



Using Data Analytics and OSIsoft's Connected Services to Remotely Monitor and Optimize Energy Usage

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BLACK & VEATCH

INTRODUCTIONS



- **Jeff Neemann**

- 17 years - Water and Wastewater



- **Jacques Brados**

- 25 years - Computing, (9 years in Municipal Water)



- **Kevin Bogart**

- 17 years -Configuration Expert



WE'RE BUILDING A WORLD OF DIFFERENCE. TOGETHER.

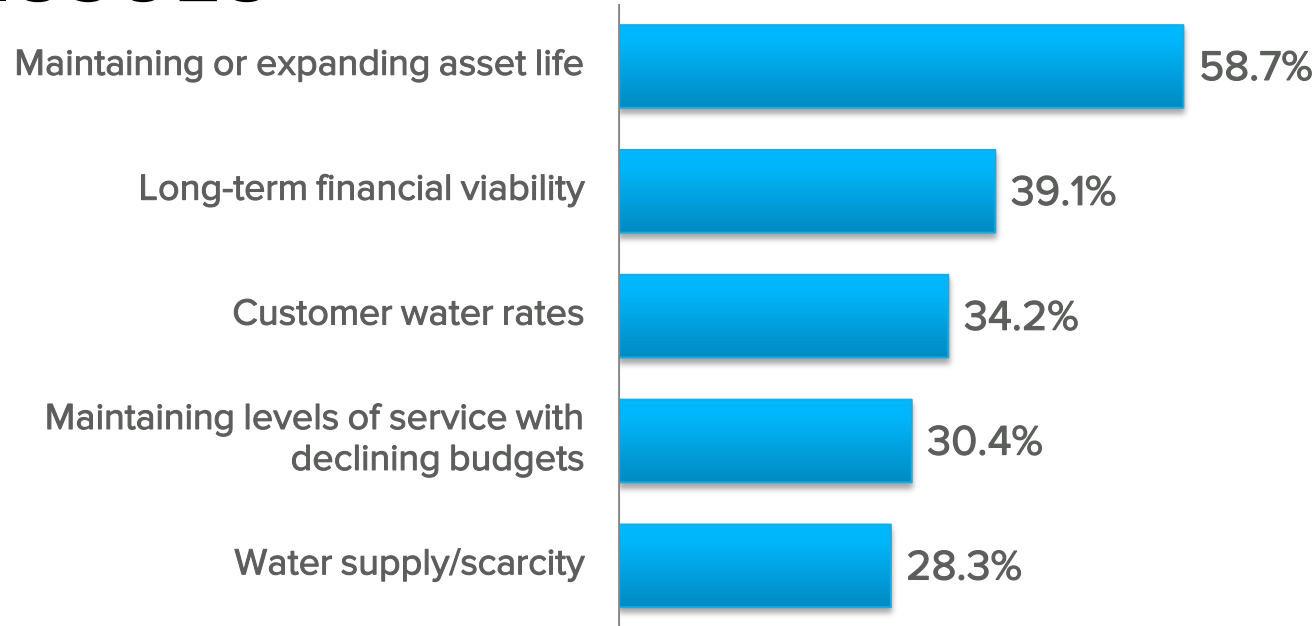
- **Founded in 1915**
- **Global workforce of more than 10,000**
- **Employee-owned corporation**
- **\$3.0 billion in annual revenues in 2014**
- **More than 110 offices worldwide**
- **Completed projects in more than 100 countries**

Black & Veatch conducts 7,000+ active projects globally at any one time

WHY ANALYTICS?



