EMERSON EXCHANGE 2025

ACCELERATING INNOVATION

Have a Splitting Headache? Lessons Learned From a Large Zone Split

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cenovus ENERGY

LEGEND

- Conventional
- Offshore
- U.S. Refining
- Oil Sands
- Canadian Refining
- Crude export pipelines
- White Rose
- Terra Nova

Spartan Controls

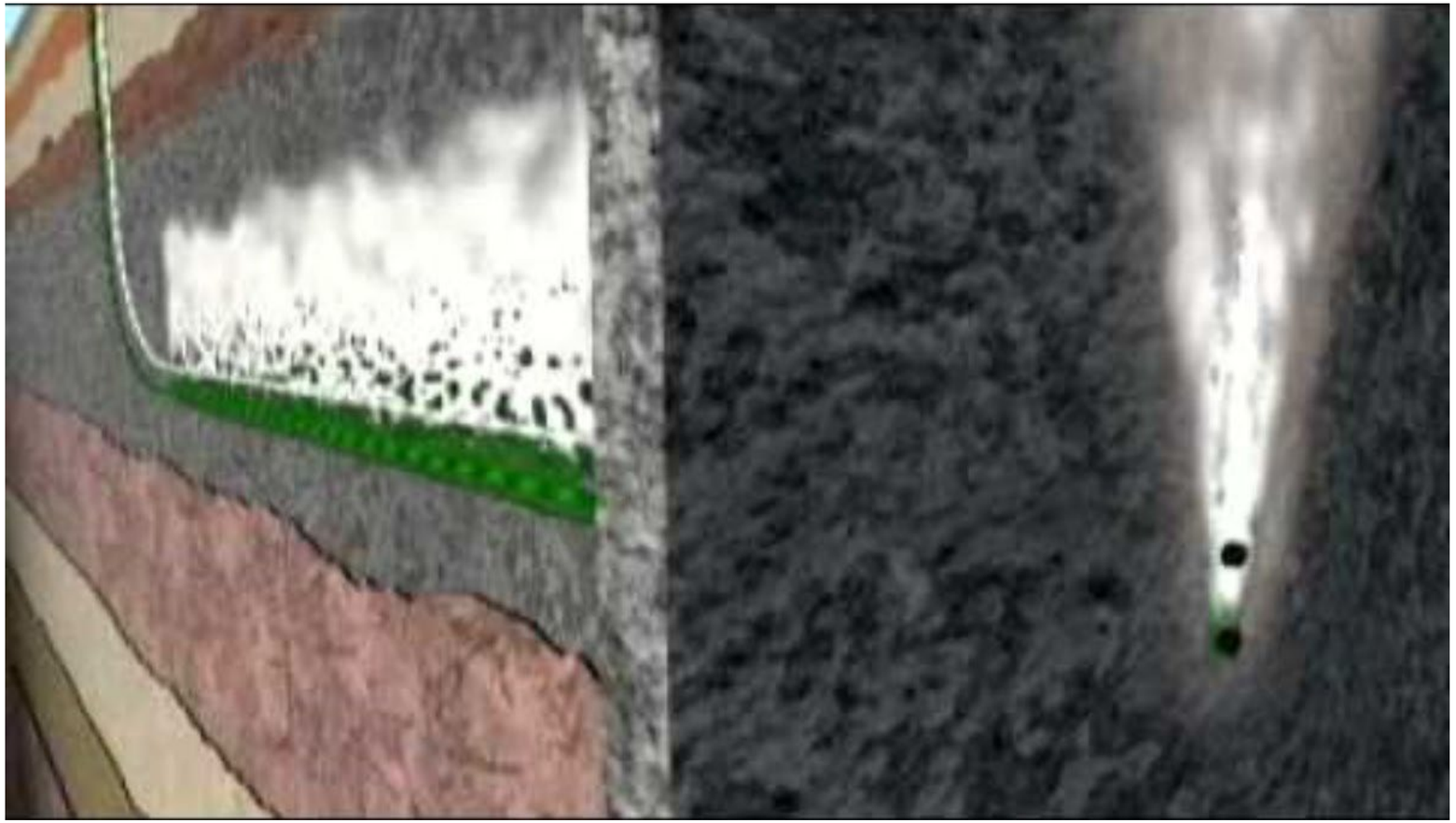
Spartan is the Emerson Impact Partner for Western Canada. We are employee owned and proud to serve our customers in a variety of industries domestically and abroad.

