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Cardinal Plant:
Post Transition Evolutions

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OEC Summer Conference
August 13, 2024

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2018

Buckeye Begins Operating Cardinal Plant

- Fifty years of operating history and culture at transition
- Transition of support functions – a large task
- Where are the improvement opportunities?

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2018 – 2024

Changes, Challenges, & Opportunities

- Safety Program – Proactive focus, updated performance metrics, and job observations
- Personnel – New leaders and changes in roles, responsibilities, and reporting structures
- Budget Process & Adherence – Change to a scope-based approach

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2018 – 2024

Changes, Challenges, & Opportunities

- Byproduct Sales Program – Quality focus, increased revenue, and new opportunities
- Support Organizations – Who, what, where, and how much
- Initiatives – Staffing, outage process, ORM, standard work, process improvements, cross-functional teams, contractor management

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2018 – 2024

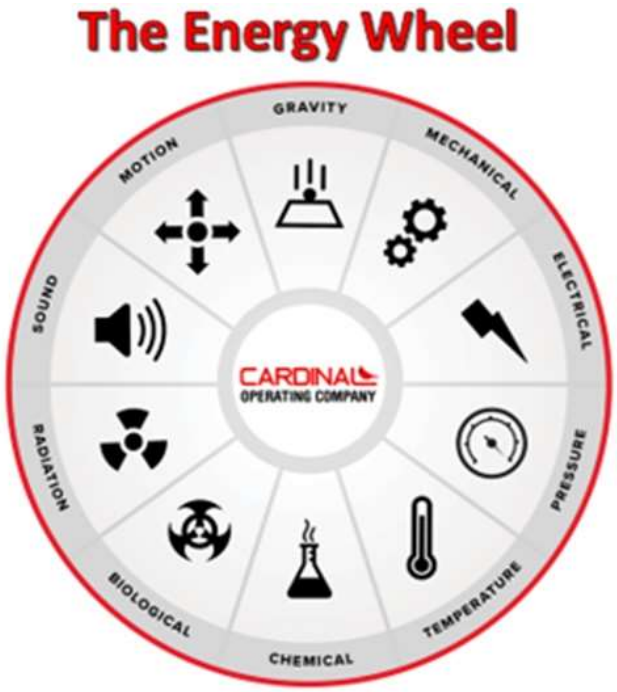
Changes, Challenges, & Opportunities

- Major Projects – Completed projects, ongoing efforts, and a forward look
- Performance – Challenges and opportunities, reliability, record runs, being there when the stakes are high
- The Future – Continued evolution of Cardinal and the road ahead

Safety & Health

Proactive Focus

- Increased Job Observations
- Updated Initiatives
- Benchmarking
- New Team



Plant Personnel

Change Agents

- New leadership in key roles
- Determining proper level and work location of support resources
- Reorganizing resources within departments
- Reorganization of departments

Budget Process

- **Characteristics**

OWNERSHIP

- Budget Owner Network
- Responsibility
- Effective Communication
- Project Management

SCOPE-BASED

- Outlining Project Tasks
- Prioritize Liabilities
- Reliability & Stakeholder Alignment

MEASURE PERFORMANCE

- Accountability
- Budget Evaluation
- Supports Decision Making

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Budget Process

- **Components**

PRODUCTION

- G&A
- Operations
- Environmental/ Chemicals

Operations Supt.

- Corporate Acct
- Environmental Process Owner/Lab
- Fire & Safety Ops
- Acct/Stores/ Procurement
- IT

MAINTENANCE

- Unplanned Maintenance
- Forced Outage
- Planned Outage
- Non-Outage Maintenance Improvements

Maintenance Supt.

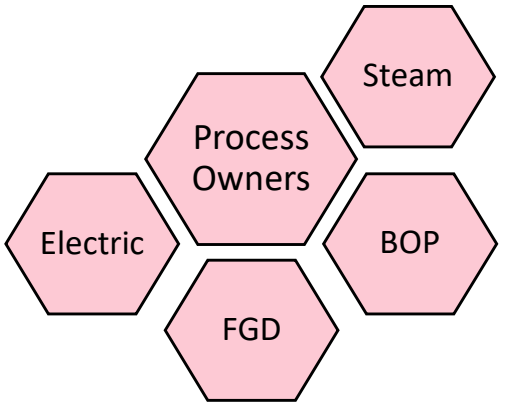
- Outage Manager
- Process Owners
- Fire & Safety Maint.
- Acct/Stores/ Procurement
- IT

CAPITAL

- Minor Capital Expenditures
- Major Capital Expenditures

Corporate Engineering & Construction/ Maintenance Supt.