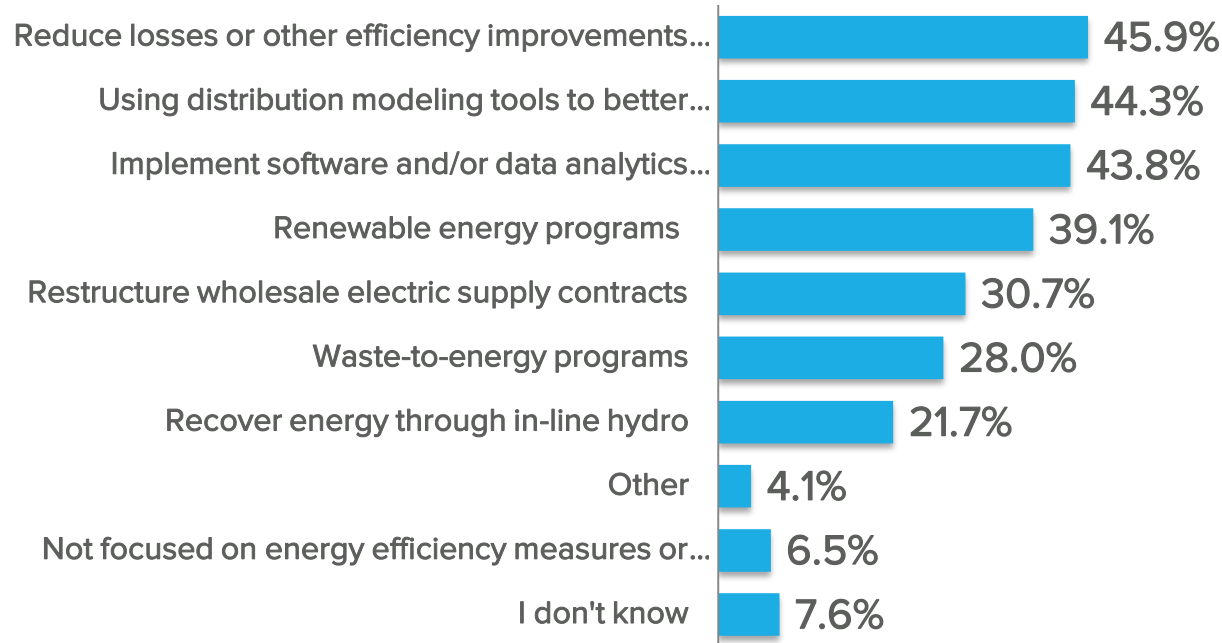
MOST SIGNIFICANT SUSTAINABILITY ISSUES



Source: Black & Veatch 2014 Strategic Directions: U.S. Water Industry

Respondents were asked to select the three most significant sustainability issues for their utility from a broad list of items. This chart highlights the five issues selected most among all respondents.

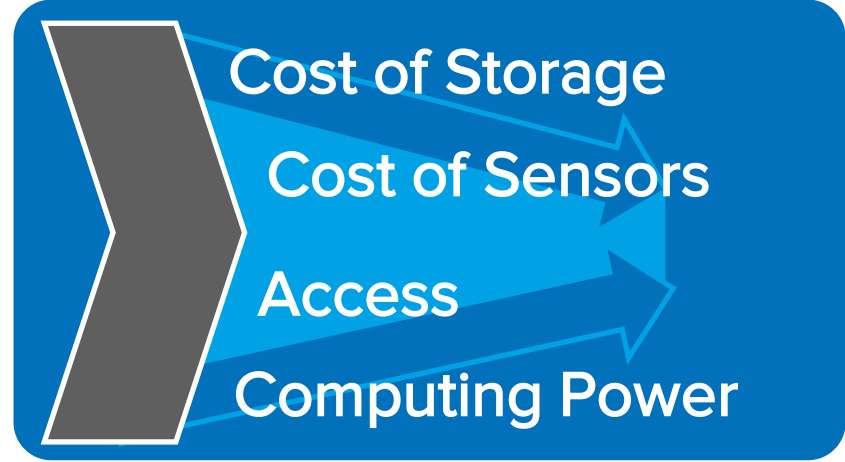
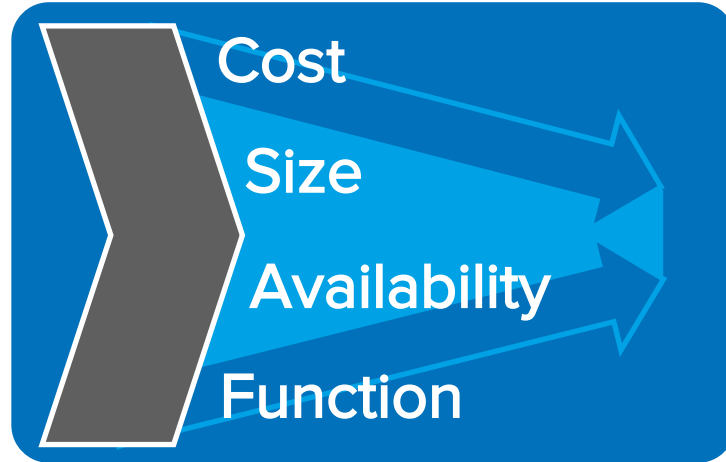
ENERGY EFFICIENCY / RECOVERY OPTIONS CONSIDERED OR IMPLEMENTED



