

Non-Wires Alternatives to Building a New Substation in Washington, D.C.

Key Takeaways for Other Jurisdictions

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Efficiency as a Resource

Synapse Energy Economics

- Founded in 1996 by CEO Bruce Biewald
- Leader for public interest and government clients in providing rigorous analysis of the electric power sector
- Staff of 35 includes experts in energy and environmental economics and environmental compliance
- We assess the costs, impacts, and technical issues associated with transmission solutions and non-transmission alternatives in order to inform better policy and planning decisions.

Disclaimer

The views expressed in this presentation are those of the presenter and should not be taken to represent the views of the Department of Energy and the Environment for the District of Columbia (DOEE) or the District of Columbia Government. Further, this presentation does not represent the official view of the District or its agencies with respect to the ongoing case of the substation discussed.

Overview

- Key takeaways
- Background
- PEPCO's load forecast
- Assessment of Non-Wires Alternatives (NWAs)
- Portfolio of deferral and load forecast

Key Takeaways

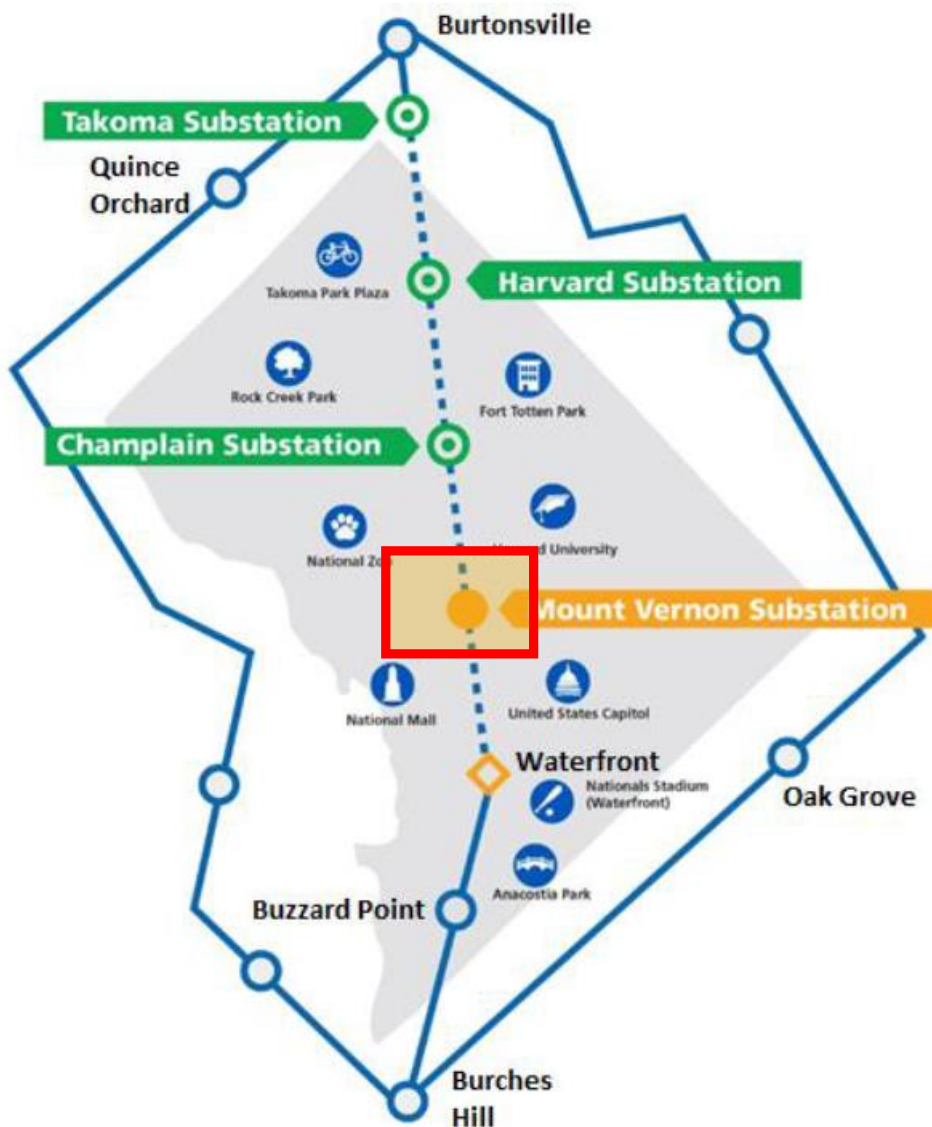
1. Carefully examine utilities' load forecasts and assess the validity of the forecasts
2. Based on the data availability, choose a method most appropriate for your case.
3. In any methodology:
 - a) Seek as much location-specific data as possible
 - b) Be conservative when estimating NWA portfolio potential
 - c) Explore various NWA resources
4. A combination of various NWAs can defer or avoid T&D investment with enough lead time and save a significant amount of ratepayer money

