# ADEQ Analysis of Clean Power Plan Building Blocks 2 & 3

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# Best System of Emissions Reductions: Four Building Blocks

Heat Rate Improvements at Coal-Fired EGUs

**Increase utilization of existing Natural Gas Combined Cycle capacity by re-dispatching generation from higher-emitting sources including coal- and oil/gas-fired EGUs**

**Expanding renewable energy sources and maintaining nuclear generation**

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# Historical Generation

- 2012 Unit-Level Data using eGRID Methodology
- Data Sources:
  - Air Markets Program Database (AMPD)
  - EIA 860
  - EIA 923
- Unit-Level Data not available for many generator units
  - Data Priority according to Unit-Level Data using eGRID Methodology Technical Support Document:
    - Generator-Specific reported data (AMPD or EIA 923)
    - Calculated by distributing plant-level data to generators according to nameplate capacity based on prime mover classification
- Noted Deviation in EPA's data set from methodology as described in the Technical Support Document (TSD)
  - Treatment of Combined Cycle Steam (CA) and Combustion Turbine (CT) units from NGCC facilities

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# Historical Generation: Treatment of NGCC Units

- In EPA's data set
  - Units with CA or CT prime movers reclassified as Combined Cycle (CC)
  - EIA 923 prime mover-specific plant-level data aggregated then distributed across both CA and CT units
  - AMPD generator-specific emissions data added then distributed across all units; EIA fuel consumption estimated emissions were not included for CA units
- Effect of NGCC CA and CT treatment of data (Prime mover-specific vs CA+CT aggregated)

| | **CA + CT Aggregated** | **Prime-mover specific** |
|---|---|---|
| NGCC Emissions (tons $CO_2$) | 7,015,577 | 7,239,688 |
| NGCC Emissions rate (lb $CO_2$/MWh) | 827 | 864 |
| Other Generation (MWh) | 1,310,917 | 1,108,853 |
| Other Emissions (lb $CO_2$) | 789,080,955 | 810,895,697 |
| **Final Goal (lb $CO_2$/MWh)** | **910** | **936** |

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# Historical Generation: Treatment of Combined Heat and Power (CHP)

- In the goal computation, useful thermal output (UTO) from CHP facilities factors into emission rates, other generation, and other emissions
- Generation from UTO is not part of the re-dispatch formula
- One affected facility in Arkansas uses CHP, Pine Bluff Energy Center (PBEC)
  - PBEC has 2 NGCC units: CT01 and ST01
  - PBEC Emission Rate: 602 lb/MWh (with UTO) vs 1,132 lb/MWh (without UTO)
  - 2012 utilization rate for PBEC: 71.8%
  - PBEC not expected to ramp up under proposed BSER
- Effects of inclusion of UTO using EPA historical data:

| | UTO (proposed) | No UTO |
|---|---|---|
| 2012 NGCC Emissions Rate (lb $CO_2$/MWh) | 827 | 896 |
| Final Goal (lb $CO_2$/MWh | 910 | 960 |

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# Questions and Concerns with Historical Generation Data

- Why did EPA aggregate CA and CT data without indicating why this treatment of the data was appropriate in the TSD?
- Why is EPA redistributing generator-specific data from its sources among all units at a NGCC facility?
- Should useful thermal output from one facility be factored into a fleet-wide NGCC emission rate used for goal computation?

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# Building Block 2

- Re-dispatch dependent on historical generation and NGCC capacity (existing and under construction)
- Arkansas NGCC Capacity Utilization:

| 2012 | Proposed | Alternative |
|---|---|---|
| 32% | 70% | 65% |

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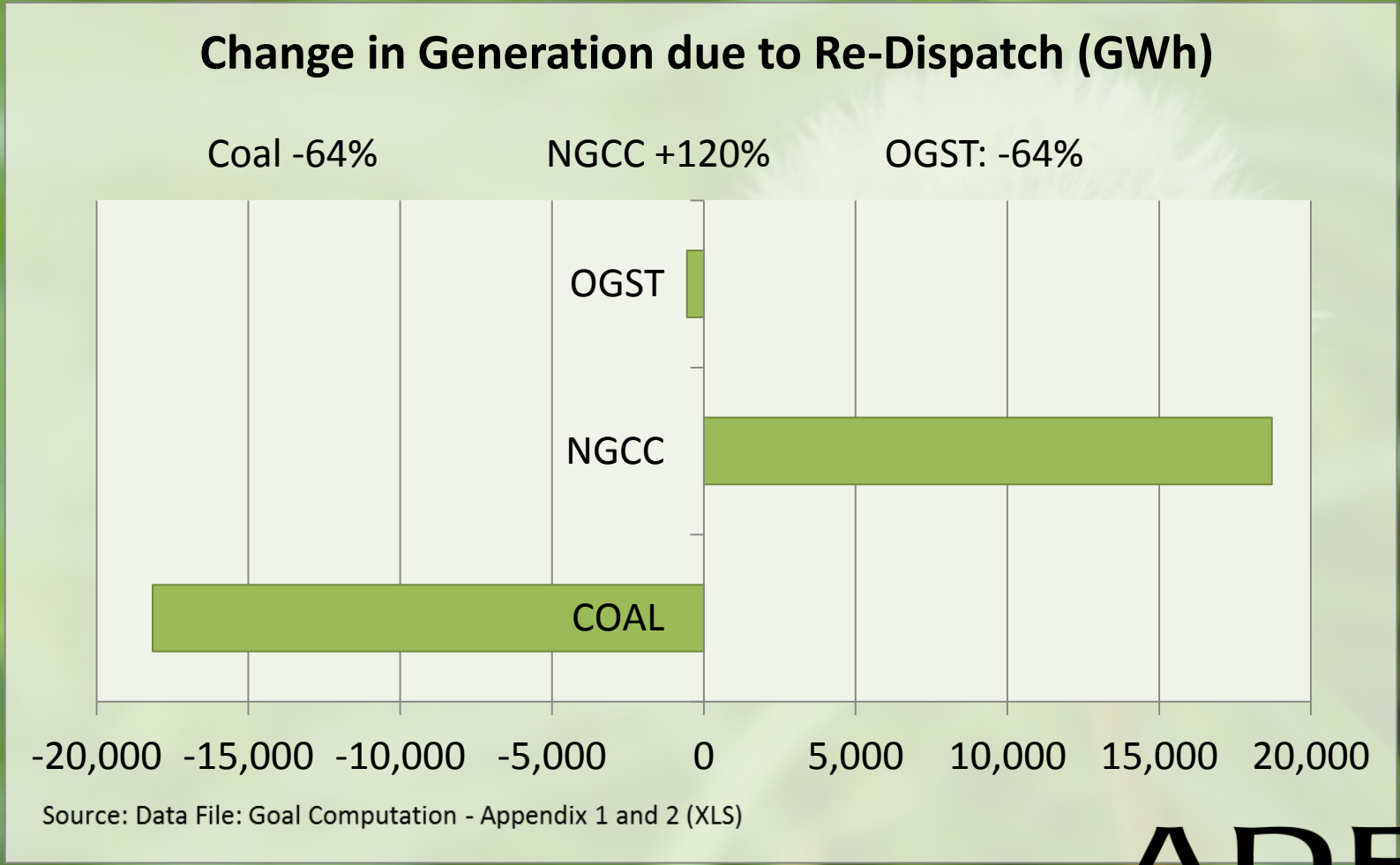
# Building Block 2: Generation Changes

