WRIGHT CENTER for PHOTOVOLTAICS INNOVATION AND COMMERCIALIZATION

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A Brief Introduction to VOLTTRON: Transactive Energy for PV Variability Mitigation

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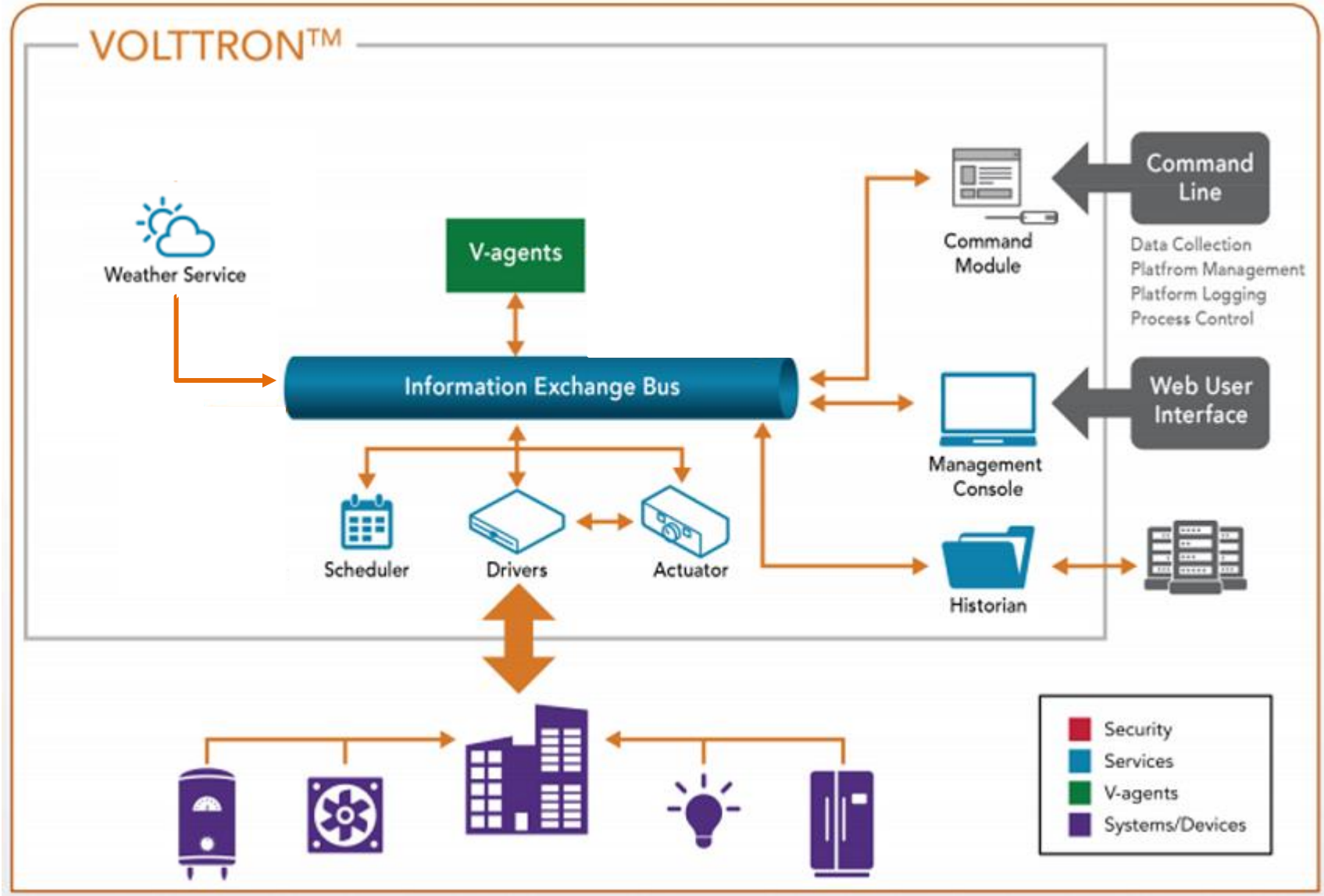
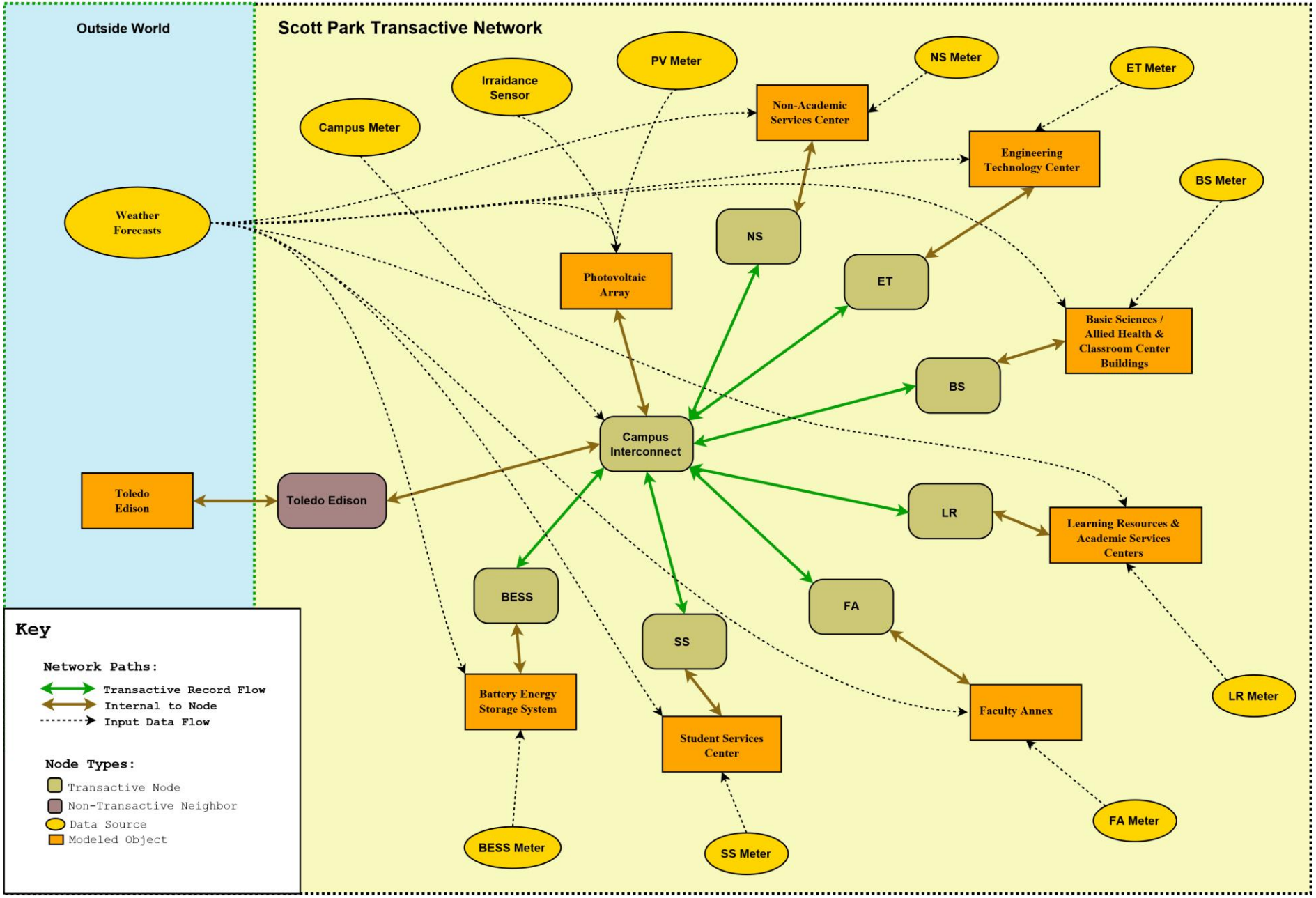
Transactive Energy

- Conventional energy generators/consumers act independently, without regard for their neighbors → inefficiencies and risks.
- Impractical for a single system to coordinate everything, or for each entity to track/respond to every other entity.
- Actors on the grid often have contradictory and conflicting goals.
- Alternatively: create an information network for cost information to propagate through the grid – e.g. demand and supply curves.
- Transactive Energy (TE) incentivizes responsive behavior by internalizing costs via dynamic pricing.
- Several benefits can be realized: peak demand reduction, demand smoothing.
- In TE, no entity needs to act on behalf of any other entity; they act on their own behalf in response to price signals.

