

PRESENTATION TO THE GOVERNOR'S EXECUTIVE ORDER 57 WORKGROUP

VIRGINIA'S CARBON REDUCTION EFFORTS
Department of Environmental Quality
August 31, 2016



CARBON EMISSIONS IN VIRGINIA

▶ *Where we've been*

- Carbon emission trends in Virginia
- Regulations and factors affecting carbon emissions
- Virginia's fossil fuel power plants

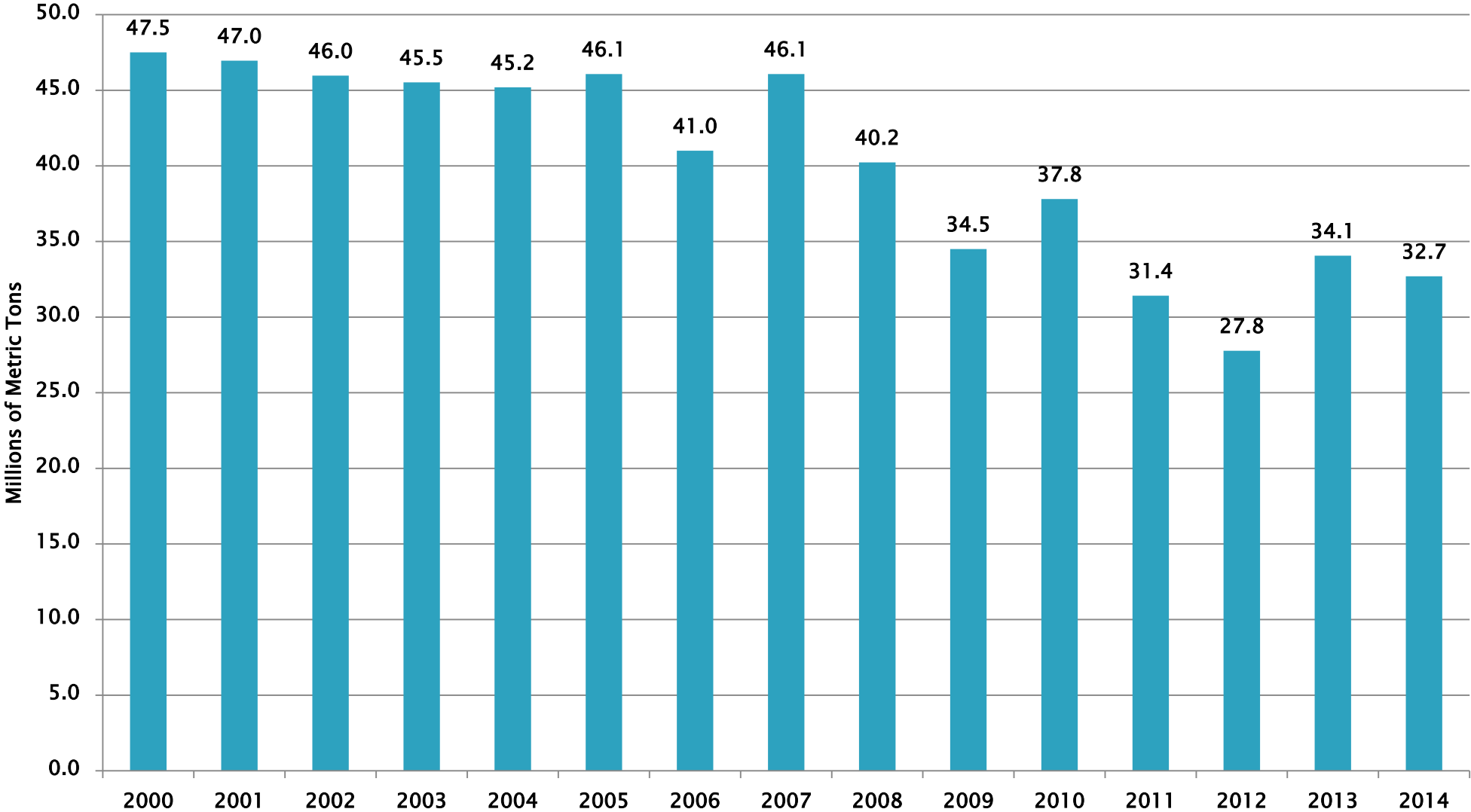
▶ *Where we are*

- GHG permitting for major sources
- Virginia's Permit By Rule for small solar and wind projects

