



# Operationalizing Seeq at TC Energy

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LIQUIDS ASSET OPTIMIZATION &  
DATA ANALYTICS

TC ENERGY

# Our energy network

## Natural gas pipelines

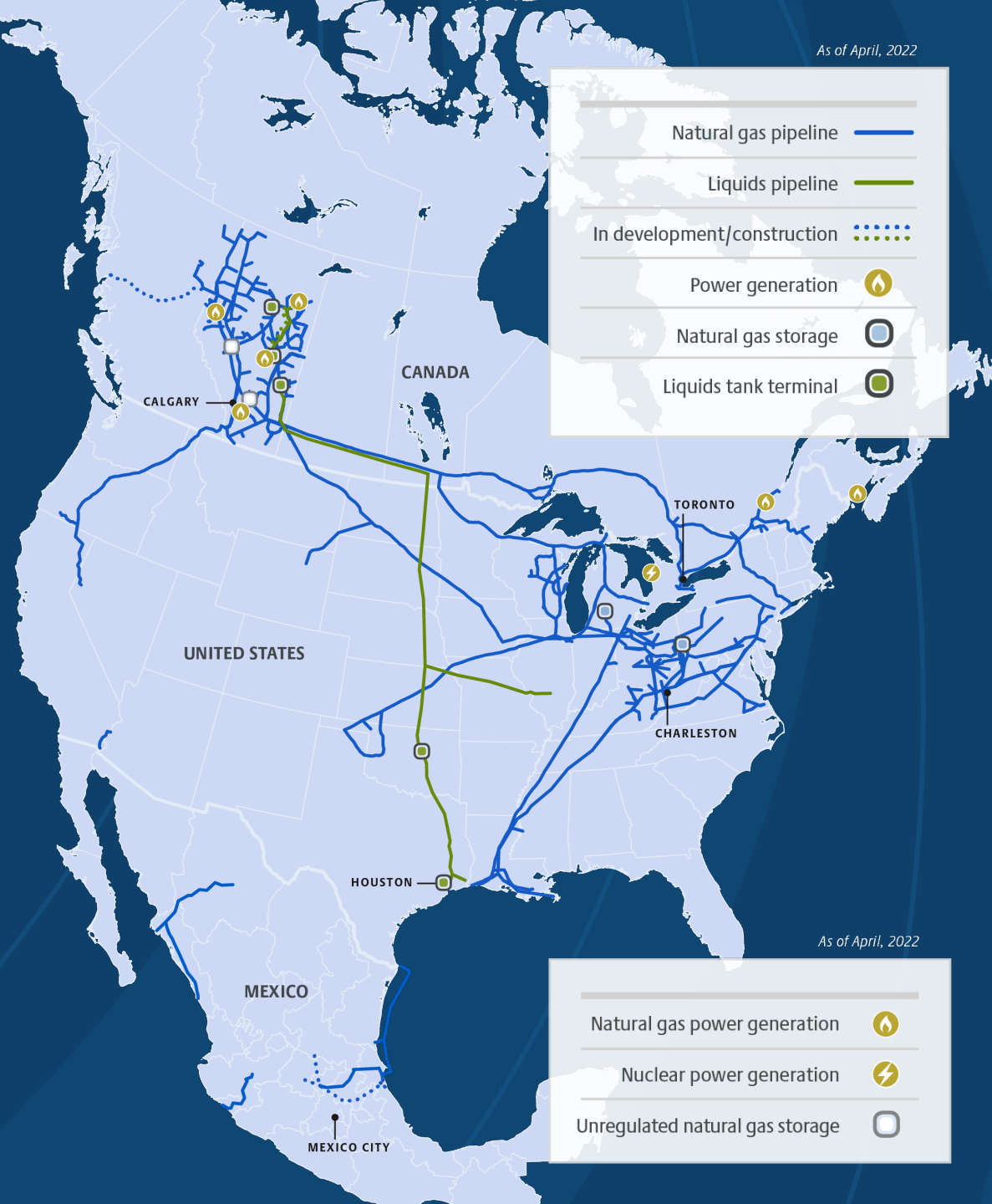
25% of the natural gas that North America uses every day