- Process Owners



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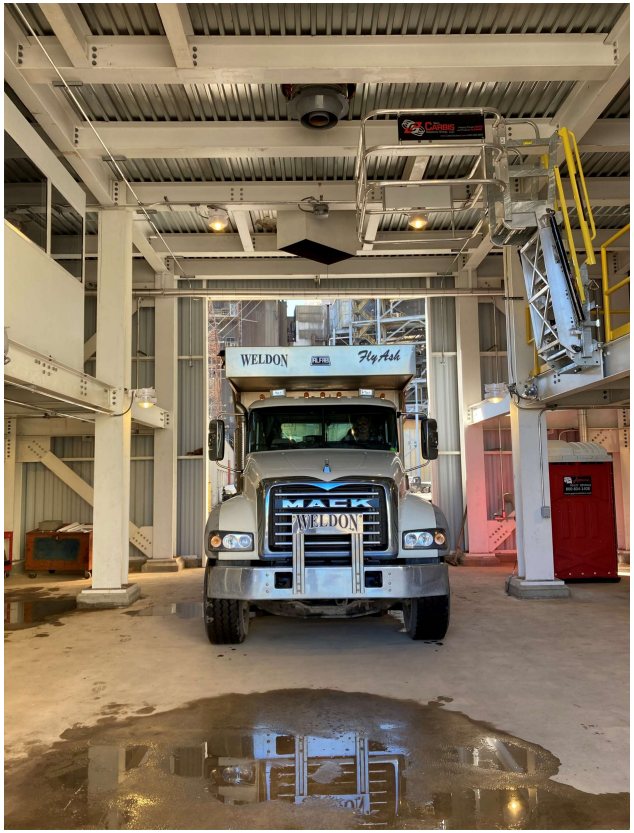
Byproduct Sales

Bottom Ash, Gypsum, & Fly Ash

- Cardinal produces three byproducts used for beneficial purposes
- Gypsum – The big hitter, wallboard production
- Fly Ash – A new challenge, emerging markets, and opportunity for Cardinal
- Bottom ash – Small market, limited use



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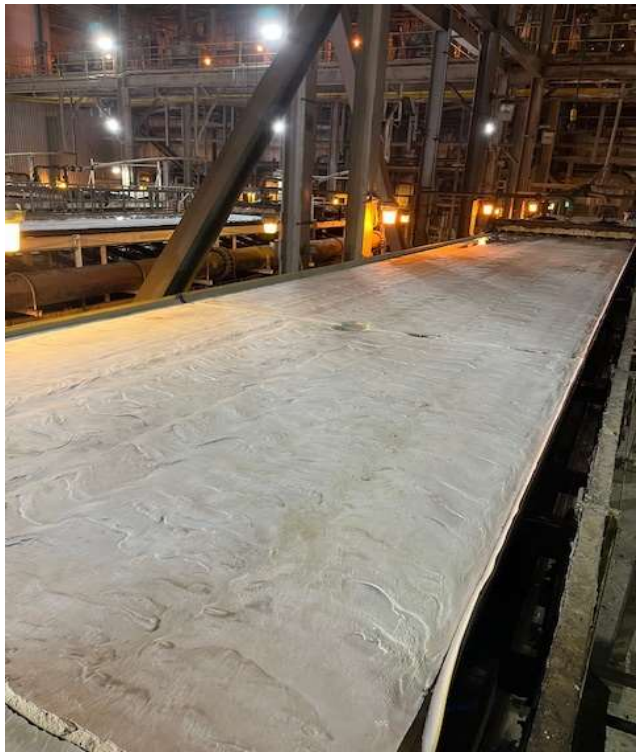
Byproduct Sales

Gyspum – Byproduct of SO2 Removal

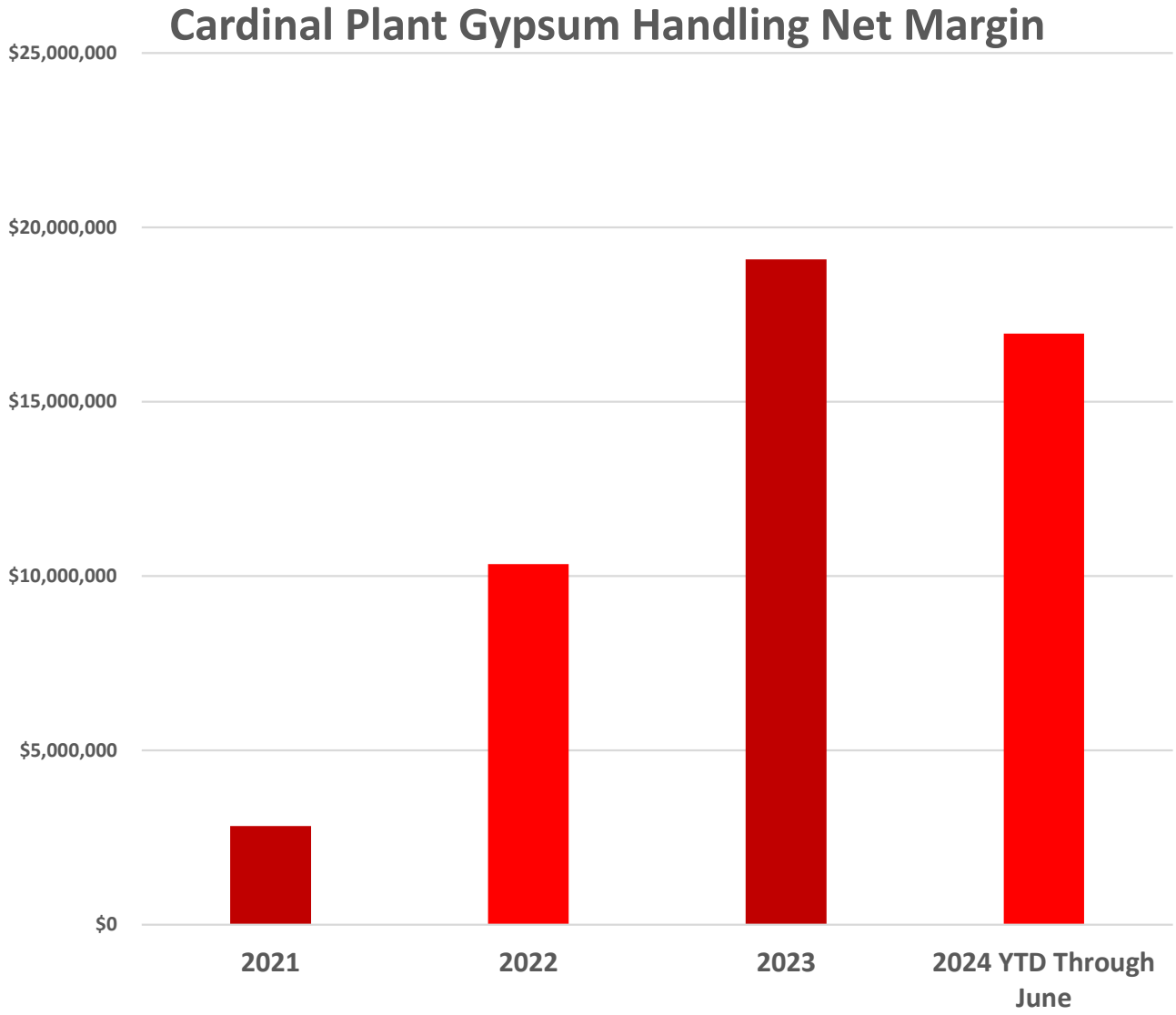
- FGD Process byproduct
- Solids are de-watered using long vacuum filter belts and are tested for purity and the presence of moisture and chlorides
- Gypsum meeting the quality spec is sent to “the dome,” gypsum that does not meet the spec goes to “the pad”



