

Welcome to
NRG Energy's

Hunterstown Combined
Cycle Power Plant

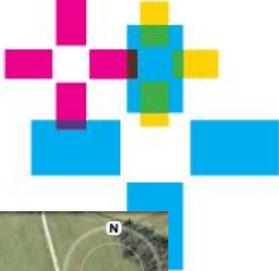


Safety Message



A backpack should weigh no more than 15-20% of the body weight of a child. Lighten the load and make sure your child is wearing a pack that matches his/her size to avoid back injury.

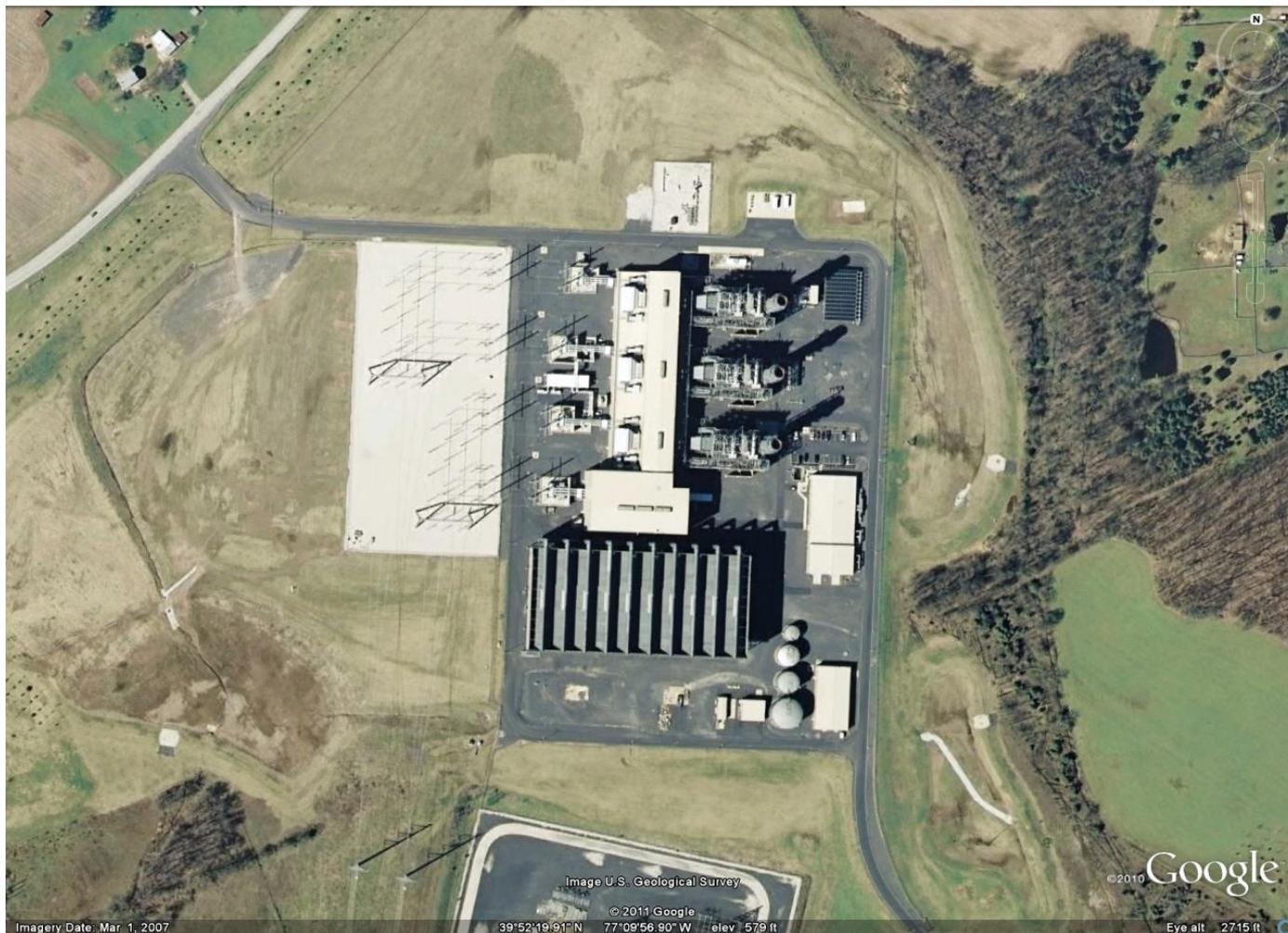
Hunterstown Site



n



Hunterstown CCGT



Hunterstown Combined Cycle Power Plant



Artist's Rendering – Hunterstown Project

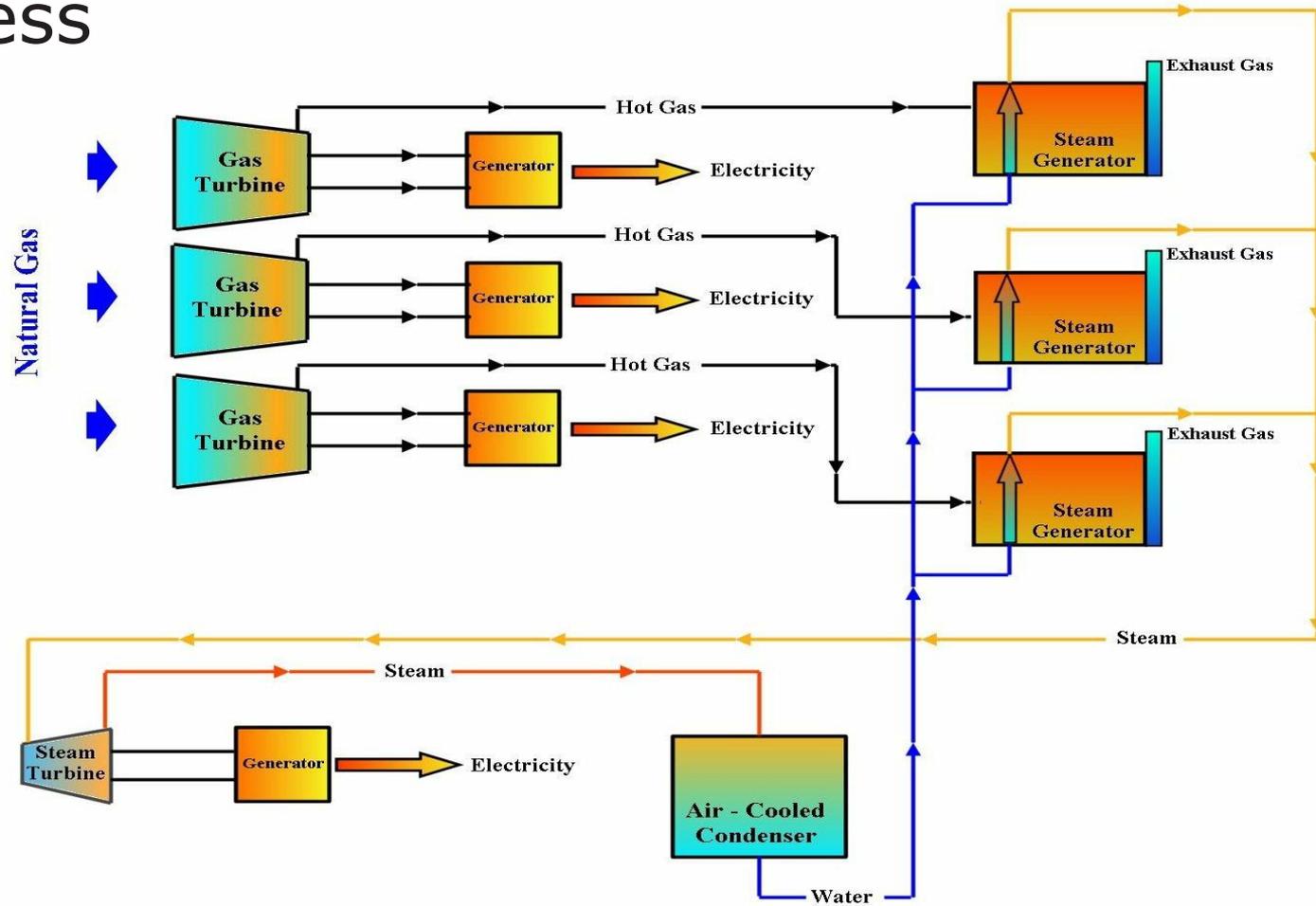
- **Net Capacity Ratings:**

- Summer
 - 758 Mw w/o Duct Burners
 - 810 Mw w Duct Burners
- Winter
 - 818 Mw w/o Duct Burners
 - 892 Mw w Duct Burners



- **State of the Art Technology**
 - 3 GE 7FB.04 Combustion Turbines
 - 1 GE D-11 Steam Turbine
 - Air-Cooled Condenser
 - RO/CDI Water Treatment
- **Fuel Supply**
 - Natural Gas Only
- **Water Supply**
 - Groundwater
- **Construction Started**
 - April 2001
 - Ground Breaking June 20, 2001
- **Commercial operation**
 - July 30, 2003

Combined Cycle Gas-Fired Generation Process





