



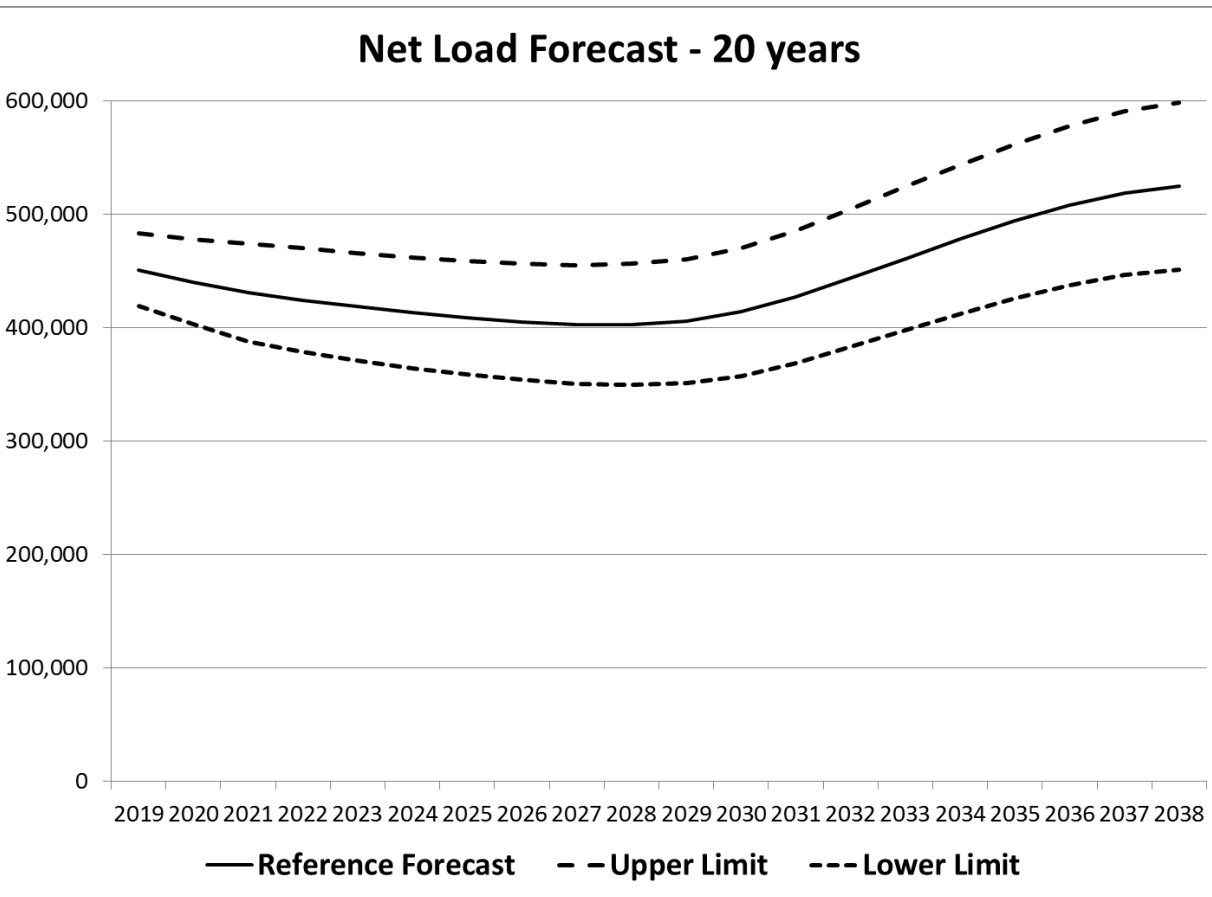
# Vermont Electric Cooperative

April 16, 2020

## Impacts of Beneficial Electrification on a Rural Distribution