Source: Black & Veatch 2014 Strategic Directions: U.S. Water Industry

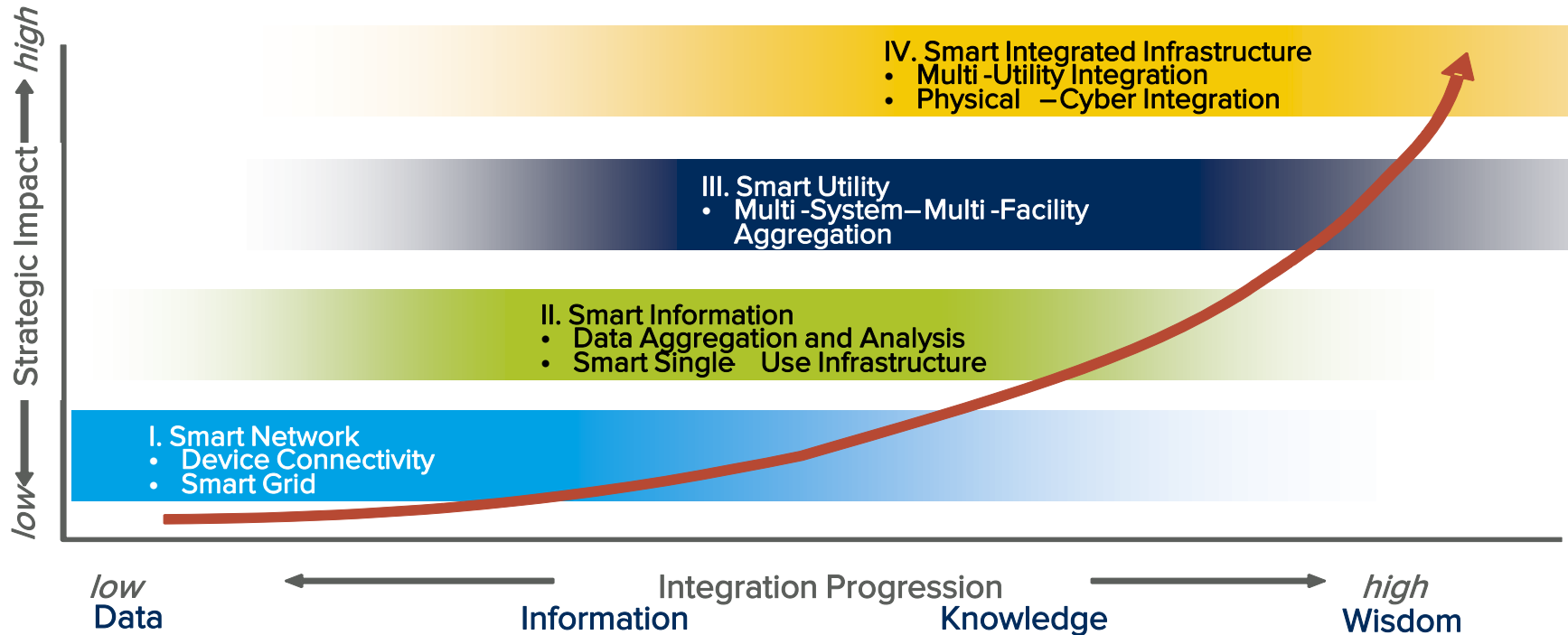
Respondents were asked which of the listed items their utility is considering or has implemented in order to proactively manage energy costs.

WHAT IS DRIVING ANALYTICS?



Data analytics will transform ability to make better, more informed operational decisions

HOW DO WE GET THERE?



