

Analysis of a 50 Percent by 2035 National Renewable Electricity Standard

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June 26, 2019

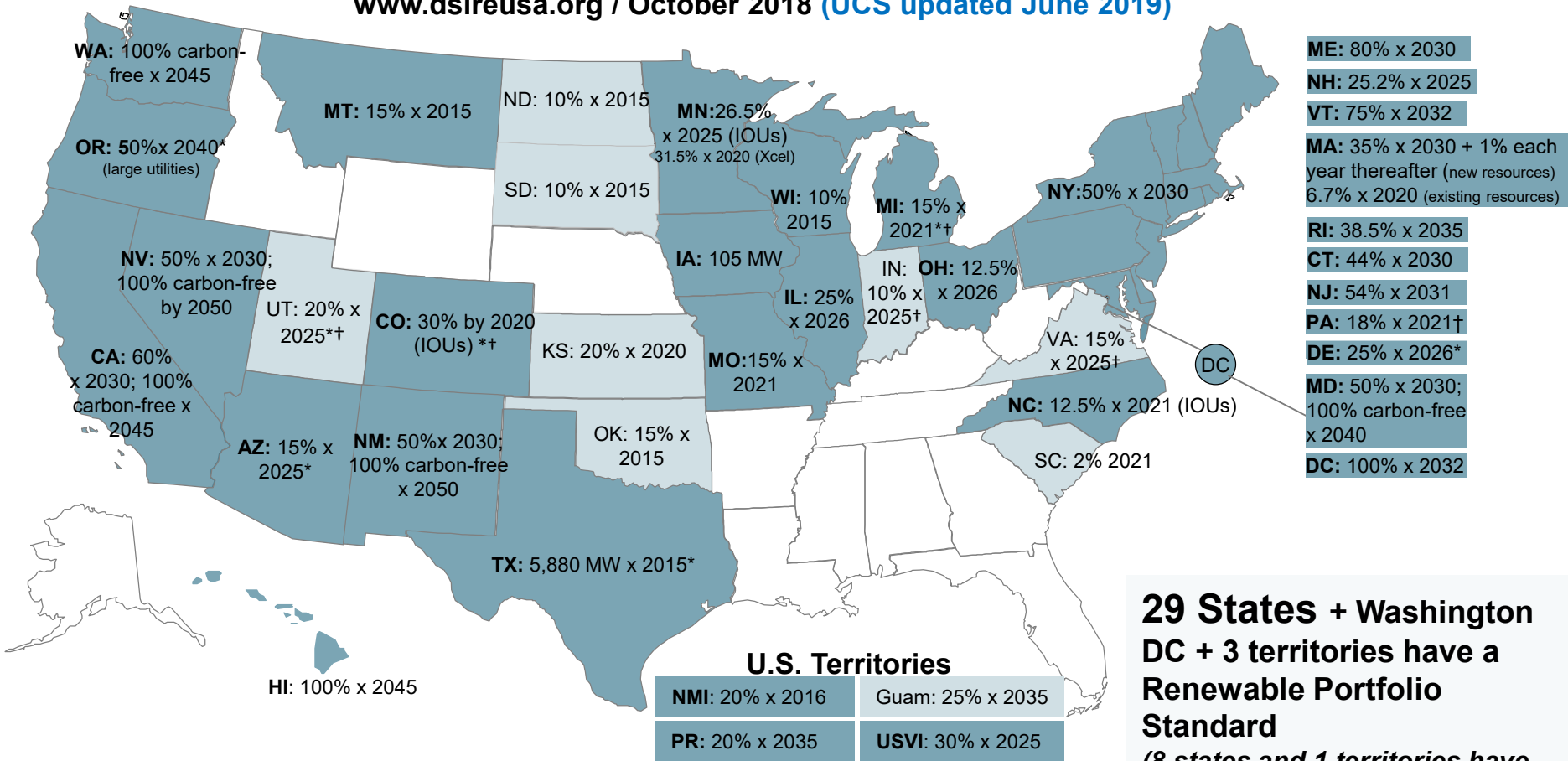


Why a 50% by 2035 National RES?

