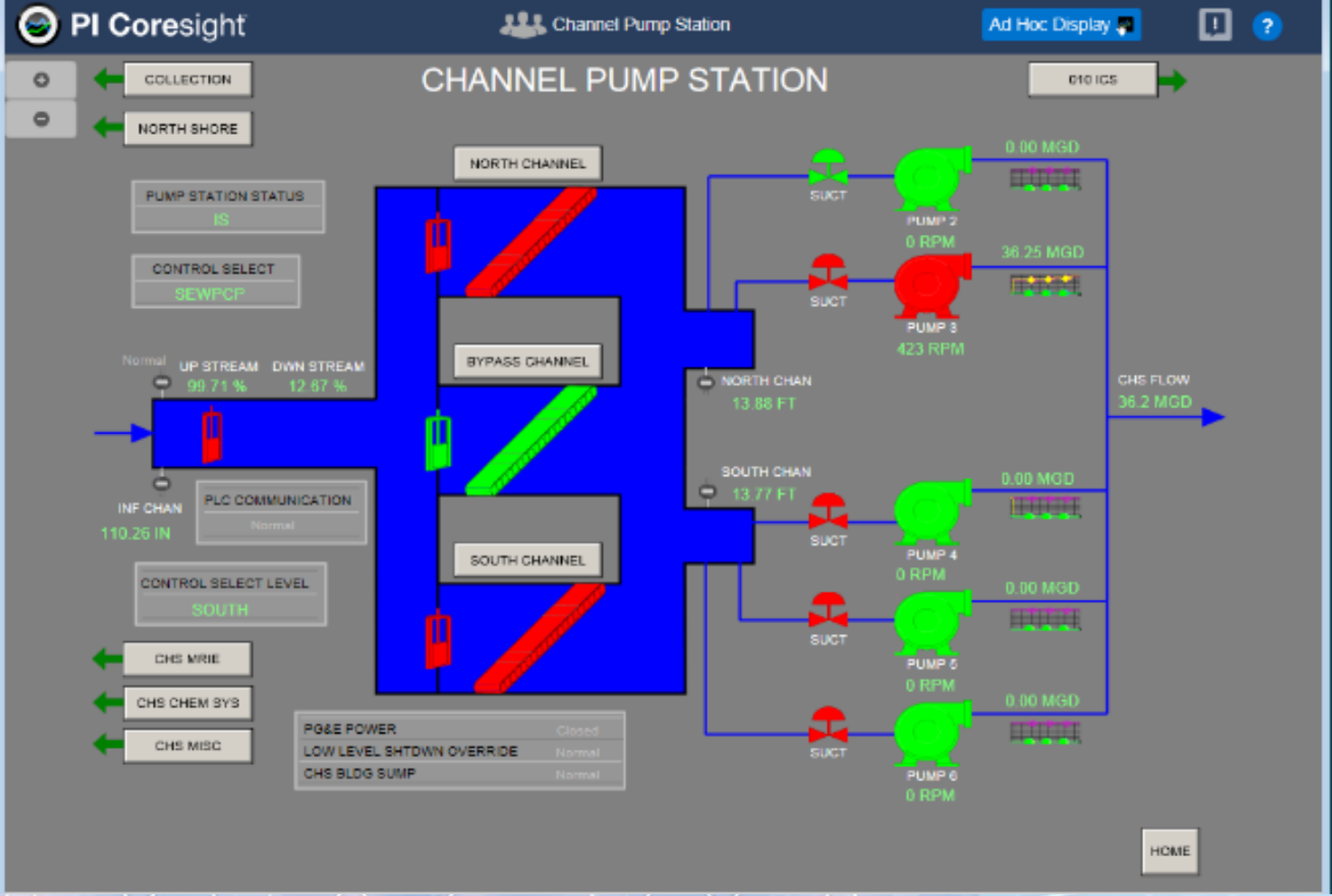
San Francisco Water Power Sewer

Services of the San Francisco Public Utilities Commission

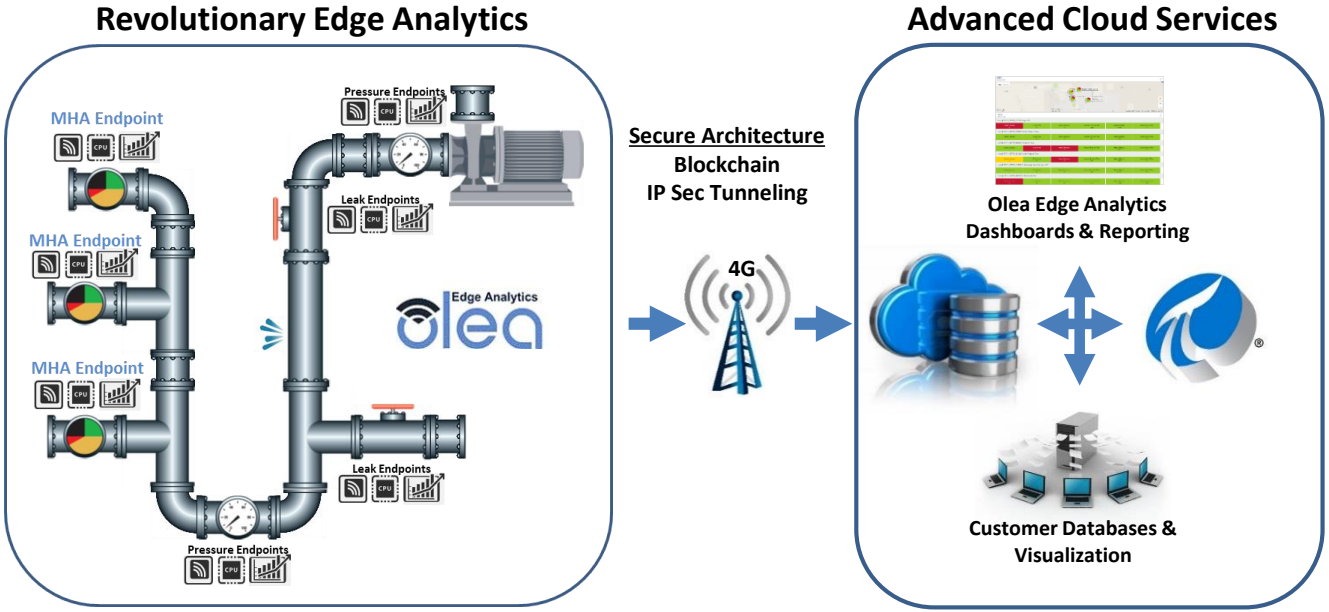
Condition-Based Maintenance yielded a 70% reduction in labor

