## 2021 Vermont Long Range Transmission Plan

#### vermont electric power company



June 18<sup>th</sup>, 2020 OC meeting

## Long Range Plan development timeline

Activity	Timing	
Prepare a load/renewable Load Forecast	November 2019 to June 2020	We are
Review high level scope with the VSPC	April VSPC quarterly meeting	
Prepare load flow cases and auxiliary files	May to June 2020	
Consultation with distribution utilities	June 2020	
Perform system analysis	July to November 2020	
Identify deficiencies and develop solution options	July to October 2020	
Engineering support (modeling data)	August 2020	
Construction Controls support (Cost estimates)	September and October 2020	
Prepare the draft report for VSPC review	November and December 2020	
Obtain formal feedback from VSPC	January to March 2021	
Incorporate VSPC comments	March 2021	
Conduct public meetings for input to the report	April to May 2021	
Incorporate comments from the public	June 2021	
Publish Plan	June 2021 (on or before 7/1/21)	

# LOAD FORECAST



## Load forecast work plan

- November 2019: Key inputs into the forecast, identify data sources
- January 2020: Review methodology to reflect the effects of future committed energy efficiency, net metering, distributed generation, and other committed small scale resources
- February 2020: State economic outlook and results of the most recent saturation survey
- May 2020: Review draft load forecast
- June 2020: Review final load forecast



## **Status**

- Itron submitted and VSPC reviewed the state level forecast
  - Base energy and demand forecasts
    - Includes effects of EE, long term weather trends, economy, electric prices, ...
  - Exogenous technology forecasts
    - Behind-the-meter solar PV
    - Heat pumps
    - Electric vehicles
  - Generated forecast scenarios (low, expected, high)
    - Itron thinks the low forecast is more reasonable
- Working on the zonal forecasts (16 load zones)
- Incorporating the latest economic outlook, which includes the effects of Covid-19
- Will finalize the forecasts by the end of June



## Data provided or available to Itron

- Hourly system loads and generation
  - Calculated zonal loads (gens plus ties)
    - Moving generation behind the meter (BTM) reduced loads
  - Standard offer
  - ISO-NE demand response (may no longer get this)
- Installed small-scale generation
- Solar PV production
- EV charging load shape
- AMI data (heat pump load shape)

New this year

See latest ltron load forecast presentation at https://www.vermontspc.com/library/document/download/7040/IRPFcst20\_June8.pdf



## **BASELINE ENERGY FORECAST**



#### **Delivered is Consumed minus BTM generation**





## **BASELINE SUMMER PEAK FORECAST**







## **BASELINE WINTER PEAK FORECAST**







### **INSTALLED SOLAR CAPACITY BY ZONE**



\* Zonal solar capacity derived by aggregating reported town-level capacity

#### We will need an update through June (all gens by DU substation)





### **BTM SOLAR FORECAST**

Behind the Meter Solar					
Year	MWh	Capacity (MW)			
2020	30,050.2	21.6			
2021	73,634.5	53.9			
2022	136,237.5	98.1			
2023	175,594.4	127.2			
2024	216,446.5	156.0			
2025	240,969.6	173.9			
2026	252,012.0	182.2			
2027	264,072.9	190.7			
2028	271,153.2	195.5			
2029	272,669.6	197.0			
2030	277,919.0	200.8			
2031	284,603.2	205.7			
2032	293,297.8	211.4			
2033	295,077.0	213.2			
2034	298,354.8	215.5			
2035	299,695.3	216.5			
2036	303,138.5	218.6			
2037	303,895.5	219.6			
2038	306,581.8	221.4			
2039	307,665.5	222.3			
2040	310,511.5	223.9			

#### Forecast based on payback model Payback starts flattening after 2020



#### ISO-NE forecasts about 230 MW incremental vs. 197 MW in 2029





#### ADDS SIGNIFICANT LOAD OVER TIME Cold Climate Heat Pump forecasts





### **HEAT PUMP PROGRAM DEMAND IMPACTS**



Adds 43 MW over the next five years and 180 MW by 2040

#### ISO-NE winter forecast 32 MW in 2025 68 MW in 2029

ISO-NE shows no summer load impact







## **CURRENT REGISTRATIONS**

Vermont Electric Vehicle Registrations



Drive EV VT: www.driveelectricvt.com/Media/Default/docs/maps/vt\_ev\_registration\_trends.pdf





