UPDATES OF RES MODELING

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Presented at WECC MVS May 8th, 2025

AKNOWLEDGMENTS

The work done thus far collectively by the Renewable Energy Modeling (REM) Adhoc group, within WECC MVS, has had contributions from many entities as well as constant feedback from the wider MVS group. Thanks to all who have contributed. Below are the main contributing entities. We apologies for any inadvertent omissions.

EPRI, GE, PEACE®, PGE, PowerTech Labs, PowerWorld, Qualus, Siemens PTI, WECC

Work done in these slides by PEACE®, in presenting some initial thoughts on REPC_E model, was sponsored by EPRI

PREVIOUS WORK

- REGC_B, REGC_C (not WECC approved), REEC_D, REEC_E, REPC_C, REPC_D, WTGT_B, WTGIBFFR_A, WTGWGO_A, WTGP_B
- All above done and in all the tools (REEC_E still only in Siemens PTI PSS®E?)
- New GFM models also recently done and approved:
  - REGFM_A1
  - REGFM_B1

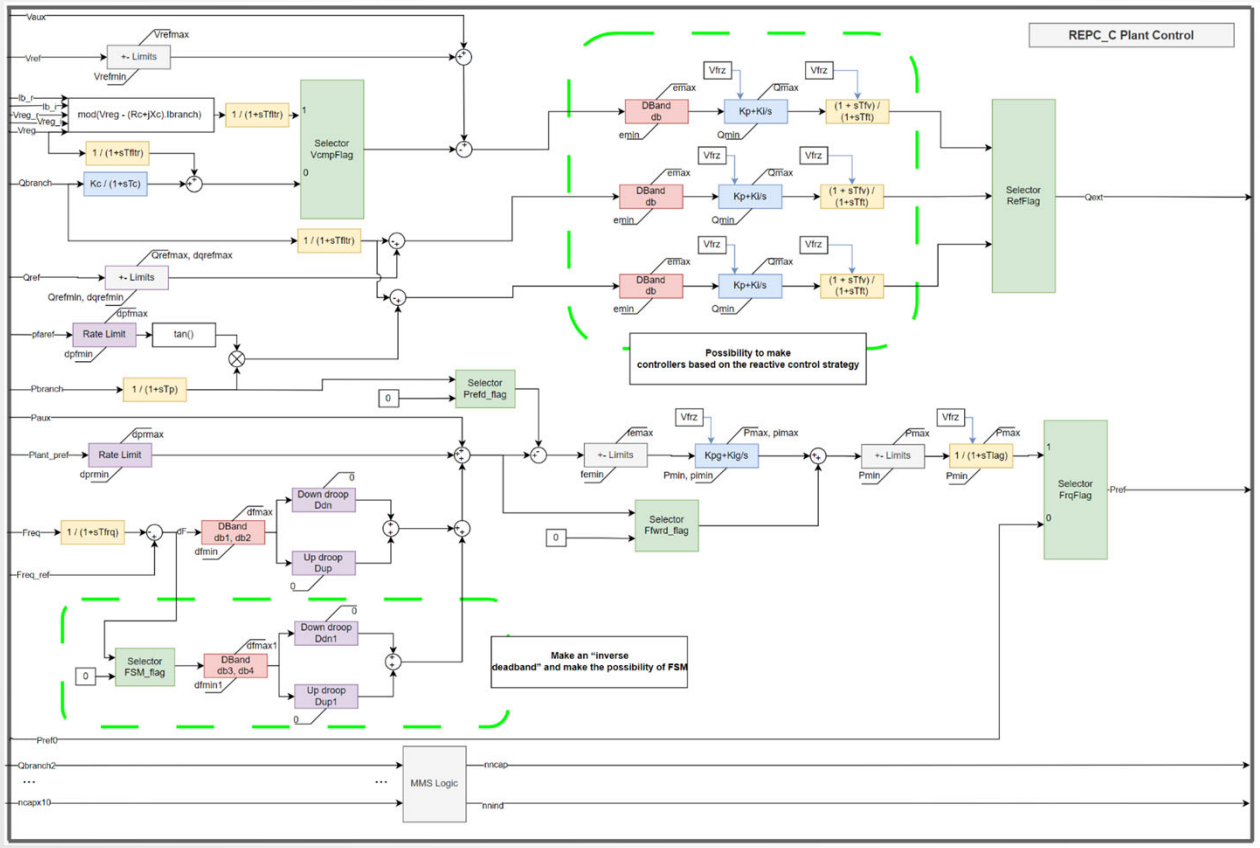
OPPORTUNITIES FOR NEW REPC_E MODEL

- There have been four (4) proposed additions, specifically:
  - From Energinet (Anders Oddleif Nielsen – email 12/18/24; forwarded to MVS by WECC staff on 1/15/25)
    - FCAS or LFSM – a second layer of frequency response controls (frequency response as a service or limited frequency sensitive mode)
    - Different KP/KI for various Q/V control modes
    - Pavailable limit on active power path to emulate maximum power tracking
  - From BC Hydro (Sam Li – discussed in September 2024 WECC MVS meeting)
    - QV-droop control – to have a separate proportional/droop control mode with deadband and limits to allow for Q limits at point-of-measurement

