

FIDVR

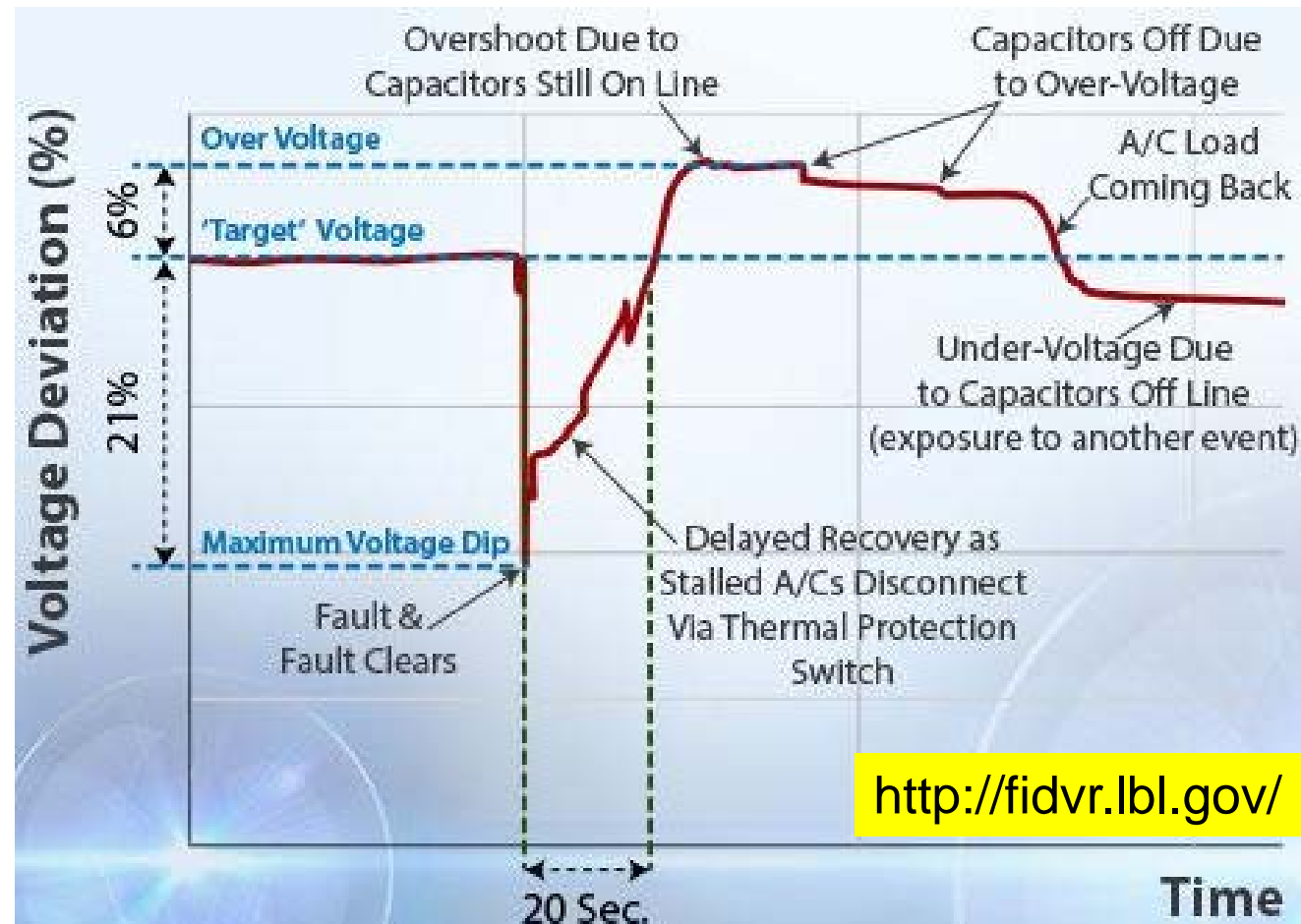
Distribution System Monitors

NASPI Technical Session
“New ways and reasons to use PMUs”