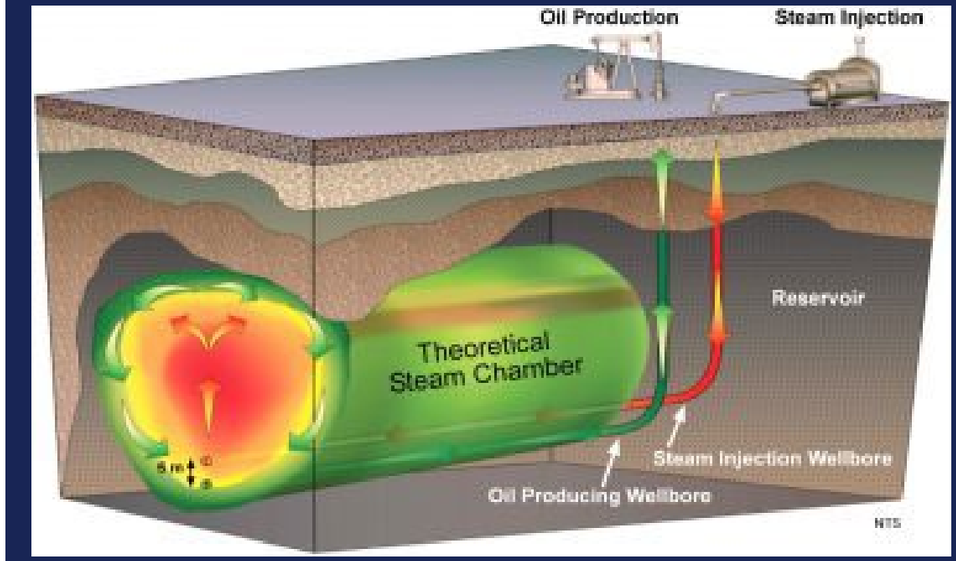
Our vision is to create a Sustainable Modern World with Innovative Automation.

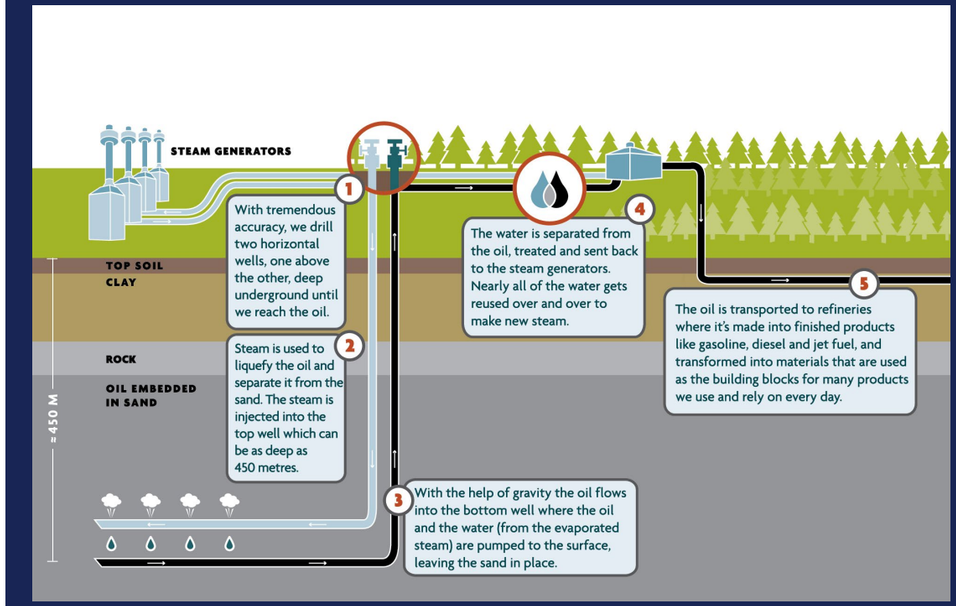
The Challenge

The system grows…

SAGD Growth




Oil Production
Steam Injection
Reservoir
Theoretical
Steam Chamber
5 m
Steam Injection Wellbore
Oil Producing Wellbore
NTS


STEAM GENERATORS
1
With tremendous accuracy, we drill two horizontal wells, one above the other, deep underground until we reach the oil.
TOP SOIL
CLAY
ROCK
OIL EMBEDDED IN SAND
≈ 450 M
2
Steam is used to liquefy the oil and separate it from the sand. The steam is injected into the top well which can be as deep as 450 metres.
3
With the help of gravity the oil flows into the bottom well where the oil and the water (from the evaporated steam) are pumped to the surface, leaving the sand in place.
4
The water is separated from the oil, treated and sent back to the steam generators. Nearly all of the water gets reused over and over to make new steam.
5
The oil is transported to refineries where it's made into finished products like gasoline, diesel and jet fuel, and transformed into materials that are used as the building blocks for many products we use and rely on every day.

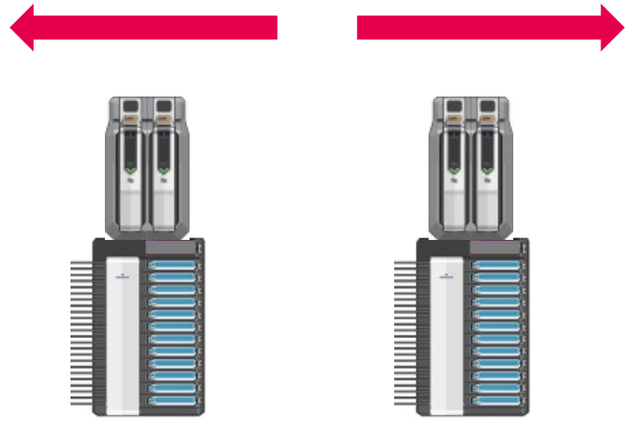
Why zone split?

