

OCTOBER 24, 2023

SNOLAB: The world leading deep underground laboratory, leading with AVEVA PI System

Presenter: Steven Back

AVEVA

THE WORLD LEADING DEEP UNDERGROUND LABORATORY,
LEADING WITH AVEVA PI

Agenda

October 2023

- About SNOLAB
- The Challenge and the AVEVA solution
- A Use Case
- What's Next?

SNOLAB is located on the traditional territory of the Robinson-Huron Treaty of 1850, shared by the Indigenous people of the surrounding Atikameksheng Anishnawbek First Nation as part of the larger Anishinabek Nation.

We acknowledge those who came before us, and honor those who are the caretakers of this land and the waters.

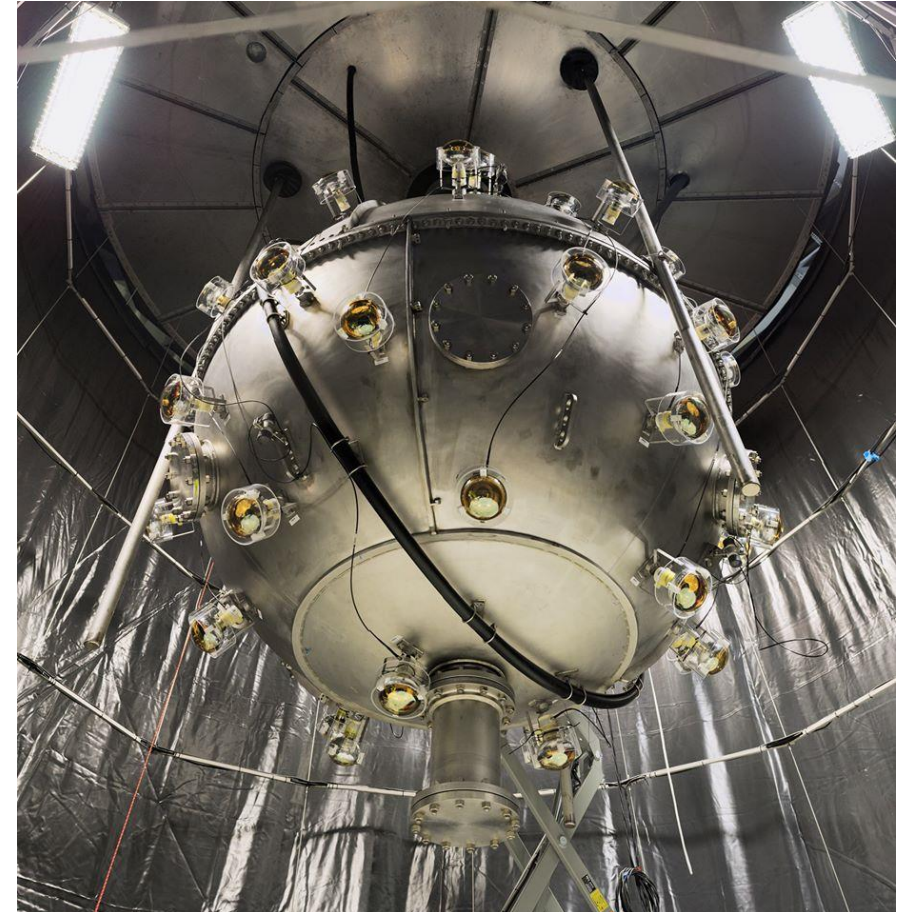
Introducing SNOLAB

The world leading deep underground laboratory, leading with AVEVA PI

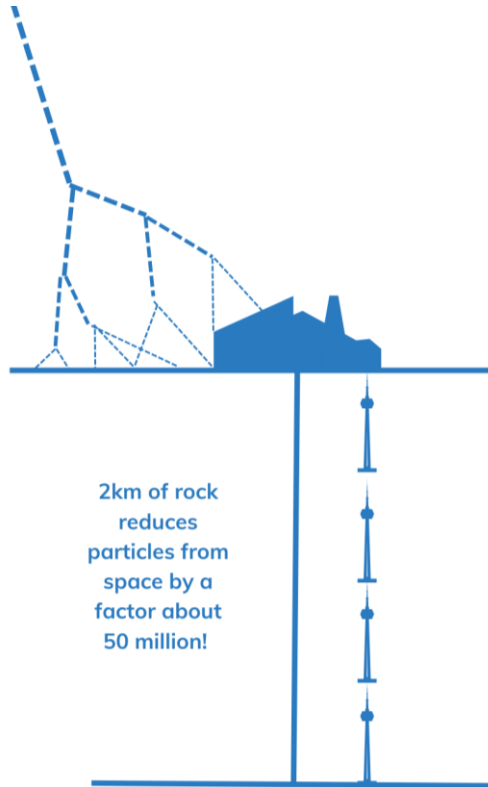
- Sudbury, Ontario, CANADA



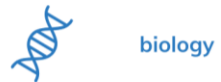
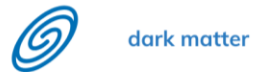
- Academic Institution
- Operate 53,180 ft² Class 2000 (~ISO 6) clean space
- 1000+ annual academic collaborators, 24 different countries, 164 institutions
- Hosted in Vale Creighton Mine
- SNO Experiment wins Dr. Art McDonald 2015 Nobel Prize
- Deepest underground flushing toilets
- ... 2 km underground!



Canada's deep underground science laboratory



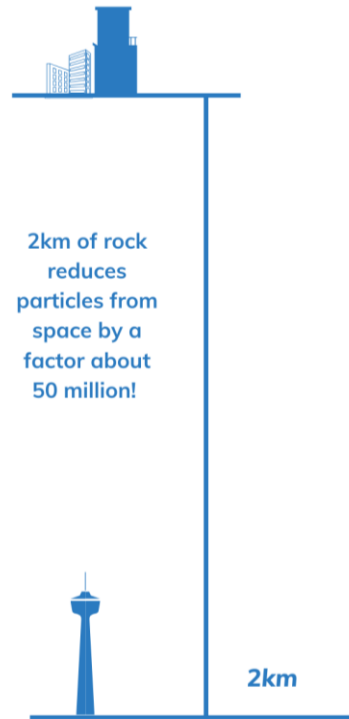
A diverse research program



SNOLAB is the deepest, cleanest lab in the world!



Canada's deep underground science laboratory



SNOLAB has a diverse research program



How did the universe begin?



What is the universe made of?