4 pumps saved $16,000/year

From 100 pumps an expected savings of $400,000/year

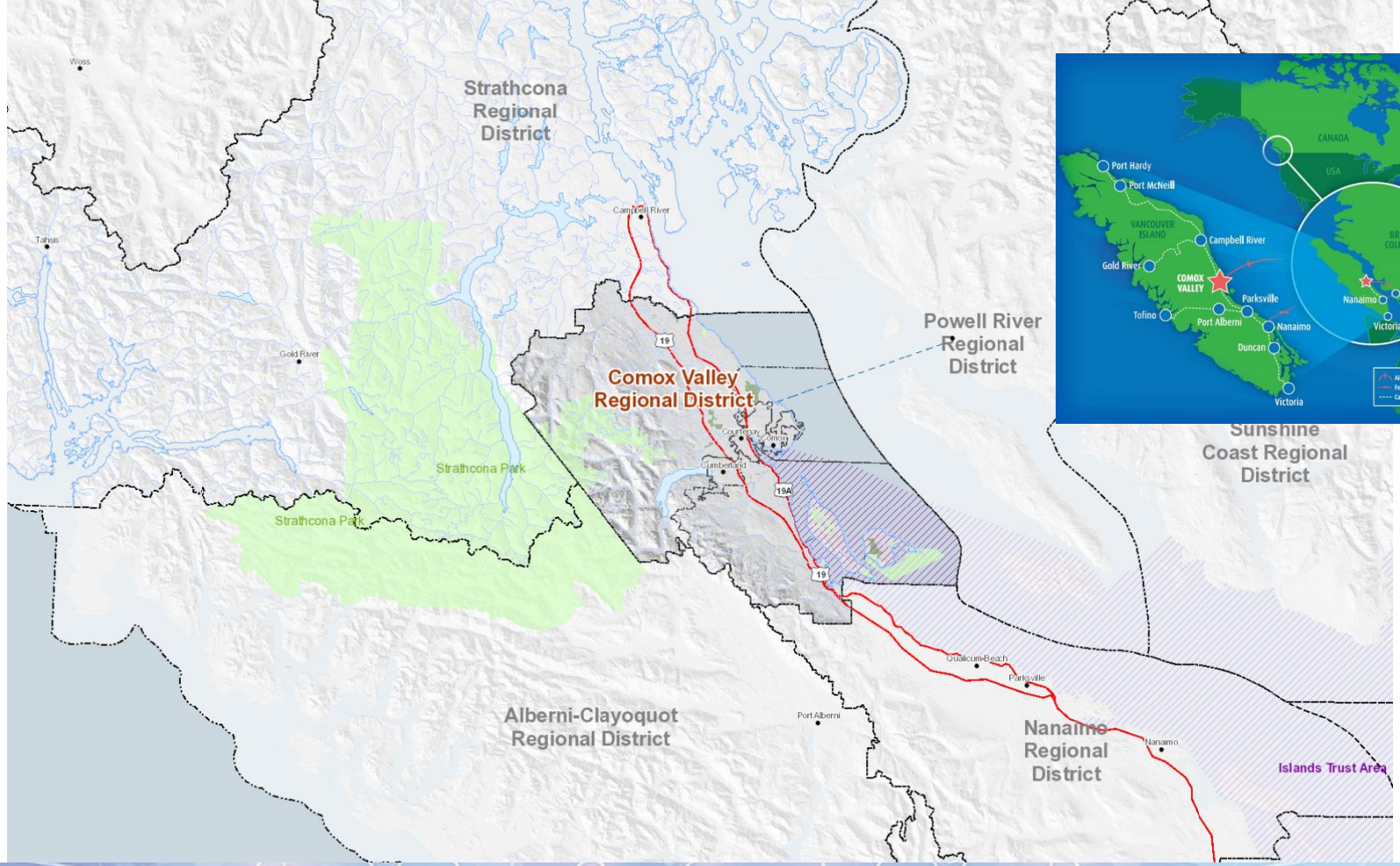


