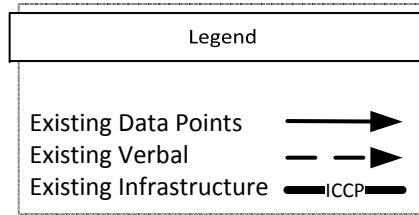
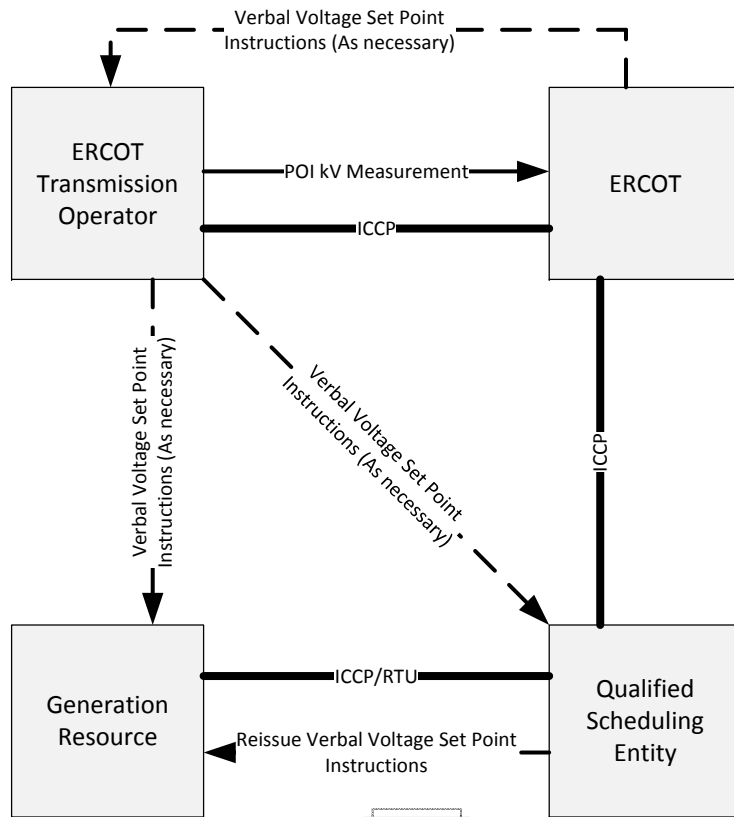


# Current State



## Problem Statement:

Currently ERCOT has very little visibility of Voltage Set Point instructions issued from the ERCOT TO to either the QSE or GR. The same can be said for the QSE if issued from the ERCOT TO to the GR. This complicates historical analysis, assessment of adherence to requirements, and troubleshooting efforts. This issue has been recently compounded by an ongoing debate as part of NPPR 747 on the appropriate communication path which is hindering NPPR 747's progress.

Performance of adherence to a Voltage Set Point by a GR is often affected by the TO and GR having different measurement equipment and or measurement location. Not every GR has POI kV.

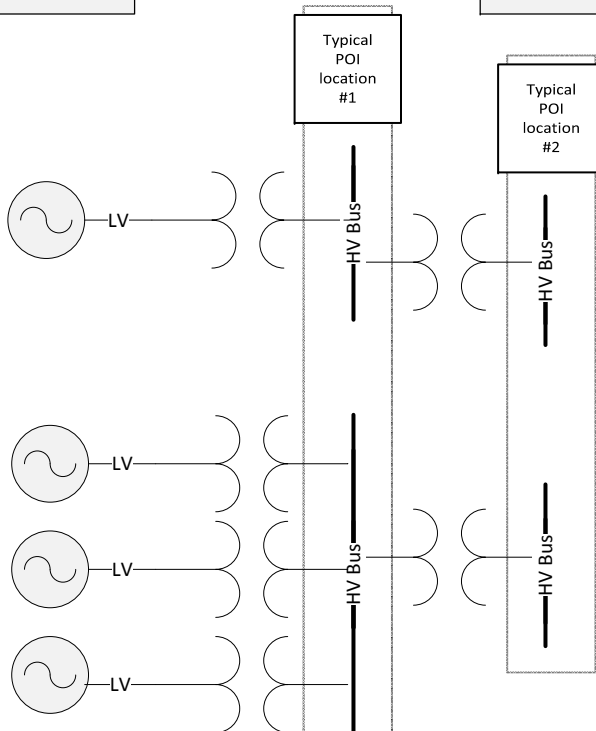
QSEs to GR relationships are ever changing and must be managed by any solution.