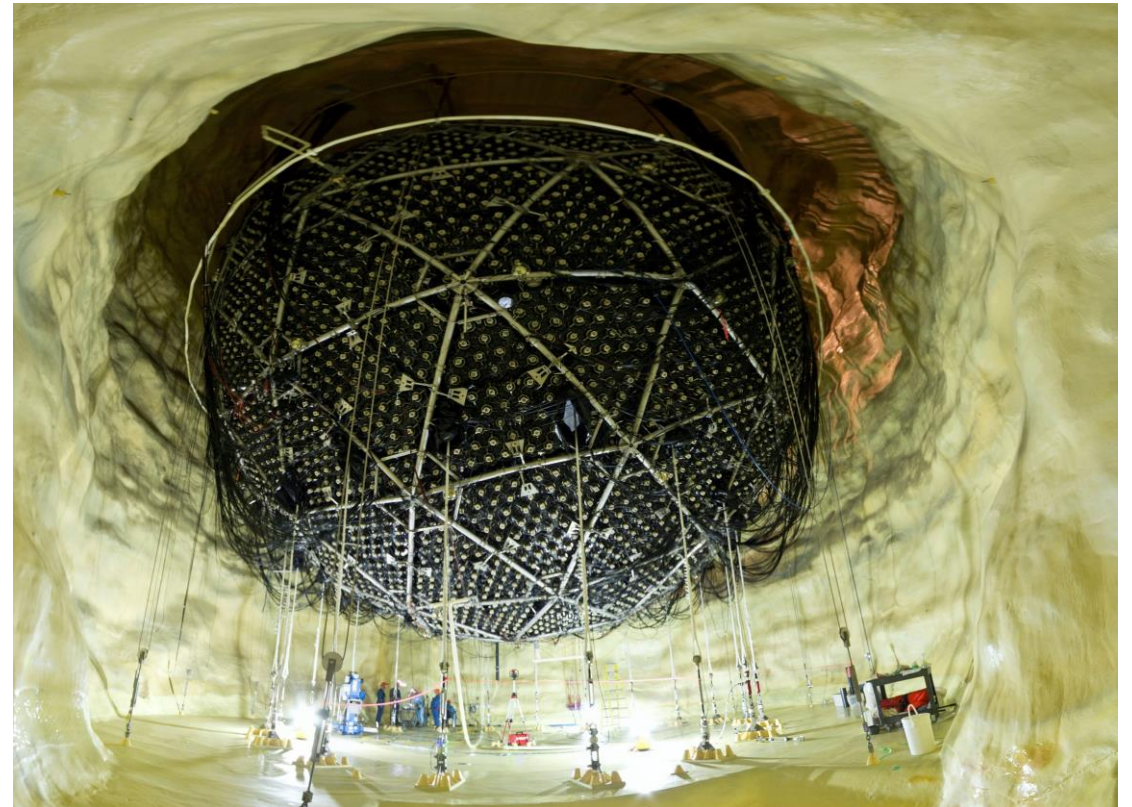


How have neutrinos shaped the universe?



What can we learn about biology from experiments at SNOLAB?

SNOLAB is the deepest, cleanest lab in the world!



But Why So Deep?

When you have eliminated the impossible, ...



The Challenge

AVEVA

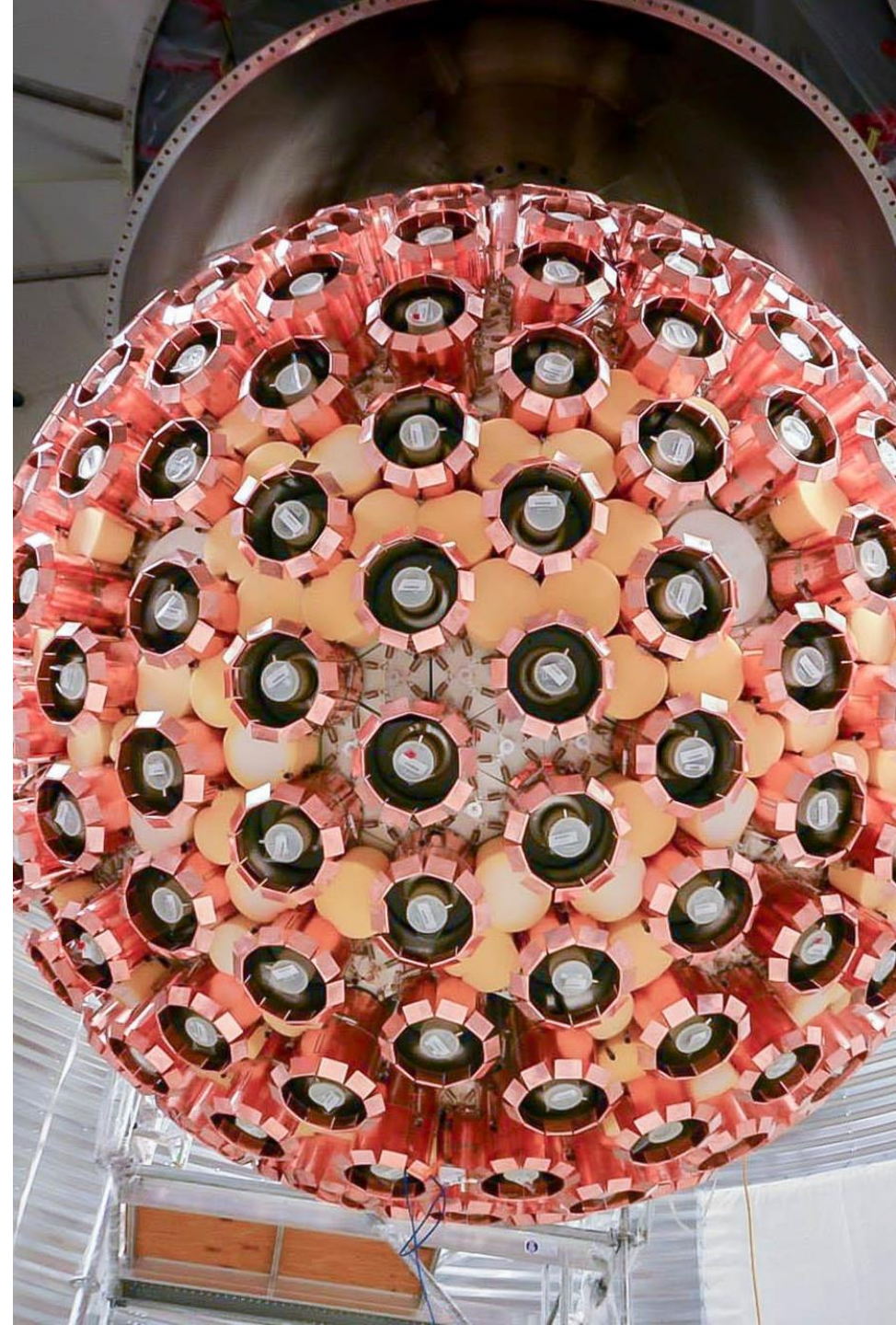
SNOLAB provides visibility into vital operating data and is on its way to predictive analytics

Challenge

- Lack of visibility into operational data limited root cause investigations after process upsets
- Data lakes, upon data lakes with no system to turn them into insights to address maintenance needs, equipment failure, and event reconstruction

Solution

- Deployed AVEVA™ PI System™ to collate and structure data collection, improve data visibility, and reconstruct events.