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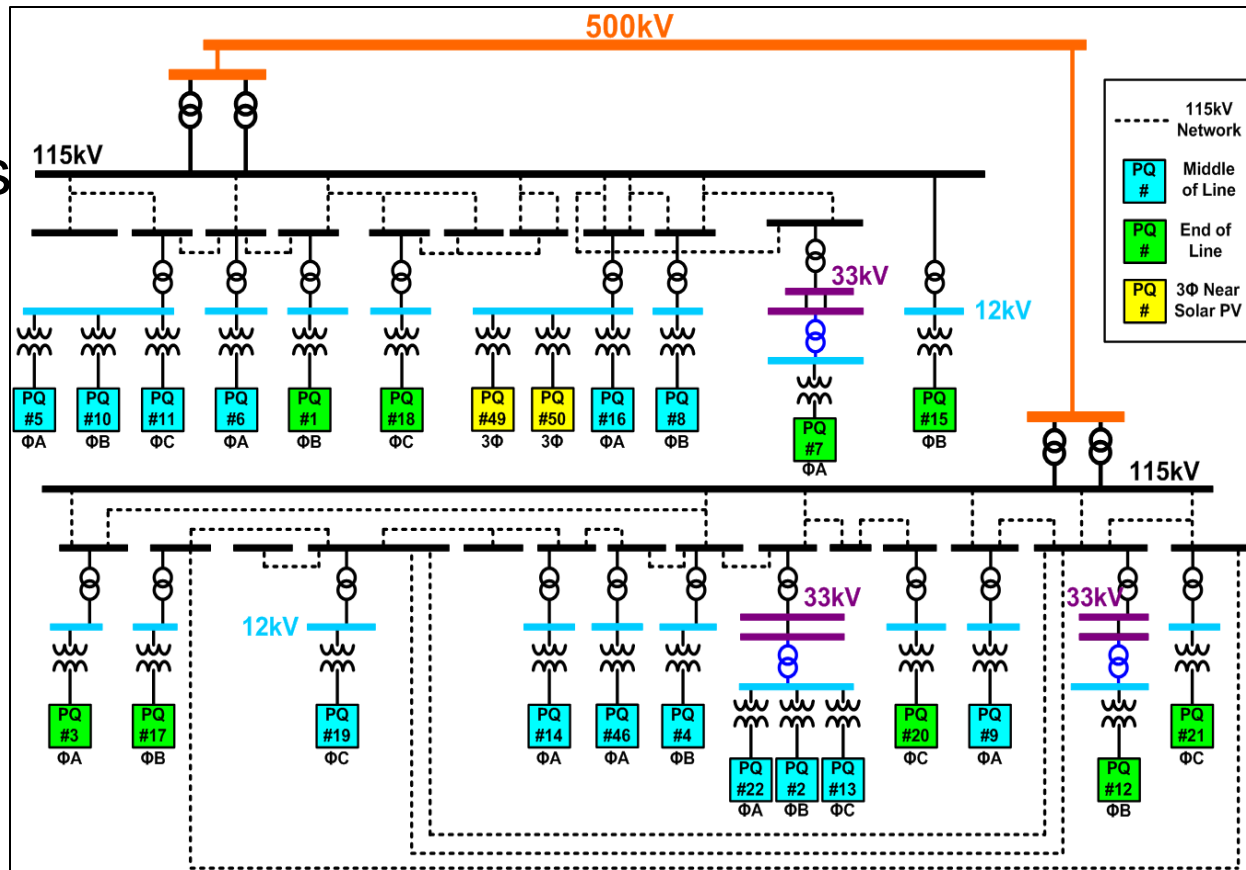
FIDVR Events

- Transmission FIDVR events recorded for decades
- Evolution of FIDVR unknown
- Distribution FIDVR impacts unknown