- Renewables have grown from 9% of US electricity generation in 2007 to 18% in 2018, or less than 1%/year
- 50% RES would more than double that rate through 2035 and double total renewables compared to BAU
- 50% by 2035 national RES targets are consistent with:
 - NREL's 2018 national 80% by 2050 RES modeling
 - IPCC 2018 1.5 C Report
 - Evolved Energy Research May 2019 350 ppm Pathways for the US report
 - UCS 2016 U.S. Power Sector in a Net-Zero World report
 - RES policies adopted by leading states

Renewable Portfolio Standard Policies

www.dsireusa.org / October 2018 (UCS updated June 2019)



29 States + Washington DC + 3 territories have a Renewable Portfolio Standard
(8 states and 1 territories have renewable portfolio goals)

Renewable portfolio standard * Extra credit for solar or customer-sited renewables
 Renewable portfolio goal † Includes non-renewable alternative resources

UCS National RES Analysis

- Examines the impact of a 50% by 2035 national Renewable Electricity Standard (RES) on the U.S. electricity sector
- Uses the Regional Energy Deployment System (ReEDS) model developed by the National Renewable Energy Laboratory (NREL)
- Uses cost and performance assumptions from EIA's Annual Energy Outlook 2018 and NREL's Annual Technology Baseline 2017 mid-case projections

Scenarios

Business as Usual: no new state or federal policies beyond May 2019

50 percent by 2035 RES key provisions:

- Requires retail electricity providers with annual sales of 1 million MWh or more to increase annual renewable generation by 1.5% of total retail sales in 2020, 2% in 2021-2029, and 2.5% in 2030-2035.
- Smaller retail providers below 1 million MWh annual sales only have to meet half of this annual increase
- Eligible resources: wind, solar, geothermal, biomass, landfill gas, ocean/tidal, and incremental hydro
- Compliance demonstrated through national renewable energy credit trading primarily focused on new renewables
- Provides extra credits for projects built on Native American lands or impacted communities (economically distressed areas negatively affected by pollution or high employment due to a decline in coal).
- Allows utilities with renewables exceeding 60% of sales to opt-out
- Preserves integrity of state RES programs and voluntary market