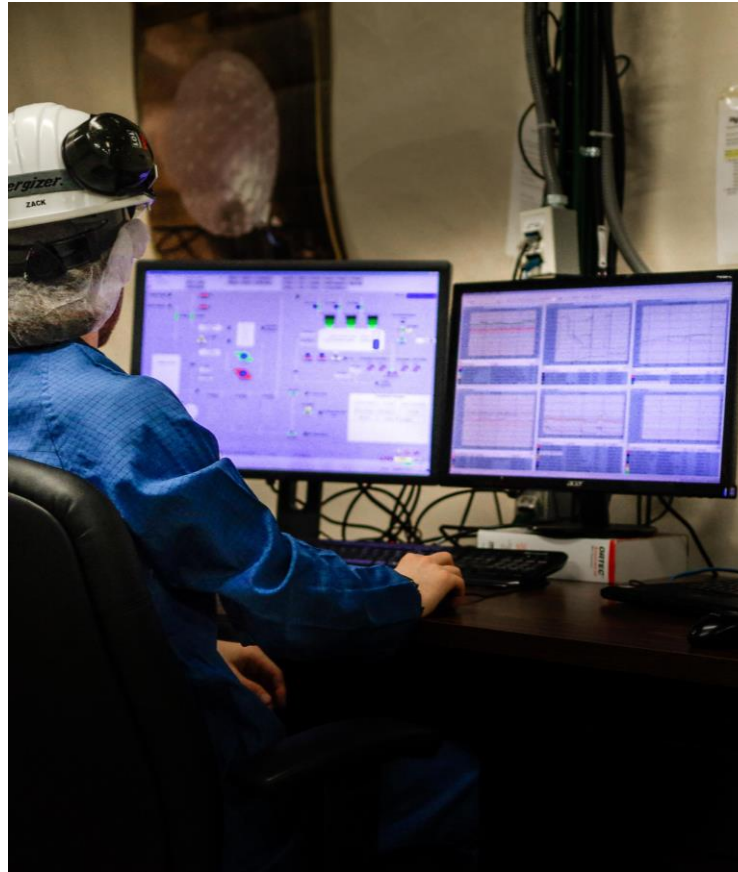


Challenge: Data Lakes

Manual



Experiment



Operations



Photo by: Shannon Kingsley

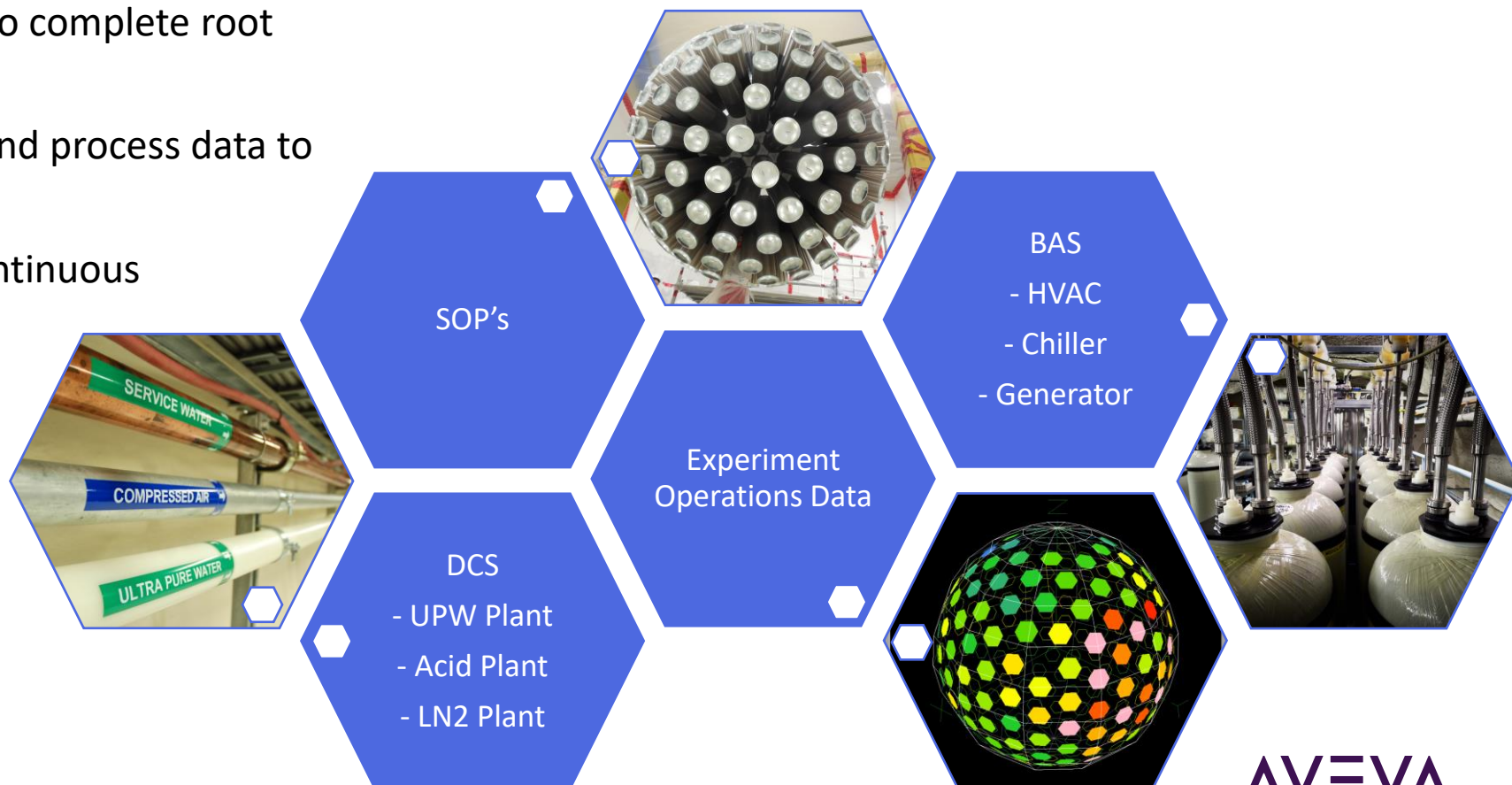
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Challenge: Root Cause Investigation