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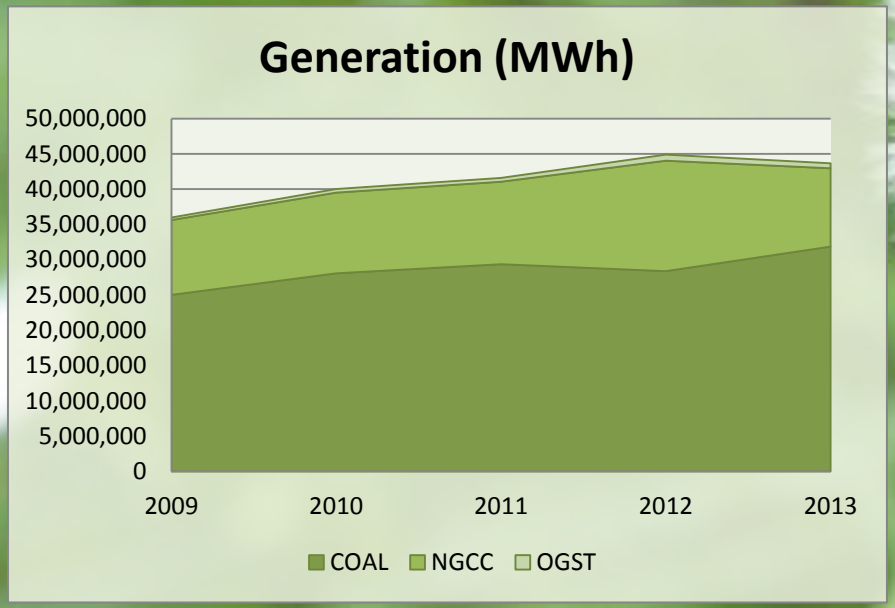
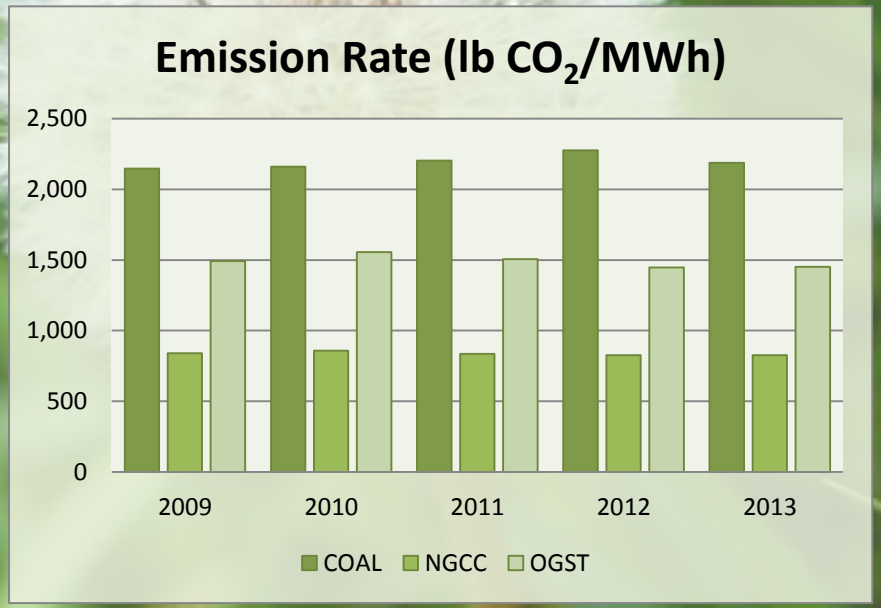
# Building Block 2: Effect of Base Year Selection

- Single year: 2012 (proposed) or 2013 (most current)
- Multi-year 2009-2012 (considered, but dismissed by EPA)

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# Building Block 2: Effect of Base Year Selection

| Baseline | Historical Fossil Emission Rate (lb $CO_2$/MWh) | Building Block 2 only (lb $CO_2$/MWh) | *Final Goal (lb $CO_2$/MWh) |
|---|---|---|---|
| **2012** | 1,722 | 1,145 | **910** |
| **2009 - 2012** | 1,742 | 1,037 | **814** |
| **2013** | 1,793 | 1,101 | **871** |

*Calculated final goal assumes base year selection affects only blocks 1 and 2, no changes to building blocks 3 and 4.

- The goal rate decreases when other base years are selected, because re-dispatch is based on NGCC capacity and total generation.
- The generation mix during the base year only affects the proportion of generation remaining after re-dispatch for coal and oil and gas.

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# Building Block 2: Timeline


- Because building blocks 1 and 2 account for ~75 % of the reductions required for Arkansas, the interim goal, 968 lb $CO_2$/MWh, is very close to the final goal of 910 lb $CO_2$/MWh.
- As proposed, only four years are available to complete necessary transmission and pipeline infrastructure projects needed to ramp up NGCC utilization rate to 70%.

