

# *Citizens Advisory Board Presentation*

---

## *Integrated Waste Treatment Unit*

*14 November 2012*

Curtis Roth  
IWTU Operations Activity  
Deputy Manager



**EM** *Environmental Management*

safety ❖ performance ❖ cleanup ❖ closure

# Facility Description

---

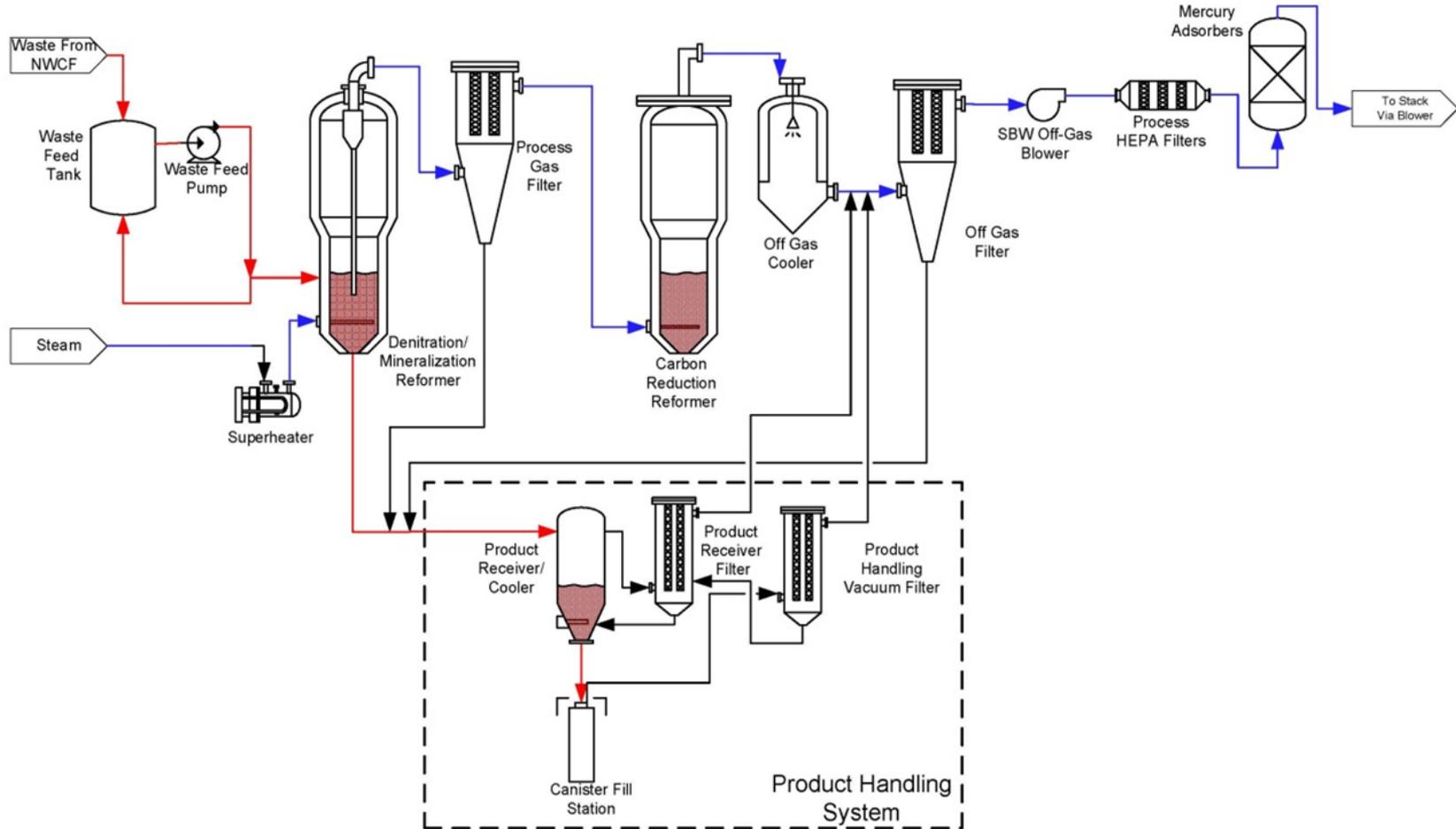
- **New Hazard Category 2 Nuclear Facility:**
  - Process Building with reinforced concrete process cells inside a structural steel building, along with a Product Storage Building
- **Steam Reforming Process:**
  - First of its kind, full scale steam reforming process; reformer vessels use superheated steam and nitrogen gas, along with coal and coke, to convert acidic radioactive liquid waste to solid carbonate particles