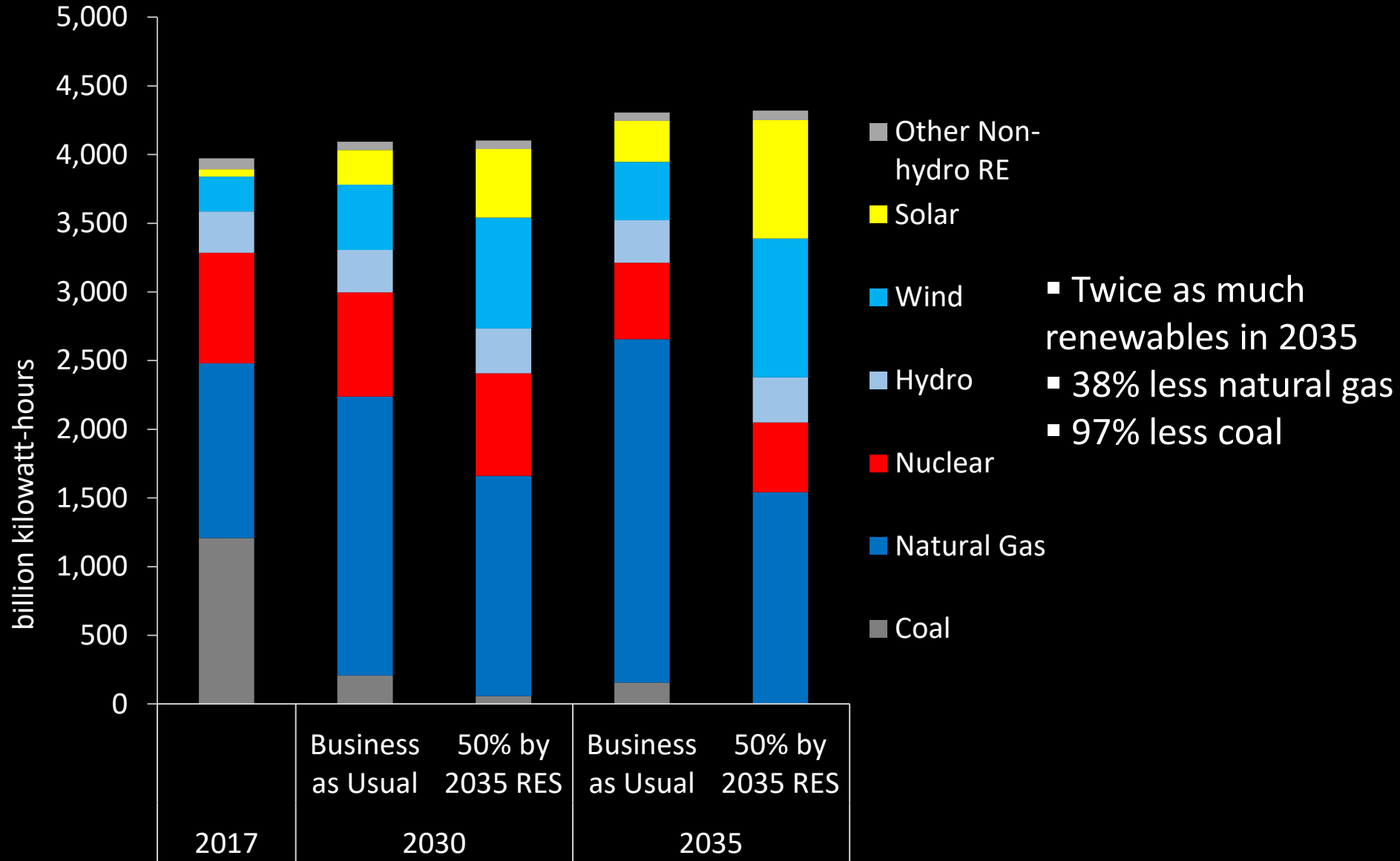
Key Takeaways

50% by 2035 national RES is achievable and provides important economic, consumer and climate benefits:

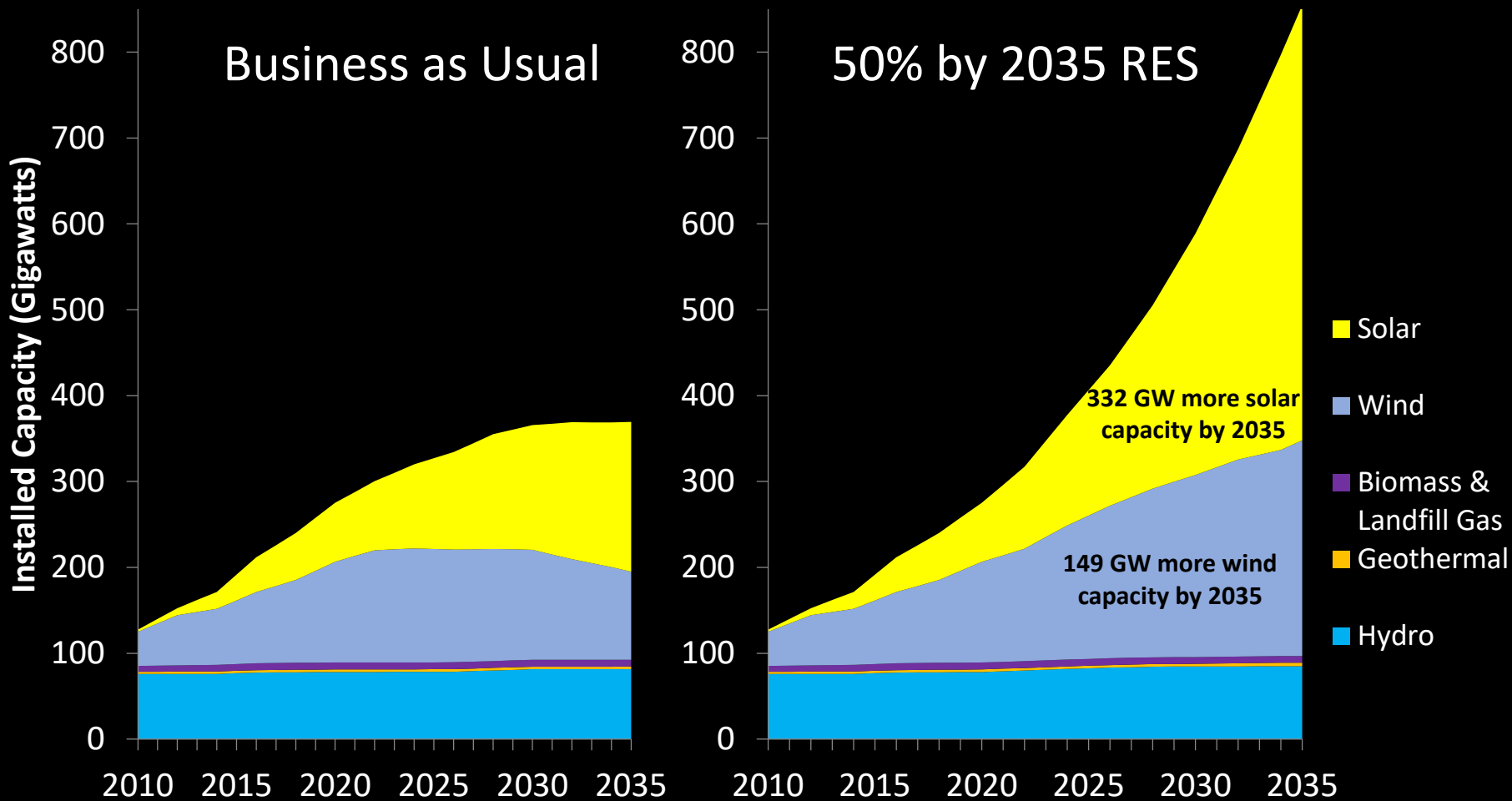
- \$374 billion in cumulative new capital investments from 2020-2035
- Over \$34 billion (0.6%) in cumulative savings on consumer electricity and natural gas bills from 2020-2035
- 46% reduction in power sector CO₂ emissions in 2035