Background

Background

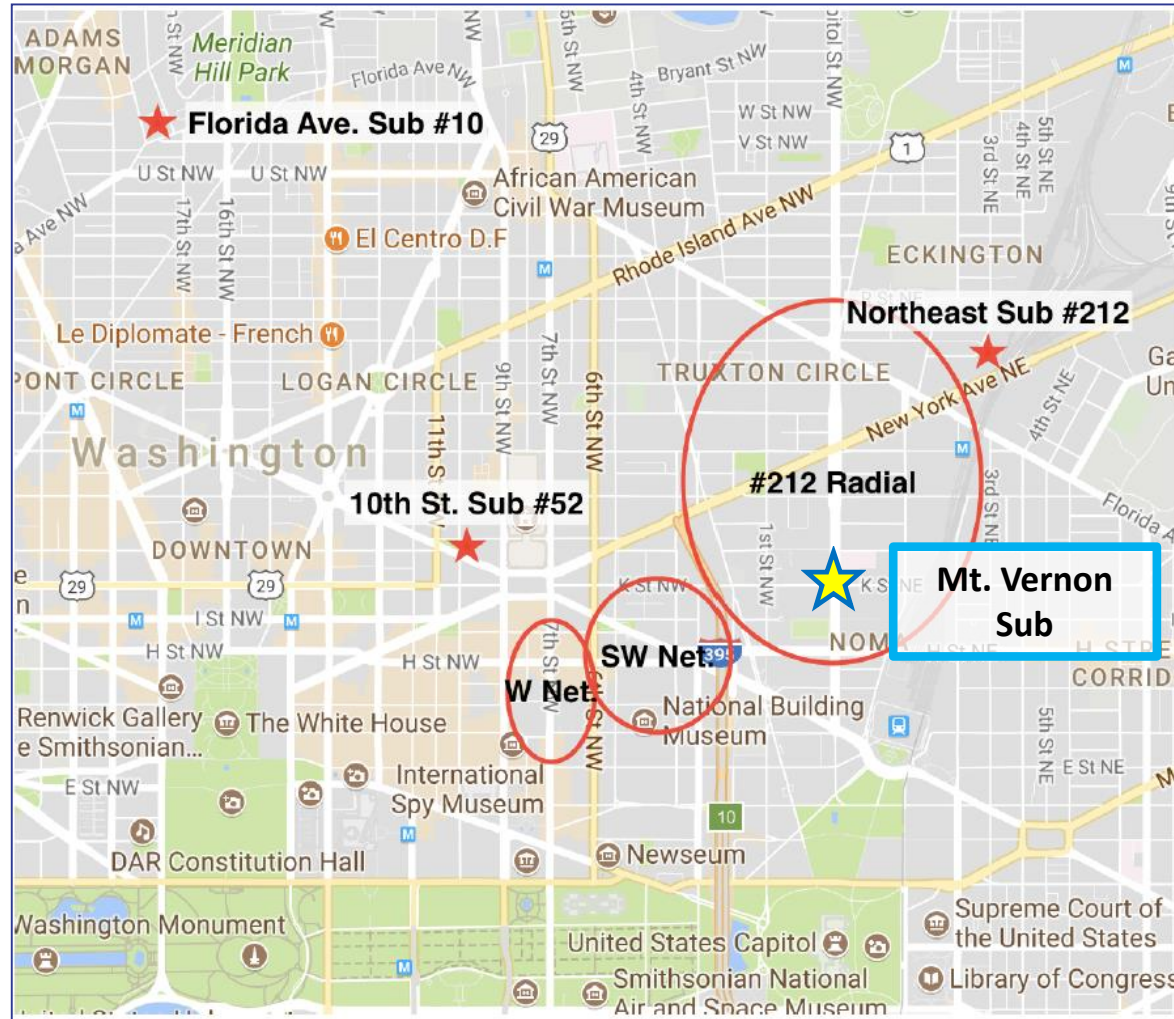
- PEPCO proposed a \$850 million grid modernization project “Capital Grid Project” in 2017 (FC Case No. 1144), including the construction of a New Mt. Vernon Substation.
- D.C Department of Energy and Environment (DOEE) retained Synapse to assess the need for the proposed Mt. Vernon substation.
- Synapse’s assessment focused on PEPCO’s load forecasts and the potential of NWAs to avoid or defer the substation.
 - First report issued in November 2017
 - Revision filed in September 2018

