# SCE&G NOx Controls Update

AAPCA Conference

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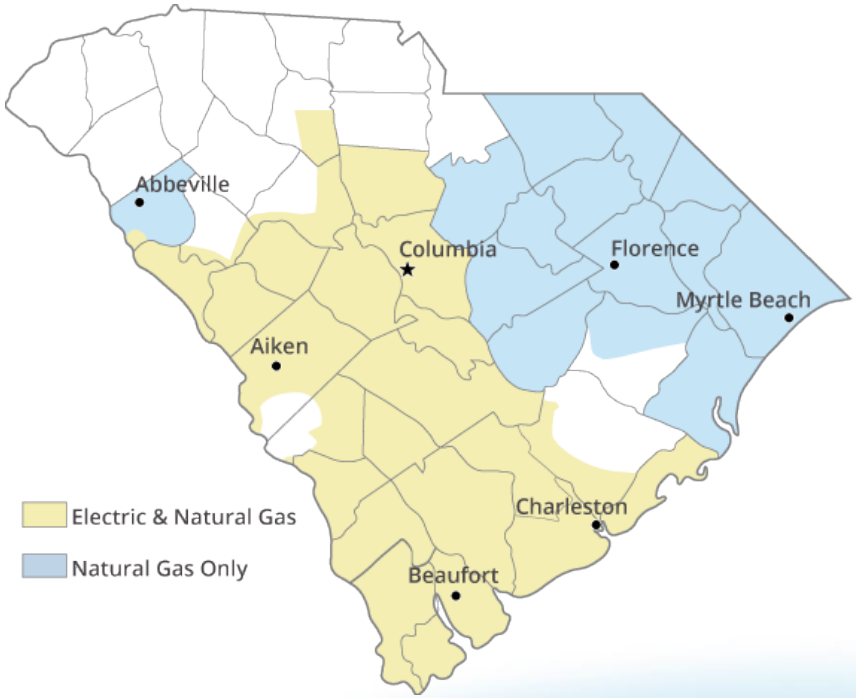
# SCANA/SCE&G

- SCANA Corporation (NYSE: SCG)
  - Energy-based holding corporation; HQ: Cayce, SC
  - Primary subsidiary – South Carolina Electric & Gas Co. (SCE&G)
  - SCE&G operations in SC regulated by SC PSC
- Approx. 500,000 electric customers in 25 counties
- ~5,000 MW of owned generation in SC



# Fossil Generation Fleet

| | In-Service Date | Summer (MW) | Winter (MW) |
|---|---|---|---|
| **Coal-Fired Steam**: | | | |
| Wateree – Eastover, SC | 1970 | 684 | 684 |
| Williams – Goose Creek, SC* | 1973 | 605 | 610 |
| Cope - Cope, SC | 1996 | 415 | 415 |
| KapStone – Charleston, SC | 1999 | 85 | 85 |
| Total Coal-Fired Steam Capacity | | 1,789 | 1,794 |
| **Gas-Fired Steam**: | | | |
| McMeekin – Irmo, SC | 1958 | 250 | 250 |
| Urquhart – Beech Island, SC | 1955 | 95 | 96 |
| Total Gas-Fired Steam Capacity | | 345 | 346 |
| **Nuclear**: | | | |
| V. C. Summer - Parr, SC | 1984 | 647 | 661 |
| **I. C. Turbines**: | | | |
| Hardeeville, SC | 1968 | 9 | 9 |
| Urquhart – Beech Island, SC | 1969 | 39 | 48 |
| Coit – Columbia, SC | 1969 | 26 | 36 |
| Parr, SC | 1970 | 60 | 73 |
| Williams – Goose Creek, SC | 1972 | 40 | 52 |
| Hagood – Charleston, SC | 1991 | 127 | 141 |
| Urquhart No. 4 – Beech Island, SC | 1999 | 48 | 49 |
| Urquhart Combined Cycle – Beech Island, SC | 2002 | 458 | 484 |
| Jasper Combined Cycle – Jasper, SC | 2004 | 852 | 924 |
| Total I. C. Turbines Capacity | | 1,659 | 1,816 |
| **Hydro**: | | | |
| Neal Shoals – Carlisle, SC | 1905 | 3 | 4 |
| Parr Shoals – Parr, SC | 1914 | 7 | 12 |
| Stevens Creek - Near Martinez, GA | 1914 | 8 | 10 |
| Saluda - Irmo, SC | 1930 | 200 | 200 |
| Fairfield Pumped Storage - Parr, SC | 1978 | 576 | 576 |
| Total Hydro Capacity | | 794 | 802 |
| **Other:** Long-Term Purchases | | 25 | 25 |
| Southeastern Power Administration (SEPA) | | 20 | 20 |
| **Grand Total:** | | 5,279 | 5,464 |

* Williams Station is owned by GENCO, a wholly owned subsidiary of SCANA and is operated by SCE&G.
* Not reflected in the table is a solar PV generator owned by SCE&G with a nominal direct current rating of 2.6 MWs, nor off-system purchases totaling 300 MWs of firm capacity for the years 2016-2017.
* The Leeds Avenue solar farm (North Charleston, SC), a 0.50 MW project, is also not reflected in the table.

