BC BLUE

November 14, 2019

Smart Utility and Technology for the Next Generation of Workers

Brown AND Caldwell

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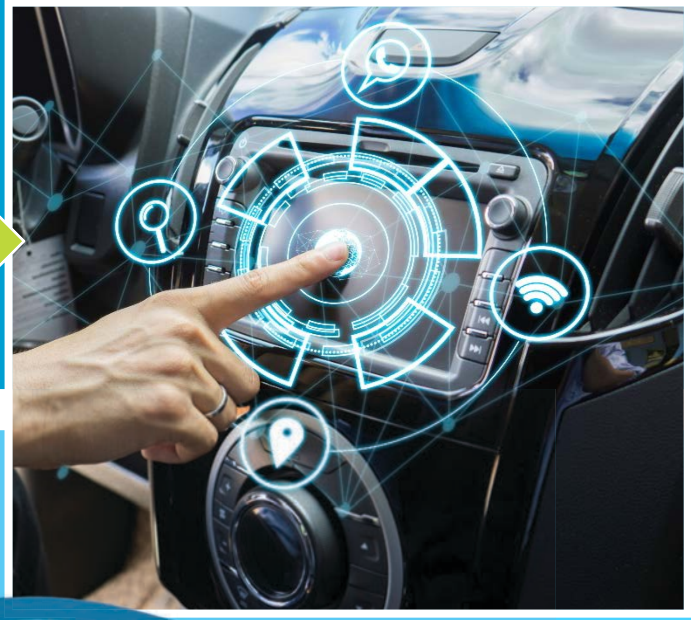
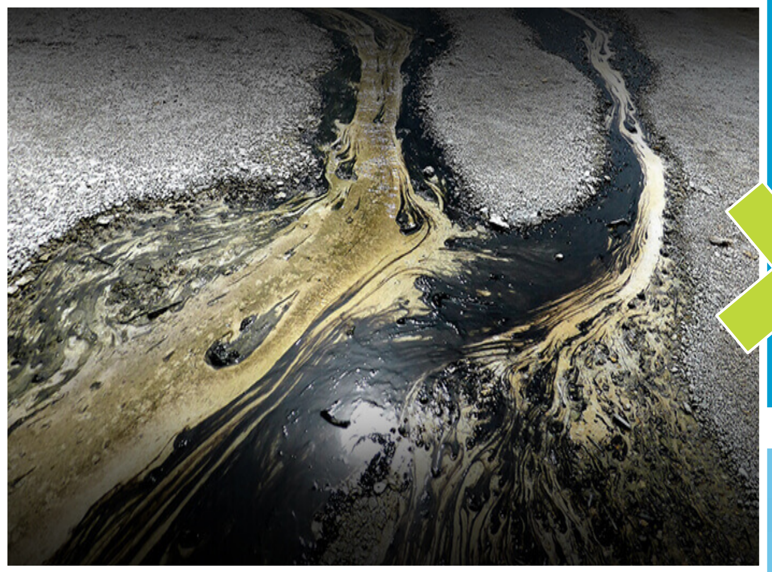
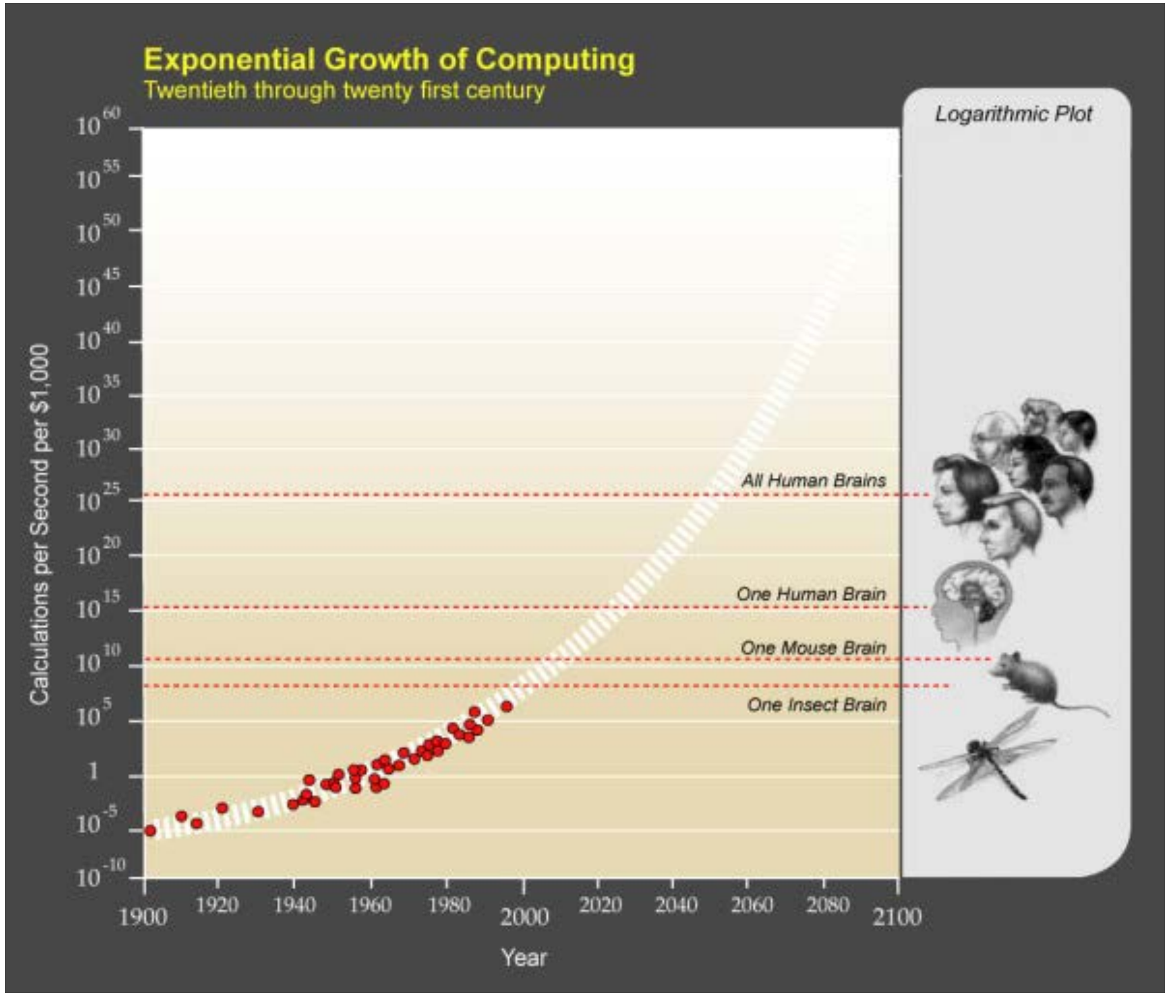
Advancements in transportation lead to safer travel . . .

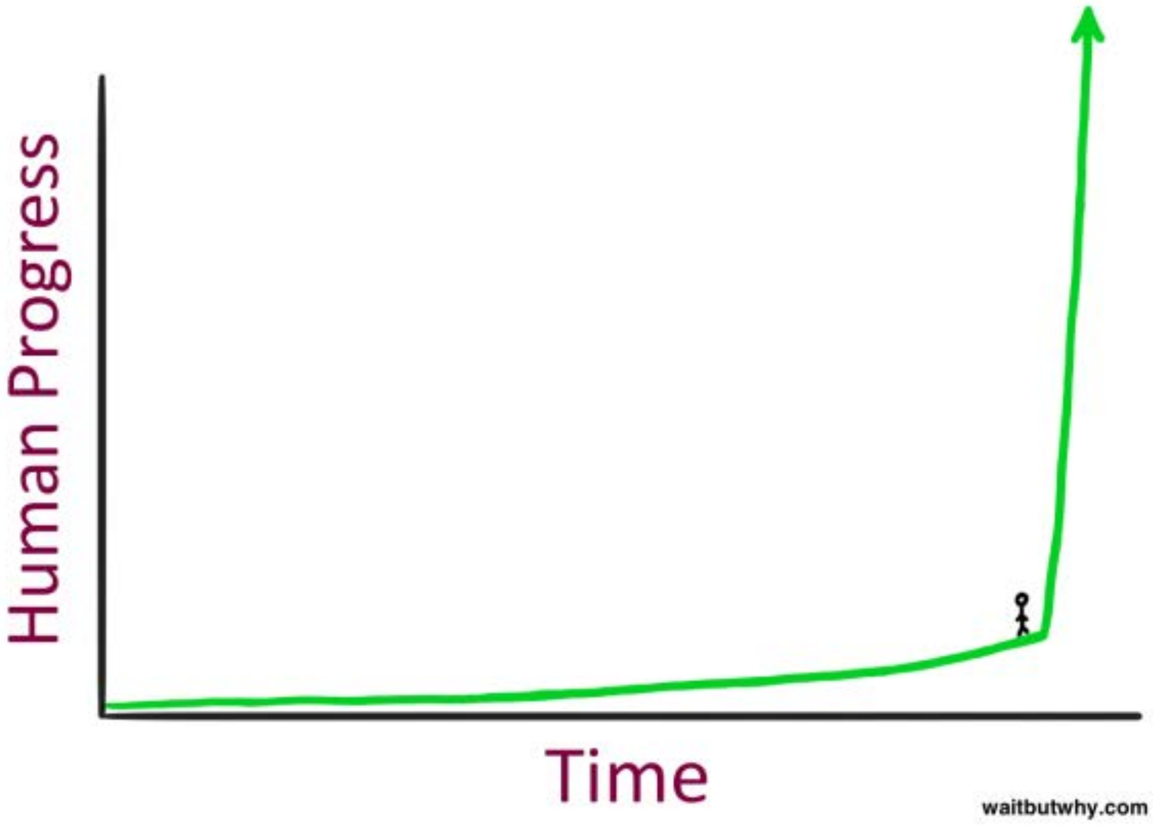


. . . just as Smart Utility results in safer water



Technology is changing at an exponential pace





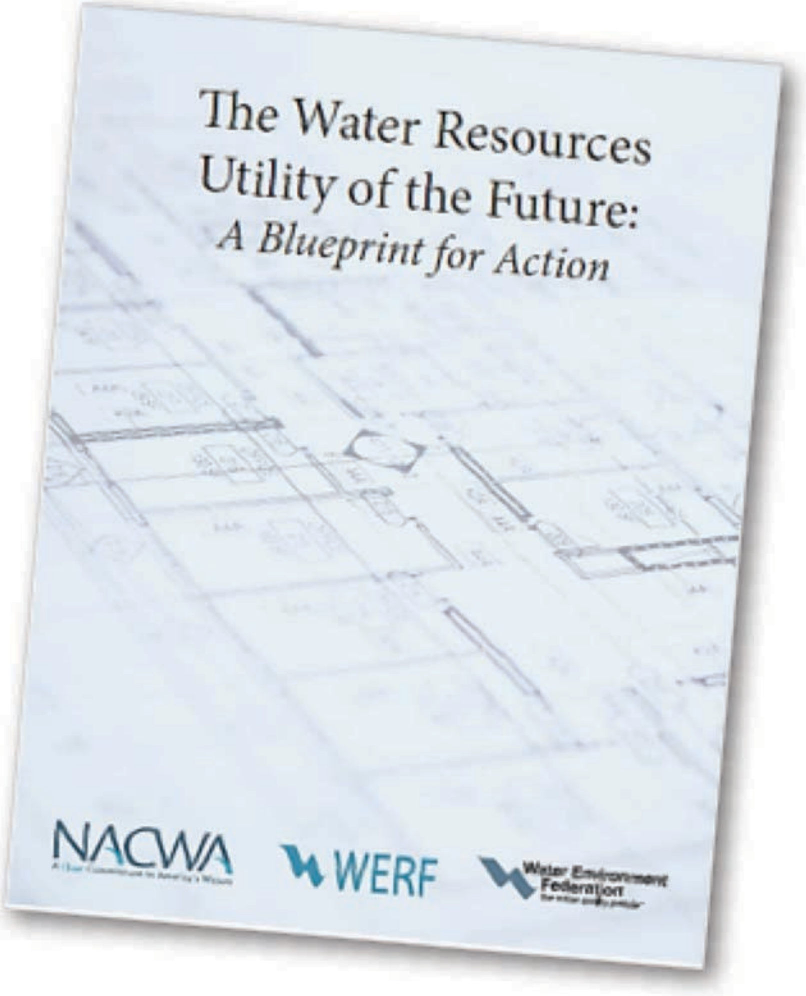
Source: Wait but why
https://waitbutwhy.com/2015/01/artificial-intelligence-revolution-1.html

The future workforce thrives on technology

What our future workforce is learning with this technology!