MODEL SPECIFICATIONS

- All previous models have been implemented and, in the tools, now.
- REEC_E was lingering but now done.
- Some new thoughts on PPC updates:
  - FCAS/FSM/LFSM (from Energinet)
  - Different KP/KI for various control modes (from Energinet)
  - Pavailable (from Energinet)
  - QV-droop control (comment from BC Hydro a few meetings ago)

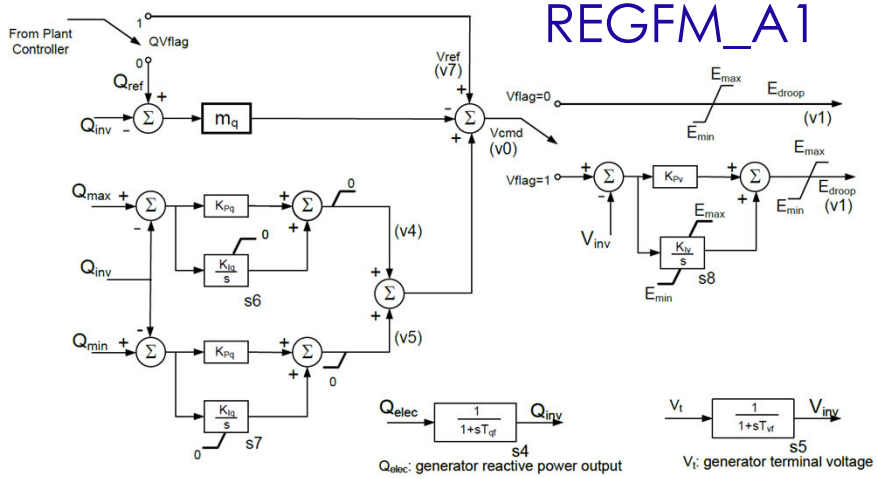
FROM ENERGINET



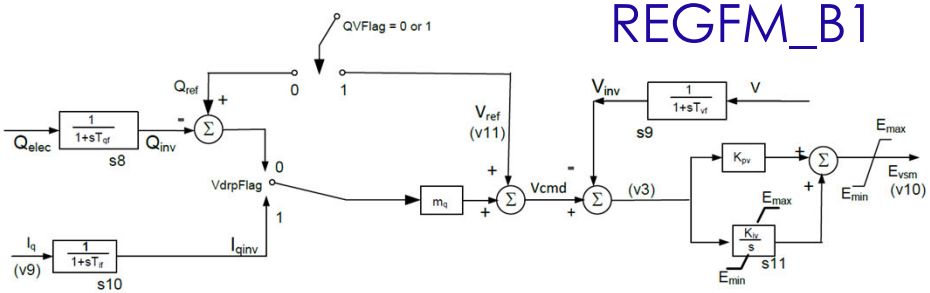
SOME OTHER THOUGHTS

- In addition to all of the above we also should take this opportunity to enhance the PPC model to allow for V/P mode as well as the standard Q/P mode for GFM controls (both REGFM_A1 and REGFM_B1)
- Actually, some GFL inverters also operate in V/P mode since years ago (original REPC_A catered to this)

