PSC Labadie Energy Center Tour

October 29, 2015

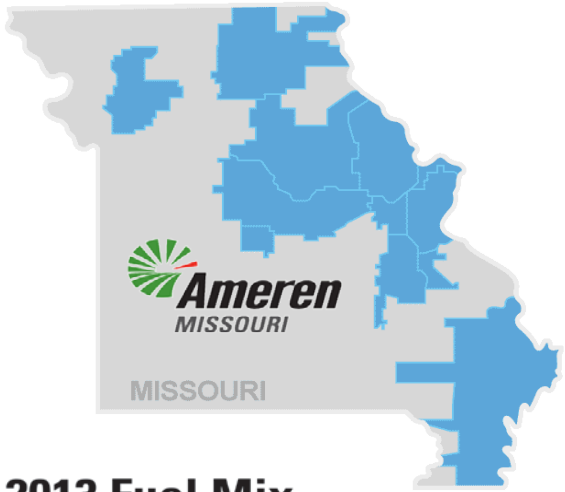
David Strubberg
Director – Labadie Energy Center

Ameren
FOCUSED ENERGY. For Life.

Powering Missouri

Integrated Electric & Gas Utility

- 1.2 million electric customers (3 mill. people)
- 10,200 MW of generation
- 129,000 natural gas customers
- 24,000 square miles of service territory
  - 500+ communities in 64 counties
  - 3,000 miles of electric transmission lines
  - 33,000 miles of electric distribution lines
  - 900 substations
- ~3,700 employees
- #1 Property taxpayer in Missouri

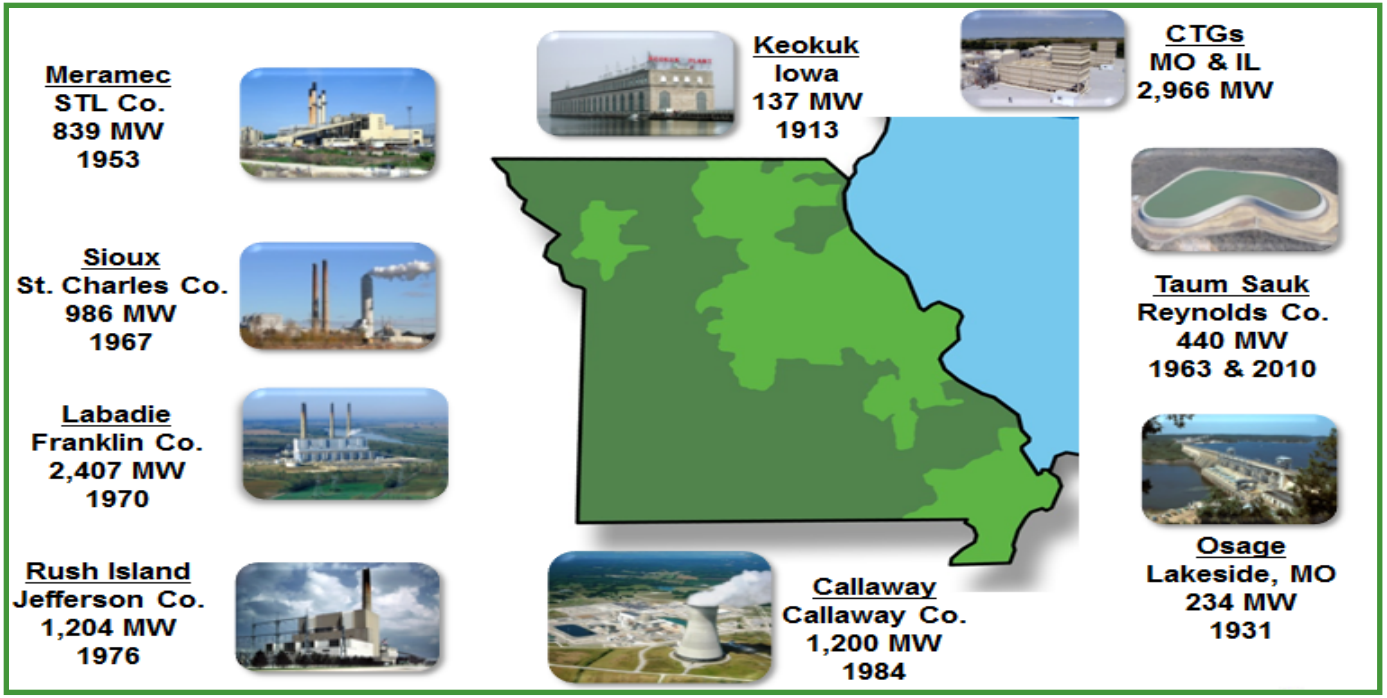


2013 Fuel Mix

Other Generation Sources include:

- Natural Gas
- Methane Gas
- Wind Energy
- Solar energy

Ameren Missouri Generation…over 10,000 MW



Recent Additions

Landfill Gas Energy
15 MW

Wind Energy
102 MW

Solar Energy
6 MW (12/14)

Ameren Missouri has also implemented the largest Energy Efficiency Program in our state's history; investing more than $150 million over the past three years. Customers are saving energy and reducing demand.

The Big L

- Commercial operation 1970-1973
- Four units producing 2580 gross megawatts, 2424 net megawatts
- Site is 1100 acres along the Missouri River
- Receive almost two full trains of coal a day (700 annually)
- Original cost 750 million dollars
- 238 employees

We turn coal into electricity

- Nearly 2 trains per day
- Each train is 135-150 cars
- Each car >100 tons of Power River Basin Coal
- 9 trains continually in motion to keep Labadie supplied in coal

Coal Pile

- 57 day supply
- Can move 1700 tons per hour
- Constantly unloading, stacking, reclaiming, milling, burning
- 3 miles of coal conveyors,

Getting coal to the boiler

silo

feeder

mill

boiler

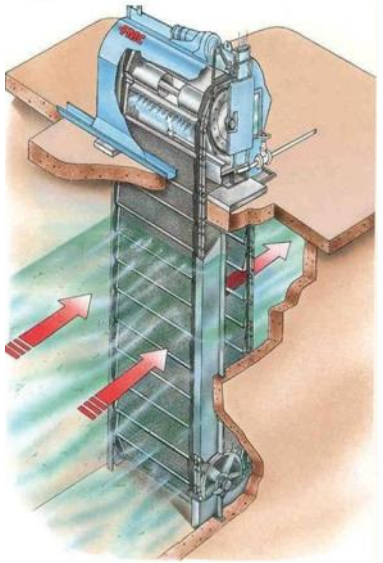
Ameren
FOCUSED ENERGY. For life.