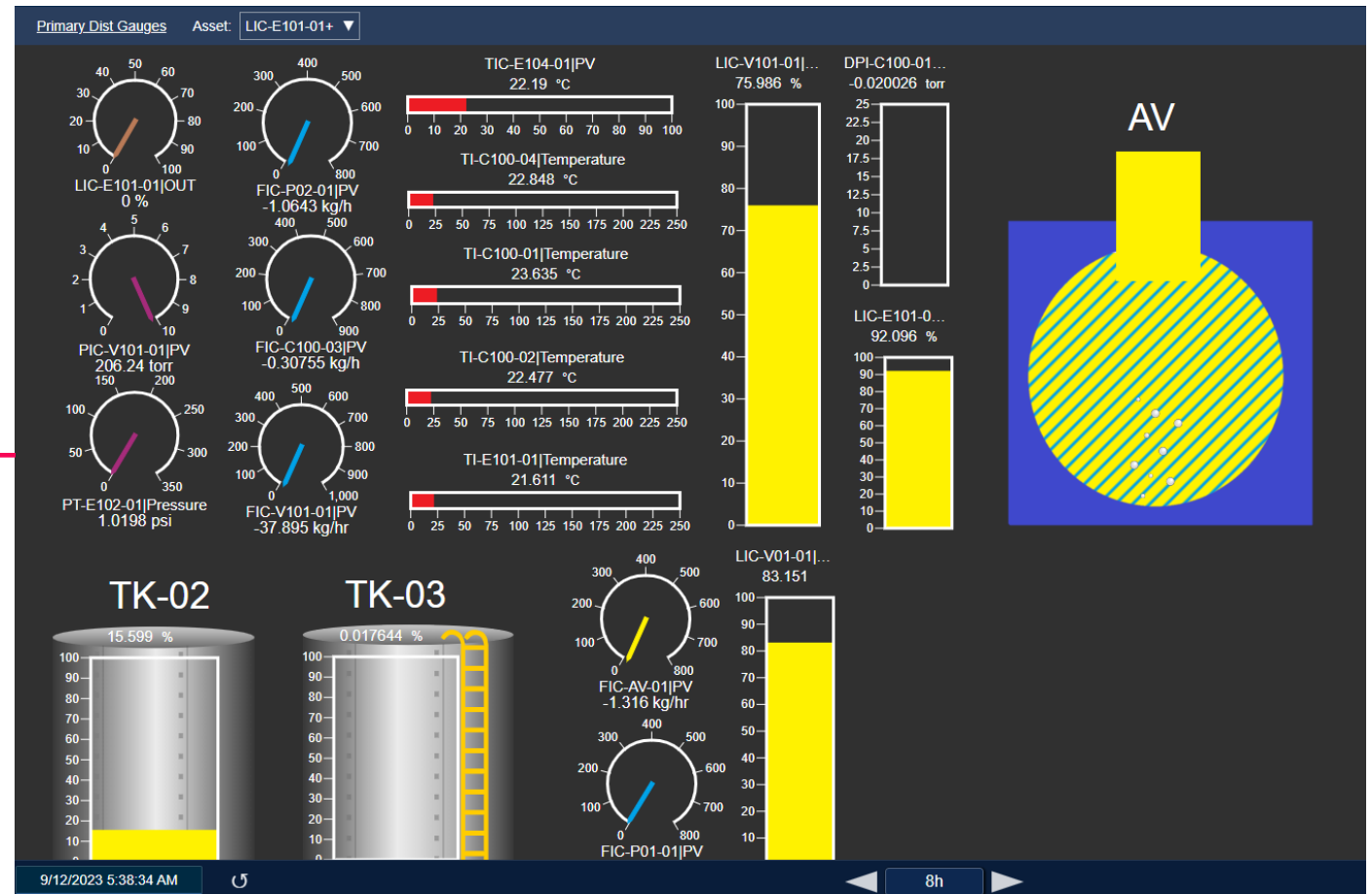
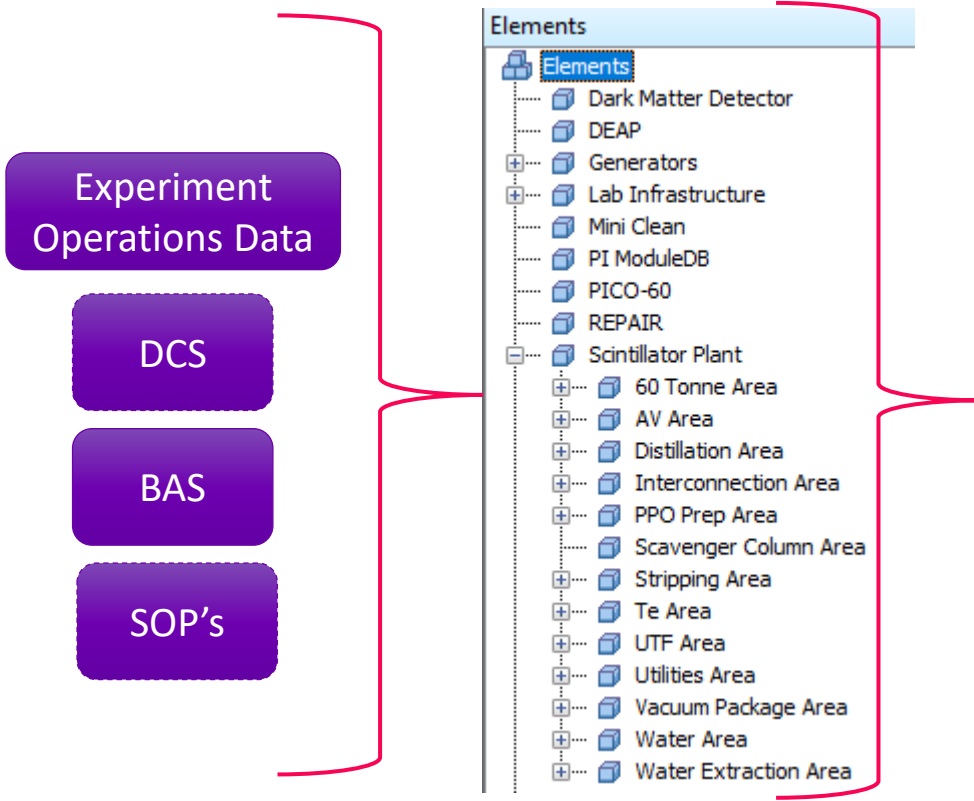
How to turn data lakes into insights

- Dozens of platforms each collecting information
- No central way to collate data to complete root cause investigations
- No method to provide facility and process data to experiments
- No easy method to perform continuous improvement across systems



