

# BUILDING A WORLD OF DIFFERENCE

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## TURNING PLANT DATA INTO SYSTEM OPTIMIZATION AND WATER/ENERGY EFFICIENCY TOOLS

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**BLACK & VEATCH**  
Building a world of difference.

**DO I HAVE A  
DATA PROBLEM?**

**“THE WIDESPREAD DEPLOYMENT  
OF DIGITAL TECHNOLOGY ACROSS  
THE UTILITY ENTERPRISE IS  
GENERATING VOLUMES OF DATA  
NEVER BEFORE ENCOUNTERED.”**

**— UTILITY ANALYTICS INSTITUTE**

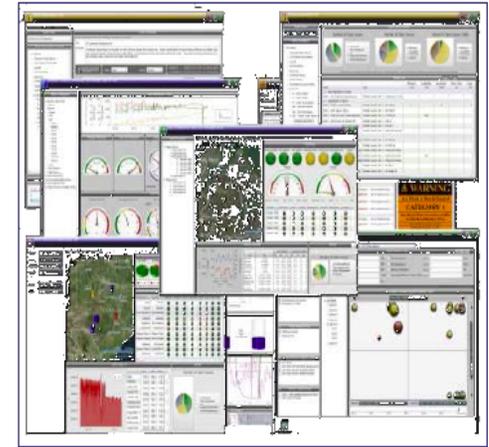
**SMART  
INTEGRATED  
INFRASTRUCTURE**



Data



Data Analytics = Value



Black & Veatch ASSET360 Platform

**Cost**



**Size**



**Availability**



**Function**



**Cost of Storage**



**Cost of Sensors**



**Computing Power**



**Access**



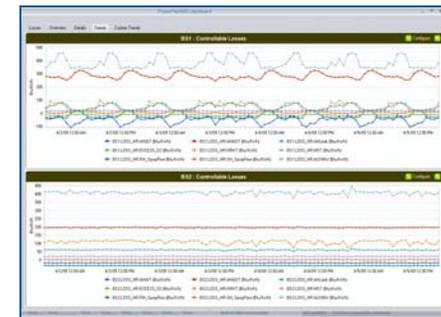
**Data analytics will transform how to make better informed operational decisions**

# BEING “SMART” IS UNDERSTANDING HOW TO PLAN, INTEGRATE AND OPERATE TECHNOLOGIES HOLISTICALLY

**Smart** = Leveraging data from sensors, networks, etc. to improve system performance

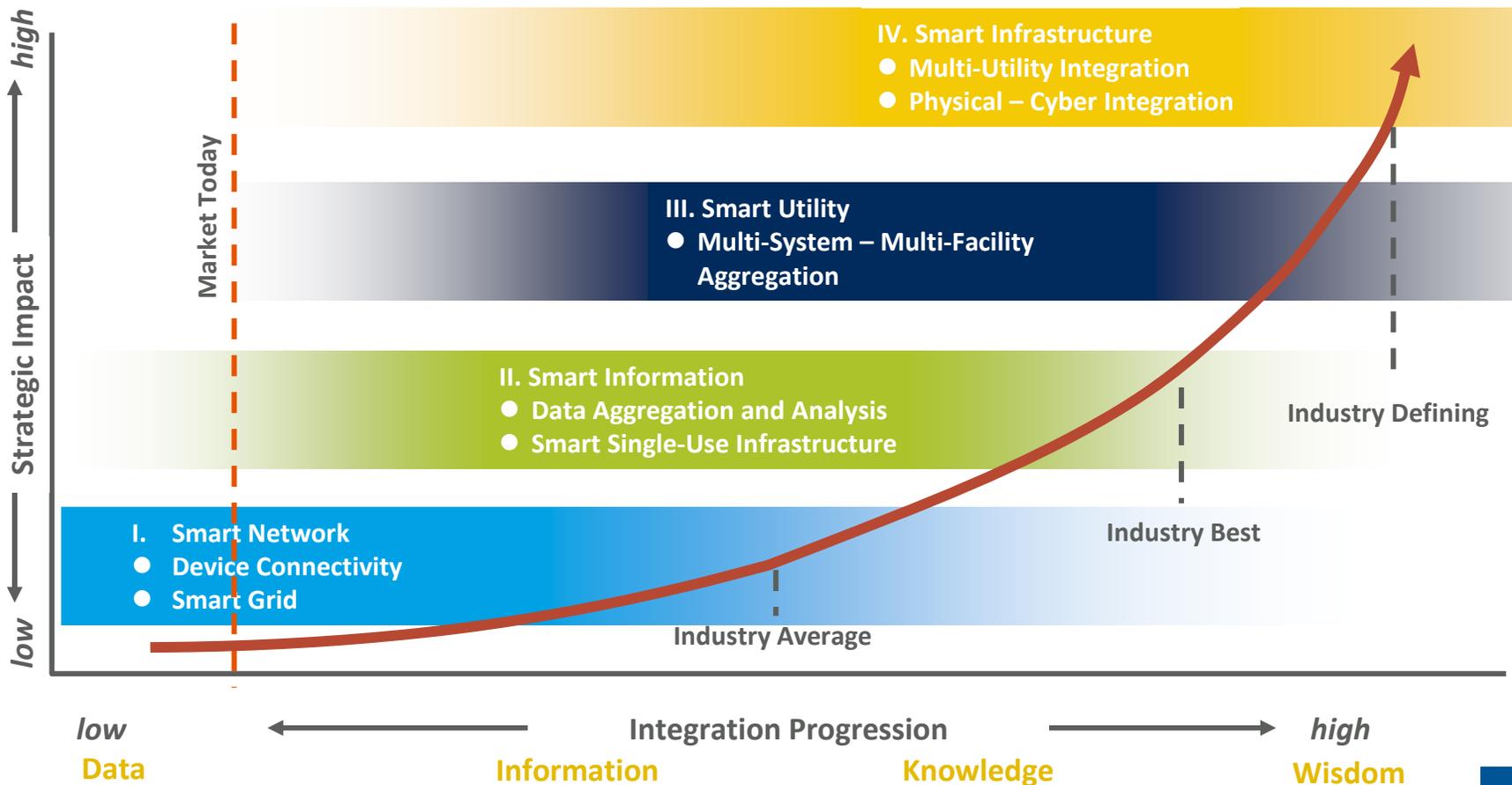
**Integrated** = Systems working together to produce value that could not be achieved independently