Analytics is a journey and simplicity has a cost

INTEGRATED DATA MANAGEMENT & ANALYTICS

THE CHALLENGE IS KNOWING HOW TO CONVERT DATA INTO VALUE

Data



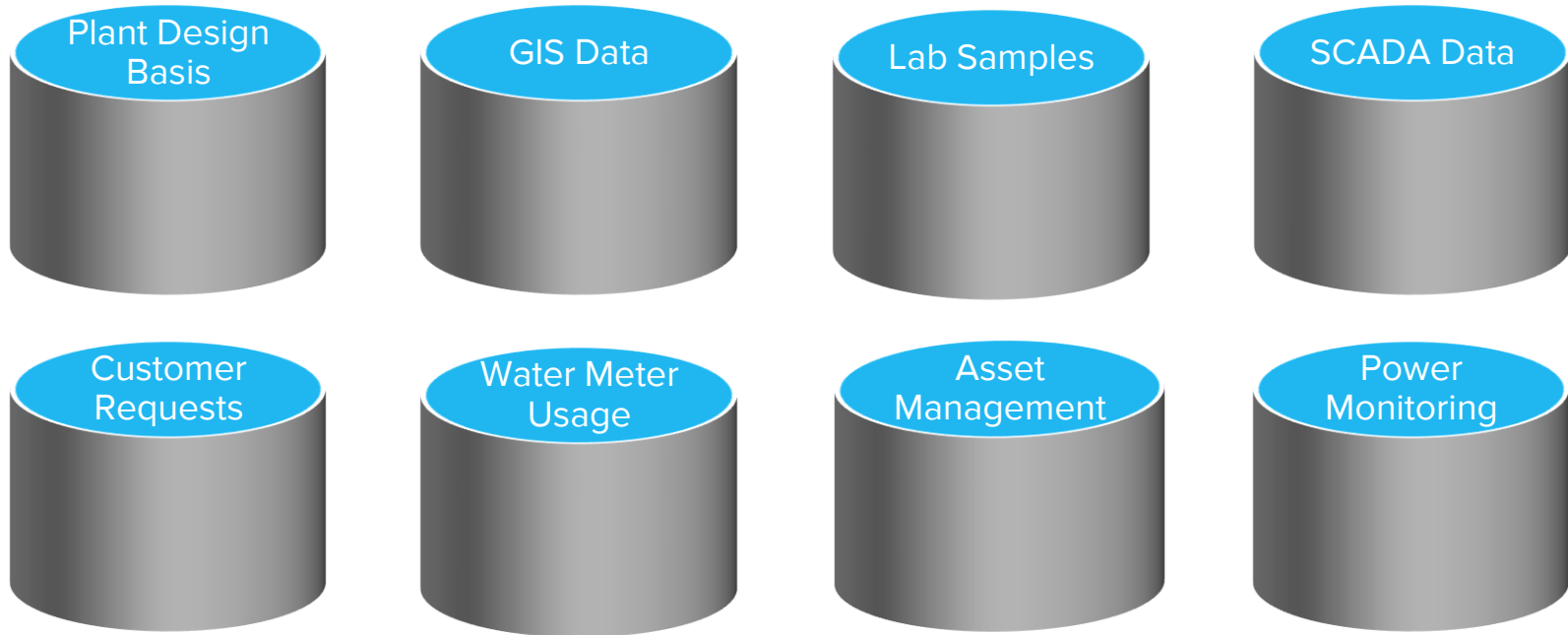
Value



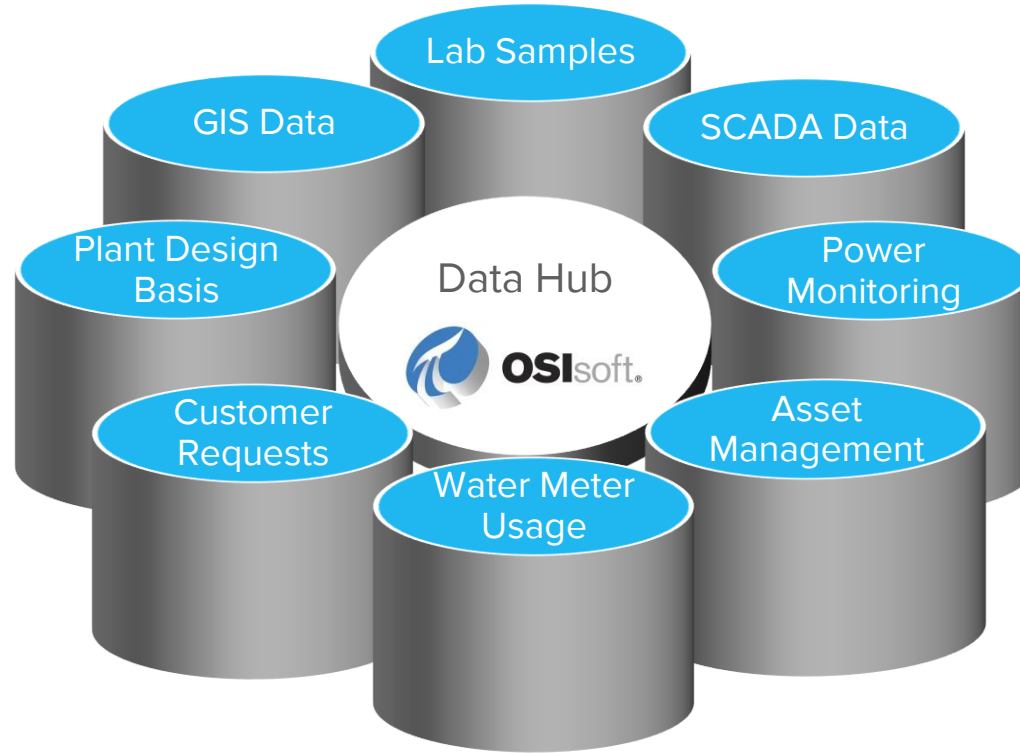
Black & Veatch ASSET360™ Platform

The bridge between data and value

DATA SILOS ARE PREVALENT



BRIDGING THE DATA SILO GAP



A PARTNERED OFFERING