A national RES reduces the risks of an overreliance on natural gas



A national RES spurs investment in wind and solar



Renewable energy drives economic development*



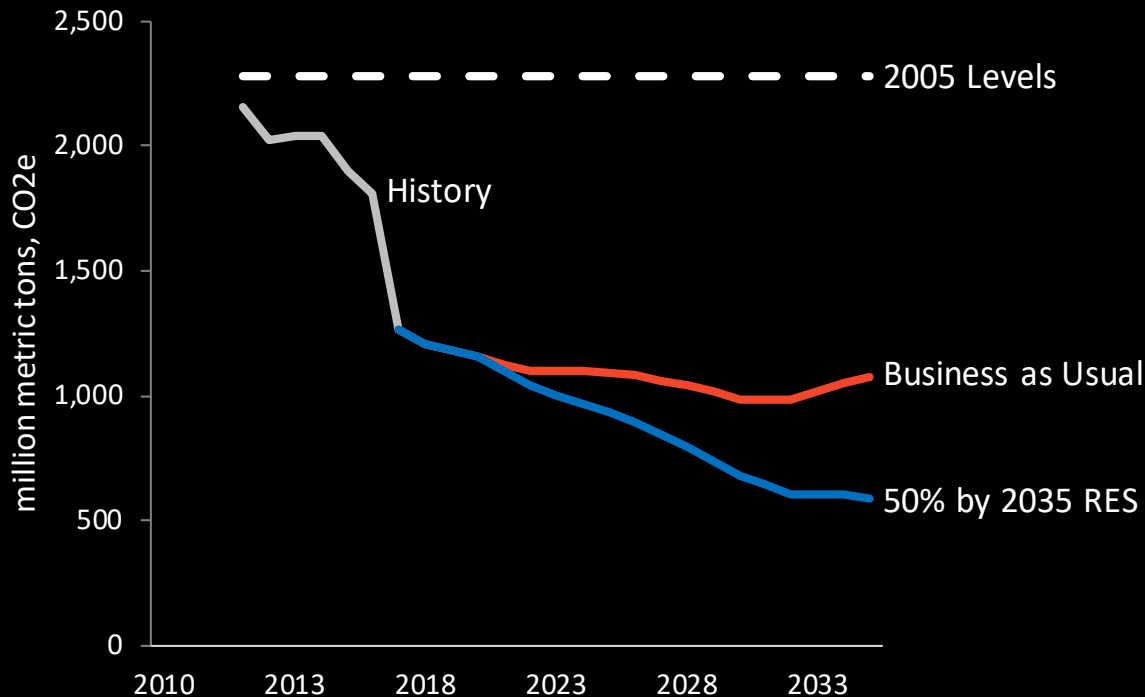
Cumulative benefits 2020-2035:

- \$374 billion in new capital investment; \$244 billion more than BAU
- \$5.6 billion in property taxes to local governments
- \$1.4 billion in wind power land lease payments to rural landowners
- \$12 billion in annual operation and maintenance payments in 2035

*All results reflect net economic benefits of a 50% by 2035 national RES compared with Business As Usual. Cumulative results are NPV 2017\$ using a 7% discount rate. Property tax payments are assumed to total 0.41% of capital investment and land lease payments are assumed to be \$3,000/MW/year based on 2015 DOE Wind Vision study.

