Vermonters for a Clean Environment

CHANGING VERMONT'S RENEWABLE ENERGY STANDARD

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TESTIMONY TO HOUSE ENVIRONMENT & ENERGY COMMITTEE
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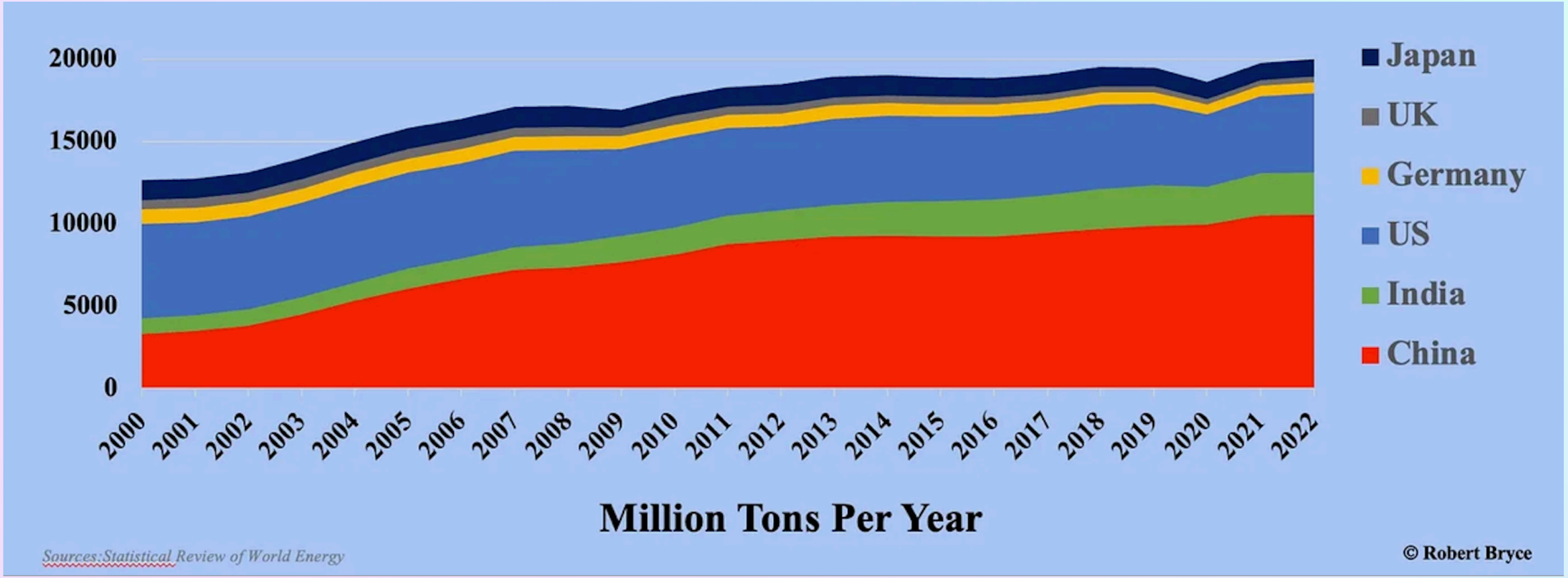
CO_2 EMISSIONS IN SIX LARGEST ECONOMIES