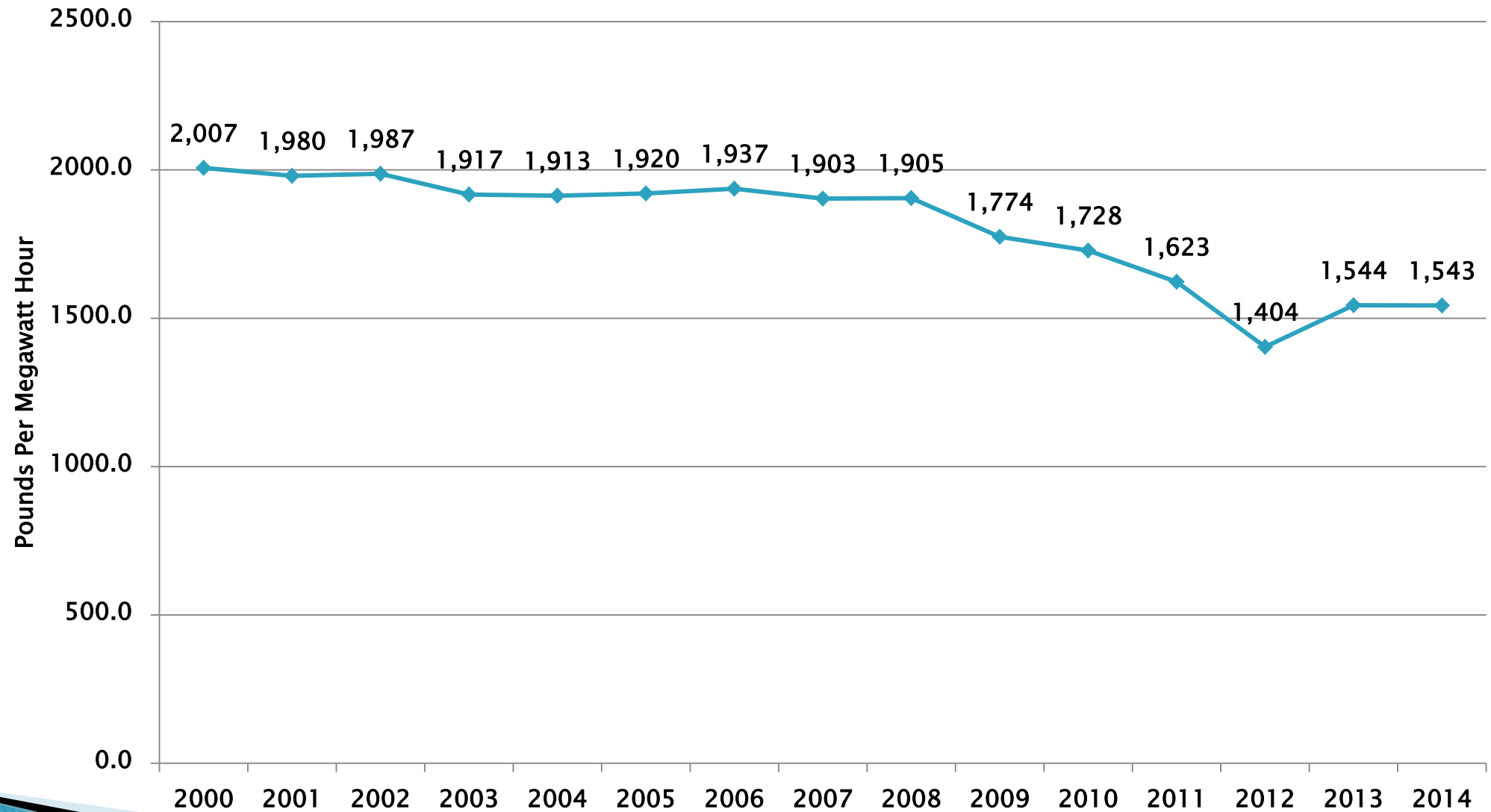
▶ *Status of EPA's Clean Power Plan*

- Potential pathways for additional carbon emission reductions

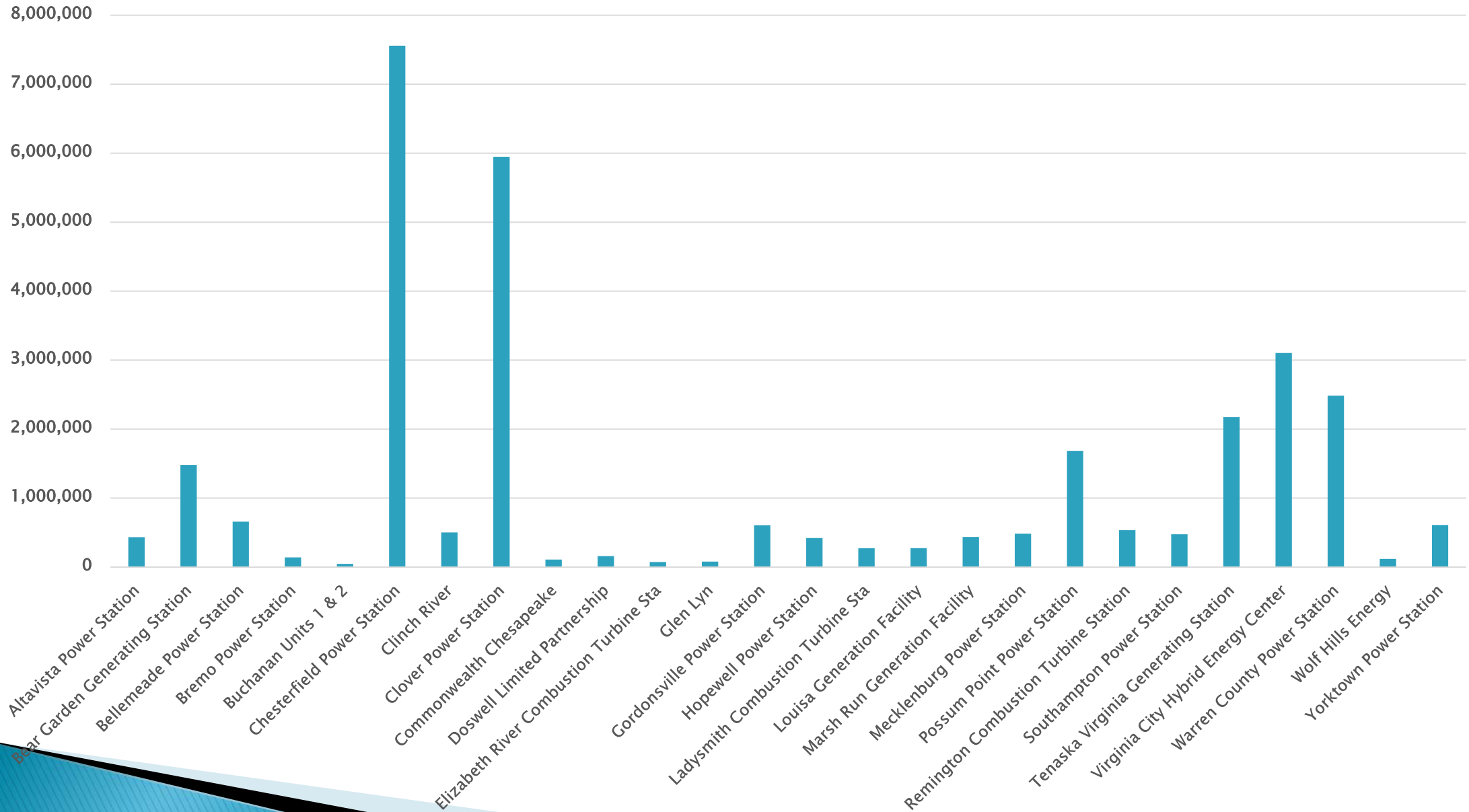
VIRGINIA POWER SECTOR CO2 EMISSIONS



Virginia Power Sector CO2 Emission Rate



2015 CO2 EMISSIONS FROM VIRGINIA POWER PLANTS