**EM** *Environmental Management*

safety ❖ performance ❖ cleanup ❖ closure

# Integrated Waste Treatment Unit Process



**EM** Environmental Management

safety ❖ performance ❖ cleanup ❖ closure

# Event Description

---

- **June 9, 2012**
  - Process Gas Filter differential pressure spikes, causing filter bundles to lift
  - Contractor continued operations, convinced filter bundles re-seated based on process parameters
- **June 16, 2012**
  - Off Gas Filter bundles lift due to high delta pressure releasing coal fines and bed material
  - Process HEPA filters load up, fail, and release from the stack
  - No radioactive or hazardous material released to environment
  - Rapid Shutdown System operated as designed



**EM** *Environmental Management*

safety ❖ performance ❖ cleanup ❖ closure

# OGF—Filter Bundle, Before and After



Clogged OGF Filter



Cleaned OGF Filter



**EM** *Environmental Management*

safety ❖ performance ❖ cleanup ❖ closure

# Event Investigation

---

- June 25 thru July 6, 2012
  - Event investigation team conducted reviews, led by H. Handfinger, URS
- August 2, 2012 Report issued;
  - **Direct Cause:**
    - OGF filter bundle lift due to excessive wood-based charcoal fines carryover, blinding the OGF filters, allowing solids to pass through the OGF to the HEPA filters, causing their loading and breach
  - **Root Causes:**
    - Lack of adequate technical direction on expected operating envelope, parameters, and indications
    - Design deficiencies
    - Inadequate oversight and management systems (technical inquisitiveness)



# Event Investigation

---

- **Collective Significance Review (completed)**
  - Evaluate, understand, and focus on corrective actions
  - Determine if additional actions are necessary for safety and reliability
  - Resulted in nine additional recommendations
- **Hazard Analysis of System Changes (ongoing)**
  - Review impact of system modifications
  - Review previous Hazard and Operability Study
  - Revise Safety Analysis Report (SAR-219)
  - Revise Technical Safety Requirements (TSR-219)



# Facility Recovery—Modifications

## Facility Modifications Include:

- ✓ Process filter bundle restraints to prevent lifting, all four filters
- ✓ Re-design of filter bundle gaskets
- ✓ Install pre-filter differential pressure transmitters on process off-gas High Efficiency Particulate Air (HEPA) Filters  
(allows Rapid Shutdown System trip)



**EM** Environmental Management

safety ❖ performance ❖ cleanup ❖ closure

# Facility Recovery—Modifications

## Facility Modifications Include:

- ✓ Process filter bundle fuses removed, all four filters
- Product Receiver Filter and Product Handling Vacuum Filter pressure relief valves added
- Inject oxygen lower in Carbon Reduction Reformer vessel
- Evaluate and modify the Rapid Shutdown System alarm and trip strategy