Solution: AVEVA™ PI System™

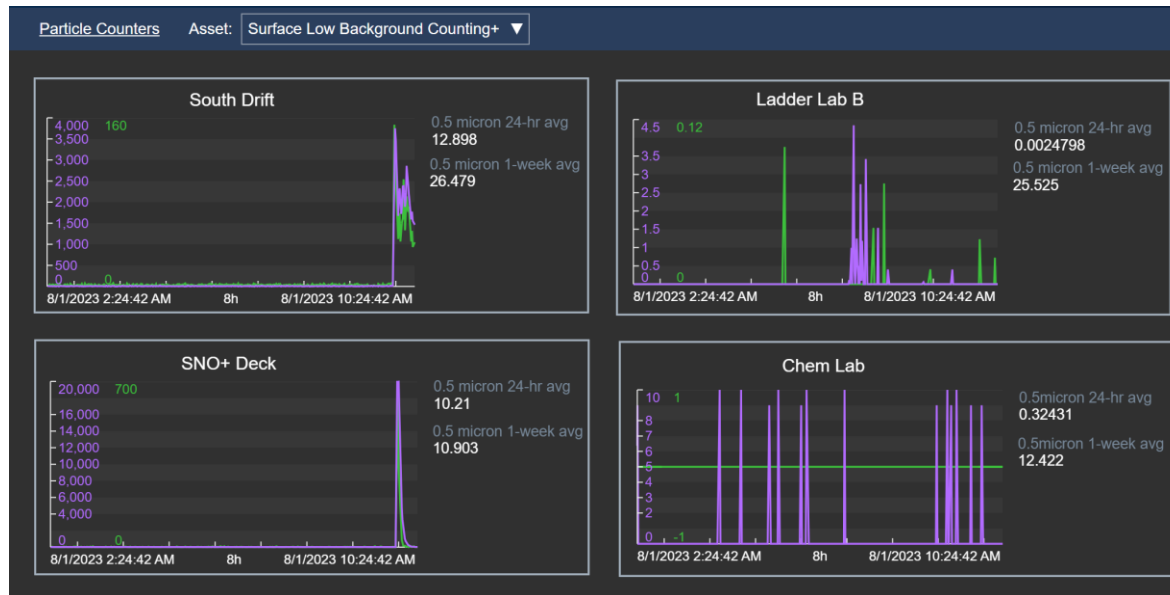
One platform to rule them all



Solution: AVEVA™ PI System™

Maintaining Lab Cleanliness

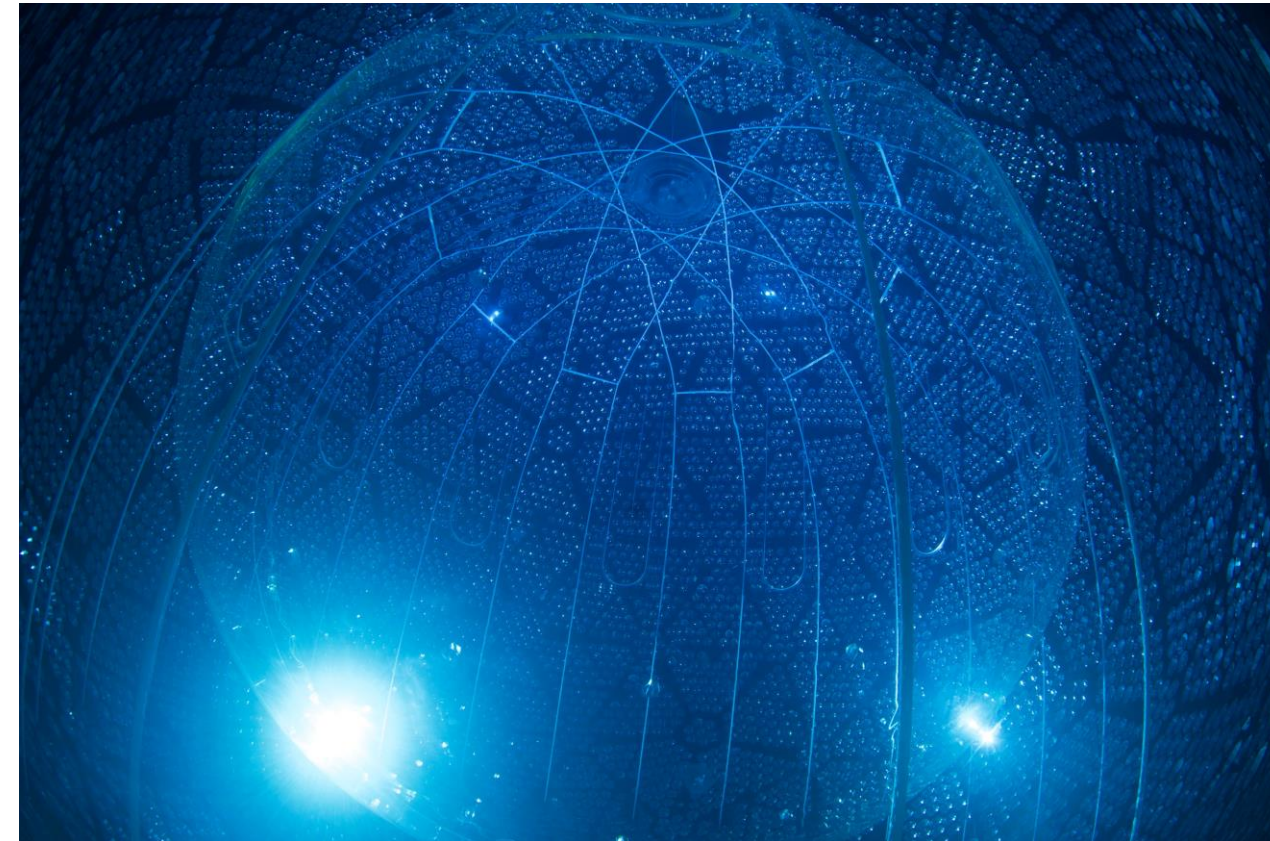
- Allow the lab to monitor and trend lab cleanliness with an array of sensitive particle counters



Solution: AVEVA™ PI System™

Autonomy to experiments

- Enables the 1000+ scientists at 164 institutions to create their own trends based on both experiment and operations data



Use Case

Lightning Strikes ... Power Goes Out

SNOLAB Goes Dark



Photo by: Andre Furtado

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- Power is the live blood of SNOLAB
 - Runs the experiments
 - Keeps the 1 MW chillers running
 - Keeps critical infrastructure powered

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UPW Plant Goes Down

- SNOLAB Underground Ultra-Pure Water Plant goes down
- Plant re-circulates UPW to the SNO+ experiment
- Notification sent to on call managers on the event trigger

UPW Plant Down 2023-07-15 13:06:52.750 generated a new notification event.

 PI-Server@snolab.ca
To: Steven Back

Event: UPW Plant Down 2023-07-15 13:06:52.750

Name: UPW Plant is Down

Server: PI

Database: PI-AF

Start Time: 2023-07-15 1:06:52 PM Eastern Daylight Time (GMT-04:00:00)

Target: Lab Infrastructure\UPW Plant\Purification\311-FIT-108

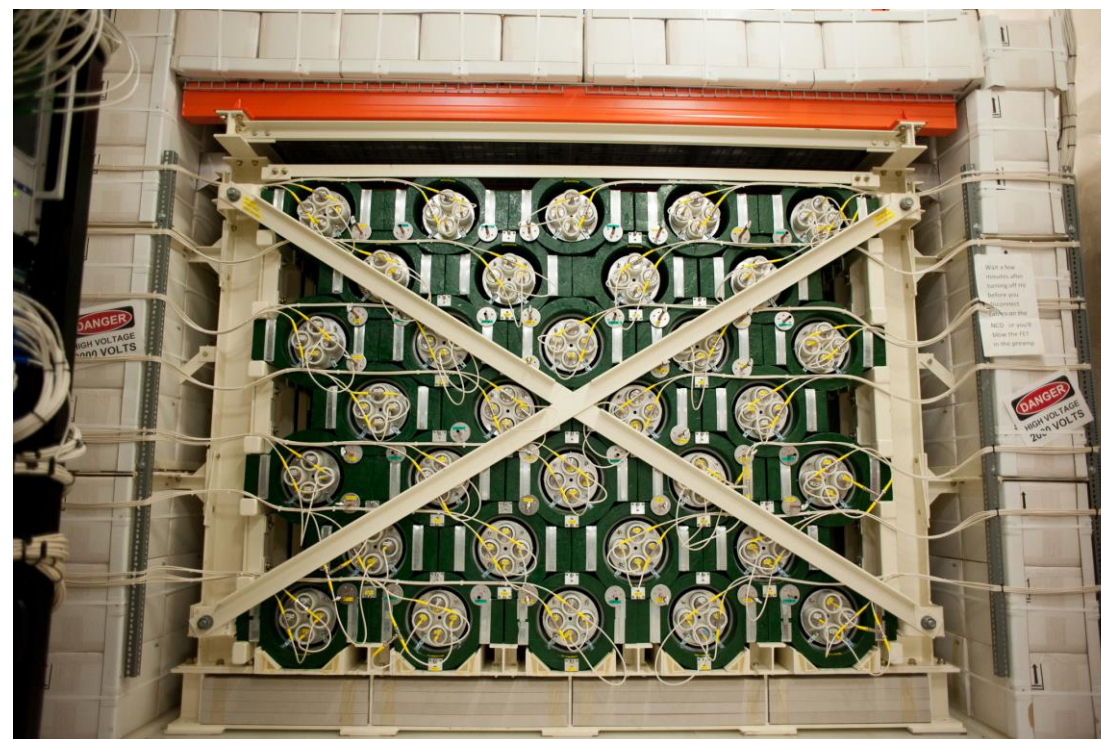
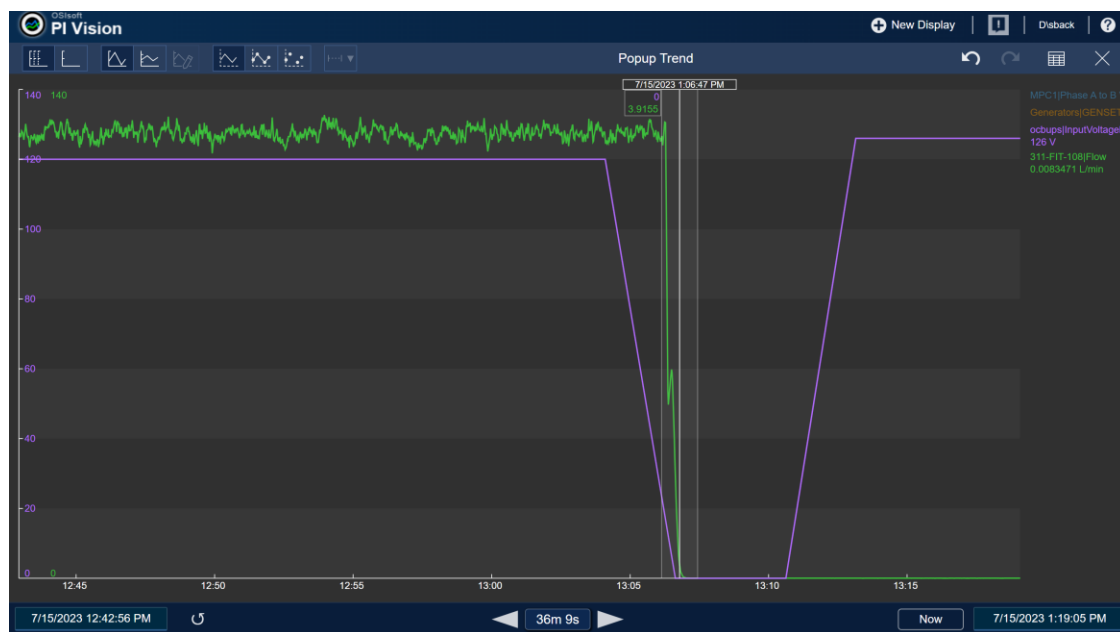
Severity: Major

