

Princeton Energy Plant Operations Best Practices

IDEA Conference, *Denver*

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Co Gen Plant

- Decision to build in early 1990s
- Replaced 1921 boiler house
- Princeton believed in operations to run this plant
- May 1995 initial construction
- Fall 1996 first KWH and steam.
- Plant embraced Ops & Maintenance







Economic Dispatch

The First Step & Now

- ICETEC Implementation
 - Princeton met ICETEC at IDEA, Baltimore 2003
 - Started dispatch August 1, 2003 - New Jersey deregulation.
 - Turbine dispatch 7 to 15 MW
 - steam/electric chiller dispatch.
- Savings –
 - 800k in first year.
 - between \$1.5 - \$2.8 m now.
 - Continued improvements & full market integration
 - high value even with lower gas costs.
- Meeting dispatch is rewarded by pay for performance
 - embraced by Union
- 2013 Introduced limited turbine control for Frequency Regulation

Overview (current)



Full Chiller Dispatch Screen



Regulation Screen



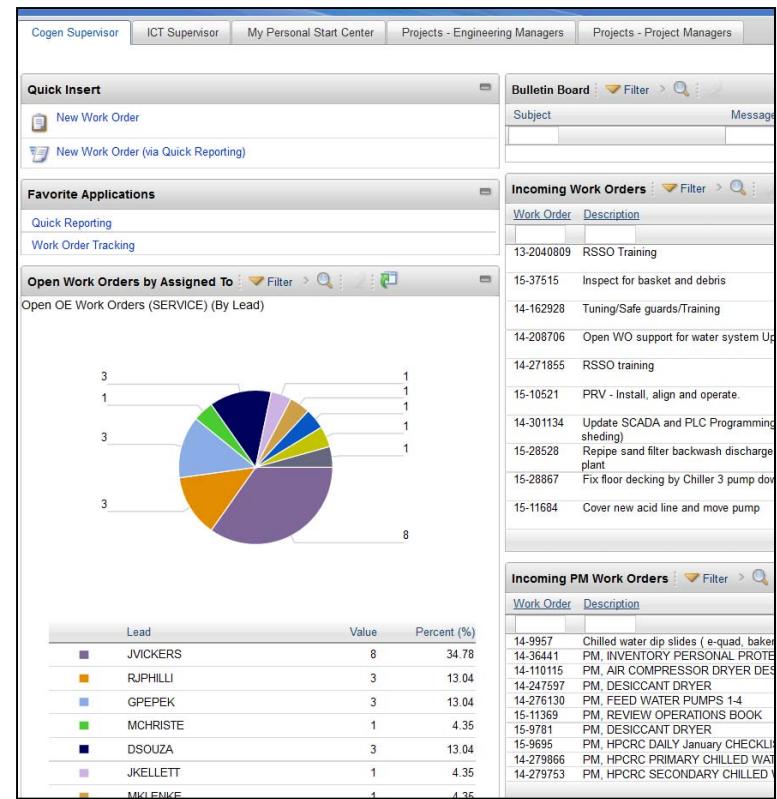
Water Treatment

- **Prior to Cogen**
 - Broken glassware
 - In the dark
 - Under the boiler
 - In the corner
 - Word of mouth procedures
- **Today**
 - High Quality Lab & Tools



Maintenance Management

- Maximo
 - Before:
 - memory, experience and paper
 - Today:
 - Its an evolution in progress
 - 2000 assets
 - Tracking man hours and dollars spent on assets
 - PM's, work orders, Major maintenance, work packages, inventory and safety
 - The Dream...



Energy Conservation Projects

- We seek many layers of benefits

- Less energy used (pays for it)
- Safer
- Less water
- Less pollution
- Less risk
- Easier maintenance
- More reliable
- Controls, VFD's we have to remember to keep it simple!



How to Work in Our House

- Our House

- Work and respect our plant and people
- Don't ever think we need your company to keep us alive
- Remain competitive
- Communications at all time
- Optimization through information to operations
 - Control HMI or Dispatch system
- Working as partners / providing help and involvement from our staff.

The Way We Consider New Stuff

- **The Sales Guy**
- Does it work? ...at the scale we're interested in?
- Pro-forma and space required?
- Peer visits, kick-the-tires!
 - Ops talk to ops & maint staff!
 - What breaks?
 - How does it break?
 - What can you fix vs. OEM?
 - What spares are needed?
 - How is service?
 - How responsive?

Our Team



The Take-Away

- Seek Constant Improvement
- Get Past Fear Of Change
- Seek Input From All Staff
- Learn From Other's Experience
- Provide Good Tools & Training
- Require Respect & Quality

Thank You

Overview (current)

Princeton University - Icetec HMI --- Build#126@2014-10-16 02:38

TURBINE DISPATCH

Set at 8.0 MW
ALL CLEAR

TURBINE INLET COOLING
Dispatch TIC:DISABLE
Status Offline

TES DISPATCH

CHARGE
ALL CLEAR

User WRITE DISABLED Login

PJM Events None

Silence Audio Alarm

CHLR DISPATCH

ELECTRIC
ALL CLEAR

Cooling Status CH-1 (Out) CH-2 (In) CH-3 (In) CH-4 (In) CH-5 (Out) CH-6 (Out) CH-2100 CH-2200

OFF OFF OFF OFF OFF OFF ON ON

PJM Market (Zone:PSEG)

5min	\$ 41.50
60min	\$ 46.06
Hr Avg	\$ 36.22
Zonal Load	4,998.2 MW
Regional Load	101,671.0 MW

Overview CHW Plant Chiller Dispatch Generators Boilers Fuel Breakdown Markets Logs Weather Alarms Emissions Sofame Hours Reports System Info
CHiller Tons Total CHW Load 1.33 ktons Power Generation Import Meters Gas Consumption Steam Production & Usage

Total CHW Load 1.33 ktons
MicroTurbines 0.52 MW Charlton St 4.38 MW PSEG CIG Meter 180.0 dt/hr Boiler 52.46 kpph
Electric TES STEAM FreeCooling 0.00 ktons 1.31 ktons 0.00 ktons 0.00 ktons
Turbine 8.09 MW Elm St Market Meter 26.0 dt/hr HRSG 103.93 kpph
West Windsor PV -0.01 MW Site Load 17.07 MW Duct Burner 77.9 dt/hr Total 156.39 kpph
Plant CIG Meter 183.6 dt/hr Campus 156.39 kpph Chillers 0.00 kpph

Avg Hdr Supply Temp 30.9 °F
Turbine Output 53 %

Overview Trends Plant Forecast Generation
CHW Load -vs- OutsideAir

Power Overview
OutsideAir-Temp

Steam (Production & Consumption)
Steam Production -vs- OutsideAir

OAT 15.8 °F OAH 50 % Wet Bulb 13.2 °F Equad -1.00 DP Green Hall -7.48 DP
CHLR FAULT/ Normal 45.0 MB : 189.0 MB

Campus ITREND Profiler
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