PEPCO's D.C. Capital Grid Project



- Rebuild aging Harvard and Champlain substations and expand their capacity from 138 kV to 230 kV.
- Build 10 miles of two 230 kV underground transmission lines, extending up to Waterfront sub.
- Build a new Mt. Vernon substation at a cost of about **\$140 million**.

Load Areas to be Served by Proposed Mt. Vernon Substation



Source: Pepco hosting capacity map, Google Maps.

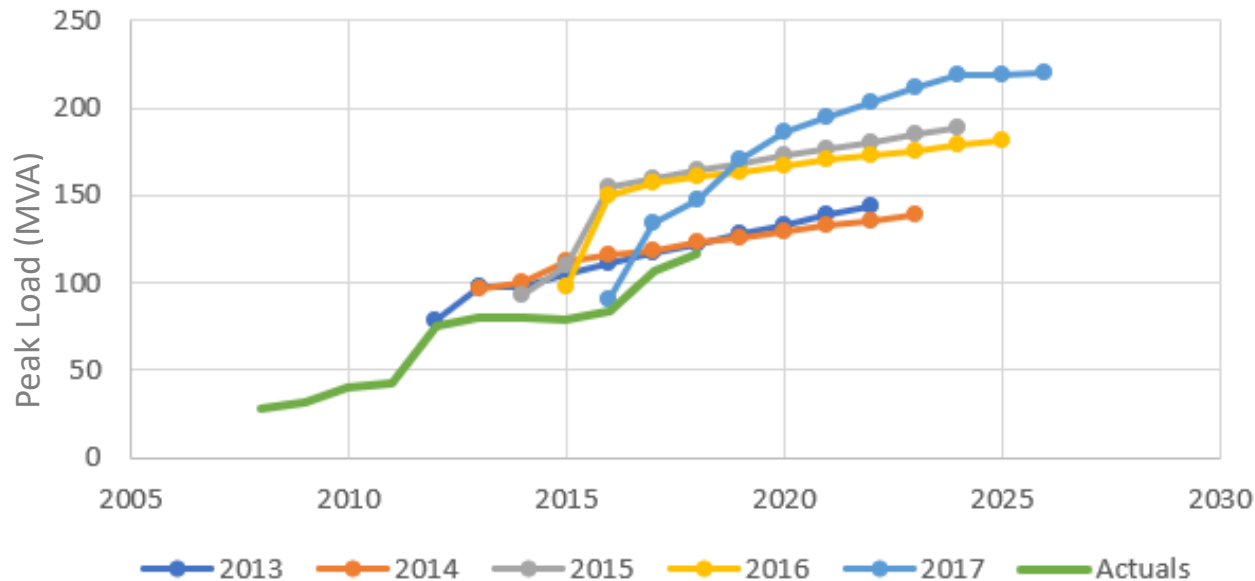
Load Forecast

Takeaway #1: Carefully examine utilities' load forecasts and assess the validity of the forecasts

