Transmission discussion

Southern Loop Community Working Group meeting

By Dean LaForest

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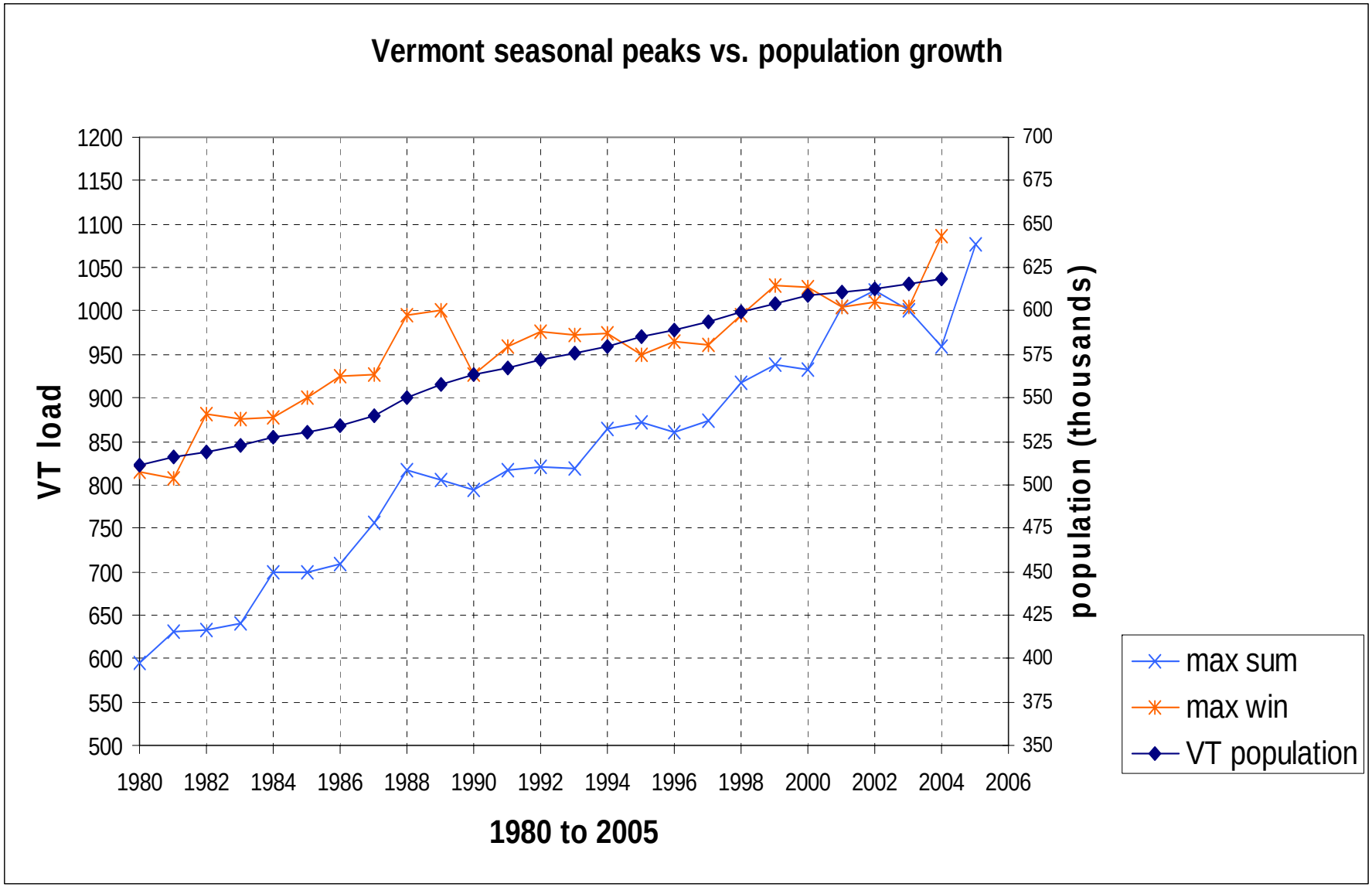
What are the present local reliability problems that new transmission infrastructure would resolve?

- Loss of the 115 kV supply to Brattleboro causes the immediate loss of a portion of Brattleboro, and may result in sustained customer outages until the 115 kV supply is restored (depending on time of year and local load levels)

- Loss of 46 kV line sections feeding the southern Vermont area today will result in customer outages
  - Different line sections have different exposures
    - For example, loss of the line sections at the Bennington and Brattleboro ends of the 46 kV loop may cause customer outages during many days of the year. Outages in the middle of the loop may less exposure.
  - These problems make line maintenance very difficult to schedule, and always add customer risk into the scheduling effort

What near-term future Vermont reliability problems may arise that may be addressed by transmission also of value to southern Vermont ?