Byproduct Sales

Production Gypsum & Reclaimed Gypsum

- **2023 Gypsum Production Sales – 647,327 tons**
- **2023 Landfill Reclaimed Gypsum – 574,015 tons New record!**
- **June 2024 YTD Total Gypsum Production Sales – 342,832 tons**
- **June 2024 TYD Reclaimed Gypsum – 154,846 tons**



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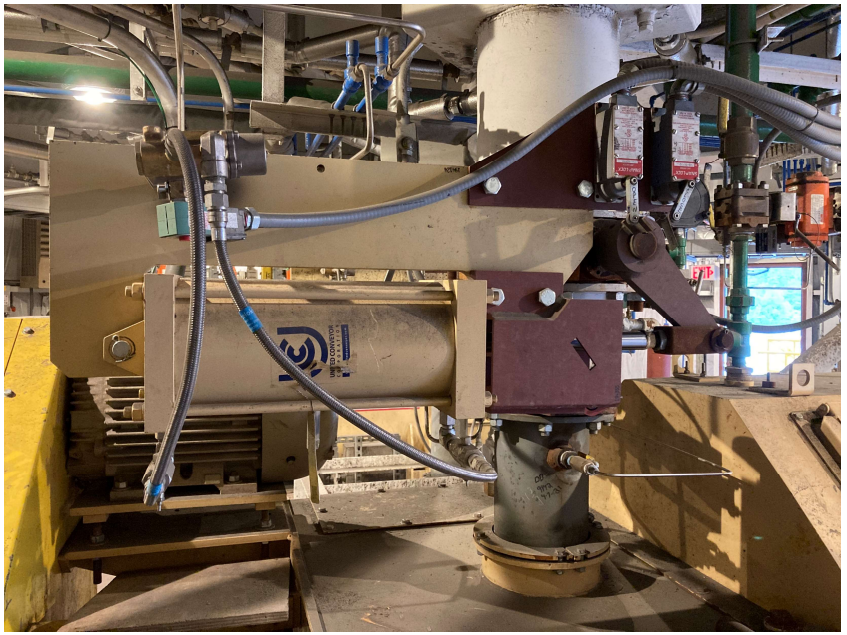
Byproduct Sales

Dry Fly Ash – Combustion Byproduct

- **Byproduct of coal combustion**
- **Light enough to be carried with the flow of gas through the boiler and convection passes**
- **Removed from gas path with electrostatic precipitators**
- **Sold as dry ash and as "conditioned" ash – remainder of conditioned ash is landfilled**



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Byproduct Sales

Dry Fly Ash – Quality & Specifications

- **Fly ash is used in the production of concrete**
- **It must meet certain quality specifications; LOI (unburnt carbon) is the most important**
- **Samples pulled multiple times per day and analyzed. Combustion optimization is the name of the game for good LOI, and there is a lot that goes into that**