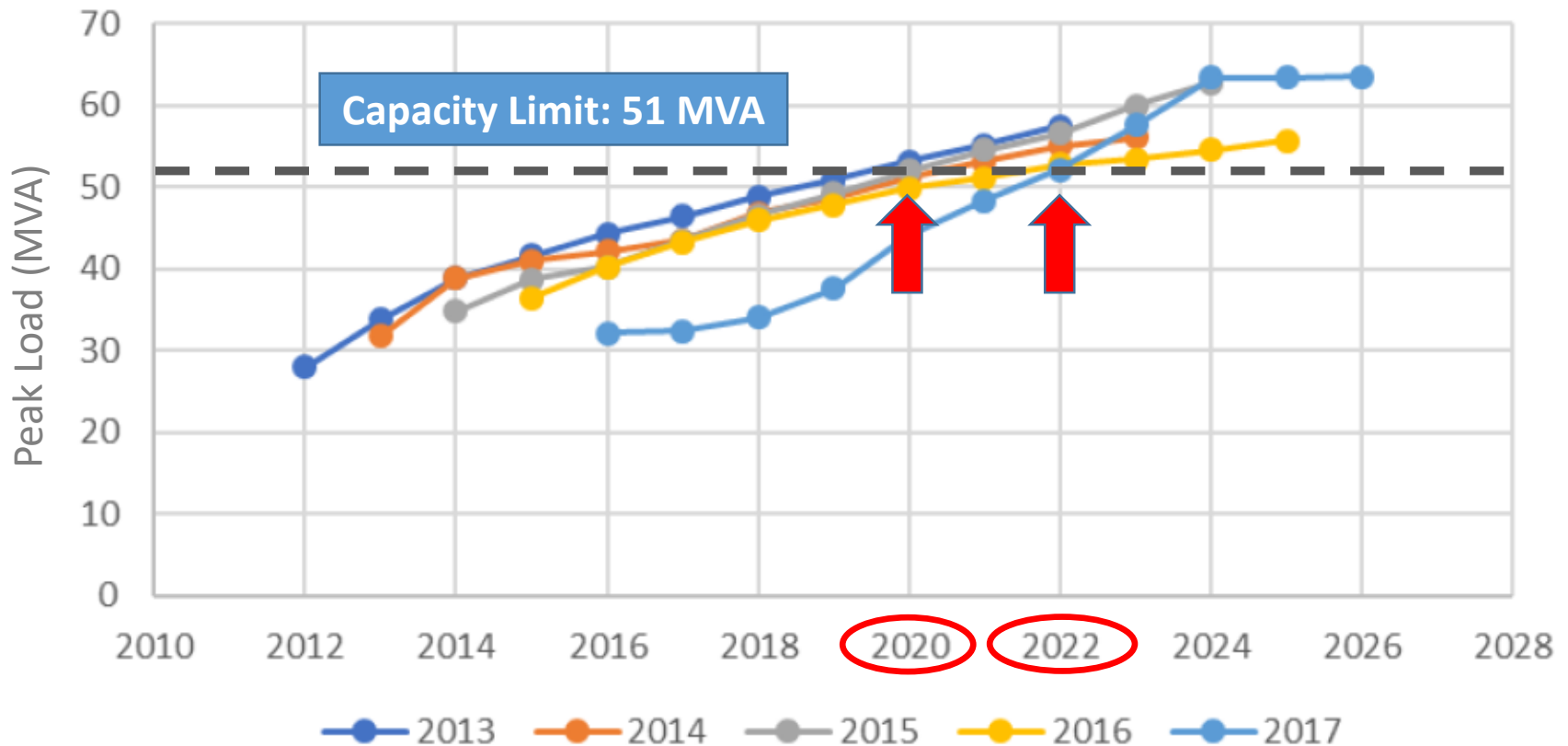
PEPCO's Load Forecast

- Bottom-up building-specific load forecast
- PEPCO's forecasts have been proven to be inaccurate
- Use of old building energy data for new buildings