Investing in Renewable Energy Cuts Carbon

U.S. Power Sector CO₂ Emissions

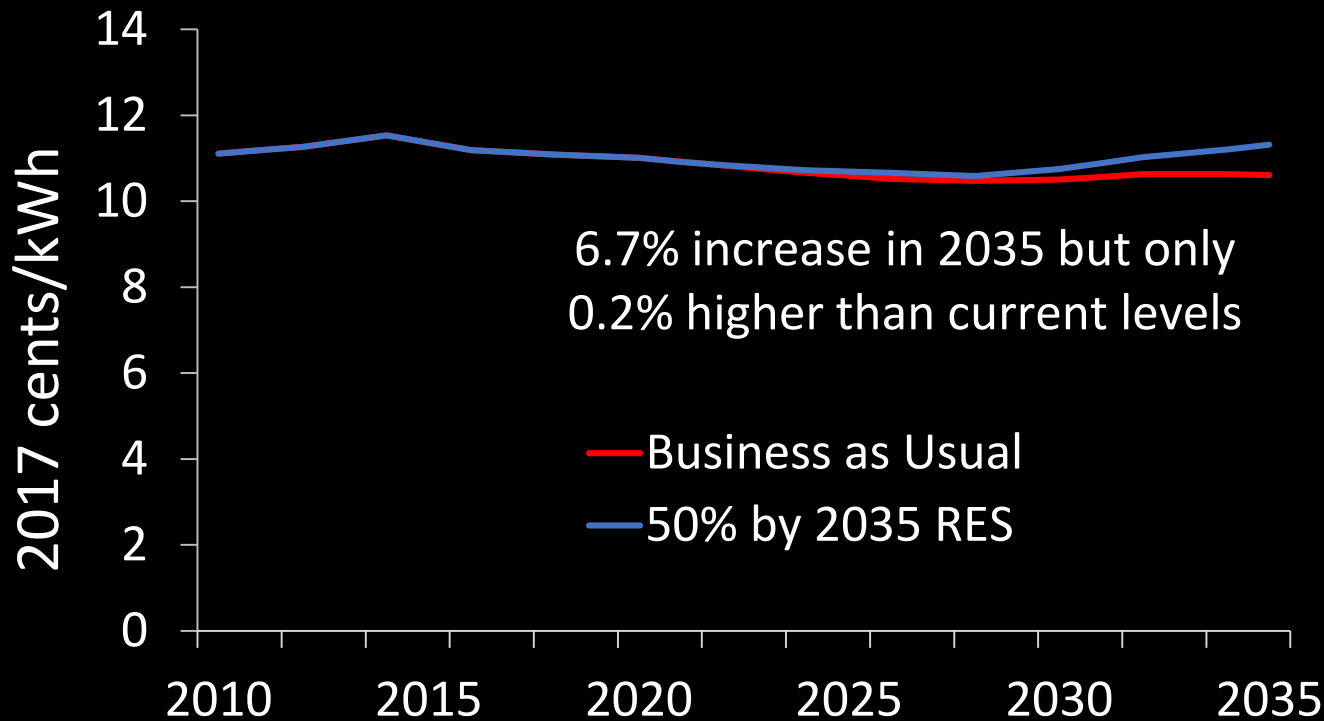


- 46% below BAU by 2035
- \$140 billion in climate and public health benefits* in 2035
- 4.2 billion metric tons of cumulative CO₂ savings from 2020-2035

*Based on the U.S. government's estimates for the social costs of carbon, which includes the dollar damages to public health and the environment caused by emission of an additional metric ton of CO₂ in a given year.