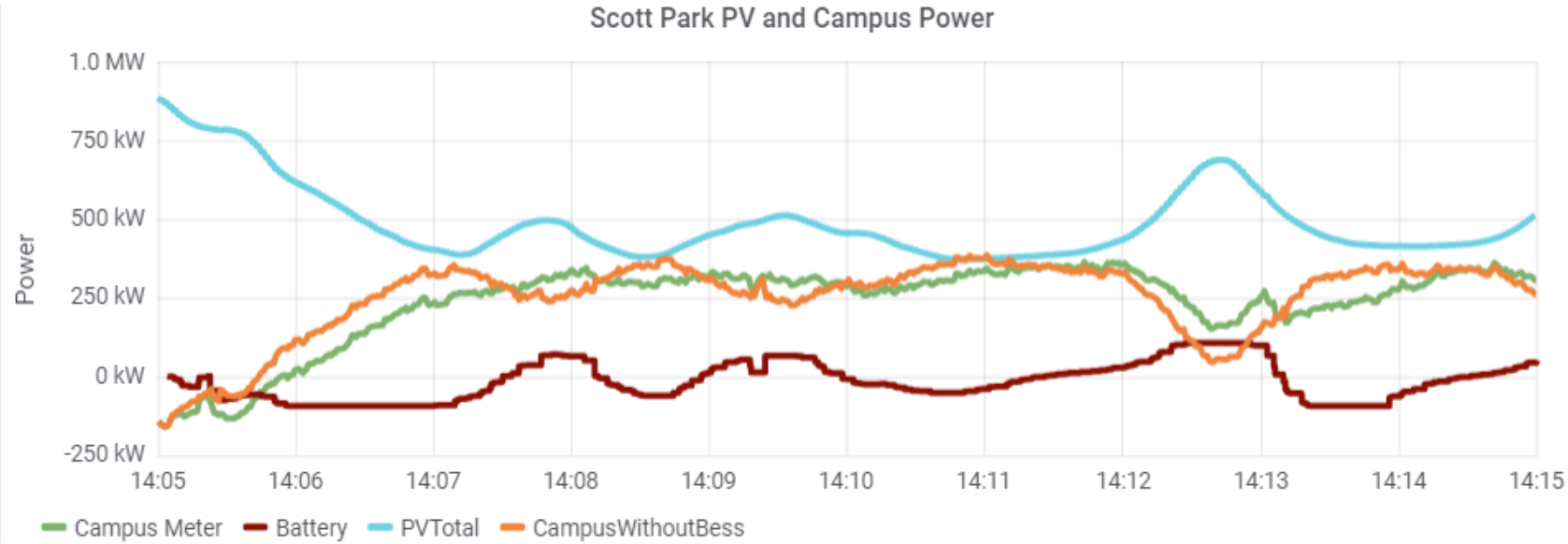
VOLTTRON Overview

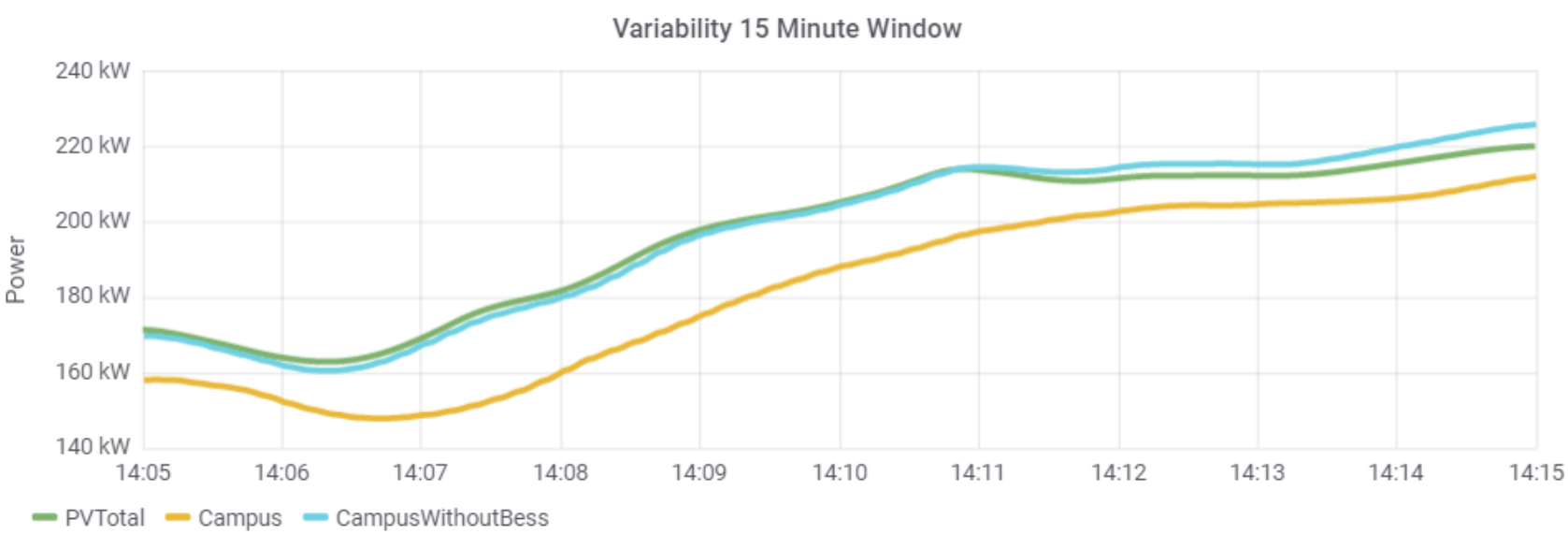