## Oil and liquids pipelines

~20% of the western Canadian oil that goes to the U.S. Midwest and Gulf Coast

## Power generation

Powering more than 4 million homes





# Oil and liquids pipelines

**Transports ~20% of Western Canadian crude oil exports – nearly 3 billion barrels delivered safely since 2010.**

- Covers a strategic corridor near growing production basins, connected to key U.S. markets
- Transports ~20% of Western Canadian crude oil exports to key refineries in the U.S. Midwest and Gulf Coast
- Delivers U.S. crude oil from the market hub in Cushing, OK, to the U.S. Gulf Coast

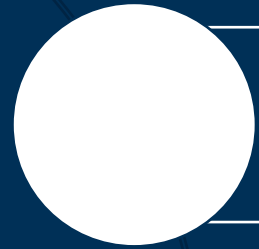


# Our Team

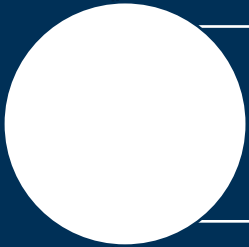
- A forward-looking team
- Adoption of modern tools to do optimization and predictive maintenance
- Introduction of Seeq in 2021
- Implementation in the Liquids Business Unit



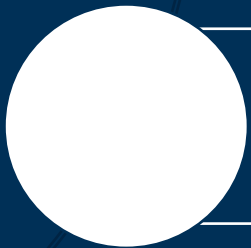
# Our Problem



Realized Seeq's value immediately



Had no path to drive action in the field



Needed to build a system to bridge Seeq insights to action

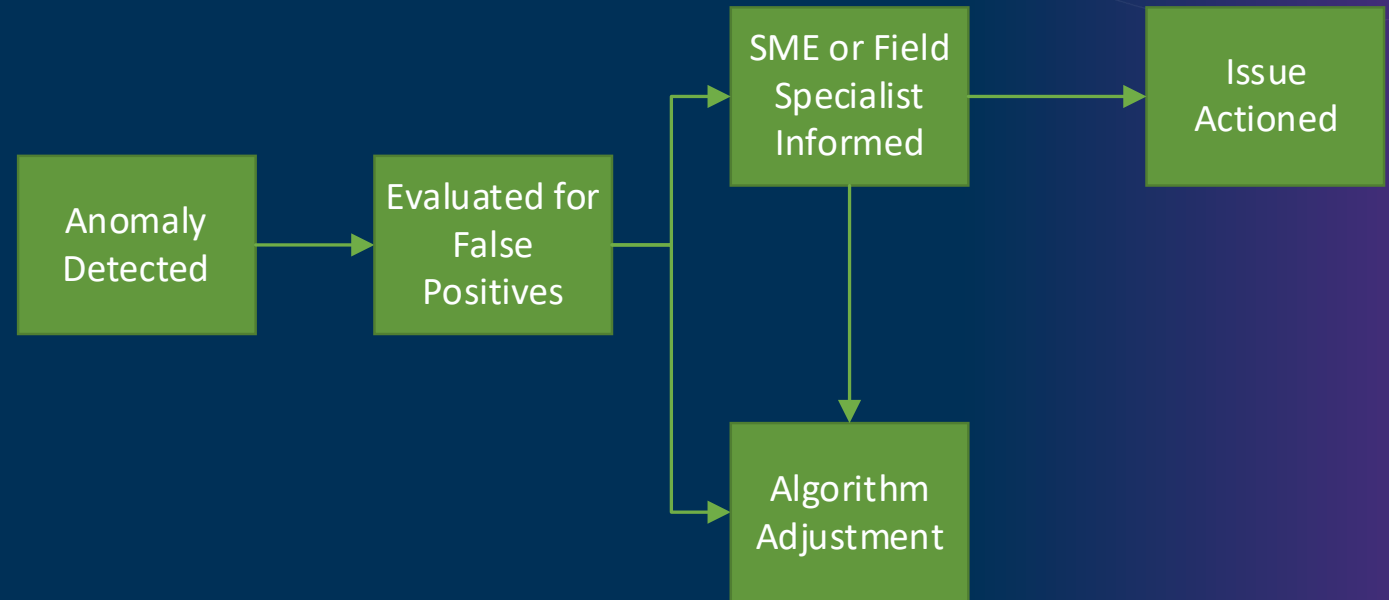
# Operationalizing – What does it mean?

