Cold Weather Resource Performance Improvement Education

PJM Operating Committee, July 22, 2014

Agenda

- Dual Fuel Capable Start Failures and Forced Outages Follow-up
- Future Analysis
  - Unit Performance by Last Operation
- Cold Weather Improvement Template

Dual Fuel Capable Unit Start Failure and Forced Outages

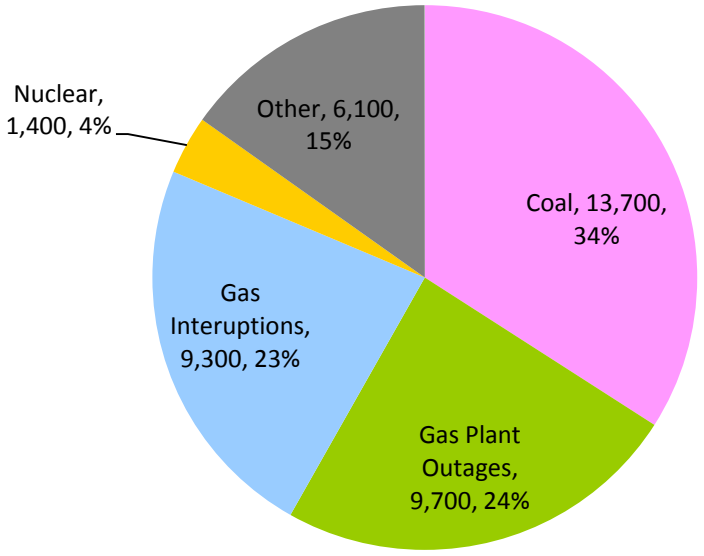
- Dual Fuel Capable Start Failure and Forced Outage MWs on
  - 1/7/14 @ 1900
  - 1/24/14 @ 0800
  - 1/28/14 @ 1900

- Dual Fuel vs Non-Dual Fuel Forced Outage Rates

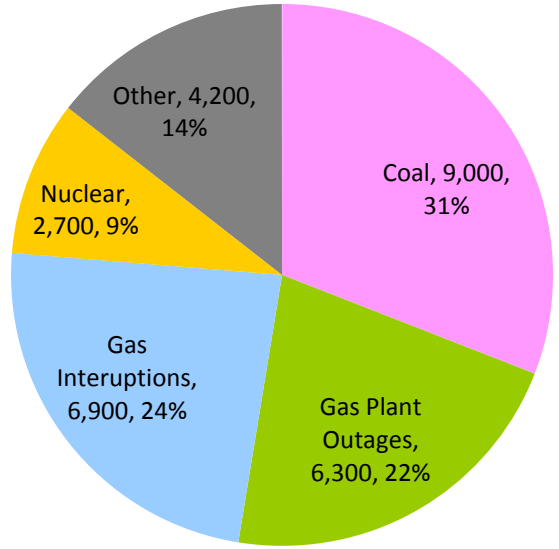
- Analysis is based on GADS data and does not factor in whether a unit was on primary or back-up fuel

Forced Outages by Fuel Type Comparison

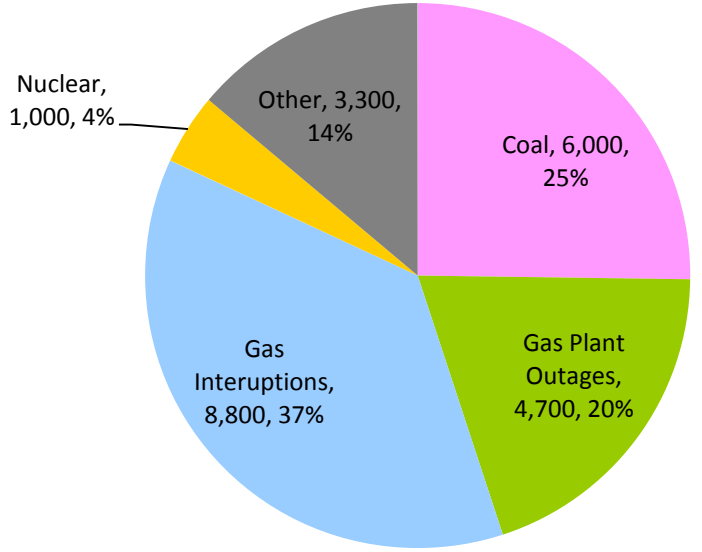
Forced Outages on 1/7 @ 1900 (40,200 MW)