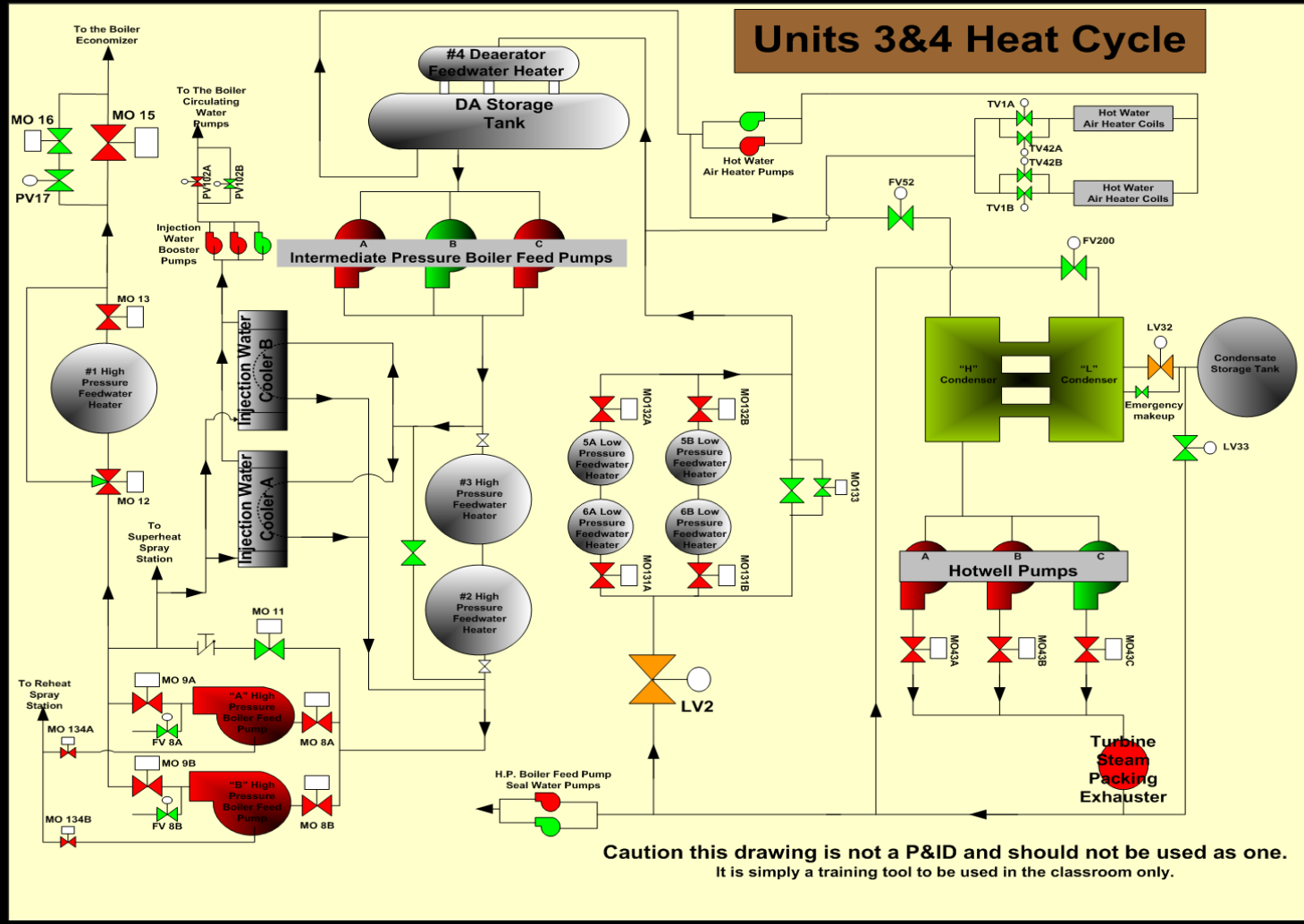
Combustion requires fuel and oxygen

- 5 fans per unit
- Move 385,000 tons of air per unit

Turbine Efficiency Requires Water

- 856,000 gallons per minute
- 99.7 % returned to the river

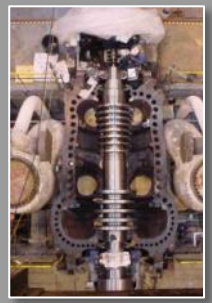



Units 3&4 Heat Cycle
To the Boiler Economizer
MO 16
MO 15
PV17
To The Boiler Circulating Water Pumps
PV102A
PV102B
Injection Water Booster Pumps
#4 Deaerator Feedwater Heater
DA Storage Tank
A
B
C
Intermediate Pressure Boiler Feed Pumps
Hot Water Air Heater Pumps
TV1A
TV42A
TV42B
TV1B
Hot Water Air Heater Coils
Hot Water Air Heater Coils
FV52
FV200
MO 13
#1 High Pressure Feedwater Heater
MO 12
Injection Water Cooler B
Injection Water Cooler A
To Superheat Spray Station
#3 High Pressure Feedwater Heater
#2 High Pressure Feedwater Heater
MO 11
MO132A
MO132B
5A Low Pressure Feedwater Heater
5B Low Pressure Feedwater Heater
6A Low Pressure Feedwater Heater
6B Low Pressure Feedwater Heater
MO131A
MO131B
MO133
LV2
"H" Condenser
"L" Condenser
LV32
Emergency makeup
Condensate Storage Tank
LV33
A
B
C
Hotwell Pumps
MO43A
MO43B
MO43C
Turbine Steam Packing Exhauster
To Reheat Spray Station
MO 9A
MO 134A
FV 8A
"A" High Pressure Boiler Feed Pump
MO 8A
MO 9B
MO 134B
FV 8B
"B" High Pressure Boiler Feed Pump
MO 8B
H.P. Boiler Feed Pump Seal Water Pumps
Caution this drawing is not a P&ID and should not be used as one.
It is simply a training tool to be used in the classroom only.