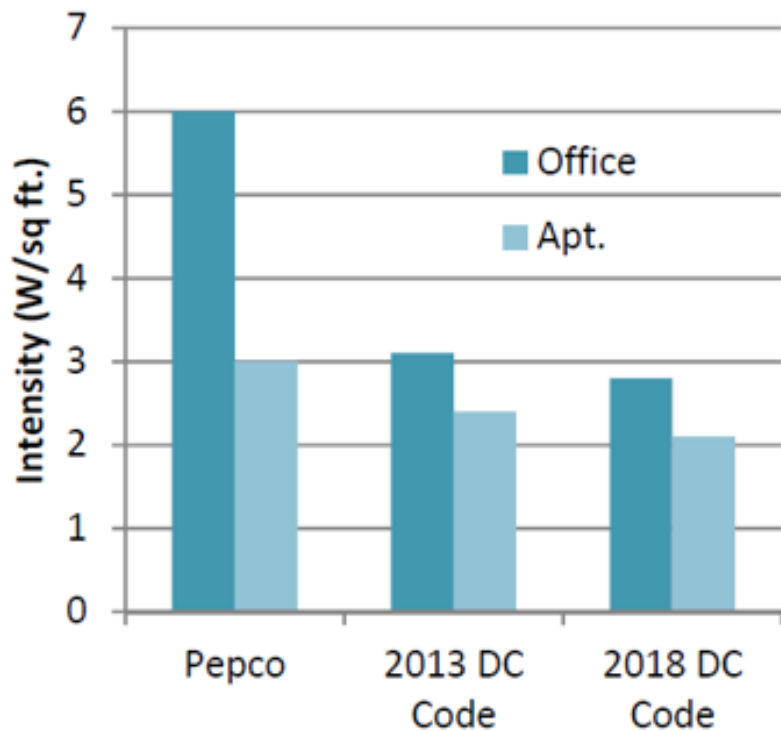
PEPCO's 90/10 Load Forecast for Northeast Sub #212



SW Network Group Peak Load Forecasts



Primary Factor for Load Overestimation: Assumed Load for New Construction



- Pepco's load forecast is based on outdated building load data
- For office buildings, the peak load is over 2x higher than the expected load from the new code
- For apartments, the peak load is more than 20 to 30 percent higher

Assessment of Non-Wires Alternatives

Takeaway #2: Based on the data availability, choose a method most appropriate for your case.

