Ice & Wind Map
NESC Rule 250B

Past Industry Ice Loading Criteria

- **NESC District Map** was first put in place with the 2nd ed. (1916)

NESC Ice & Wind Map

NESC 7th ed. Part II, 1977 to present
Past Industry Ice Loading Criteria

- In the early 1980’s, transmission line engineers from across the country began working on new criteria for line design based on research and benchmarking.

- this resulted in the ASCE Committee report on loads (1984)

- recognized that most utilities had design guidelines for ultimate loads in addition to the NESC district loads
ASCE #74 Ice & Wind Map

Past Industry Ice Loading Criteria

- *ASCE Manual 74 published in 1991*
  - 50-year return interval ice based on 9 years of data collected by Bennet
  - added a wind on ice requirement as a percentage of the 50 year basic wind speed intended to represent the extreme wind which could be expected over a 7 day period
ASCE #74 Ice & Wind Map

ASCE Manual 74, 1991
New ASCE Ice & Wind Map

Increased interest in transmission line icing started as a result of catastrophic line failures in 1990 and 1991.

- On December 26, 1991, President Bush declared 43 Iowa counties disaster areas as a result of severe icing.
- FEMA recommended that greater ice loads that exceeded current code levels be used.
New ASCE Ice & Wind Map

In February 1992, EPRI and Omaha Public Power District hosted a workshop for utilities and icing experts.

- Ten utilities, represented by 27 participants, discussed recent ice related line failures.
- The consensus was that an industry study on icing was needed.
New ASCE Ice & Wind Map

In 1993, EPRI, in conjunction with several utilities (Illinois Power, Midwest Power, WAPA, TVA, Mid America, and Northern States Power) and the US Army Cold Regions Research & Engineering Laboratory (CRREL), developed a plan to study & map icing with the following key elements:
New ASCE Ice & Wind Map

- Severe ice storms were identified using historical meteorological data
- Ice accretion modeling using historical meteorological data would be performed
- The ice accretion modeling would be validated using utility records for the events
- Validation would also be performed using Storm Data (NOAA 1959-1995) and newspaper reports
- Nationwide Ice Severity & Event Index Maps - completed 1996
New ASCE Ice & Wind Map

In 1993 an task committee (in ASCE 7) on icing was formed to begin the revision of 7-95 “Minimum Design Loads for Buildings and Other Structures,” which had used the 1991 Manual 74 transmission line ice & wind map.

- Several members of the initial EPRI, utility, CRREL team participated.
New ASCE Ice & Wind Map

1993 ASCE task committee continued:
- The group used the research being performed for the utilities as a starting basis for the nationwide map
- CRREL and others began the effort of completing the map for the rest of the United States.
Add “Draft ice load map for ASCE 7-2002 and ASCE 74”
New ASCE Ice & Wind Map
NESC 2002, CP2309

ASCE map was proposed to NESC - 2002, Rule 250B, (CP2309)
- SC 5 committee proposed to incorporate the 50-year return period ice plus wind map
- Proposal was rejected only due to incompleteness of the map (and insufficient time for public review)
NESC CP 2309 Ice & Wind Map

(Proposed NESC 2002 Figure 250-3)
NESC CP 2309 Ice & Wind Map

(Proposed NESC 2002 Figure 250-3a)
Fig. C10-3. 50-yr mean recurrence interval uniform ice thicknesses due to freezing rain with concurrent 3-sec gust wind speeds: Lake Superior
## Proposed New Ice & Wind Map
### Rule 250B, CP2309

**RULE 250B1 NESC EQUIVALENT CONDITIONS**

(If Overload Factor 1.0 is used)

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<th>Heavy Load District</th>
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<td>Wind (mph)</td>
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<td>Grade C</td>
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</tr>
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<td>53.0</td>
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</tbody>
</table>
Proposed New Ice & Wind Loads
Rule 250B, CP2309

NESC - 2002 continued

- Referring to the equivalent conditions shown on the previous table, you will realize that smaller wire sizes have not had the same reliability against failure due to loading as larger wires in past editions of the code.

- Proposed Rule 250B2 will require all wire sizes to have a consistent reliability level with respect to loads.
NESC - 2002 continued

- Much of the medium loading area in the southeast will see an increase in vertical load and a reduction of transverse load
- Some areas of heavy loading in the Midwest will also see an increase in vertical load and a reduction of transverse load
Proposed New Ice & Wind Loads
Rule 250B, CP2309

- In summary,
- Proposed Rule 250B2 is a first step toward implementing an ultimate ice and wind speed approach which will be kept up to date just like the ultimate wind speeds are adjusted with updates to ASCE-7
- Offers the advantage of being able to have a consistent requirement for all wire sizes on the same structure leading to improved safety and reliability