Design Configuration Summary

1. Dogbone Joint – boundary between LP Steam Turbine and Condenser
2. Fifty (50) Bay arrangement in a 5 X 10 configuration.
3. Each bay contains 4 condenser (K) bays and 1 dephlegmator (D) bay.
4. Each bay contains a 2 speed fan motor/gearbox arrangement.
5. Two (2) Hibon Hogger Pumps
6. Steam Jest Air Ejector
7. Deaerator Condensate Tank

Hunterstown - GEA Air Cooled Condenser Description



Thermal Design Conditions

| | | |
|-----------------------------------|-----------|----------|
| Turbine Design Exhaust Steam Flow | 1,690,000 | lbs./hr. |
| Turbine Exhaust Pressure | 4.6 | in Hg(a) |
| Exhaust Enthalpy | 1078.8 | Btu/lb. |
| Ambient Air Temperature | 90 | ° F |

Hunterstown - GEA Air Cooled Condenser Equipment



Dogbone Joint

| | |
|--------------|---------------------|
| Manufacturer | Microflex |
| Size | 232 1/2" X 281 7/8" |
| Belt | 10 5/8" |

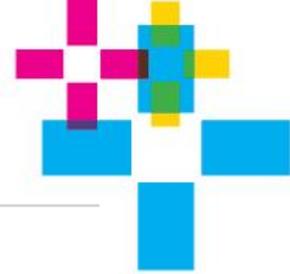
Fans:

| | |
|------------------------------|---------|
| Fans Number | 50 |
| Manufacturer | Howden |