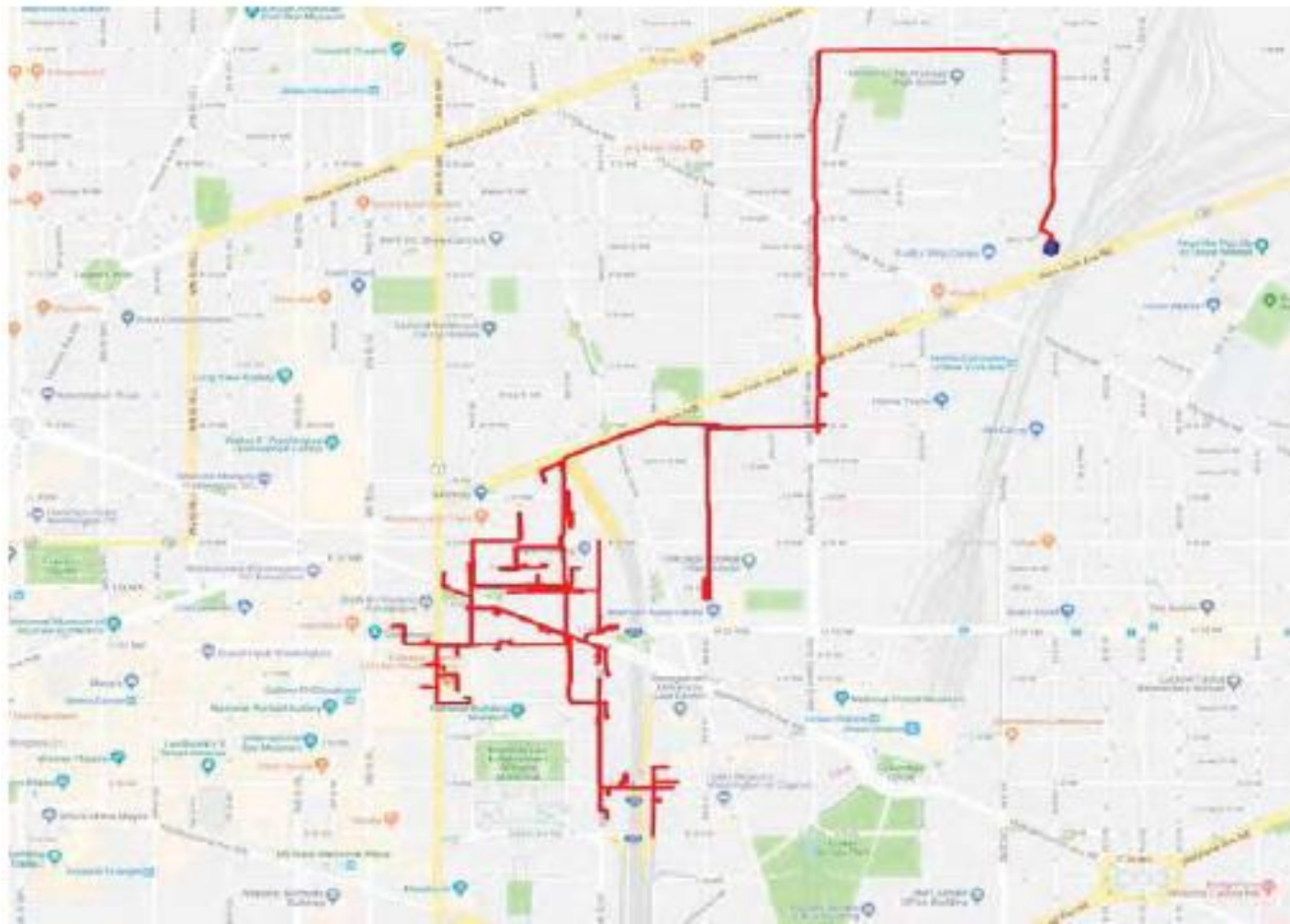
Takeaway #3: In any methodology,

- a) Seek as much location specific data as possible
- b) Be conservative when estimating NWA portfolio potential
- c) Explore various NWA resources

First Assessment of NWAs: Bottom-up Method

- Analysis of energy efficiency (EE), demand response (DR), solar PV, and batteries. Excludes CHP.
- Bottom-up method of assessing EE and DR
 - Load data for existing and new large buildings
 - Measure and building type specific savings and costs based on a 2015 Pennsylvania potential study for EE and other studies for DR
 - Cost-effectiveness screening for EE
 - Adjustment for a portfolio of NWAs

Map of Sub #212 SW Network Group



Source: PEPCO's Reply Comments, June 29, 2018 (FC No. 1130 and 1144), Figure 5.

Large Existing Buildings in the SW Network Group

Address	Size (sq. ft.)	Load in peak hour (kW)
441 G St. NW (GAO)	1,935,500	6,342
425 Massachusetts Ave NW	605,405	1,902
Gallery Place	590,688	2,228
600 5th St. NW	423,710	1,388
450 Massachusetts Ave. NW	407,710	1,335
425 I St. NW	399,371	1,309
700 Sixth St. NW	306,459	971
455 Massachusetts Ave. NW	247,330	784
770 5th St. NW	233,968	766
811 4th St. NW	208,767	609
461 H St. NW	197,648	1,325
401 F St. NW	197,094	644
777 6th St. NW	196,997	624
599 Massachusetts Ave. NW	172,236	428
500 H St., NW	120,000	309
251 H St. NW	93,877	298
301 Massachusetts Ave. NW	68,989	201

Peak Savings Estimates for EE

Segment	End Use	Peak Savings (Retrofit)	Peak Savings (ROB)	Peak Savings (Retrofit + ROB)	Peak Savings - Mid Case
Office	Lighting	19%	35%	53%	36%
Office	Cooling	2%	12%	14%	8%
Office	Refrigeration	19%	28%	47%	33%
Office	Electronics	24%	n/a	24%	24%
Hotels	Lighting	22%	35%	57%	39%
Hotels	Cooling	4%	11%	15%	9%
Hotels	Refrigeration	10%	28%	38%	24%
Hotels	Electronics	24%	13%	37%	31%
Multifamily	Lighting	15%	21%	36%	26%
Multifamily	Cooling	4%	9%	13%	8%
Multifamily	Refrigeration	27%	22%	49%	38%
Multifamily	Electronics	n/a	22%	22%	22%

ROB = Replace on Burnout

Results of our analysis:
6.7 MW of cost-effective EE available in the area.