System

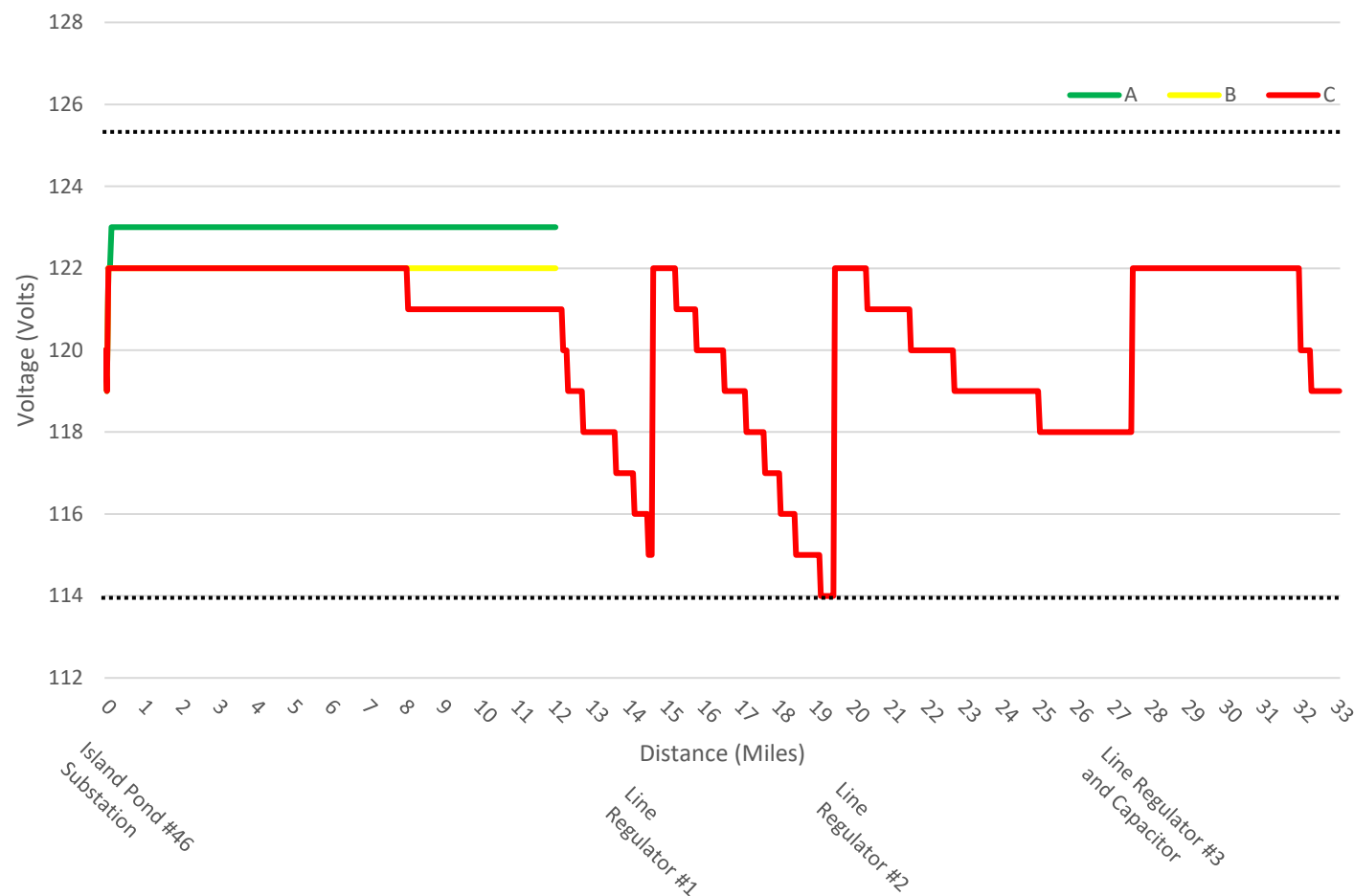
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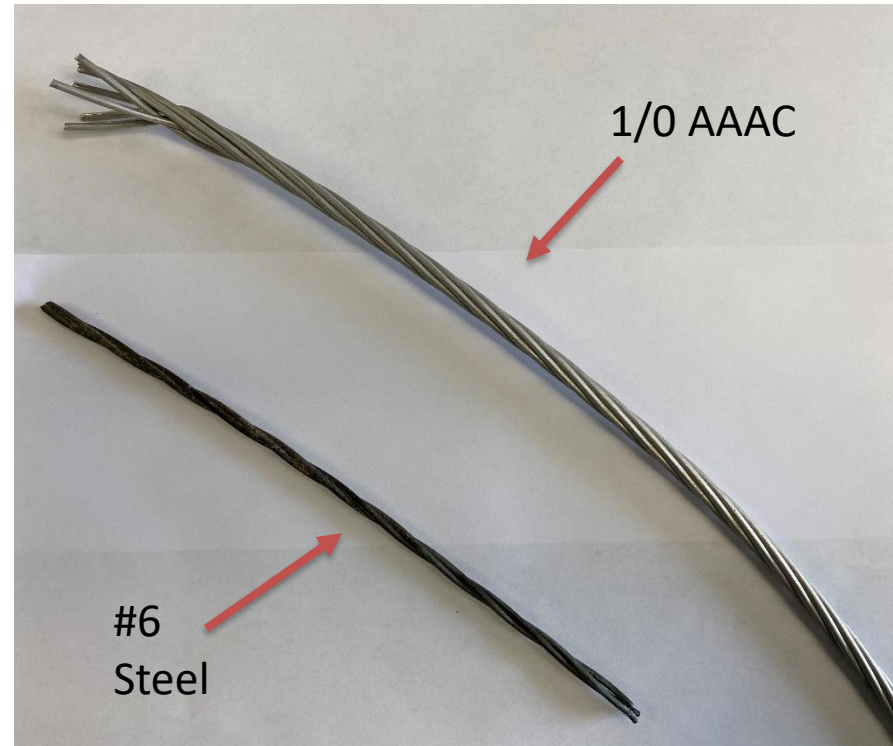
Cyril Brunner