| Type Diameter | 32' SX6 |
| Number of Blades | 6 |
| Weight of Complete Fan, lbs. | 10,188 |
| Weight of One Blade, lbs. | 1149 |

Gearboxes

| | |
|--------------------------|---------------------|
| Number | 50 |
| Manufacturer | Merger |
| Type | Parallel Shaft Gear |
| Model | UNIPA 300-2 Sp |
| Ratio | 16.63:1 |
| Weight without oil, lbs. | 4300 |

Hunterstown - GEA Air Cooled Condenser Equipment



Tube Bundles

| | | |
|-----------------------------|---------|--------------------------|
| Number | K- Type | 320 |
| | D- Type | 80 |
| Tube Type | | AE436-D/AE510 |
| Active Tube Length, MM | | 9600-K, 7500-D |
| Active Tube Field Width, MM | | 2900 |
| Number of rows of tubes | | 2 |
| Material, Tubes and Fins | | Carbon Steel, galvanized |

Fan Motors:

| | |
|-----------------|------------------------------------|
| Fans Number | 50 |
| Manufacturer | A.O. Smith |
| Type | Vertical, Flange Mounted IPW-55 |
| Frame | 449TSD |
| Speed | 1195/595 RPM |
| Electrical Data | 460 VAC, 3 PH, 60 HZ |
| Power Rating HP | 150/37.5 |
| Weight, lbs. | 2590 |