2000 TO 2022



CHANGE IN CO_2 EMISSIONS IN THE SIX LARGEST ECONOMIES

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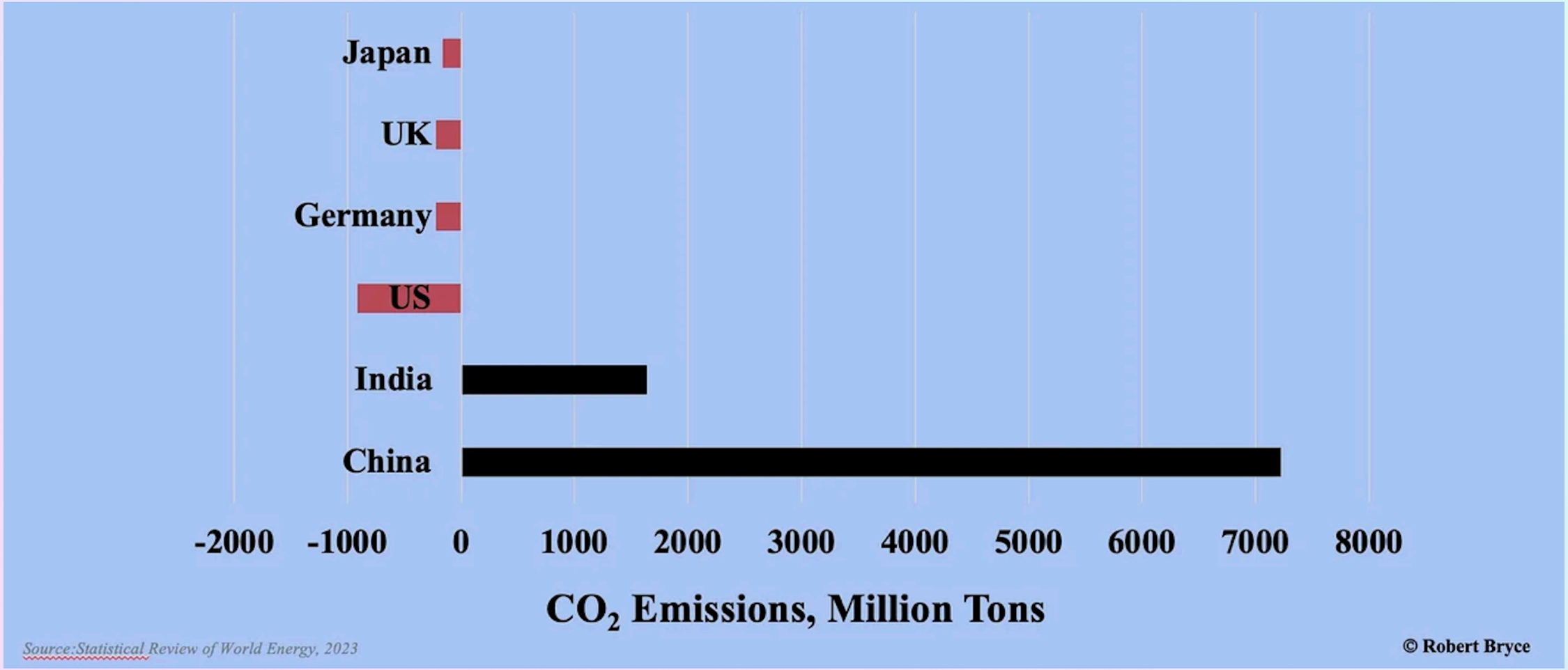
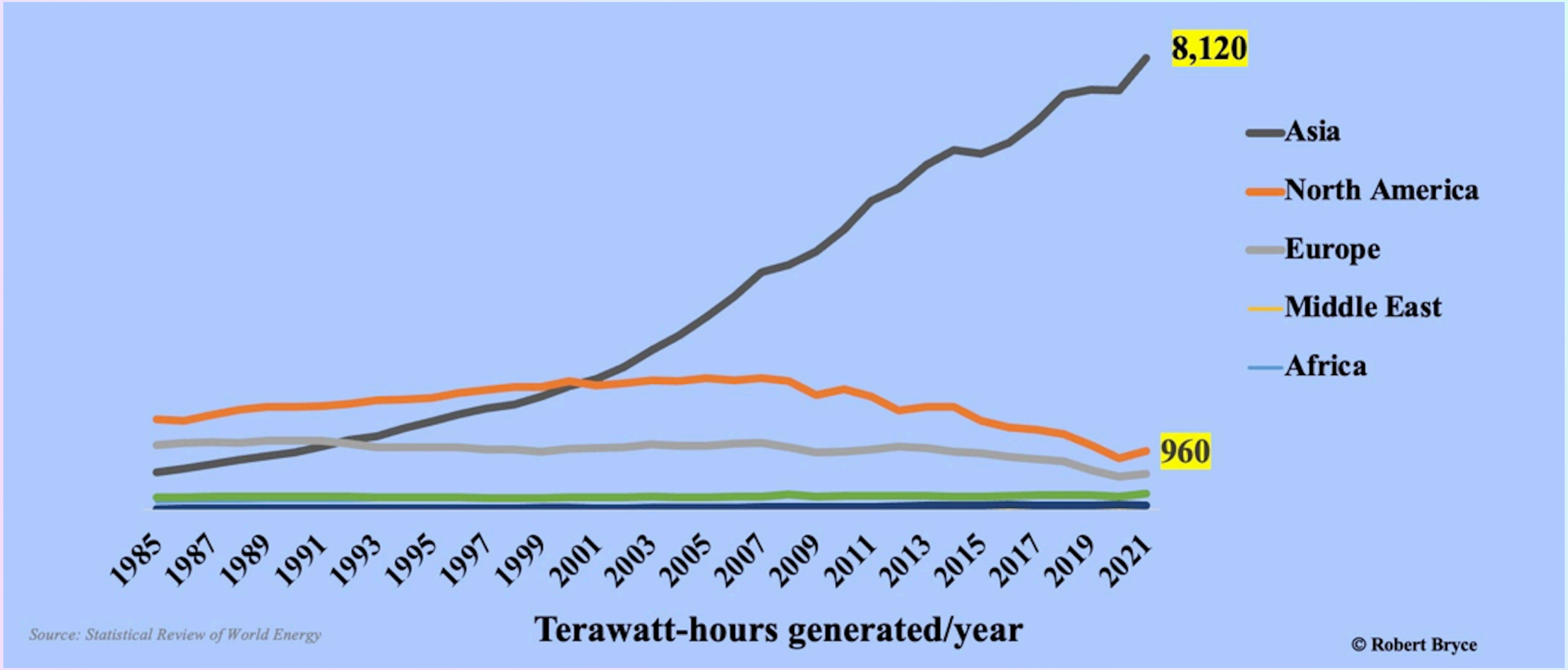