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# Building Block 2: Constraints to Re-dispatch

- Re-dispatch to NGCC is based on nameplate capacity, but temperature and humidity can affect actual capacity rating.
- Increased generation from NGCC may trigger permit updates and PSD review due to increased emissions of other pollutants.
- Infrastructure:
  - Natural Gas Availability
    - Pipelines
    - Storage
  - Transmission constraints:
    - Congestion points
    - Changes in transmission lines due to shift in generation

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# Building Block 2: Questions and Concerns

- Can the fleet of existing affected NGCC units ramp up to 70% of nameplate capacity?
- Is it reasonable to use nameplate capacity given the effects of temperature and humidity on operation or would summer capacity have been more appropriate?
- Which base year or multi-year period for historical generation is most appropriate?
- In the goal computation, should EPA phase in the building block 2 to allow for completion of transmission and pipeline infrastructure projects necessary to accommodate re-dispatch?

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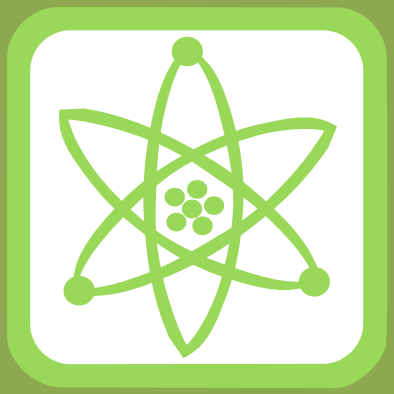
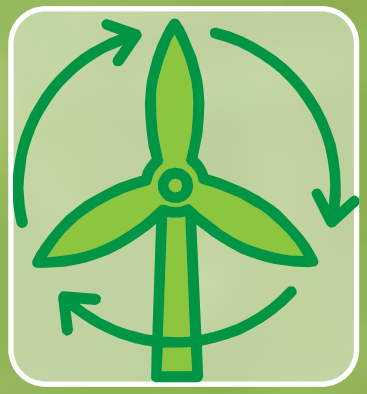
# Building Block 3



## Nuclear

- Under construction nuclear and ~5.8% existing nuclear considered “at-risk”
- Presumed to cancel out if included in both goal computation and compliance
- Use of net summer dependable capacity instead of nameplate capacity (why the switch?)



## RE approach options

- Proposed RE Approach
- Alternate RE Approach
  - Benchmarking
  - Technical and Economic Potential

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# Building Block 3: Treatment of Hydropower

- Proposed RE Approach excludes hydropower
- Alternate RE Approach includes hydropower
- EPA seeks comments under both approaches as to whether hydropower should be included or excluded
  - Additional hydropower capacity
    - Expansion of capacity at current hydropower generators
    - Effect on potential new dams on navigation and other environmental parameters

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# Building Block 3: Proposed RE Approach

- AR in region with TX, NE, KS, OK, and LA
- Regional target: 20%, based on KS RPS
- Regional growth rate: ~8% annually
- Proposed: ramp up begins in 2017 and holds steady for 2029 and beyond
- Alternative: ramp up begins in 2017 and holds steady for 2024 and beyond