Hunterstown - GEA Air Cooled Condenser Equipment



Air Removal Equipment

| | |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service Type | Condenser Holding Steam Jet Air Ejector |
| Manufacturer | Schutte & Koerting |
| Capacity (each) | 17.5 SCFM, 78.71b./hr, air+173.71b./hr, vapor@l.O " HgA Skid mounted steam jet air ejector package consisting of two 100% two-stage ejector trains w/inter & after condenser. |
| 1 st Stage Ejector | Qty. (2), 6" T4S2-7B |
| 2 nd Stage Ejector | Qty. (2), 3" S3B |
| Motive Steam Consumption, lbs.lhr | 1 st Stage 1111, 2 nd Stage 1135 @150 psig 390°F |
| Service Type | Deaerator Holding |
| Type | Steam Jet Air Ejector |
| Number | 2 |
| Manufacturer | Croll-Reynolds |

Hunterstown - GEA Air Cooled Condenser Equipment

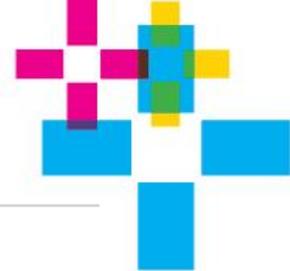


Hogging Vacuum Pump

| | |
|-----------------------|---------------------------------|
| Service | Condenser Hogging |
| Type | AL-I 00 Liquid Ring Vacuum Pump |
| Number | 2 |
| Manufacturer | Hibons |
| Electric Motor, kW/HP | 186.5/250 |

Drain Pumps

| | |
|--------------|--------------------------------|
| Number | 2 |
| Type | Vertical Condensate Drain Pump |
| Manufacturer | Goulds Model No. DWT-9RCLC |
| Capacity | 340GPM |
| Power Rating | 5HP |



Hunterstown - Operation

| Hunterstown Combined Cycle Historical Operating Summary | | | | | |
|----------------------------------------------------------------|-------------------|----------------|-------------|-------------|------------|
| Year | Days of Operation | Overnight Runs | Cold Starts | Warm Starts | Hot starts |
| 2003 | 17 | N/A | 7 | 3 | 7 |
| 2004 | 57 | N/A | 13 | 6 | 38 |
| 2005 | 112 | N/A | 21 | 12 | 80 |
| 2006 | 98 | N/A | 13 | 6 | 79 |
| 2007 | 139 | N/A | 16 | 12 | 111 |
| 2008 | 131 | N/A | 16 | 8 | 107 |
| 2009 | 160 | 42 | 20 | 11 | 87 |
| 2010 | 199 | 94 | 10 | 7 | 88 |
| 2011 | 263 | 224 | 3 | 7 | 29 |
| 2012 | 274 | 266 | 5 | 1 | 2 |
| 2013 | 256 | 185 | 4 | 3 | 64 |
| 2014 | 244 | 230 | 2 | 4 | 8 |
| 2015 | 227 | 218 | 1 | | 8 |

ACC Operations and Maintenance Early History



2003-2006:

Operations: Daily Cycles and learning skills of ACC Operation
Focus on Water Chemistry Control

Maintenance: Lube Oil Samples

2007-2009

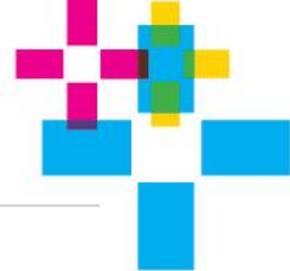
Operations: Daily Cycles proficient ACC Operations
Focus on Water Chemistry Control

Maintenance: Lube Oil Samples
Steam Turbine LP Diaphragm replaced.
Dogbone Joint Replacement
Lube Oil Samples

2010-2011

Operations: Daily Cycles proficient Summer ACC Operations now
expanding into Winter Operation skill develop
(Ran ACC in Manual during Winter Operations)
Focus on Water Chemistry Control