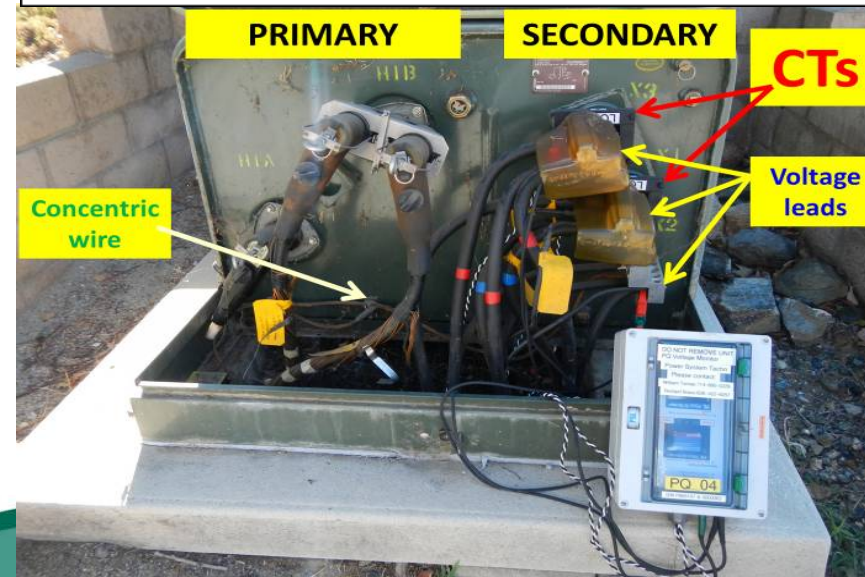
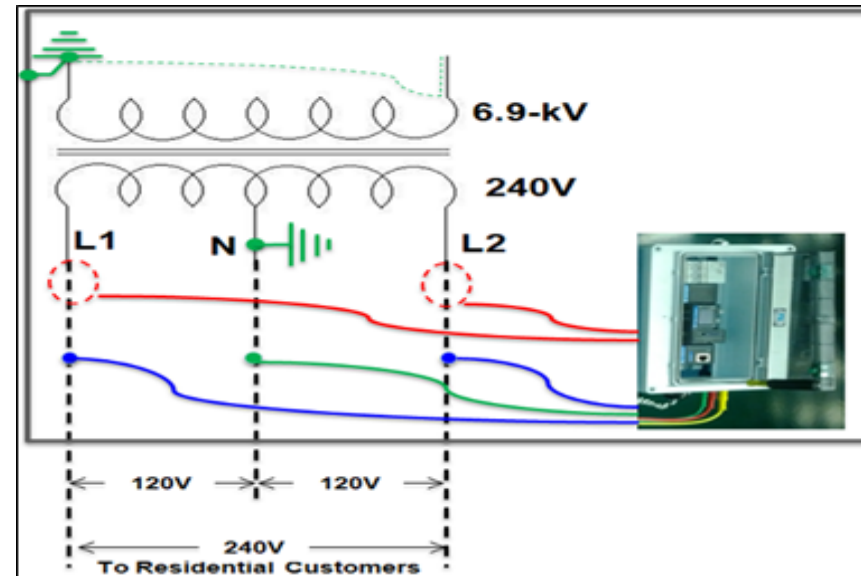
Valley PQ Meters in Distribution System

- Installed 25 PQ meters at Valley Distribution system
 - Middle of line
 - End of line
 - Different phases
 - Different distribution circuits



