



VELCO Transformer Fleet

vermont electric power company

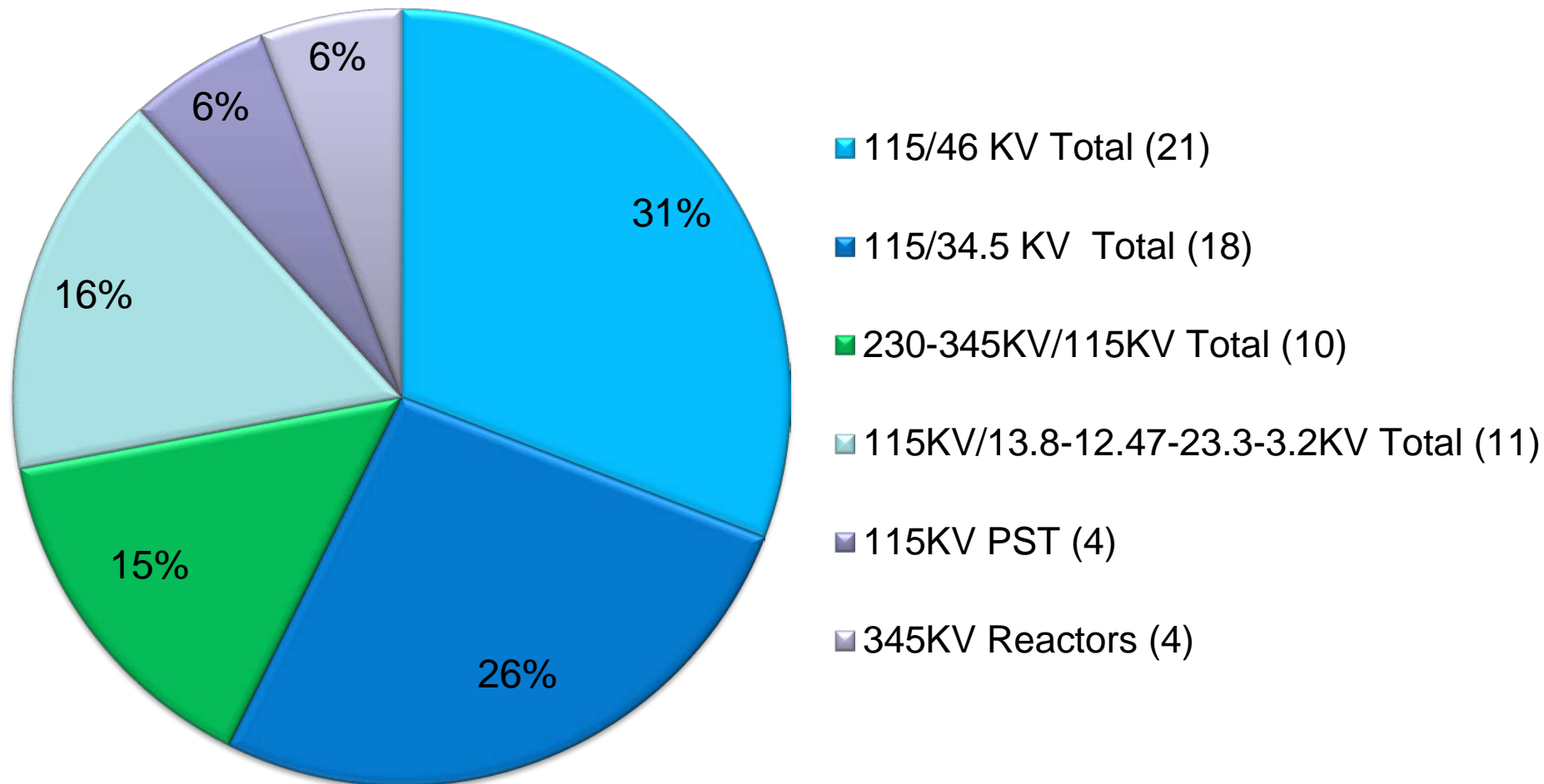


February 16, 2017

Mike Fiske

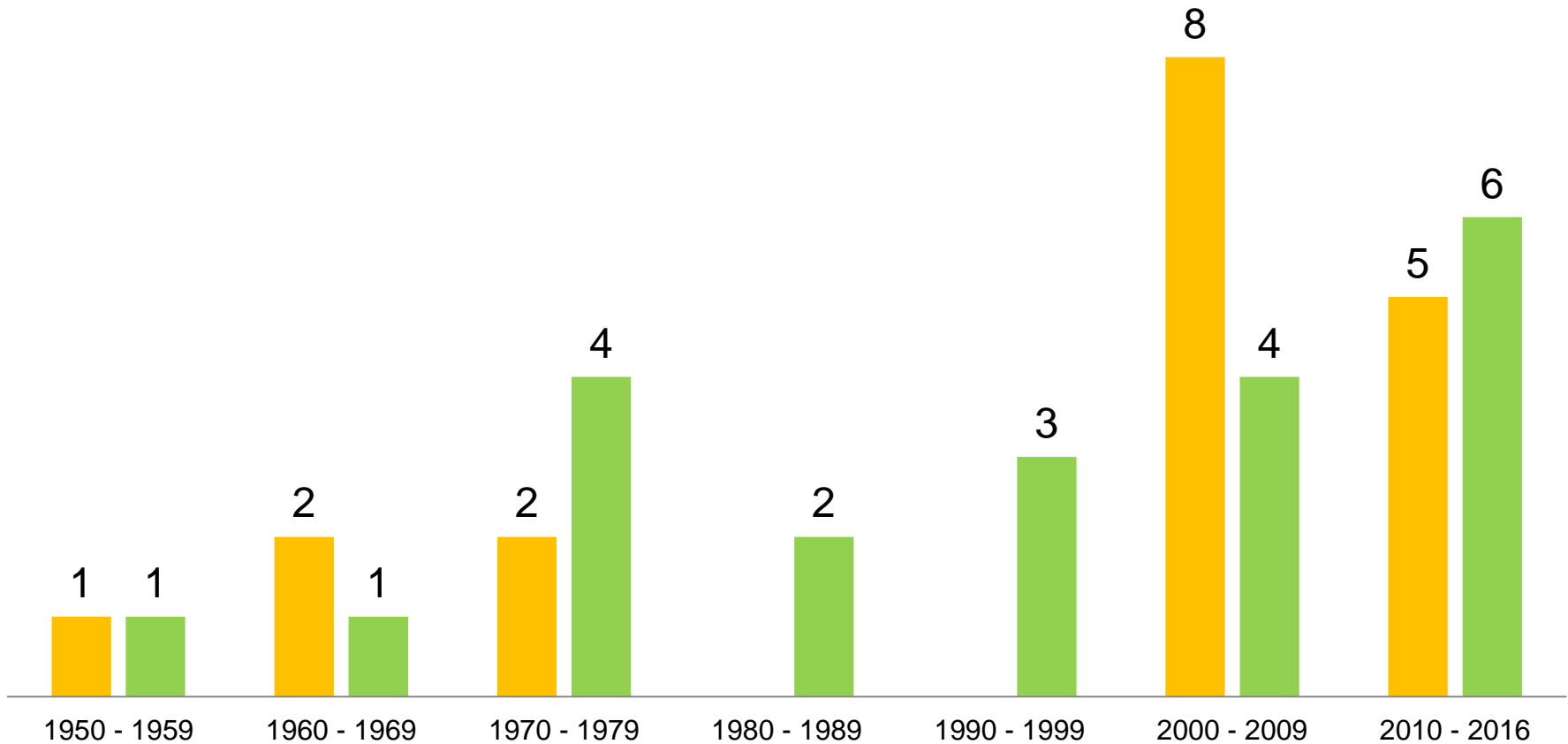
In Service Transformers

- VELCO presently has 68 Transformer in service.



In Service Transformer Fleet

■ 34.5 KV Transformer ■ 46 KV Transformer



In Service Transformer - Year of Manufacture

Transformer Condition Strategy

- VELCO performed a study in 2013 of twenty transformers based on age, through faults, loading, diagnostic testing results and manufacture.
- The study produced a probability of failure percentage (PF%) for each of the 20 transformers. The top 5 transformers had a PF% over 4% and actions have been taken to install additional monitoring or perform a complete replacement.
- VELCO then inventoried existing spare transformers, performed contingency planning and a replacement strategy for the system transformers.
- As a result VELCO began a replacement program in which five transformers were purchased over three years based on system criticality and spare strategy.
- VELCO has replaced three transformers since 2013 based on condition and one due to failure.
- VELCO has also salvaged four obsolete spares since 2014 due to their questionable condition.

Emergent Transformer Replacement

- VELCO's spare strategy is based on critical loads, contingency studies and reliability concerns.
- VELCO presently has the ability to respond to a loss of a transformer for secondary voltages ranging from 12.47 KV – 46 KV in two ways.