GLOBAL COAL-FIRED GENERATION

1985 - 2002



India plans to double its coal production, but it ignores climate threat

The move to invest more in the world's dirtiest fuel – one of the biggest contributors to global warming – may seem counterintuitive for the South Asian country, which is highly vulnerable to climate impacts.

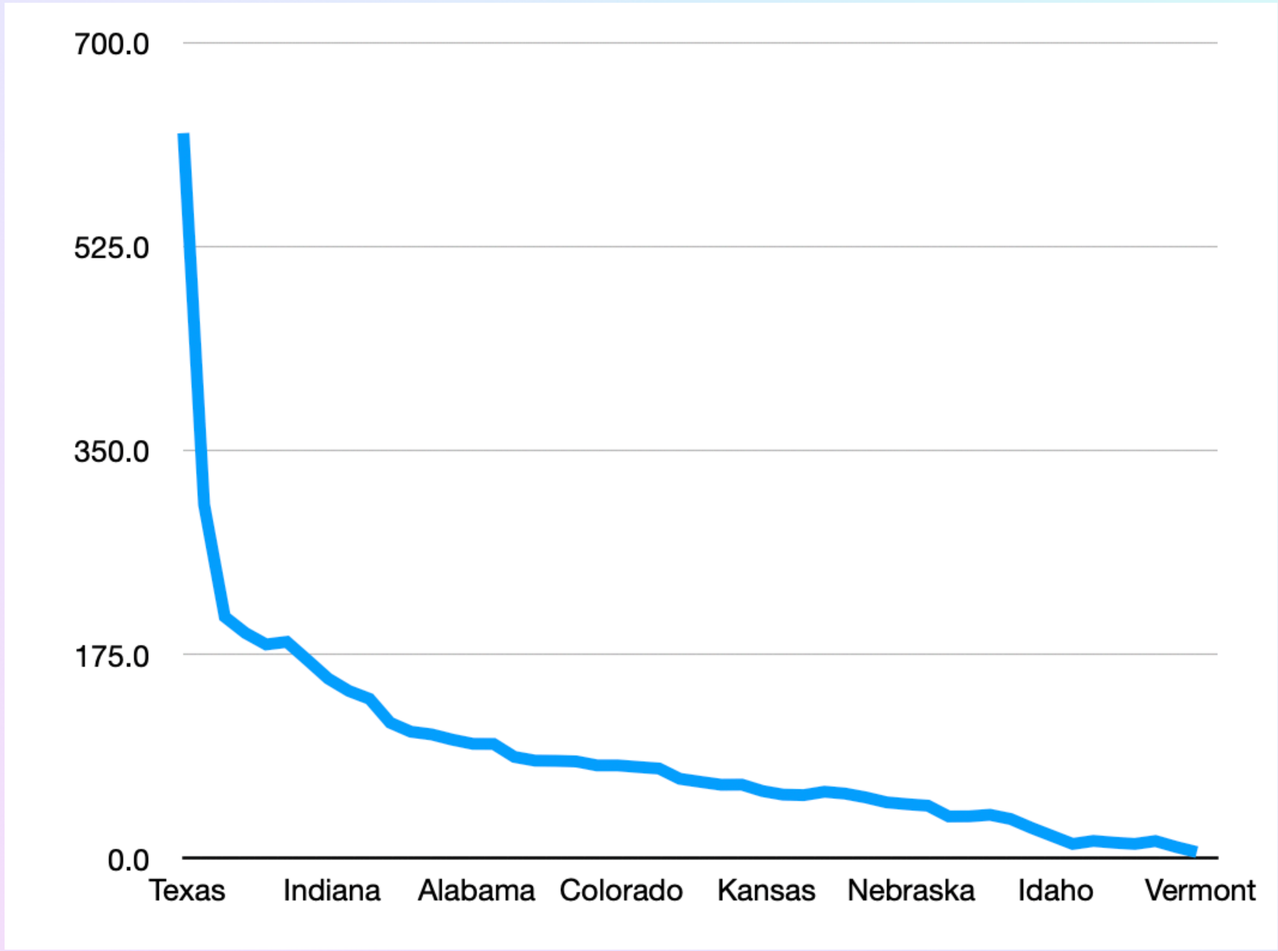
Bloomberg
Updated On Jan 10, 2024 at 08:35 AM IST