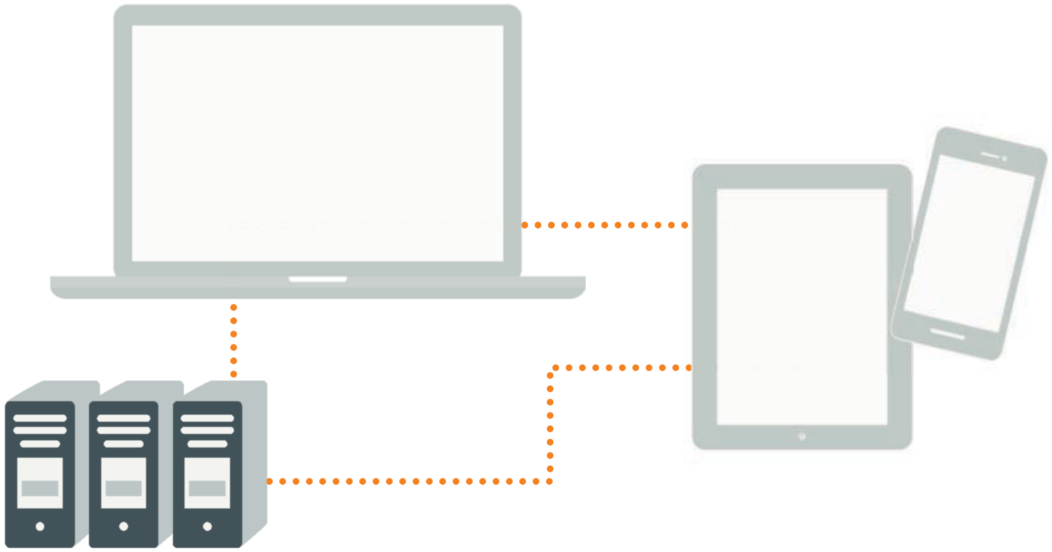
NACWA: The Utility of the Future will be...

- Focused on innovation
- Highly automated
- Predictive infrastructure
- Enabled with full real-time monitoring and control
- Highly leveraging analytics and intelligence systems
- Highly integrated digital and physical systems



Market changes affect "Smart Utility"

Technologies have changed

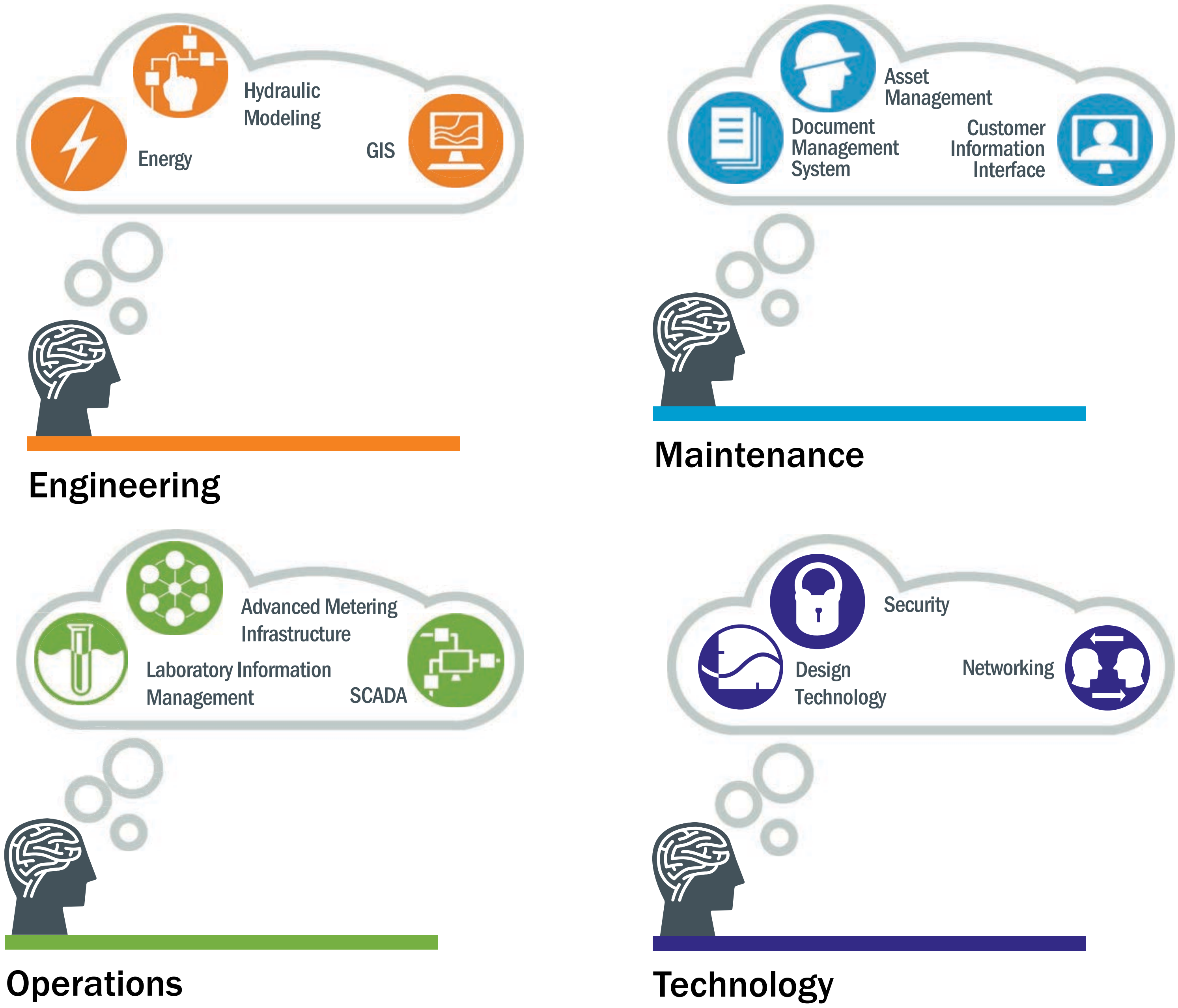


- New ways to instrument and obtain data
- Improved communication networks
- Improved battery technologies
- Operational technology adopts standard business technology protocols
- Cybersecurity landscape

Workforces are changing

- Retiring workforce
- Increased level of comfort leveraging automation
- Young staff are eager to leverage technology
- Workspace has evolved to needing constant real-time information

Departmental tools created information silos



We have the data – a lot of it! Now what?

We rely on experienced staff to process large volumes of data. This approach has caused data overload and isn't sustainable.

Providing *Smart* tools is essential for a sustainable future.

We live in a world where everything is "Smart"

The term, "Smart" has a marketing feel like the adjectives *Green or Organic*.

In this industry, we need to leverage the meaning to be Smart to **improve our systems and processes.**

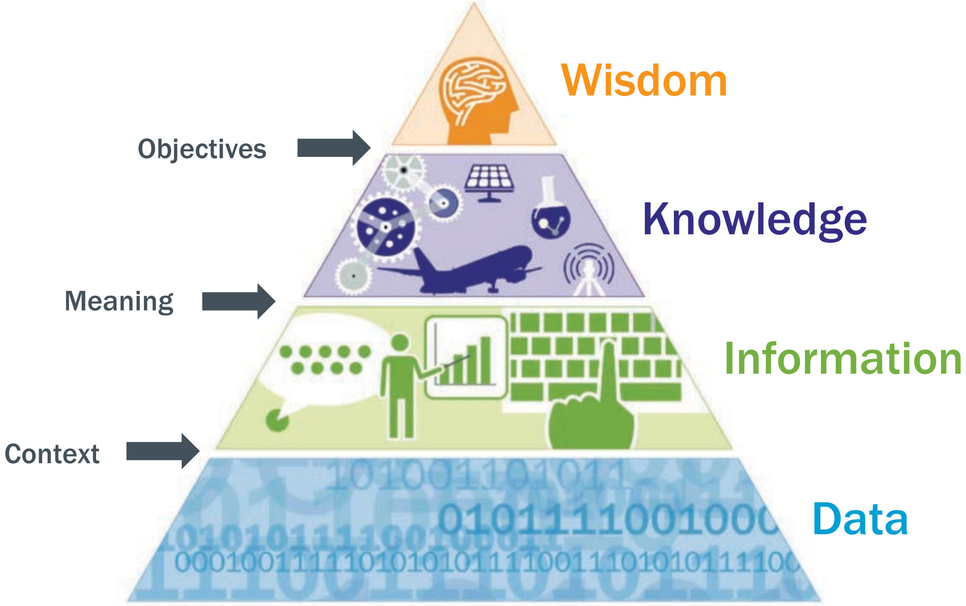
Smart tools aid proactive decisions

What is a Smart Utility?