- Also projecting demand decline
- Beneficial electrification (primarily EV's) will have impacts on peaks
- System and Local Impacts

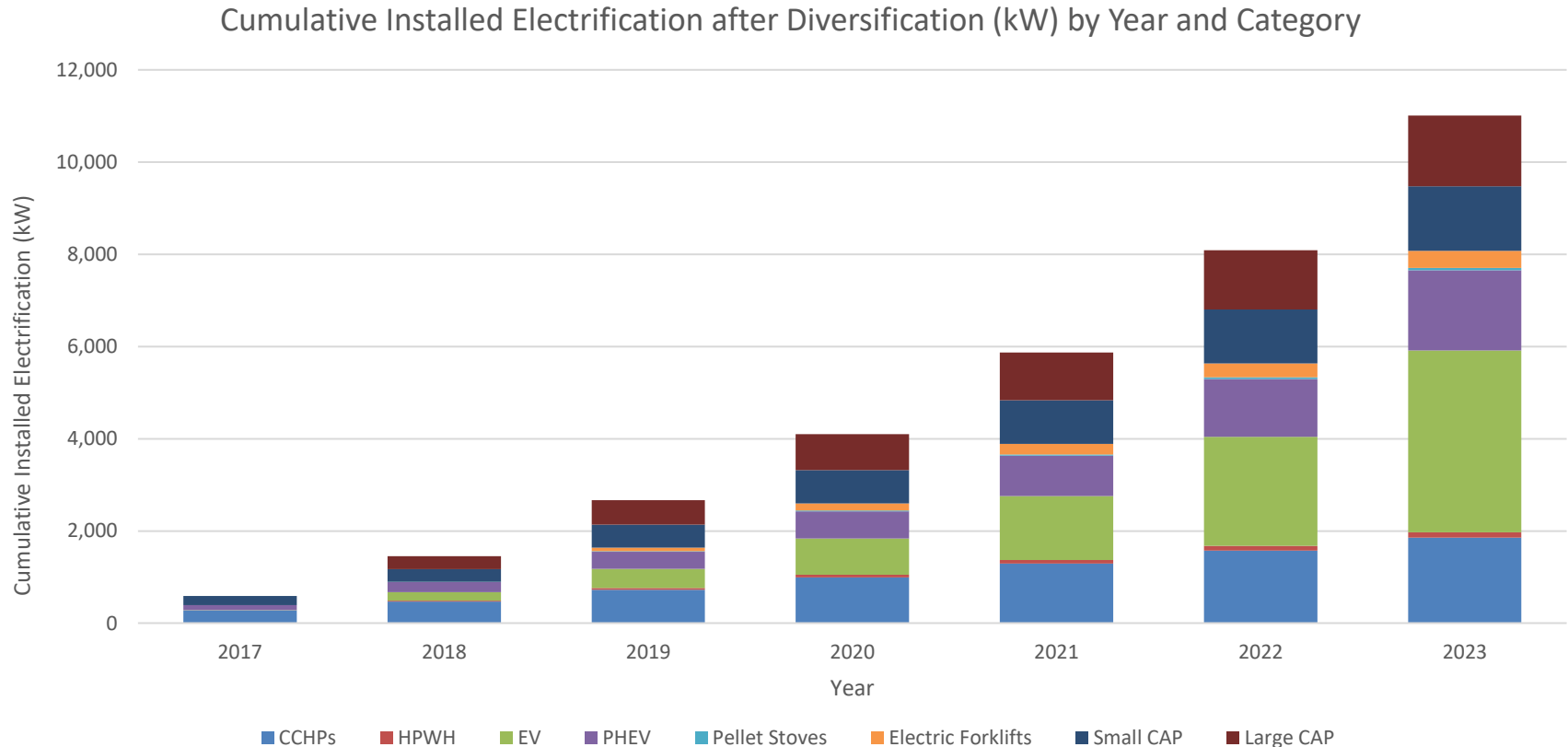
- Long distance radial lines
- Voltage performance (Island Pond to Guildhall)