As climate diplomats at COP28 in Dubai debated an agreement to transition away from fossil fuels last December, India was facing another energy conundrum: It needed to build more power capacity, fast.

https://energy.economictimes.indiatimes.com/news/coal/india-plans-to-double-its-coal-production-but-it-ignores-climate-threat/106682592

ENERGY-RELATED CO_2 EMISSIONS BY STATE

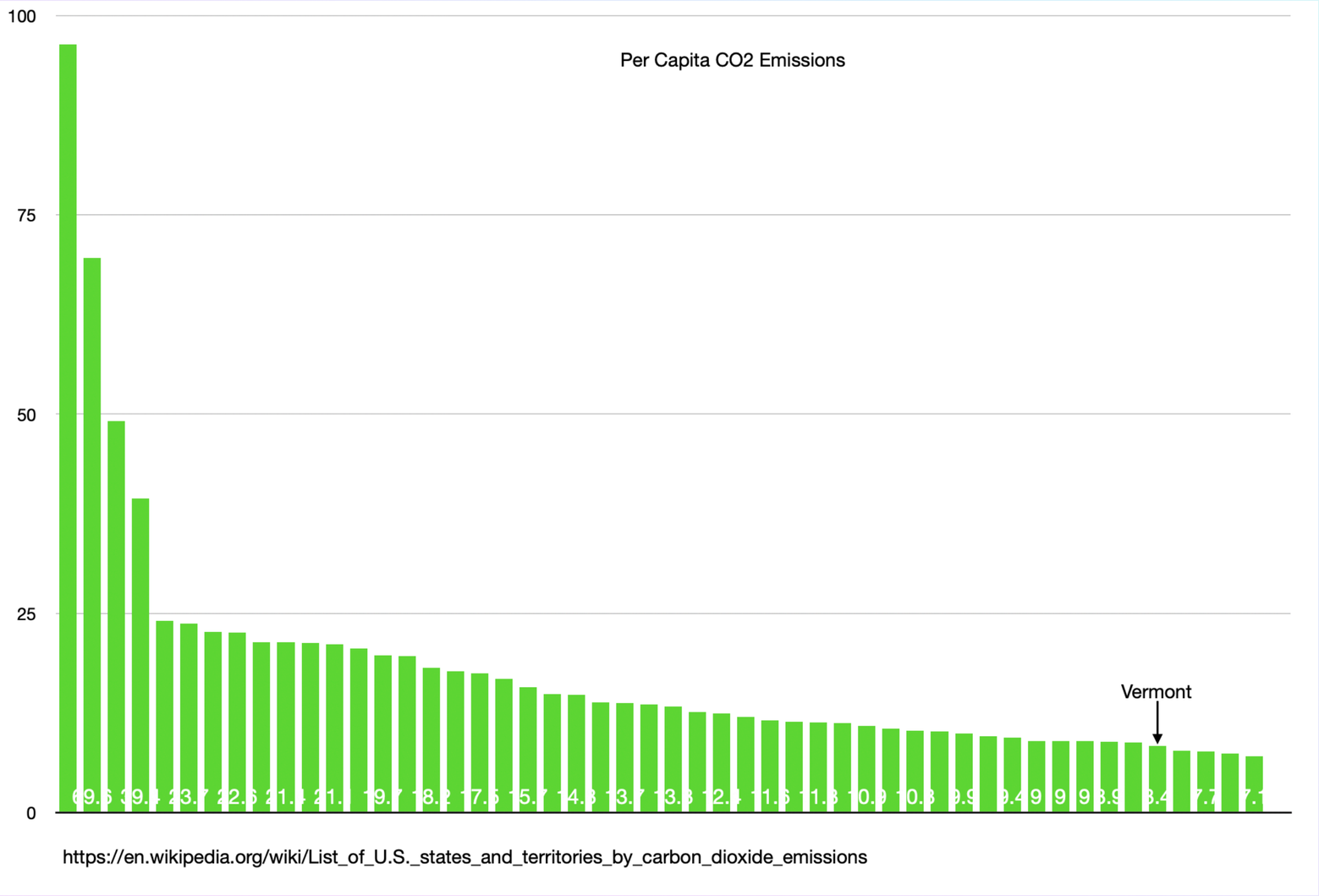
TEXAS IS THE STATE WITH THE HIGHEST CO_2 EMISSIONS. VERMONT HAS THE LOWEST CO_2 EMISSIONS.