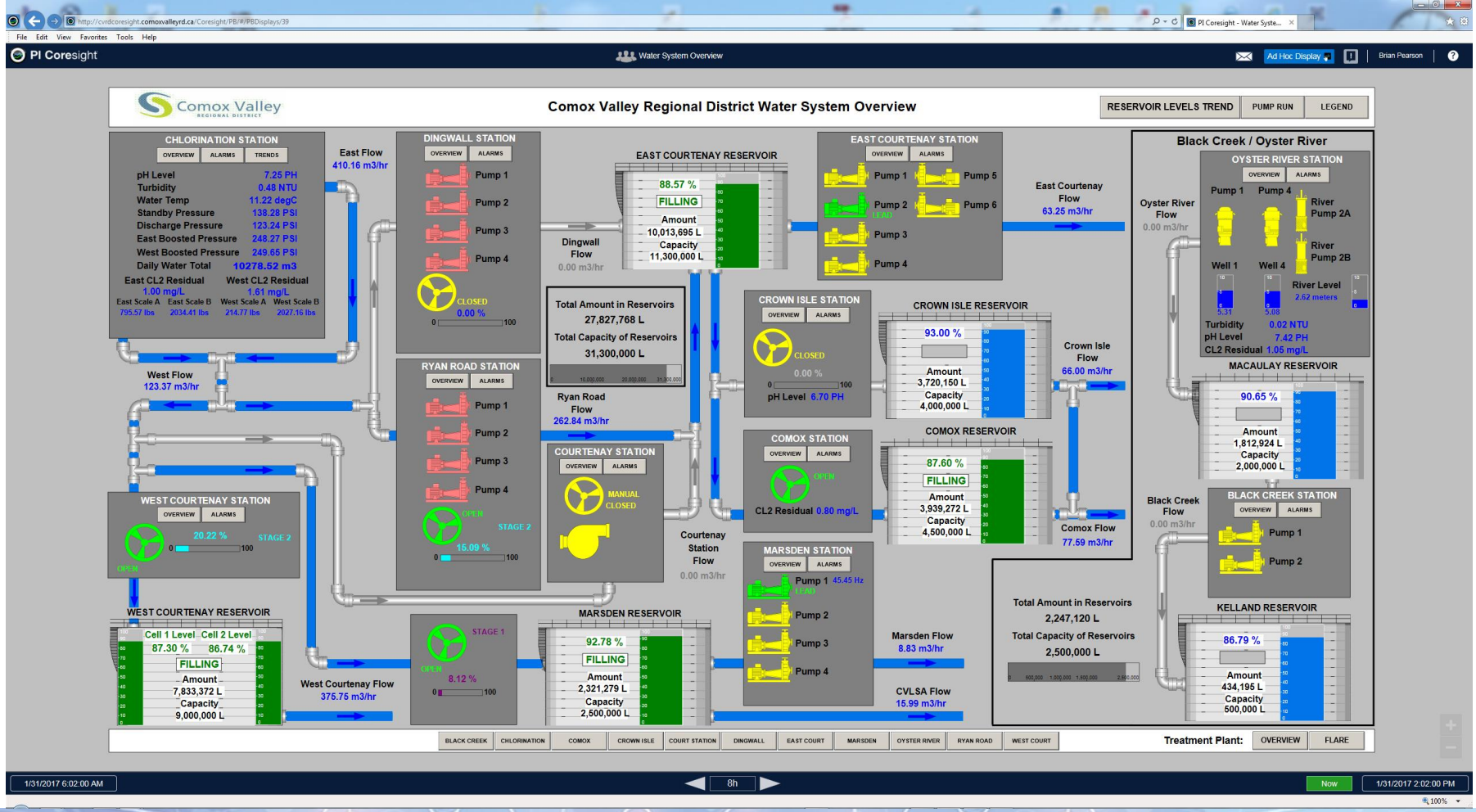
Analytics @ the Edge: Finding Lost Revenue