- ~700 miles (8D – 32 miles, #6 Steel – 41 miles, ~300 miles of 4AWAC and 6A each)
  - 28% of VEC's system
- Wire is at minimum 50 years old
- 7x as many losses as our standard conductor (1/0 AAAC)
  - ~\$2,000/mile worse than our standard conductor

# Can the system support this growth?

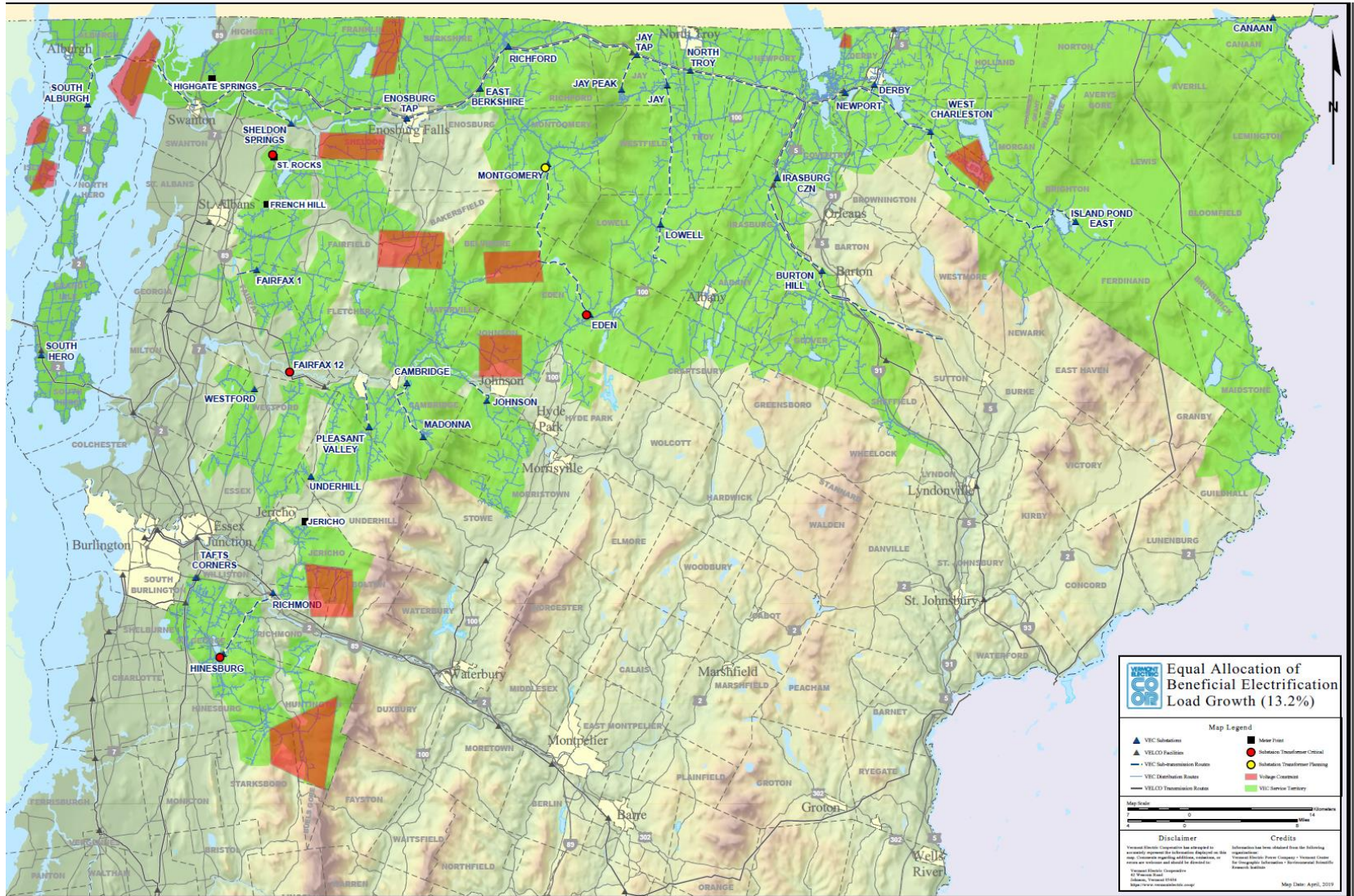


- The total forecasted load increase is around 11MW which is about 13% of VEC's system peak (approximately 85MW).
- Equal and Distributed Allocation