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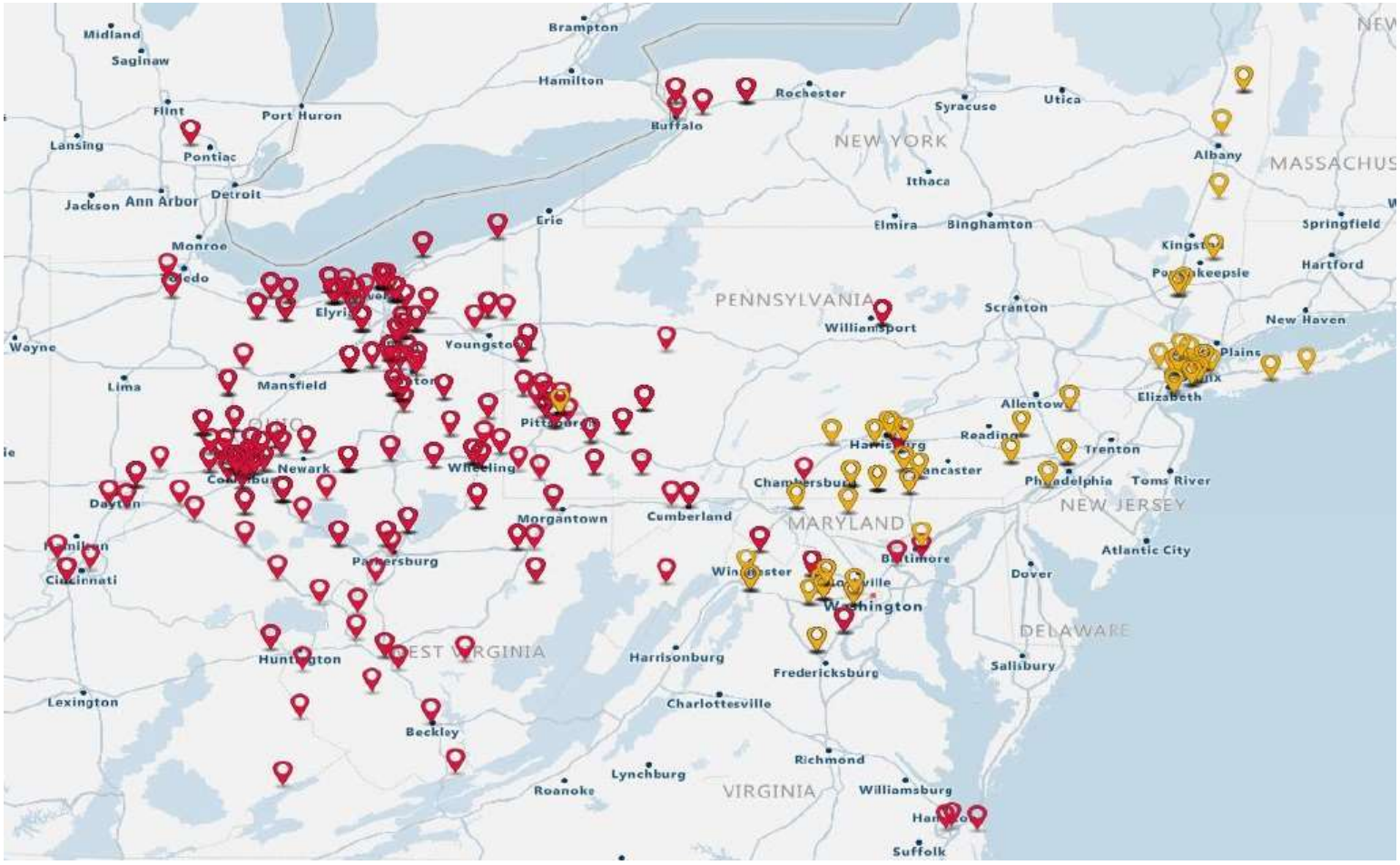
Byproduct Sales

Dry Fly Ash Market – 2024 Expansion

- **Sites that have received Cardinal Plant fly ash through 2024 – 8 states and into Canada**



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Engineering Support Post Transition

- AEP technical support is fading
- Hired 7 engineers since transition
- Leveraging experienced plant engineers and personnel
- Hiring 3rd party engineering design firms
- Utilizing Electric Power Research Institute (EPRI)

Department Initiatives

Department Initiatives

- Standard Work
- Operator Minor Maintenance
- Outage Process
- Operational Risk Management
- Process Improvements
- Cross Functional Teams
- Contractor Management

	Compiled by:	Reviewed By*:	Approved By**:
Name	Brad A Richards	Eric West	Eric Lowe
Date	02/26/2024	03/08/2024	03/08/2024
Signature	Brad A Richards	Eric West	Eric Lowe
SharePoint Upload			
Revision			0

*Reviewed by PSL level and above
**Approved by Superintendent level and above

Cleaning Traveling Water Screen Strainers
Operator Minor Maintenance

Select all that apply ☐ Unit 0 ☒ Unit 1 ☒Unit 2 ☐ Unit 3
Process: General **System:** 500 Turbine/Generator **Class:** Class 3 - Low Risk/Low Complexity

PURPOSE: To provide instructions on how to clean the traveling water screen stainers

MATERIALS/EQUIPMENT/TOOLING: Valve wrench, Battery impact, Impact sockets ¾" and 7/8" , needle nose pliers, wire brush
Cat ID for replacement strainer- 0600273069
Warehouse location- Zone B Row N Section 04 Tier B06 Bin B00