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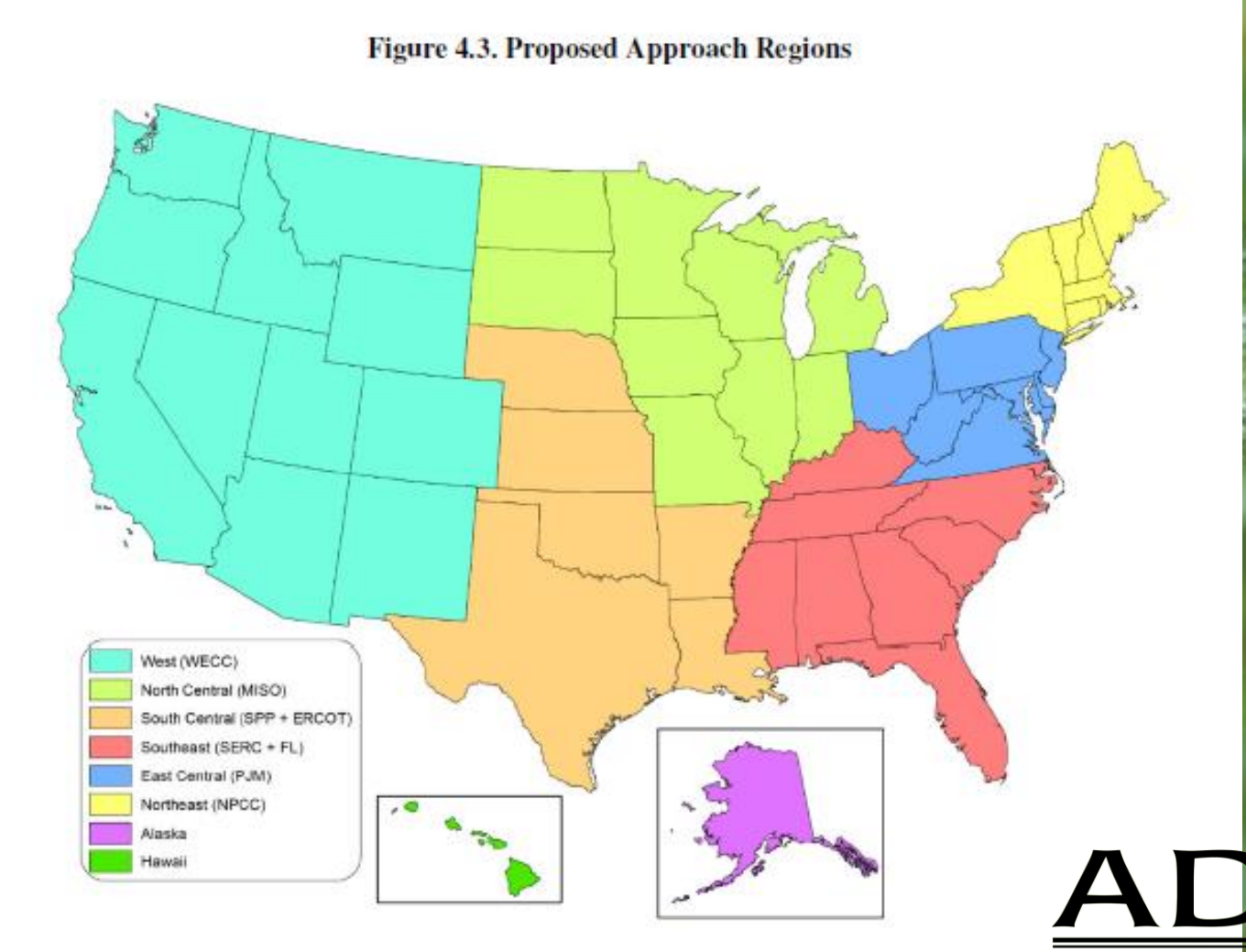
# Building Block 3: Proposed RE Approach

