South Texas SSO Update

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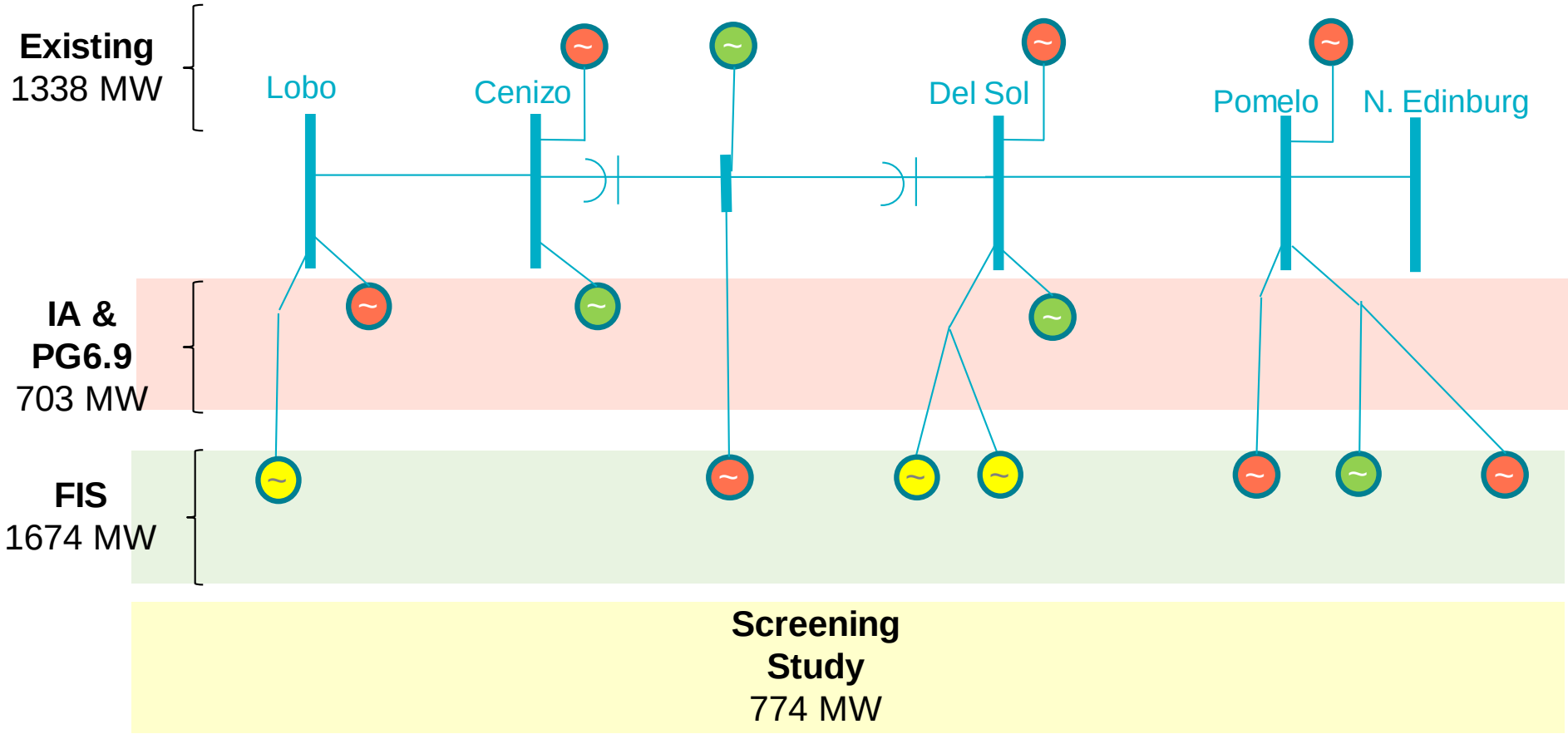
Background: South Texas SSO

- Recall that there were SSR events in 2017 – 2018 involving wind farms on the Lobo – North Edinburg line.
  - Wind farms have since tuned their SSR mitigation.
  - However, more wind and solar generation projects are coming to the area.
  - These changes are creating additional SSO and stability challenges.

Generation Interconnection Overview at LOBO-North Edinburg 345 kV Series Compensated Circuit



As of March, 2019

Constraints

- Total Committed WGR Capacity:
  - Existing + PG 6.9 = 2041 MW

- Challenges:
  - Thermal Constraint
  - Stability Constraints: voltage stability and weak grid
  - Subsynchronous Resonance

Constraints

- Thermal and stability limits (e.g. GTC) can be resolved through SCED disptach
- One SSCI constraint is at lower WGR dispatch
  - Weak Grid + High Series Compensation at Lobo-North Edinburg 345 kV circuit could cause the existing WGRs to reach their physical and controller design capability to reliably ride through faults and SSCI as required/expected
  - Reliance on specific tuning of controllers is a concern.
    - Recurring tuning of the existing and new generation projects involves various REs and vendors
    - Diminishing reliability margin of controllers may not be easily identified in the studies.

SSCI at Lobo-North Edinburg 345 kV Circuit

- SSCI potential has been identified in the SSR study of proposed generation projects.
  - All the latest SSR improvements through 2017/2018 SSCI events investigation were included.
  - No issues at single-line-to-ground faults for any tested events at different WGRs' output levels.
  - SSCI observed:
    - Following a 3 Phase fault
    - Radial connection to Lobo or North Edinburg
    - At lower WGR output
  - SSCI observed in the study results is possibly a result of the WGRs not having much margin for grid changes (the area is very challenging from a control design perspective)

Study Challenges

- Generally, only manufacturers tune the models
  - There is little available published documentation on how the models work and what all the parameters do.
  - Controllers becoming increasingly complex.
- Visibility/Data Sharing problem:
  - Manufacturers cannot receive an area model including other turbine models.
- Also, tuning challenges
  - Fixing the SSO issues last year took months of redesign. And even still it appears there may not be much margin to accommodate future grid changes.
- → We may have reached the practical limit for control tuning.

Next Steps

- Work with TSPs on potential mitigation options

- Identify system changes/improvements to address SSCI issues
  - To be considered as reliability projects?