Forced Outages on 1/24 @ 0800 (29,000 MW)

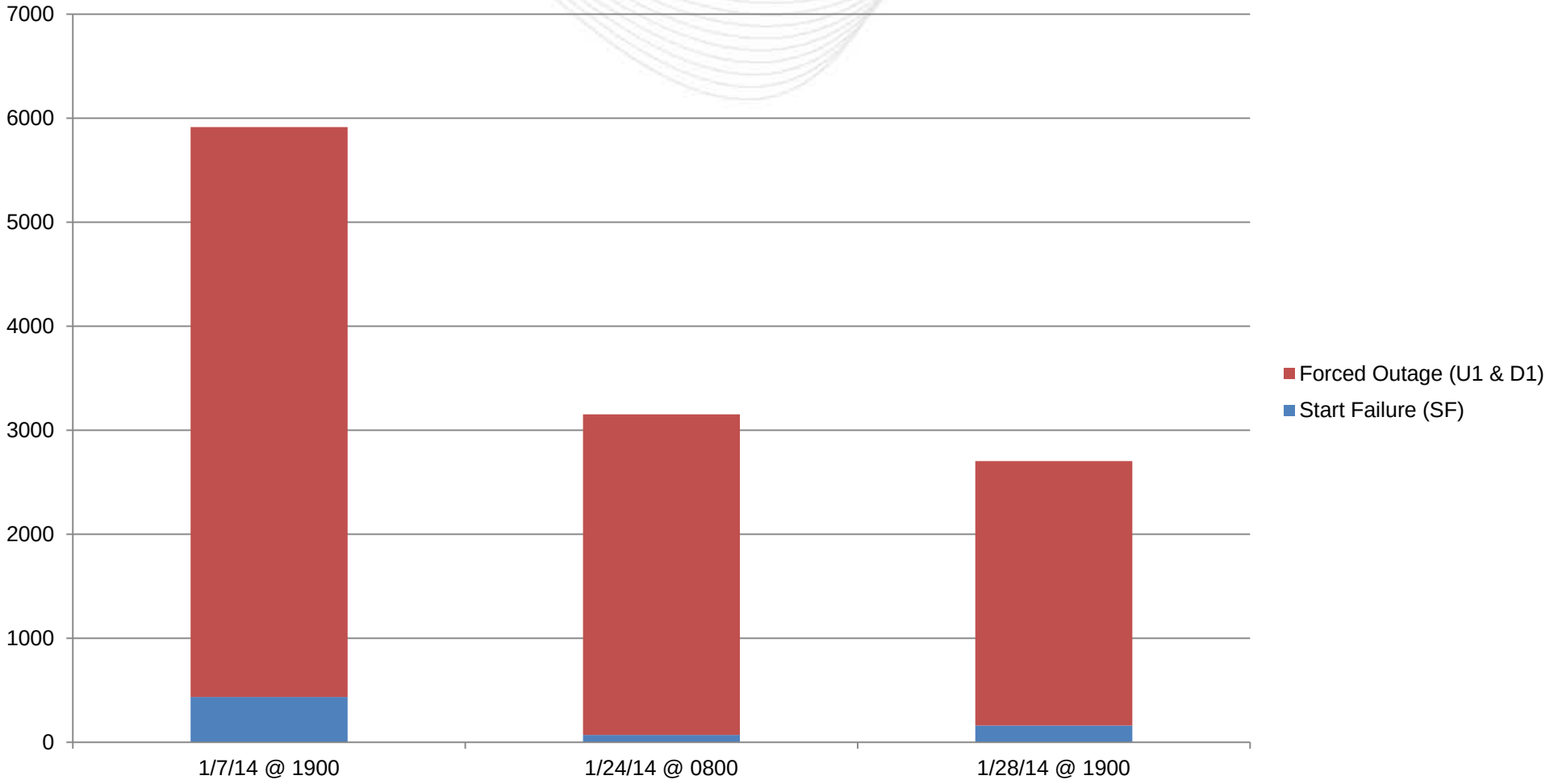


Forced Outages on 1/28 @ 1900 (23,800 MW)