**Infrastructure** = Physical assets or systems that play a central role in the “smart community”

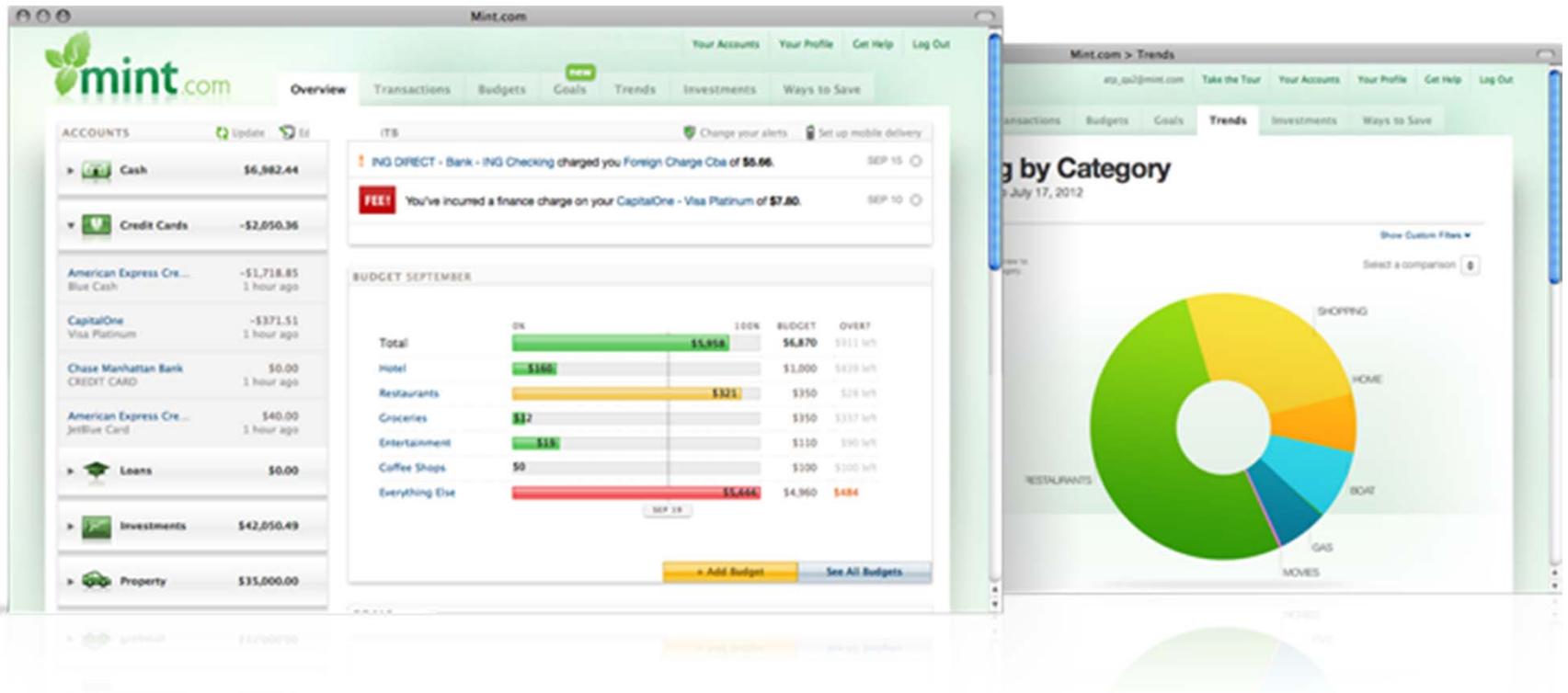


**Added infrastructure intelligence enables increased reliability, efficiency and security.**

# SMART INTEGRATED INFRASTRUCTURE IS A JOURNEY

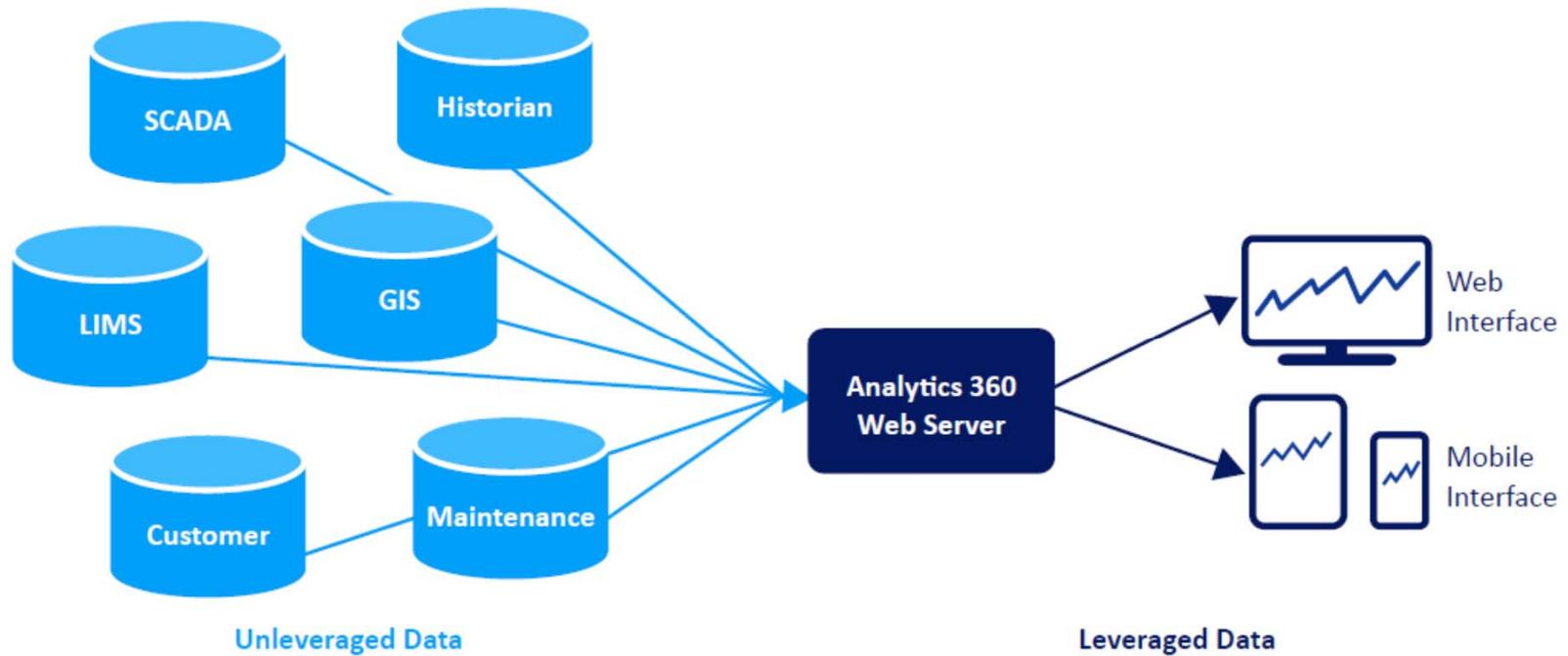


