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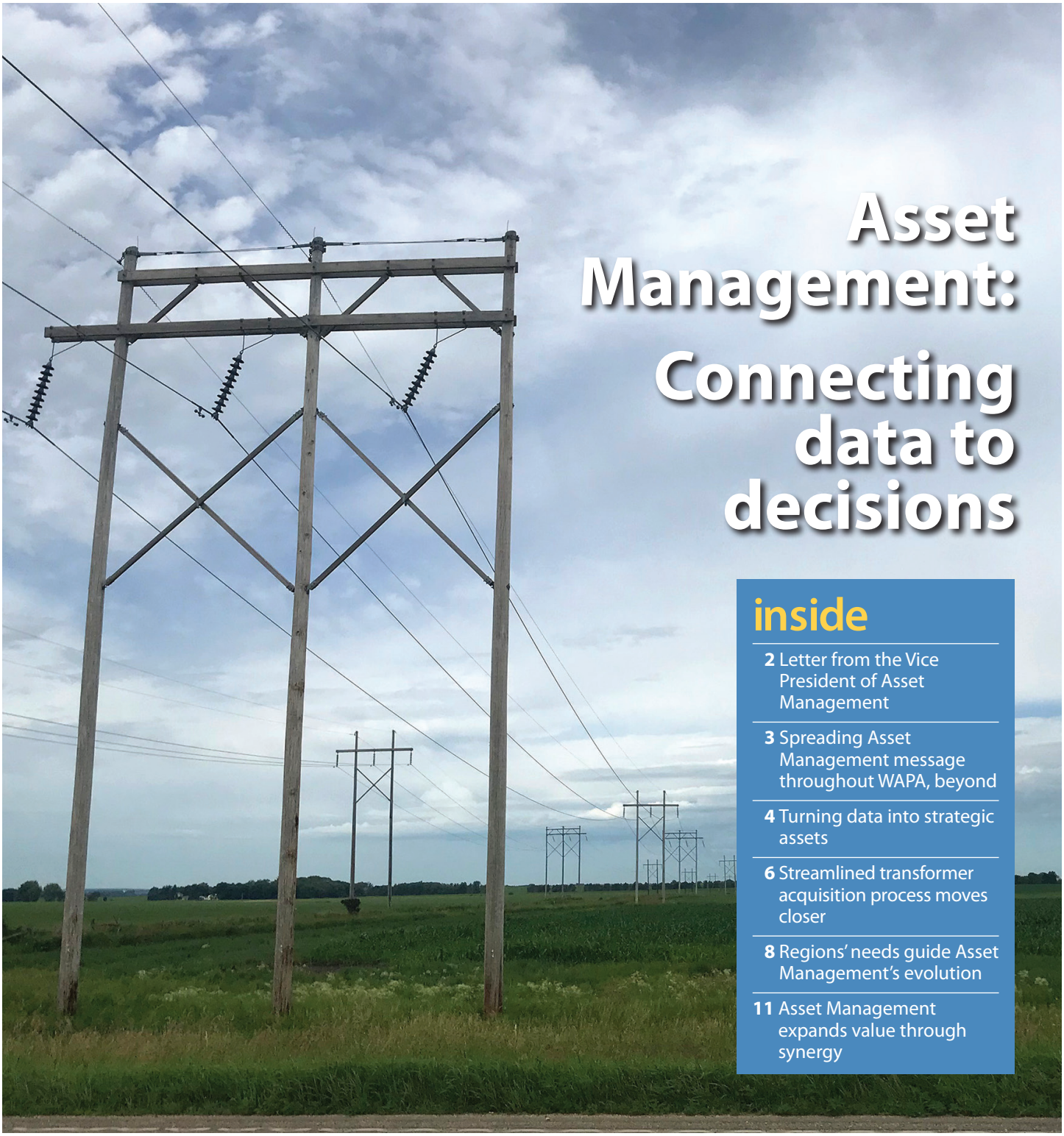
SUMMER 2019
WESTERN AREA POWER ADMINISTRATION



# Asset Management: Connecting data to decisions

## inside

# LETTER FROM THE VICE PRESIDENT OF ASSET MANAGEMENT

WAPA formally launched its Asset Management program in 2015 to improve the management of capital investments. Based on leading business practices rather than regulatory drivers, Asset Management fits into the critical pathway of Business, Technology and Organizational Excellence identified in WAPA's *Strategic Roadmap 2024*. Collecting and analyzing data about the condition of transmission equipment and sharing it with planners throughout WAPA will build a foundation for data-based investment decisions while maximizing the value of assets.