Maintenance: Steam Turbine Minor
Dogbone Joint Re-Alignment and Replacement
Water Wash ACC using General Contractor
Lube Oil Samples



ACC Operations and Maintenance History

2012

Operations: Daily Cycles proficient Summer ACC Operations now expanding into Winter Operation skill develop (Ran ACC in Manual during Winter Operations)
Focus on Water Chemistry Control

Maintenance: Water Wash ACC using General Contractor
Lube Oil Samples

2013

Operations: Daily Cycles proficient Summer ACC Operations Winter Operations ran ACC in Manual
Focus on Water Chemistry Control

Maintenance: Water Wash ACC using General Contractor
Performed Helium Leak survey, replaced man-way gaskets
Lube Oil Samples



ACC Operations and Maintenance History

2014

Operations: Daily Cycles proficient Summer ACC Operations Winter Operations ran ACC in Manual Focus on Water Chemistry Control

Maintenance: Water Wash ACC using General Contractor
Replaced all man-way gaskets
Replaced Rupture Disc
Performed helium Leak survey
Repaired ACC tube leaks found in K75 and K74
Replaced 1st Merger Gearbox with spare
Lube Oil Samples

2015

Operations: Daily Cycles proficient Summer ACC Operations re-configured ACC Control Logic to enable Winter Operations in AUTO control Focus on Water Chemistry Control

Maintenance: Experience 1st On-line ACC Tube Leak on Row 1 during Winter Operation that impacted Operations hired GEA for repairs plugged (4) four tubes.
Water Wash ACC using JS Solutions Contractor
Performed Helium Leak survey, replaced man-way gaskets
Lube Oil Samples

ACC Operations and Maintenance Future Plans



Future Plan Operations:

Daily Cycles proficient Summer ACC Operations re-configured ACC Control Logic to enable Winter Operations in AUTO control Continue strong focus on Water Chemistry to reduce FAC and Iron content.

Continue reliability checks on ACC focused on oil analysis, vibration, coil monitoring, and motors.

Maintenance:

Water Wash ACC using specialized contractor

Continue Helium Leak Check surveys

Continue replacement project of ACC Polyvinyl Fan Casings with Reinforced Fiberglass Fan Casings

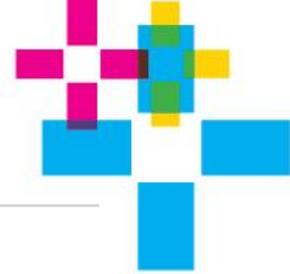
Modifications to gearboxes to reduce oil leak potential

Replacement of Lube Oil Cooler Hoses due to age

Lube Oil Samples

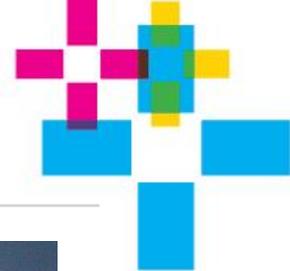
Change in Lube Oil from Omala 302 to 220.