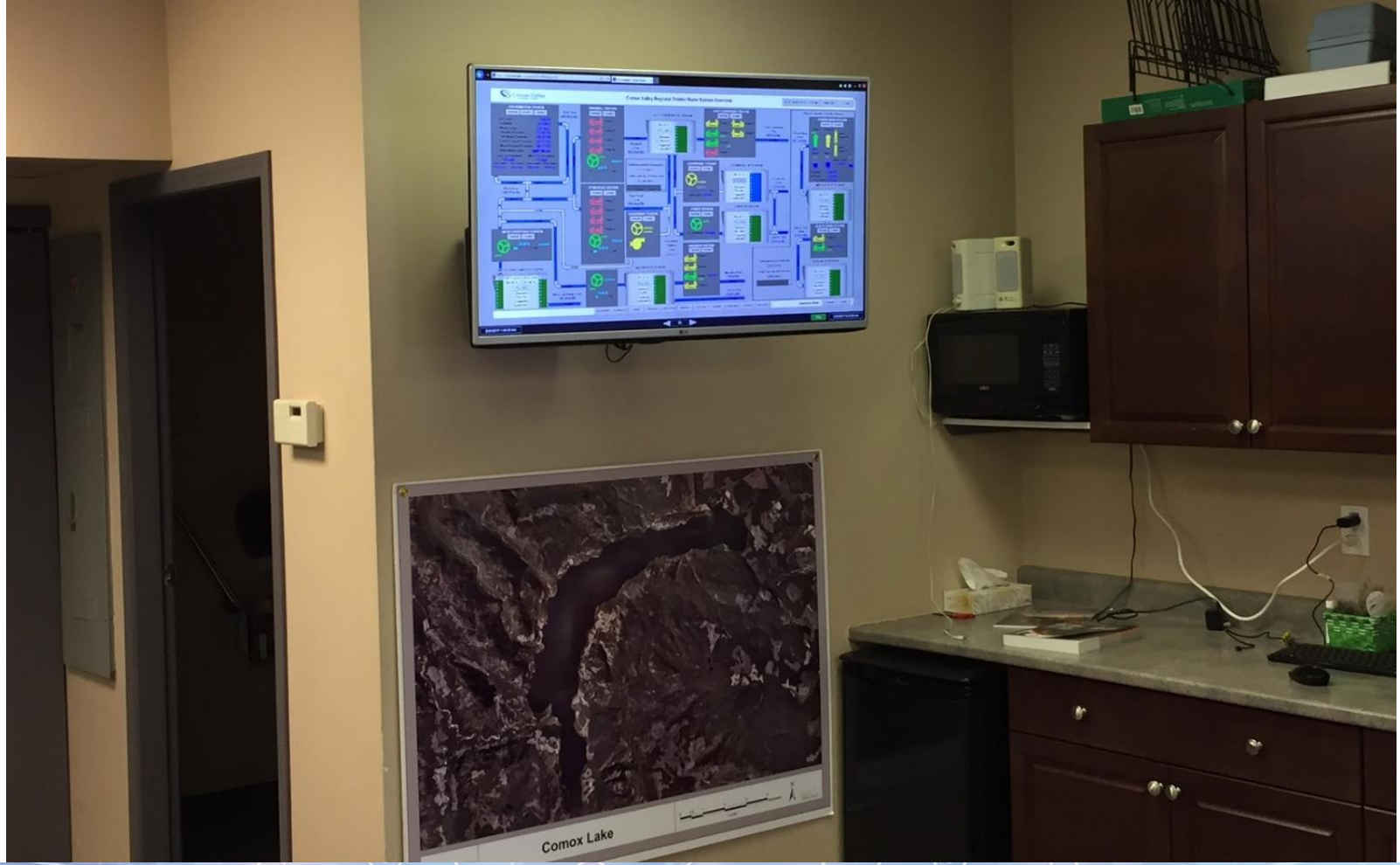


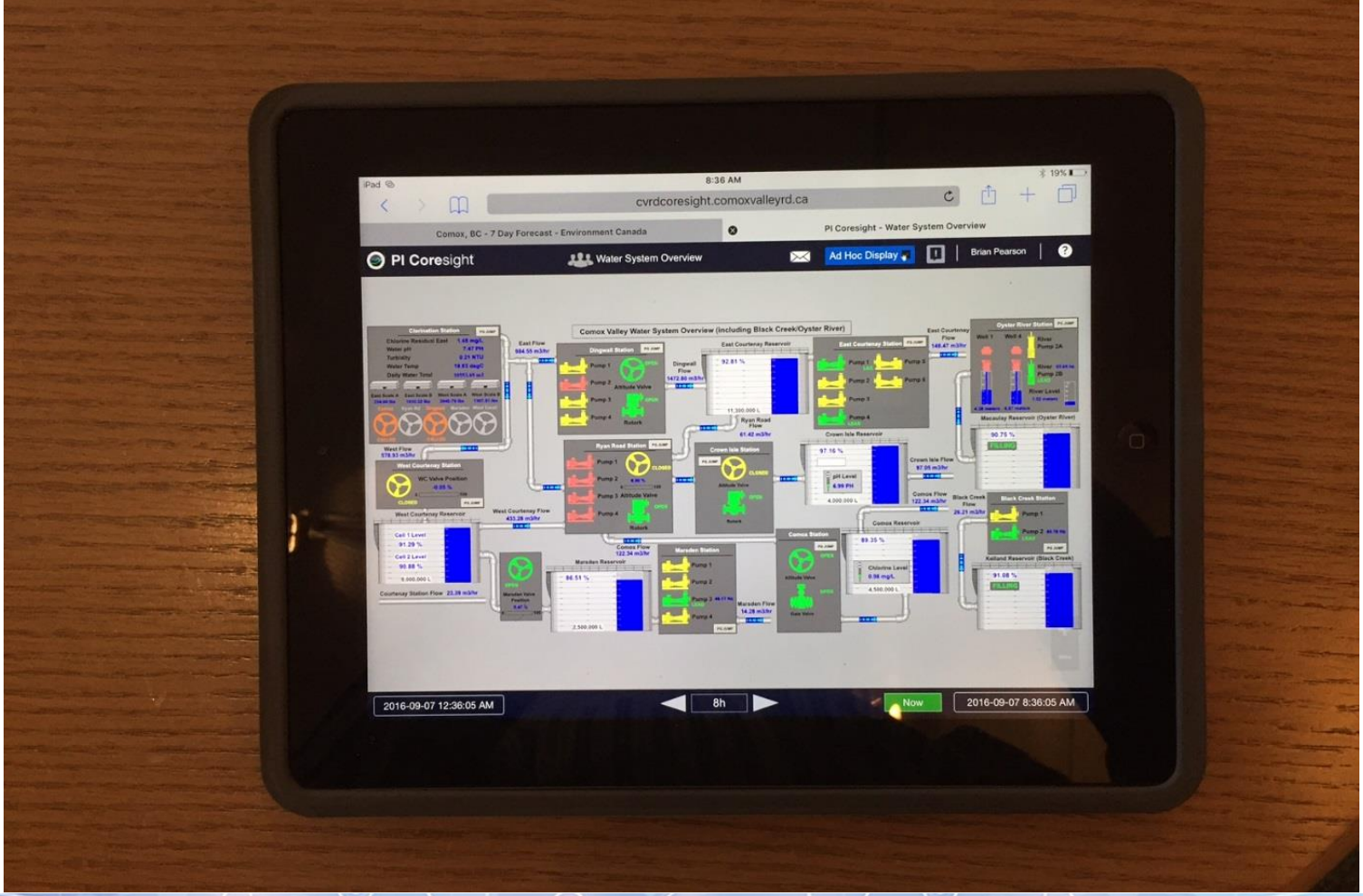
Unhealthy and missized water meters, leaky pipes, and energy costs