- Original system size:
  - 16625 DST
  - 30 workstations
  - 67 controller pairs
  - 8 embedded IO pairs
- System capacities:
  - 30,000 DST
  - **120 nodes**
  - 100 controllers
  - 300 embedded IO

23

FREE CAPACITY

Only 23 spare node counts for future growth



What we needed to know

BPCS Split

- Network design
- Inter-controller references
- License breakdown
- Inter-zone alarming

SIS Split

- Network design
- Secure references

Other Considerations

- AMS
- Virtual Machine distribution
- L3/DMZ redesign
- Online or Offline (online possible for some customers previously)

FEED Study

- Performed FEED to determine answers to our questions
- Performed on DeltaV v13.3.1
- Previous SAGD splits showed logical split design between Field Facilities (FF) and Central Processing Facility (CPF)
  - Field Facilities and Wellpads can be used interchangeably for this presentation
  - Central Processing Facility includes steam generation, oil treatment, water treatment, and other utilities

The Plan

Tested and ready to execute…

What we planned for

BPCS Split

- Fibre home-runs to main control center
- Rebalance network cables
- Create landing/shadow modules
- Account for SDO (steam demand optimization) parameters between proposed zones
- Inter-zone graphics
- License counts finalized

SIS Split

- Create two rings
- Account for L1 and L2 shutdowns

Auxiliary Application Split

- Create two separate AMS Server Plus instances
- “Split-Ready” virtual host architecture already in place from last upgrade
- Addition of L3 OT network for common assets