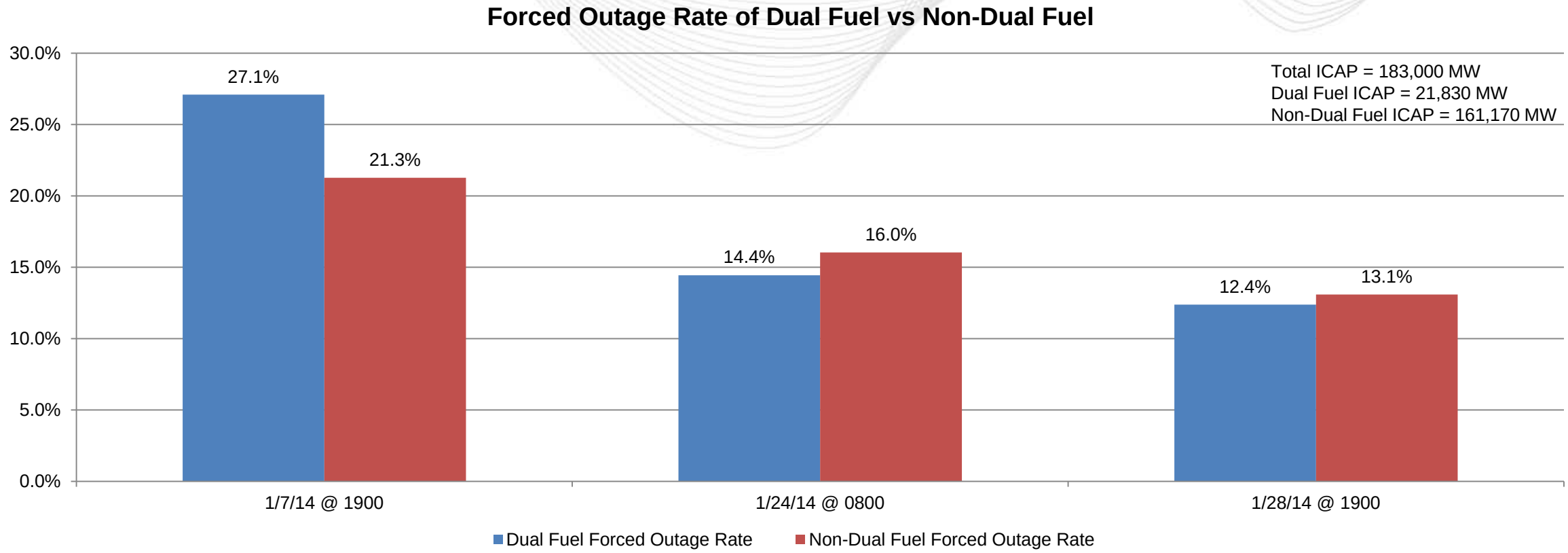


Dual Fuel Capable Unit Start Failure and Forced Outages

Dual Fuel Forced Outage MWs by Start Failure and Forced Outages on 1/7/14 @ 1900, 1/24/14 @ 0800, 1/28/14 @ 1900