NON-CARBON RELATED REGULATIONS AND FACTORS INCIDENTALLY AFFECTING CARBON EMISSIONS

- ▶ NOx regulations to achieve ozone National Ambient Air Quality Standard (NAAQS)
 - NOx SIP Call (1998)
 - Clean Air Interstate Rule (CAIR) (2005)
 - Cross State Air Pollution Rule (CSAPR) (being implemented)
- ▶ Mercury Air Toxics Rule (MATS) aimed at reducing toxics emissions from EGUs (2015–2016)
- ▶ Sulfur Dioxide NAAQS (being implemented)
- ▶ Falling natural gas prices
 - \$9.00 per million Btu 2008
 - \$2.00 per million Btu 2016

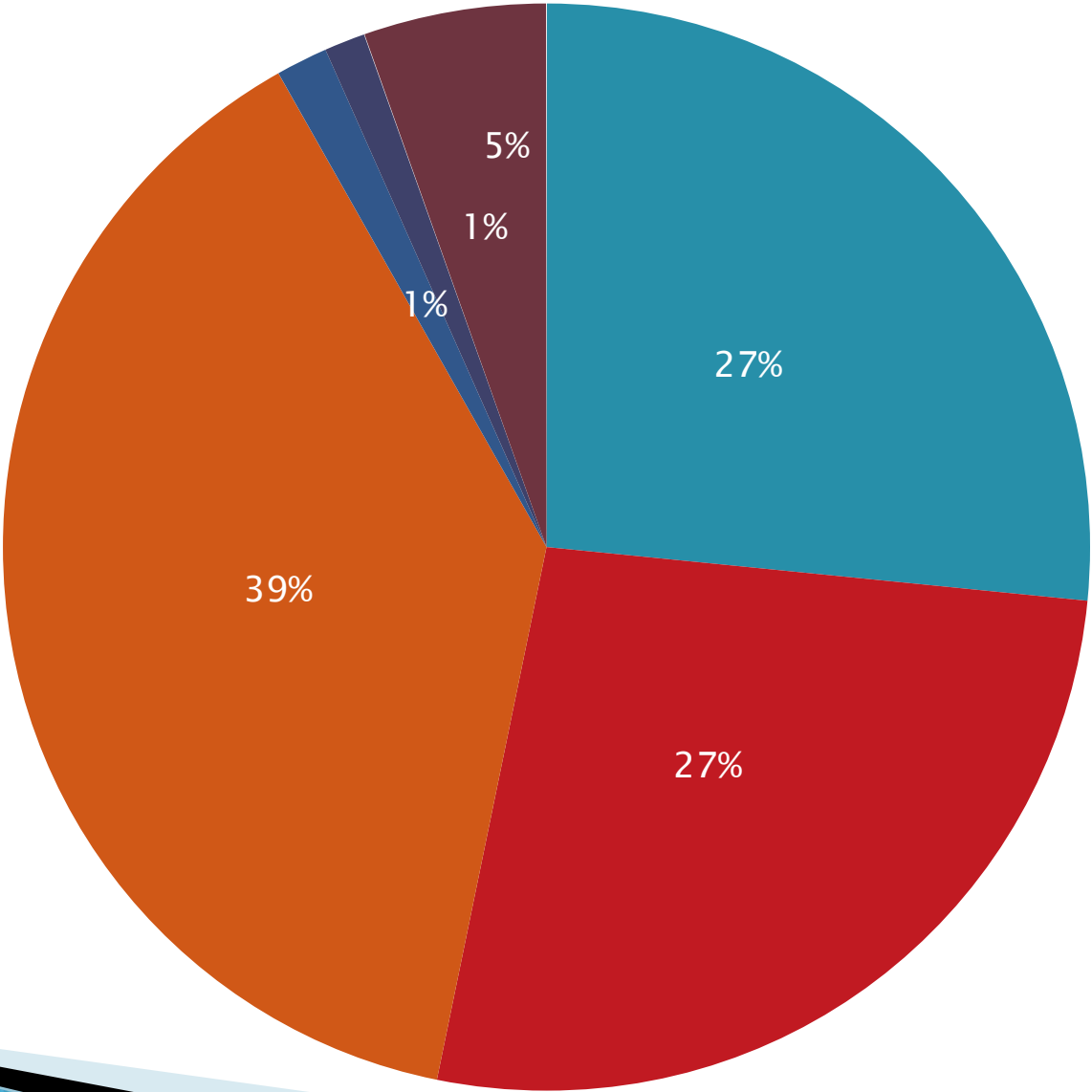
CHANGES TO AFFECTED SOURCES IN VIRGINIA POST-2012