## Common Pros for each of the suggested Options

- Addresses transparency of Voltage Set Points to all involved parties
- Offers a superior solution to the NPPR 747 debate
- Improves actual vs set point performance
- Implements a important control for any future reactive power optimization efforts
- Improves historical analysis while minimizing need to examine operator logs
- Improves visibility for GR's to aid in VAR-002 compliance
- Allows VPWG to easily analyze historical Voltage Set Points to aid in range determination
- Allows for improvement/alignment of POI to voltage control buses in study applications

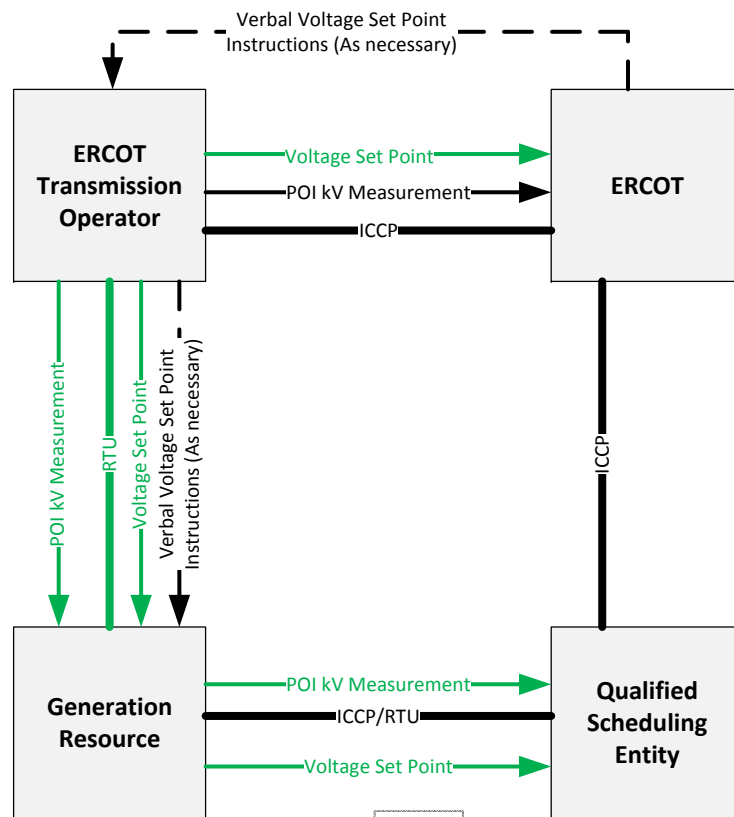
## Common Cons for each of the suggested Options

- All options will required work to implement and maintain, some more than others, and some impact some stakeholders more than other.
- All options require some entity to conform to different communication practices than what is utilized today (e.g. GR receiving instructions directly from QSE or TO). Some more impact than others
- QSEs and GRs will have to manage the additional data points in their current change management practices when QSEs are changed.



ERCOT is presenting 3 options in order of preference from most to least all of which would require a separate impact analysis and revision requests.