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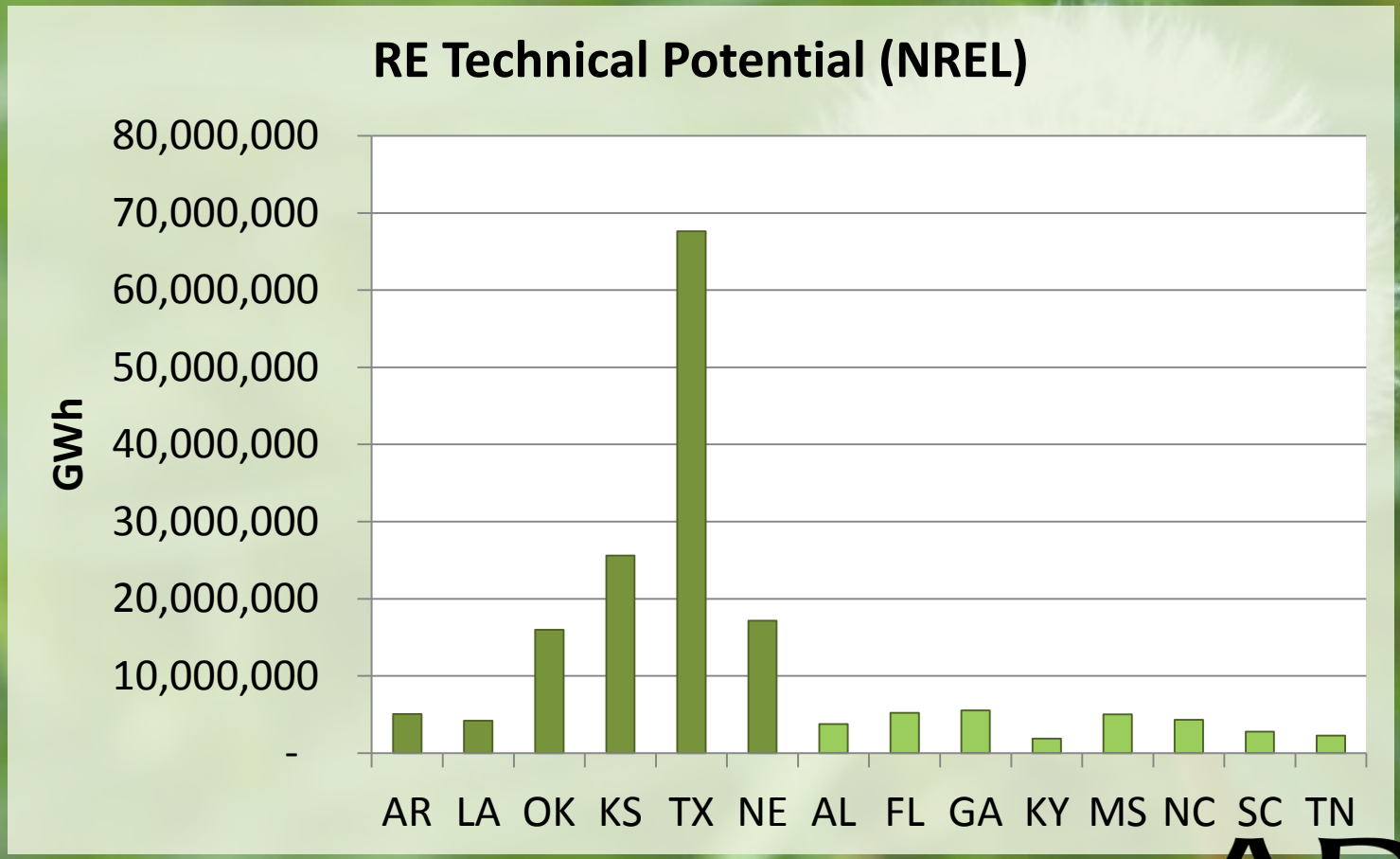
# Building Block 3: Comparison of RE Technical Potential

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# Building Block 3: Regional Proposed RE Growth Rates

- **South Central** including AR and LA
  - Region target: 20%
  - 2012 RE regional generation % of target: 35%
  - **Regional annual growth rate: 8%**
  - **AR 2029 Existing and Incremental RE: 4,708,823 MWh (7.2%)**
- **Southeast** if AR and LA were included
  - Region target: 10%
  - 2012 RE regional generation % of target : 19%
  - **Regional annual growth rate: 13%**
  - **AR 2029 Existing and Incremental RE: 6,500,568 MWh (10%)**

Growth rate applied as BSER is based on regional growth needed to achieve regional target, not state growth rate needed to achieve state target.

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# Building Block 3: Alternate RE Approaches

- Benchmarking Method
  - Based on deploying RE technical potential according to NREL based on a benchmark rate for each technology
  - Includes the full technical potential for hydropower, not a technical potential multiplied by the benchmark deployment rate
  - RE target generation for each technology was capped at the IPM-projected generation rate at a $30/MWh discount, except for hydropower
  - **AR 2029 Existing and Incremental RE: 6,255,165 MWh (10%)**

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# Building Block 3: Alternate RE Approaches

- Technical and Economic Potential Method
  - Compares cost of new renewable energy to avoided energy costs (fuel, operating costs, environmental costs, etc.) of the generation mix displaced by renewable energy
  - Estimates a cost-effective potential for each renewable energy technology
  - EPA has not fleshed out this methodology or calculated cost-effective potentials using this method

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# Building Block 3: Concerns

- Grouping of states into regions with varying RE technical potentials
- Regional RE target for South Central region based solely on Kansas RPS
- Historical RE progress (or lack thereof) from other states plays a strong role in developing a given state's annual RE growth rate
- Treatment of hydropower (exclude or include)
- Lack of development for Potential Alternative method using Technical and Economic Potential

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# Resources

- EPA Technical Support Documents
- Air Markets Program Data
- Form EIA-860 detailed data
- Form EIA 923 detailed data
- Form EIA 861 detailed data
- U.S. Renewable Energy Technical Potentials: A GIS-Based Analysis

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