Send Time: 2023-07-15 1:11:43 PM Eastern Daylight Time (GMT-04:00:00)



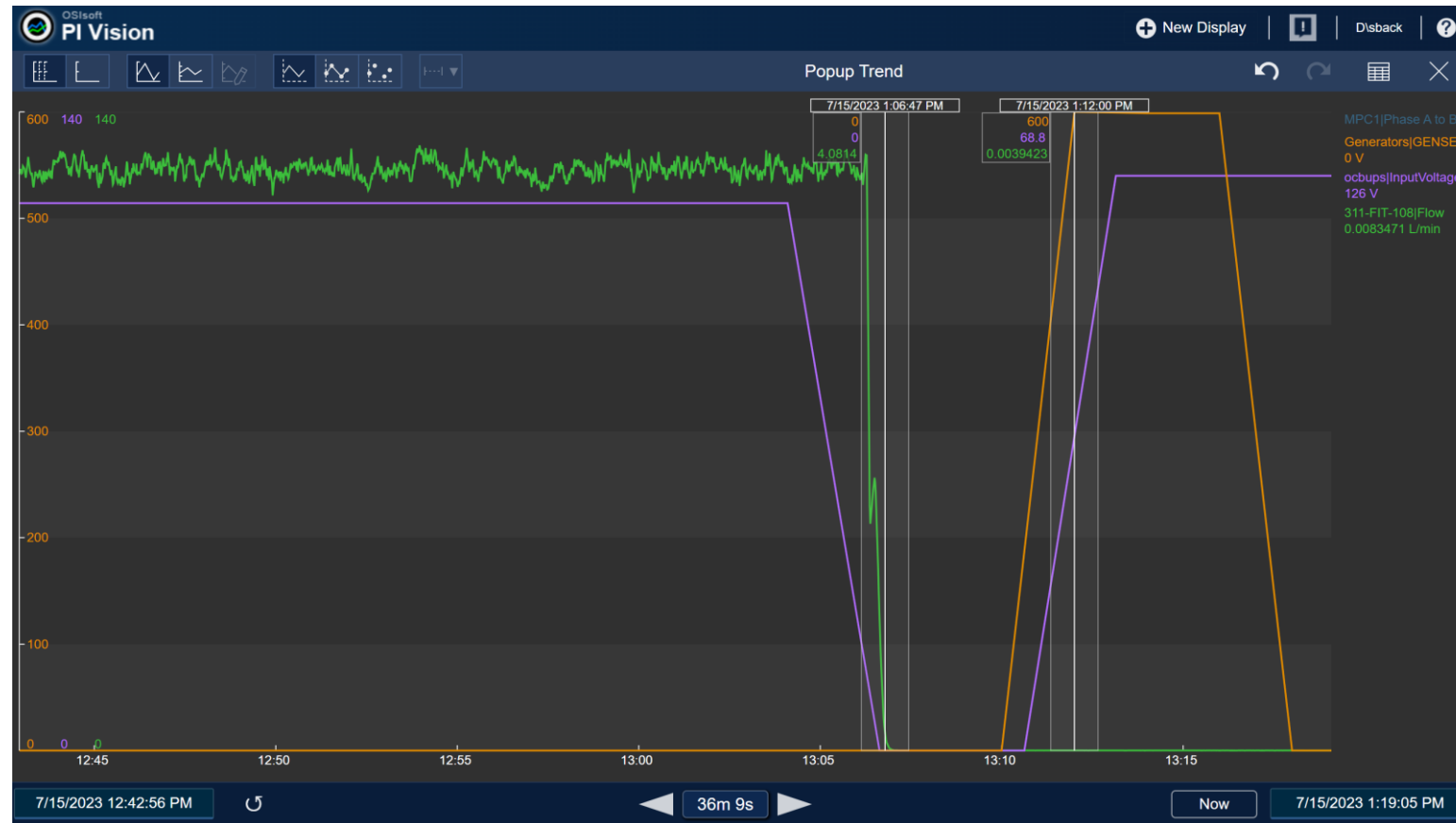
HALO goes on UPS

Many critical infrastructure is on local UPS to provide bridging power



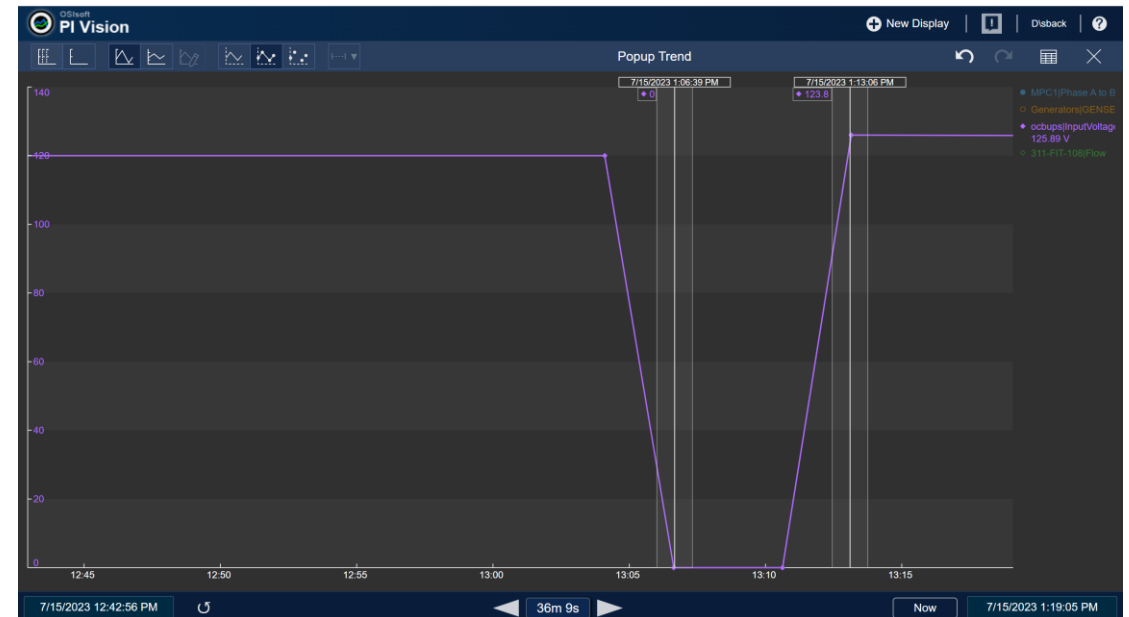
Generators kick on!