ASSET360™

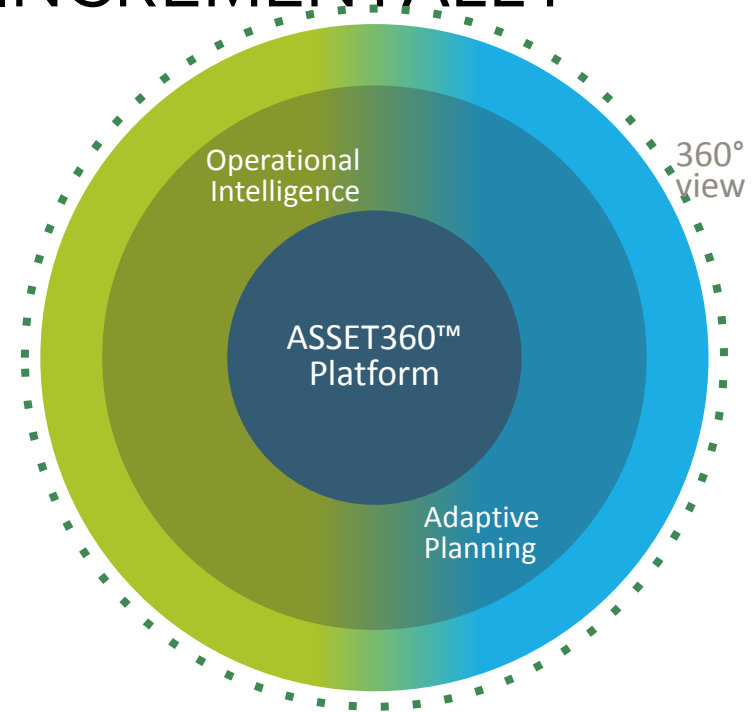


BLACK & VEATCH
Building a world of difference.®



B&V'S ASSET360™ PLATFORM ENABLES BIG ISSUES TO BE SOLVED INCREMENTALLY

- Big Data Management
- Single Point of Truth
- Solution Scalability
- Speed to Value
- Collaborative Problem Solving



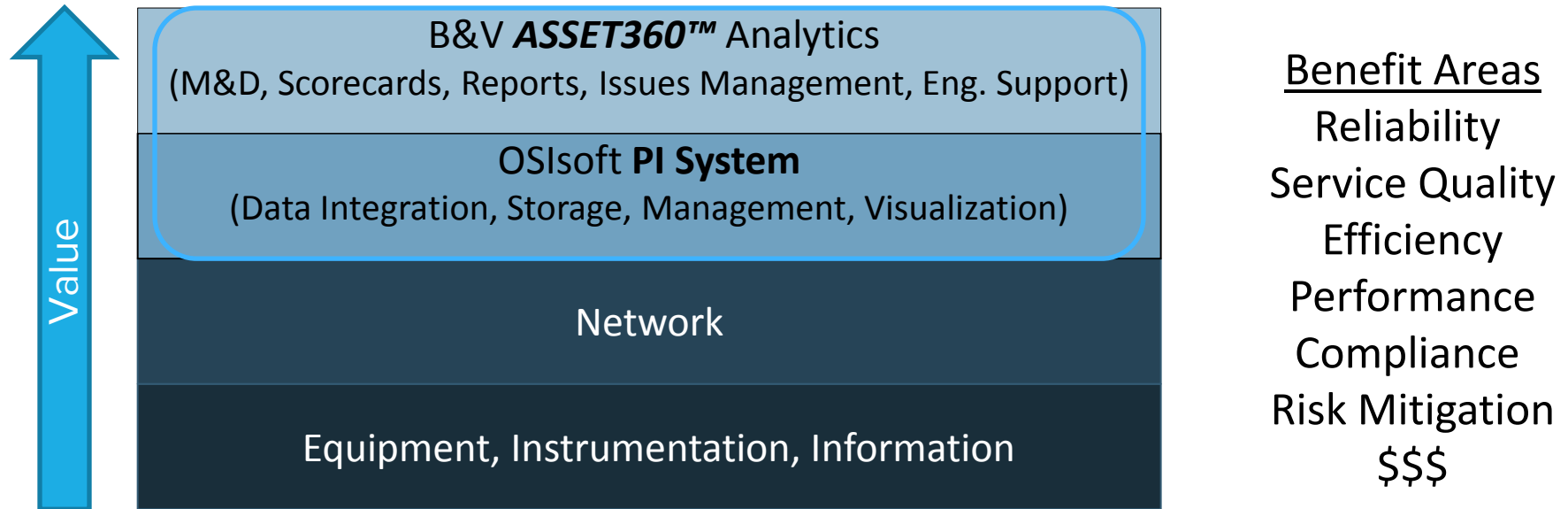
World-Class set of technologies, tools and capabilities

