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Energy Outage Data Analysis
2016 & 2017
Presenter : Angela Ho Date: 03/31/2020

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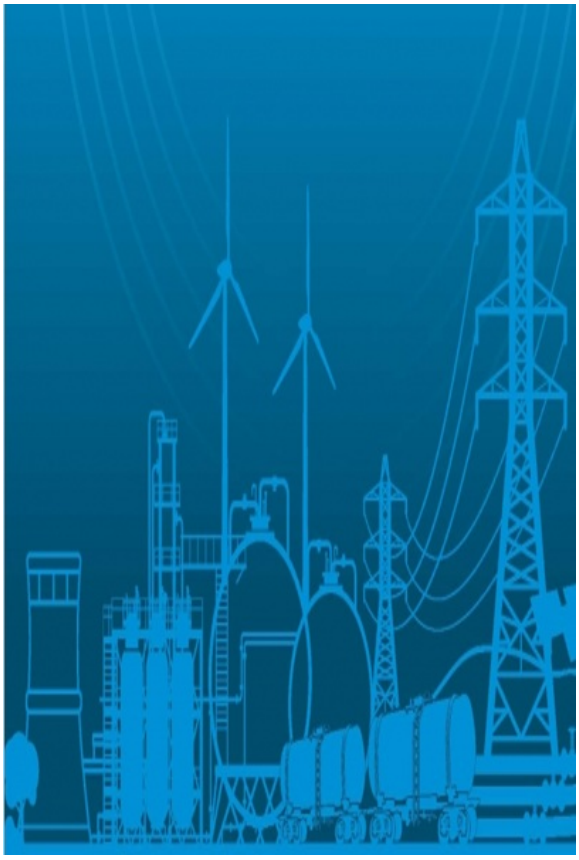

Overview

Recently there has been an increasing number of outages reported. Thus, management expressed a concern on energy stability and losses as well as market outage and reliability. After further investigation of data from 2016 and 2017, the results were as follows:

- Forced Outages occurred most often within the four types of Approved Outages and was the main driver for the number of increased outage events.

- Aubricoin and Melk were the most unreliable energy providers. Not only did the report show the most outage events like Forced Outages, but also their total number of Energy Loss MW are top two among all other providers.

Recommendations

Reducing the number of outages would help stabilize the energy supply by:
- Encouraging all providers to submit annual maintenance plans at the beginning of year
- Scheduling major facility maintenance strategically to minimize the impact on energy
- The Government can consider providing subsidies if energy providers undergo expansion or have major upgrades on their facilities

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The number of Outages have been increasing steadily from 2017 Q2.

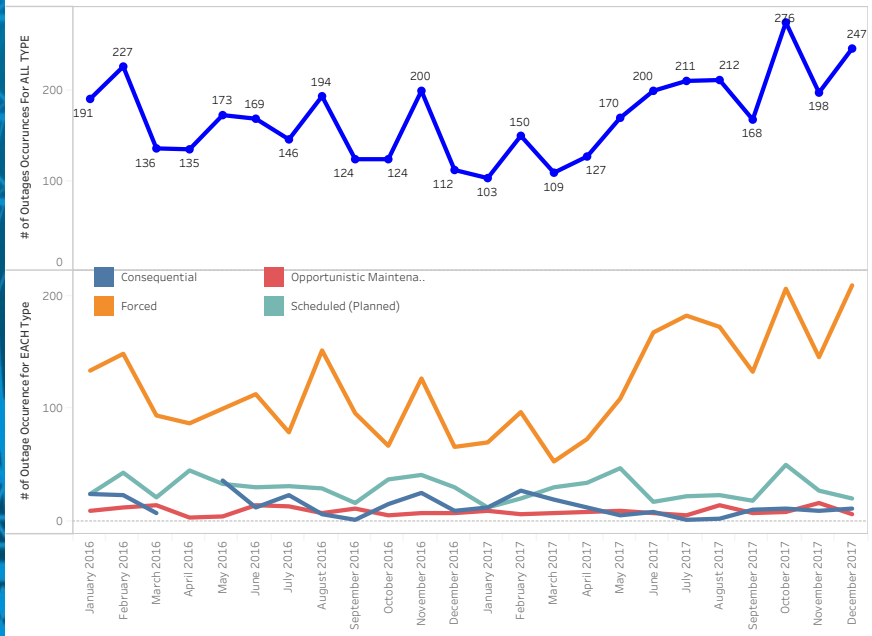
- There was a 12.43% increase in the number of Outage events overall

- Forced Outages fluctuated more than other types of outage events which was also the key driver for the increased total number of outage events.