# Equal Allocation of Load Growth

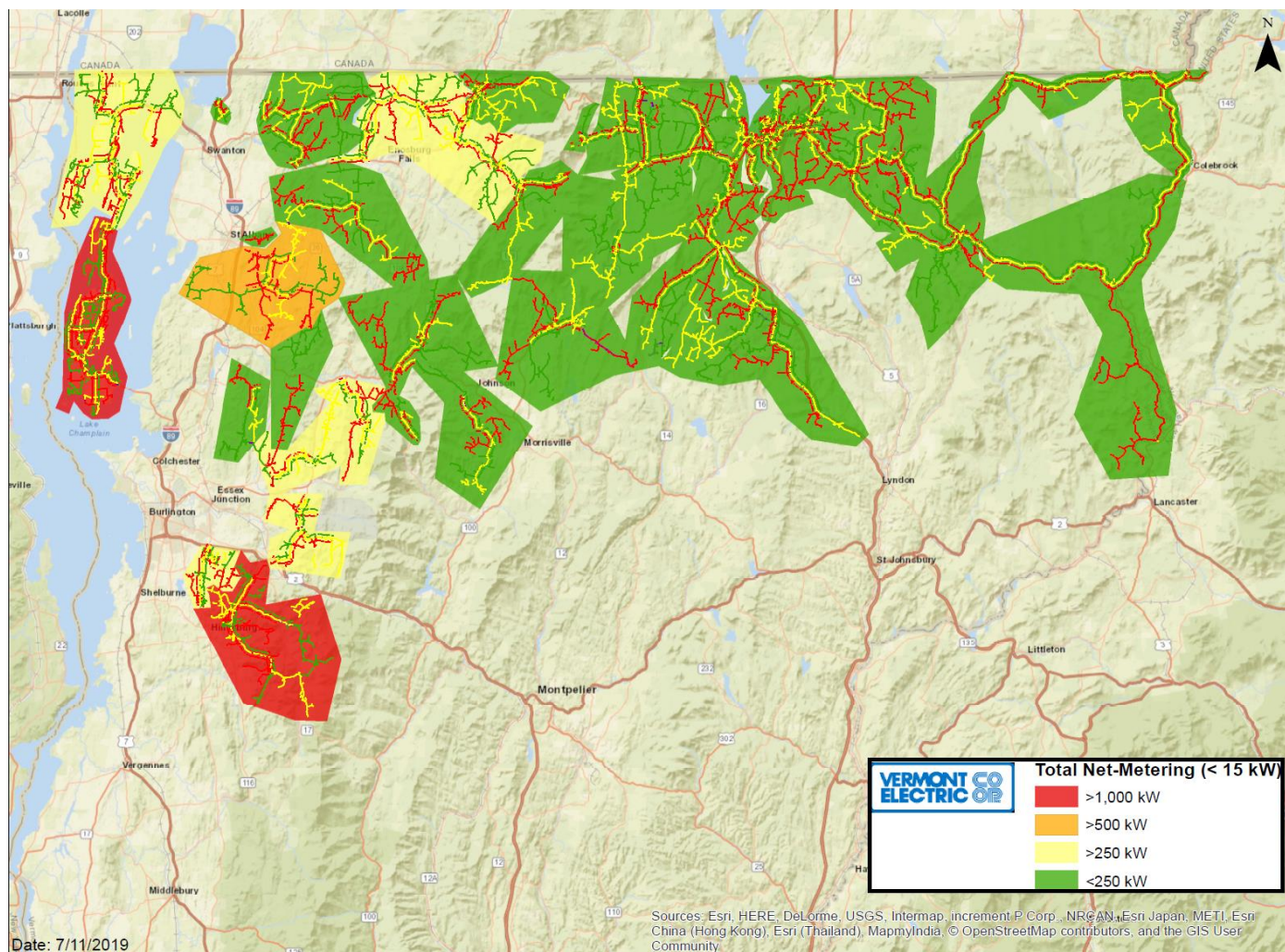
- 13% increase to all substation peaks





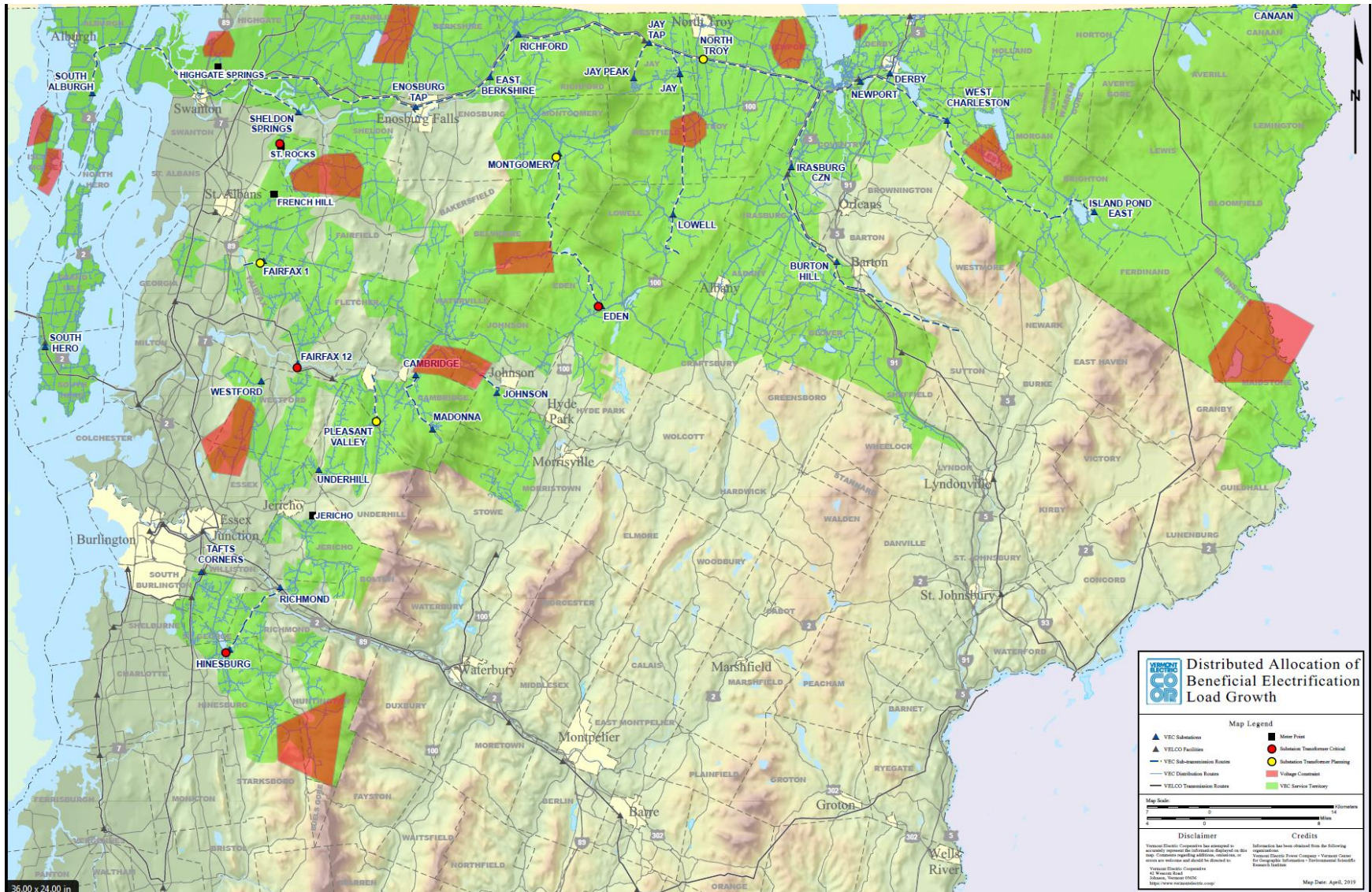
# Distributed Allocation

- EV, Heat Pump, Stove allocation based on existing net metering (<15 kW)
- Location of sites < 15 kW