Second Assessment of NWAs: Top-down Method

- The total load estimate for the SW Network
- Assumed building mixture
- Estimated end-use load share by building type
- **D.C.-specific**, and more **conservative savings estimates** based on a 2018 PNNL study
 - Includes **only cooling, lighting, and fans**
 - Savings of 12% for office and 20% for apartment per building
- Realistic participation rates for EE and DR
 - EE participation rates: 25% for multifamily buildings and 50% for offices and hotels
- Program and measure costs data from D.C. and other jurisdictions

Results of our analysis:
**approximately 2 MW of cost-effective EE from “existing” buildings
available in the area.**

Portfolio of Deferral

Takeaway #4: A combination of various NWAs can defer or avoid T&D investment with enough lead time and save a significant amount of ratepayer money

Portfolio of Deferral – Initial Analysis

Two-year deferral portfolio

Year	EE (MW)	DR (MW)	Total (MW)
2019	0.5	1.0	1.5
2020	1.3	2.0	3.3
2021	2.0	3.0	5.0
2022	2.5	4.0	6.5
2023	3.0	4.5	7.5

Two-Year Deferral Results

- Benefits: \$27 M
 - \$10 M non-substation
 - \$17 M sub deferral
- Cost: \$9.3 M
- **Net Benefit:** \$17.5 M

Indefinite deferral portfolio

Year	EE (MW)	DR (MW)	PV (MW)	Storage (MW)	Total (MW)
2019	0.5	1.0	-	-	1.5
2020	1.3	2.0	-	-	3.3
2021	2.0	3.0	-	-	5.0
2022	2.5	4.0	0.5	-	7.0
2023	3.0	4.5	1.0	2.5	11.0
2024	3.5	5.0	1.0	5.0	14.5
2025	3.5	5.0	1.0	5.0	14.5

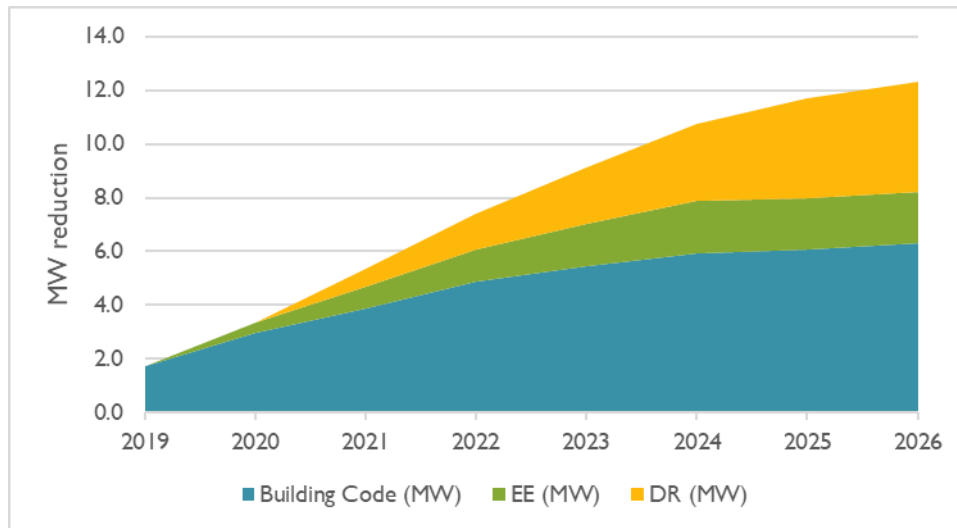
Indefinite Deferral Results

- Benefits: \$78 M or more
- Cost: \$36.5 M
- **Net Benefit:**
 - \$41 M through 2030
 - Permanent avoidance: \$211 M