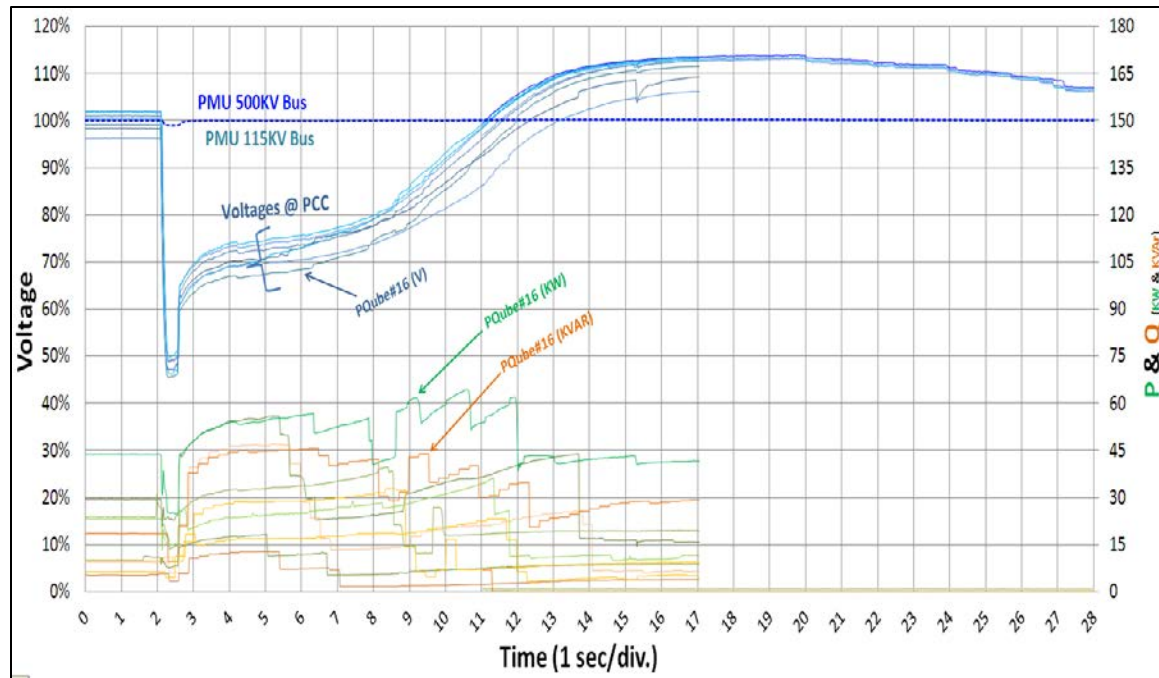
PQ Meters Installation

- Voltage trigger recording events ($V \leq 80\%$)
 - Sinusoidal waveform (V, I, P, Q)
 - RMS waveform
- Trend recording (V, I, P, Q)
 - 1 minute resolution
- Not synchronized
- Recorded in memory cards



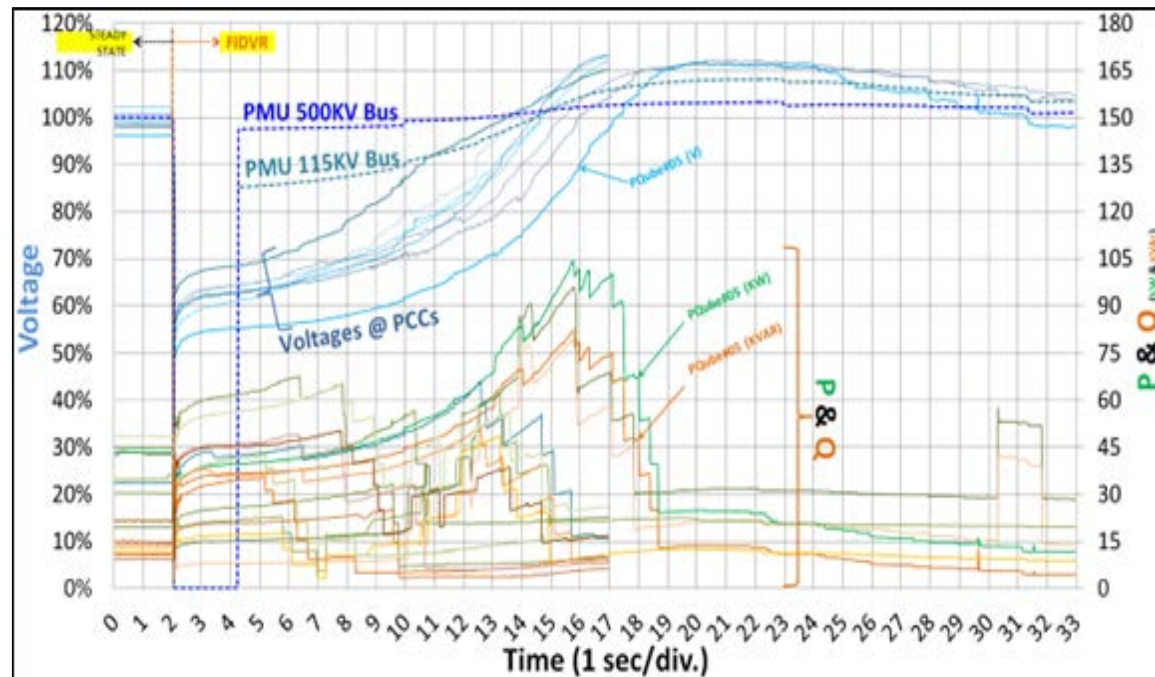
Localized FIDVR Events

- There were many localized FIDVR events that were not shown in the transmission system PMUs
- Typical air conditioner stalling behavior
- Voltage depressed for many seconds below 75% at various distribution circuits
- Overvoltages 114%