- Three coal-fired facilities (Cope, Wateree, A.M. Williams)
- Two natural-gas steam units (McMeekin, Urquhart 3)
- Three combined cycle plants (Urquhart 1/5, Urquhart 2/6, Jasper – 3X1)

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# NOx Controls History

- Cope
  - NSR/PSD plant (1994)
  - LNB, OFA
  - SCR (2008)
- Wateree (2 Units)
  - LNB (1997)
  - SCR (2003)
- A.M. Williams
  - Originally #6 Oil (Converted to Coal ~1983)
  - LNB, OFA
  - SCR (2003)
- Urquhart (3 Units)
  - LNB, OFA (Unit 3)
  - DLN / H2O Injection (Units 5, 6)
- Jasper (3 Units)
  - DLN / H2O Injection
  - SCR (Aqueous NH3)
- All coal SCRs designed by Alstom (now GE)
  - Honeycomb tungsten-vanadium catalyst (Cormetech)
  - Utilize anhydrous NH3

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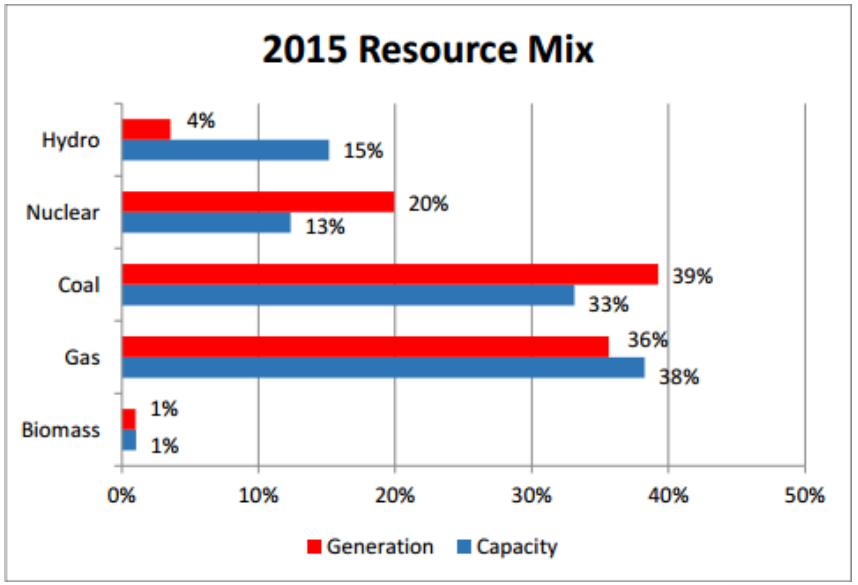
# What’s new in NOx?

# MATS and Multi-Pollutant Control

- SCRs being driven to control pollutants beyond original design basis
- Co-benefit of SCR + WFGD
  - SCR catalyst provides oxidation of gaseous mercury (Hg0 to Hg2+)
  - Oxidized mercury capable of being captured in WFGD
- Catalyst management previously driven around managing activity for NOx
  - Traditionally a balance of NOx and SO2/SO3 conversion (tradeoff)
  - Shifting towards control of Hg for plants without secondary mercury oxidation (low chlorine coals, bromine addition)

# Shift in Generation Mix

- Original design basis for SCRs predicated on coal units being baseload generation
- Coal units moving to intermediate-load and peaking-load
- Rethinking assumptions on SCR operation



# Shift in Generation Mix

- Inherently lower NOx rates on CCGT plants vs. coal (even with SCR)
- Relatively high minimum load requirements to operate coal SCRs
  - Lower commodity prices for NG putting coal units at end of merit dispatch order
  - Dispatching coal units out of merit to keep SCRs online
    - How to balance SCR operational requirements
    - Dispatching NG over coal – generally lower NOx and reduced fuel costs for customers
- Change in assumptions (coal vs. NG prices) requires more intensive modeling efforts
- SCR operation previously “set and forget” since coal units were bulk of emissions and baseload
- More pressure for NG cofiring for coal units
  - Inherent NOx reductions with NG
  - Staged combustion/FLGR

# Future of NOx Controls

- Will NG prices stay low?
  - CSAPR/CAIR limits set around greater coal burn
- Will additional coal-fired NOx control be required in future?
  - SCR retrofits (AIG improvements, catalyst modifications)
- CPP Impacts
  - SCE&G NND
  - Coal units moving even further down in dispatch order/cyclic operation
  - How to keep units online with SCR?
    - Gas/water-side bypass systems
    - Duct burners
    - FLGR/gas co-firing

# Thank You!