Texas	622.4
California	303.7
Florida	207.3
Pennsylvania	193.4
Louisiana	183.6
Ohio	185.8
Illinois	170.2
Indiana	154.3
New York	143.7
Michigan	136.9
Georgia	116.4
Missouri	108.7
North Carolina	106.4
Kentucky	101.9
Alabama	98.3
Virginia	98.2
Wisconsin	87.1
New Jersey	83.9
Oklahoma	83.7
Tennessee	83.2
Arizona	79.8
Colorado	79.8
Minnesota	78.4
West Virginia	77.1
Washington	68.3
Iowa	65.7
Mississippi	63.2
South Carolina	63.3
Kansas	57.8
Arkansas	54.7
North Dakota	54.3
Utah	57.2
Wyoming	55.6
Massachusetts	52.3
Maryland	48.1
Nebraska	46.5
New Mexico	45.2
Alaska	36.0
Nevada	36.1
Oregon	37.4
Connecticut	33.8
Montana	26.2
Idaho	19.3
Delaware	12.4
Hawaii	15.0
Maine	13.5
New Hampshire	12.4
South Dakota	14.9
Rhode Island	9.8
Vermont	5.4

EIA Current as of Oct. 2022

ENERGY-RELATED PER CAPITA CO_2 EMISSIONS BY STATE - VERMONT IS FIFTH LOWEST



Wyoming	96.4
North Dakota	69.6
Alaska	49.1
Louisiana	39.4
Montana	24.1
Nebraska	23.7
Indiana	22.7
Kentucky	22.6
Mississippi	21.4
Texas	21.4
New Mexico	21.3
Oklahoma	21.1
Iowa	20.6
Kansas	19.7
Alabama	19.6
Arkansas	18.2
Missouri	17.7
Utah	17.5
South Dakota	16.8
Ohio	15.7
Pennsylvania	14.9
Wisconsin	14.8
Colorado	13.8
Minnesota	13.7
Michigan	13.6
Illinois	13.3
Delaware	12.6
South Carolina	12.4
Tennessee	12
Nevada	11.6
Virginia	11.4
Guam	11.3
Arizona	11.2
Georgia	10.9
Idaho	10.5
Hawaii	10.3
North Carolina	10.2
Maine	9.9
Florida	9.6
Connecticut	9.4
Rhode Island	9.0
New Hampshire	9.0
New Jersey	9.0
Washington	8.9
Oregon	8.8
Vermont	**8.4**
Maryland	7.8
California	7.7
Massachusetts	7.4
New York	7.1

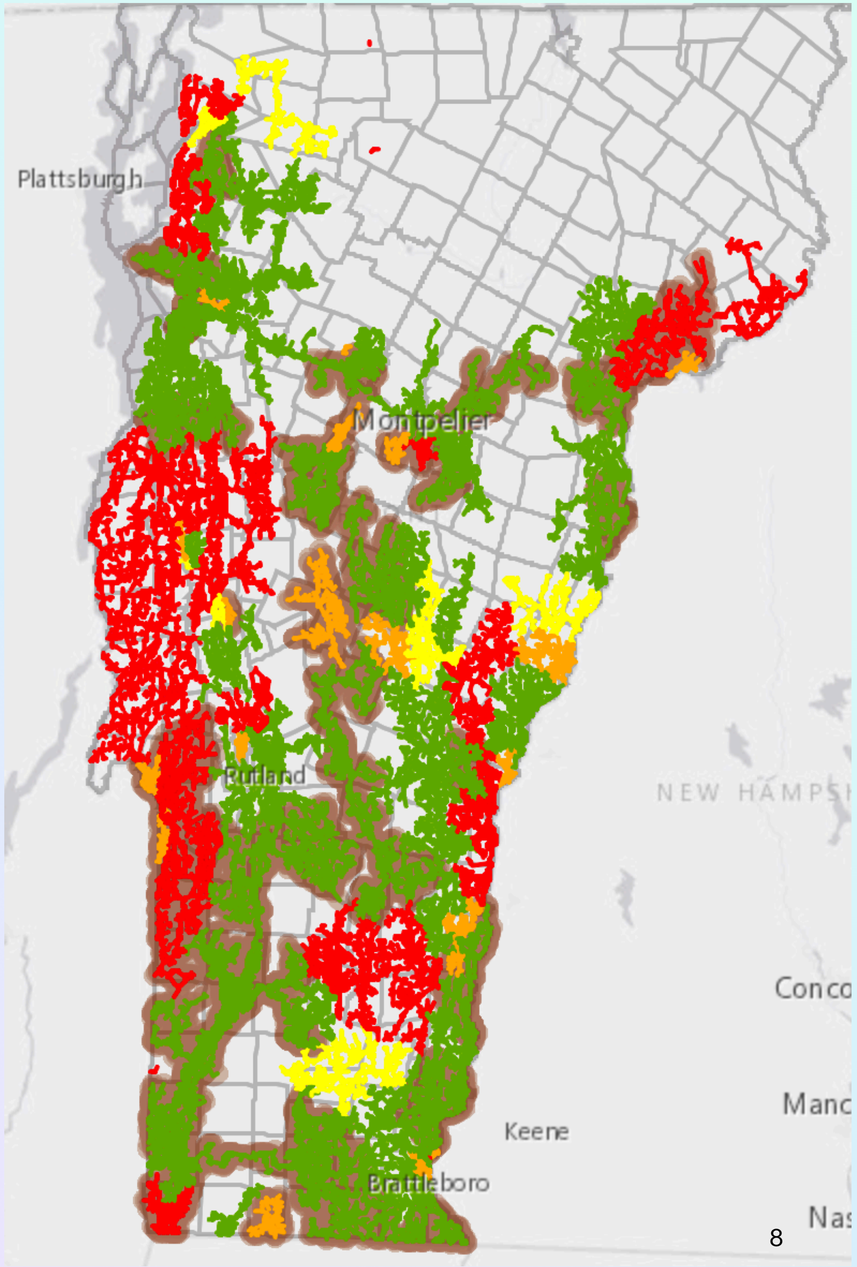
GREEN MOUNTAIN POWER

DG CIRCUIT CAPACITY PER SUBSTATION NAMEPLATE RATING

- Unrated
- Substation transformer with at least 20% capacity remaining
- Substation transformer with less than 20% capacity remaining
- Substation transformer with less than 10% capacity remaining
- Due to system limitations, interconnections on this circuit may experience higher costs and delayed interconnections

TGFOV Circuits

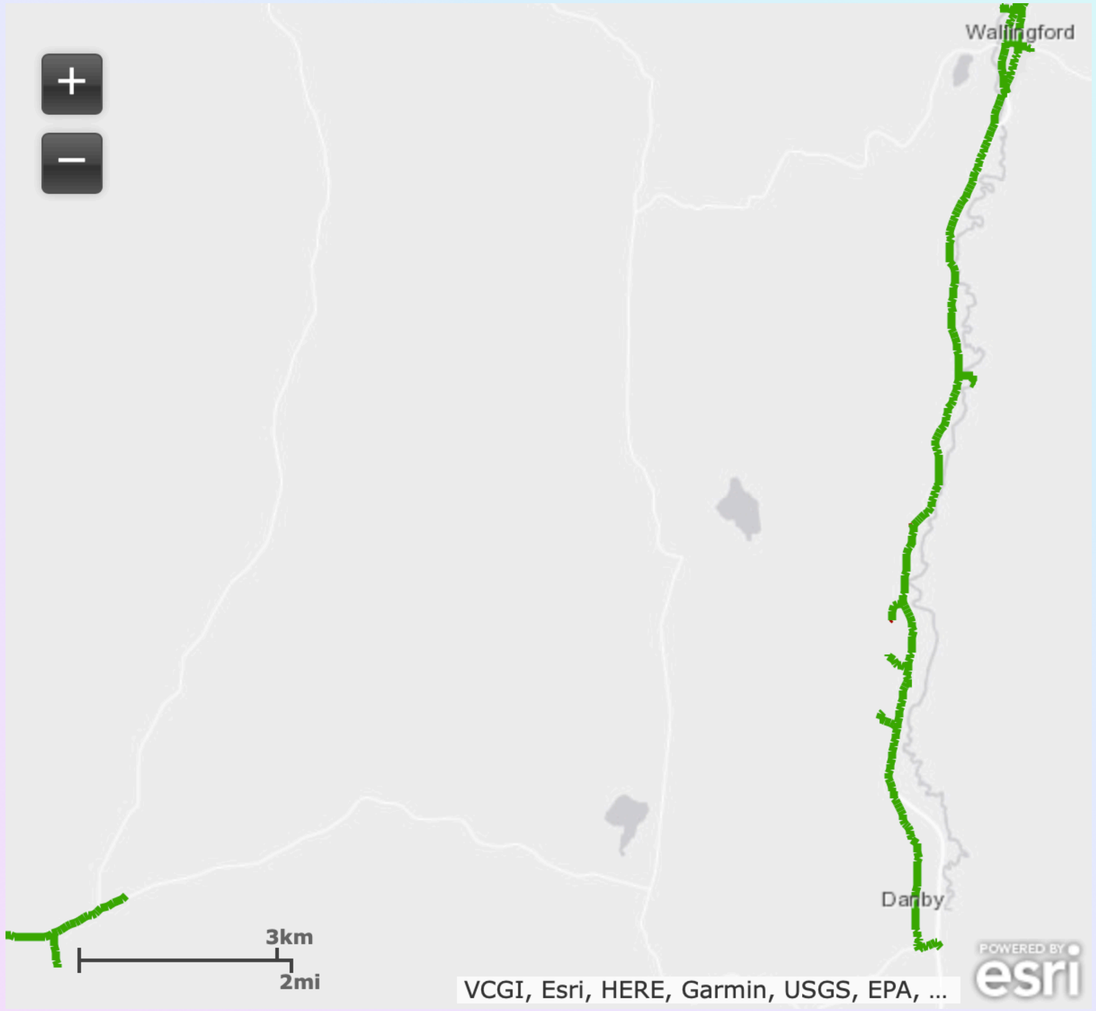
- Interconnections on these circuits subject to GMP TGFOV Tariff fee of $37 per kW of AC capacity authorized by VT PUC Docket # 19-0441-TF.