Although WAPA has successfully, if informally, managed its assets for many years, capital planning decisions relied heavily on the age of the asset and anecdotal information from field personnel. To get the most value from the capital planning process, WAPA needed to document the extensive knowledge of field crews and develop a consistent way to score and rank assets.

Asset Management has collected data that captures the asset's condition and the risk associated with its condition. The data integrate input from functional groups across WAPA, including Power Marketing, Operations, Transmission Business Unit, Construction and Engineering. This unique feature of formal asset management gives decision makers far greater insight into the consequence and subsequent risk of an asset failure from an enterprise perspective.

In its first three years, the program focused on the equipment that comprises a major portion of WAPA's transmission system, including transmission lines and breakers of 100 kilovolts and above and power transformers. As these initial efforts mature, they are yielding new data that demonstrate the benefits of the asset management strategy and provide direction for adding additional asset classes to the program.

In addition to adding new asset classes, Asset Management is now focusing on improving reporting. Creating user-friendly reports is a theme that runs through the stories in this issue for a good reason. The easier it is for decision makers to see, understand and apply asset data, the more they will be able to base business and maintenance decisions on solid information rather than arbitrary metrics—the reason Asset Management was established.

Chris Lyles
Vice President of Asset Management
Western Area Power Administration

# Spreading Asset Management message throughout WAPA, beyond

The success of a new program depends not only on accomplishing its stated goals but also on making sure that everyone in the organization knows what those goals are and how the program fits into the overall mission. This is particularly true with any kind of process-improvement program—the process will only improve if the stakeholders in the organization know about the program.

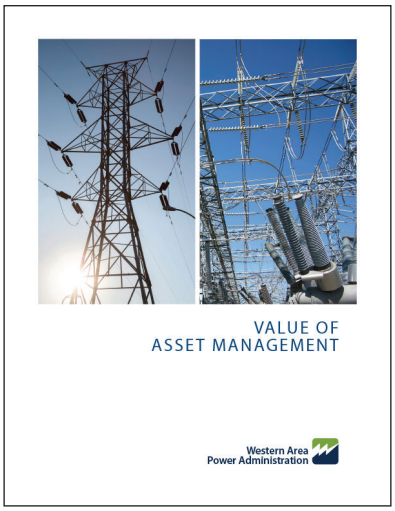
### Use it, improve it

Communicating the availability of asset data to every department in WAPA has been an integral part of Asset Management since its implementation. The program's communication plan identifies key stakeholder groups within WAPA as:

- Senior Leadership Team.
- Regional rate-setting organizations.
- Financial Leadership Council.
- Power Marketing Management Council.
- Power System Operations Council.
- WAPA Maintenance Management Council.
- Information Technology Senior Leadership Team.
- Acquisition Collaboration Team.
- Regional Asset Management specialists.
- HQ Asset Management specialists.
- Regional capital planning groups.

Meeting regularly with internal stakeholders has been key to the evolution of the program. Asset Management program staff attends quarterly meetings with WAPA leadership councils—in person, whenever possible—to hear from them directly. WAPA Administrator and CEO Mark A. Gabriel, who championed moving to a formal asset management strategy, strongly encourages this open exchange. "Input from senior leadership ensures that the program evolves in the way that best serves WAPA's needs," he said.

Vice President of Asset Management Chris Lyles added, "Communication is absolutely a two-way street for successful asset management."




### Almanac shares early successes

The communication plan also identifies external stakeholders, such as regional customers and industry groups, who could benefit from a greater understanding of WAPA's assets. These stakeholders are the audience for *The Value of Asset Management*, an overview of what the program has achieved so far. The almanac, as it is called, summarizes the type of data Asset Management has been collecting, what can be learned from it and how WAPA is putting that information to use.

Although it is not the program's first annual report, Lyles pointed out, it is the first one targeting external stakeholders. "Our past reports contained a lot of data that was only of interest to specific departments," he said. "Customers don't need or want to wade through that much granularity."

They may find the almanac valuable, however, to see how WAPA has set up its program. The reason for producing a report in a streamlined, reader-friendly format was to have something to share with customers to start a conversation about asset management. As the electricity industry discovers how the strategy informs budgeting, aids organizational knowledge retention and ultimately bolsters reliability, interest among utilities and other industry organizations is growing.

Actively participating in industry planning, technical committees and forums on asset management will help WAPA's program evolve, said Lyles. "Asset managers are still learning hard lessons and identifying best practices," he observed. "Reaching out to others in the electricity industry to share our experience will be key to the program's success."

Download the Asset Management almanac at www.wapa.gov, About, Asset Management

# Turning data into strategic assets

Strategic assets—both tangible and intangible—are the assets an organization creates or acquires that are essential to its operation. Asset management is a system for collecting and organizing data on strategic assets to inform decisions on maintenance, purchasing, budgeting and other areas. The routine collection of field and asset-level information can also be used to measure the asset's health and the risk to the organization. Viewed in that light, asset data is a strategic asset too, as essential to WAPA's mission of marketing and delivering affordable hydropower as electrical equipment and construction supplies.

The trick is turning raw asset data into a customized decision-making tool relevant to different WAPA program areas and regions. This has been a goal of WAPA's Asset Management program since its inception.

## Breakdown needed

In the broadest sense, what capital planners, maintenance planners and program managers need to know about a tangible asset is its condition, the likelihood of it failing and the potential effects of that failure on WAPA and its customers—health, risk and consequence, respectively.

In its first iteration, Asset Management collected that critical data in one database. "It was basically a matter of documenting what the field crews already know," explained Vice President of Asset Management Chris Lyles. "That gave us a lot of valuable information that, unfortunately, wasn't easy for people outside the program to see or digest."

## Creating a score card

To give that data greater visibility to different audiences, Asset Management developed a consistent scoring system that showed an asset's risk of failure, compared to the same or similar assets in WAPA's system. "This puts the pertinent data into a document that people sitting in a meeting can use to inform their discussions," said Reliability-Centered Maintenance Program Manager Jackie Brusoe.

An asset's health index and consequence data are used to determine its risk score. Factors such as age, maintenance history, function, design and operating capacity make up

the health index. "Traditionally, the age—the expected service life—of an asset largely guided decisions about maintenance and replacement," explained Brusoe. "Incorporating this other data gives us a much clearer picture of how a piece of equipment is likely to perform over time."

Consequence data measures the importance of an asset to the system. A circuit breaker in a substation that could cause a power loss to 100,000 customers if it failed, perhaps including a hospital or large factory, is an example of a high-consequence asset. If that circuit breaker were 45 years old and had a history of frequent repairs, it would have a high risk score and its replacement would be prioritized accordingly. The consideration of consequence data was the piece that was missing from the informal approach to asset management, Brusoe noted.

The scoring systems can be valuable to functional groups across WAPA outside of Asset Management. For instance, the Office of Security and Emergency Management can use it to prioritize physical security improvement projects on substations, while maintenance managers can focus on the transmission lines and critical substation equipment that will cost WAPA and its customers the most if they are not in service.

## Building better reports

Now that a scoring system is in place, Asset Management is tackling the challenge of refining the data to better meet the needs of its users. "We are always looking for intuitive ways to share asset data analyses with stakeholders," said Lyles.

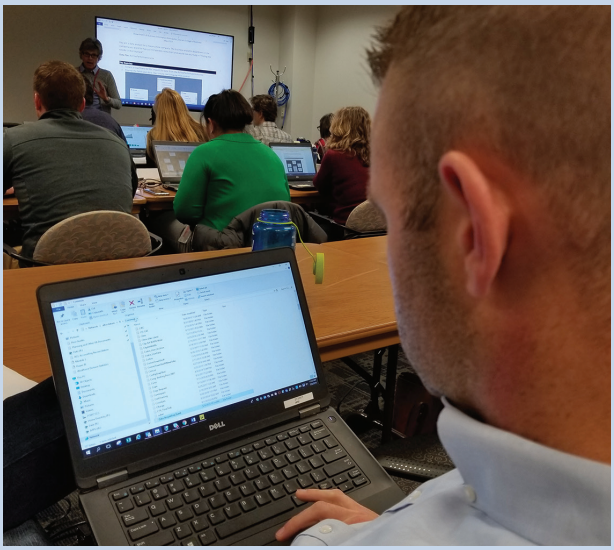
Currently, scoring data is mined from the same database that maintenance crews use to record the work they are doing and presented in Excel spreadsheets. "These software programs will give you all the information you need but in a pretty basic way," Lyles said. "We are looking to get away from using tabular data in reports, and moving toward visual displays that quickly provide valuable information to key decisions makers."

The Asset Management team is exploring advanced reporting tools that are designed to help end-users better visualize data. Talking with employees in different departments and regions (see pg. 8, *Regions' needs guide Asset Management's evolution*) will help to further shape the program's reporting techniques. "Tailoring the reports to show stakeholders how all these different factors interact with each other will encourage them to use the data to make strategic decisions," Lyles said. "That's when data truly becomes a strategic asset."

## Employees train in data visualization

Photo by Steve Gurzenski

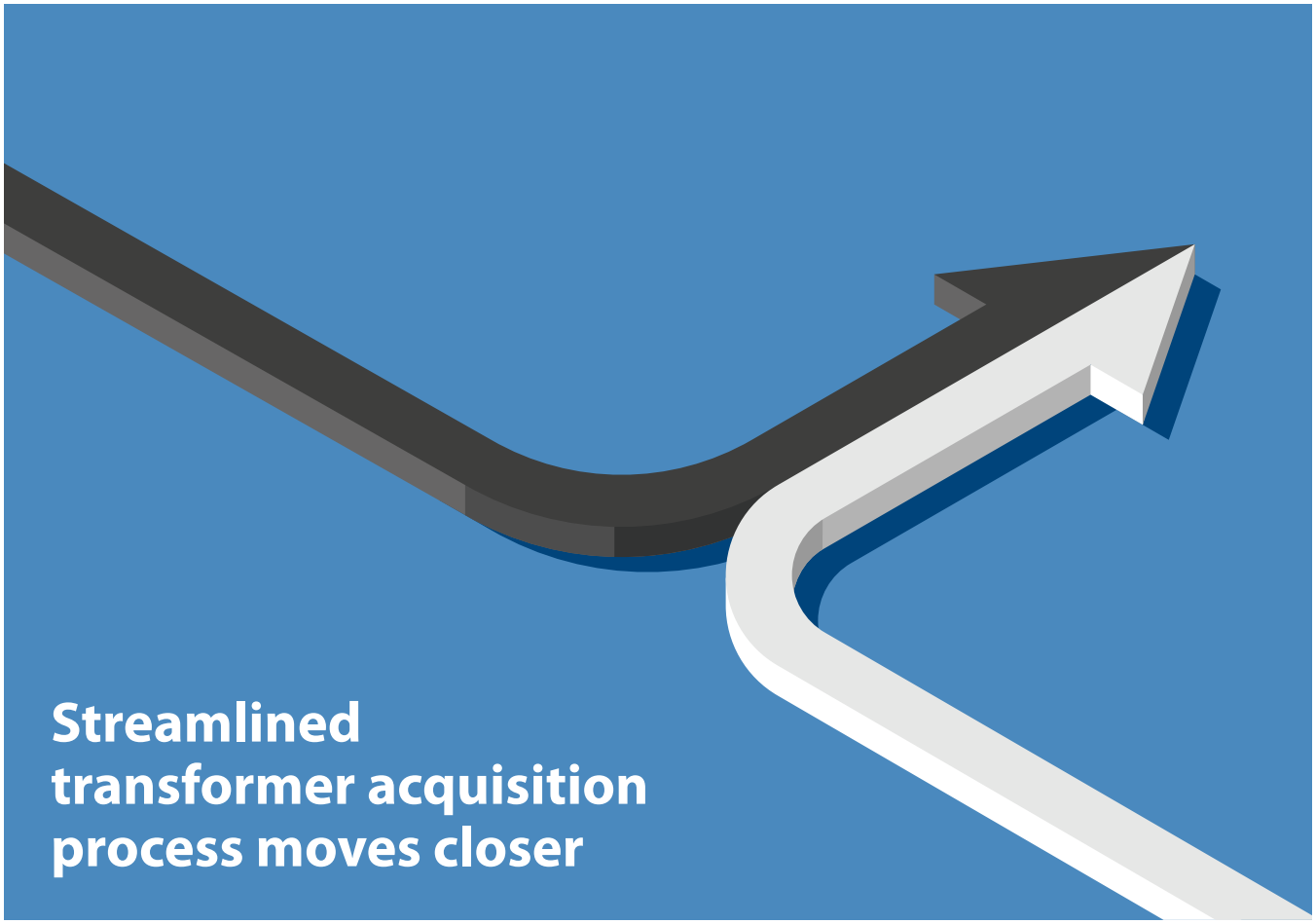
On May 7-10, 24 WAPA employees representing Asset Management, the Office of the Chief Information Officer, Enterprise Applications, Governance and Policy, Budget and Analysis, Financial Reporting and Procurement came together at Headquarters in Lakewood, Colorado, for the "Becoming a Visual Organization: The Power of Data Storytelling" workshop.



In support of the Data as a Strategic Asset goal in Tactical Action Plan 2019, participants learned how to understand the relationships between data, about various data-processing techniques and how to find compelling narratives within the data.

The attendees used election data, airline performance data and flu data to tell stories. By the end of the course, students learned how visualization tools could serve WAPA's data-driven culture.

*Note: Program and Management Analyst Leah Shapiro contributed to this story.*



# Streamlined transformer acquisition process moves closer

A transformer is a critical link in the transmission system, the failure of which can cause big problems ranging from power outages to fire. Replacing them, moreover, is not simply a matter of calling a warehouse for an off-the-shelf part. That made transformer acquisition a logical early focus for WAPA's Asset Management program and Procurement department.

Historically, the lead time for purchasing large-power transformers has been as long as two years. Faced with aging infrastructure, growing security threats to physical sites and an increase in extreme weather events, WAPA needed to streamline the process to ensure reliability and grid resilience. "WAPA needed a strategic and systematic process for acquiring large-power transformers, a process that could be used for all transformer acquisitions, including capital replacements, new installations and emergency replacements," said Vice President of Asset Management Chris Lyles.

## Standard specifications prove challenging

The first step in streamlining the acquisition process sounds deceptively simple: Develop a list of standard specifications for transformers and identify requirements for potential vendors.

However, transformers are geographically sensitive, making standardization in a territory as vast as WAPA's anything but easy. "Although the equipment does roughly the same job in the desert as it does in the Midwest, those transformers have different specifications," Lyles explained. "Even individual substation crews had specific needs and preferences."

Input from subject matter experts, field crews and electrical engineers was critical in compiling a list that meets the needs of all WAPA regions. With their experience in using various contracting mechanisms for procuring high-valued assets, Procurement specialists played a key role in identifying vendor selection criteria, as well. After determining how many transformers WAPA would need in the coming year and forecasting the number for the next three to four years, the project team was ready for the next step: "We are entering into a contract for an eight-to-nine-year term," Lyles said. "A long-term contract with a single vendor is significantly different from the typical one-off purchases with multiple vendors we have been accustomed to."

## Goal in sight

A great deal of effort has gone into resolving the many competing factors in standardizing transformer acquisition. The project team spent hours researching transformer requirements and specific asset fabrication needs, collecting data on previous purchases, interviewing equipment manufacturers and vendors and consulting with risk experts. "We only have to go through the process once, though," Lyles pointed out, "and it will help us cut the lead time for transformer acquisition by as much as half. Once a long-term contract is established, WAPA can begin working with the selected vendor to ensure we get the most reliable and appropriate product to serve our transmission needs."

The shorter lead time, along with a deeper understanding of equipment needs that arose from the research, should have a positive impact on grid resilience and performance. "It will also help to reduce procurement acquisition costs," Lyles added. "This is where strategic procurement plans and asset management really show their value."

## New transformer supports reliability, Folsom Dam

By Lisa Meiman

On June 4 Sierra Nevada celebrated the successful energization of the new Folsom transformer, on time and under budget.

The new transformer supports the reliability of the grid and Folsom Dam in northern California and also helps avoid future maintenance costs associated with the old transformer.

"The existing transformer was about 35 years old," said Project Manager Zia Islam. "Periodic maintenance by our electricians and Asset Management team revealed signs of poor health in addition to the asset coming to the end of its expected service life."

**A new transformer at Folsom Dam was installed after periodic maintenance and Asset Management data indicated the old unit was reaching the end of its service life.**

SN began planning to replace the old transformer around 2015, working with WAPA's Design and Procurement offices, the Bureau of Reclamation, the Central Valley Project Governing Board and construction contractors.

"We needed concurrence from Reclamation as a partner as they operate Folsom Dam," said Islam. "We had a series of meetings and discussions and came up with a plan in 2017 that was a compromise to replace the existing transformer with new one. Because of Reclamation's need to operate the pumps 24/7, we could not take the transformer out of service without a backup. An emergency backup consisting of large temporary generators was brought in during construction."

SN staff celebrated the project with a pizza party June 13.

*Note: Meiman is a Public Affairs specialist.*

# Regions' needs guide Asset Management's evolution

The concept of asset management is not new to WAPA. WAPA's regional offices—Desert Southwest, Rocky Mountain, Sierra Nevada and Upper Great Plains—along with the Colorado River Storage Project Management Center, have always managed assets. Field crews observed and kept notes about the condition and performance of tools, equipment and components as part of their jobs. This information helps regions budget for the repairs, replacements and work hours necessary to keep the system up and running, and it has become the backbone of Asset Management.

## Field crews see potential

The Asset Management team is now returning the favor by working with the regions to develop an actionable format for applying that data to maintenance and equipment replacement decisions. "The almanac was a good start for showing what Asset Management does, but we kept hearing from the regions that they needed greater granularity—more equipment-specific data," explained Reliability-Centered Maintenance Program Manager Jackie Brusoe.

Most of those comments came from maintenance staff who recognized the potential value of asset data. WAPA has always made data-driven decisions, Brusoe pointed out. "If a field office wants to replace or purchase equipment, they have to justify the expenditure to their managers," she said. "What Asset Management can provide is a greater detail, quantity and scope of data to help them make their business case."

The challenge is determining what information each region needs, since the regions differ widely in terms of their budgets, geography, climate, equipment on their systems and populations served. "You can't paint all the regions with one brush," Brusoe said. "Asset Management needs to fully collaborate with the regions to come up with the products they need."

## Rocky Mountain asks for help

An opportunity to collaborate with the Rocky Mountain region arose when Electrician Foreman II Paul Davis contacted Brusoe with a request. The substation electrician foreman in Cody, Wyoming, needed maintenance history and other data to justify breaker replacements. In the past, field crews had to pull together that information on their own, relying on the observations and experience of other crew members. "The engineers and foremen didn't always have the latest information, though," Davis noted. "Sometimes, because maintenance schedules rotate over a number of years, a newer foreman might not even have had a chance to touch the equipment in question," he added.

This time, Davis opted to take advantage of the extensive Asset Management database. "They have been collecting this data for a long time," he said, "and the way Jackie put the information into a table made it so much easier to use."

Brusoe's initial report was only the beginning, however. "The difference between my first attempt and the final product was huge," she admitted. "I had the idea of showing the whole breaker fleet on one page, but with pages of graphs that had tons of lines and bars."

Davis, with help from Field Maintenance Manager Don Hardy, offered suggestions on weighting the different data categories to give a clearer explanation of why the breakers needed to be replaced. The final report put all the breakers on one page and used a color coding system to highlight where a piece of equipment ranked in terms of age, risk to the system, overall health and lifetime maintenance cost. "Don and Paul were instrumental in driving toward a clean and concise product," said Brusoe. "Their input helped to clarify the kind of reports stakeholders would want from Asset Management."

## Playing long game

While Davis and Hardy were using asset data for imminent acquisition decisions, Maintenance managers Rich Hansen and Rob Manders were looking at incorporating similar reports into the Rocky Mountain region's 10-year maintenance plan. "We saw what they were doing with the data in Nebraska and Wyoming and thought it would be a good long-range planning tool," Hansen said.

*continued on Page10*

**Equipment classes that Asset Management plans to add to its database in the next few years include station batteries, current transformers, capacitive voltage transformers and IT network equipment.**

Again, a certain amount of trial and error was necessary to produce the exact information Maintenance needed for its plan. The first report folded the cost of purchasing and commissioning into maintenance, yielding extreme ranges. Purchasing and commissioning are one-time costs that are not part of ongoing maintenance expenses. "We asked Jackie to drill down to show whether maintenance was emergency, corrective or reactive and code those differences," said Hansen. "That gave us a clearer picture of maintenance costs."

Rocky Mountain's long-range maintenance plan will cover assets that are not yet included in the Asset Management program. Manders said he looks forward to eventually being able to get data on assets such as mobile equipment and transmission lines. "Data on the age and maintenance of those classes would be really useful to plug into a 10-year plan," he said. "People would like to see more asset-management-driven data."

People will be getting their wish as Asset Management plans to add four new asset classes each year. Input from the regions and other WAPA departments will be critical in prioritizing asset classes as well as in developing reports, said Vice President of Asset Management Chris Lyles. "When we launched the program, you could have asked most WAPA employees what Asset Management was and they would not have been able to tell you. We had to show them what we were bringing to the table," he acknowledged. "Now they are starting to tell us what they need."

## Unplanned maintenance data adds to picture

Transmission assets, such as circuit breakers, transformers and transmission lines, all need regularly scheduled preventive maintenance to continue functioning properly. Similar to oil changes or tire rotations on a car, this type of maintenance is expected and planned.

However, there is another type of event in the maintenance universe: unplanned maintenance. The repair of failed equipment necessitated by an act of nature or random chance generally falls into one of three categories:

- **Emergency** - occurs when an equipment or facility problem significantly threatens safety, profitability or the overall integrity of the system.
- **Reactive** – occurs following a breakdown or observance of unusual performance to restore the asset to normal operating condition.
- **Corrective** – occurs when inspections, preventive maintenance tasks or work orders uncover a problem. These issues typically do not affect the health or viability of a facility and its employees.

Although the detailed information in unplanned maintenance activities has not traditionally contributed to asset health scores, cross-referencing data about unplanned maintenance work orders will increase the value of Asset Management reports and help the WAPA Maintenance crews the program ultimately serves. "These events add detail to the picture of asset health and are valid to factor into maintenance and capital planning decisions," said Lyles.

Asset Management has taken an increasingly active role in tracking unplanned maintenance and is working on developing standardized applications. "Once we started analyzing data from unplanned maintenance work orders, we noticed that events are not consistently defined or classified from region to region," Lyles observed.

So far, he added, maintenance workers have not seen unplanned maintenance data reflected much in asset reports, but that will change as the approach to collecting and reporting the data gets more methodical. "When field crews see their data put to use, they get enthusiastic about collecting it and they provide us a better quality of data," noted Lyles. "The primary purpose of Asset Management is to provide WAPA's maintenance community with information that helps to ensure the most resilient grid for the least cost and labor."


# Asset Management expands value through synergy

As WAPA's Asset Management program matures, unexpected pathways for improving efficiency and decision making are emerging. Reliability-centered maintenance and geographical information system data are two areas in which data sharing could yield significant benefits.

## Toward greater reliability

Reliability-centered maintenance is a component of asset management that focuses on the goal of ensuring that important power system equipment continues to function. The approach leverages data field crews already gather on the type and frequency of maintenance on specific assets and what type of equipment works best in particular operating environments.

In the short term, Maintenance uses this information to establish regular schedules of maintenance and prioritize limited financial and personnel resources. It also helps Procurement refine vendor criteria for future acquisitions. Incorporating this data into Asset Management regional reports will support increased cost effectiveness, reliability, equipment uptime and a greater understanding of the risk level that WAPA is managing.

## Location, location, location

GIS, or the geographic information system, plays a key role in Asset Management, starting with being the system WAPA uses to locate rights-of-way, transmission lines, communication sites and substations to name a few assets.

Geospatial displays include information about the terrain, vegetation and climate surrounding an asset. All of this data provides insight into the operating environment of an asset and can give Maintenance a clearer understanding of the conditions field crews face. GIS serves as the system of record for more than 100,000 WAPA transmission line structures. The system is also the central hub for the condition-based transmission line data gathered by field crews during their routine inspections.

WAPA is fortunate to have a GIS team and supporting Information Technology partners who are among the best in the utility industry. By leveraging this extensive GIS expertise and capability, Asset Management can support efforts such as strategic vegetation management, environmental management, fire mitigation and emergency preparedness. There are also opportunities to acquire data from other federal agencies that can be layered into displays to determine other risks.

The purpose of Asset Management is to provide Maintenance with a framework to parlay data on equipment, processes and customers into greater reliability and more cost-effective operations. In the process, the program continues to uncover synergies with other functional areas that have the potential to improve business practices across WAPA.

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