ASSET360™ MONITORING & DIAGNOSTICS



- **Collaborative monitoring services range from full scope to shared responsibilities to support of owner operated centers**
 - Improving Performance and Operations while Reducing Business Risk
 - 20+ Years of Experience, 200+ Customers including 120+ Monitored Sites
 - Deep domain knowledge and engineering expertise
 - ASSET360 Platform is basis for integrated Smart Analytics

BUNDLED DATA MANAGEMENT AND ANALYTICS



CASE: DISTRIBUTION SYSTEM ENERGY

DISTRIBUTION ENERGY SELECTION



- **District metered area has a well site and a pump station with reservoir**
 - What is the least expensive source of water based on energy?
- **Minimal information is needed**
 - Flow rate, pressure – SCADA
 - Electric rate – Electric company
 - Pump curves – Design documents

Determine most energy efficient water source

AF CALCULATION TEMPLATE

- **Electrical cost per million gallons**
- **$(\text{Electrical power cost}/(\text{Gallons}/1,000,000))$**

The screenshot displays the OSIsoft Element Designer interface for the 'WP_15' calculation template. The left pane shows the 'Elements' tree with 'WP_15' selected. The main pane shows the 'Attributes' tab for 'WP_15', which contains a table of calculation components. The right pane shows the configuration for the selected '\$/MG' attribute.

Name	Value
\$/MG	31.689393668812517
Electrical Power Cost	2.96000003814697 US\$
Electrical_Power	283.451499300836 kW
Flow Meter	6227.10986328125 gpm
Gallons	93406.6479492188 gal
Motor_Efficiency	95 %
Num_Pumps	1
Pressure Transmitter	76.9599990844727 psi
Pump_Efficiency	77.4460359862511 %

Configuration for '\$/MG':

- Name: \$/MG
- Description: Dollars Per Million Gallons
- Configuration Item: ☐
- Categories:
- Default UOM: <None>
- Value Type: Double
- Value: 31.689393668812517
- Data Reference: Formula

Settings...

Formula: $A = \text{Electrical Power Cost}; B = \text{Gallons}; [(A/(B/1000000))]$

Calculations on calculations on calculations

DISTRIBUTION ENERGY VISUALIZATION

- **Well Site**

- 34.7 MG
- 31 mWh
- \$1,855
- **\$53/MG**

- **Pump Station**

- 32.2 MG
- 23 mWh
- \$1,649
- **\$54/MG**



Operational flexibility to choose either water source
\$53/MG vs. \$54/MG

DISTRIBUTION ENERGY – A CLOSER LOOK

Well Site

- 34.7 MG
 - 31 mWh
 - \$1,855
 - \$53/MG
 - 1.13 MG/mWh
- **Pump station is more electrically efficient**
 - 1.4 MG/mWh vs 1.1 MG/mWh of electricity
 - **Why does cost look the same?**
 - Well site is on seasonal rate
 - Pump station is on time of use

Pump Station

- 32.2 MG
 - 23 mWh
 - \$1,649
 - \$54/MG
 - 1.43 MG/mWh
- **Changing billing rate saves**
 - 21% for pump station
 - 10% electrical savings for this pressure zone

Still considering the operational changes

NEXT STEPS – RECOMMENDED WATER SOURCE “TOMORROW”



Scale up - Operational Considerations

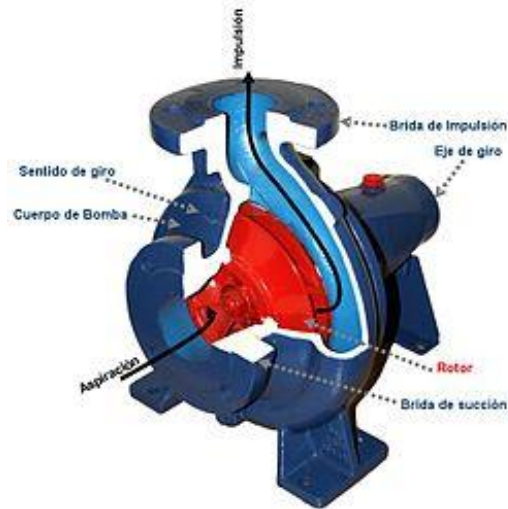
- Efficiency at different flow rates
- Electrical demand charges
- Water demand predictions
- Water production costs
- There are a total of six water sources