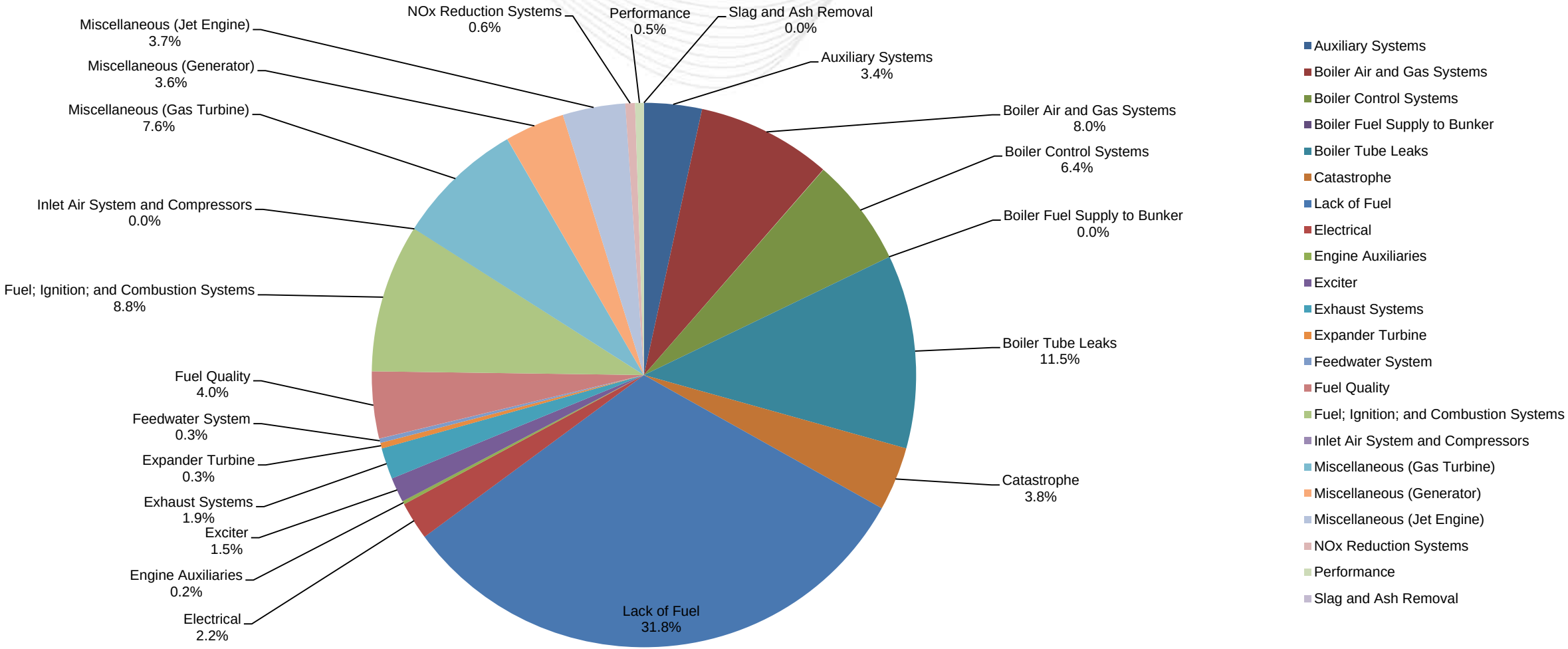
Dual Fuel vs Non-Dual Fuel Forced Outages Rates



	1/7/14 @ 1900	1/24/14 @ 0800	1/28/14 @ 1900
Dual Fuel FO MW	5,915	3,153	2,703
Non-Dual Fuel FO MW	34,285	25,847	21,097
Dual Fuel Forced Outage Rate	27.1%	14.4%	12.4%
Non-Dual Fuel Forced Outage Rate	21.3%	16.0%	13.1%