Number of Outages From 2016 to 2017

Status		2016	2017	Grand Total
Approved	# of Outages	1,931	2,171	**4,102**
	% Change		12.43%	

Monthly Approved Outages from 2016 to 2017: All VS Each Type



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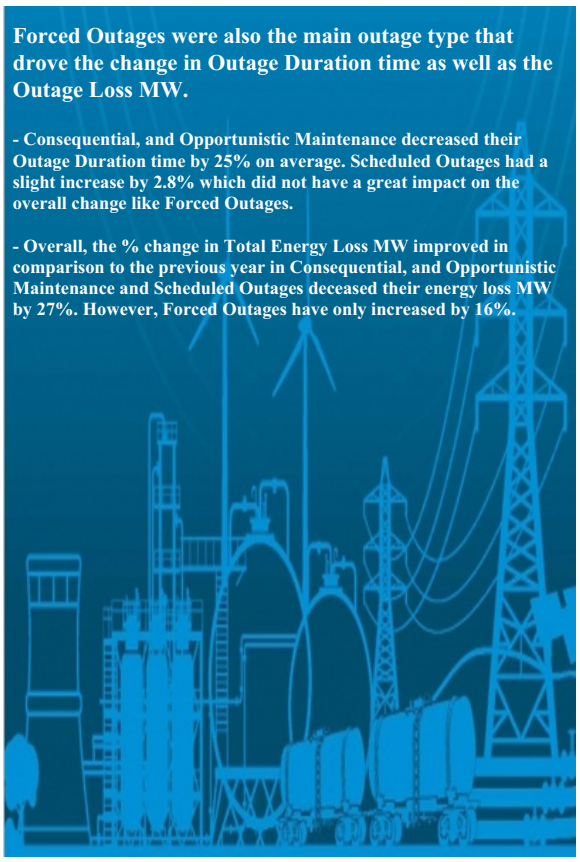
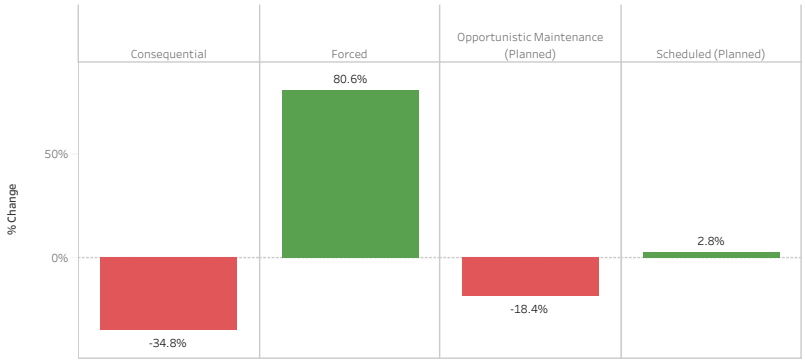
Forced Outages were also the main outage type that drove the change in Outage Duration time as well as the Outage Loss MW.

- Consequential, and Opportunistic Maintenance decreased their Outage Duration time by 25% on average. Scheduled Outages had a slight increase by 2.8% which did not have a great impact on the overall change like Forced Outages.

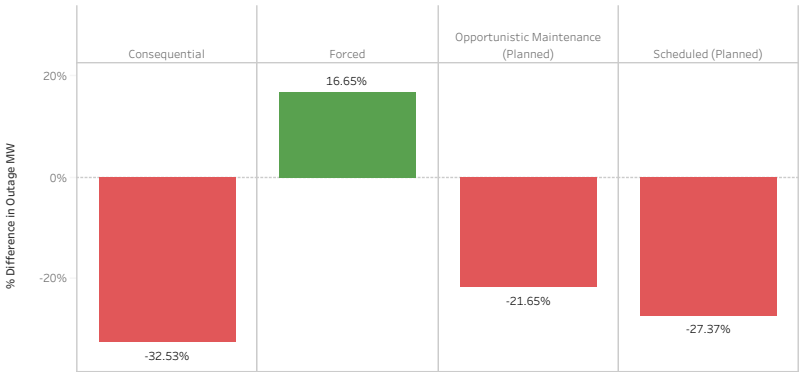
- Overall, the % change in Total Energy Loss MW improved in comparison to the previous year in Consequential, and Opportunistic Maintenance and Scheduled Outages deceased their energy loss MW by 27%. However, Forced Outages have only increased by 16%.