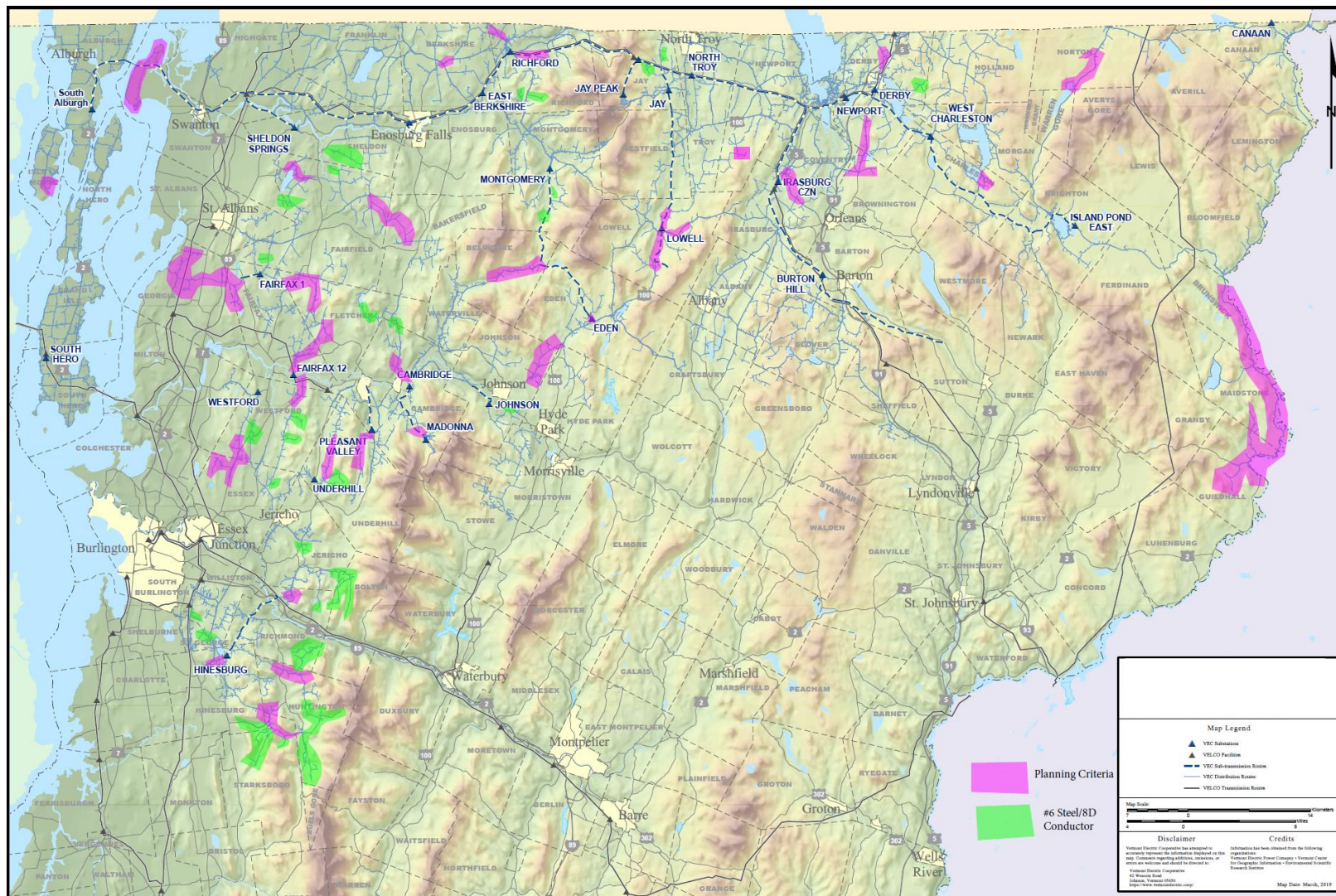


# Distributed Allocation of Load Growth

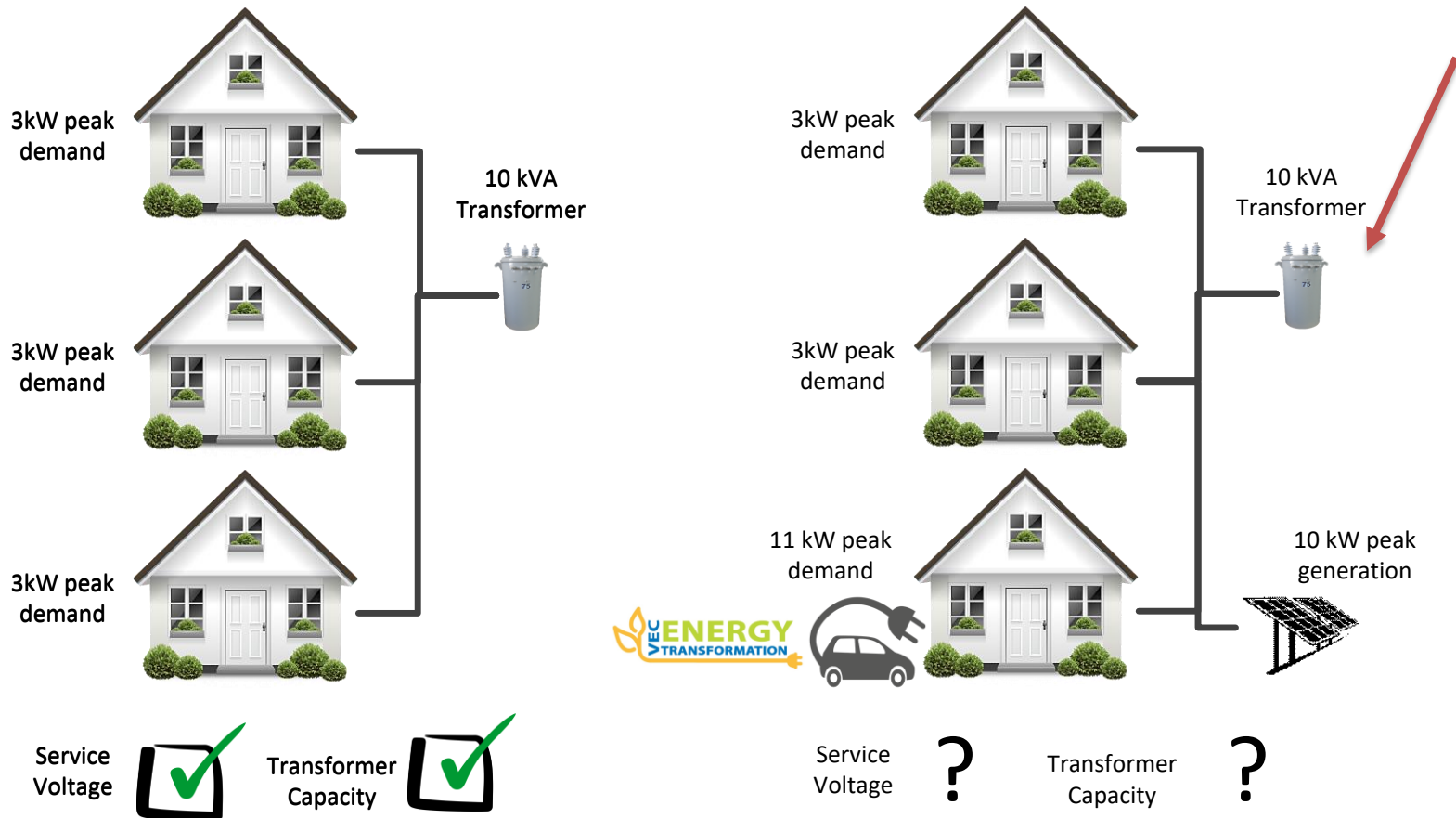




# Voltage and Load Limitations



- ~60% of VEC's circuits have a violation. (43/72)





## ■ Transformer Sizes

Size (kVA)	VEC %	GMP %
< 10 kVA	2.26%	8.88%
10	47.84%	44.29%
15	32.41%	25.85%
25	15.97%	12.31%
37.5	0.95%	2.13%
45	0.02%	0.54%
50	3.16%	1.98%





- Number of meters on a 10 kVA (standard overhead) transformer

# of Meters	VEC %	GMP %
1	72.41%	81.51%
2	18.25%	15.25%
3	5.43%	2.25%
4	2.07%	0.72%
5	0.97%	0.15%
6	0.40%	0.06%
7	0.22%	0.03%
8	0.04%	0.01%



- Number of meters on a 15 kVA (standard underground padmount) transformer

# of Meters	VEC %	GMP %
1	63.47%	74.84%
2	21.62%	17.80%
3	7.72%	4.25%
4	3.48%	1.64%
5	1.64%	0.69%
6	0.99%	0.35%
7	0.44%	0.14%
8	0.28%	0.09%



Type	VEC %	GMP %
< 10 kVA	2.3%	8.9%
10 kVA with > 1 meter	13.1%	8.2%
15 kVA with > 2 meters	4.7%	1.9%
25 kVA with > 3 meters	2.8%	1.2%
Total	22.9%	20.2%

- For VEC ~ 5,500 would need to be replaced
- 250 transformers replaced per year for condition/load growth.





- Similar local impacts to GMP
- Local impacts are harder to address (limited to no notification)
- Consistent with GMP we have time to plan and implement capital upgrades
- VEC has load serving challenges on the distribution system without new load

# More Information? Integrated Resource Plan (IRP)



- Vermont's only IRP to include an image of beer