## **SHARE PROJECTIONS**



» Bloomberg NEF forecasting 42% by 2040





## **EV PEAK ENERGY AND DEMAND IMPACT**

	Energy Imp	act (MWh)		Summer Peak Impact (MW)			Winter Peak Impact (MW)				
Year	Low	Expected	High	Year	Low	Expected	High	Year	Low	Expected	High
2020	3,011	4,035	4,837	2020	0.6	0.8	0.9	2020	0.9	1.2	1.4
2021	6,788	9,440	11,646	2021	1.3	1.8	2.2	2021	1.9	2.7	3.3
2022	11,473	16,619	23,489	2022	2.3	3.3	4.6	2022	3.3	4.7	6.7
2023	17,266	26,115	41,102	2023	3.4	5.2	8.1	2023	4.9	7.5	11.7
2024	24,397	38,616	72,229	2024	4.8	7.6	14.2	2024	6.9	11.0	20.5
2025	33,131	54,967	128,393	2025	6.5	10.9	25.3	2025	9.4	15.7	36.6
2026	43,761	76,179	205,306	2026	8.6	15.0	40.5	2026	12.5	21.7	58.5
2027	56,602	103,407	298,673	2027	11.2	20.4	59.0	2027	16.1	29.5	85.1
2028	71,973	137,883	397,445	2028	14.2	27.2	78.3	2028	20.5	39.2	113.0
2029	90,173	180,779	516,119	2029	17.8	35.7	101.9	2029	25.7	51.6	147.2
2030	111,444	232,981	638,169	2030	22.0	46.0	126.0	2030	31.8	66.4	181.9
2031	135,925	294,769	764,839	2031	26.8	58.2	151.0	2031	38.7	84.0	218.0
2032	163,597	365,450	892,172	2032	32.2	71.9	175.6	2032	46.5	103.8	253.5
2033	194,228	443,054	1,012,412	2033	38.4	87.5	199.9	2033	55.4	126.3	288.7
2034	227,337	524,281	1,133,738	2034	44.9	103.5	223.9	2034	64.8	149.5	323.3
2035	262,184	604,849	1,231,151	2035	51.8	119.4	243.1	2035	74.8	172.5	351.1
2036	297,803	680,267	1,303,585	2036	58.6	133.9	256.5	2036	84.6	193.3	370.4
2037	333,092	746,805	1,354,100	2037	65.8	147.4	267.3	2037	95.0	212.9	386.0
2038	366,932	802,229	1,387,591	2038	72.4	158.4	273.9	2038	104.6	228.7	395.5
2039	398,325	846,014	1,408,919	2039	78.7	167.0	278.2	2039	113.6	241.2	401.7
2040	426,514	879,021	1,422,002	2040	84.0	173.1	280.0	2040	121.3	249.9	404.3

ISO-NE summer forecast 11 MW in 2025, 20 MW in 2029 ISO-NE winter forecast 15 MW in 2025, 28 MW in 2029





### SCENARIOS COMBINE BASELINE AND TECHNOLOGY FORECASTS

- » New technologies impact on load depends on adoption level, and timing of technology use
- » Layer technology hourly load forecasts on baseline hourly load projections
  - Combine baseline energy forecast with system profile and peak forecast
  - Combine new technology energy forecast and hourly profile forecasts
  - 3. Add baseline and technology hourly load forecasts