# DATA AGGREGATION AND VISUALIZATION

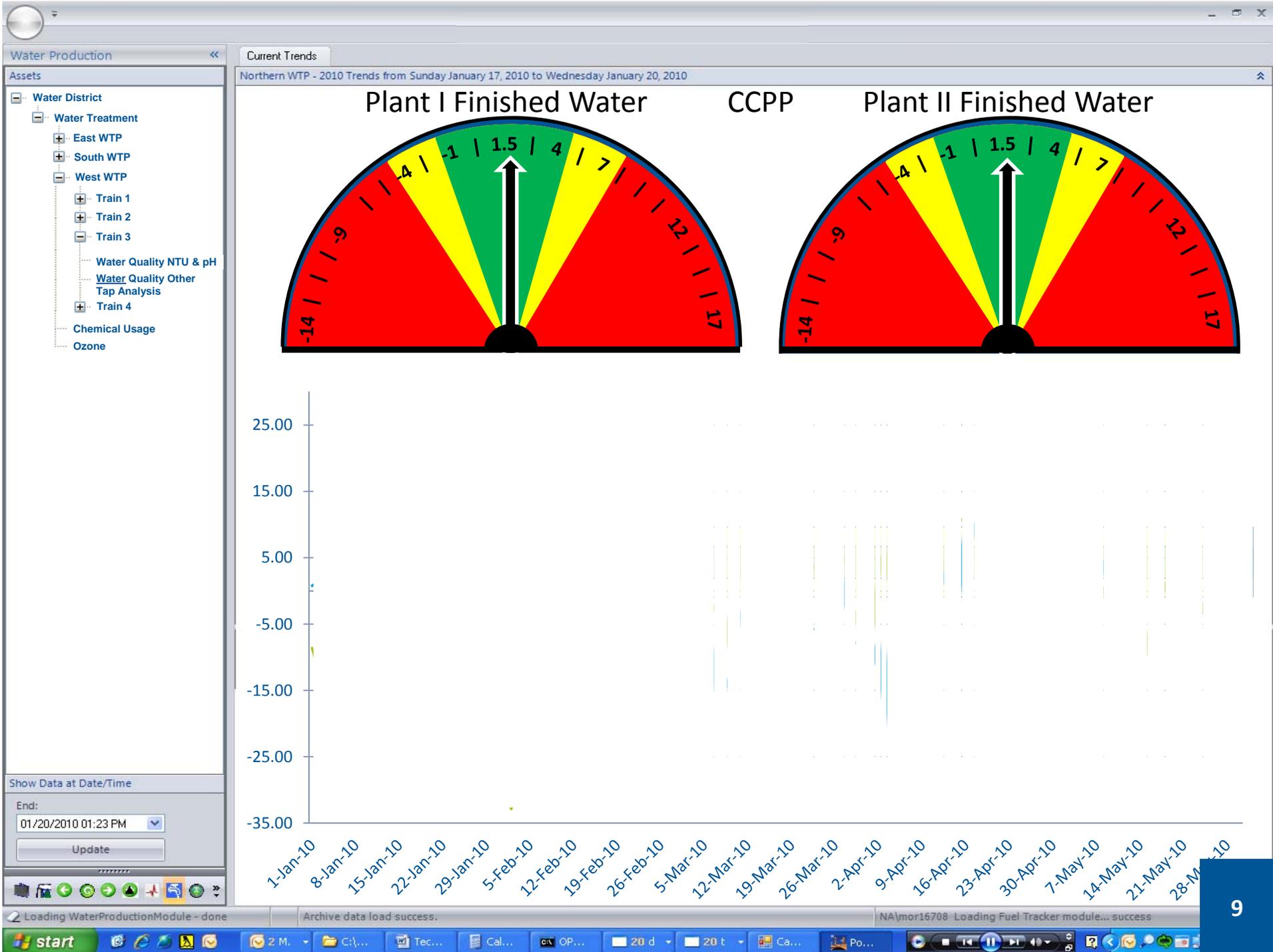


Spend time analyzing not collecting

# IS YOUR DATA IN SILOS?



**Do spreadsheets exist on hard drives?**



**“ANALYTICS HAVE PROVEN TO BE  
A LOW-COST APPROACH TO  
ACHIEVING GREATER EFFICIENCY.”**

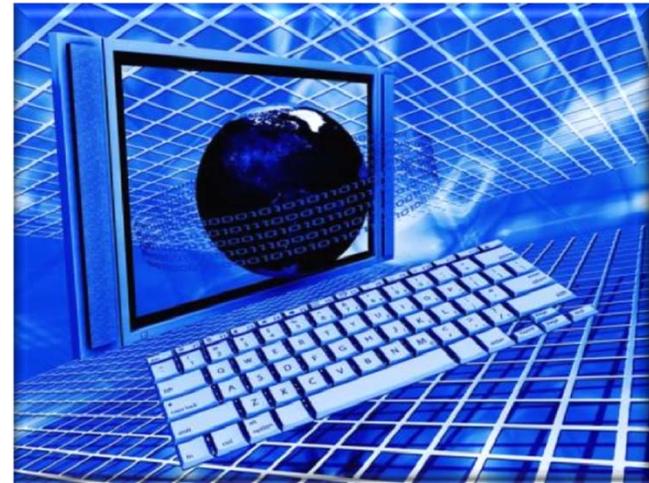
**— IDC ENERGY INSIGHTS**

**“UTILITY ANALYTICS SPENDING  
PREDICTED TO GROW BY  
39% PER YEAR.”**

**— UTILITY ANALYTICS INSTITUTE**

## KEY INDUSTRY ISSUES DRIVING NEED FOR SMART ANALYTICS

- Data Overload
- Operational Complexity
- Skilled Workforce Shortage
- Aging Assets
- Tight Operating Margins
- Volatile Markets (Chemicals, Energy, Financial)
- Regulatory Compliance + Future Uncertainty