Smart Utility objective:
Make technology a better partner

Technology Integration

Workforce Empowerment



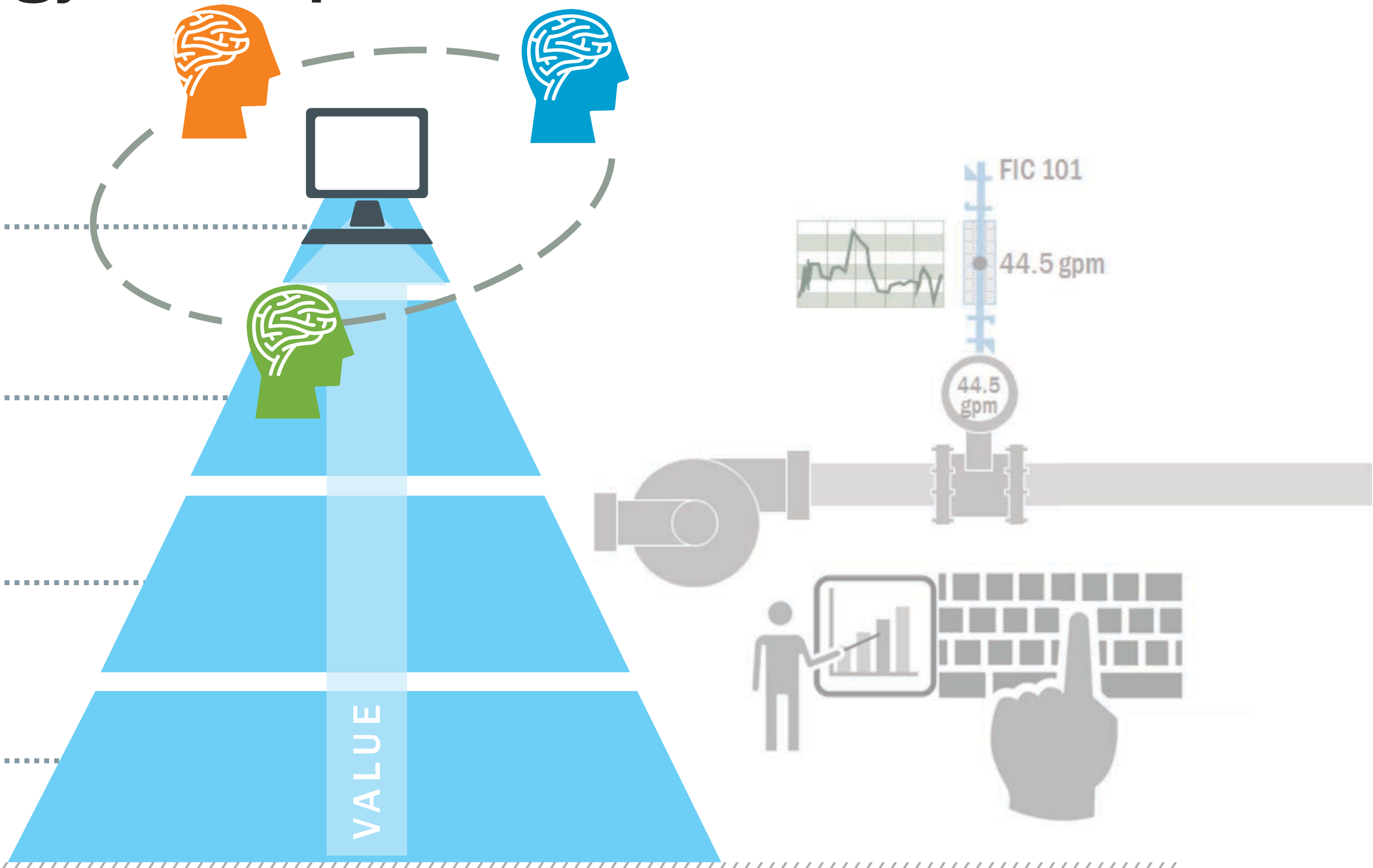
Leveraging technology to empower our workforce