## **SCENARIOS: ENERGY**

Energy MWh						
Year	Low	Expected	High			
2020	5,551,287	5,552,310	5,553,113			
2021	5,499,246	5,503,048	5,507,553			
2022	5,442,058	5,450,073	5,462,683			
2023	5,401,212	5,415,211	5,440,499			
2024	5,365,428	5,387,638	5,437,236			
2025	5,330,604	5,363,833	5,460,044			
2026	5,322,949	5,370,718	5,530,547			
2027	5,316,894	5,383,565	5,618,563			
2028	5,331,553	5,422,399	5,731,832			
2029	5,356,531	5,477,698	5,874,159			
2030	5,382,069	5,540,907	6,019,574			
2031	5,405,250	5,609,249	6,166,261			
2032	5,434,471	5,690,445	6,318,679			
2033	5,456,281	5,769,305	6,455,850			
2034	5,484,623	5,856,952	6,600,376			
2035	5,518,894	5,949,239	6,727,393			
2036	5,563,030	6,045,462	6,837,388			
2037	5,595,781	6,122,302	6,914,953			
2038	5,627,604	6,189,102	6,976,561			
2039	5,657,685	6,245,519	7,027,255			
2040	5,685,963	6,293,114	7,071,653			
20-30	-0.3%	0.0%	0.8%			
30-40	0.6%	1.3%	1.6%			
20-40	0.1%	0.6%	1.2%			



No significant deviation until after 2025





## **SCENARIOS: SUMMERS PEAKS**

Summer Peak MW					
Year	Low	Expected	High		
2020	974	975	975		
2021	974	975	976		
2022	976	977	979		
2023	978	980	984		
2024	980	984	993		
2025	982	987	1,005		
2026	985	994	1,023		
2027	989	1,001	1,045		
2028	995	1,012	1,070		
2029	1,003	1,025	1,099		
2030	1,011	1,040	1,130		
2031	1,019	1,056	1,161		
2032	1,028	1,075	1,193		
2033	1,036	1,094	1,222		
2034	1,045	1,114	1,253		
2035	1,055	1,134	1,279		
2036	1,066	1,155	1,301		
2037	1,076	1,173	1,318		
2038	1,087	1,190	1,332		
2039	1,096	1,203	1,344		
2040	1,105	1,215	1,354		
20-30	0.4%	0.7%	1.5%		
30-40	0.9%	1.6%	1.8%		
20-40	0.6%	1.1%	1.7%		



Summer peak demand increases faster than energy





## **SCENARIOS: WINTER PEAKS**

Winter Peak MW						
Year	Low	Expected	High			
2020	976	976	976			
2021	982	983	985			
2022	989	992	997			
2023	996	1,002	1,012			
2024	1,004	1,012	1,031			
2025	1,012	1,024	1,057			
2026	1,022	1,039	1,093			
2027	1,033	1,057	1,134			
2028	1,046	1,078	1,178			
2029	1,061	1,103	1,232			
2030	1,077	1,132	1,287			
2031	1,090	1,160	1,341			
2032	1,105	1,191	1,395			
2033	1,118	1,224	1,449			
2034	1,132	1,257	1,503			
2035	1,146	1,291	1,551			
2036	1,161	1,324	1,591			
2037	1,176	1,355	1,628			
2038	1,190	1,383	1,659			
2039	1,204	1,407	1,686			
2040	1,215	1,427	1,707			
20-30	1.0%	1.5%	2.8%			
30-40	1.2%	2.3%	2.9%			
20-40	1.1%	1.9%	2.8%			



Significantly faster winter peak demand growth





## Preparing for the long range plan analysis

- The load forecast will be lowered slightly by
  - Demand response load in ISO-NE forward capacity market
  - Specific DU plans for storage or load management
- Need to compare the high load scenario with VT's 90/50 targets
- Will test peak load scenarios without NTAs (load management and/or storage)
  - Determine transmission upgrades with conceptual level costs
  - Calculate amount of NTA needed to mitigate criteria violations
- Will test high generation scenario coincident with lower loads without corresponding load increases
  - Integrate load-related transmission upgrades, and determine additional transmission upgrades
  - Consider frequency and duration of system concerns
  - Calculate amount storage/load management/curtailment needed to mitigate criteria violations
  - Update optimization of DG geographical distribution by
    - Considering distribution system limits and other constraints, as time permits
    - Modeling more realistic system conditions (expected tie flows, proposed FERC generation, ...)