% Change in Outage Duration Time from 2016 to 2017 Per Type



% Change in Total Energy Loss MW from 2016 to 2017 Per Type



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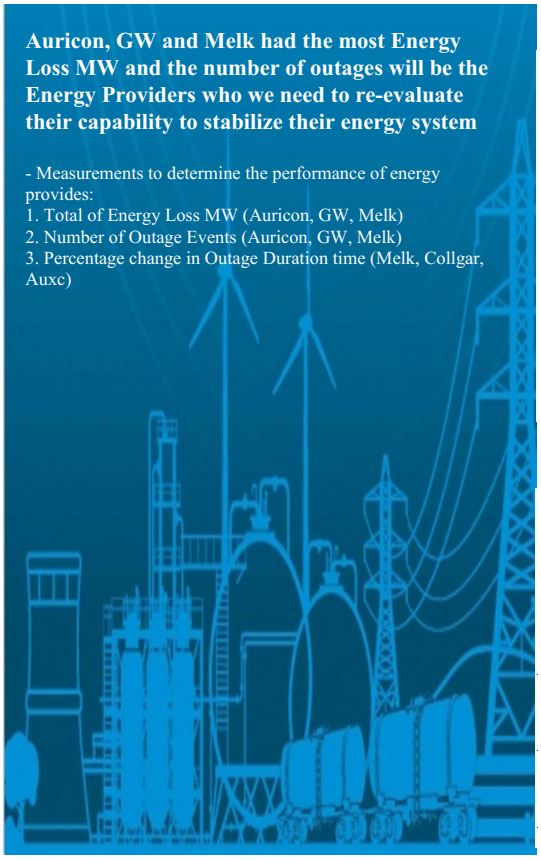
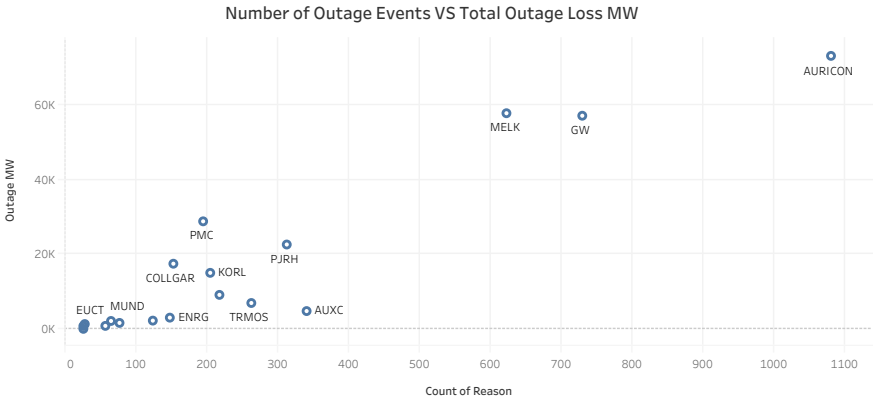
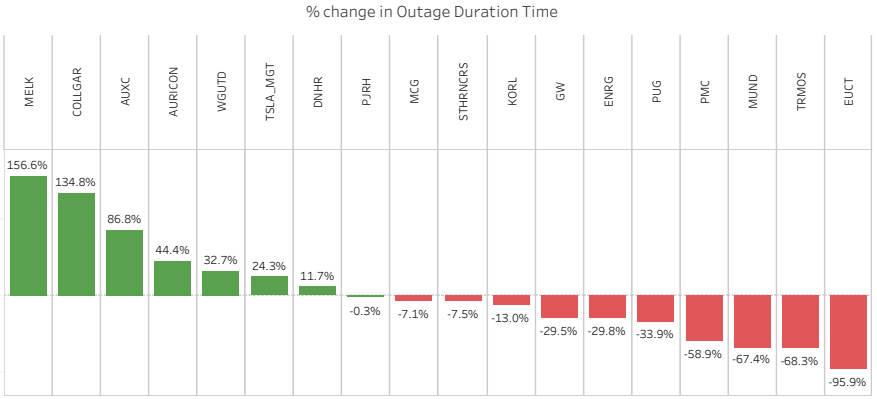
Auricon, GW and Melk had the most Energy Loss MW and the number of outages will be the Energy Providers who we need to re-evaluate their capability to stabilize their energy system

- Measurements to determine the performance of energy provides:
1. Total of Energy Loss MW (Auricon, GW, Melk)
2. Number of Outage Events (Auricon, GW, Melk)
3. Percentage change in Outage Duration time (Melk, Collgar, Auxc)