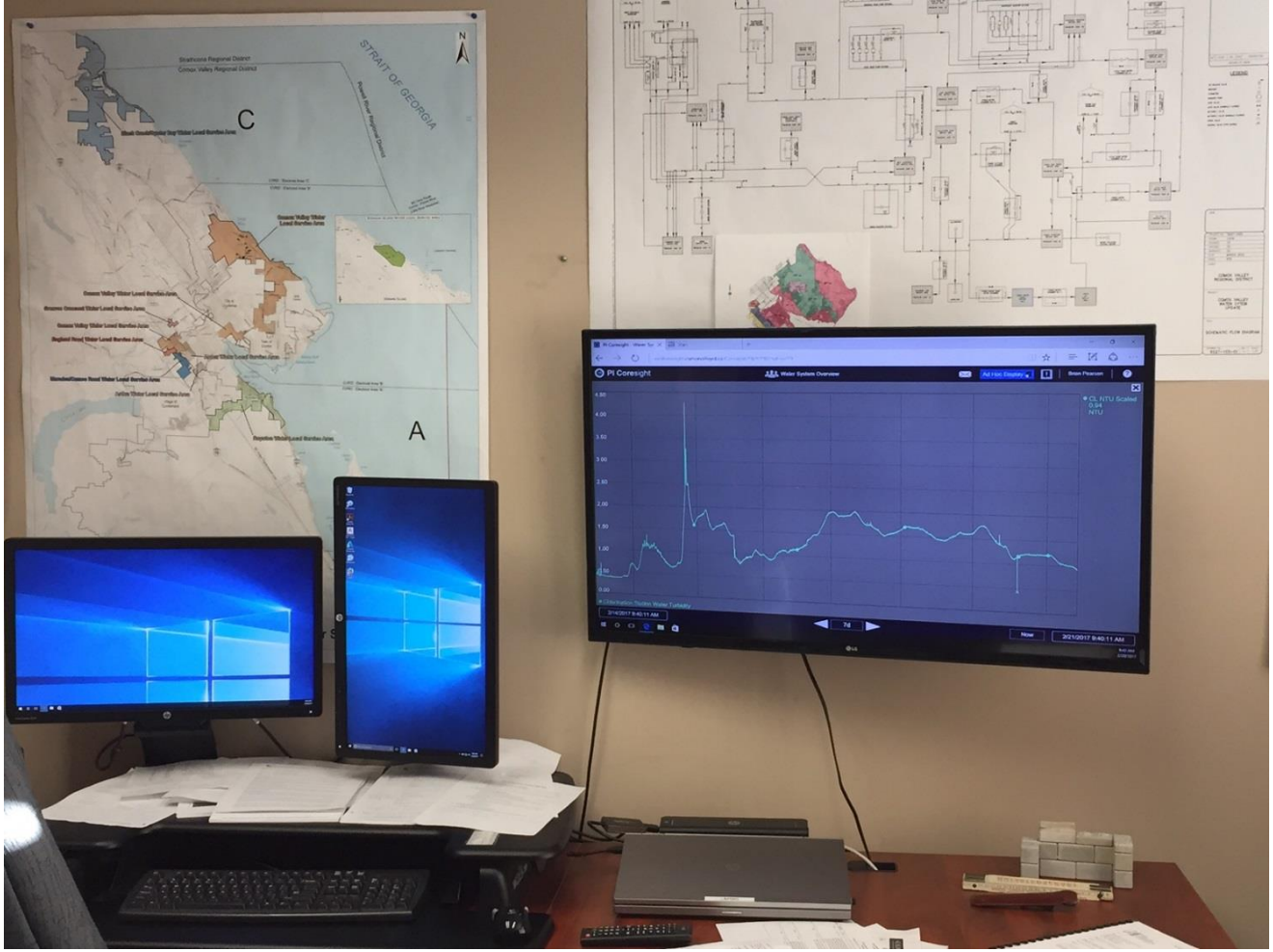
Recent installation identified over 60% of AMI provisioned meters were failing to accurately report water delivered, yielding a 330% return on investment!