A clearer path to the future

SYSTEM ENERGY IMPACTS



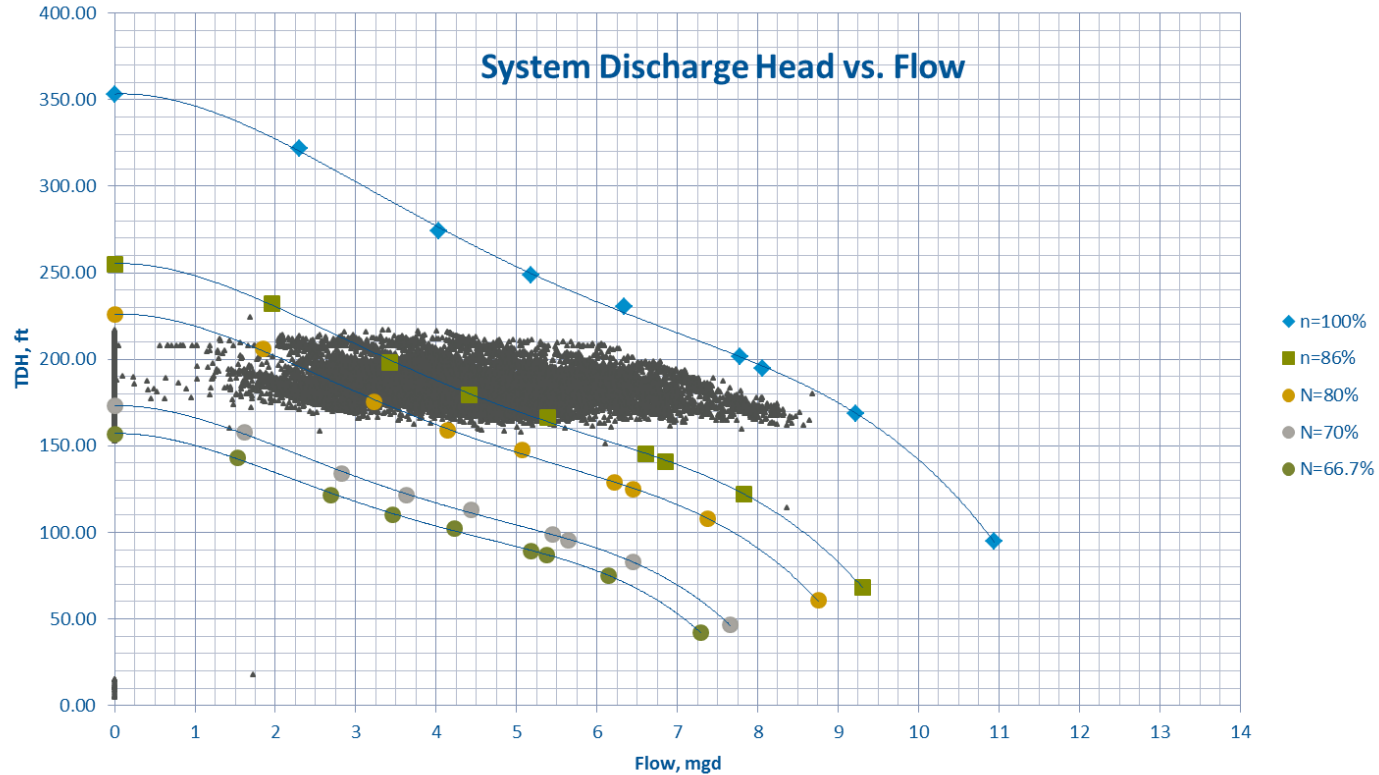
PUMPING ENERGY WASTED



- **Drinking Water Station with Three 250HP Pumps**
 - Three pumps needed more often to meet flow requirement which seems unusual
- **Information Needed**
 - Pump speed, flow rate - SCADA
 - Pump & System Curves – Design Docs