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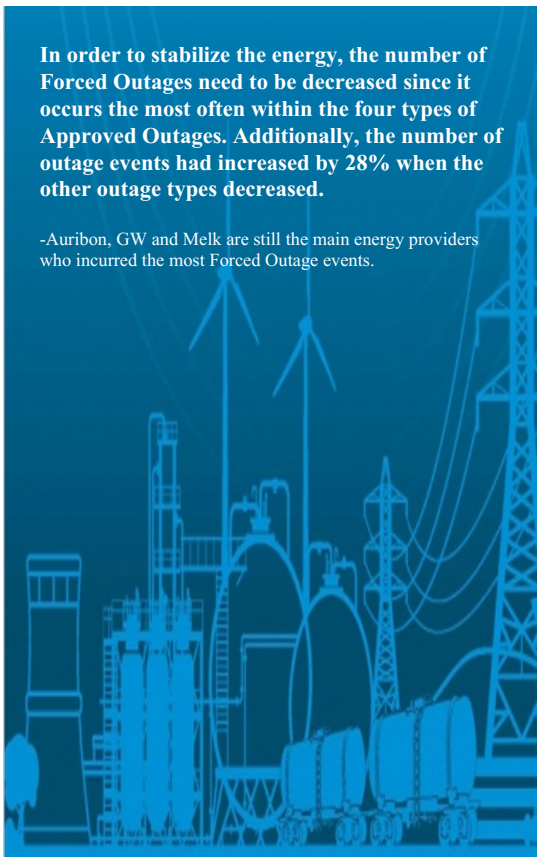
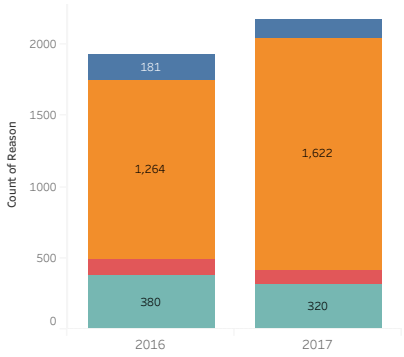
Reason
Consequential
Forced
Opportunistic Maintena..
Scheduled (Planned)

In order to stabilize the energy, the number of Forced Outages need to be decreased since it occurs the most often within the four types of Approved Outages. Additionally, the number of outage events had increased by 28% when the other outage types decreased.

-Auribon, GW and Melk are still the main energy providers who incurred the most Forced Outage events.



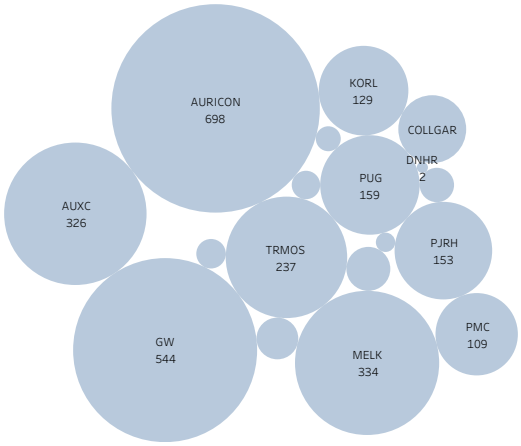
Most Common Outage Type



% Change of Forced Outage Occurences

Reason	
Consequential	-29.83%
Forced	28.32%
Opportunistic Maintenance (Planned)	-3.77%
Scheduled (Planned)	-15.79%

Accumulated # Of Forced Outage Per Particpant



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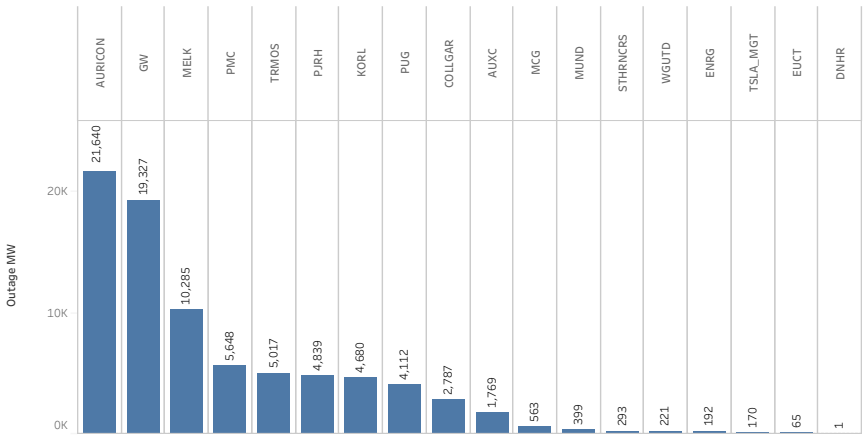
Participant Code
All

Previously, Auricon, GW and Melk were the top three energy providers from the dataset since their total number of outage events as well as duration time. The charts also strongly indicate that they are the providers to be considered unreliable especially Auricon and Melk.

- Due to the dramatic increase of duration time from the provider WGUTD, this would be the next provider to investigate aside from Aurion and Melk within the Force Outage Sector.

Forced Outage: Total Outage Loss in Min Per Participant



Forced Outage Duration Time in Min and % Change

	Start Time			
	% Change in Duration Time		Duration Time	
Participant Code	2016	2017	2016	2017
WGUTD		11,100.00%	60	6,720
MELK		1,837.83%	63,450	1,229,550
COLLGAR		278.11%	16,860	63,750
AURICON		158.13%	21,210	54,750
TSLA_MGT		145.83%	720	1,770
GW		141.96%	118,770	287,370
KORL		135.66%	25,740	60,660
MCG		111.29%	1,860	3,930