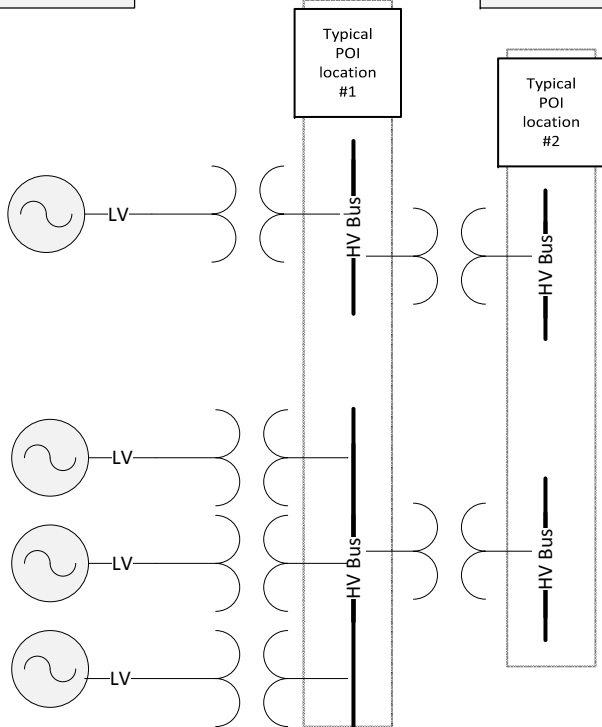
# Option 1



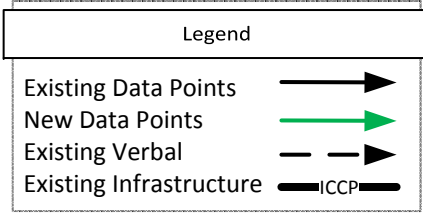
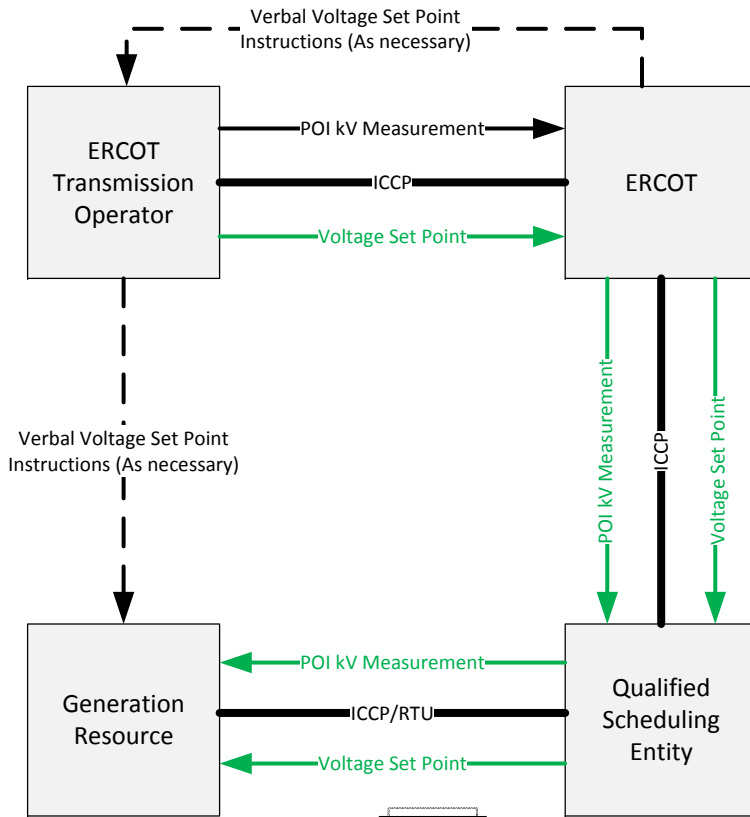
**Details (Option 1):**  
 Option 1 provides a new data point “Voltage Set Point” and its associated POI kV measurement that originates from the ERCOT Transmission Operator and is communicated via mostly existing data/telemetry infrastructure to ERCOT, the QSE, and GR for every Generation Resource POI for maximum transparency. Option 1 may require additional RTU to RTU communications between the ERCOT Transmission Operator and the Generation Resource. The ERCOT TO can still verbally issue Voltage Set Point instructions if necessary. The ERCOT TO would in those instances match the Voltage Set Point to the verbally coordinated Voltage Set Point changes just made. ERCOT would coordinate with the ERCOT TO for any additional Voltage Set Point Instructions that become necessary based on its Wide Area assessments. This option assumes identification of the POI kV measurement to be used by the TO, GR, ERCOT and QSE with a process for implementing and updating in the ERCOT Network Model. All data/telemetry additions would be handled by the TO, GR, and QSE with minimal impact to ERCOT (only adding the new Voltage Set Point per GR POI). Several options may exist to communicate this information (RTU to RTU as POI substation, EPS meters, etc.)