People

# DMC – Diagnostics and Maintenance Console

Collection of algorithms  
and dashboards for  
condition-based  
response

Daily monitoring,  
aggregation and  
response initiation

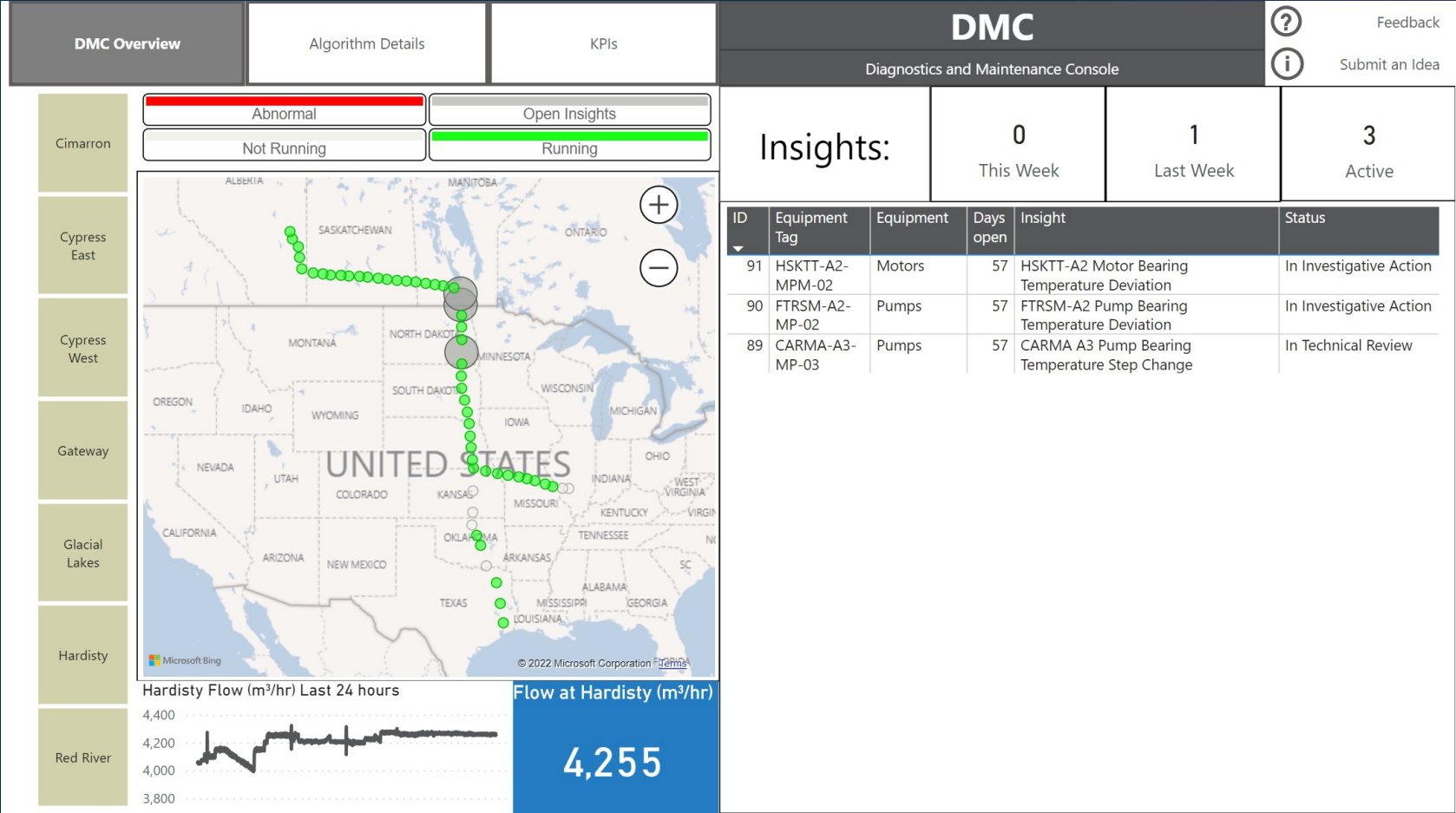
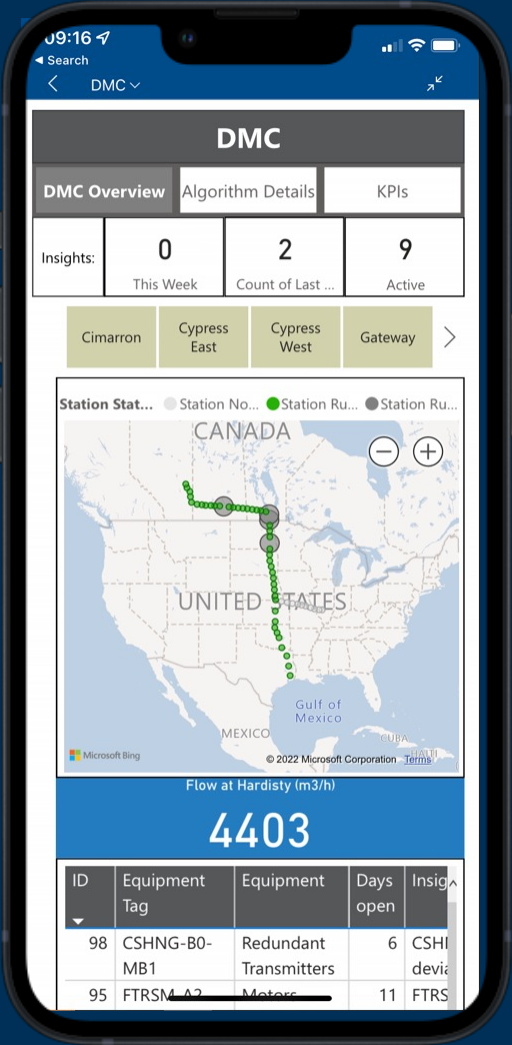