- If Vermont continues to see summer peak load growth over the next 10 years that we've seen over the past 25 years, AND if we do not build in-state generation of significant magnitude and with the right attributes to reduce our reliance on the transmission network, we will need to build more transmission within the next 5 to 10 years (at VT peak load levels of roughly 1200 to 1250 MW)
  - The most significant exposure Vermont has is loss of the 345 kV line from Vermont Yankee to Coolidge
    - Loss of this line under peak load conditions can overload transmission lines in other states (New York and New Hampshire), cause unacceptably low voltages in multiple states (NY, VT and NH) and potentially cause a cascading outage or blackout in portions of the three noted states
    - This result has been determined in VELCO's first "Long Range Planning Analysis" required by Act 61 (enacted into law in 2005)


Vermont seasonal peaks vs. population growth
VT load
population (thousands)
1200
1150
1100
1050
1000
950
900
850
800
750
700
650
600
550
500
700
675
650
625
600
575
550
525
500
475
450
425
400
375
350
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
1980 to 2005
max sum
max win
VT population

What transmission options are available to address the current and future reliability problems?

- The “East to West” option
  - Build a 115 kV line from Bennington to the Vermont Yankee (about 66 miles)
    - Line would likely be double circuit in areas due to need to maintain the existing 46 kV network (to minimize cost and eliminate need for extra ROW)
    - Will use existing CVPS / VELCO rights of way (ROW)
    - New substations would be built at Stratton and West Dummerston
    - Additions would be made to existing substations at Bennington and Vermont Yankee (add breakers / buswork to terminate new transmission lines)
  - This option deals with current local reliability problems, and future ones for some time, and its life can be extended with non-transmission alternatives
  - This option does not address the state-wide future reliability problem identified earlier
- The “North to South” option
  - Build a line from Coolidge to the Vermont Yankee (about 51 miles) in existing VELCO corridor
    - Line would likely be built for 345 kV operation, but could operate at 115 kV for some time
    - A new substation would be built at West Dummerston
    - Additions would be made to existing substations at Coolidge and Vermont Yankee (add breakers / buswork to terminate new transmission lines)
  - This option deals both with current local reliability problems, future local issues, and the state-wide reliability problems
    - This option does not address local reliability concerns as effectively as the “East to West” option, but can also benefit in the same way from non-transmission alternatives

What might these transmission lines look like?

- Structure types
  - 345 kV “H-frame”
    - VELCO standard for 345 kV
    - Uses wooden poles, minimizes pole height, has proven reliable in 30+ years of use within VT
  - 115 kV “H-frame”
    - VELCO standard for 115 kV construction (for same reasons – durability / reliability / cost / pole height)
    - Has been used since VELCO’s inception (50 years ago)
  - 115 kV “single pole”, with double circuit construction
    - Design would allow both a 115 and 46 kV line to be on the same pole
    - Depending on structural needs, cost, and availability, these poles may be wood, laminates or steel
    - VELCO built some of this recently for the Northern Loop project
- Examples follow (for in-service VELCO lines today)

345 kV "H-frame"

115 kV "H-frame"

Double circuit, single pole (example)

Some "Pro's & Con's" of the transmission options

- Siting
  - The "East to West" option would utilize existing CVPS / VELCO ROW
    - The CVPS ROW is 100 to 150 feet wide, and cannot easily accommodate a new line with the existing 46 kV line
    - Some of that ROW goes through communities (Manchester)
  - The "North to South" option would utilize existing VELCO ROW
    - VELCO has 250 to 350 feet of ROW where the 340 line exists today, and would allow construction of the new line without disturbing the existing line
    - This ROW is much more remote from both people and communities

Some "Pro's & Con's" of the transmission options (continued)

- Construction
  - East to West option
    - Poses challenges due to narrow ROW, need to maintain existing 46 kV line, and location of corridor in a few discrete locations
  - North to South option
    - Construction challenges exist mostly from an "ability to build the line" perspective
      - The ROW is in remote, rugged country, especially in the southern end
    - Does not pose construction challenges with respect to existing facilities (due to wide ROW previously noted)

Some "Pro's & Con's" of the transmission options (continued)

- Cost
  - The "East to West" option
    - Line and substation cost would shared between the region and Vermont
      - The line costs, because they have both 115 kV and 46 kV portions, would be shared (roughly 70 / 30 between the region and Vermont)
      - The substation costs would be shared too (roughly 65 / 35 between the region and Vermont in the new stations, and almost exclusively regional in the augmented stations)
  - The "North to South" option
    - Line costs would be exclusively regional, and the substation costs would remain the same (new stations split between the region and VT / augmented existing stations regionally borne)
  - Vermont pays for about 4.2% of regional transmission cost
    - So 96% of the cost of regional portions of a transmission project are borne by the rest of New England

How long would it take to build these projects?

- Phases
  - Preparation for 248 filing
    - Studies / filed work / engineering analysis & design / testimony preparation
    - On projects of this scope – 12 to 18 months
  - 248 filing
    - Multiple sets of live hearings before public service board (PSB), multiple rounds of discovery questions & answers, site visits
    - On projects of this scope (involving new transmission) – 18 to 24 months
  - Post-248 permitting efforts
    - Needed before construction can begin
    - Recent experience with the NRP suggests 6 to 18 months when new transmission is involved.
  - Construction
    - Given the rugged local terrain, the length of line (for both options) and potential difficulty in scheduling construction outages (for the East to West option), roughly 24 months would seem reasonable
- Total time from project inception to completion
  - 248 prep + 248 + post-248 permits + construction = **5 to 7 years**