Plant Name	Change In Operation/Fuel	Year
Altavista Power Station (Coal)	Converted to biomass (wood)	2012
Bremo Bluff (Coal)	Converted to natural gas	2014
Chesapeake (Coal)	Coal units permanently shut down	2015
Clinch River (Coal)	1 coal unit shut down/2 converting to gas	2015
Glen Lyn (Coal)	Facility permanently closed	2015
Hopewell Power Station (Coal)	Converted to biomass (wood)	2013
Portsmouth Genco (Coal)	Currently closed/possible biomass conversion	2015
Potomac River (Coal)	Facility permanently closed	2012
Southampton Power Station (Coal)	Converting to biomass (wood)	2013
Warren County (NGCC)	Constructed and began operation	2014
Brunswick County (NGCC)	Currently under construction	2016
Yorktown (Coal)	Pending coal shutdown	2017*
Greenville County (NGCC)	Permit issued in June 2016	2019

* Pending transmission line issue resolution

VIRGINIA ELECTRICITY GENERATION 2014

Total Generation
77 Million Megawatt Hours



- Coal
- Natural Gas
- Nuclear
- Petroleum
- Hydroelectric
- Other

▶ *Where we are*

- GHG permitting for major sources
- Virginia's Permit By Rule for small solar and wind projects



GREENHOUSE GAS (GHG) PERMITTING

- ▶ EPA Tailoring Rule – Effective January 2, 2011
- ▶ GHGs – 6 different compounds including Carbon Dioxide (CO₂) and Methane (CH₄)
- ▶ Limited to Major Sources of Pollution
 - Sources must be major for a pollutant other than GHG
 - Must be major for GHG >100,000 tons per year (tpy)
 - GHG expressed as Carbon Dioxide Equivalents (CO₂(e))
- ▶ Requires a Best Available Control Technology (BACT) analysis
- ▶ Few add-on controls exist for GHGs
- ▶ Emissions related to combustion efficiencies

