SAND2020-7056C

Paper No: 20PESGM0405

Sandia National Laboratories

Models and Analysis of Fuel Switching Generation Impacts on Power System Resilience

August 5, 2020

Felipe Wilches-Bernal[1], Bernard Knueven[2], Andrea Staid[1], Jean-Paul Watson[3]

[1]Sandia National Laboratories, [2]National Renewable Energy Laboratory,
[3]Lawrence Livermore National Laboratory

✉ E-mail: fwilche@sandia.gov

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology and Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International, Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

IEEE PES Power & Energy Society®

IEEE

Background

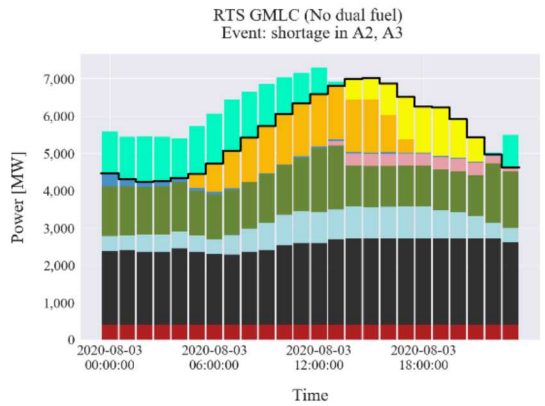
- Increase of natural gas in the US energy mix
- Interdependency between the gas and electricity sector
- Power system may be affected by supplies in natural gas (fuel shortages)
- Asset to address those shortages (and increase resilience): units that are able to produce power with more than one fuel –fuel switching units

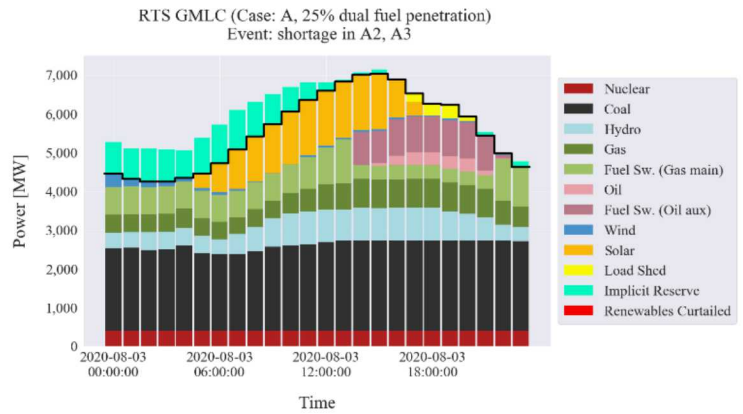
Fuel Switching Models

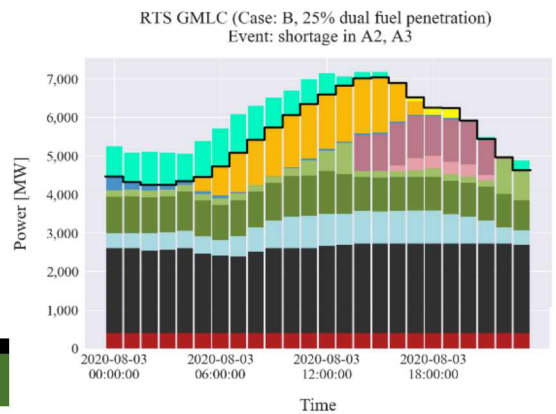
- Formulations to add fuel constraints and to model fuel switching capabilities were proposed
  - Instantaneous fuel supply model
  - Fuel consumption model
  - Dual fuel generator model
    - Single fire units
    - Offline-only Fuel Switching Units
- Test power system was the RTS-GMLC
  - Different cases

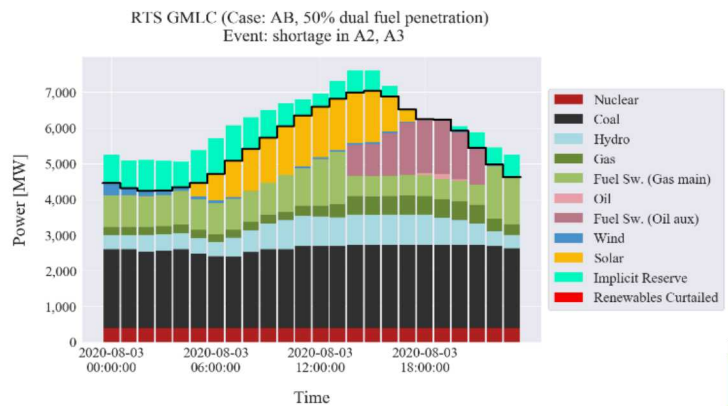
Results

- Severe shortage of NG fuel supply was tested for different penetrations of fuel-switching generation
  - Case A and B are both 25% of dual fuel penetration but achieved by selecting different units natural gas in the system to be fuel-switching









Conclusions and Future Work

- Models for fuel switching generation, fuel availability, and fuel consumption for dispatch and commitment are introduced
- Having generators with fuel-switching capabilities helps in mitigating the negative effects of natural gas shortage events (reduction in duration and quantity of load not served)
- Future work will include interconnecting the gas supply to a realistic gas delivery system to correctly model the interdependence between the electric and gas infrastructures