Look under the hood

B	C	D	E	F	G	H	I	
controller	tag	module_name	attribute_instance_r	cate	source_controller	reference	ref	ref
CG1-SDS-002	CG1TI0031	CG1TI0031	AI1$IO_IN		CG1SDS002-SLS05	CG1SISC002	//CG1SISC002/CG1TI0031-HH/IN1	
CG1-SDS-002	CG1TI0031	CG1TI0031	H_ALM_HYS		CG1SDS002-SLS05	CG1SISC002	//CG1SISC002/CG1TI0031-HH/TRIP_HYS	
CG1-SDS-002	CG1TI0031	CG1TI0031	H_LIM_REF		CG1SDS002-SLS05	CG1SISC002	//CG1SISC002/CG1TI0031-HH/PRE_TRIP_LIM	
CG1-SDS-002	CG1TI0031	CG1TI0031	HH_ALM_HYS		CG1SDS002-SLS05	CG1SISC002	//CG1SISC002/CG1TI0031-HH/TRIP_HYS	
CG1-SDS-002	CG1TI0031	CG1TI0031	HH_LIM_REF		CG1SDS002-SLS05	CG1SISC002	//CG1SISC002/CG1TI0031-HH/TRIP_LIM	
CG1-SDS-002	CG1TI0031	CG1TI0031	SCALE_REF		CG1SDS002-SLS05	CG1SISC002	//CG1SISC002/CG1TI0031-HH/IN_SCALE	
CG1-SDS-002	CG1YY1030EF	CG1YY1030EF	DI1$IO_IN		CG1SDS002-SLS21	CG1-CE-FG06	//CG1-CE-FG06/CG1YY1030EF/OUT_D	
CG1-SDS-002	CG1YYE0020EH	CG1YYE0020EH	DI1$IO_IN		CG1SDS002-SLS01	CG1SISE001	//CG1SISE001/CG1UC0020EH-SR	
CG1-SDS-002	CG1YYE0021EH	CG1YYE0021EH	DI1$IO_IN		CG1SDS002-SLS05	CG1SISE002	//CG1SISE002/CG1UC0021EH-SR	
CG1-SDS-002	CG1YYE0022EH	CG1YYE0022EH	DI1$IO_IN		CG1SDS002-SLS09	CG1SISE003	//CG1SISE003/CG1UC0022EH-SR	
CG1-SDS-002	CG1FLMF1100B	CG1FLMF1100B	DI1$IO_IN		CG1SDS002-SLS53	CG1-CE-FG11	//CG1-CE-FG11/CG1FLM1100ABBAD/IN_D2	
CG1-SDS-002	CG1FLMI0040A	CG1FLMI0040A	AI1$IO_IN		CG1SDS002-SLS21	CG1-CE-FG06	//CG1-CE-FG06/CG1AVTRF0040AHH/IN1	
CG1-SDS-002	CG1FLMI0040A	CG1FLMI0040A	H_ALM_HYS		CG1SDS002-SLS21	CG1-CE-FG06	//CG1-CE-FG06/CG1AVTRF0040AHH/TRIP_HYS	
CG1-SDS-002	CG1FLMI0040A	CG1FLMI0040A	H_LIM_REF		CG1SDS002-SLS21	CG1-CE-FG06	//CG1-CE-FG06/CG1AVTRF0040AHH/PRE_TRIP_	
CG1-SDS-002	CG1FLMI0040A	CG1FLMI0040A	HH_ALM_HYS		CG1SDS002-SLS21	CG1-CE-FG06	//CG1-CE-FG06/CG1AVTRF0040AHH/TRIP_HYS	
CG1-SDS-002	CG1FLMI0040A	CG1FLMI0040A	HH_LIM_REF		CG1SDS002-SLS21	CG1-CE-FG06	//CG1-CE-FG06/CG1AVTRF0040AHH/TRIP_LIM	
CG1-SDS-002	CG1FLMI0040A	CG1FLMI0040A	SCALE_REF		CG1SDS002-SLS21	CG1-CE-FG06	//CG1-CE-FG06/CG1AVTRF0040AHH/IN_SCALE	
CG1-SDS-002	CG1FLMI1100A	CG1FLMI1100A	AI1$IO_IN		CG1SDS002-SLS53	CG1-CE-FG11	//CG1-CE-FG11/CG1AVTRF1100AHH/IN1	
CG1-SDS-002	CG1FLMI1100A	CG1FLMI1100A	H_ALM_HYS		CG1SDS002-SLS53	CG1-CE-FG11	//CG1-CE-FG11/CG1AVTRF1100AHH/TRIP_HYS	
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CG1-SDS-002	CG1FLMI1100B	CG1FLMI1100B	SCALE_REF		CG1SDS002-SLS53	CG1-CE-FG11	//CG1-CE-FG11/CG1AVTRF1100AHH/IN_SCALE	
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CG1-SDS-002	CG1H2SF0020BA	CG1H2SF0020BA	DI1$IO_IN		CG1SDS002-SLS33	CG1-CE-FG03	//CG1-CE-FG03/CG1H2S0020BABAD/IN_D1	
CG1-SDS-002	CG1H2SF0021BA	CG1H2SF0021BA	DI1$IO_IN		CG1SDS002-SLS33	CG1-CE-FG03	//CG1-CE-FG03/CG1H2S0021BABAD/IN_D1	
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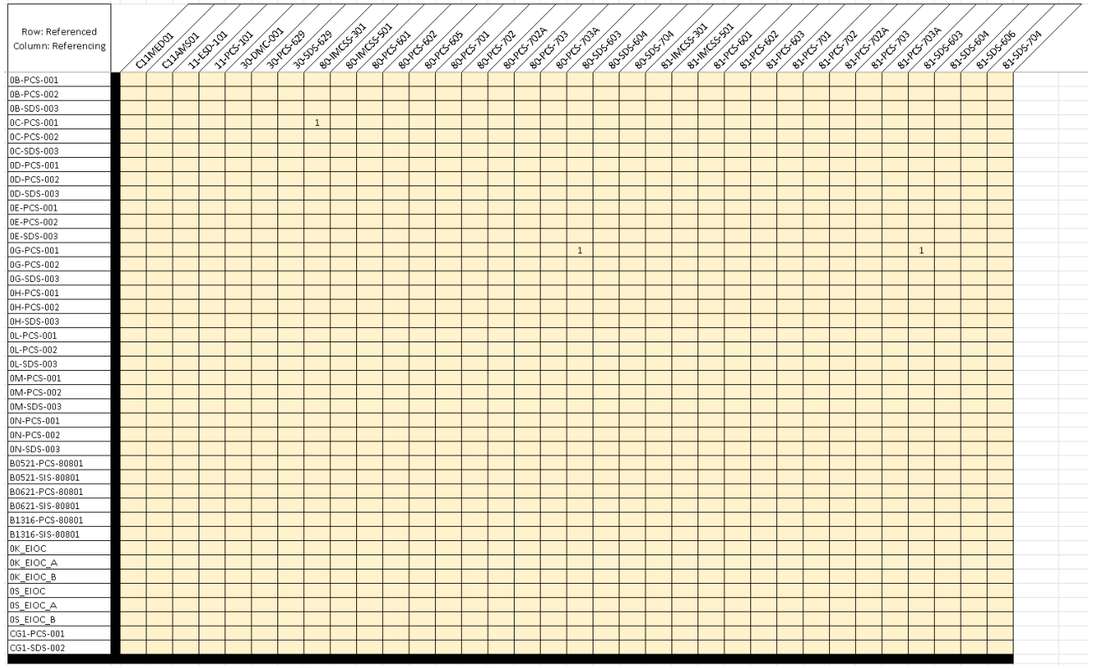
CG1-SDS-002	CG1H2SI0020BA	CG1H2SI0020BA	H_ALM_HYS		CG1SDS002-SLS33	CG1-CE-FG03	//CG1-CE-FG03/CG1H0020BAHH-BYP/TRIP_HYS	
CG1-SDS-002	CG1H2SI0020BA	CG1H2SI0020BA	H_LIM_REF		CG1SDS002-SLS33	CG1-CE-FG03	//CG1-CE-FG03/CG1H0020BAHH-BYP/PRE_TRIF	
CG1-SDS-002	CG1H2SI0020BA	CG1H2SI0020BA	HH_ALM_HYS		CG1SDS002-SLS33	CG1-CE-FG03	//CG1-CE-FG03/CG1H0020BAHH-BYP/TRIP_HYS	
CG1-SDS-002	CG1H2SI0020BA	CG1H2SI0020BA	HH_LIM_REF		CG1SDS002-SLS33	CG1-CE-FG03	//CG1-CE-FG03/CG1H0020BAHH-BYP/TRIP_LIM	
CG1-SDS-002	CG1H2SI0020BA	CG1H2SI0020BA	SCALE_REF		CG1SDS002-SLS33	CG1-CE-FG03	//CG1-CE-FG03/CG1H0020BAHH-BYP/IN_SCALE	
CG1-SDS-002	CG1H2SI0021BA	CG1H2SI0021BA	AI1$IO_IN		CG1SDS002-SLS33	CG1-CE-FG03	//CG1-CE-FG03/CG1H0021BAHH-BYP/IN1	
CG1-SDS-002	CG1H2SI0021BA	CG1H2SI0021BA	H_ALM_HYS		CG1SDS002-SLS33	CG1-CE-FG03	//CG1-CE-FG03/CG1H0021BAHH-BYP/TRIP_HYS	
CG1-SDS-002	CG1H2SI0021BA	CG1H2SI0021BA	H_LIM_REF		CG1SDS002-SLS33	CG1-CE-FG03	//CG1-CE-FG03/CG1H0021BAHH-BYP/PRE_TRIF	
CG1-SDS-002	CG1H2SI0021BA	CG1H2SI0021BA	HH_ALM_HYS		CG1SDS002-SLS33	CG1-CE-FG03	//CG1-CE-FG03/CG1H0021BAHH-BYP/TRIP_HYS	
CG1-SDS-002	CG1H2SI0021BA	CG1H2SI0021BA	HH_LIM_REF		CG1SDS002-SLS33	CG1-CE-FG03	//CG1-CE-FG03/CG1H0021BAHH-BYP/TRIP_LIM	
CG1-SDS-002	CG1H2SI0021BA	CG1H2SI0021BA	SCALE_REF		CG1SDS002-SLS33	CG1-CE-FG03	//CG1-CE-FG03/CG1H0021BAHH-BYP/IN_SCALE	
CG1-SDS-002	CG1H2SI0022BA	CG1H2SI0022BA	AI1$IO_IN		CG1SDS002-SLS37	CG1-CE-FG04	//CG1-CE-FG04/CG1H0022BAHH-BYP/IN1	
CG1-SDS-002	CG1H2SI0022BA	CG1H2SI0022BA	H_ALM_HYS		CG1SDS002-SLS37	CG1-CE-FG04	//CG1-CE-FG04/CG1H0022BAHH-BYP/TRIP_HYS	
CG1-SDS-002	CG1H2SI0022BA	CG1H2SI0022BA	H_LIM_REF		CG1SDS002-SLS37	CG1-CE-FG04	//CG1-CE-FG04/CG1H0022BAHH-BYP/PRE_TRIF	
CG1-SDS-002	CG1H2SI0022BA	CG1H2SI0022BA	HH_ALM_HYS		CG1SDS002-SLS37	CG1-CE-FG04	//CG1-CE-FG04/CG1H0022BAHH-BYP/TRIP_HYS	
CG1-SDS-002	CG1H2SI0022BA	CG1H2SI0022BA	HH_LIM_REF		CG1SDS002-SLS37	CG1-CE-FG04	//CG1-CE-FG04/CG1H0022BAHH-BYP/TRIP_LIM	