PREREQUISITES: Traveling water screen shut down

POTENTIAL HAZARDS: Body positioning, trapped water pressure

PPE/SAFETY EQUIPMENT PRECAUTIONS: Standard PPE

PROCEDURE:
1. **If the traveling water screen is in service, Radio the control room to shut down the screen.**
2. **Close the water supply HSO.**

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Major Projects

Dry Fly Ash Conversion

Dry Fly Ash

- Installed on all three units to meet Coal Combustion Residual (CCR) regulations
- Also created opportunity for byproduct sales of fly ash

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Major Projects

Fly Ash Reservoir Closure

FAR II Closure

- Closure of FAR II required to meet Coal Combustion Residual (CCR) regulations
- Enormous earth-moving operation. Bulk of work will be completed by the end of 2024

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Major Projects

Bottom Ash Retrofit

Bottom Ash Project

- Pond lining required to meet Coal Combustion Residual (CCR) regulations

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Unit Reliability

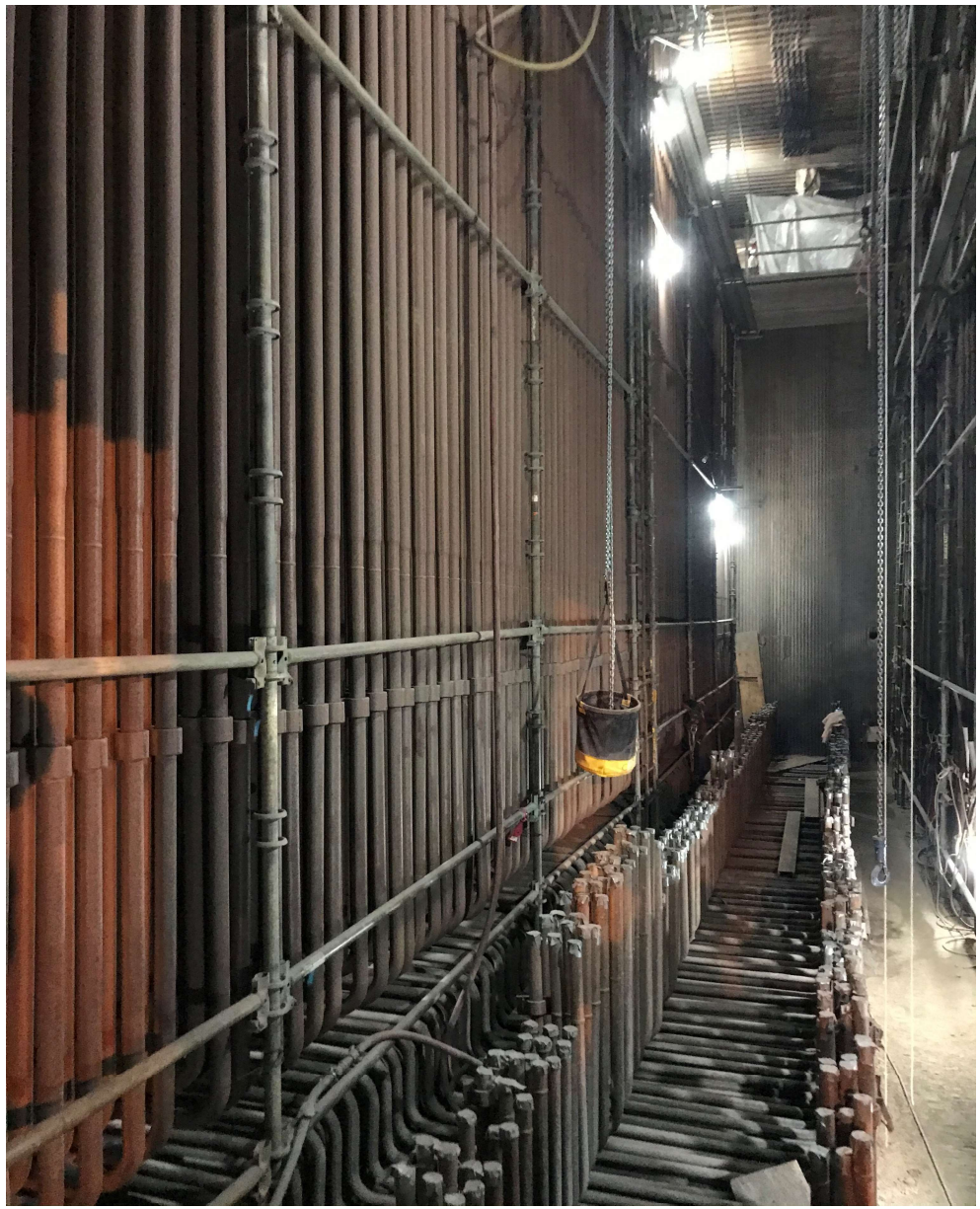
Steam Generator Maintenance

2015 Spring – Unit 1

- Replaced 1st Vertical Reheat

2021 Spring – Unit 2

- Replaced 1st Vertical Reheat
  - U2 had experienced several leaks in this section of the boiler