VIRGINIA GHG PERMITS

- ▶ Dominion Brunswick – 1400 MW Natural Gas Combined–Cycle
 - Permit Issued 03/12/2013
 - 920 lbs/MWh CO2(e) Limit
- ▶ Panda Stonewall LLC – 750 MW Natural Gas Combined–Cycle
 - Permit Issued 04/30/2013
 - 903 lbs/MWh CO2(e) Limit
- ▶ Dominion Greensville – 1600 MW Natural Gas Combined– Cycle
 - Permit Issued 06/17/2016
 - Tiered Limit
 - 812 lbs/MWh CO2(e) first 6 years
 - Increases in 6 year increments
 - Final Limit (years 31 & later) – 890 lbs/MWh
 - **MOST STRINGENT GHG LIMITS IN THE NATION**

NEW EPA GHG STANDARDS TO BE INCORPORATED INTO AIR PERMITS

- ▶ 40 CFR Part 60 Subpart TTTT – New Source Performance Standard (NSPS) for Greenhouse Gas Emissions for New or Modified Electric Generating Units
 - Applies to Fossil–Fuel Power Plants
 - Commenced construction after January 8, 2014
- ▶ 40 CFR Part 60 Subpart OOOOa – NSPS for Crude Oil and Natural Gas Facilities Constructed or Modified after September 18, 2015
 - Applies to gas wells and compressor stations
 - Implementation of rule is pending

PERMIT BY RULE FOR SMALL RENEWABLE ENERGY PROJECTS

VIRGINIA CODE § 10.1-1197.5

- ▶ DEQ shall develop, by regulations to be effective as soon as practicable, but not later than July 1, 2012, a permit by rule or permits by rule if it is determined by the Department that one or more such permits by rule are necessary for the construction and operation of small renewable energy projects, including such conditions and standards necessary to protect the Commonwealth's natural resources. If the Department determines that more than a single permit by rule is necessary, the Department initially shall develop the permit by rule for wind energy, which shall be effective as soon as practicable, but not later than January 1, 2011.

SMALL RENEWABLE ENERGY PROJECTS

VIRGINIA CODE § 10.1-1197.5

- ▶ As used in this article, "small renewable energy project" means (i) an electrical generation facility with a rated capacity not exceeding 100 megawatts that generates electricity only from sunlight, wind, falling water, wave motion, tides, or geothermal power, or (ii) an electrical generation facility with a rated capacity not exceeding 20 megawatts that generates electricity only from biomass, energy from waste, or municipal solid waste.

PERMIT BY RULE FOR SMALL SOLAR AND WIND ENERGY PROJECTS

- ▶ **Three solar projects permitted**
 - Amazon, Eastern Shore, 80 MW
 - Buckingham Firestone, Buckingham Co., 20 MW
 - Hecate Energy Cherrydale. Northampton Co., 20MW
- ▶ **Over 20 Notices of Intent submitted**
 - 710 projected total MW
- ▶ **At least four solar applications expected by mid September totaling an additional 160 MW**
- ▶ **Wind regulation litigation resolved successfully in favor of DEQ**
 - *Karr, et al., v VDEQ*, (Record No. 1715-15-2, Court of Appeals of Virginia, Judge Humphreys, August 9, 2016)

DEQ RENEWABLE ENERGY PERMIT-BY-RULE INFORMATION RESOURCES

- ▶ <http://www.deq.virginia.gov/Programs/RenewableEnergy.aspx>
X
- ▶ <https://www.google.com/maps/d/viewer?mid=1XZyl-JGFb2B9uAbuXCXfxUrb31k>
- ▶ <http://www.deq.virginia.gov/Programs/RenewableEnergy/PublicNotices.aspx>