How to move data

BPCS Hard Wire

- Setpoints
- PVs for control
- Alarm bits

SIS Hard Wire

- Emergency shutdowns

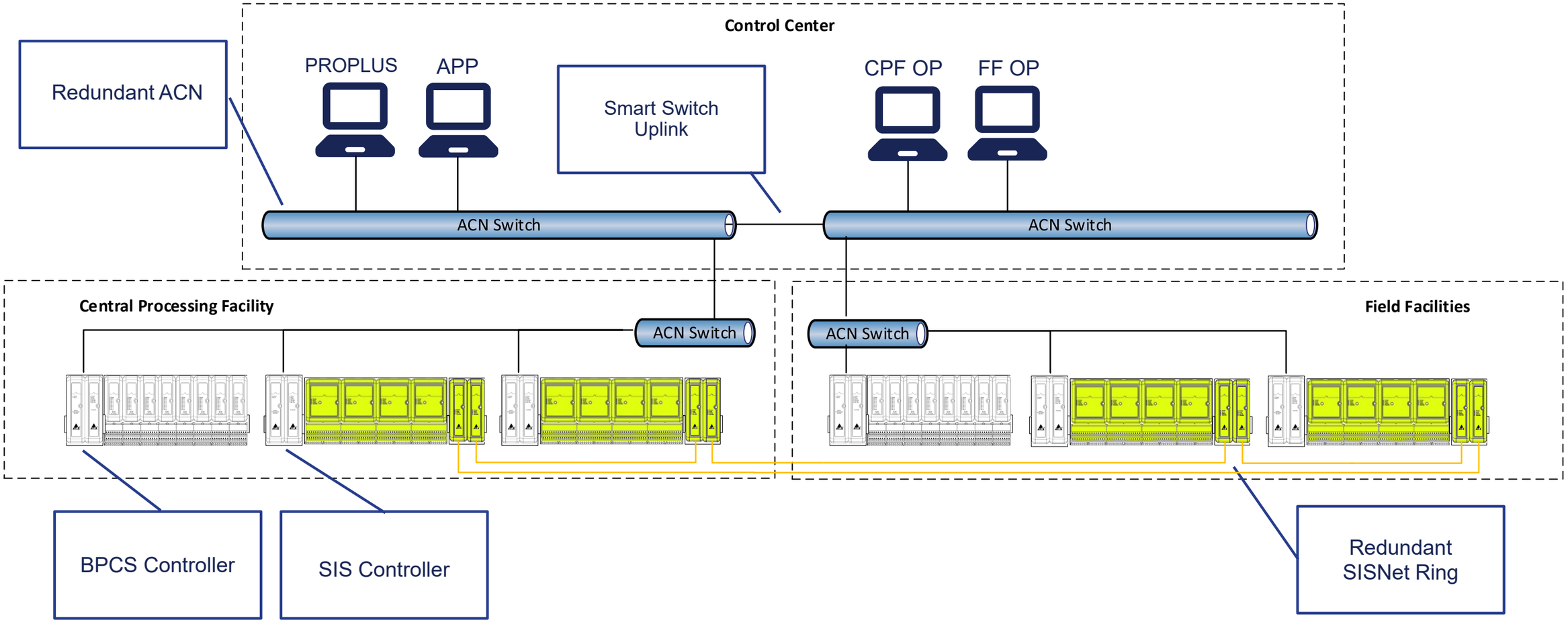
Soft via Interzone Servers

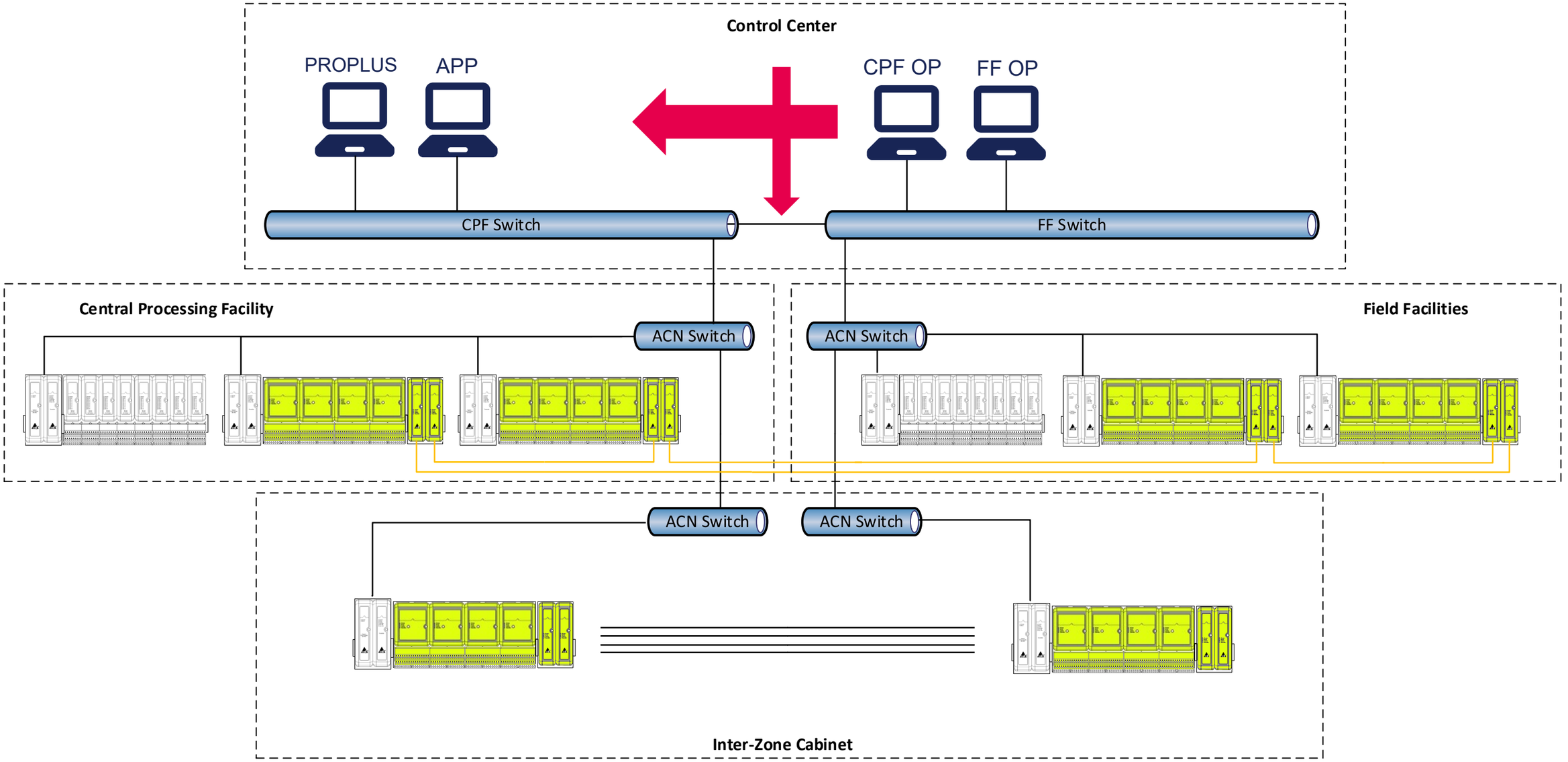
- View-only data

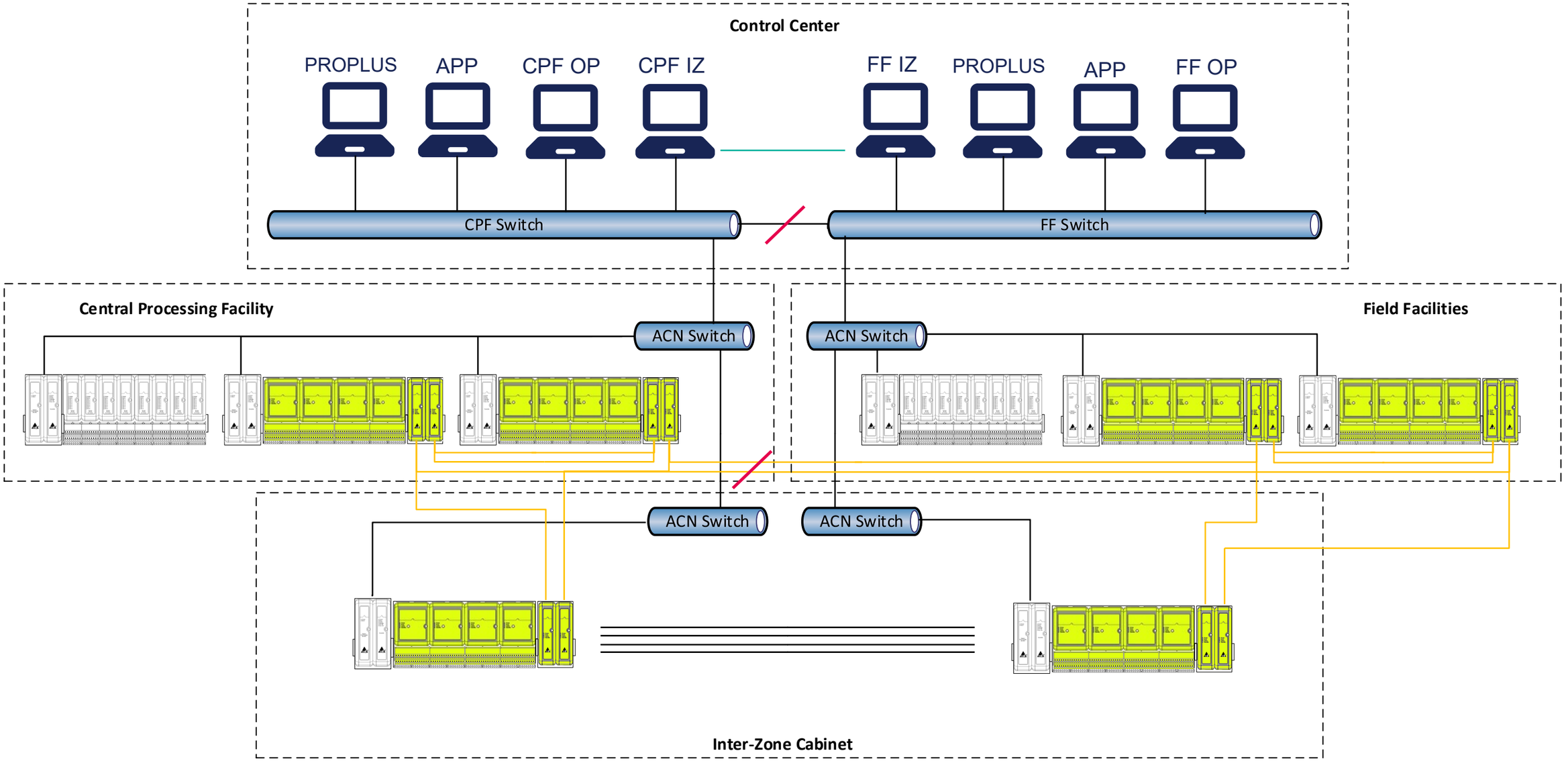
Inter-Zone Cabinet

- Flexible solution to move hardware data
- Install prior to split
- Scalable

Pre-split topology




Control Center
PROPLUS
APP
CPF OP
FF OP
CPF Switch
FF Switch
Central Processing Facility
Field Facilities
ACN Switch