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Unit Reliability

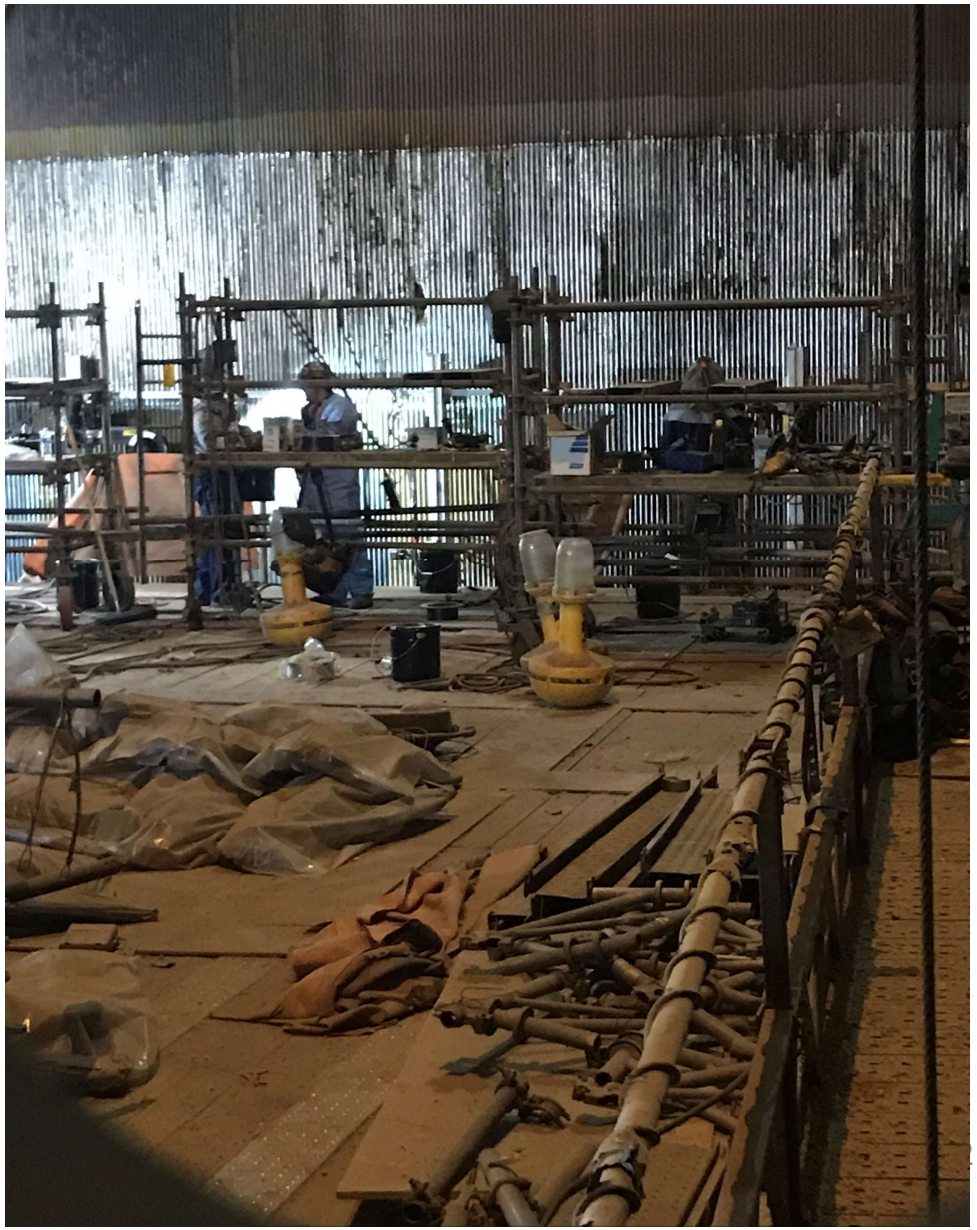
Steam Generator Maintenance

2021 Spring – Unit 1

- Over 5000 sq. ft. of weld overlay

2023 Spring - Unit 2

- Over 5000 sq. ft. of weld overlay



Unit Reliability

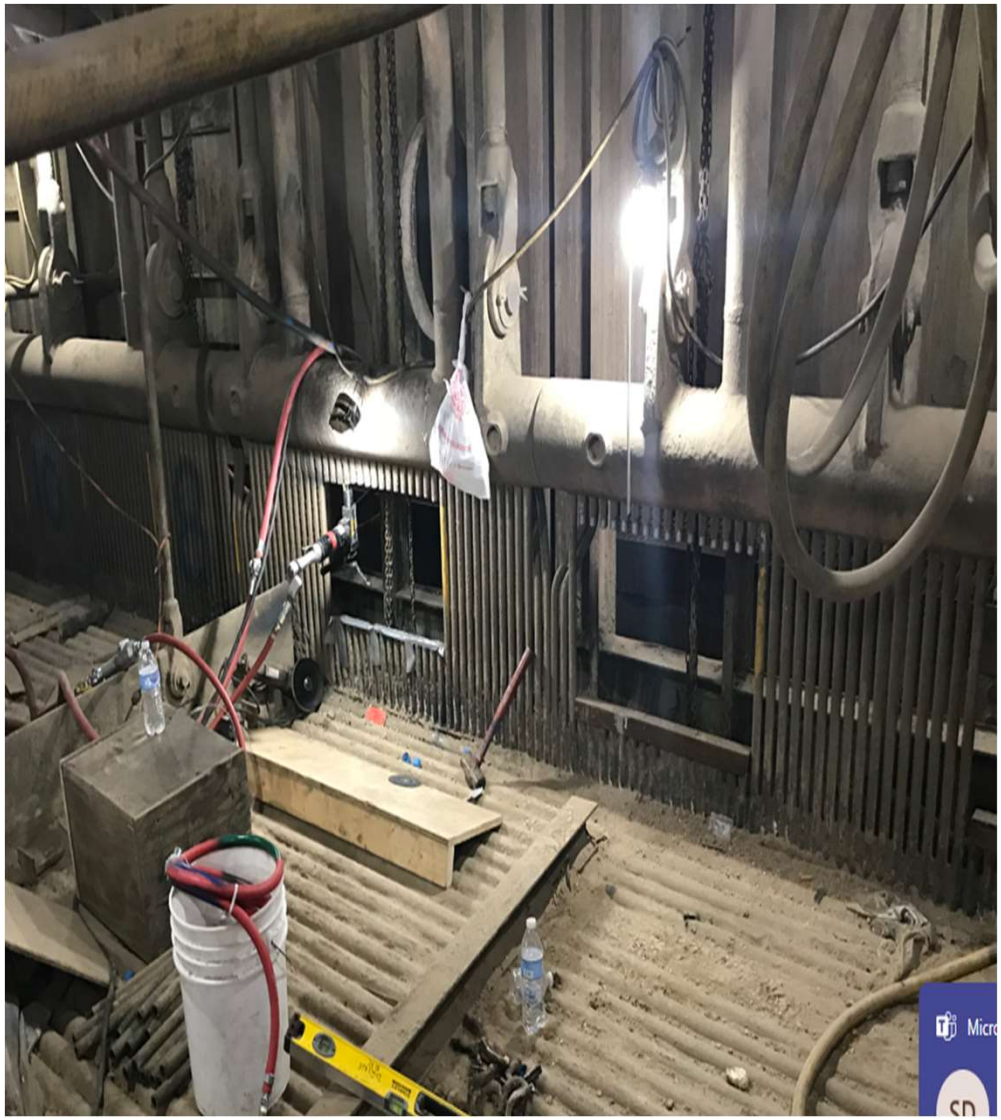
Steam Generator Maintenance

2021 Spring – Unit 2

- Replaced upper furnace water wall panels.
- Corrosion fatigue had caused many leaks in this area.