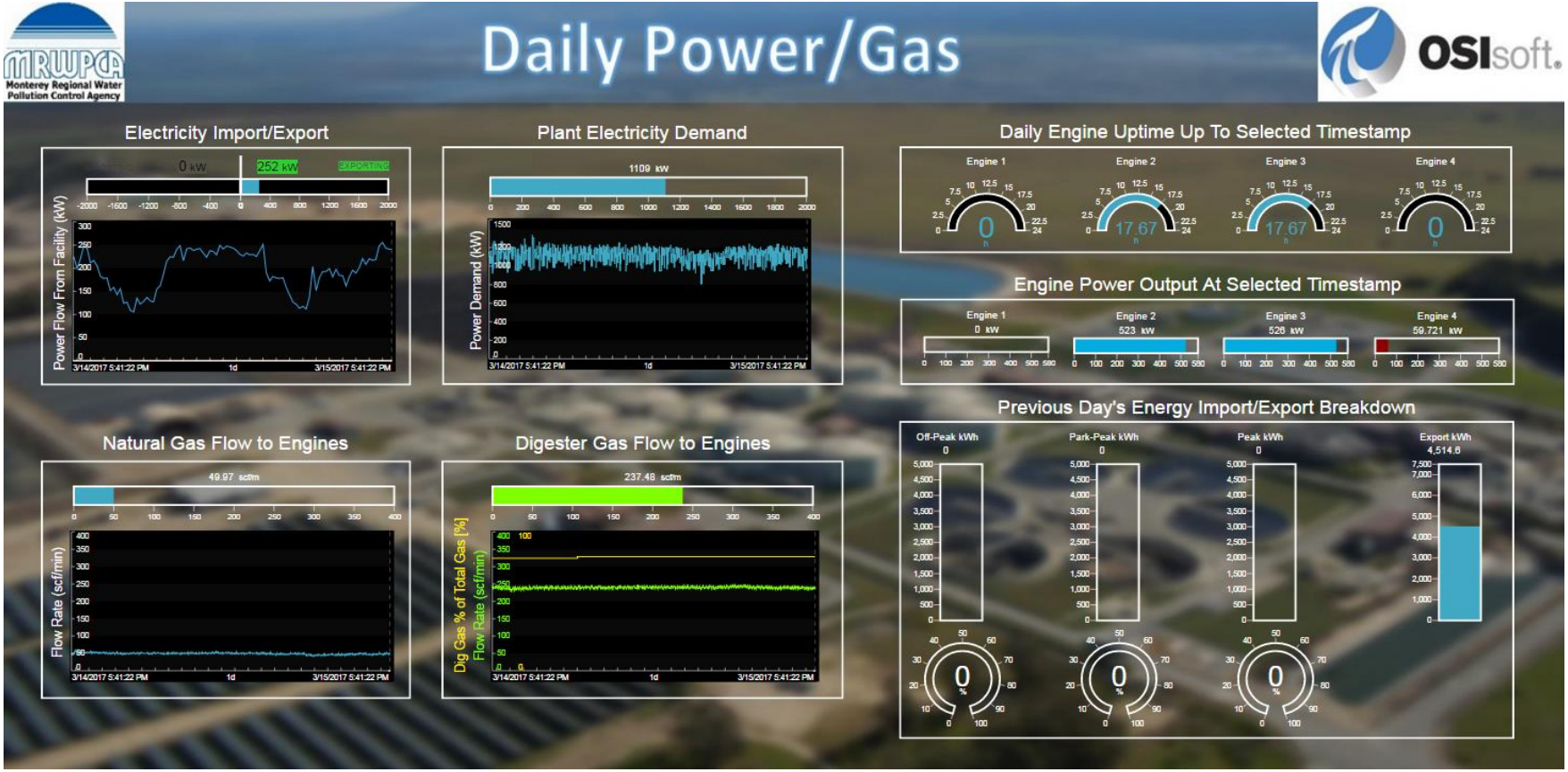




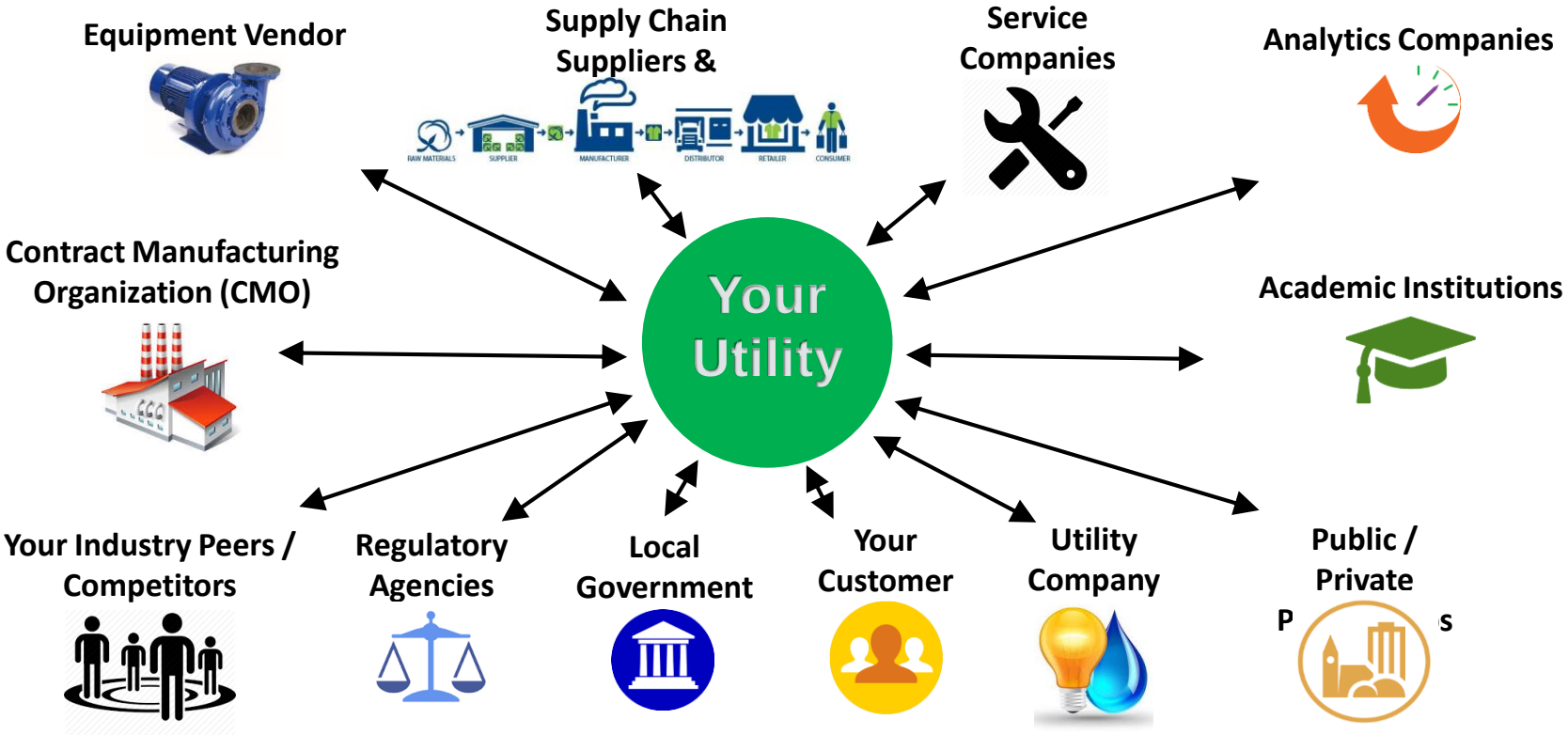




Real-time Energy Management



Communities: Data Sharing



Contact Information

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Questions

Please wait for the **microphone** before asking your questions

State your **name & company**

Please don't forget to…

complete the Post Event Survey

감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado