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PNM’s Journey to data integration and optimized operations

Removing the noise

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Agenda

- About PNM
- The case for improved data operations
- PNM's road to improvement
- Results delivered to the organization
- Lessons Learned

Powering New Mexico homes and businesses since 1917

- More than 525,000 residential and business customers across New Mexico
- 15,428 miles of transmission and distribution lines
- 2,982 megawatt installed generation capacity.
- 18+ solar centers powering more than 60,000 homes
- Investing in 1 million solar panels, New Mexico is in the top 10 nation-wide for solar installations
- Wind power supports 73,000 homes

PNM’s journey to decarbonization

Major Legislation

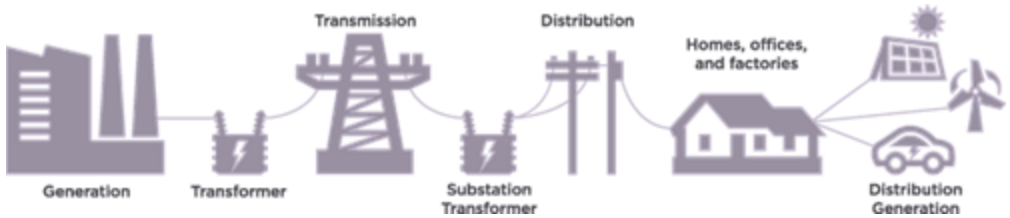
New Mexico Energy Transition Act sets mandates for utilities to achieve 100 percent emissions-free generation by 2045.

- 40% renewable energy by 2025,
- 50% by 2030 and
- 80% by 2040
- PNM has a corporate goal to be 100% carbon-free by 2040

Making the case for improved data operations

Enabling decarbonization requires new ways of working

Traditional Utility Operating Model



Decarbonization Operating Model

Plan and forecast for centralized generation resources, T&D resources
Customer as a consumer
Clear visibility & control of utility generating assets; little visibility / control of substation/distribution assets
Minimum load & ramping constraints met by traditional capital investment
One-way flow of energy and dollars
Centralized generation aligned to PNM dynamic load

DERs integrated into resource and system planning
Customers are prosumers and well connected to PNM
DERs leveraged for local and global system support
Clear visibility & control of all grid assets
Non-wires alternatives as important as traditional capital investment
Multi-way flow of energy and dollars, distribution marketplace established
Energy storage aligned to PNM dynamic generation

BLACK & VEATCH

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The impacts of poor operational data grow with decarbonization

• 10% of an annual operational budget	(Uni. of Tennessee, Chevron)
• 4% of a capital project improvement (8x cost for OO)	(NIST)
• 1% loss in OEE (Overall Equipment Effectiveness)	(IDC)
• 19% lower CAGR due to technical debt (bottom 20% performers)	(McKinsey)
• 64% believe unplanned downtime will decrease	(KG Research)
• 5% of the capital project value	(Forrester Research)
• 57% potential reduction in construction waste management by leveraging BIM	(Uni. Of Alabama)

"We started seeing that all our capital projects were grossly over budget, after a root cause analysis, almost all were due to wrong or missing information"

Capital Project Engineer – Pulp & Paper Industry, LA

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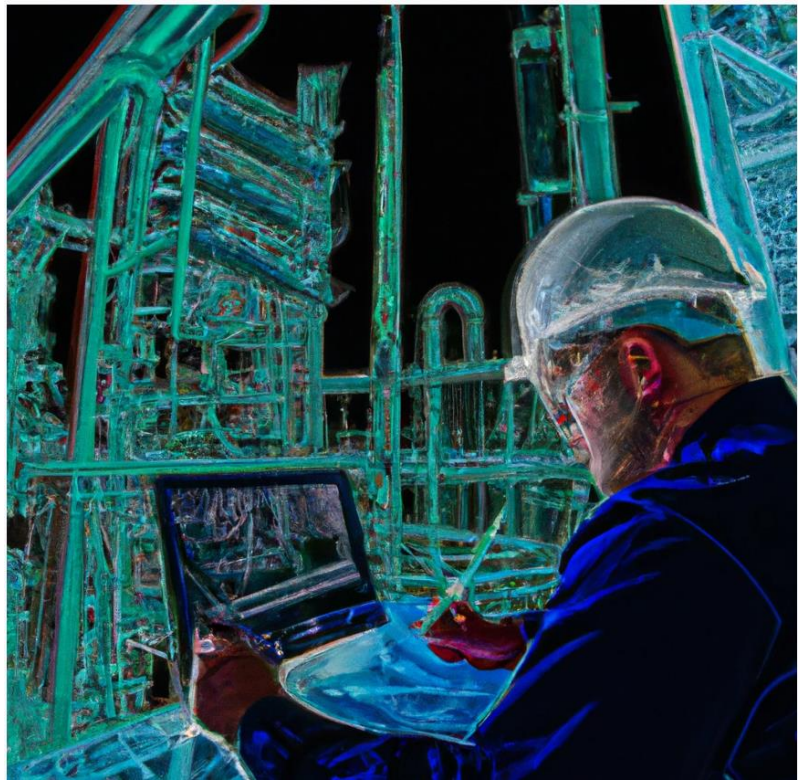
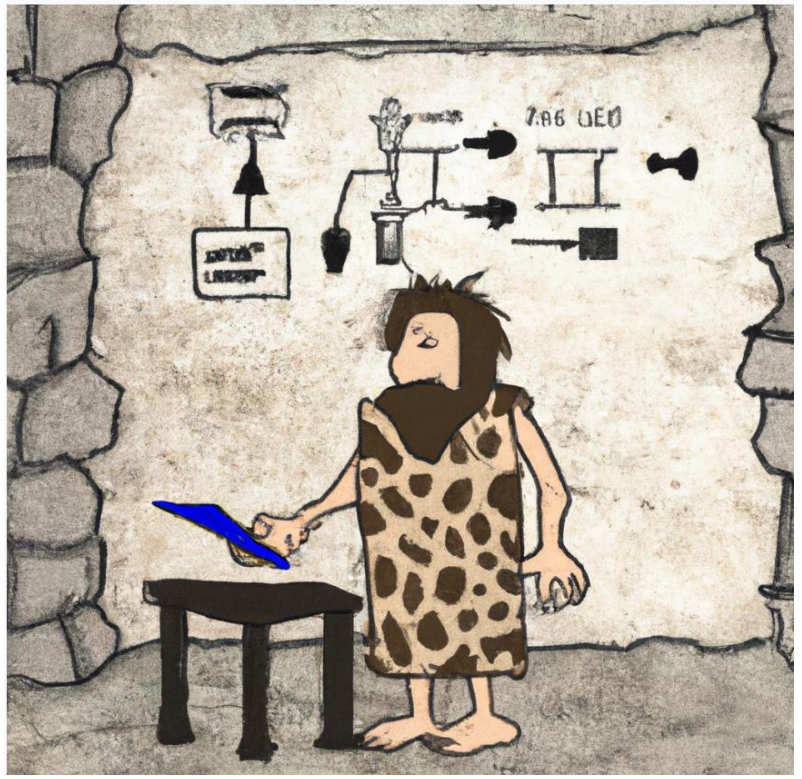
But it’s 2023 – Isn't everything AI already?



DALL-E – “Engineer working on a digital twin for an oil refinery drawing art”



DALL-E – “picture of a caveman engineer working on process diagram on a stone tablet art”

The owner-operator maturity chasm

EPC VIEW OF THE PROJECT

OO VIEW OF THE PROJECT AND OPERATIONS

Taking ownership is between 3 and 5% of the capital budget.

1D Engineering Lists

- Equipment Lists, Line Lists, Electrical List, Data Sheets, Client standards
- Engineering deliverable list
- Risk Matrix

2D Design Drawings

- Isometrics, P&ID's, SLD

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Why do we have this chasm between projects and owners?

INTERNAL FACTORS

Some level of control and influence to improve

- Current operational staff not ready for a digital wave and tools
- Digital innovation is not for the faint of heart
- Use cases not always evident to C-Suite
- C-Suite does not have a data mindset
- It's not a shiny physical thing that makes money – digital is often seen as a cost
- Operating margins are thin
- Decentralized decision making

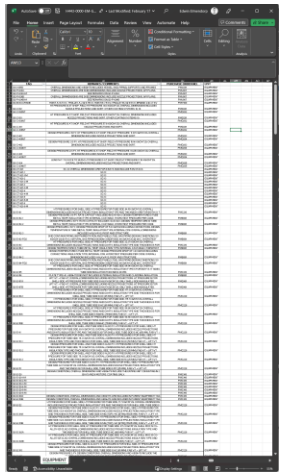
EXTERNAL FACTORS

Very limited control or influence to improve

- Many facilities are old (+ 35 years)
- Too many digital standards
- Regulatory framework still rooted in paper
- Technologies don't always easily scale across the asset portfolio
- For most of the existing facilities, digital innovation relies on data captured inside 1D/2D information (unstructured and unintelligent)

Exxon Mobil and their years of experience with Digital Twin technology
https://m.youtube.com/watch?v=a0X09ntpRc0 (22 minutes)

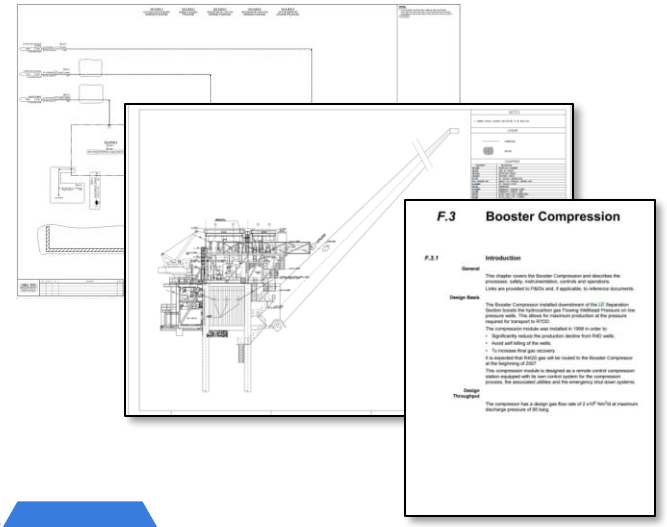
What is the result of this gap?

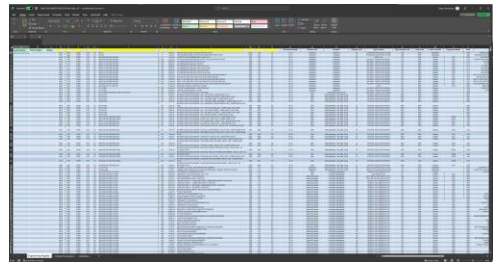


Tens of thousands of pieces of equipment, instruments, lines, Piping, transformers, switches, etc.

Transformer 702-A

N:N





Hundreds of thousands of documents

PNM’s road to improvement

PNM’s road to improvement

Started work with Kinsmen

- Challenges around information
- Deployed AI/ML to improve information insights
- OSI PI Enterprise agreement

2018 San Juan Failure

- Further elevating the advantages
- Tool shaved several weeks of demanding project schedule

Data Integration and Engineering Document Management System

- Integrate with PI
- Integrate with SharePoint
- Integrate with Vault
- Integrate with Maximo
- Integrate with file shares
- Deployed Asset Strategies Optimization (ASO)
- Started work to adopt Engineering Data Standards (CFIHOS)

Planning for T&D assets

- Planning activities
- Grow tools and methods to Enterprise adoption
- Designed a multi year roadmap for improved data operations across the enterprise

Deploy to T&D assets

- Integrate with ARCFM for Asset management
- Introduce process framework for utility operations
- Planning to migrate DMS to M365

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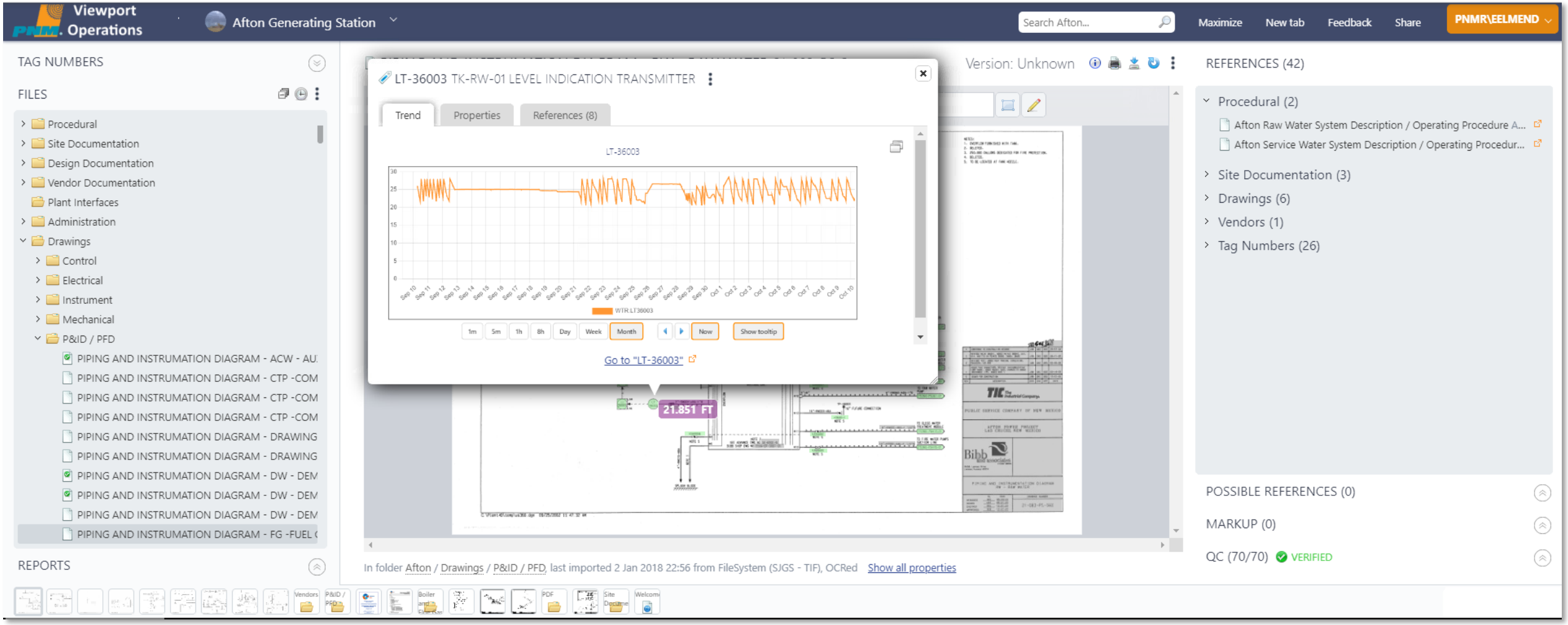
Results delivered to the organization



Single web-based Data Hub for Generation, Transmission, Distribution

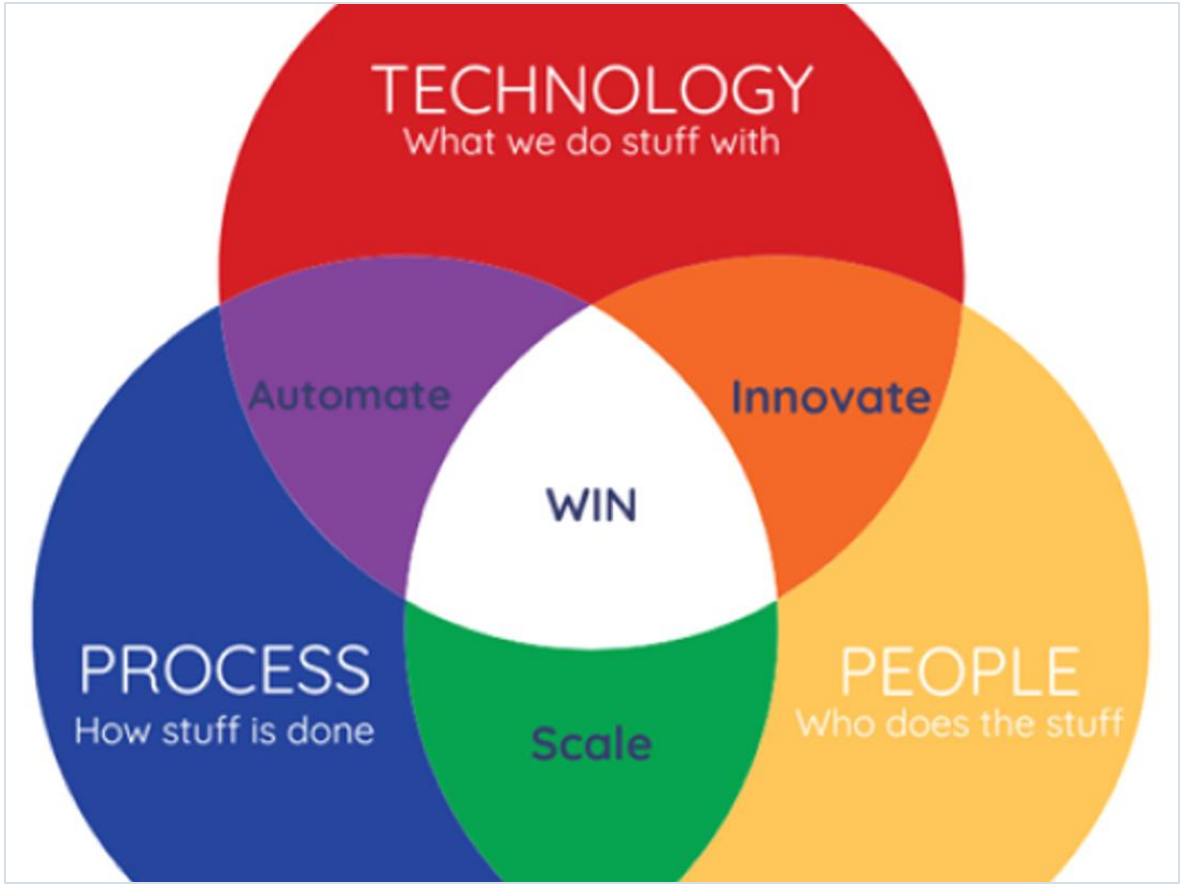
AVEVA · AUTODESK Vault · IBM maximo · SharePoint · Microsoft 365 · esri · AVEVA

Lessons learned

Lessons learned

- **PEOPLE**
  - As a utility, we have a lot of tribal knowledge, causing disconnected data, where process change is the most difficult thing to accomplish.
- **TECHNOLOGY**
  - Technology is mostly not a limiting factor, the internal challenges (organization, existing systems, security, etc.) are much more limiting how you can apply technology.
- **PROCESS,**
  - Automate (digitize) processes is just the beginning, we now need to put effort into the improvement part.

JUST START.. Take a small area, experiment and grow.



Questions?

Please wait for the microphone.

State your name and company.

Please remember to…

Navigate to this session in the mobile app to complete the survey.

Thank you!

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