REGFM_A1

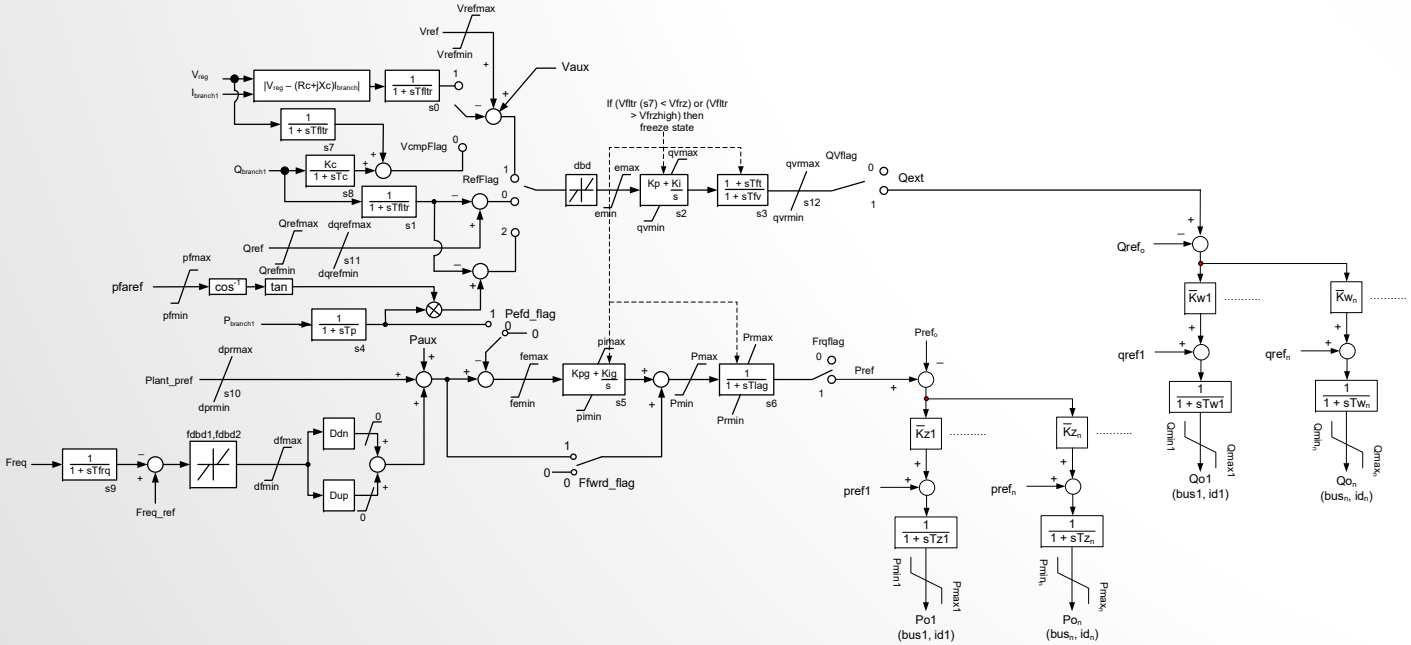


REGFM_B1

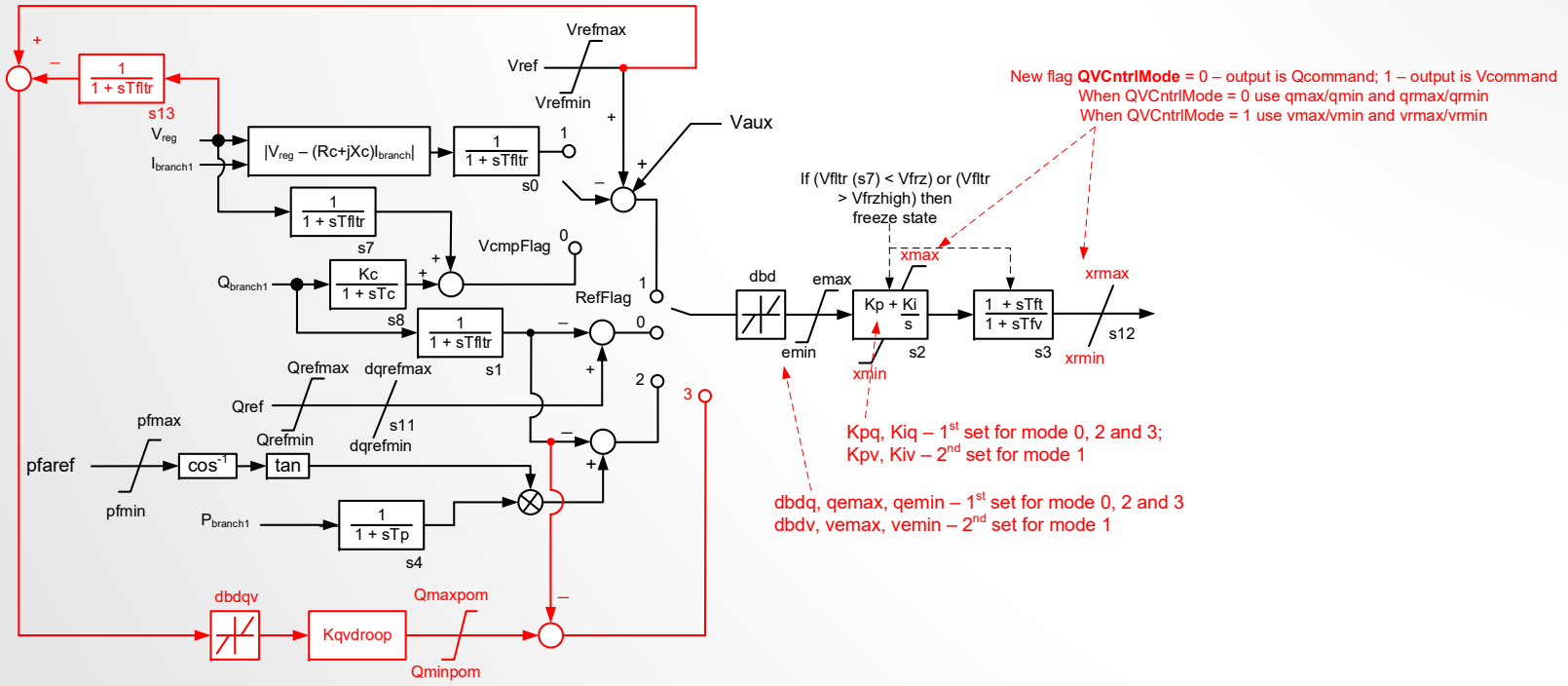


THE PROPOSAL

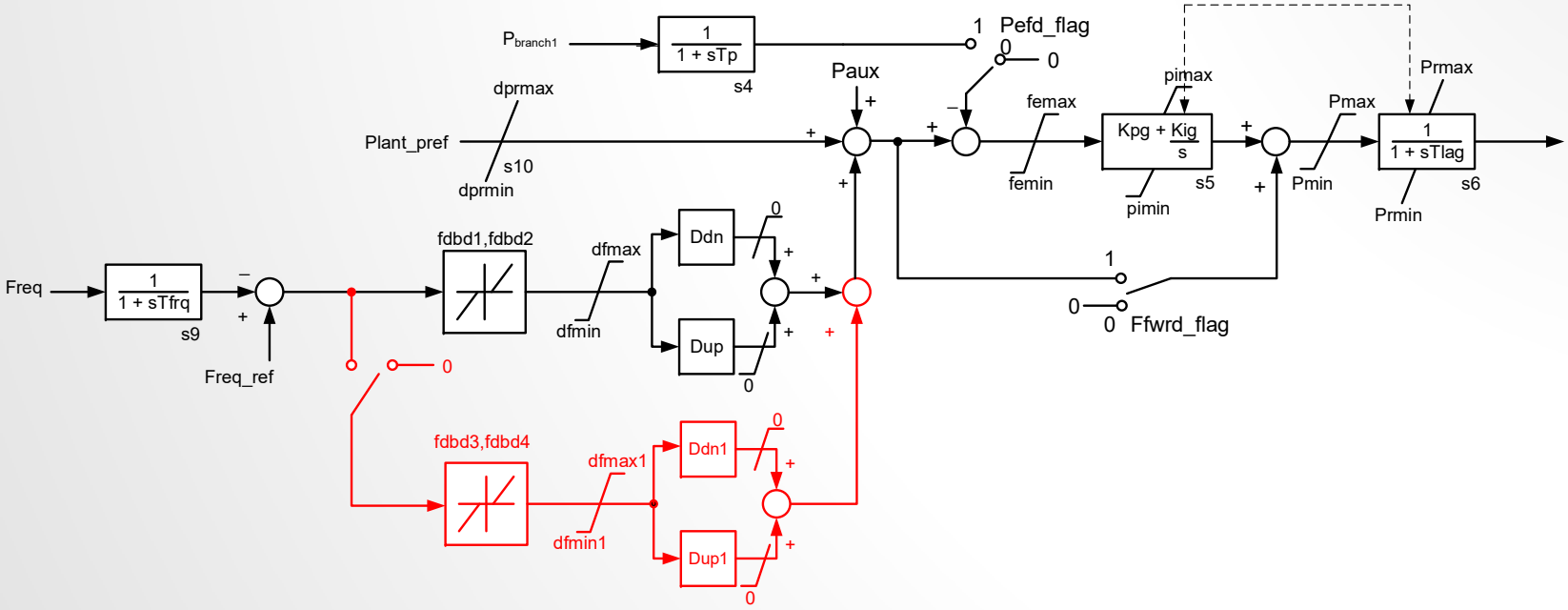
- Start with REPC_D as the base since it is the most general model – can always be used for single-inverter control



PROPOSED CHANGES TO Q PATH



PROPOSED CHANGES IN P PATH



NEXT STEPS

- Will write a brief memo/spec to be review and commented on by MVS, and then hopefully approved in September
- Then hand-off to software vendors for implemented based on model priorities
- Then can test using the same test cases used in the past for REPC_D and benchmark for approval by MVS

QUESTIONS AND COMMENTS

- Any other questions or comments?