A 50 Percent by 2035 National RES is Affordable

Average Retail Electricity Prices



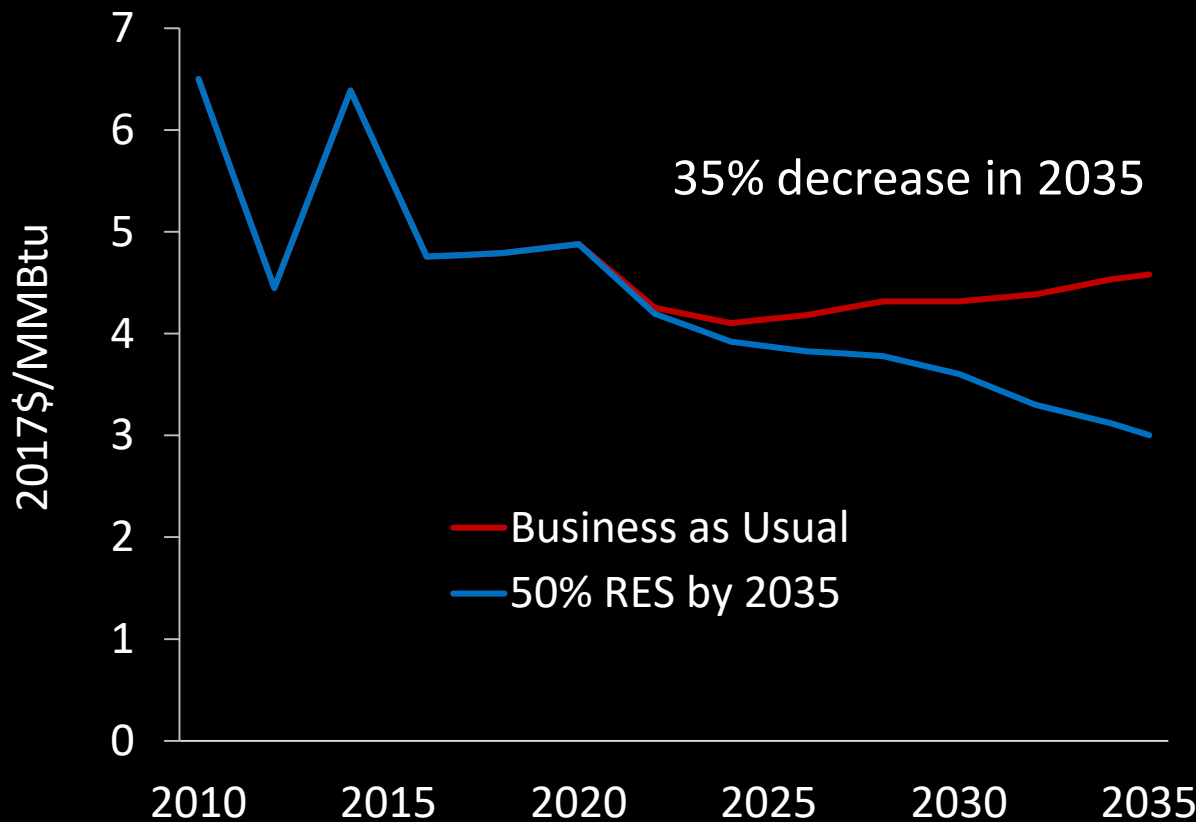
6.7% increase in 2035 but only 0.2% higher than current levels

— Business as Usual
— 50% by 2035 RES

Slightly higher costs of investing in renewables are offset by reductions in fossil fuel costs, leading to a modest increase in electricity prices.

Diversifying Power Supplies with Renewable Energy Reduces Natural Gas Prices

Average Power Sector Natural Gas Prices



By increasing competition and diversifying power supplies, a 50% by 2035 national RES helps lower natural gas prices for the power sector and consumers.

Increasing renewable energy can provide modest savings on consumer energy bills*

- \$34 billion (0.6%) in cumulative net savings on consumer electricity and natural gas bills from 2020-2035
- For a typical household, \$18 in higher annual electricity bills in 2030, and \$51 higher in 2035
- For the nearly 50% of U.S. homes that heat with natural gas, typical annual natural gas bills are nearly \$43 lower in 2030, and \$94 lower in 2035
- Industrial and commercial consumers of natural gas also see lower bills



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* Cumulative results are NPV 2017\$ using a 7% discount rate. A typical household is assumed to consume 600 kWh/month, and homes that primarily use natural gas for heat consume 59.63 MMBtu/year

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