ACN Switch
ACN Switch
ACN Switch
Inter-Zone Cabinet


Control Center
PROPLUS
APP
CPF OP
CPF IZ
FF IZ
PROPLUS
APP
FF OP
CPF Switch
FF Switch
Central Processing Facility
Field Facilities
ACN Switch
ACN Switch
ACN Switch
ACN Switch
Inter-Zone Cabinet

Execution Disturbances

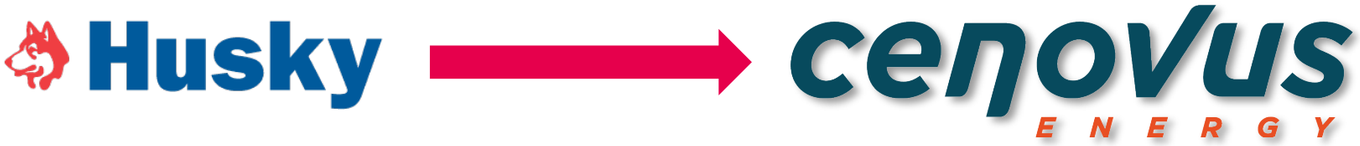
Everybody has a plan until…

COVID-19 Hits

- Project put on hold
- Non-essential changes and personnel to be restricted at site

Husky and Cenovus

- Cenovus Energy and Husky Oil merger January 1, 2021.