SNOLAB 3MW Toromont CAT generators kick on and take over providing power to the lab



HALO downtime

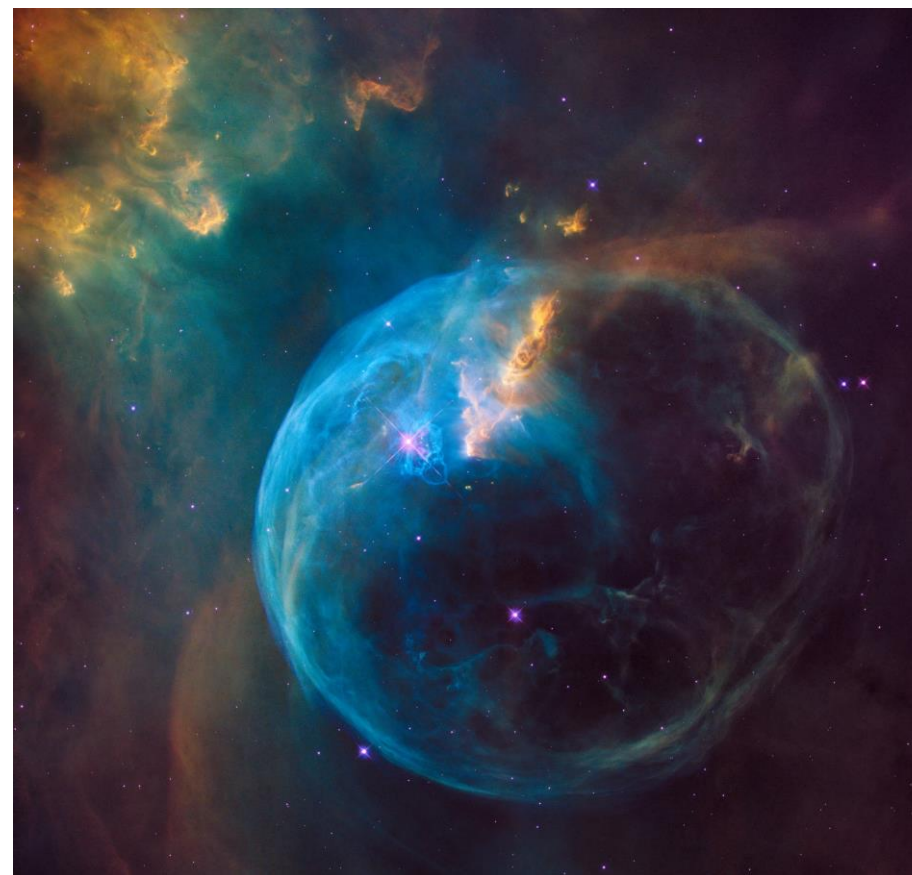
- From this event we can see the bridging power required was ~7 minutes
- In design, this allows us to size appropriate bridging power for critical infrastructure. Data driven design.
- In Operations, this allows us to validate that every event meets our requirements.
- Collect trends to address problems before they become problems
- 66% cost savings



Why does it matter?

Supernovas! ... don't want to be late to this party

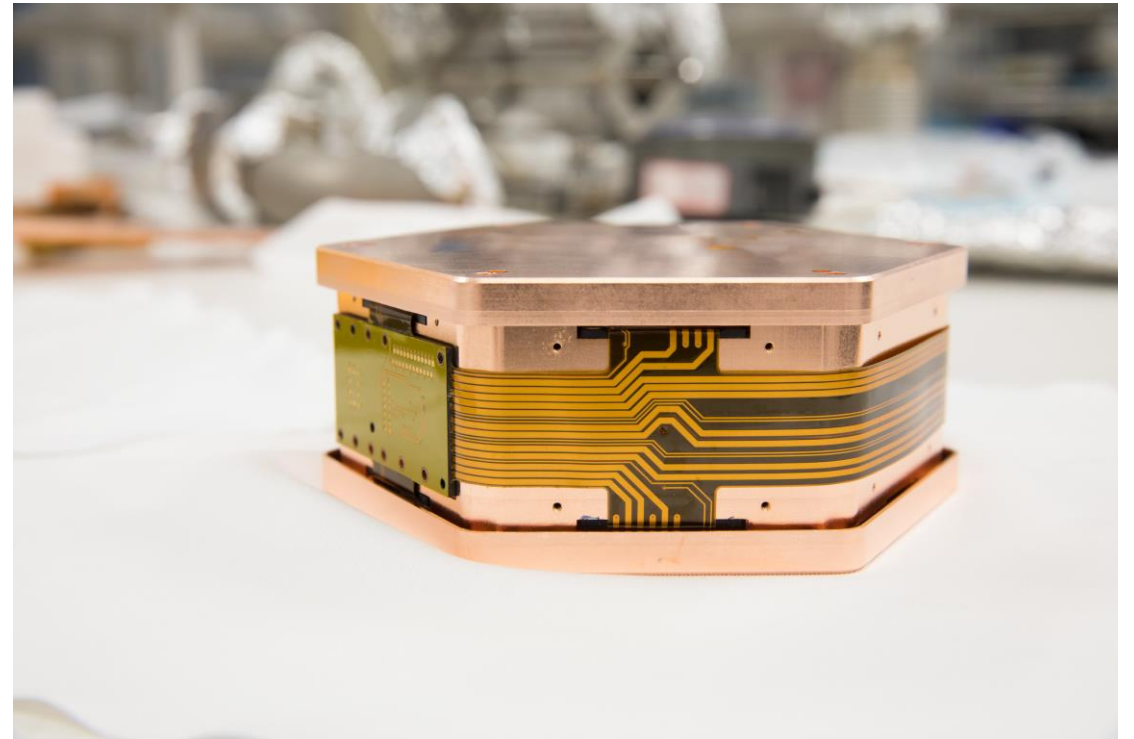
- Experiment uptime is important
- A supernova is predicted to occur every few decades, last one: 1987
- When a star explodes, neutrinos will reach the earth before visible light
- SNEWS network, an international collection of sensitive neutrino detectors that act as a giant alarm clock
- Directs large telescopes to the region of interest



Why does it matter?

Dark Matter

- Experiment uptime is important
- Astronomers and astrophysicists predict about 95% of all the matter in the universe is dark
- SCDMS is an upcoming dark matter detector at SNOLAB
- It operates a fraction of a degree above absolute zero
- Any outages will result in several weeks lost science data to reach this cold of a temperature