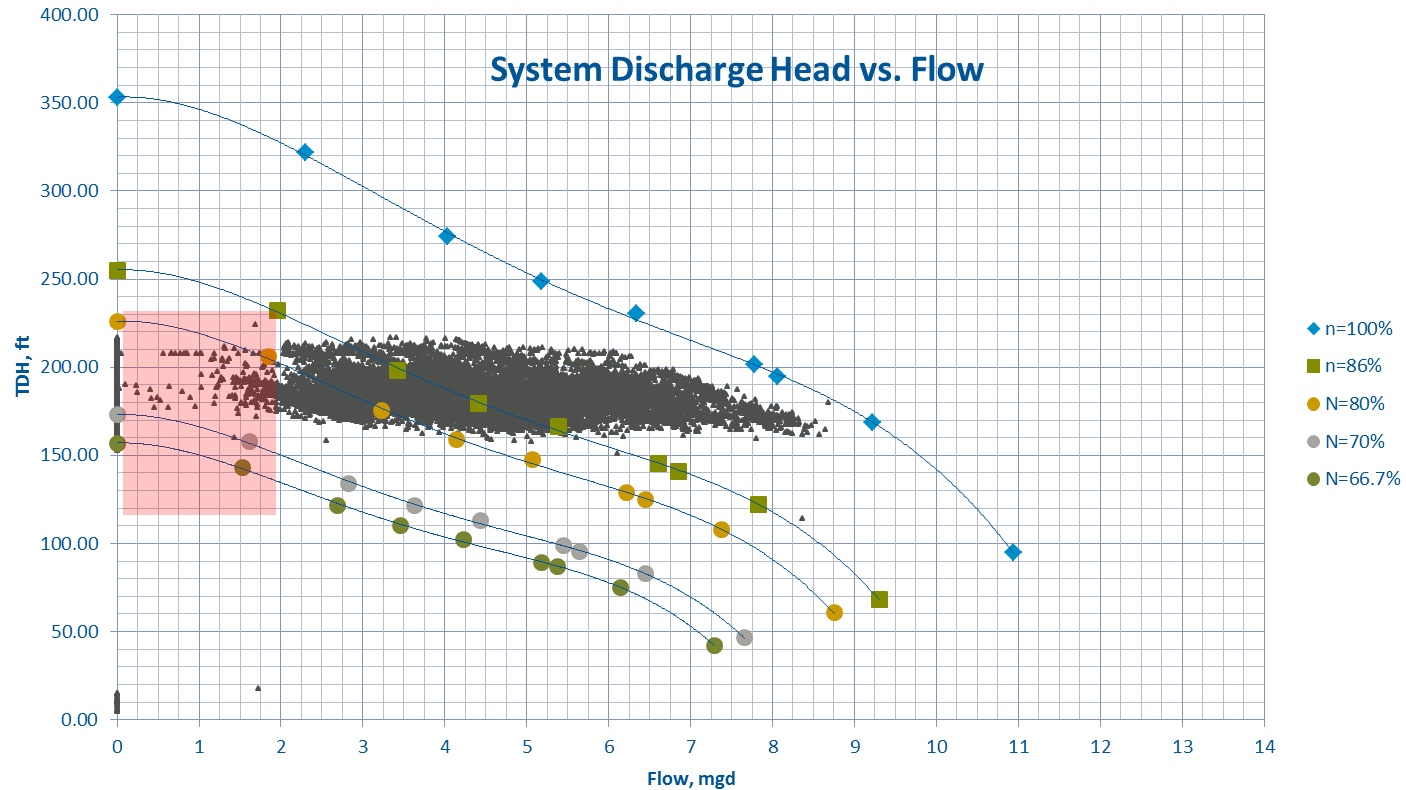
Pump station is 7 years old

PUMPS ALWAYS OPERATING NORMALLY



7 years of 15 minute SCADA data

MINIMUM FLOW = 2000 GPM



SCADA data and design data

RECIRCULATION CAVITATION HAPPENS

- **Pump 3**



7 years of wear

- **Pump 1**



ENERGY IMPACT



- **Estimated \$100,000 of lost energy spinning a pump with no impeller**
- **Challenging to notice because**
 - Electrical energy is not in SCADA
 - Design limits were not programmed
 - Used affinity laws to detect
 - $\text{Power} \sim \text{speed}^3$

Bring all VFD data into OSIsoft's PI System

THE FUTURE: CONNECTED SERVICES

PI SYSTEM AND B&V: CONNECTED SERVICES

- Cloud Connect - Publish and subscribe is an excellent solution
 - Customer on site databases can publish information to PI Cloud Connect
 - B&V PI Server subscribes to the customer data
 - B&V PI Server performs the analytics and publishes the result to PI Cloud Connect
 - Customer subscribes to the analytical result
- Benefits
 - Customer data is secure
 - B&V Intellectual Property is secure
 - Client can create their own Asset Framework based on values published by B&V
 - Allows Software as a Service (SaaS) purchasing option
 - Multiple customer data sets are kept separate

Cloud services maintains security and adds benefits

PI CLOUD CONNECT AND B&V ASSET360™

• Test Case 1 – Water Usage



- B&V providing PI server and connecting to...
 - Water meter usage database (Elster)
 - GIS maps(ESRI)
 - Water zone supply (Wonderware Historian)
- All levels of business and B&V will see usage and water loss by pressure zone

Solving Connectivity

PI CLOUD CONNECT AND B&V ASSET360™

- **Test Case 2 – Wastewater Plant Optimization**

- Customer with scarce IT resources
- B&V providing PI Server and connecting to...
 - Plant process values (Proficy Historian)
- All levels of business and B&V will have read only access to the plant optimization data



Developing Baselines



THANK
YOU