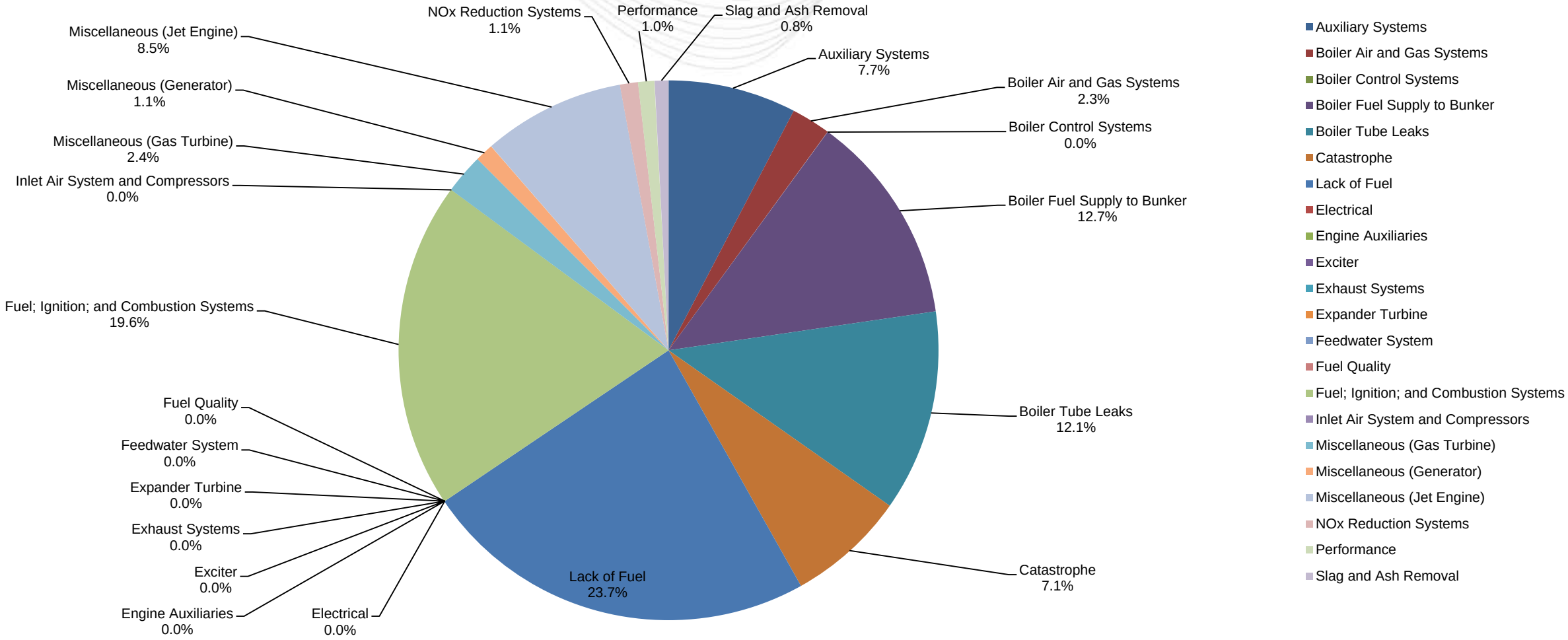
Dual Fuel Capable Unit Start Failure and Forced Outages

Dual Fuel Capable Start Failure and Forced Outage Causes on 1/7/2014 1800 to 1900



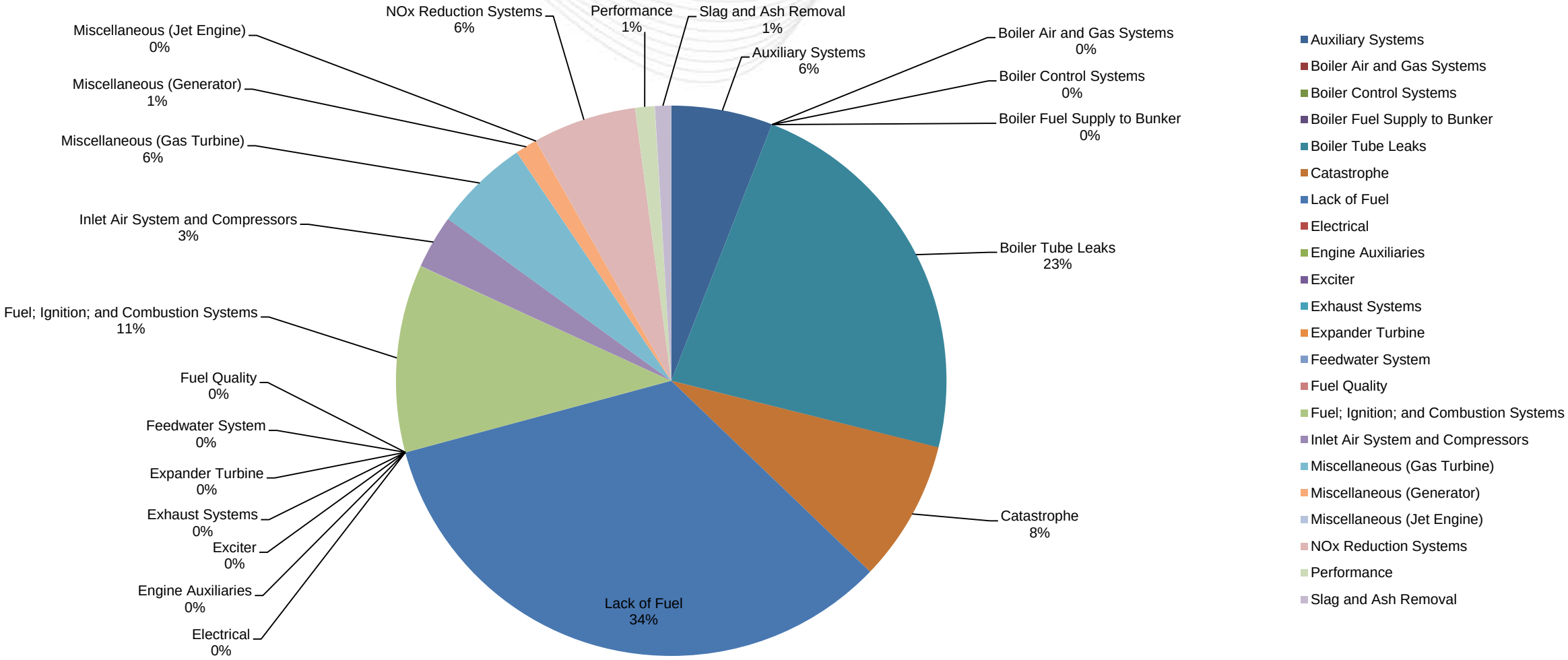
Dual Fuel Capable Unit Start Failure and Forced Outages