Wisdom
Predictive capabilities that enable best outcomes

Knowledge
Historical actions and results

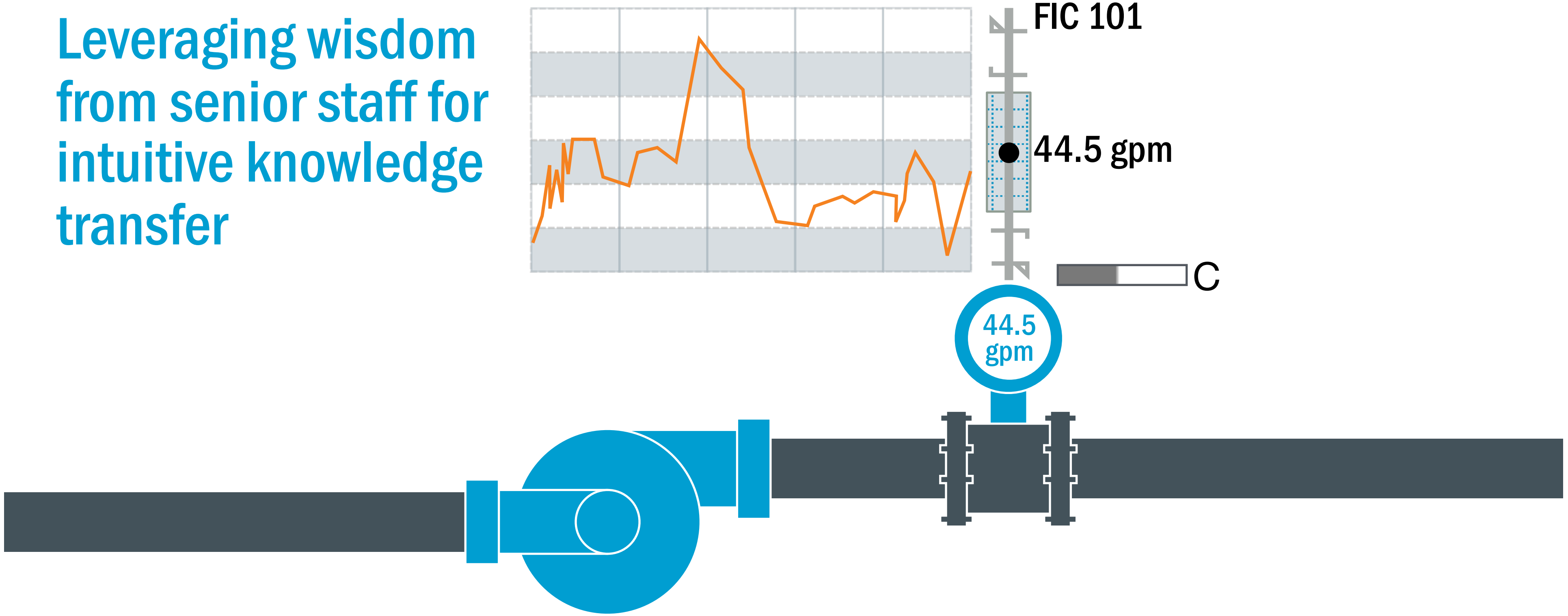
Information
Combined data with context

Data
Discrete parameters of different datasets

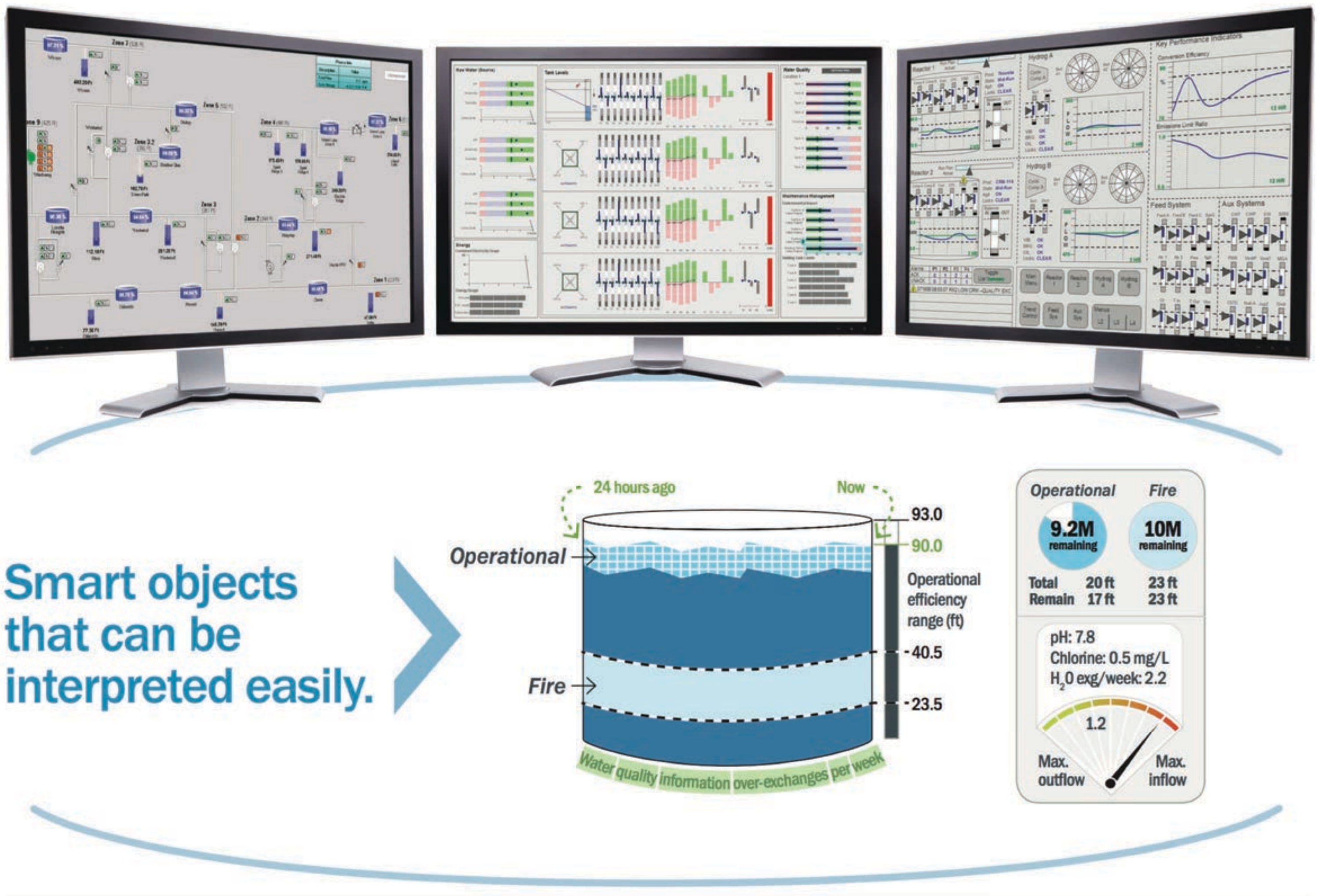


Increasing operational excellence by providing insight to operators

Leveraging wisdom from senior staff for intuitive knowledge transfer

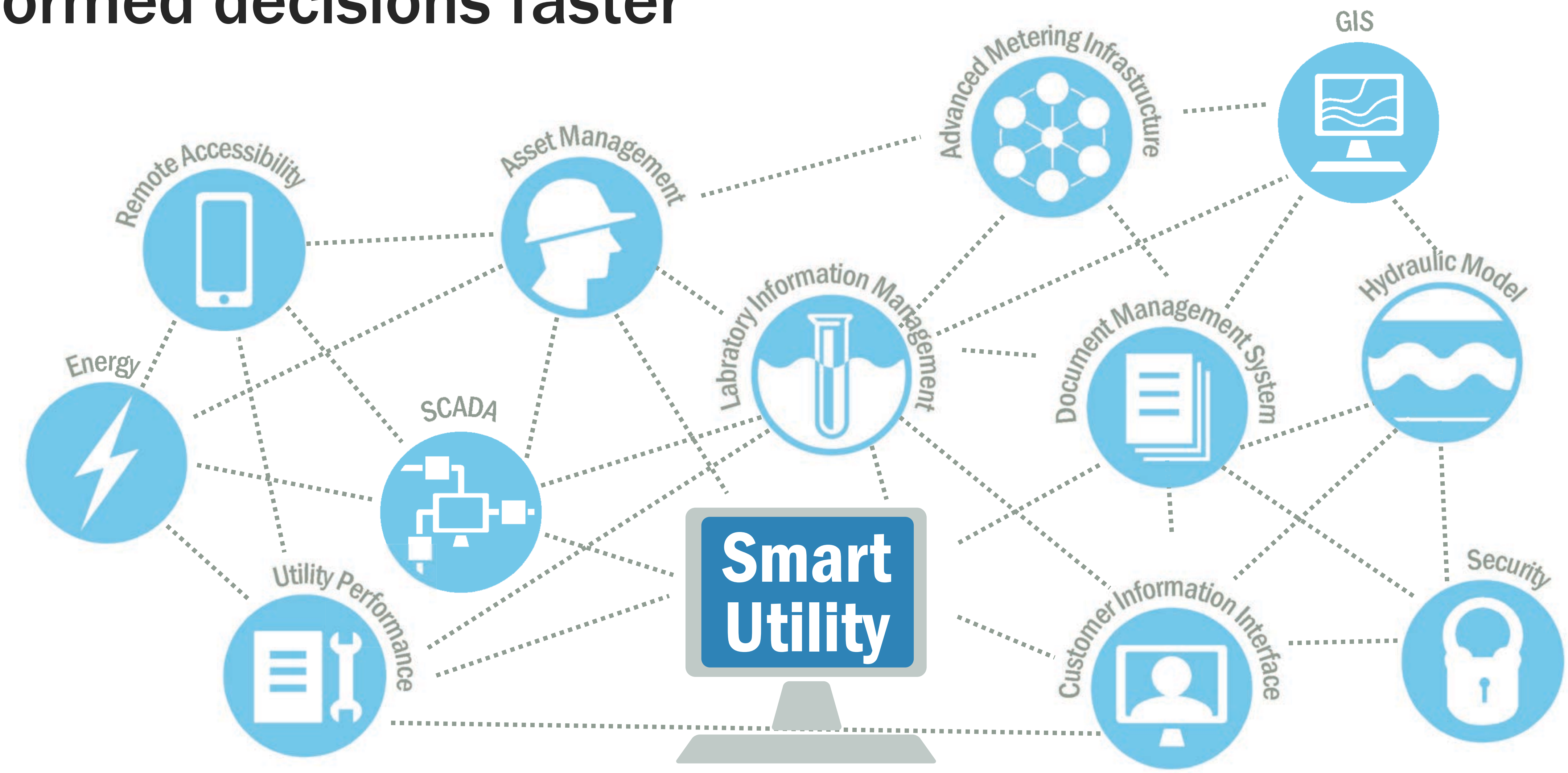


Process graphics utility wide



Building standards around smart objects result in SCADA systems that provide greater transparency into the water system and enhance operator training