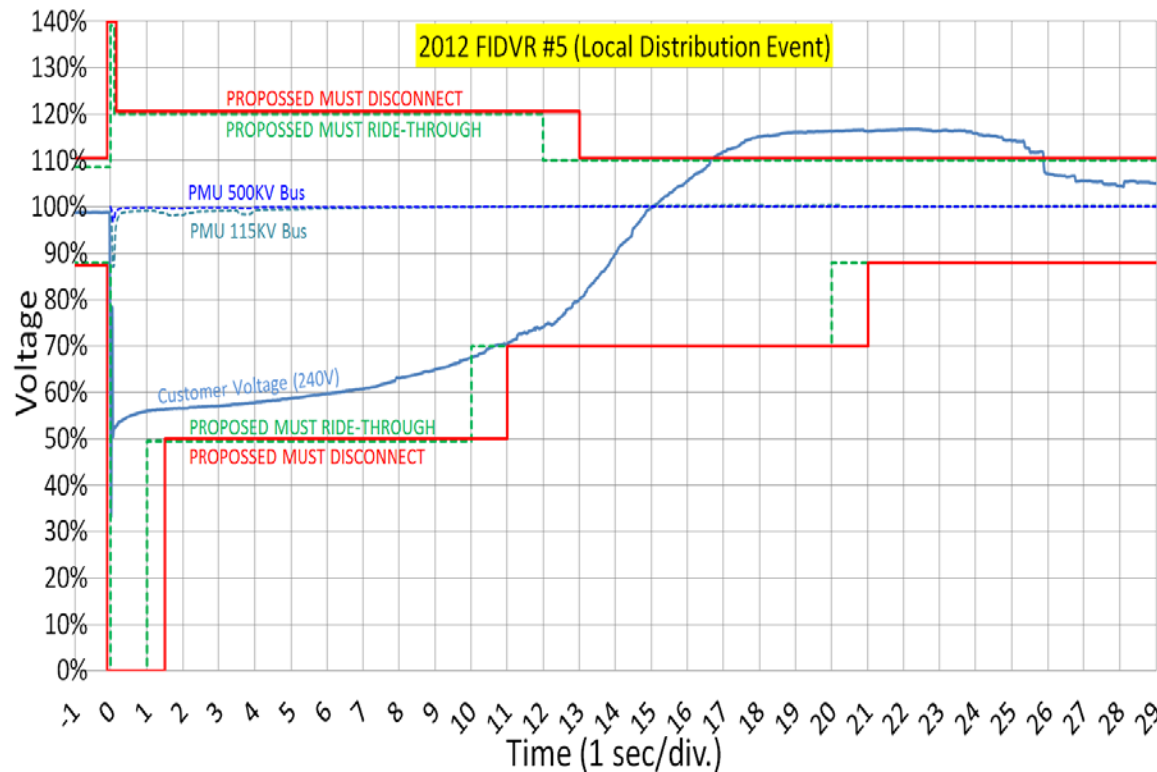
FIDVR Events

- There were some FIDVR events that were recorded by transmission system PMUs
- Subtransmission depressed voltage 80%
- Distribution depressed voltage 55~65%
- Overvoltages 115%



