



CHRISTINE TEZAK  
MANAGING DIRECTOR



**"GREENER AND TIGHTER"**

*Council of Industrial Boiler Owners  
Annual Conference  
October 22, 2015*

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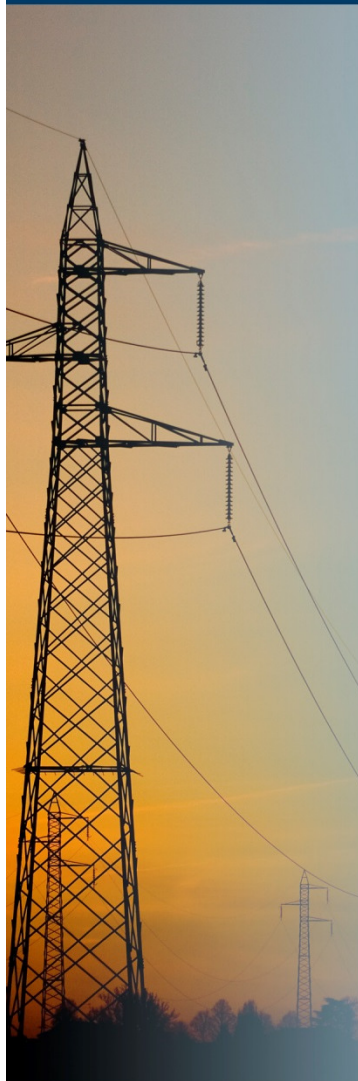
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  - Alternative power and efficiency
  - Climate change and emissions
  - Geopolitical risk and international policy
  - Oil, natural gas and refined products
  - Power generation, coal mining and nuclear power
  - Electric transmission and power markets
  - Natural gas, oil and refined product pipelines
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I further certify that no part of my compensation was, is or will be directly or indirectly related to the specific recommendations or views contained in this presentation.

By: *Christine Tezak*

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# GREENER AND TIGHTER



- ▼ Where We've Been
- ▼ The Stuff of Legacy
- ▼ Where We're Headed
- ▼ The March of the Renewables
- ▼ The Mechanics of Legacy Construction
- ▼ Go-Forward Constraints
- ▼ A Word on the 2016 Elections

OCTOBER 22, 2015



# REGIONALIZATION ADVANCES



## ▼ Electric Transmission

- Scale efficiency realized from broader generation dispatch
- Consistent with federal tax policy fostering utility-scale renewables
- Seeks to leverage regional grid structures and interstate collaboration
- Consistent with regional approaches to air emissions

## ▼ Natural Gas and Oil Pipelines

- Realignment of existing infrastructure
- New infrastructure to support new supply resources
- Meet growing power sector use

Source: ClearView Energy Partners, LLC

# PRESIDENT OBAMA'S ENERGY POLICY LEGACY



## ▼ The Big Picture

- “Transformation” + “all of the above” = “give a little, take a little”

## ▼ Transitioning From Scarcity to Adequacy

- “Safe and responsible” production
- Reforms for “fair share,” “diligent development”
- “Some, not all” export policy

## ▼ The *Climate Action Plan*

- A two-fer: domestic and international legacies
- Endangerment → Tailoring/Timing → Standards
- Continuity a function of next President

Source: ClearView Energy Partners, LLC

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# WHERE WE ARE HEADED



- ▼ New resources change supply options
  - Natural gas displaces coal in power sector
  - On-shore resources change pipeline flows
  - Light crude surplus in a heavy crude-aligned refinery market
- ▼ From scarcity to adequacy
  - Reconsidering export policy
  - “Some not all”?
  - Is there a “sweet spot”?



Source: ClearView Energy Partners, LLC



# WHERE WE ARE HEADED



## ▼ Questioning efficiencies of scale

- Regional strategic reserves of refined fuel contemplated
- Decentralized power generation is trendy
- Microgrids for resiliency
- Storage as the problem solver
- New technologies versus useful assets
- Smart technology but dumb tariffs

## ▼ Environmental policy

- Carbon emissions, climate change
- Greater efficiency can change demand growth
- Electrification = good for emissions?
- Nuclear power, clean coal, natural gas

Source: ClearView Energy Partners, LLC

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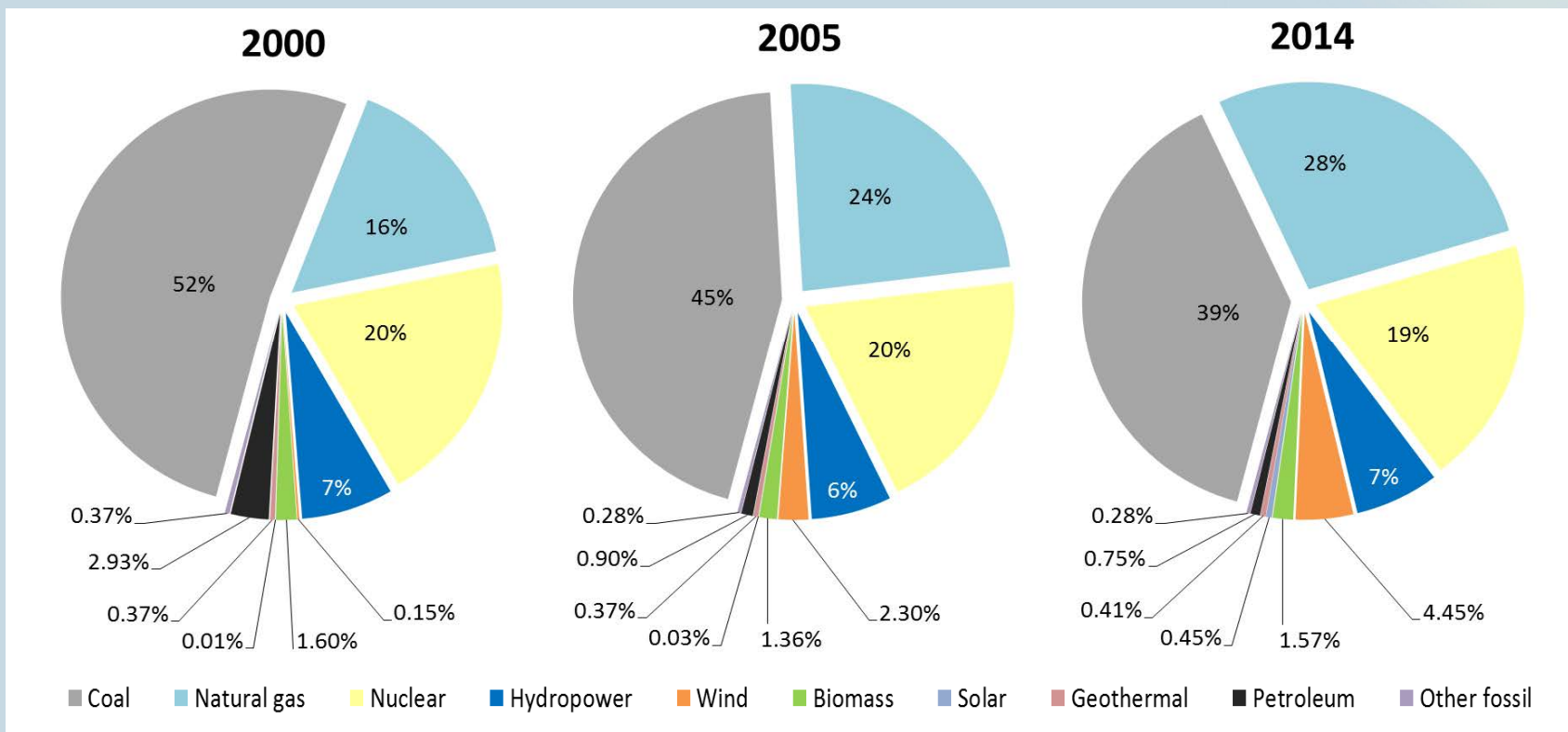
- Carbon *pollution*, climate *crisis*
- Greater efficiency can change demand growth
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Source: ClearView Energy Partners, LLC

# GAS GROWS, POLICY DRIVES RENEWABLES



The Shift In the U.S. Power Portfolio Is Well Underway (~12% *de facto* RPS by 2020)



California's New RPS Could Take U.S. to 14% by 2030

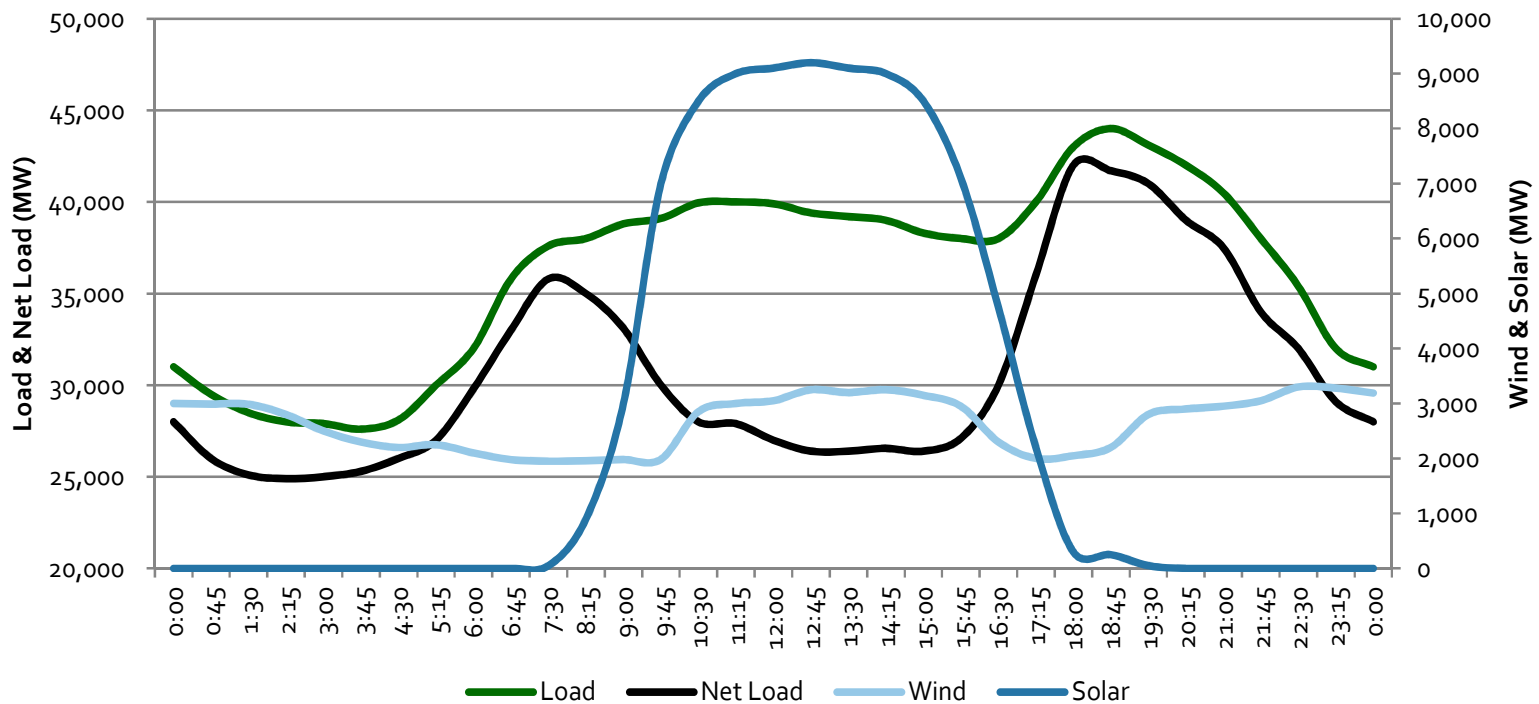
Source: U.S. Energy Information Administration



# CAMELS, ELEPHANTS AND DUCKS!



## CAISO Projects Disparate Shapes of Renewable Dispatch and Power Demand in 2020



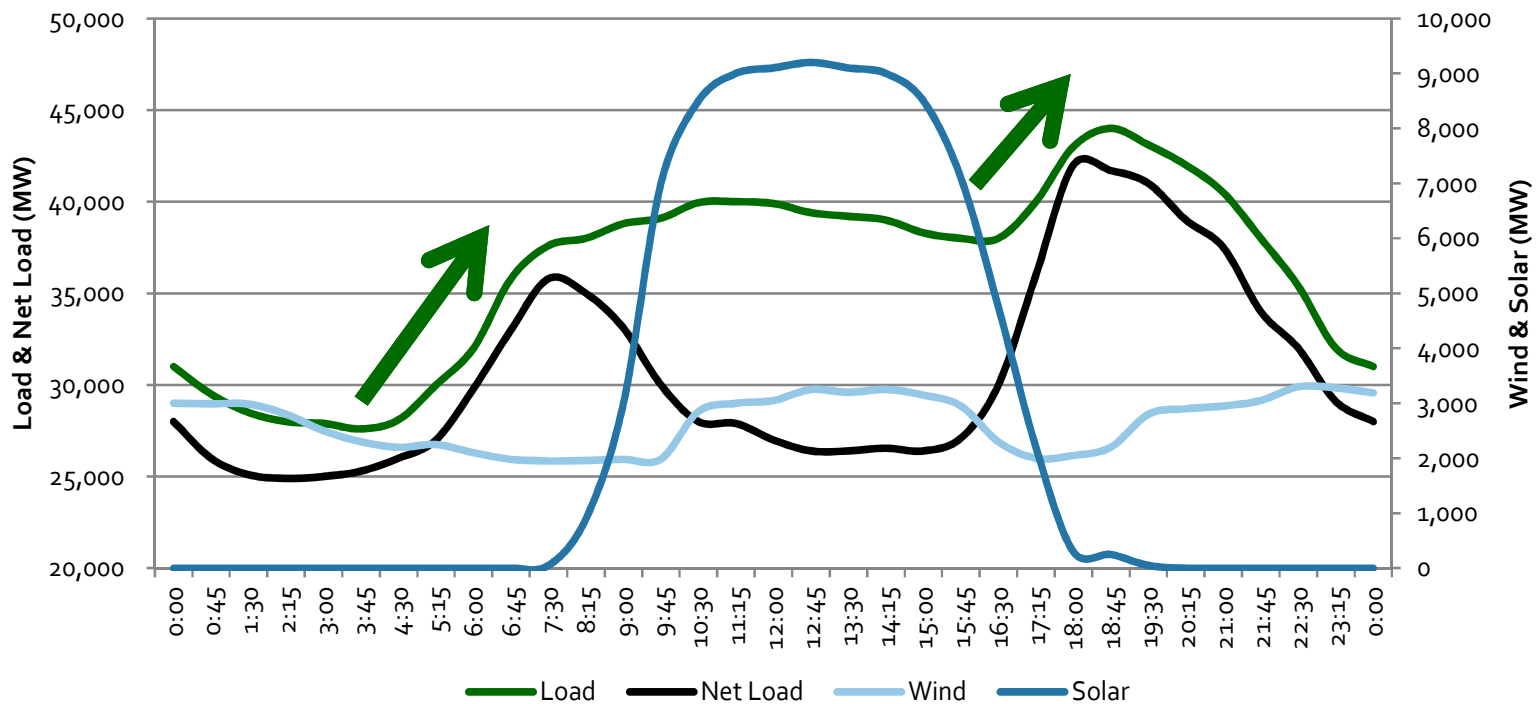
**Note:** The Elephant, Camel and Duck references correspond to the general shape of the load (elephant), solar (camel) and net load (duck) curves over the course of a day.

Source: ClearView Energy Partners, LLC, California Independent System Operator

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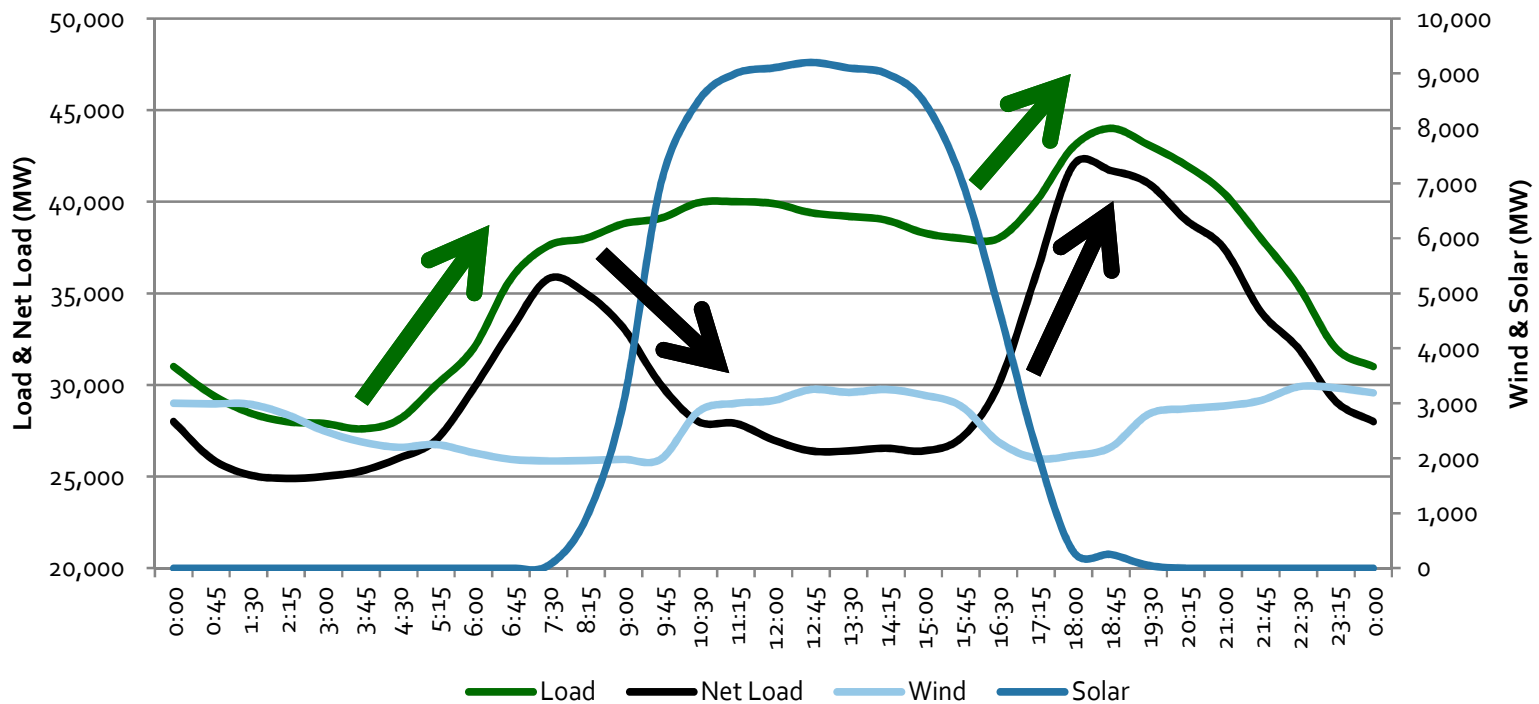
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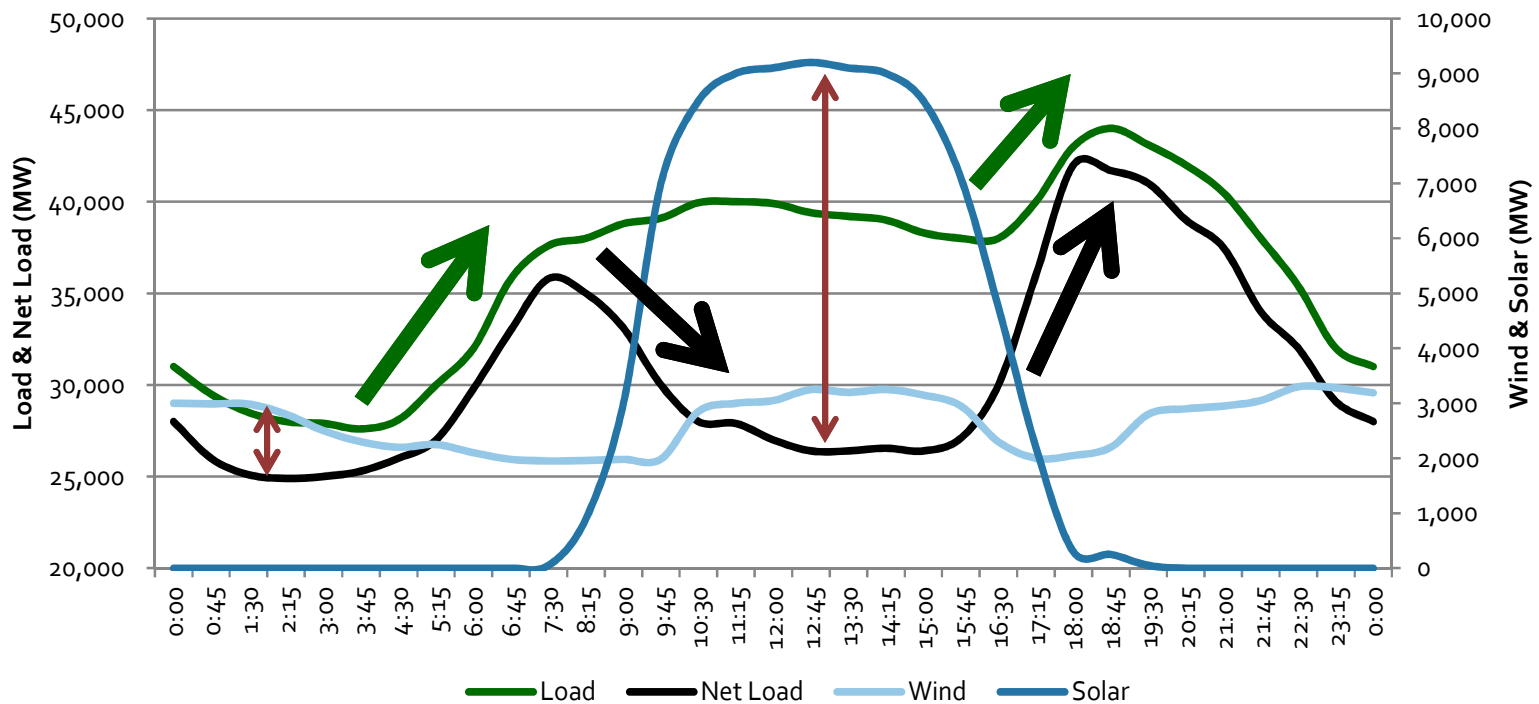
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# KEY TRENDS WE SEE



- ▼ Policy-supported renewables have already changed the U.S. power portfolio
- ▼ Aggressive state policies favor decentralized/distributed generation (especially solar)
- ▼ Long-standing energy efficiency programs continue
- ▼ Affordable natural gas has given rise to new gas/electric coordination issues
- ▼ Environmental activists oppose a wide variety of energy infrastructure (attacking the “doors” by which energy moves to end users)

Source: ClearView Energy Partners, LLC

# DOE'S *QUADRENNIAL ENERGY REVIEW*

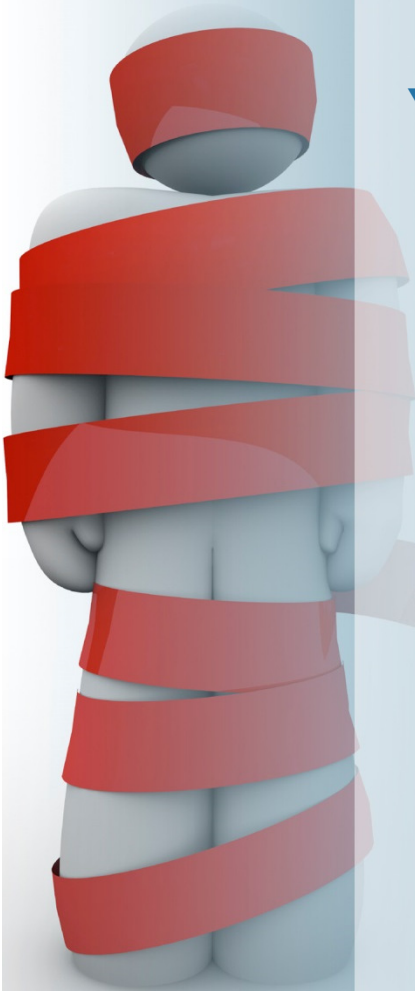


- ▼ Annual transmission spending has likely peaked
- ▼ Favors “grid of the future” to support decentralized/distributed generation over central station power/transmission
- ▼ Swap/augment national SPR with regional petroleum product reserves (RPPRs)
- ▼ Pipeline investment overshadowed by stopping GHG leaks in distribution system?
- ▼ “Resilience” the new watchword in infrastructure (h/t Superstorm Sandy)
- ▼ Addresses shared infrastructure and the need to process permits efficiently and effectively

Source: ClearView Energy Partners, LLC



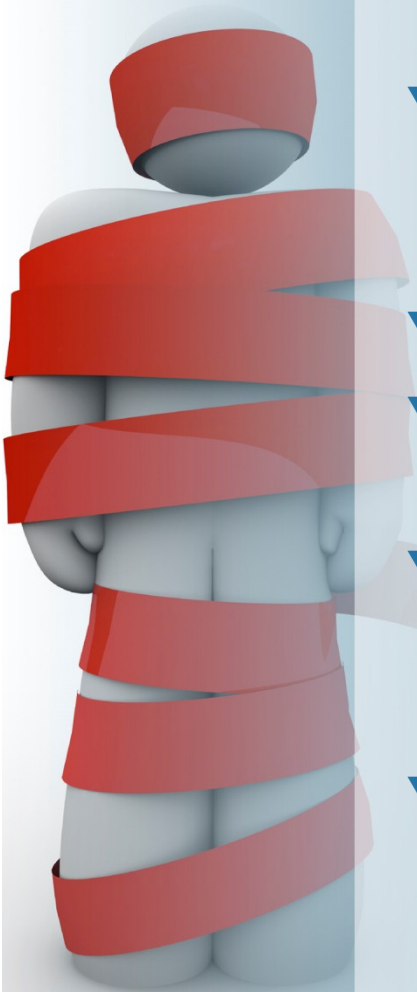
# CEQ'S RE-PROPOSED GHG NEPA GUIDANCE



- ▼ Would modify environmental reviews under the *National Environmental Policy Act* (NEPA)
  - Proposes a minimum threshold for quantitative analysis of GHG emissions (25,000 Mt/Y CO<sub>2</sub>e)
  - Recommends programmatic environmental impact statements (EIS) where appropriate
  - Monetary cost-benefit analyses encouraged (not required), as is use of federal social cost of carbon
  - Offsets may be contemplated as mitigation
  - Qualitative analysis needed when quantification is impractical
  - Agencies retain “substantial discretion”
  - Should be applied to “on-going” reviews

Source: ClearView Energy Partners, LLC

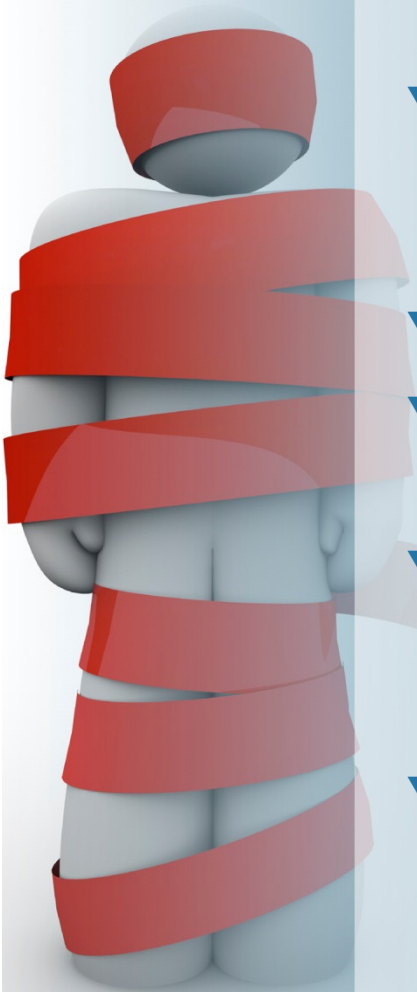
# REPRESENTATIVE COMMENTS OPPOSING



- ▼ Inconsistent with NEPA itself, Executive Order 13604, and Supreme Court precedent – EIS/EA as disclosure document, not a decision document
- ▼ Risks “Analysis Paralysis”
- ▼ Reviews risk being expensive and too broad in scope to be useful in decision making
- ▼ Extended reviews could frustrate *Clean Power Plan* compliance plans by slowing natural gas delivery investment
- ▼ Programmatic reviews for transmission lines are unnecessary because of the vetting that precedes their selection in regional processes

Source: ClearView Energy Partners, LLC

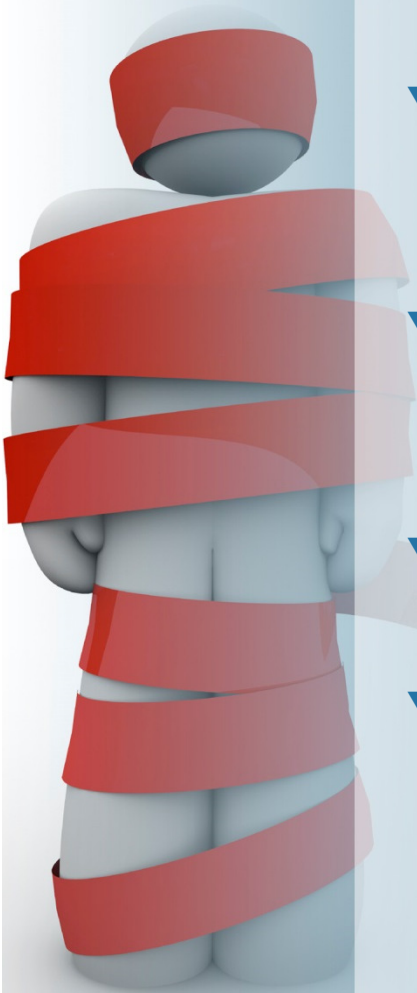
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Source: ClearView Energy Partners, LLC

# SOME COMMENTS SEEK *MORE* REVIEW



- ▼ All projects should have GHG emissions quantified and analyzed, not just those above 25,000 Mt/Y CO<sub>2</sub>e
- ▼ The alternative with the fewest GHG emissions should be selected, even if that is the “no action” alternative – Just say no! (Keystone XL?)
- ▼ Alternatives should also be evaluated for potential GHG impact
- ▼ Cost-benefit analysis should consider even *higher social cost of carbon estimates*, and use multipliers for methane emissions

Source: ClearView Energy Partners, LLC



# EPA'S CARBON POLLUTION STANDARD



- ▼ New natural gas plants
  - 1,000 lbCO<sub>2</sub>/MWh = natural gas combined cycle or combined heat and power
- ▼ Coal-fired and other fossil power plants
  - 1,400 lbCO<sub>2</sub>/MWh = ultra-supercritical pulverized coal + carbon capture and sequestration or integrated gasification combined cycle (*maybe*) and natural gas prices \$6.95-8.47/MMBtu vs. incumbent NGCC and \$8.41-9.93 /MMBtu v. new NGCC

Source: ClearView Energy Partners, LLC

# EPA's *CLEAN POWER PLAN*



- ▼ Individual state targets (lbCO<sub>2</sub>/MWh or tons/Y)
- ▼ Compliance begins 2022 through 2030
- ▼ Trading programs recommended
- ▼ State implementation plans due 9/6/2016
- ▼ Final state plans due 9/6/2018
- ▼ Bogey constructed from Building Blocks  
**based on regional averages**
  - BB1 – coal-plant efficiency upgrades
  - BB2 – gentler re-dispatch to existing natural gas
  - BB3 – *incremental utility-scale* renewables

Source: ClearView Energy Partners, LLC

# GOING FROM PROPOSAL TO FINAL



- ▼ More coal retired (between 12 and 15 GW, as compared to between 2 and 17 GW)
- ▼ Slower gas re-dispatch constrains natural gas demand growth
- ▼ Renewables have higher starting base (157 GW versus 107 GW)
- ▼ Renewables play larger role 17 to 20 GW, instead of 1-10 GW
- ▼ “At-risk” nuclear removed
- ▼ Energy efficiency assumptions removed

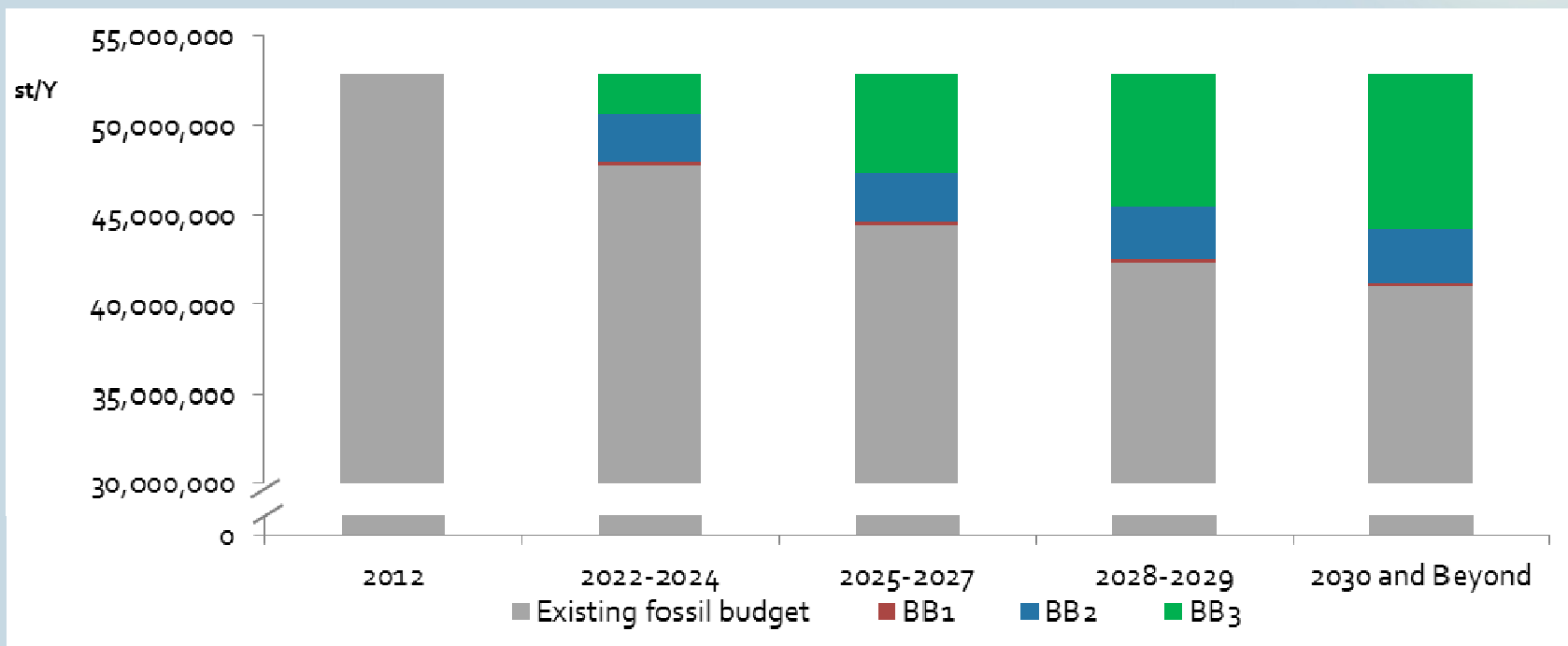
Source: ClearView Energy Partners, LLC

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# USING BLOCKS TO SET THE TARGETS



A Hypothetical of How EPA Derived Oklahoma's Mass-based Target



Source: ClearView Energy Partners, LLC



# EPA's *CLEAN POWER PLAN*

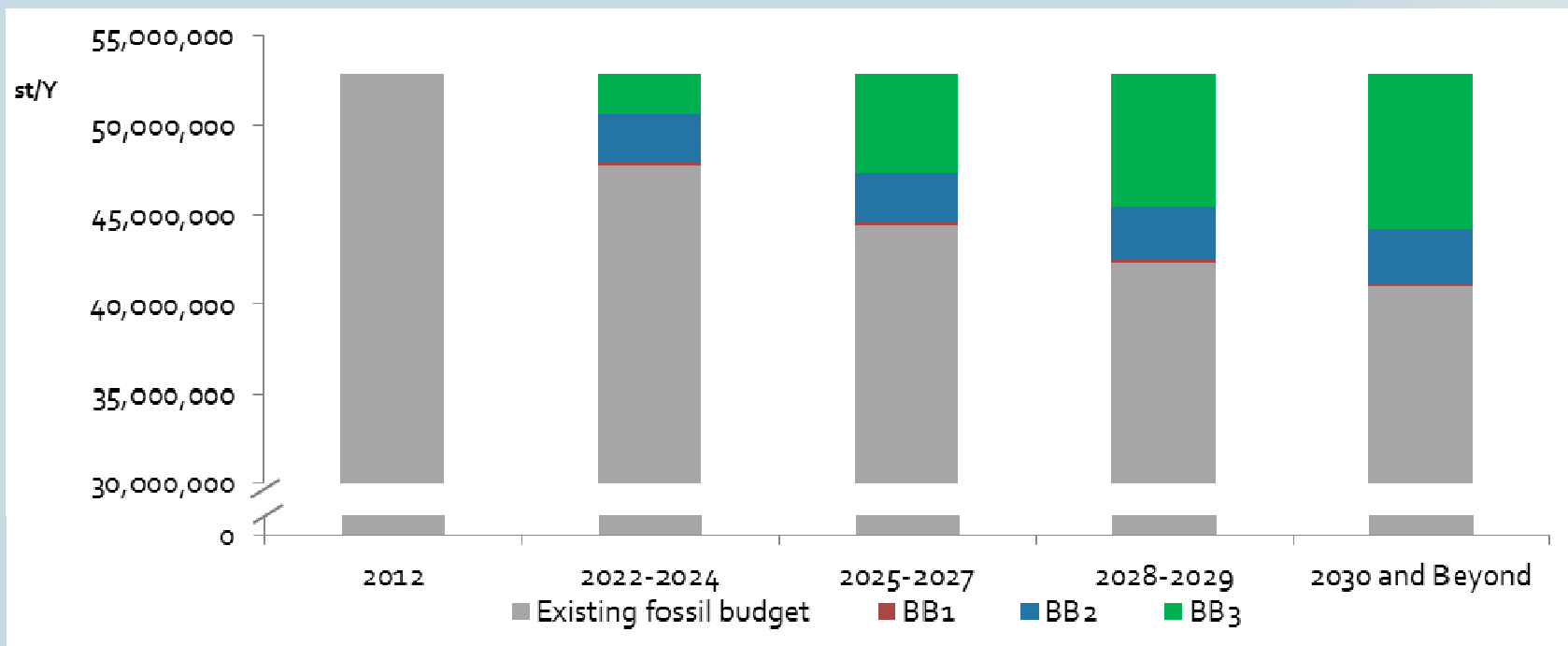


- ▼ Compliance options (any/all of the below...)
  - Energy efficiency – use less
  - Distributed renewables – more no-carbon generation works too
  - Storage – manage intermittent sources
  - CHP and/or biomass – average emissions down
  - New nuclear – if you can and want to pay for it
  - New gas plants – you probably need to “offset” them given EPA’s assumptions in your targets

# USING BLOCKS TO SET THE TARGETS



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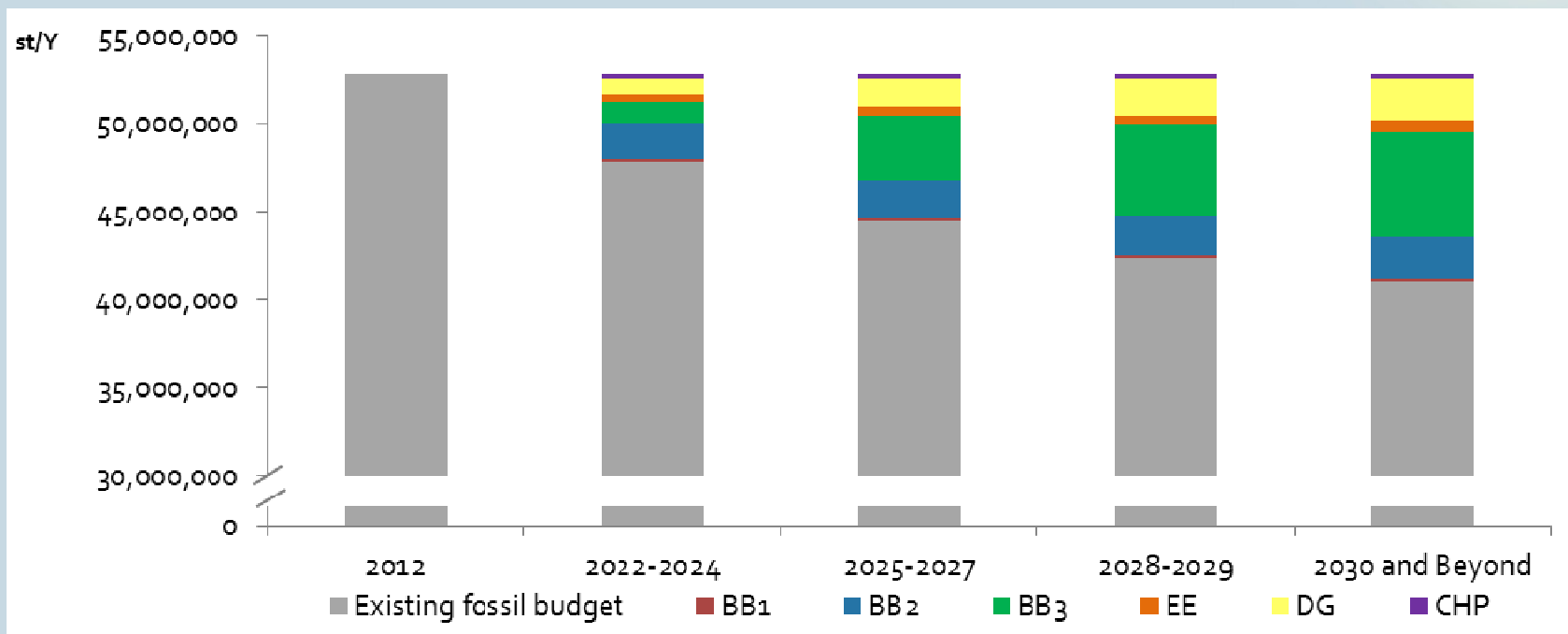


Source: ClearView Energy Partners, LLC

# PLAYING WITH BLOCKS... AND LEGOS?



A Hypothetical of Oklahoma's Potential Options Under CPP

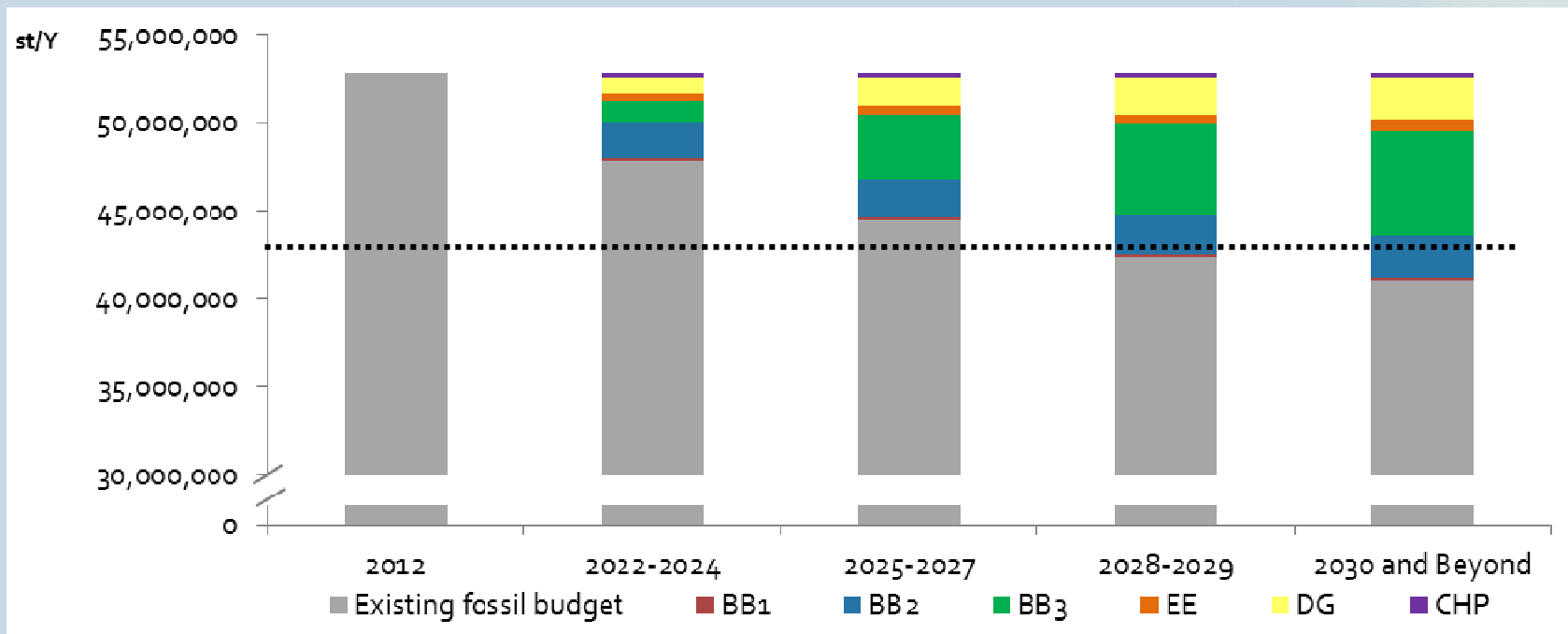


Source: ClearView Energy Partners, LLC

# PLAYING WITH BLOCKS... AND LEGOS?



## A Hypothetical of Oklahoma's Potential Options Under CPP

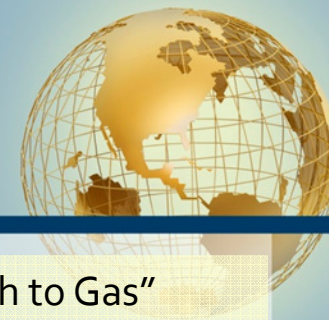


EPA projects 2020 OK's emissions "without CPP"  
43.8 million short tons CO<sub>2</sub>/Y

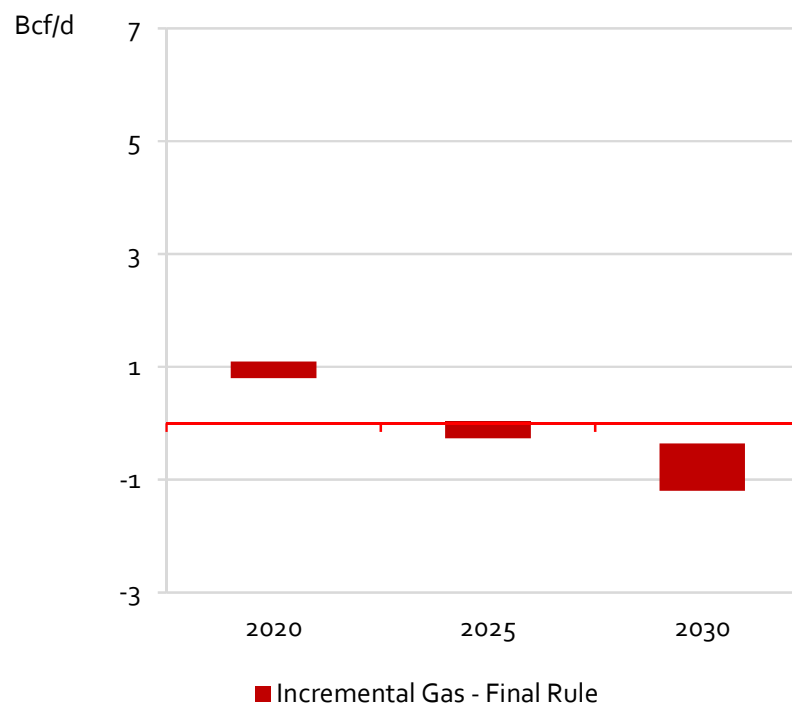
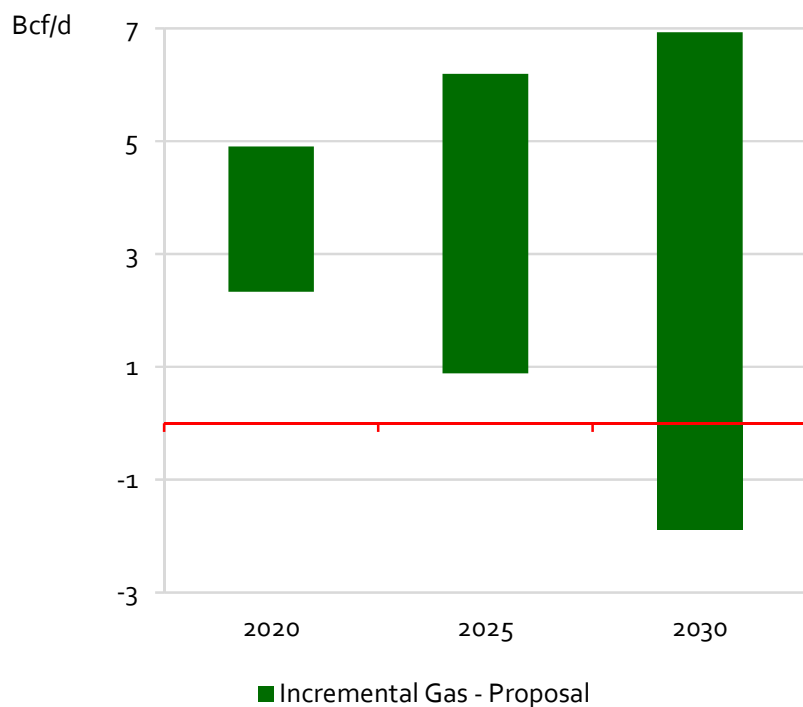
Source: ClearView Energy Partners, LLC



# THE "GREEN SQUEEZE" ON NATURAL GAS



Natural Gas in the Final *Clean Power Plan* – EPA Projects an End to the "Rush to Gas"



**Notes**

<sup>1</sup> Sources: *Final Existing Unit Rule Technical Support Document* spreadsheet, *Final Clean Power Plan*, *Final Clean Power Plan Regulatory Impact Analysis*

<sup>2</sup> Sources: *Proposed Clean Power Plan Technical Support Document* spreadsheets, *Rate-to-Mass Technical Support Document*, *Proposal Regulatory Impact Analysis*

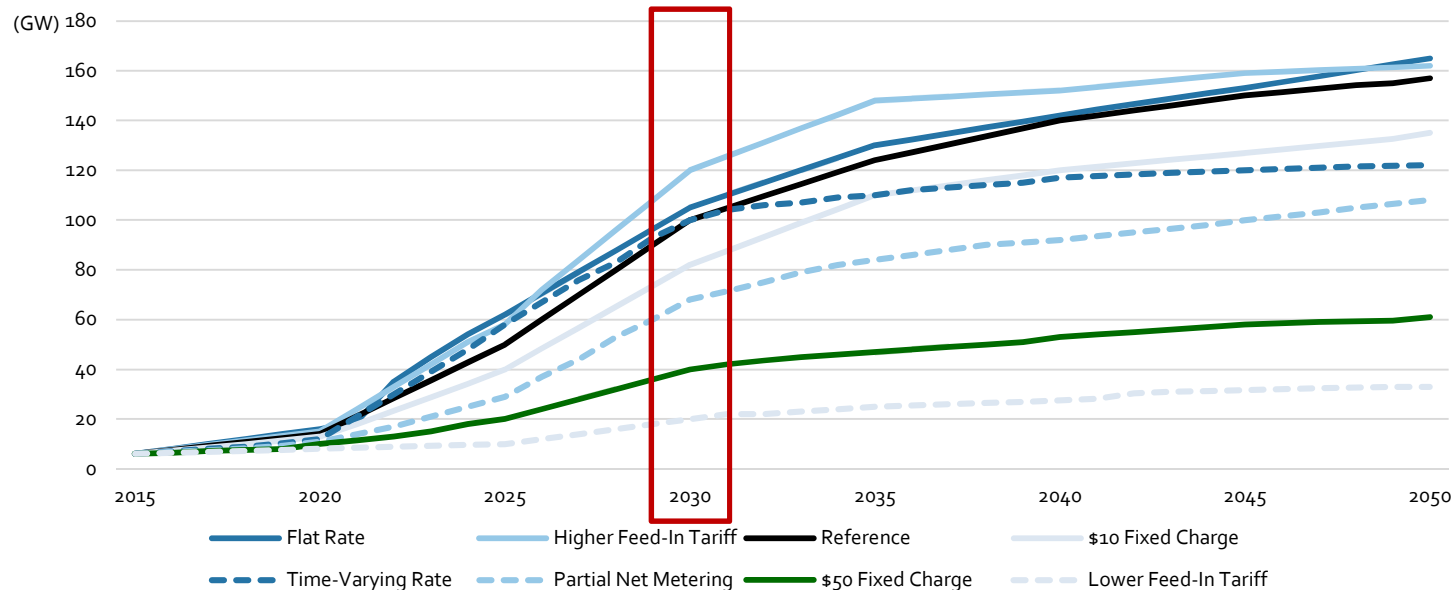
<sup>3</sup> Low and high cases represent the minimums and maximums, respectively, of the two-block (state and regional), "Option 1" state and regional and "Option 2" state and regional configurations as projected by EPA.

Source: ClearView Energy Partners, LLC using EPA data as of August 3, 2015

# DISTRIBUTED GENERATION



Even with Metering Reform, Growth Promises to be Impressive (and Exceed CPP Needs?)



**Notes:**

- Reference case (black line) projects deployment based on the continuation of the current U.S. mix of flat rates, time-varying rates and demand charges.
- Flat rate (dark blue) projects deployment based on all residential and commercial customers on flat rates.
- Higher feed-in tariff (light blue) projects deployment based on all solar DG generation being compensated at \$0.15/kWh (U.S. residential average rate is \$0.126/kWh and U.S. commercial average rate is \$0.103/kWh). Feed-in Tariffs are not common in the U.S.
- \$10 fixed charge (gray) projects deployment based on the reference case, but with all residential rates adjusted with an additional \$10 monthly charge.
- Time-varying rates (dotted dark blue) projects deployment based on all residential and commercial customers on existing time-varying rates.
- Partial net metering (dotted light blue) projects deployment based on all excess solar DG generation being compensated at the avoided cost rate.
- \$50 fixed charge (green) projects deployment based on the reference case but with all residential rates adjusted with an additional \$50 monthly charge.
- Lower feed-in tariff (dotted gray) projects deployment based on all solar DG generation being compensated at \$0.07/kWh (U.S. residential average rate is \$0.126/kWh and U.S. commercial average rate is \$0.103/kWh).

Source: Lawrence Berkeley National Labs

# OZONE NAAQS: MIDDLE GROUND?



- ▼ EPA finalized new National Ambient Air Quality Standards (NAAQS) for Ozone October 1 at 70 parts per billion (ppb)
  - Compromise between industry preference to retain current 2008 targets of 75 ppb and health/enviro advocates target of 60-65 ppb
  - EPA still to define degrees of nonattainment (will finalize in 2016)
  - At minimum, new sources require offsets
  - Natural gas producers concerned about offset availability and cost
  - Potential new requirements on existing sources

Source: ClearView Energy Partners, LLC

# OZONE: DEGREE MATTERS



## SIP Components for Areas Out of Attainment with Ozone Programs

POTENTIAL DEGREE OF NONATTAINMENT	YEARS TO COMPLY	OFFSET RATIO FOR NSR PERMITS	MAJOR SOURCE PERMIT THRESHOLD	MAJOR MODIFICATION PERMIT THRESHOLD	SIP REQUIREMENTS
Marginal (71-81 ppb)	3	1.1 : 1	100 tpy	40 tpy	Emissions inventory; NSR permit program; periodic inventories
Moderate (81-93 ppb)	6	1.15 : 1	100 tpy	40 tpy	Meet all Marginal requirements; reduce VOCs 3% annually years 1-6; RACT catch-up
Serious (93-105 ppb)	9	1.20 : 1	50 tpy	20 tpy	Meet all Moderate requirements; reduce VOCs 3% annually for years 7 to 9; enhanced monitoring requirements
Severe (105-165 ppb)	15	1.30 : 1	25 tpy	20 tpy	Meet all Serious requirements; emission fee penalties on sources if area does not meet required reductions
Extreme (< 166 ppb)	20	1.50 : 1	25 tpy	20 tpy	Meet all Severe requirements; emission fee penalties on sources if area does not meet required reductions

*Abbreviations used:*

**SIP** – State Implementation Plan; **NSR** – New Source Review; **VOCs** – Volatile Organic Compounds; **RACT** – Reasonably Available Control Technology.

Source: ClearView Energy Partners, LLC projections based on 2008 NAAQS intervals



# OZONE NAAQS: LINKING CO<sub>2</sub> TO HEALTH



- ▼ The U.S. Global Climate Change Research Program's April 2015 draft Climate and Health Assessment found a warming climate has the potential to make ozone control and attainment more challenging
- ▼ Creates link between long-established science on ozone/asthma and climate agenda (carbon as pollution, climate in crisis)
- ▼ Substantial outreach between Administration and health/education entities

Source: ClearView Energy Partners, LLC

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# THE GO-FORWARD CONSTRAINTS



- ▼ **GHG Legacy:** The language has changed.
- ▼ **EPA Regulations:** Strict rules could see lighter enforcement touch or another twist of the ratchet.
- ▼ **Technology:** Regionalization gives way to decentralization, will we leave stranded assets behind (again)?
- ▼ **Infrastructure:** A victim of the “buying local” trend? Moving away from economies of scale?

Source: ClearView Energy Partners, LLC

# THE GO-FORWARD CONSTRAINTS



- ▼ Natural resources
  - Natural gas availability and deliverability
  - Earth, wind, water, fire?
  - Export policy
- ▼ Electricity market
  - Decentralization instead of regionalization
  - *Clean Power Plan*
  - Demand response under review at Supreme Court could limit opportunities
  - State contracts under review at Supreme Court could change who is in charge of power policy

Source: ClearView Energy Partners, LLC



# 2016 ELECTIONS – HOW STICKY IS THE LEGACY?



- ▼ *Clean Power Plan, Ozone NAAQS*
  - A Republican may campaign against carbon standards but may wind up living within them
  - Revocation difficult, selective enforcement easier
  - Courts tend to frown on political somersaults
  - Once an asset owner has a plan, revocation can be counterproductive (remember the *Clean Air Interstate Rule* in 2008?)

Source: ClearView Energy Partners, LLC

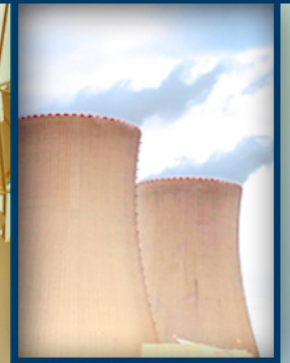


# 2016 ELECTIONS – HOW STICKY IS THE LEGACY?



- ▼ *CEQ GHG Guidance*
  - Much easier to rescind/change
- ▼ *Quadrennial Energy Review*
  - Different focus, different priorities in subsequent iterations
- ▼ *Tax policy?*
  - Tax reform could put many energy “subsidies” in play for both renewables and conventional sources
- ▼ *Public sentiment*
  - Carbon *pollution*
  - Climate *crisis*
  - Health *concerns*

Source: ClearView Energy Partners, LLC



# QUESTIONS?

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