Integration of systems and real-time analytics to make informed decisions faster



Benefits of Smart Utility

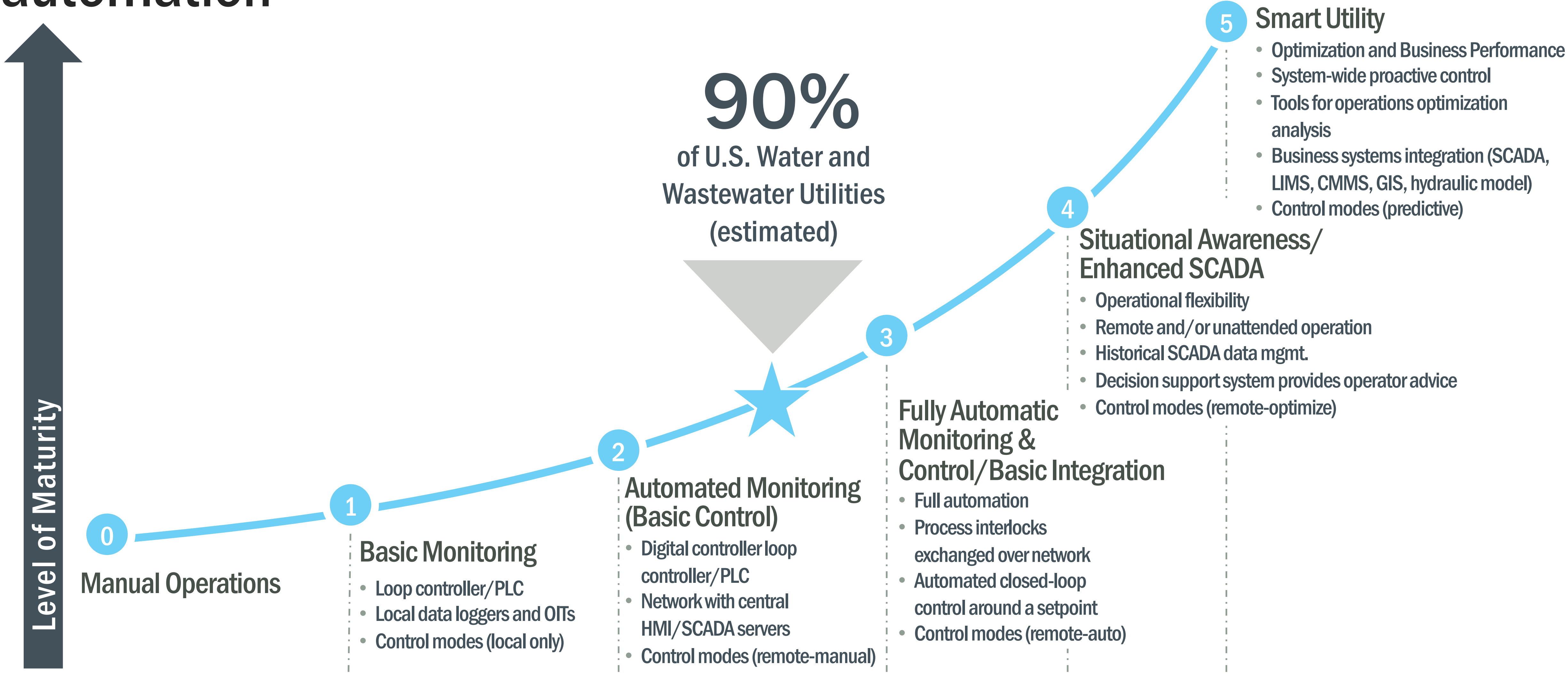
Operations & management efficiency

Informed decisions

Workforce optimization

How to achieve a Smart Utility

Understanding your workforce and technology - Levels of automation

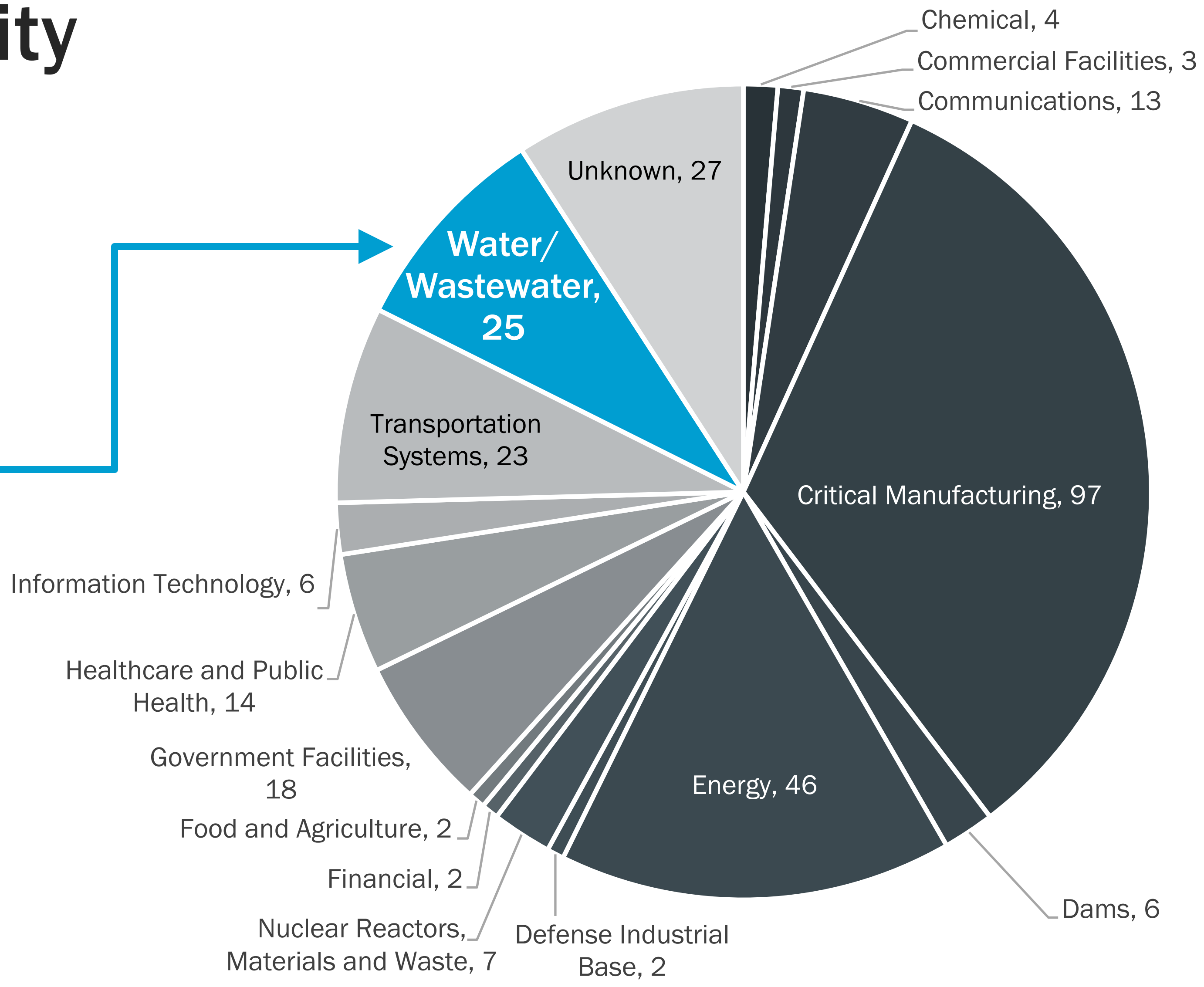


Smart Utility supports effective utility management

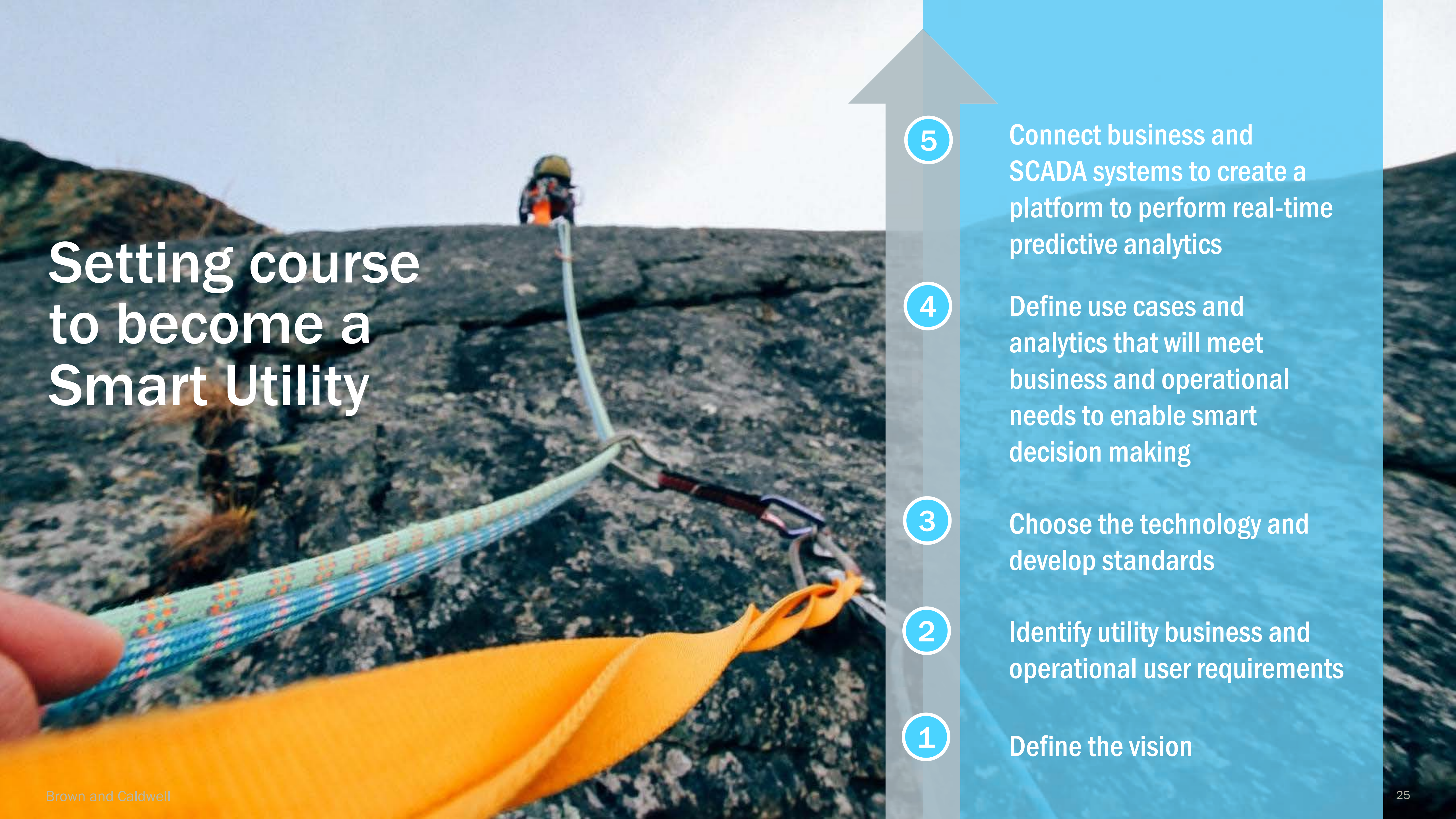
Importance of cybersecurity

Department of Homeland Security incident analysis data

Water and Wastewater industry is a significant slice of the pie…. About 8%



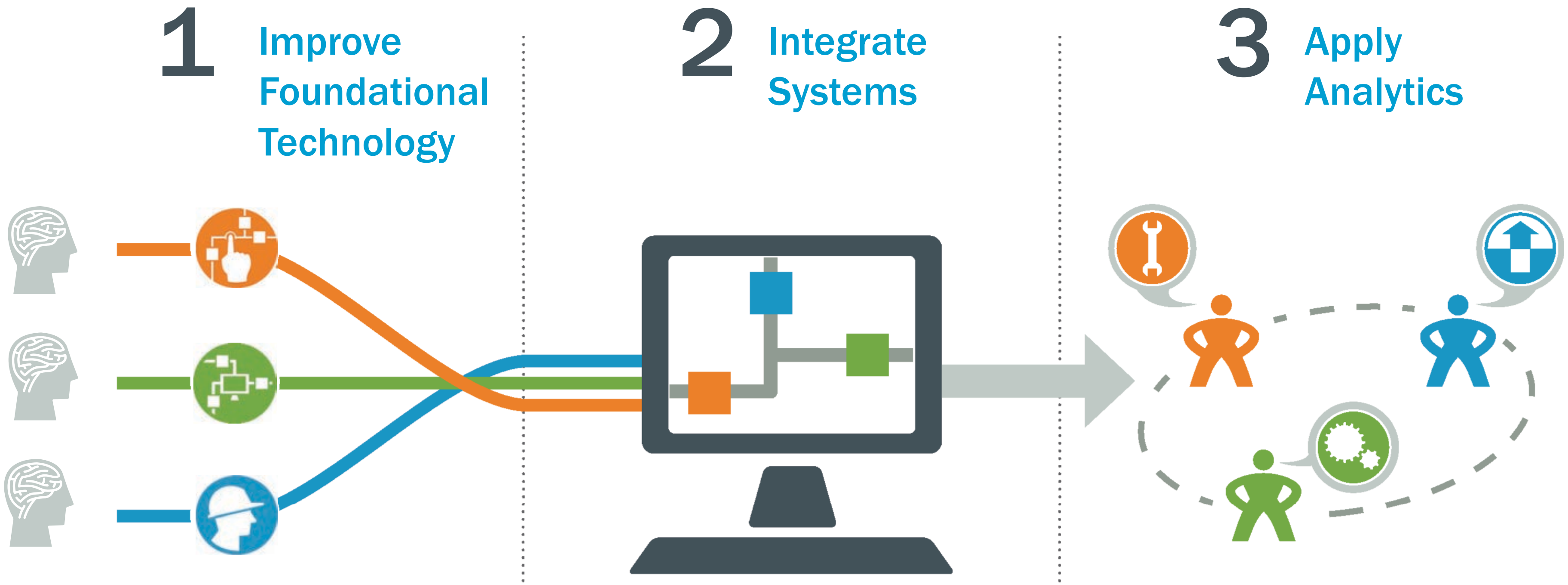
Verizon 2017 Data Breach Digest



Setting course to become a Smart Utility

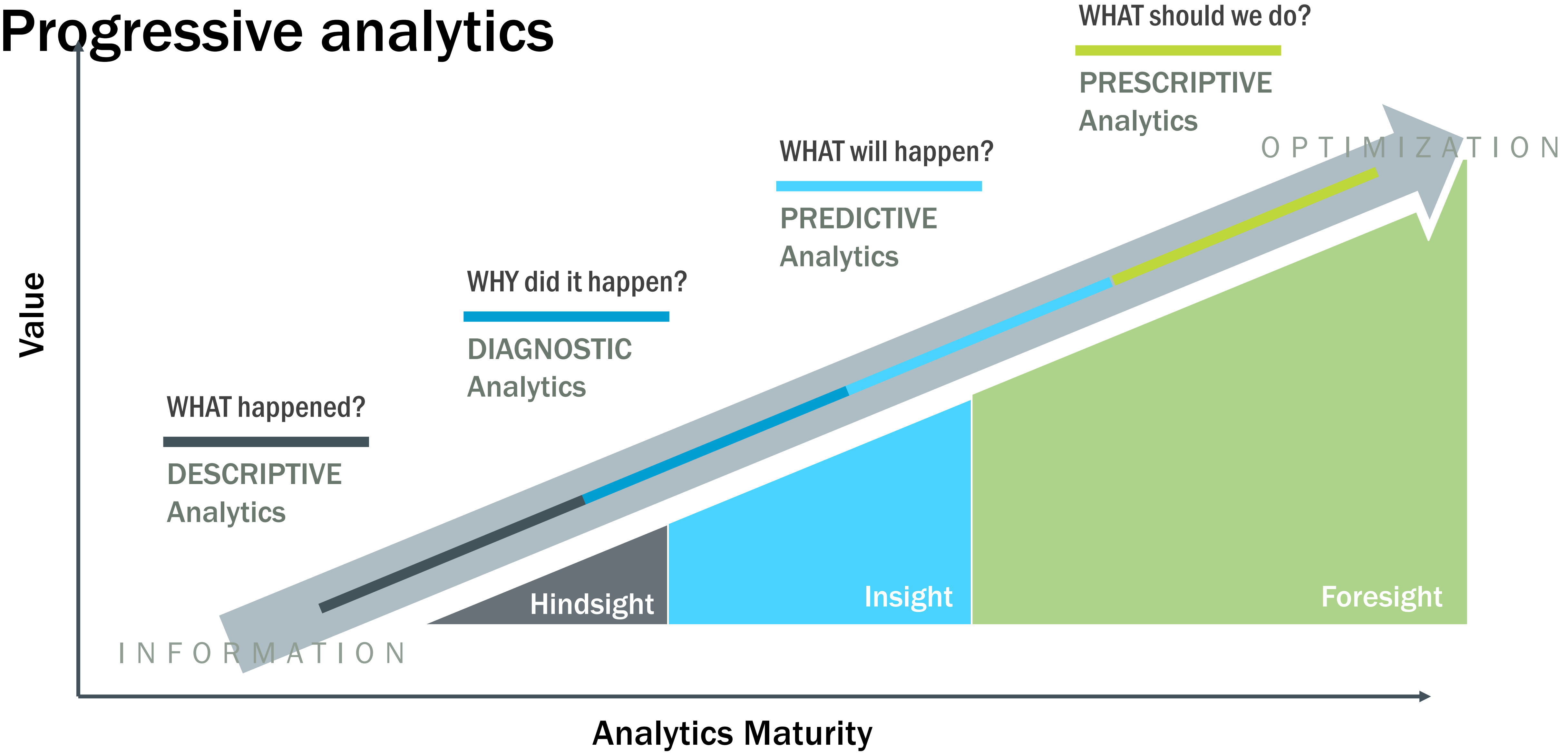
5. Connect business and SCADA systems to create a platform to perform real-time predictive analytics
4. Define use cases and analytics that will meet business and operational needs to enable smart decision making
3. Choose the technology and develop standards
2. Identify utility business and operational user requirements
1. Define the vision