**Analytics can leverage utility-wide data**

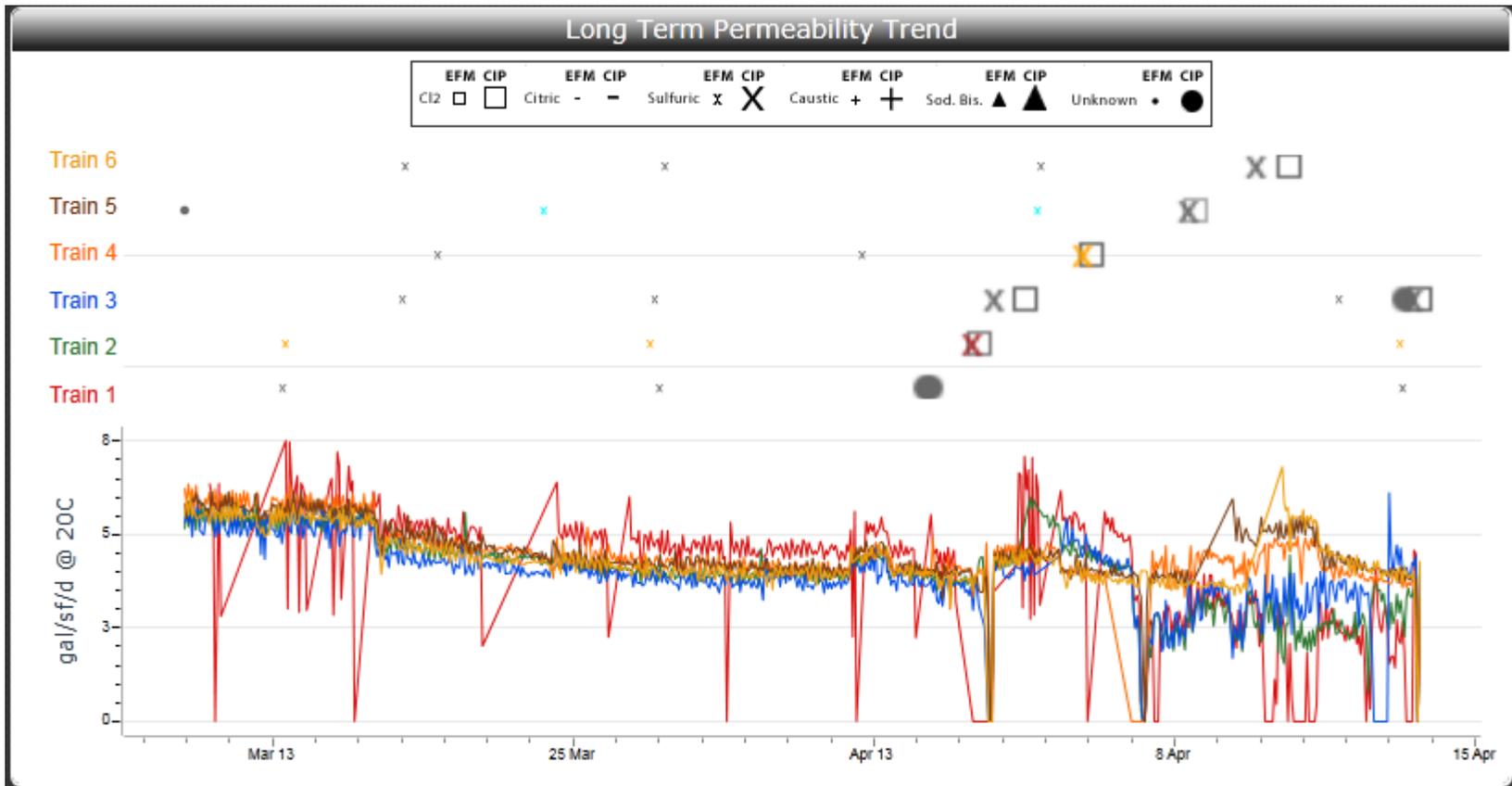


## WHAT IS AN EXAMPLES OF SMART ANALYTICS?

- Collision avoidance systems
  - “System of sensors”
  - Data on other cars, speed, traffic lights
  - “Central database”
    - Weather
    - Traffic
- Warn the driver
- Actually control the car