▶ *The Status of EPA's Clean Power Plan*

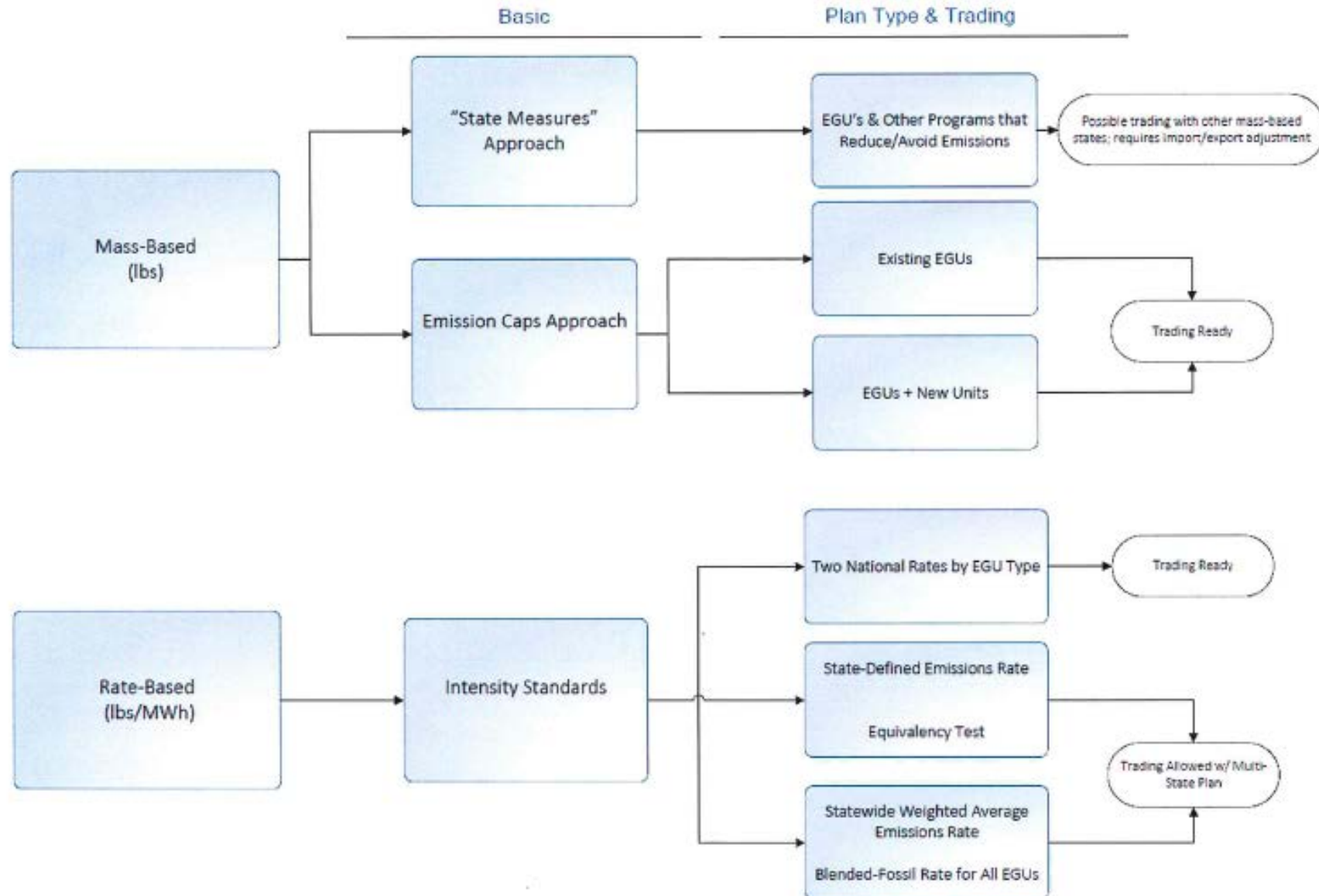
- Potential pathways for additional carbon emission reductions



EPA'S CLEAN POWER PLAN

- ▶ **While future of CPP uncertain, it provides wide range of compliance options and alternative regulatory structures, including:**
 - **Option to use established overall rate or mass goals or specific rate/mass goals for specific sources**
 - **Option to include only existing or existing & new sources**
 - **Option to participate in intra or interstate trading**
 - **Could include mixture of measures implemented by the state including renewable energy and energy efficiency standards or other measures**
- ▶ **CPP and its options have already been subject to much debate and analysis**