Investment milestones without rework

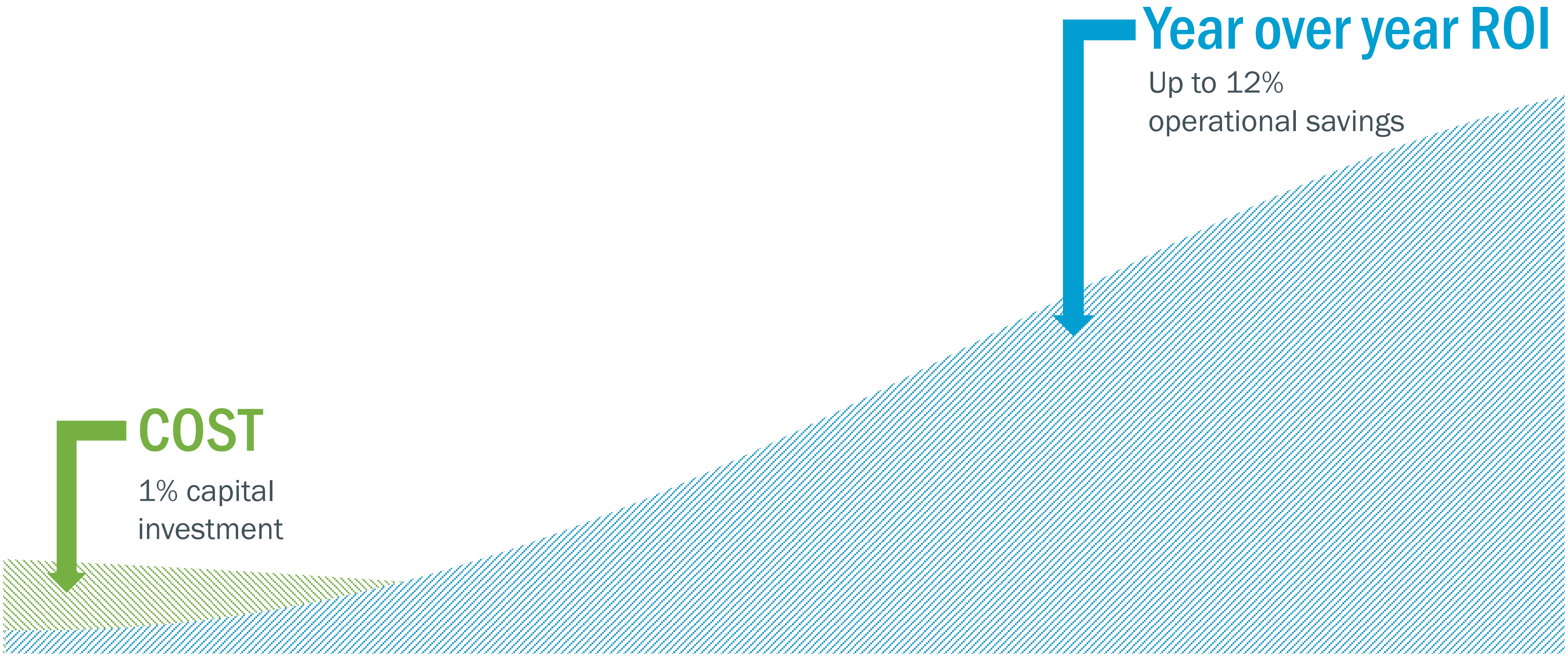


A staged approach to **implementing** Smart Utility allows you to implement new technology in phases to limit rework.

Leveraging analytics to empower our workforce
Progressive analytics



Start saving now



Example use-cases

AI

Wastewater Optimization

Leveraging analytics and new online sensors to save energy, chemicals and enhance nutrient removal

Distribution Water Quality

On line instruments, LIMS, Grab Samples, all being displayed on an overview map. Lead and copper and other contaminants management. Covers sources, storage, distribution, and blending.

CSO management

Combines rain information, hydraulic management methods and automation to best optimize collection systems.

I&I Detection/Management

Using IOT and other technologies identify where in the collection system infiltration is occurring.

Well Failure Prediction

Using AI and other data technologies to identify problems in the aquifer or well system.

EXAMPLE USE CASE:

Industrial discharge monitoring and collection system water quality monitoring

Industrial Discharges

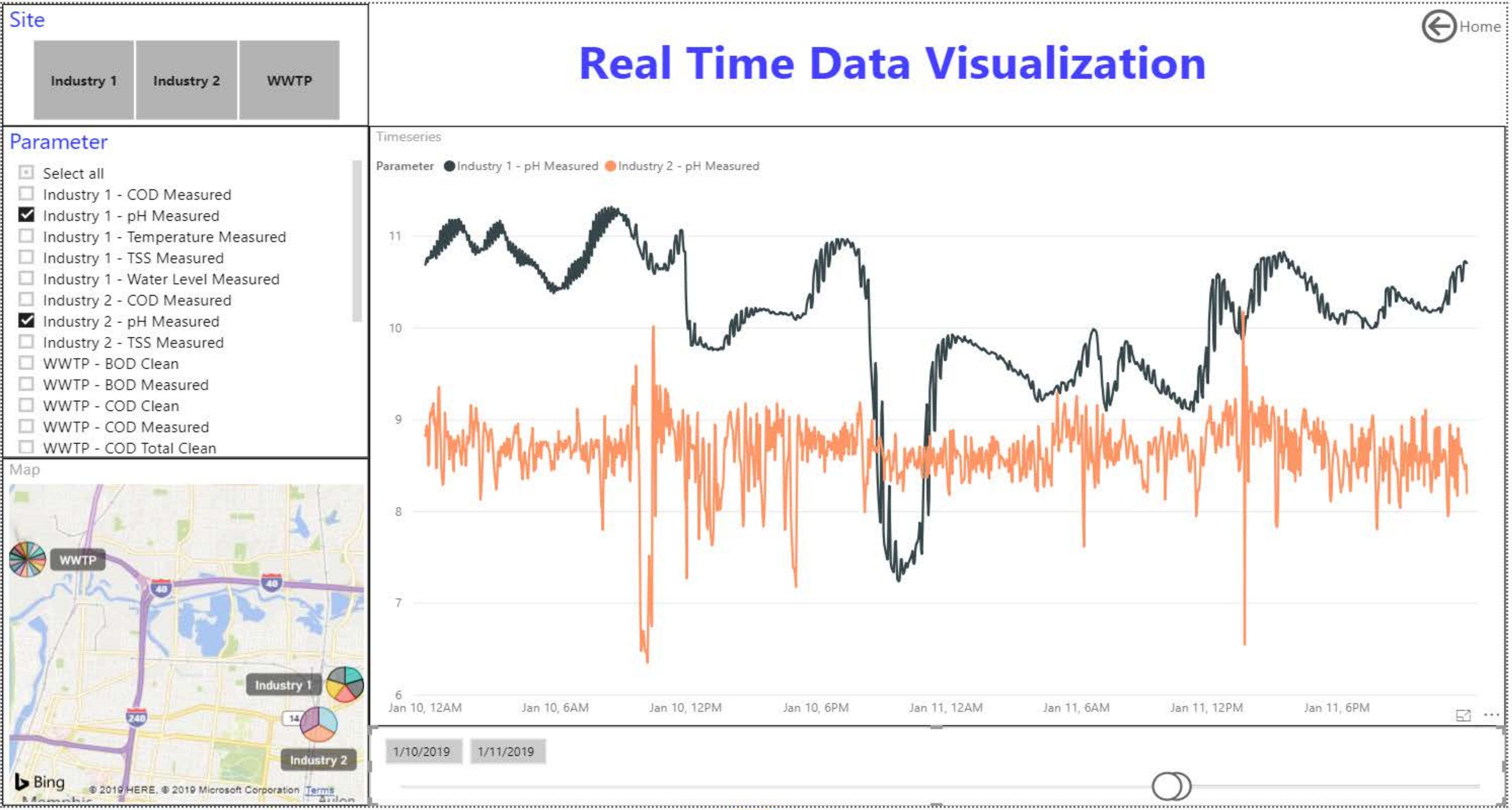
Impact wastewater treatment process

Understanding the timing and quality of discharges into sewer systems can enable a utility to more efficiently maintain asset integrity as well as NPDES permit compliance.

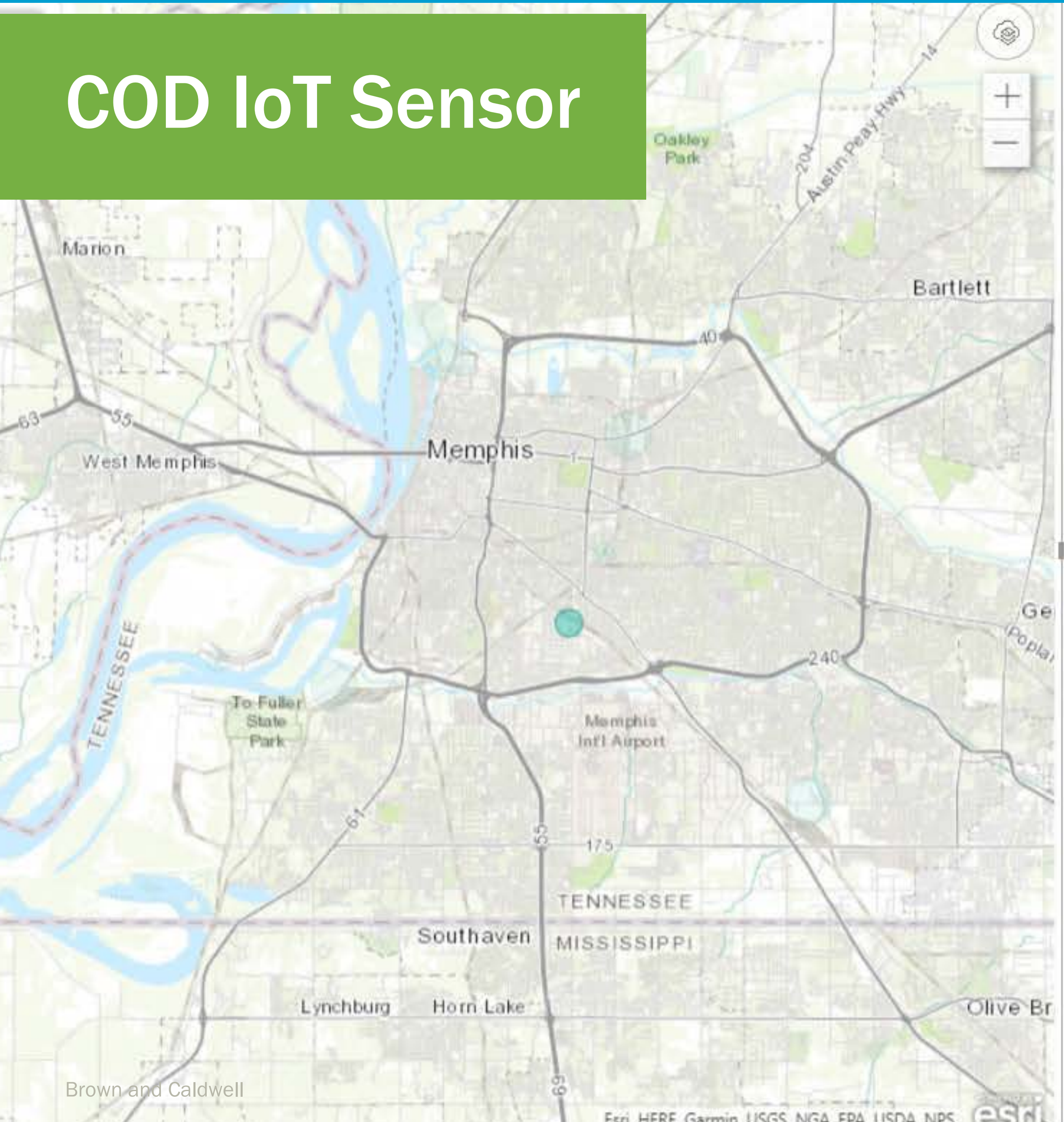
Improved water quality

City of Memphis Project Objectives

- The timing and the characteristics of industrial discharges to the collection system
- Installation of low cost IoT smart sensors to monitor industrial dischargers
  - COD, Total Suspended Solids (TSS), pH, temperature and flow monitoring.
  - High Frequency near real time data
- Cost and revenue KPI visualization