2023 Spring – Unit 1

- Replaced upper furnace water wall panels.



Unit Reliability

Performance – Impressive Run Times

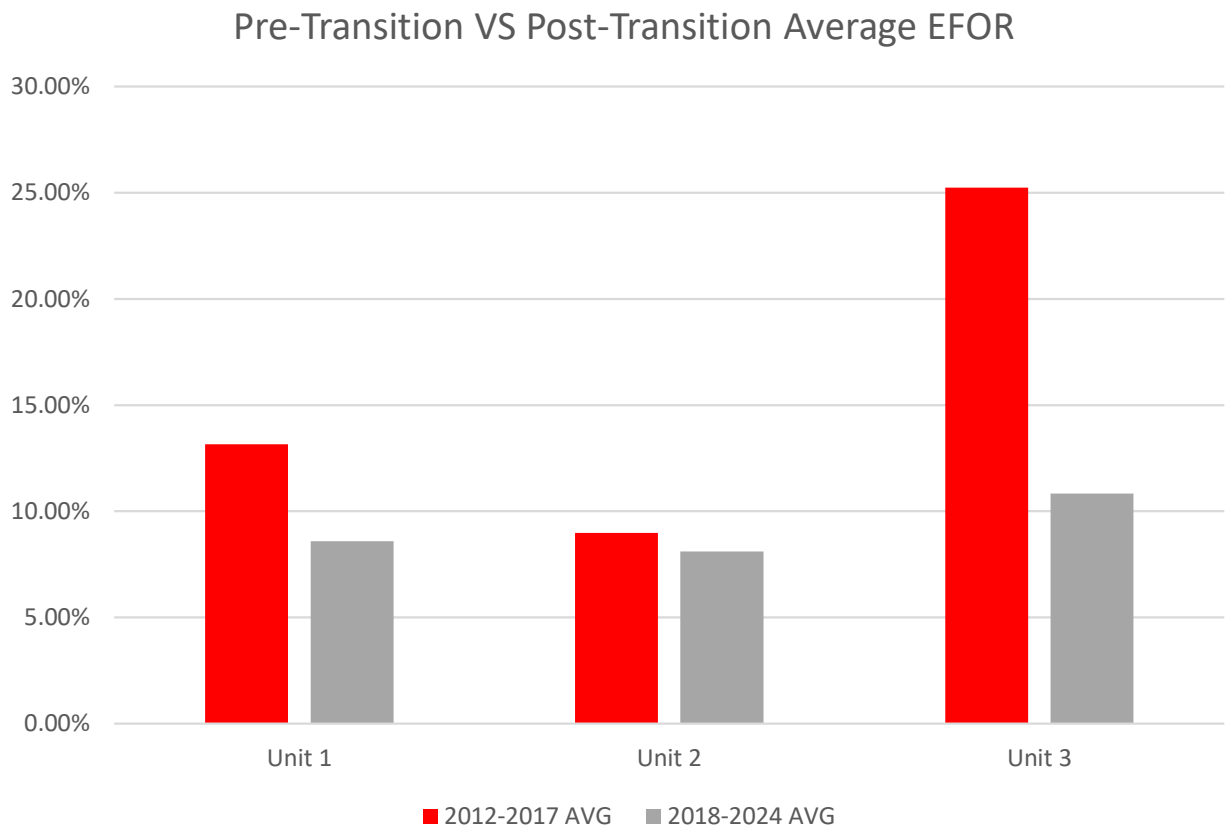
- Two new individual unit runs > 100 days since last year
- Unit 2 – October of 2023 to spring outage in March of 2024 – 157 days
- Unit 1 – End of spring outage until July 28, 2024 – 103.2 days – did not meet our goal but still a very good run historically