# Initial Challenges

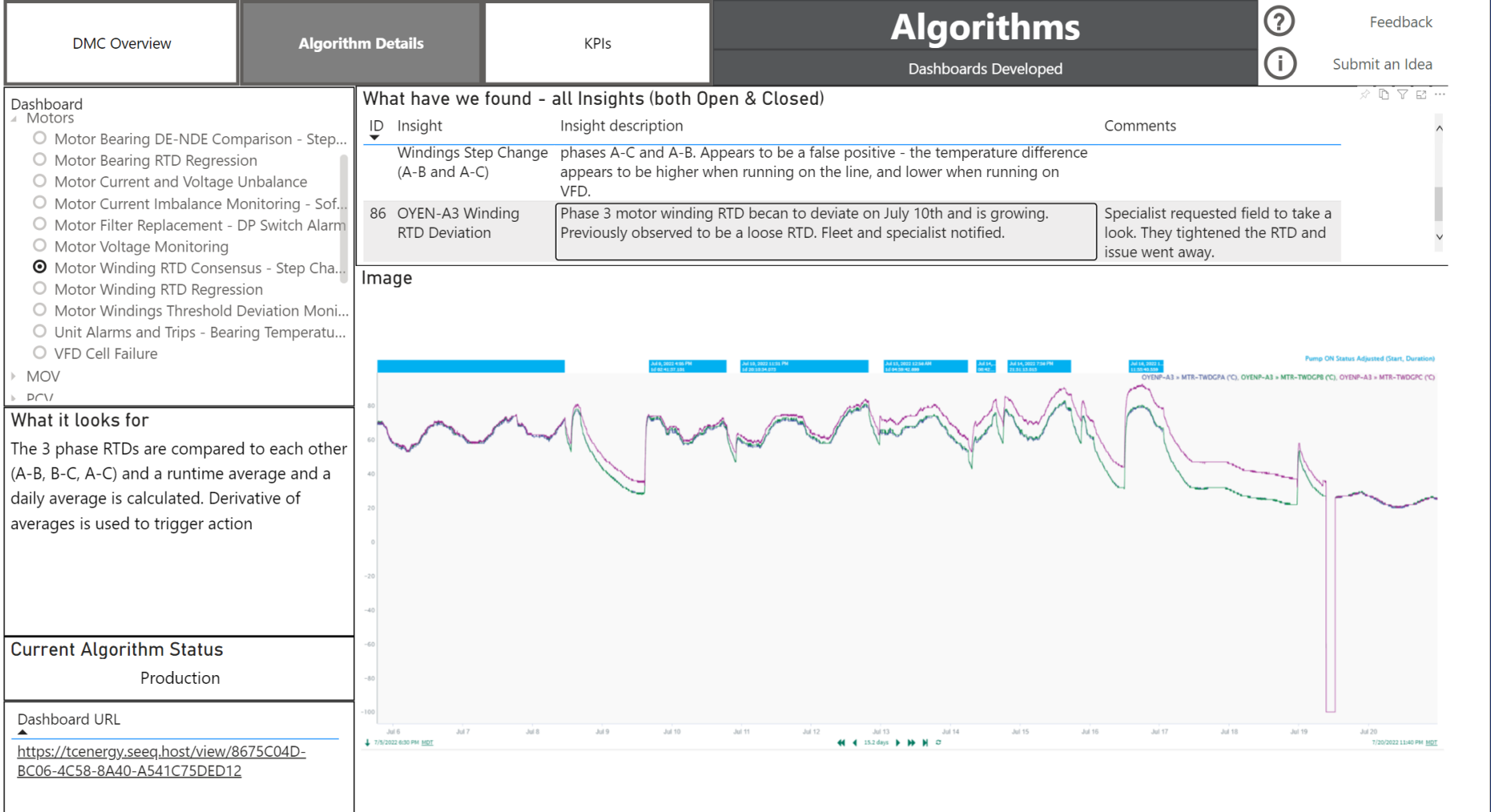




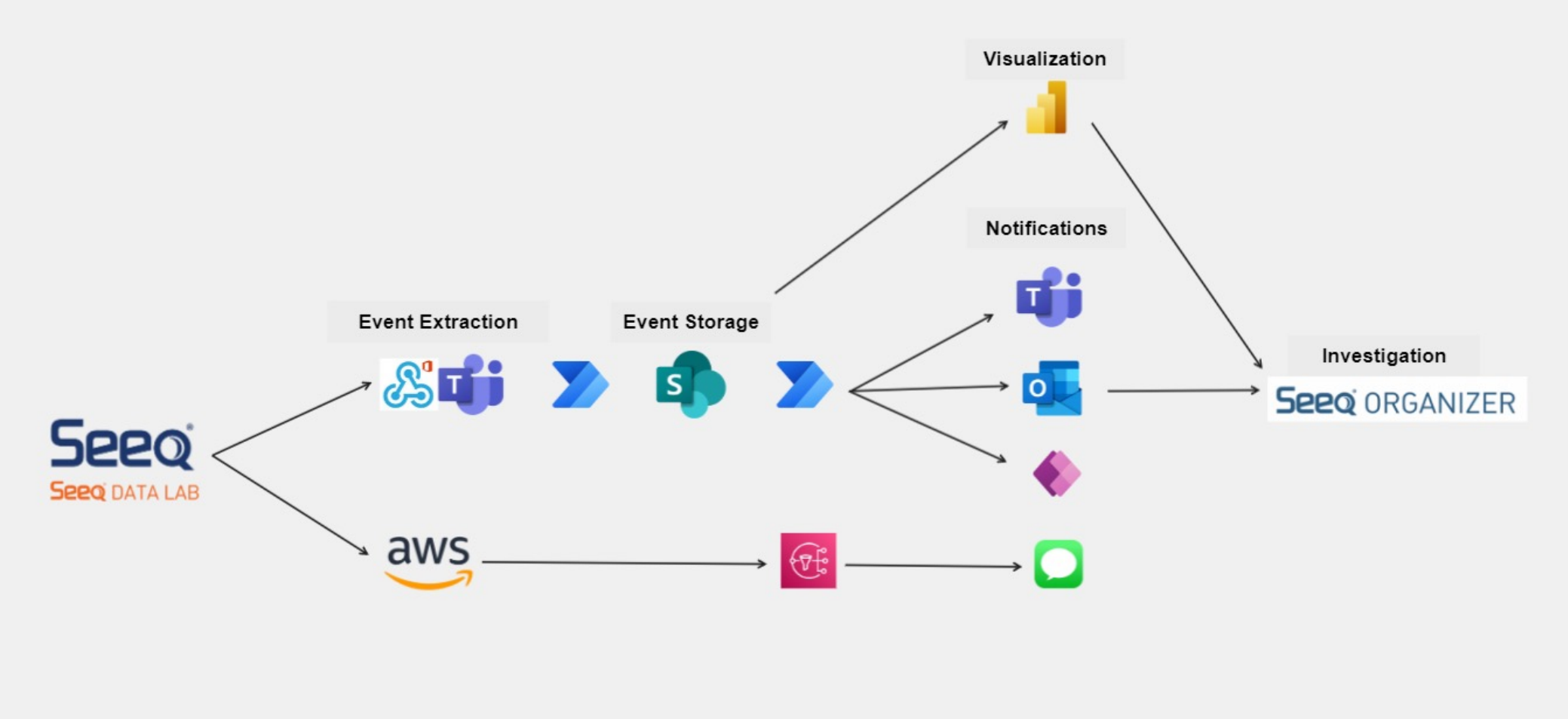
# DMC App



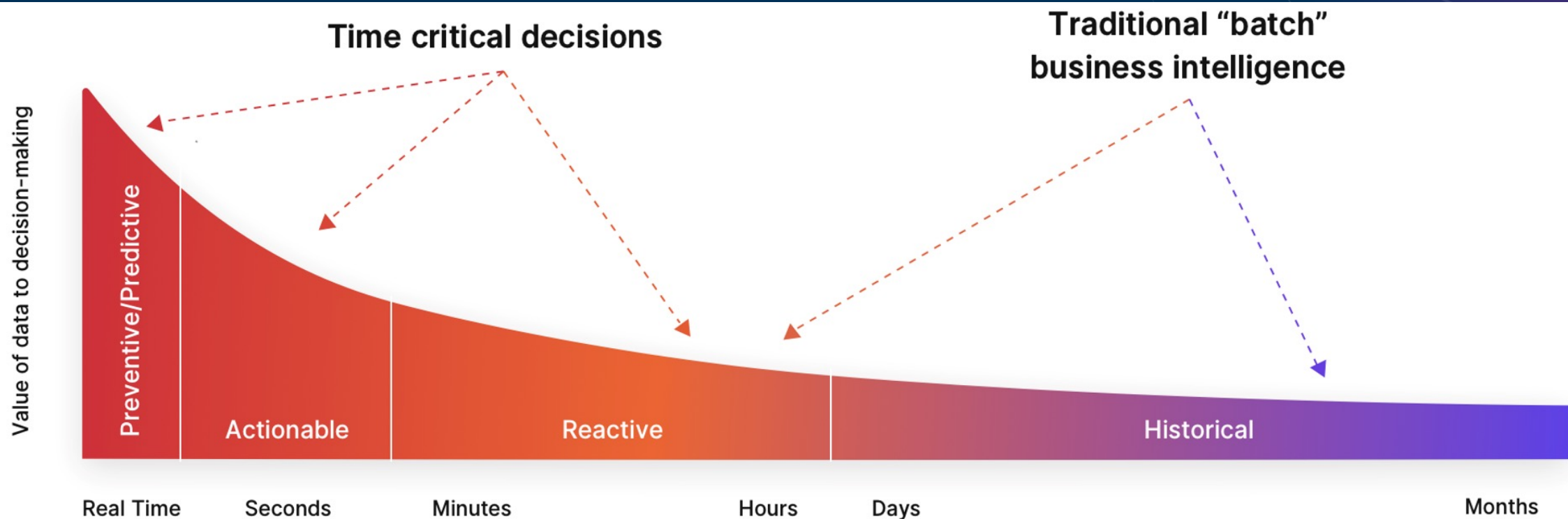
# DMC App



# Technology







Source: Perishable insights, Mike Gaultier, Forrester



### Diagnostics Maintenance Console

Looking forward for anomalies to prevent upcoming issues



### Equipment Lifecycle Planning

Taking a step back and doing historical analysis



# Equipment Lifecycle Plans



## Equipment Overview - VFD MV

Last Revised: (Blank) Submit Feedback

### General

**Select Equipment Type**

- ☐ Booster Pumps
- ☐ Coriolis Meters
- ☐ High Voltage Power Transformer
- ☐ Mainline Pump
- ☐ Medium Voltage MCC
- ☐ Medium Voltage Motors
- ☐ OMNI Flow Computer
- ☐ PD Meters
- ☐ PLC
- ☐ Pressure Safety Valves
- ☐ Protection Relays
- ☐ Provers
- ☐ Soft Starters
- ☐ Substation
- ☐ Ultrasonic Flow Meter
- ☐ UPS
- ☐ Valves
- ☒ VFD MV

**Equipment Overview**

The MV VFD fleet is comprised of one major OEM with several models: Siemens (Gen IIIe and Gen IV). One Toshiba MV VFD (T300MVi) is currently in the fleet at Hardisty West Interconnect. These MV VFDs are primarily applied used in two different applications: mainline pumps (Pump Stations) and oil storage (Terminal, Tank Farm) booster pumps. The VFD model, ratings, and configuration vary depending on the application.