THE FUTURE IS BRIGHT

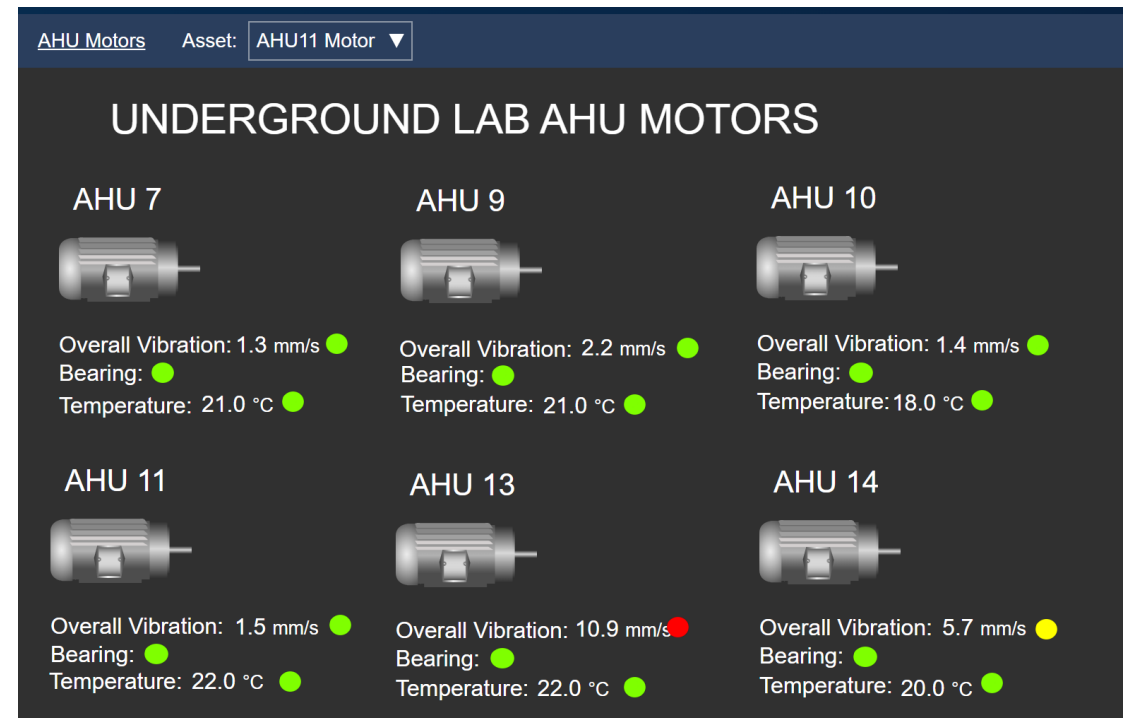
What's Next?

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What's next?

Predictive Analytics

- Using condition based preventative maintenance to reduce downtime
- Current example, using motor condition monitors to track motor vibration and temperature
- A database compiles the data and PI presents it to the maintenance department
- Long term, utilizing AVEVA predictive analytics to reduce unplanned downtime and maximize equipment reliability



SNOLAB provides visibility into vital operating data and is on its way to predictive analytics

Challenge

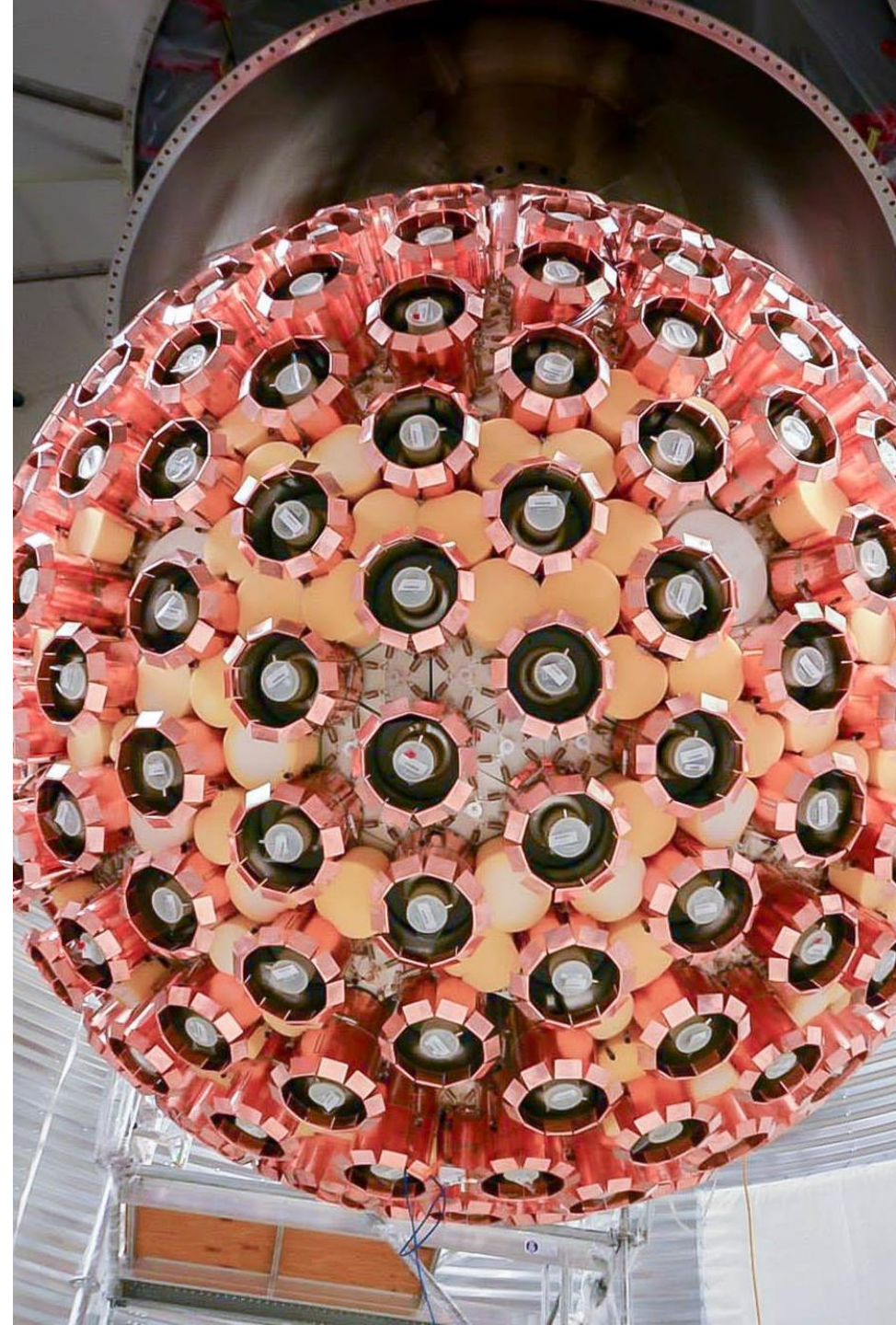
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Solution

- Deployed AVEVA™ PI System™ to collate and structure data collection, improve data visibility, and reconstruct events.

Results

- **Gave scientists, operation staff, and engineers visibility into all data in a central location**
- **Provided the tools to complete root cause investigations, ensuring we meet performance metrics for uptime**



Conclusion

The world leading deep underground laboratory, leading with AVEVA PI

- AVEVA PI has allowed scientists, operation staff, and engineers visibility into all data in a central location
- Provided the tools to complete root cause investigations, ensuring we are ready for the next supernova and enabling the world's leading scientist to hunt for dark matter
- Ensuring SNOLAB is the location of choice for deep underground science





Steven Back

Operations Manager

- SNOLAB
- Steven.Back@SNOLAB.ca



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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AVEVA is a world leader in industrial software, providing engineering and operational solutions across multiple industries, including oil and gas, chemical, pharmaceutical, power and utilities, marine, renewables, and food and beverage. Our agnostic and open architecture helps organizations design, build, operate, maintain and optimize the complete lifecycle of complex industrial assets, from production plants and offshore platforms to manufactured consumer goods.

Over 20,000 enterprises in over 100 countries rely on AVEVA to help them deliver life's essentials: safe and reliable energy, food, medicines, infrastructure and more. By connecting people with trusted information and AI-enriched insights, AVEVA enables teams to engineer efficiently and optimize operations, driving growth and sustainability.

Named as one of the world's most innovative companies, AVEVA supports customers with open solutions and the expertise of more than 6,400 employees, 5,000 partners and 5,700 certified developers. The company is headquartered in Cambridge, UK.

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