- Pros**
- Aligns Verbal communication paths with the majority of current state
  - Minimizes impact on ERCOT (minor manpower impact)
  - Faster coordination and response with direct communications between TO and GR
  - QSE to GR relationship changes can be accounted for through existing change management by those entities.
  - Utilizes a majority of existing data infrastructure with only some potential additions if there is not existing RTU to RTU capability.

- Cons**
- Some infrastructure may be needed to accommodate the POI kV and Voltage Set Point between RTUs of the GR and TO. (who bears cost?) POIs not at the high side of the GSU without existing data infrastructure may be even more expensive.
  - A few Generation Resources would have to modify practices of receiving Voltage Set Point instructions directly from ERCOT Transmission Operator.
  - Generation Resources/QSEs would be required to include this in their change management practices to ensure that these data elements are transferred if the representing QSE changes.



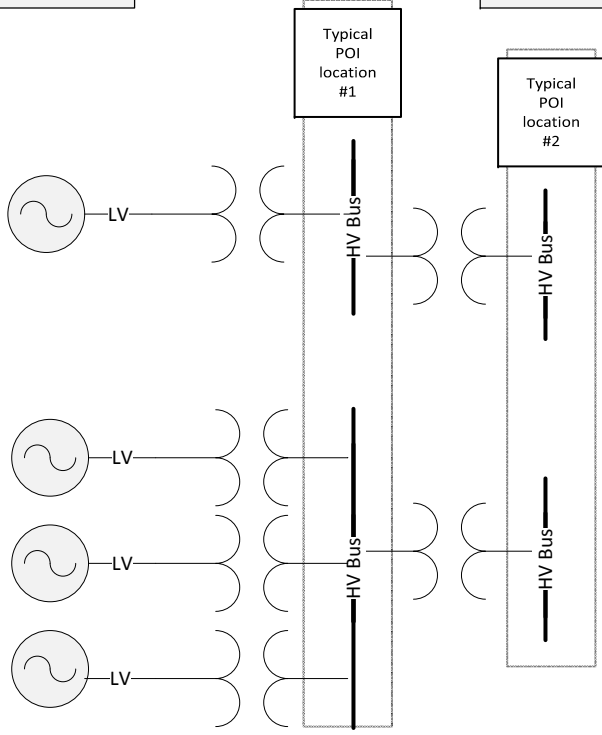
# Option 2



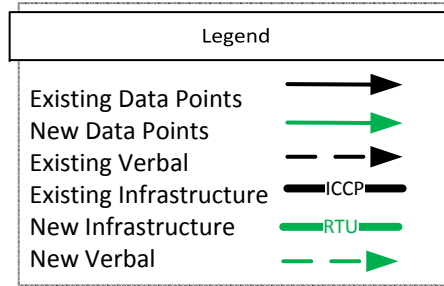
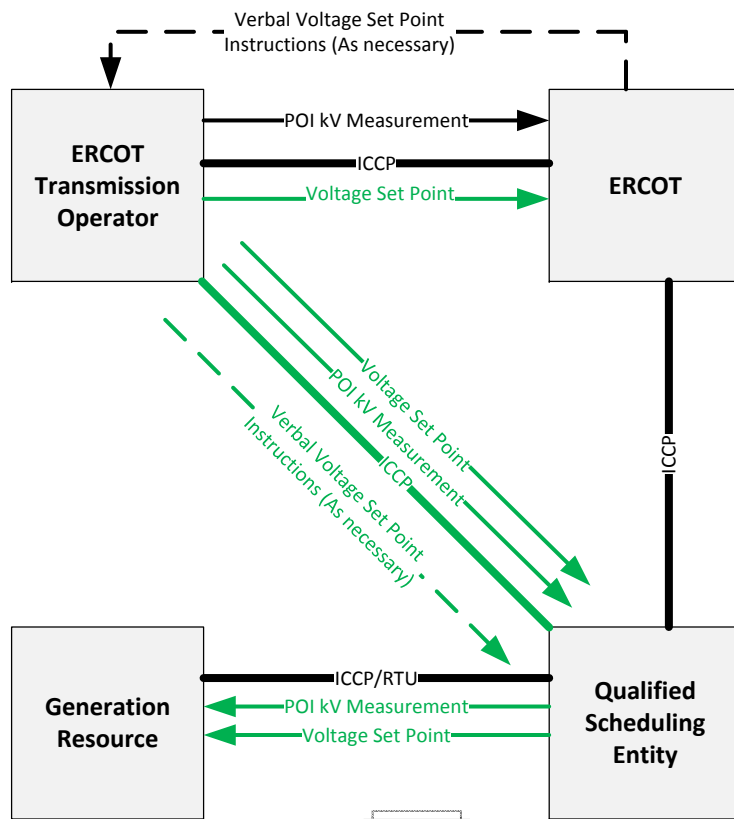
**Details (Option 2):**  
 Option 2 provides a new data point "Voltage Set Point" that originates from the ERCOT Transmission Operator and is communicated via existing data/telemetry infrastructure to ERCOT, the QSE, and GR for every Generation Resource POI for maximum transparency. The ERCOT TO can verbally issue Voltage Set Point instructions during emergency conditions or if needed for an adjust and monitor instruction when an exact Voltage Set Point may not be pre determined. The ERCOT TO would in those instances match the Voltage Set Point to the verbally coordinated Voltage Set Point changes just made. ERCOT would coordinated with the ERCOT TO for any additional Voltage Set Point Instructions that become necessary based on its Wide Area assessments. This option assumes identification of the POI kV measurement to be used by the TO with a process for implementing and updating in the ERCOT Network Model. Total estimated additional data points added (including data quality) are 2000 to 4000.