Dual Fuel Capable Start Failure and Forced Outage Causes on 1/24/2014 0700 to 0800



Dual Fuel Capable Unit Start Failure and Forced Outages

Dual Fuel Capable Start Failure and Forced Outage Causes on 1/28/2014 1800 to 1900



Future Analysis

- Unit Performance by Last Operation

Cold Weather Improvement Template Updates

COLD WEATHER IMPROVEMENT TEMPLATE		
Categories	Sub-Categories	Comments
PJM "desires"	-	1. Show progress to improve unit performance before next winter to get ahead of any regulatory efforts. GO participation is critical to the development of practical requirements/guidelines. Don't want to end up with something undesirable. 2. PJM to reach out to other areas including Wisconsin for lessons learned. 3. Develop a practical cold weather preparation chesklist that GOs can use as a weatherization guideline. 4. Short term changes (Manuals/Guidelines). 5. Long term changes (Tariff/Operating Agreement).
Testing	-	1. Old “winter capacity testing” between Thanksgiving and New Years will not solve issues in extremely cold temps. 2. Testing/tuning needs to be performed at extremely cold temps to meet emissions. 3. Testing on alternate fuel would have mitigated some of the problems, but not all that occurred during the bitter cold. 4. Monthly full speed no load or full load test on alternate fuel from November through February. 5. Still looking for feedback on testing that would be beneficial to avoid start failures, forced outages, etc.
Issues experience by GOs	Infrequent Unit Operation	1. Units that have been off line for lengthy periods of time have higher chance of problems starting and operating reliably (tube leaks on steam units, etc.) 2. Starting of mothballed units.
	Gas/Fuel/Hydrogen Availability	1. Gas availability issues. Some had no availability, some had limited availability at extremely high prices. 2. Fuel storage level was not adequate to meet the extreme cold. Would fuel inventory program be helpful? **3. Hydrogen delivery issues**
	Technical/Equipment Issues	1. Need additional time to tune units to meet environmental compliance at bitter cold temps. 2. Freezing of nozzles, boiler controls, coal, limestone, condensate lines, fly ash transfer equipment, cooling tower basins, SCR water injection systems, etc. **3. Extreme cold caused contraction on hydrogen seals. Resulted in increased margins and hydrogen leaks. Hydrogen supply/storage was not adequate to make up for leaks.**
Short term lessons learned	-	1. Improved unit performance between January & February. 2. Starting dual fueled units on oil was problematic. Even units that were tested on oil before polar vortex – large performance improvement when started units on gas and then very quickly switch to oil. 3. Improve winterization checklist communication to GO's. (Smaller GO's may not be as experience as large GO's and checklist would be helpful).
Potential operational actions	-	1. Start units earlier and stagger start times to allow limited workforce to resolve start-up issues before peak loading periods. 2. Position units full speed no load to be "warm standby" to allow times to address startup issues during peak loads.
PJM assistance to GOs	-	1. Fuel transportation waivers. 2. Advanced reach out to environmental regulators. 3. Improve Gas/Electric coordination.
Help us help you	-	1. Index of unit performance characteristics by fuel type/temperatures in advance of cold weather. E.G. – if temps are predicted to be XX, assume YY% of unit unavailability of type ZZ.