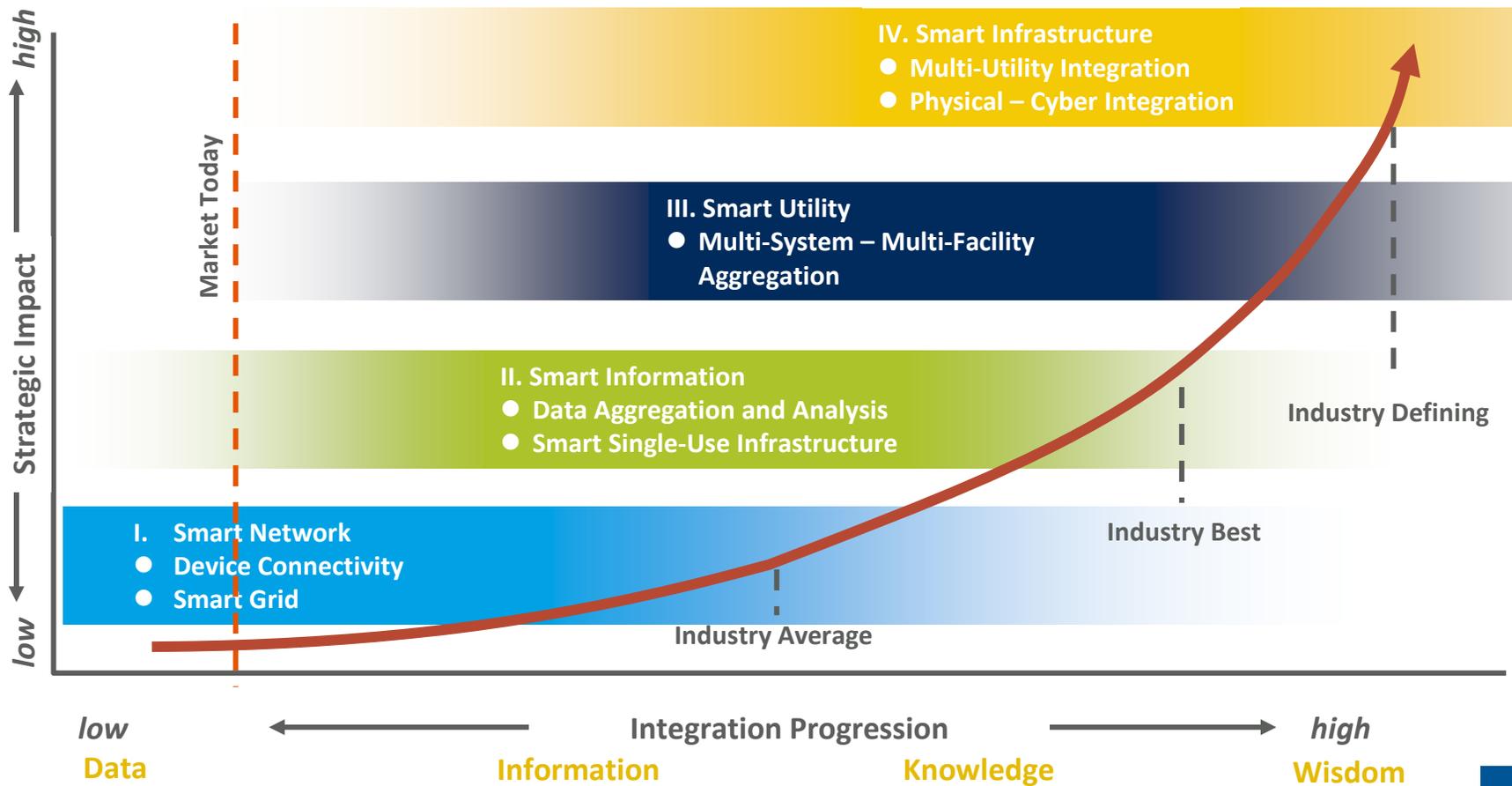
**Will this eventually be on all cars?**

# TRENDING REAL-TIME AND EVENT DATA TO SEE ISSUES



Analyze types of cleans and impact

# SMART INTEGRATED INFRASTRUCTURE IS A JOURNEY





## WHAT IS AN EXAMPLES OF A SYSTEM OF SYSTEMS?

- Vancouver Olympics
- Balance energy from heat
  - Heat generated during hockey
  - Used to heat the dorms