HTTPS://GMP.MAPS.ARCGIS.COM/APPS/WEBAPPVIEWER/INDEX.HTML?ID=4EAEC2B58C4C4820B24C408A95EE8956

THREE PHRASE POWER IS LIMITED

WALLINGFORD - DANBY



https://greenmountainpower.com/help/3-phase-service-vermont/

MODELED BENEFITS AND COSTS

Modeled Benefits and Costs

Value Stream	Cost or Benefit	Primary Data Source	Impact	Description
Incremental cost of resource	Cost	SEA calculations	High	Cost for resource incremental to generic, residual grid mix
Transmission integration costs	Cost	NREL	Low	Socialized transmission investments driven by shift to variable resources
Interconnection distribution system upgrades	Benefit	SEA estimates; MA Capital Investment Project (CIP) filings	Low	Of distribution interconnection costs paid for by interconnecting customer, a portion is assumed to be a benefit to load customers
Uncleared capacity value	Benefit	2021 Avoided Energy Supply Component (AESC) study	Low	VT-sited, distribution-connected projects are assumed to not bid their capacity into the FCM, instead, acting as load reducers
Reduced *share* of capacity costs	Benefit	2021 AESC	Moderate	VT-sited, distribution-connected projects that produce during the New England annual peak can reduce the portion of capacity costs paid for by Vermont
Price suppression	Benefit	2021 AESC	Moderate	Renewable resources with low marginal costs tend to drive down prices by shifting the supply curve to the right; applies to capacity, energy, and natural gas (through reduced demand for gas-generated electricity) prices
Reduced transmission costs	Benefit	2021 AESC; VT precedent	Low	Distribution-connected resources that generate energy during periods of high demand could reduce future needed transmission investments
Reduced *share* of transmission costs	Benefit	ISO-NE	Low	VT-sited, distribution-connected resources that generate energy during VT's monthly peak hours can reduce the *share* of regional transmission costs paid for by VT (cost shift to other New England ratepayers)
Reduced distribution costs	Benefit	2021 AESC; VT precedent	Low	VT-sited, distribution-connected resources that generate energy during periods of high demand may reduce future needed distribution investments
Reduced transmission and distribution losses	Benefit	2021 AESC	Moderate	Reduction in losses on T&D system
Improved generation reliability	Benefit	2021 AESC	Low	Improvements in generation due to additional capacity purchased in capacity market
Non-embedded GHG emissions	Benefit	2021 AESC	High	Value (based on social cost of carbon) of avoided GHG emissions not already captured RGGI embedded in energy prices
NOx emissions	Benefit	2021 AESC	Low	Value of avoided Nox emissions
Local pollutants	Benefit	EPA's AVERT/COBRA	Moderate	Value of avoided additional pollutants
RE development land use	Cost (not monetized)	Various		Acres of land associated with resources in RES portfolio
Fossil fuel water use	Benefit (not monetized)	Various		Gallons of water consumption and withdrawal reduced through RES portfolio

https://publicservice.vermont.gov/sites/dps/files/documents/VT%20RES%20Technical%20Analysis%20Report_DRAFT-FINAL-10.10.2023%20%28002%29.pdf

LAND USE IMPACT BY SCENARIO (ACRES)

THROUGH 2035

Tech (Location)	BAU	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Solar (In-State)	873.9	2197.8	2232.6	2197.8	2232.6	1582.0	937.0
Wind (In-State)	5.4	5.4	152.4	5.4	152.4	152.4	154.7
Hydro (In-State)	0.0	0.0	3.5	0.0	3.5	3.5	3.5
Total In-State	**879**	**2,203**	**2,388**	**2,203**	**2,388**	**1,738**	**1,095**
Solar (Out-of-State)	0.0	0.0	5301.2	0.0	5301.2	5007.3	11736.9
Wind (Out-of-State)	0.0	0.0	208.9	0.0	208.9	208.9	212.2
Hydro (Out-of-State)	0.0	0.0	63.0	0.0	63.0	63.0	64.1
Total Out-of-State	**-**	**-**	**5,573**	**-**	**5,573**	**5,279**	**12,013**