Post-FGD Install - Top Individual Unit Runs

Unit	Start Times	End Times	Duration (days)
2	10/30/2022 11:00	4/8/2023 0:00	159.5
2	10/11/2023 0:21	3/16/2024 0:21	157.0
3	4/24/2014 6:00	9/27/2014 0:00	155.8
1	10/16/2020 22:00	3/3/2021 21:00	138.0
1	12/14/2014 0:00	4/11/2015 1:00	118.0
3	5/29/2018 9:00	9/20/2018 5:00	113.8
1	6/5/2015 8:00	9/26/2015 2:00	112.8
2	7/2/2021 22:00	10/21/2021 1:00	110.1
1	11/2/2016 12:00	2/17/2017 16:00	107.2
1	4/16/2024 13:00	7/28/2024 17:00	103.2
2	12/5/2018 7:00	3/16/2019 1:00	100.8

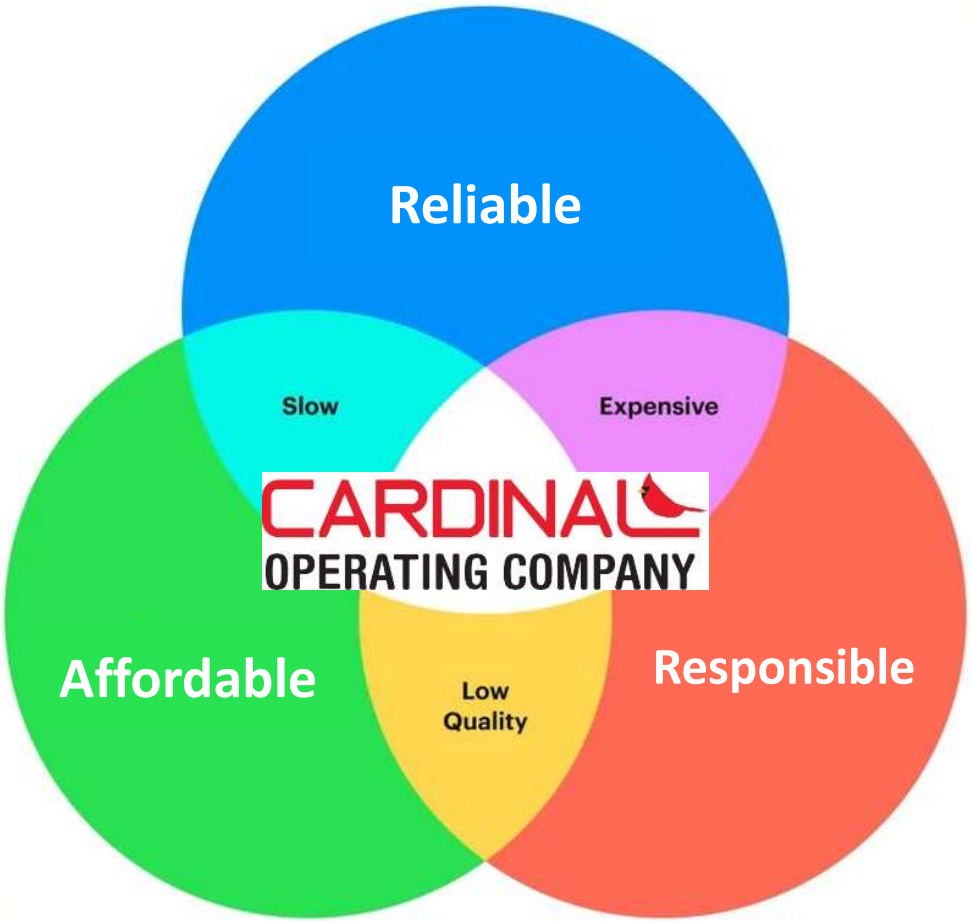
Unit Reliability

Performance – Forced Outage Rate



Unit Reliability

Performance – Balancing Demands



The Future of Cardinal

The Road Ahead in 2025 and Beyond

- Plan and adjust to 2-Unit operation
- Continue to build the culture
- Develop the next leaders
- Meet upcoming environmental requirements
- Continue to maintain and improve reliability

The Cardinal Plant Team





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