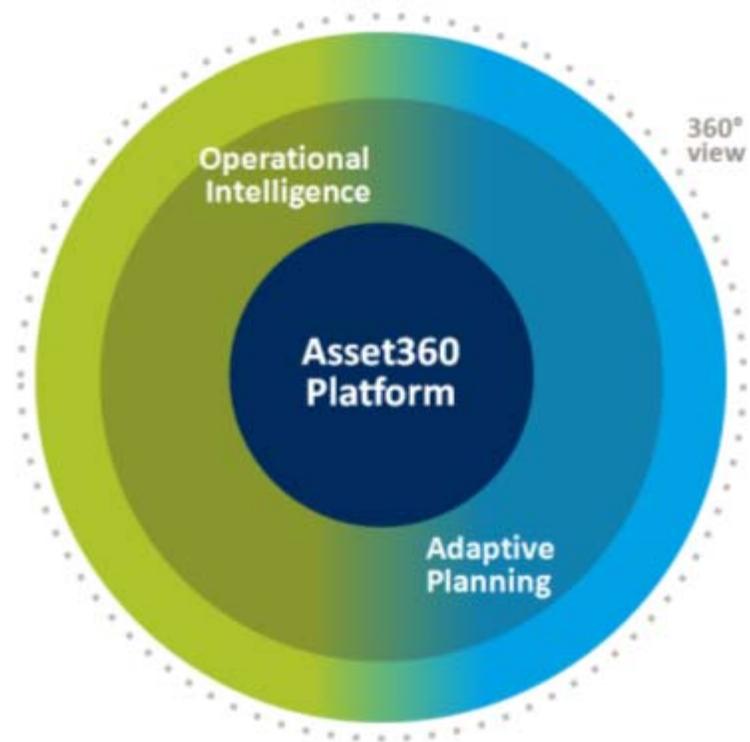
## WHERE CAN WE GO WITH WATER AND WASTEWATER?



- **Beyond automated meter data**
  - Leak detection
  - Real-time decision about source, treatment, production & storage
- **Energy management**
  - Demand profile management
  - Renewable energy management
  - Heat recovery from CHP and dryers
- **Follow the drop of water**

# STRUCTURE NEEDED TO TRANSFORM DATA INTO ACTION

- Integrated platform for Big Data and Analytics
- 360-degree perspective of infrastructure assets
- Scalability to solve big problems in an integrated way
- Ability to extend value of existing investments
- A “single point of truth” for asset planning and operations
- Collaborative work flow and problem solving



# APPROACH TO OPTIMIZATION

Data quality

Performance indicators

Tools



Instrument Panel

## DO I HAVE THE DATA AND CAN I GET TO THE DATA?

- Where and what do I need?
- **Grab/manual sample versus on-line**
  - Garbage in garbage out
  - Maintenance and calibration are important
- **Data aggregation**
  - Is the format compatible?
  - Where is it stored?
  - What resolution do I need?

## DO I NEED TO PUT IN A BUNCH OF INSTRUMENTS???



- Can we use mathematical model with process understanding to create value?
- Can we capture 80% of the value?

**Match complexity of solution to complexity of the problem**



## ESTABLISHING PERFORMANCE INDICATORS IS A PROCESS NOT AN EVENT

- **What are the important indicators**
  - Start small and work up
  - Variability of input versus variability of outputs
- **Are the indicators understood and achievable?**
  - Can I see a change?
  - Do I know what to change?
  - Who is responsible for the change?

## DO WE HAVE THE TOOLS TO BE SUCCESSFUL?

- **Well defined SOPs are important**
  - Consistency
  - Revisit and update
- **Do I have the data?**
  - Can I “see” the indicator?
  - Can I “see” the factors?
- **Do we have a way to communicate and resolve issues?**
  - Share information from shift-to-shift
  - Prioritize issues to maintenance, projects, and CIP