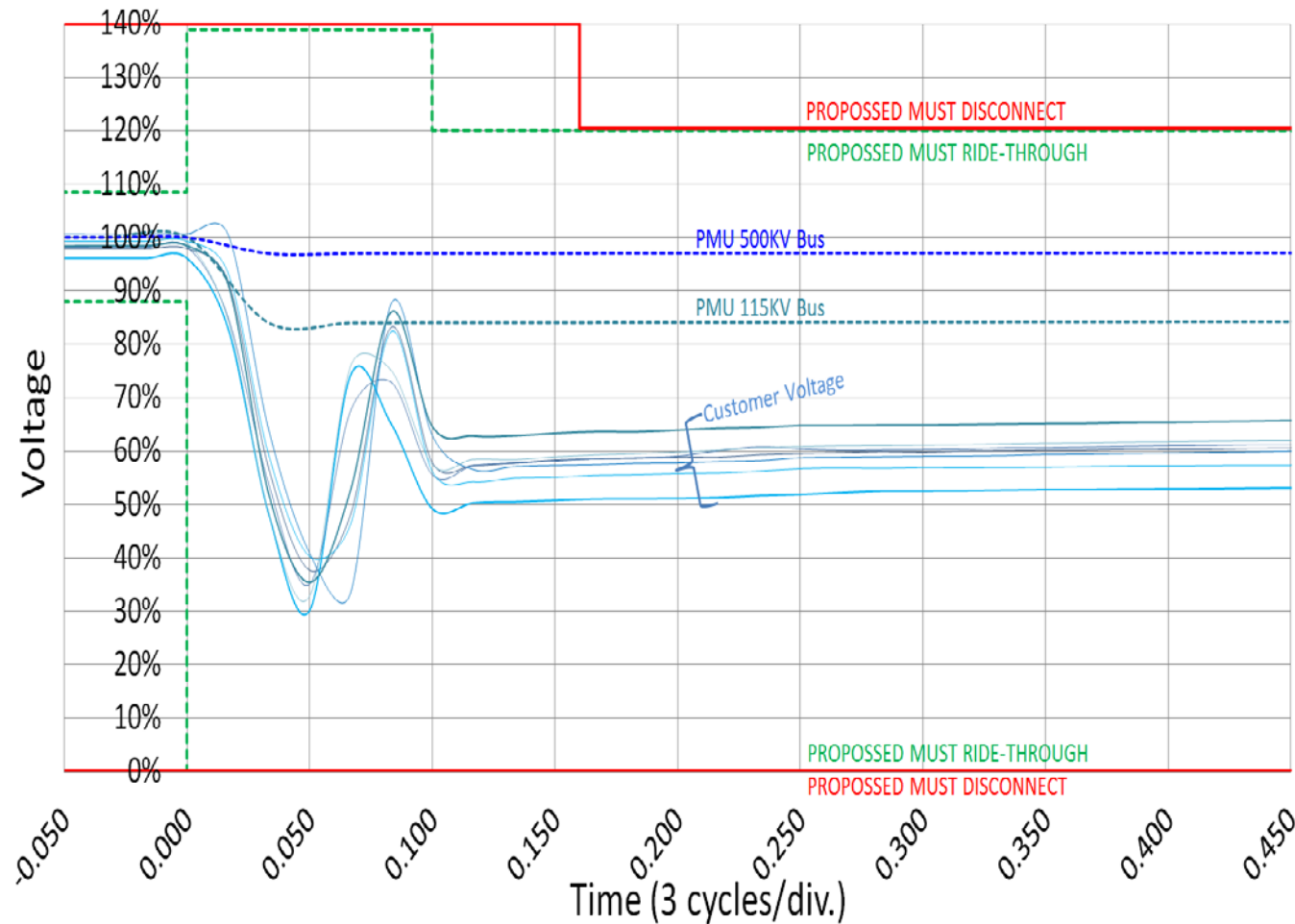
VRT Recommendation

- Recorded distribution FIDVR events helped proposing voltage ride through (VRT) parameters
 - California Rule 21
 - IEEE 1547
- NERC, FERC, WECC voltage ride through standards need to be revised to tolerate FIDVR events



VRT Recommendation (cont..)

- Zoomed RMS voltages are between 30~40%
- Low depressed voltages



Conclusion

- There is the need of advanced distribution PQ meters
 - Synchronization (e.i. GPS)
 - Record RMS, sinusoidal, phasor, harmonics
 - High sampling trend data at steady state
 - Friendly GUI that can display multiple points
 - Heavy duty (withstand deserts temperatures 40F~150F)
 - Easy, safe, inexpensive to install (up to 600V)
 - Easy communications (cell modem, radios, etc)
- Advanced PQ meters future applications
 - Dynamic impedance calculation
 - Support system protection



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