Portfolio of Deferral – Revised Analysis

Indefinite deferral portfolio

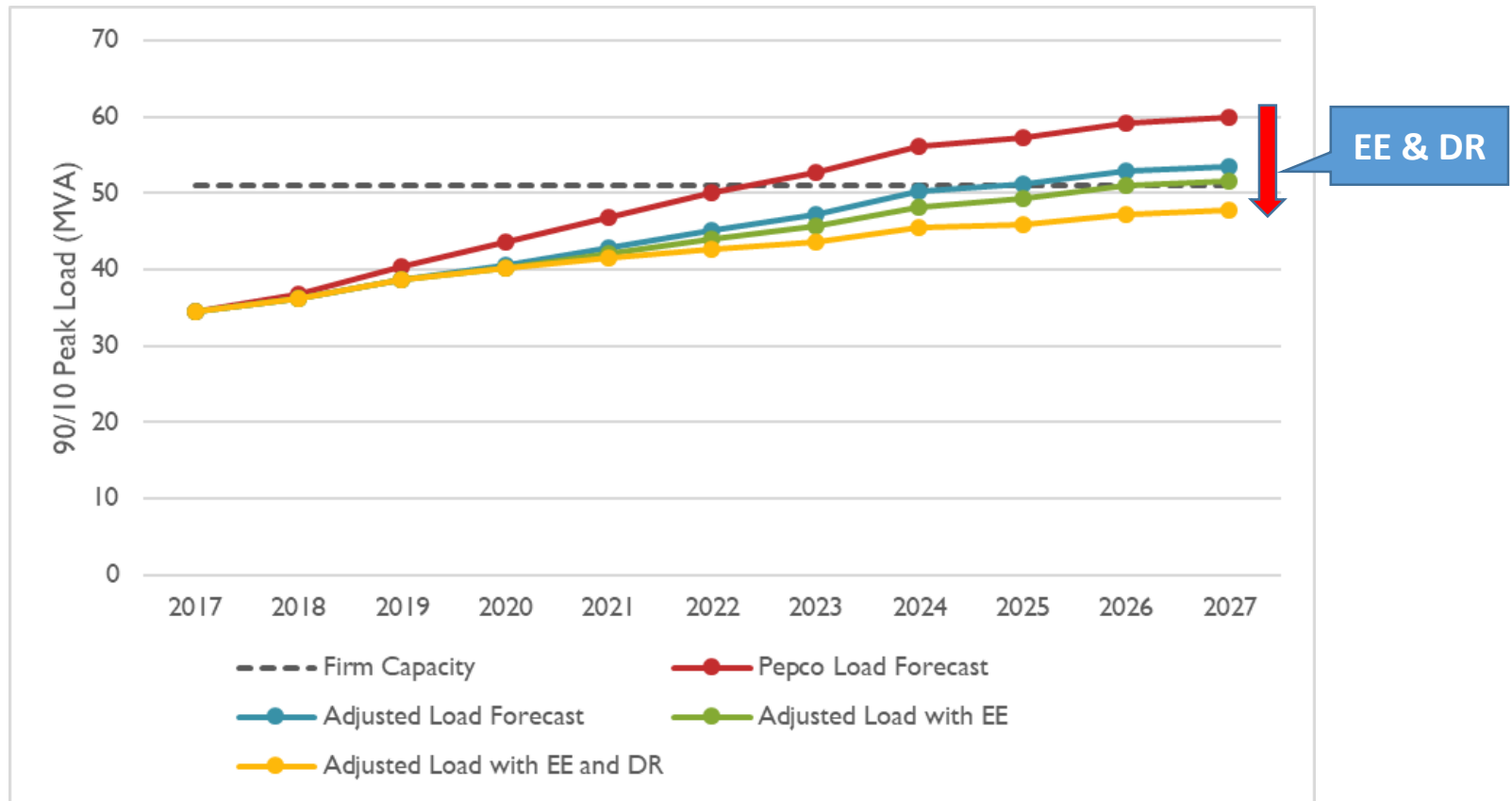
Year	Building Code (MW)	EE (MW)	DR (MW)	Total (MW)
2019	1.7	0.0	0.0	1.7
2020	3.0	0.4	0.0	3.4
2021	3.9	0.8	0.7	5.3
2022	4.9	1.2	1.4	7.4
2023	5.5	1.5	2.1	9.1
2024	5.9	1.9	2.9	10.8
2025	6.1	1.9	3.7	11.7
2026	6.3	1.9	4.1	12.3



Deferral Results

- With the adjustment to the load forecast, **EE and DR are sufficient to defer the need beyond 2026.**
- Benefits: \$32 M or more (NPV)
- Cost: \$8.5 M (NPV)
- **Net Benefit:**
 - **\$24 M through 2028**
 - **Permanent avoidance: \$150 M**

SW Network Load Forecast with EE and DR



EE and DR alone can successfully reduce enough peak load to defer or avoid the proposed Mt. Vernon substation.

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