# CASE STUDY

Lubbock, TX

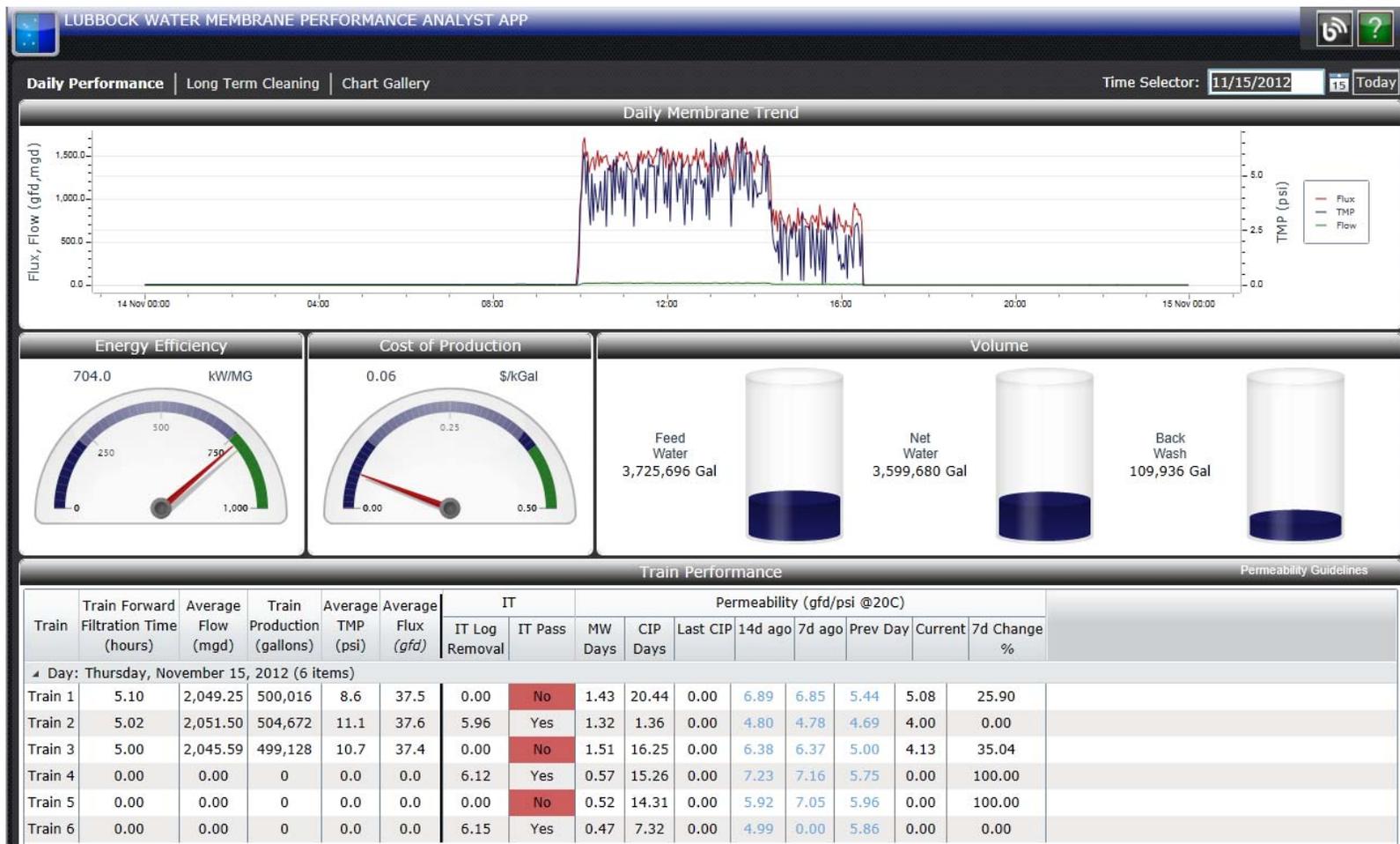


MF Membrane System

## CITY OF LUBBOCK, TX SOUTH WTP

- Lake Alan Henry
- Greenfield site
- Process – 15 mgd
  - Intake
  - Chlorine dioxide
  - Plates settlers
  - MF – Siemens
  - Disinfection
  - Chloramines

# PROVIDE DATA VISUALIZATION, ANALYTICS, MONITORING, DIAGNOSTICS



# SPEND TIME ANALYZING THE ISSUE — NOT GENERATING THE DATA

Cleaning Effectiveness Summary													Permeability Guidelines		
Date	Train	Recipe	Starting Temp (deg F)	ORP		pH		Chemical Volume From Recipe					Permeability (gfd/psi @20C)		Change %
				Start (mV)	End (mV)	Start	End	Cl2 (PPM)	NaOH (%)	Citric (%)	HCl (%)	H2SO4 (%)	Before	After	
03/24/13	Train 3	Acid	17	-673	-417	8.2	8.0	500	0	0	1.00	0.06	0	5.8	0%
03/24/13	Train 6	Acid	12.5	-409	-415	8.3	7.8	500	0	0	1.00	0.06	3.9	4.8	23.2%
03/22/13	Train 1	Acid	17.7	-629	-410	7.8	7.6	500	0	0	1.00	0.06	4.7	5.8	22.1%
03/22/13	Train 2	Acid	12.9	-417	-413	6.5	7.7	500	0	0	1.00	0.06	4.2	5.1	22.5%
03/20/13	Train 5	Acid	20	-679	-679	8.0	8.0	500	0	0	1.00	0.06	4.4	6.2	40.3%
03/15/13	Train 4	Acid	12.3	-424	-413	8.0	7.7	500	0	0	1.00	0.06	5.8	7	19.6%

- Is the starting temperature a factor?
  - Did a temperature setpoint get changed?
  - Is the heater not working?
  - Are we initiating cleanings too soon?

# DO I HAVE A DATA **OPPORTUNITY?**

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Building a **world** of difference.®

**Together**



**BLACK & VEATCH**