STATE COMPLIANCE OPTIONS



POSSIBLE COMPLIANCE OPTIONS

- Heat rate improvements
- Fuel switching to a lower carbon content fuel
- Integration of renewable energy into EGU operations
- Combined heat and power
- Qualified biomass co-firing and repowering
- Renewable energy (new & capacity uprates)
 - Wind, solar, hydro
- Nuclear generation (new & capacity uprates)
- Demand-side energy efficiency programs and policies
- Demand-side management measures
- Electricity transmission and distribution improvements
- Carbon capture and utilization for existing sources
- Carbon capture and sequestration for existing sources

CPP STATE COMPLIANCE TIMELINE

- ▶ **September 6, 2018 – Final state plans**
- ▶ **January 1, 2022 to December 31, 2024 – First interim compliance period**
- ▶ **January 1, 2025 to December 31, 2027 – Second interim compliance period**
- ▶ **January 1, 2028 to December 31, 2029 – Third interim compliance period**
- ▶ **January 1, 2030 –Final compliance**

VIRGINIA'S CPP CO2 MASS EMISSION GOALS

- ▶ 2000 – 47.5 million tons/actual emissions
- ▶ 2010 – 37.8
- ▶ 2012 – 27.8
- ▶ 2014 – 32.7
- ▶ 2022 – 29.6 million tons/ CPP goals
- ▶ 2024 – 31.3
- ▶ 2027 – 29
- ▶ 2029 – 27.9
- ▶ 2030 – 27.4

VIRGINIA'S CPP CO2 EMISSION RATE GOALS

- ▶ 2000 – 2007 pounds per megawatt hour/actual
- ▶ 2010 – 1728
- ▶ 2012 – 1404
- ▶ 2014 – 1543
- ▶ 2022 – 1047 pounds per megawatt hour/CPP goal
- ▶ 2024 – 1120
- ▶ 2027 – 1026
- ▶ 2029 – 966
- ▶ 2030 – 934

DEQ'S CPP STAKEHOLDER PROCESS

- Stakeholder group established and met 5 times from Nov 2015 through Mar 2016
- Goal to seek common ground on elements that could be included in state plan
- Included most major interested parties
 - Utilities, environmental groups, industry, and other advocates

RESULTS OF THE STAKEHOLDER PROCESS ON MAJOR ISSUES

- No consensus reached; Informal polling showed:

option	support	oppose	neutral/unsure
Rate-based	4 members	7 members	1 members
mass - existing	3 members	3 members	5 members
mass with new source component	5 members	5 members	1 members

- General consensus in support of a “trading ready” plan

RANGE OF CPP MODELING EFFORTS

- ▶ **Much CPP modeling completed since conclusion of Virginia stakeholder process**
 - Nicholas Institute, Bipartisan Policy Center, EPRI, PJM, MJ Bradley
- ▶ **Multiple objectives and differences in key assumptions make comparisons difficult**
- ▶ **Consistent big takeaways**
 - Natural gas prices may matter more than anything
 - RE and EE costs also important
 - Trading lowers costs; the wider the trading the lower the costs
 - What your neighbors do is very important

SUMMARY OF MAIN COMPLIANCE OPTIONS

▶ Three major compliance paths

- **Rate-based compliance plan (dual rate)**
 - Pros – appears to be least cost option for some states
 - Cons – administrative burden of ERC process; may lead to CO₂ emission increase
- **Mass-based compliance plan (existing sources)**
 - Pros – well known program (CAIR, CSAPR)
 - Cons – contentious allocation process
- **Mass-based compliance plan (existing & new)**
 - Pros – most environmental benefit
 - Cons – appears to be highest cost option