University of Toledo's VOLTTRON Transactive Network



Prior Work: Mitigation of Variability





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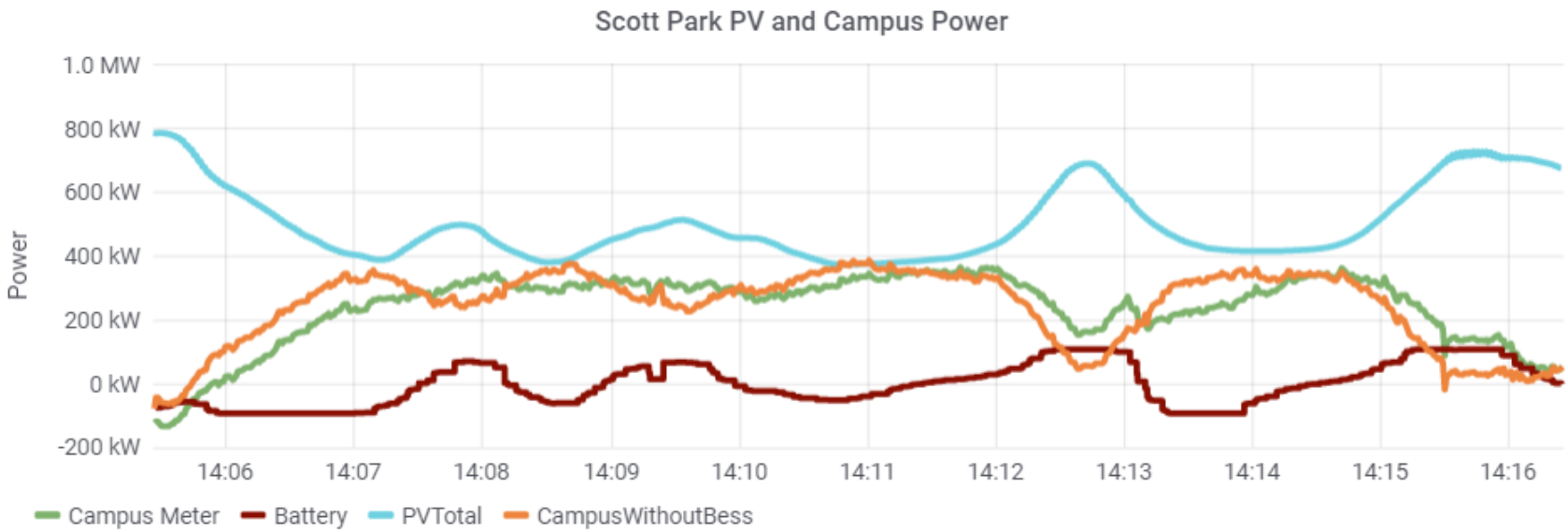
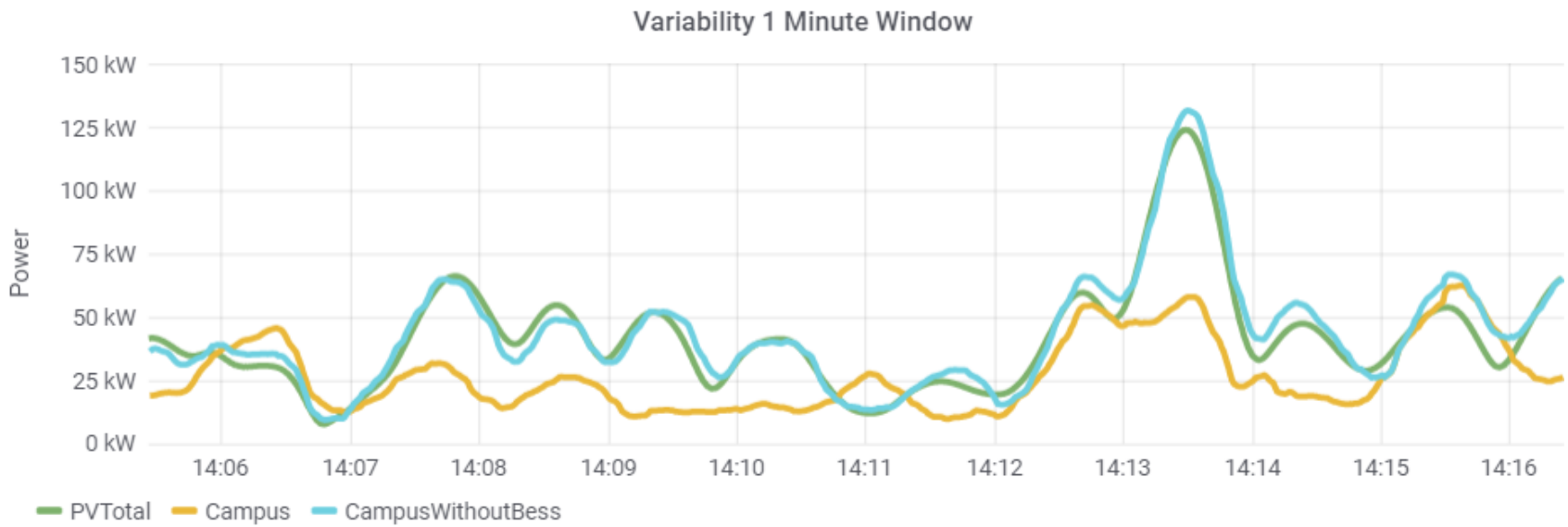