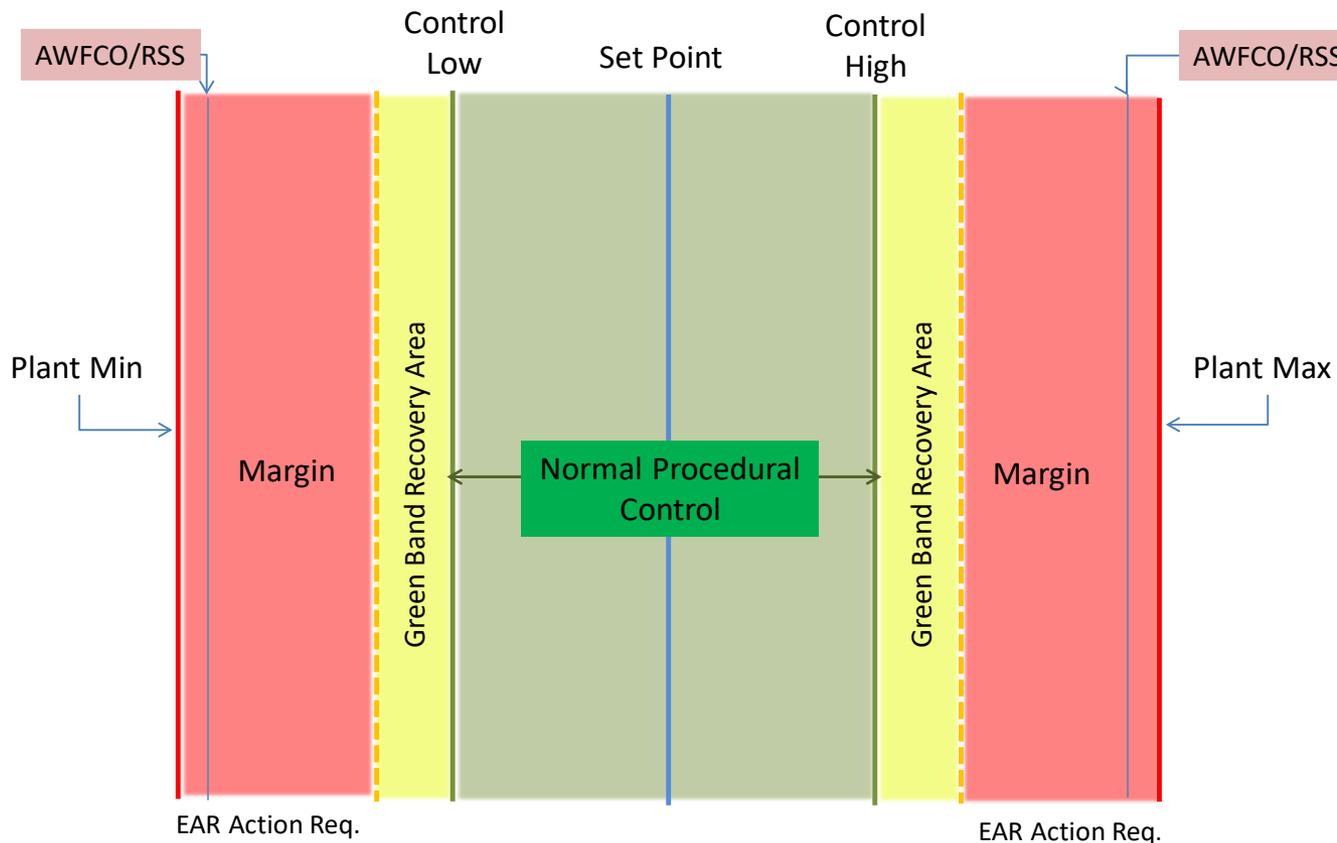


**EM** *Environmental Management*

safety ❖ performance ❖ cleanup ❖ closure

# Lessons Learned – Control Strategy

## The Green Band Control Strategy



**EM** Environmental Management

safety ❖ performance ❖ cleanup ❖ closure

# Path Forward

---

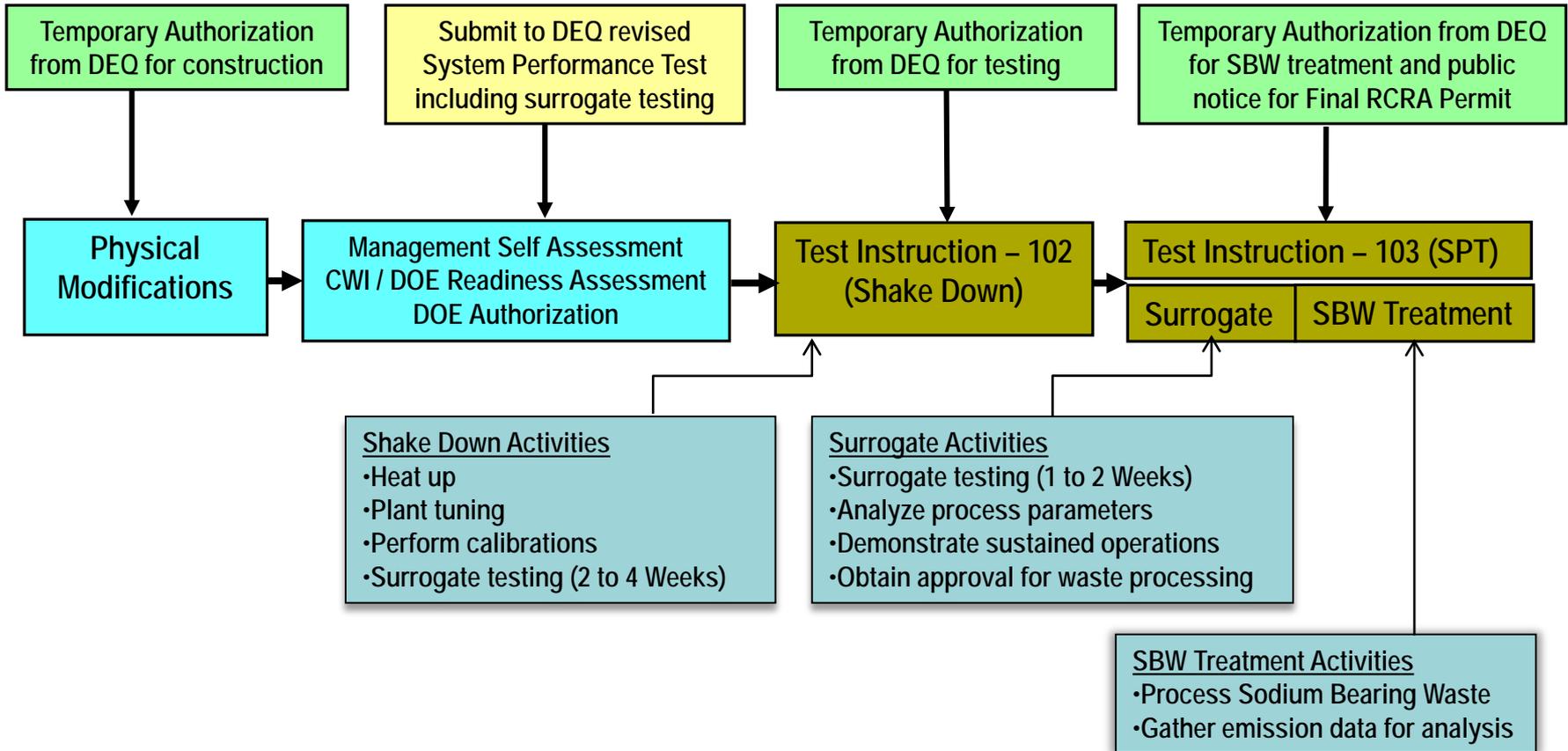
- ✓ CWI Submits Corrective Action Plan (CAP) to DOE
- ✓ DOE Idaho approves CAP after review with DEQ and DNFSB
- Work with DEQ and EPA on Proposed Permit Modifications
- Receive Phased Permit Temporary Authorizations from DEQ
- Complete Process System Modifications
- Revise Safety Basis Documents
- Complete Revisions to Operating Procedures and Training
- Perform Readiness Assessment Reviews for Recovery Phase
- Resume Facility Heat-up and Begin System Testing
- Introduce Radioactive Waste for Processing