Site
Industry 1
Industry 2
WWTP
Home
Real Time Data Visualization
Parameter
Select all
Industry 1 - COD Measured
Industry 1 - pH Measured
Industry 1 - Temperature Measured
Industry 1 - TSS Measured
Industry 1 - Water Level Measured
Industry 2 - COD Measured
Industry 2 - pH Measured
Industry 2 - TSS Measured
WWTP - BOD Clean
WWTP - BOD Measured
WWTP - COD Clean
WWTP - COD Measured
WWTP - COD Total Clean
Timeseries
Parameter
Industry 1 - pH Measured
Industry 2 - pH Measured
11
10
9
8
7
6
Jan 10, 12AM
Jan 10, 6AM
Jan 10, 12PM
Jan 10, 6PM
Jan 11, 12AM
Jan 11, 6AM
Jan 11, 12PM
Jan 11, 6PM
Map
WWTP
Industry 1
Industry 2
Bing
© 2019 HERE, © 2019 Microsoft Corporation Terms
1/10/2019
1/11/2019

COD IoT Sensor



Industry-10

Permittee

Sample Date

3/5/2017 5/18/2017

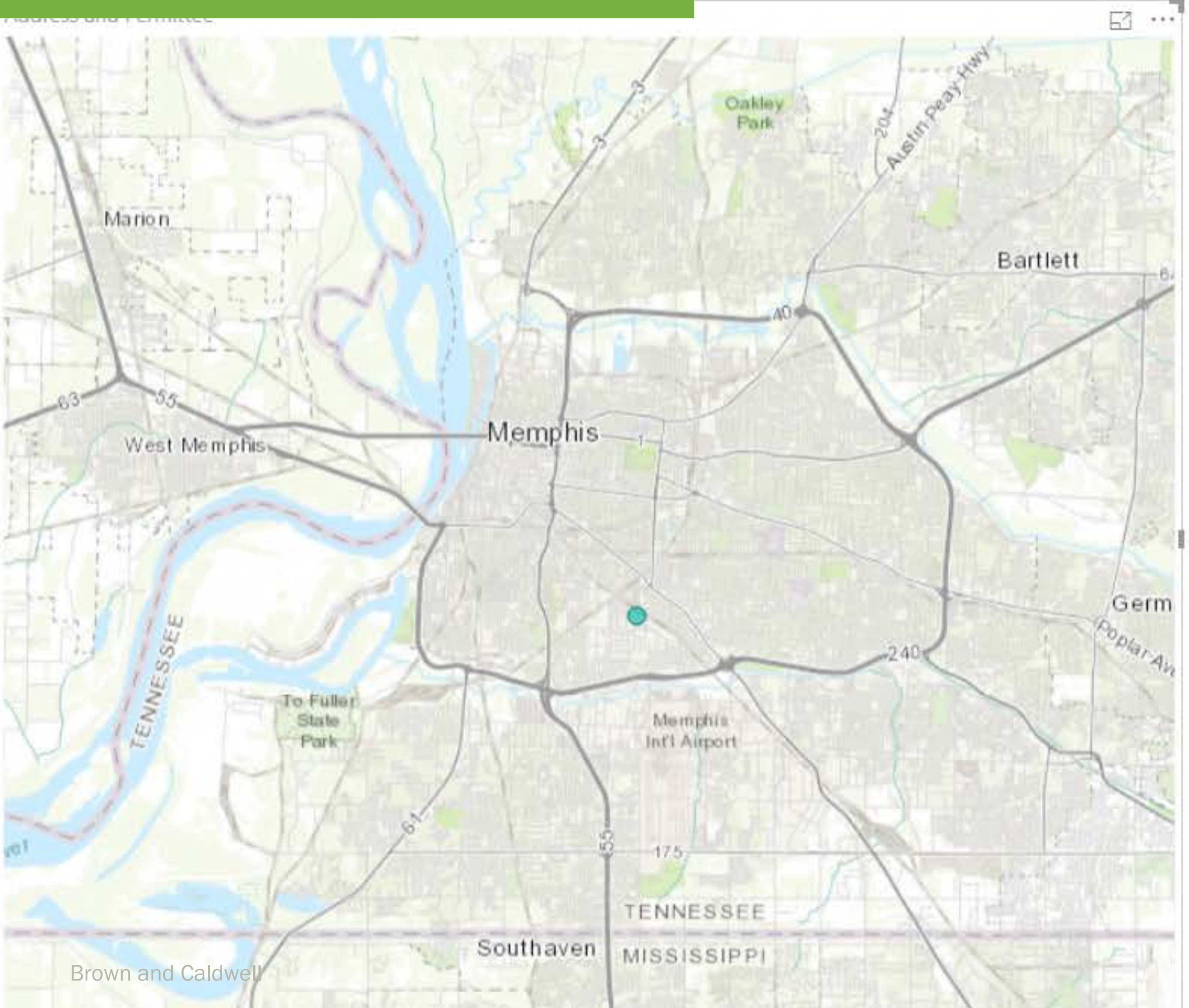
788.35K	1.58K	410.98K
COD Total (lbs)	Average of COD (mg/L)	Excess COD (lbs)

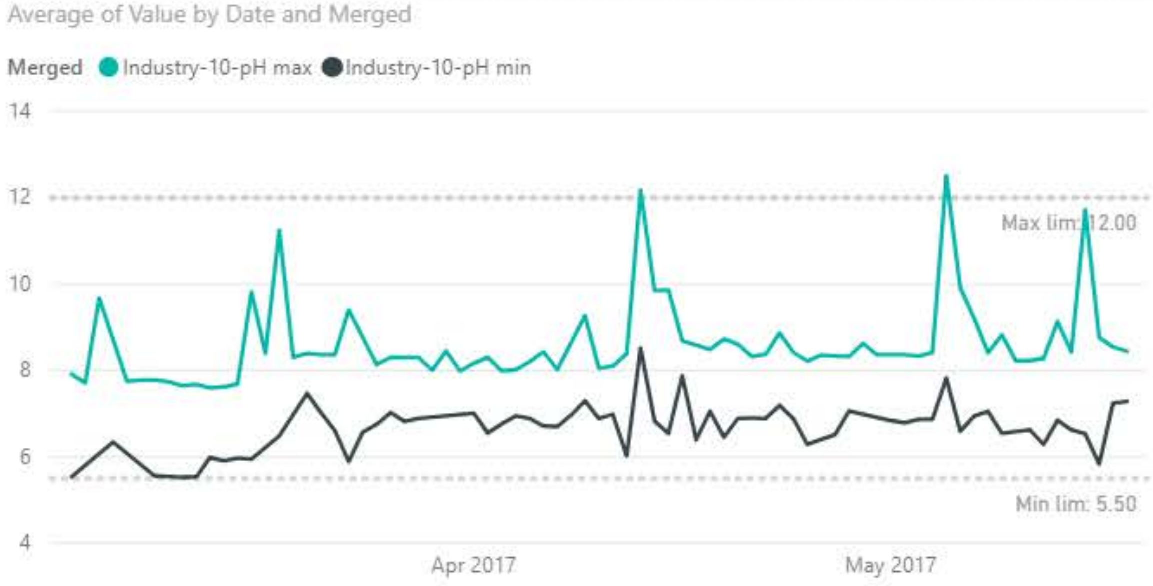
0.79

Average of Flow (mgd)

Industry Discharger 10 - COD

pH IoT Sensor





Date

3/3/2017 5/18/2017

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- [ ] Industry-1
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- [ ] Industry-2
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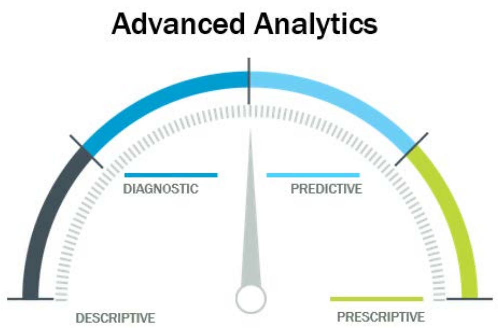
Industry Discharger 10 - pH

SMART SOLUTION:

Discharge monitoring = improved water quality



Using advanced analytics to...

- Baseline normal flow and water quality from industrial dischargers
- Identify harmful compounds
- Proactively act on abnormal influent conditions

- Internet & SCADA
- Hydraulic Modeling
- SCADA/Asset Management
- GIS *(Geographical Information System)*
- Field Sensors

Leverage a **Smart Utility Approach** to prepare your utility for the future workforce!

Brown and Caldwell

Thank You.
Questions?

it's about connecting

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Brown AND Caldwell : essential ingredients®

EXAMPLE USE CASE:

Water loss = lost revenue

10% - 35%

of water is lost to leaks

Municipalities that install smart water networks discover that leaking equipment is responsible for part of their unaccounted water.

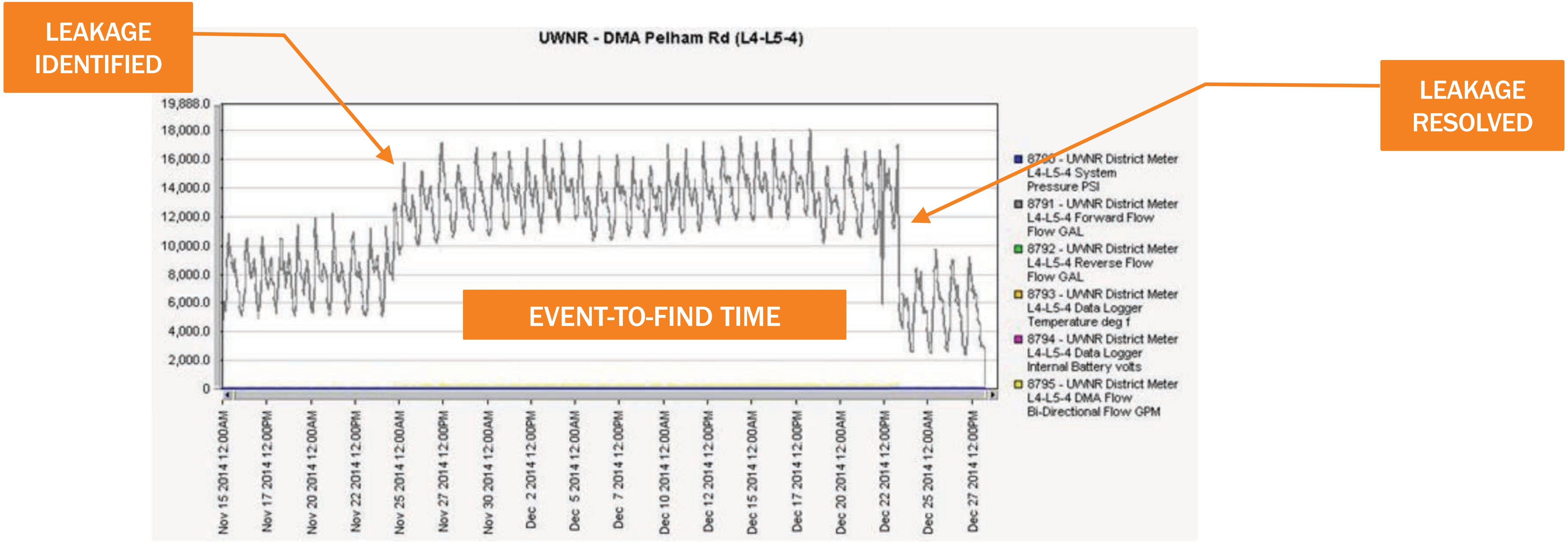
5% - 25%

of lost revenue

Around 17 trillion gallons (64.35 trillion liters) are lost every year in the U.S., according to the U.S. Environmental Protection Agency, costing the nation $2.6 billion annually. And all this water is lost through the estimated 240,000 main breaks in the water piping that occur across the U.S. every year.