Boiler

- 200 feet tall
- 40 feet wide
- Tubing for walls



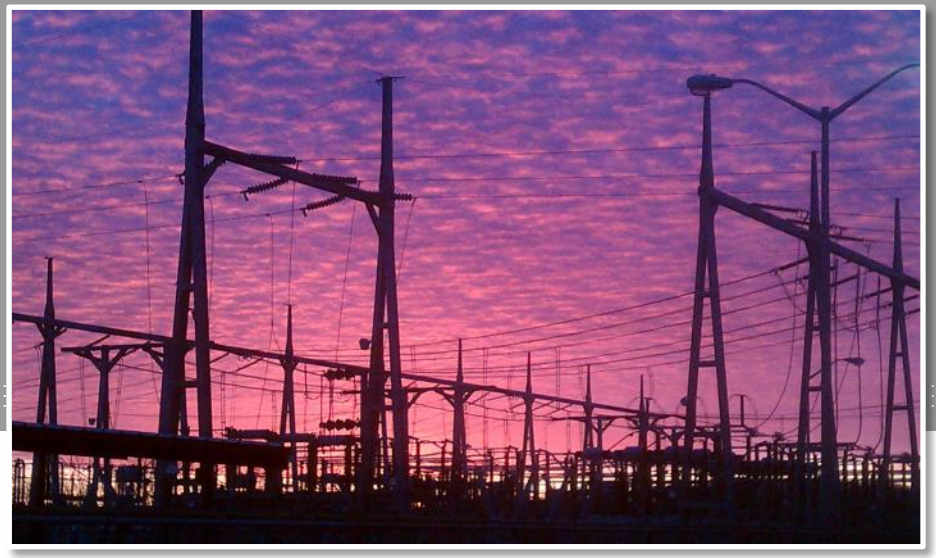

Turbines

- Steam at 1005 degrees
- 2400 pounds of pressure
- Both high and low pressure turbines
- Rotate at 3600 RPM
- High efficiency turbines installed

Ameren
FOCUSED ENERGY. For Life.

Connecting to the Grid

- Power is converted from 20 KV to 345 KV
- Switchyard connects to 6 different sets of transmission lines



Ash

- Bottom Ash
- Fly Ash
- YTD ~89% of ash was recycled

Ameren
FOCUSED ENERGY. For Life.

Mercury and Air Toxics Standards

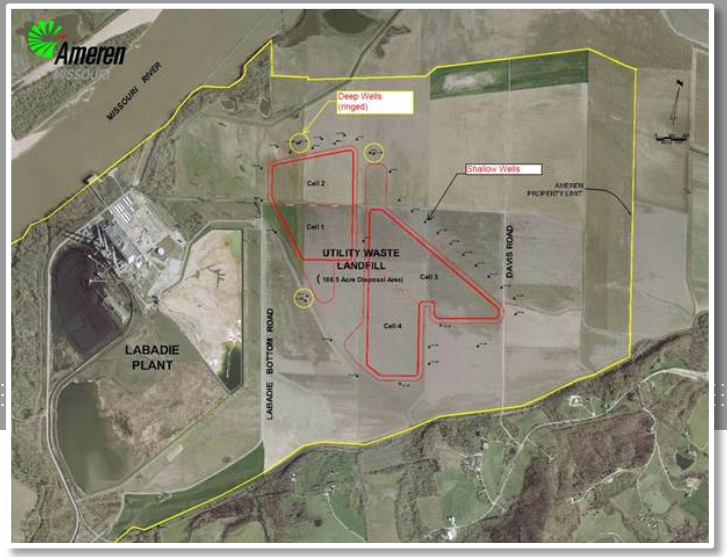
- Particulate matter (.030 lbs per million BTU)
- Mercury limit (1.2 lbs per trillion BTU)

MATS Compliance Strategy

- New “D” ESP on L1 & L2)
- Upgrade “C” ESP L1, L2 & L4
- Upgrade “A” & “B” ESP, L4
- ACI L1, L2, L3 & L4

Utility Waste Landfill

- Footprint ~200 acres
- Cell 1 in service December ’16
- https://youtu.be/XLw8flpM5IQ



Recent Awards

- GKS
  - 2010 Runner Up
  - 2011 Top Performer
  - 2014 Top Performer
- EUCG
  - 2011 Best Performer (1 yr.)
  - 2013 3rd Place (1 yr.)
  - 2014 Best Performer

Questions and Comments

Ameren
FOCUSED ENERGY. For life.


Ameren
FOCUSED ENERGY. For life.