**EM** *Environmental Management*

safety ❖ performance ❖ cleanup ❖ closure

# Permitting and Startup Strategy



---

# Questions?



**EM** *Environmental Management*

safety ❖ performance ❖ cleanup ❖ closure

---

# Backup Information



**EM** *Environmental Management*

safety ❖ performance ❖ cleanup ❖ closure

# IWTU – Lessons Learned

---

- First time startups require extreme diligence and complete understanding of plant response
  - Question thoroughly; investigate every abnormal or anomalous condition
  - Do not proceed until clear questions/issues/concerns clearly resolved
- Should have recognized plant indications of developing problem
  - Had indications a week earlier that should have alerted us
  - Had indications when back-pulse system went into continuous mode
- Should have been better prepared to understand plant response
  - Thermal characteristics
  - Coal/charcoal consumption rates
  - Vessel level control



**EM** *Environmental Management*

safety ❖ performance ❖ cleanup ❖ closure

# Lessons Learned – Design Strategy

- **Design Strategy From Event**
  - Improved Filter Product Management
  - Increase CRR Residence Time
  - Improve Fuel and Oxidant Management
  - Blower & Process Gas Flow Control During Upset Condition
  - Tie Down Vessel Filters
    - PGF, OGF, PRF, PHVF
  - Improved Filter Bundle Gasket Design



**EM** *Environmental Management*

safety ❖ performance ❖ cleanup ❖ closure

# Process Description

---

- **Reformer Vessels:**
  - Denitration Mineralization Reformer (DMR)
  - Carbon Reduction Reformer (CRR)
- **Process Filters:**
  - Off-Gas Vessel Filters:
    - *Process Gas Filter (PGF)* and *Off-Gas Filter (OGF)*
  - Product Filters:
    - *Product Receiver Filter (PRF)* and *Product Handling Vacuum Filter (PHVF)*
  - Process Off-Gas High Efficiency Particulate Air (HEPA) Filters



# Process Flow Path

---

- Basic Flow Path

- Waste Feed Tank (WFT) liquid sent from INTEC tank farm
- Denitration Mineralization Reformer (DMR) – Liquid turned to steam, carbonate formation
- Process Gas Filter (PGF) – Filters particles >2 microns from DMR
- Carbon Reduction Reformer (CRR) – Final stage organic destruction
- Off-Gas Cooler (OGC) – Cools 950 degree C gas to 180 degree C
- Off-Gas Filter (OGF) – Filters remaining particles >5 microns
- Off-Gas Blowers (260) – Provide motive force to draw process gas through system
- Process HEPAs – Provide final radiological filtration for process gas
- Granulated Activated Charcoal (GAC) – Removes mercury from the process
- Process Exhaust Blowers (240) – Provide motive force to draw process gas through final system components (HEPA Filter and GAC Beds)



**EM** *Environmental Management*

safety ❖ performance ❖ cleanup ❖ closure

# Event Description--*Timeline*

---

- June 16, 2012—IWTU startup testing in progress
  - Initial - Denitration Mineralization Reformer (DMR) at normal operating temperature (650°C)  
- Heating up Carbon Reduction Reformer (CRR) using wood-based charcoal
  - 0830 Began preparations to transfer Off-Gas Filter (OGF) solids to Product Receiver Cooler #1 (PRC1) due to rising differential pressure (D/P) on the OGF
  - 0949 OGF solids transfer was secured due to difficulties maintaining OGF D/P (at this point, based on post-event review of process data, the OGF was experiencing filter blinding/plugging)
  - 1047 Blower speeds were adjusted to optimize CRR heat-up rate
  - 1147 OGF D/P increases significantly, resulting on OGF filter bundle lifting
  - 1207 Solids (coal dust, aluminate, bauxite) from the OGF travel through the off-gas system to the Off-Gas High Efficiency Particulate Air (HEPA) filters, resulting in failure of the HEPA filters
  - 1327 Black particulate emissions observed from the IWTU stack