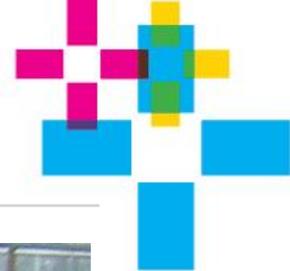
Hunterstown Cycle Chemistry



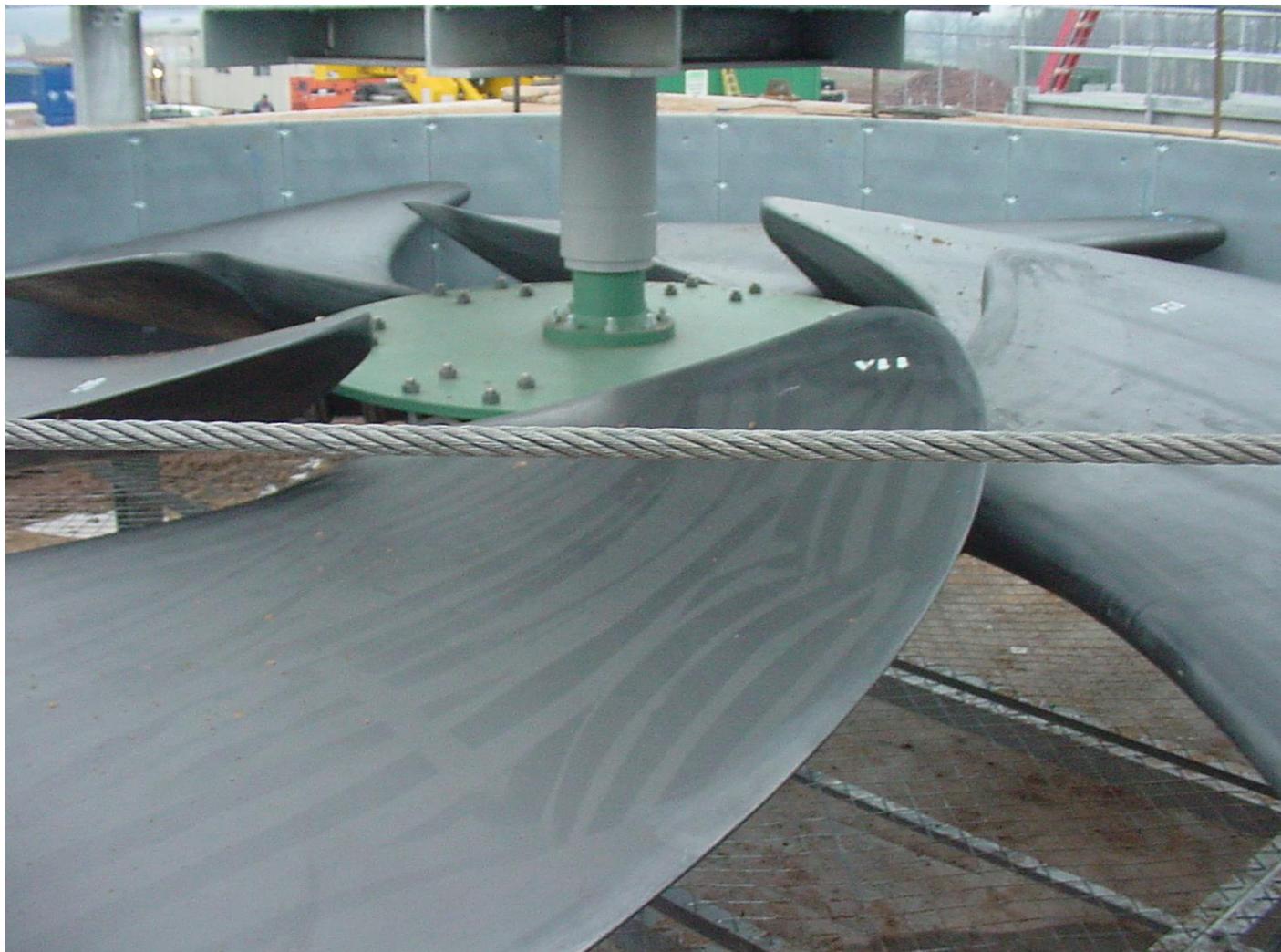
- Makeup water: Wellwater, UV, Multi-media filters, Reverse Osmosis, CDI
Supplemented with mobile demineralizer as needed
- AVT (O) all ferrous units; Powdex condensate polishing
- ACC Inspections 2005 – 2008 Evidence of FAC
DHACI 4C
Street entry tube orifices - white FAC
Turbine exhaust ducts – shiny white patches FAC
- Increased chemistry pH to 9.8 across steam cycle (ammonia feed)
- Recent ACC and turbine exhaust inspections – No evidence of FAC
- Recently began using on-line Hach turbidimeter to monitor low-level iron
in condensate

Air Cooled Condenser Construction





Low noise ACC Fan Blades in Assembly





Air Cooled Condenser Construction Feb. 19, 2003