- Pros**
- Aligns Verbal communication paths with the majority of current state
  - Utilizes existing infrastructure with no new data infrastructure needed
  - Utilizes some existing QSE to GR change management practices

- Cons**
- ERCOT would become the data owner and as the "middle man" would be called upon to troubleshoot any data issues by both TO or QSE. (Manpower Impact)
  - ERCOT would have to invest additional development time and change controls to manage the exchange of data received from TO to QSE to prevent multiple or wrong QSEs from receiving data from competitive QSEs initially and as part of database load change management process. (Manpower Impact)
  - A few Generation Resources would have to modify practices of receiving Voltage Set Point instructions directly from ERCOT Transmission Operator.
  - Generation Resources/QSEs would be required to include this in their change management practices to ensure that these data elements are transferred if the representing QSE changes.



# Option 3



## Details (Option 3):

Option 3 provides a new data point "Voltage Set Point" and its associated POI kV measurement that originates from the ERCOT Transmission Operator and is communicated via mostly new data/telemetry infrastructure directly to the QSE, and then the QSE transmits to the GR for every Generation Resource POI resulting in maximum transparency. Option 3 may require additional ICCP communications between the ERCOT Transmission Operator and the QSE. The ERCOT TO can still verbally issue Voltage Set Point instructions if necessary. The ERCOT TO would in those instances match the Voltage Set Point to the verbally coordinated Voltage Set Point changes just made. ERCOT would coordinate with the ERCOT TO for any additional Voltage Set Point Instructions that become necessary based on its Wide Area assessments. This option assumes identification of the POI kV measurement to be used by the TO with a process for implementing and updating in the ERCOT Network Model. All data/telemetry additions would be handled by the TO, GR, and QSE with minimal impact to ERCOT (only adding the new Voltage Set Point per GR POI).

## Pros

- Minimizes impact on ERCOT (minor manpower impact)
- Aligns with some QSEs preferring to be the receiver of instructions (whether from ERCOT or the Transmission Operators) rather than directly to the GRs.

## Cons

- Some infrastructure (more than option 1) may be needed to accommodate the POI kV and Voltage Set Point between ICCP of the QSE and TO. (who bears cost?)
- A good portion of Generation Resources would have to modify practices of receiving Voltage Set Point instructions directly from the QSE rather than the Transmission Operator.
- A majority of Transmission Operators would have to modify their current verbal communication practices to talk to QSE vs directly to the GR.
- Slower coordination and response for verbal Voltage Set Point Instructions with additional go through entity (QSE).
- Transmission Operators would have to manage QSE to GR representation changes through some sort of change management process and both the QSE and TO would have to add new infrastructure to accommodate changes each time the new QSE does not have appropriate ICCP infrastructure with the TO.