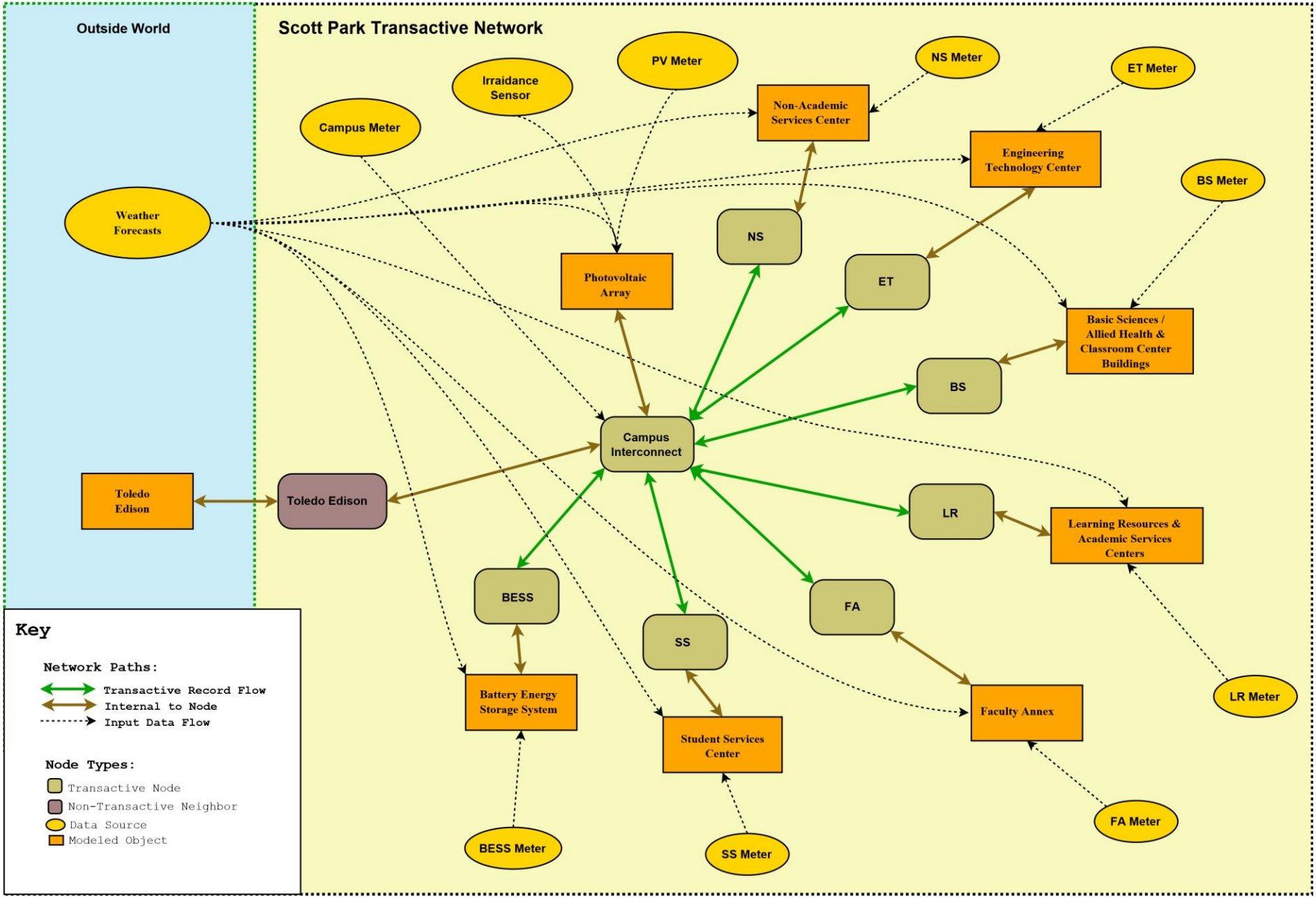


Current Status

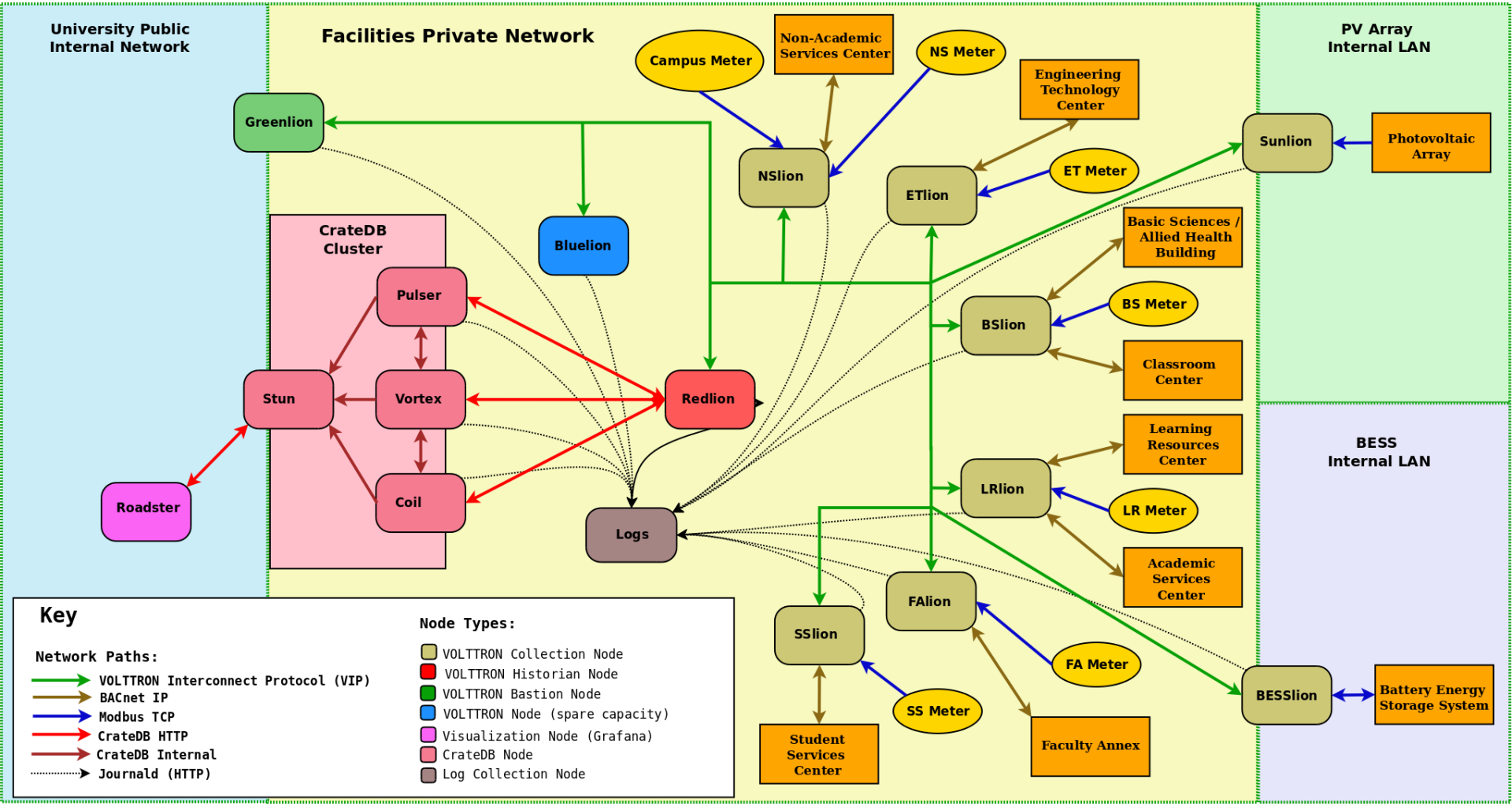
- Deployed VOLTTRON network on campus.
- Developed forecasting capability and variability model.
- Demonstrated non-transactive variability mitigation algorithm.
- Initiated integration of *transactive node* system with VOLTTRON.

Future Work

- Improve mitigation algorithm with changes to data rate, forecasting, variability model, and actuation.
- Complete build-out of transactive network.
  - Integrate *transactive node* system with VOLTTRON.
  - Adapt variability model to a regulation market (kVAR, frequency control).



Logical configuration of the UT Scott Park Campus VOLTTRON transactive energy network, including software agents enabling energy transactions.



University of Toledo Scott Park Campus VOLTTRON network – equipment layout and interconnections.