 - If loads cannot be supported for an extended timeframe VELCO will respond with a portable transformer or use our spare dual winding transformer that does not require oil processing.
 - If loads can be supported for an extended period of time VELCO will respond by installing a permanent spare transformer from inventory.



VELCO's Spare Transformers

Substation	Serial #	Manufacturer	Voltage	MVA	Year Manufactured
Essex Facts	20760103	Mitsubishi	115/3.2	25.8/34.4/43	1999
Mobile Substation	97063910	Pauwels	115/12.47	12/ 20	2007
Tafts Corner Substation	14060	Fortune	115/13.8/12.5	33/41/56	2016
Highgate Converter	7288717	ASEA	115/23.3	240/120/120	1985
Transportable	K547335	GE	115/46/34.5	30/40/50	1974
Bennington	6537115	West	115/69	16/20	1960
Saint Albans	100810	SMIT (Dual Winding)	115/34.5/46	30/40/50/56	2002
Granite	H409118	GE	230/115	180/240/300	1971
New Haven	13051	Fortune	115/34.5	33.6/44.8/56	2014
New Haven	13049	Fortune	115/46	33.6/44.8/56	2014
New Haven	E4505	Delta Star	115/46	33.6/44.8/56	2016

Requested Transformer Purchase

- Presently VELCO inventory has one 115/34.5 KV 56MVA transformer as a spare.
- As part of the Substation Condition Assessment Program VELCO will install this spare at St. Albans in 2018 as part of the substation upgrade. This will allow VELCO to rotate this spare into service before the warranty period expires.
- The two transformers located at St. Albans will be installed replacing the following transformers.
 - 1963 Essex X10 - 50 MVA
 - 1957 Vergennes T2 - 30 MVA
- As part of VELCO's spare transformer strategy a new 115/34.5 KV transformer will need to be purchased.