DMA data processing & evaluation

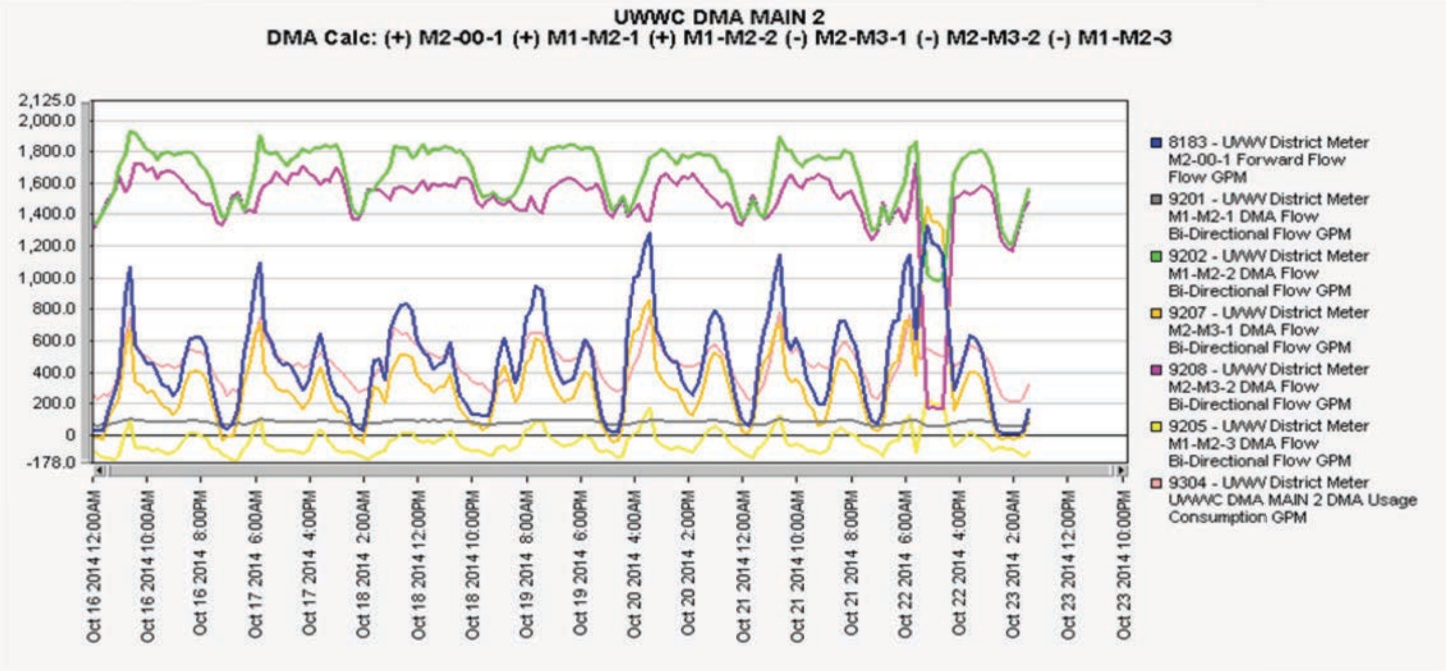
- 150 gpm Leak (216k gal/day) - ~$500/Day
- 6” Private Fire Service Line
  - Storm Drain Prevented Leak from Surfacing
  - Potential for Leak to Run for Long Durations
  - Winter Weather & Frozen Ground Conditions are Contributing Factors

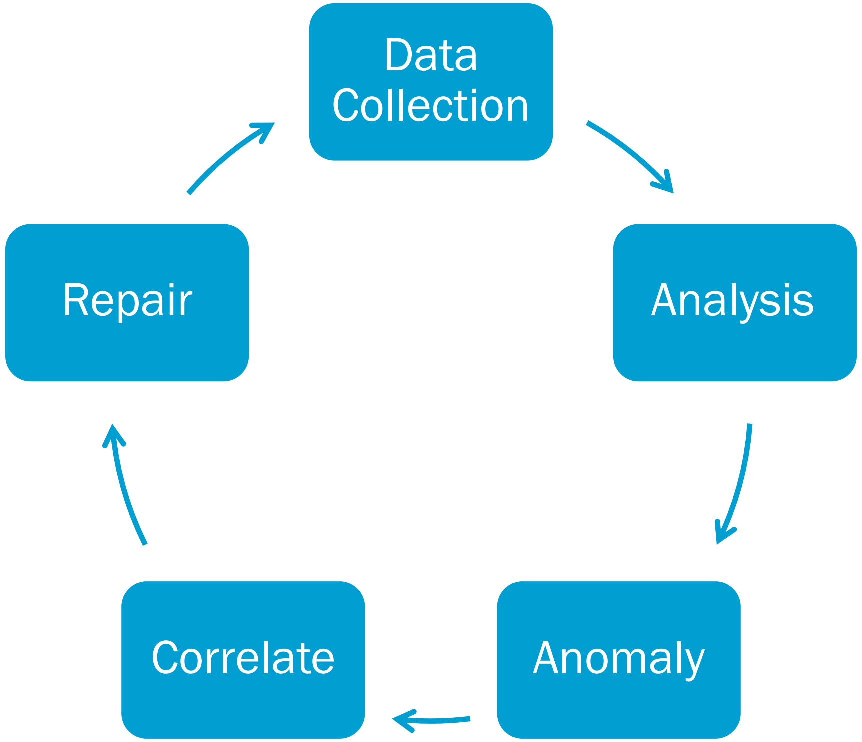


Manual DMA data processing & evaluation

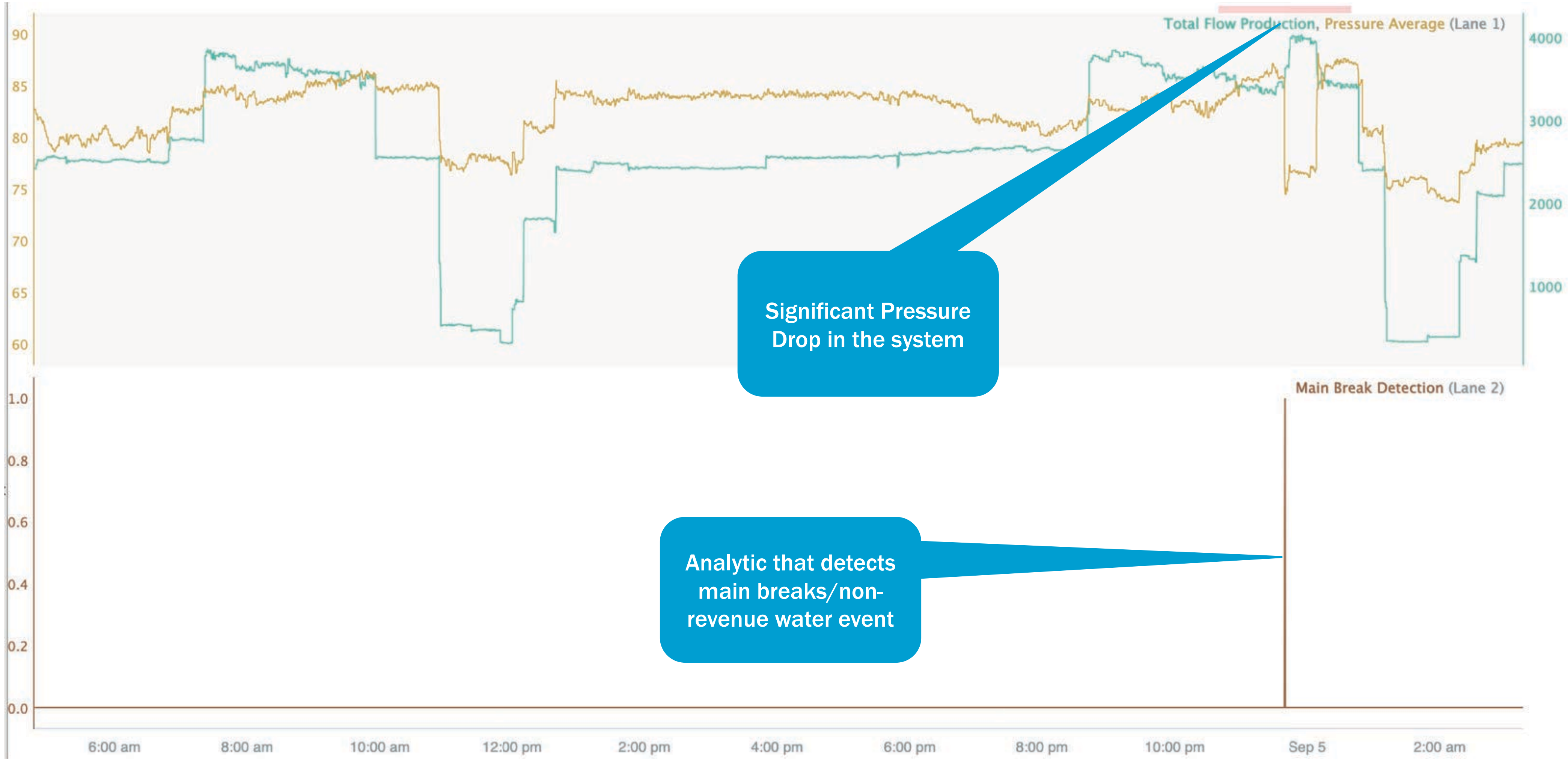
Real-Loss (Leakage) Targeting

- DMA Specific Reports
- Determine if Baseline Flow is High
- Monitor Overnight Flows and Patterns
- Identify Localized Leaks that have not surfaced



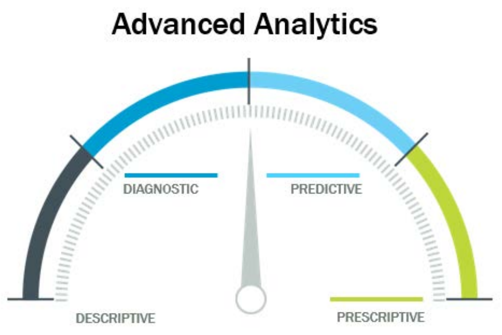


Near instant notifications (adaptive alerts) Approach to AI for non-revenue water event



SMART SOLUTION:

Mitigating water loss = resource protection



Using predictive analytics to…

- Identify potential leaks/breaks
- Prioritize main replacement
- Forecast future leaks/breaks

- Internet & SCADA
- Hydraulic Modeling
- SCADA/Asset Management
- GIS *(Geographical Information System)*
- Field Sensors