- Corporate reorganization changed to centralized management structure of control systems support team with limited DeltaV experience.
- Initial assessment was there would be no new growth plans at Sunrise so the project was put on hold in February 2021.
- By October 2022, new development and optimization plans triggered the requirement to complete the Zone-split project.

Site Changes

- DeltaV upgraded from v13.3.1 to v14.LTS
- New process area added to site since Husky FAT
- Inter-zone cabinet parts used as spares (COVID supply chain)

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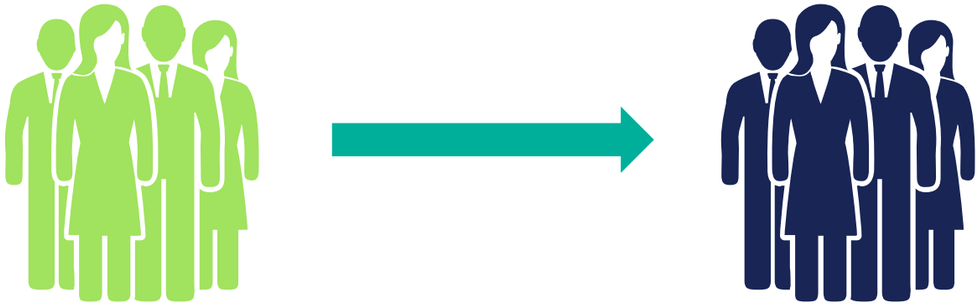
The New Plan

Adapting to new realities…

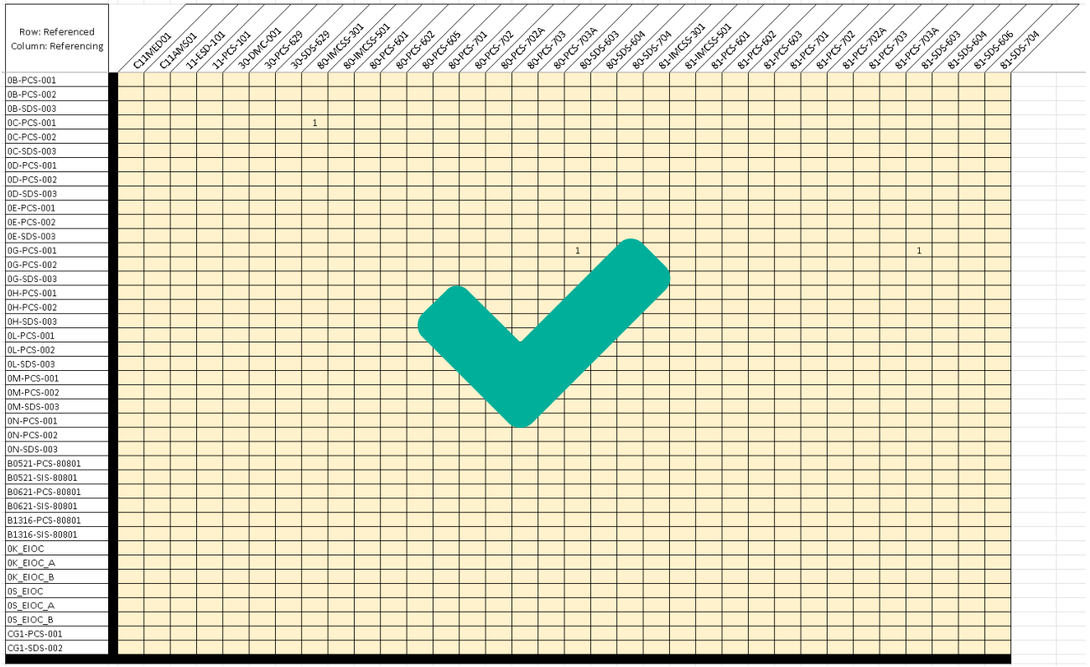
Restoration

- Project kicked off with new execution teams in 2023
- Original project team deployed to new assignments



New Changes

- New areas added to plant since FAT completed in 2020
- Retested interzone parameters and determined no additional IO was required in the interzone cabinet



Improved OT Topology

- Creation of L3 network for common assets
- Backup servers, Endpoint Protection, etc.

Outcomes

And then there were two…

Positioned for Growth

- New zones positioned for growth
- DeltaV performance improved

Lessons Learned

To split or not to split?

How did it go?

- ✔ Minimal post-split support required
- ✔ Core software outages kept to a minimum
- ✔ SISNet fiber work – done right the first time
- ✔ Critical work condensed to one day during production outage

- Overall project budget increased with multiple restarts
- Small number of graphics touch-ups required (never going to catch them all)

People Are Key

- Require high level technical resources to plan, execute, and adapt to unknowns that come up at site
- Site Team:
  - Spartan Project Lead
  - Spartan OT Specialist
  - Spartan SIS Certified SME
  - Spartan AMS/Reliability Specialist
  - Cenovus OT Specialist
  - Cenovus Automation Specialist
  - Local Fiber Specialist
  - Cenovus OT Architect (L3 Networks)
- Project Management:
  - Spartan Project Manager
  - Cenovus Project Manager

Sage Advice

- The best zone split is the split you never need to perform
- When designing large facilities, consider:
  - Operational divisions
  - Logical/physical segregations of plant areas
  - Forecasted growth
  - Synchronicity of maintenance/outage activities

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Thank You