The major components of a MV VFD include:

- Input transformer
- Power cells (complete assemblies, capacitors, IGBTs, control boards)
- Power system components (fuses, attenuators, hall effect sensors)
- Control system components
- Cooling system (blower fan assemblies, motor starters, louvers)
- Output reactor

**Useful Links**

**Vendor Documents, Manuals, & Drawings**

Description	Link
VFD How to Procedures	<a href="#">Link</a>
Siemens Drawings	<a href="#">Link</a>
Siemens Manuals	<a href="#">Link</a>

**Investigative Reports**

Description	Link
VFD Availability Report	<a href="#">Link</a>

**Reliability Analyses**

Title	Dashboard Link
VFD Availability Analysis	<a href="#">Link</a>
VFD Availability Report - Seeq Organizer	<a href="#">Link</a>
VFD Availability Report - Seeq Workbench	<a href="#">Link</a>

**Equipment Information**

**Reference Image**

**SME Contact Information**

**Manufacturers**

- TOSHIBA
- SIEMENS

**Total Pieces of Equipment**

58

### Key Performance Indicators

**Average MTBF [Hourly]**

**Average MTTR [Hourly]**

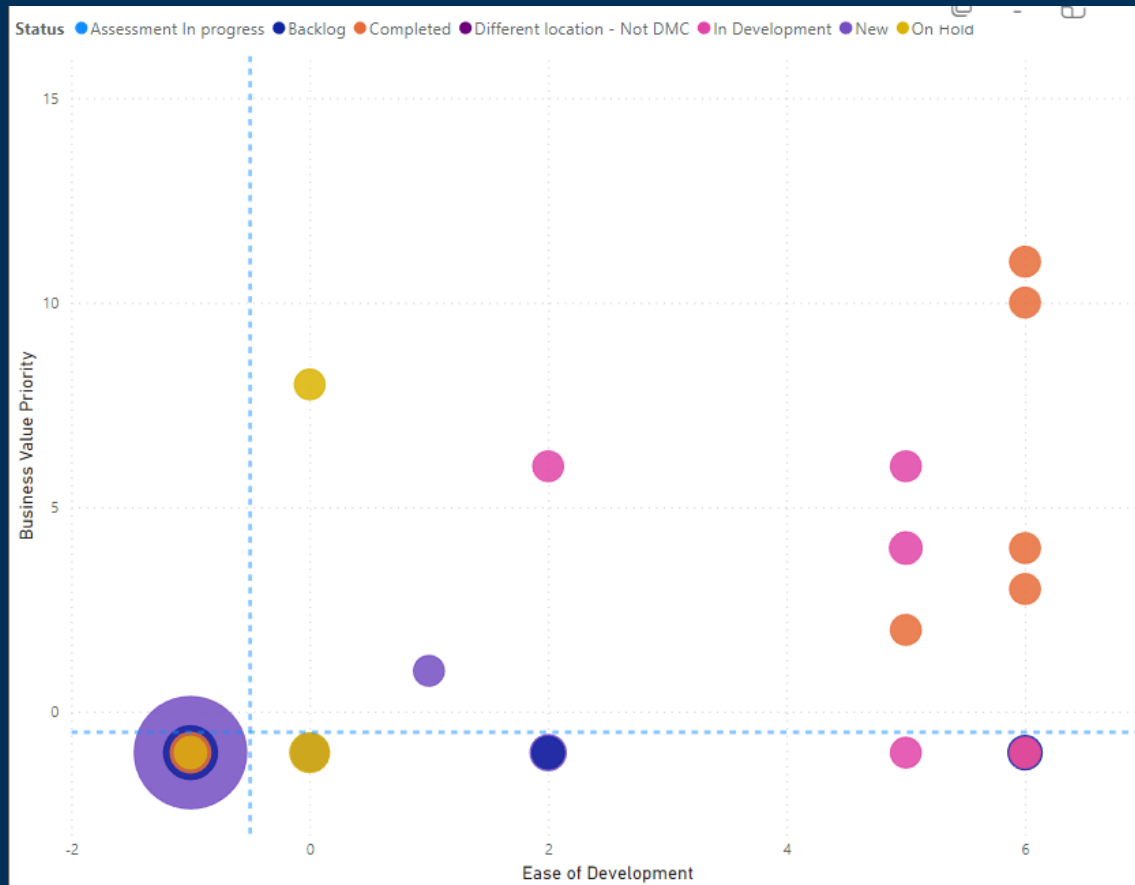
**Total VFD Failures Per Year**

**Average VFD Availability**

14

CONNEQT

# People & Ideas



# Capabilities

# Outcomes



Increased awareness  
about the system state



Reduction in unplanned  
downtime



Effective risk monitoring



Data-driven  
prioritization and  
decision making



Condition and utilization  
based maintenance



Convenient troubled  
asset monitoring



Quick turnaround

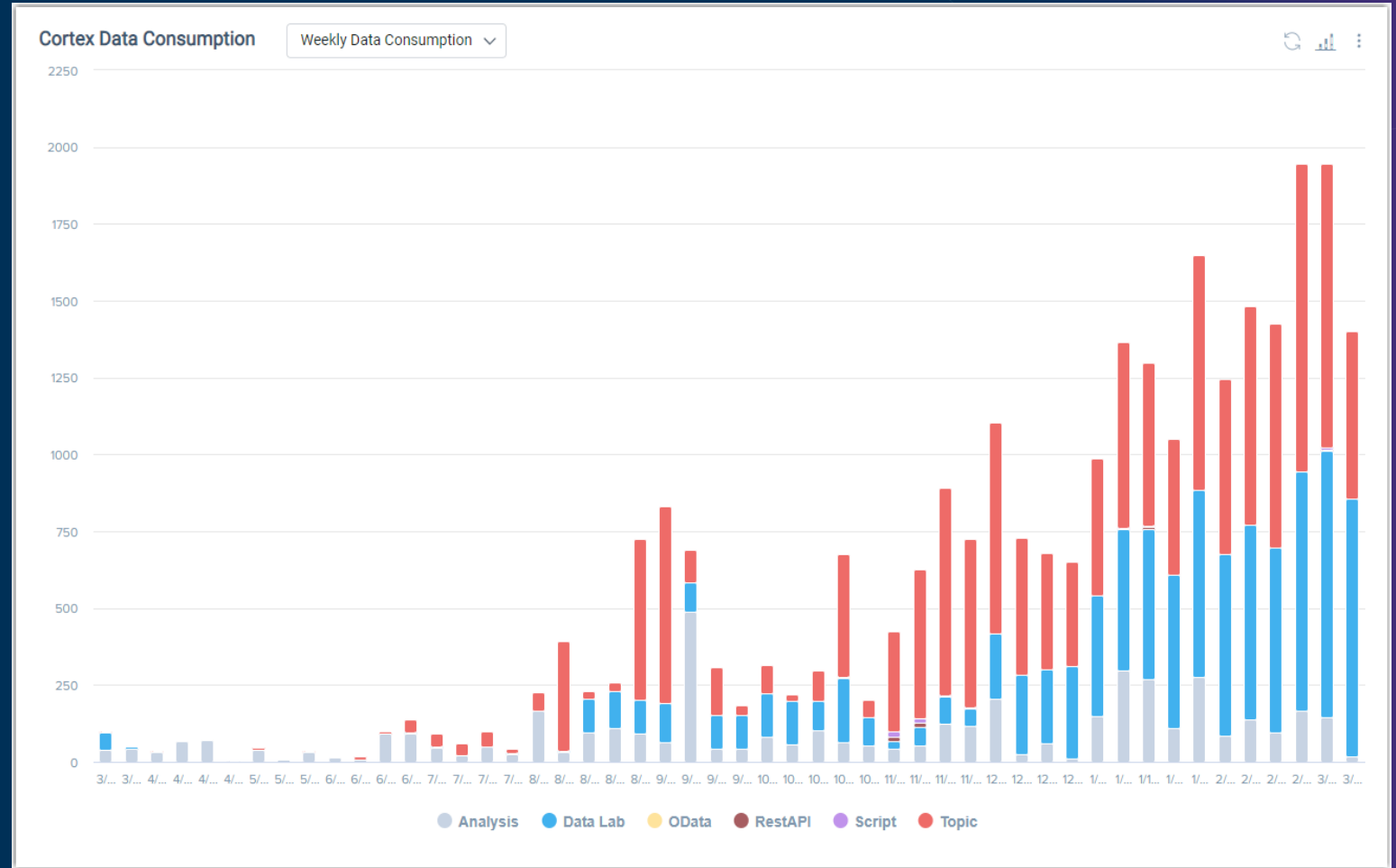


High level of adoption

# Learnings

Success came in a way we did not originally envision

User experience is key





# Future

- Partner with other Business Units to integrate Seeq into other tools
- More algorithms
- Intelligent Events





# Questions?