FROM THE SEA MODEL

HTTPS://STORYMAPS.ARCGIS.COM/STORIES/932BE293F1AF43C8B776FDAD24D9F071

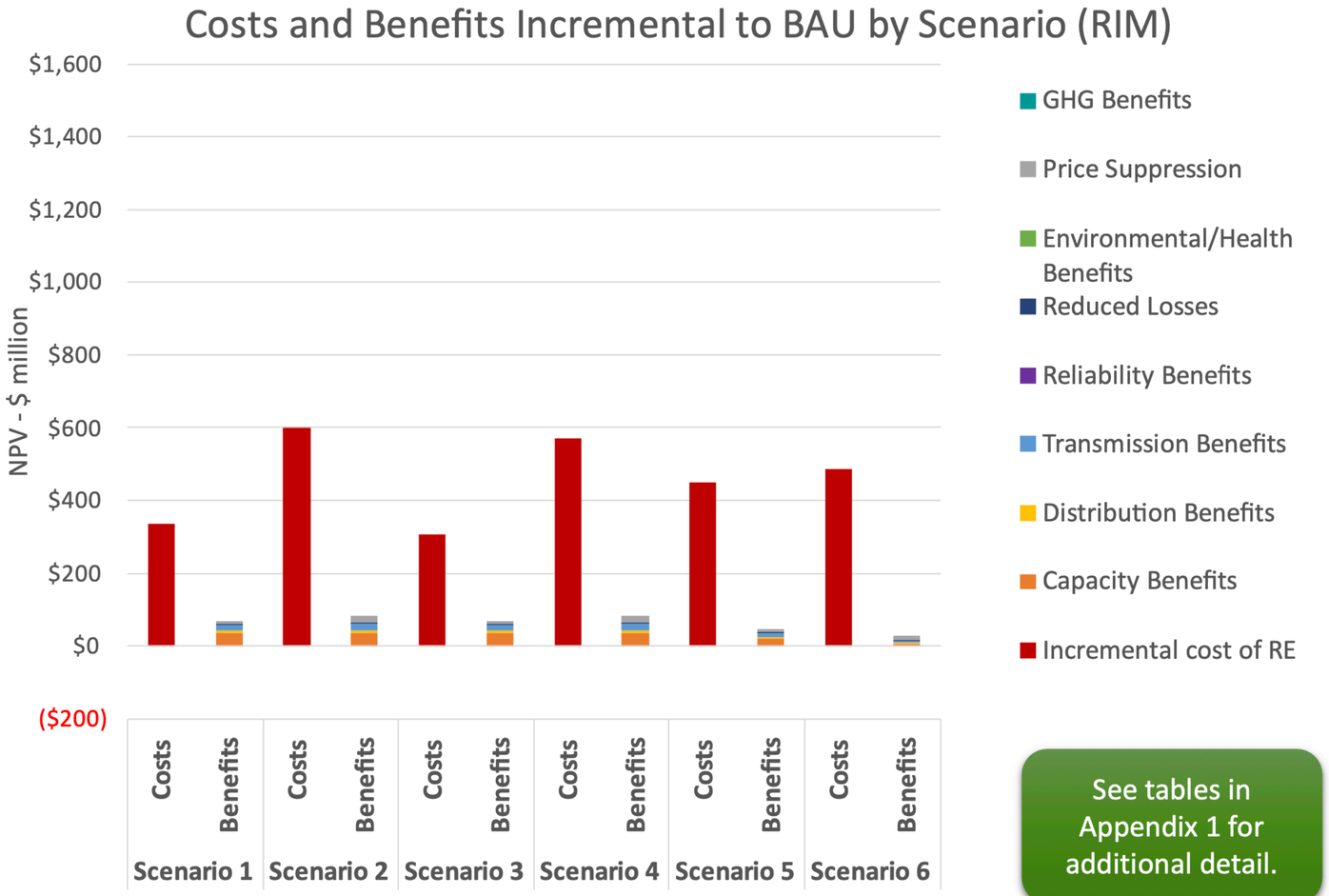
Costs & Benefits by Scenario: Incremental, RIM

Observations:

- RIM focuses exclusively on items impacting VT bills
- Excludes GHG benefits
- Price suppression benefits limited to in-state (~4% of regional benefits)
- RIM approach yields net costs under every scenario

Scenario Definitions

	Reg. Tier Target	Tier II Target	Tier I Target	Target Date	Nuclear Tier I Eligible	Biomass Tier I Eligible
BAU	0%	10%	BAU	2032	No	Yes
Scenario 1	0%	30%	100% by 2030	2035	No	Yes
Scenario 2	30%	30%	100% by 2030	2035	No	Yes
Scenario 3	0%	30%	100% by 2030	2035	Yes	Yes
Scenario 4	30%	30%	100% by 2030	2035	Yes	Yes
Scenario 5	30%	20%	100% by 2030	2035	No	No
Scenario 6	50%	10%	100% by 2030	2035	Yes	No



See tables in Appendix 1 for additional detail.

NET COSTS OF THE RES, BY BUSINESS AS USUAL (BAU = COST OF CURRENT RES) AND SCENARIO

AS MODELED BY SUSTAINABLE ENERGY ADVANTAGE LLC

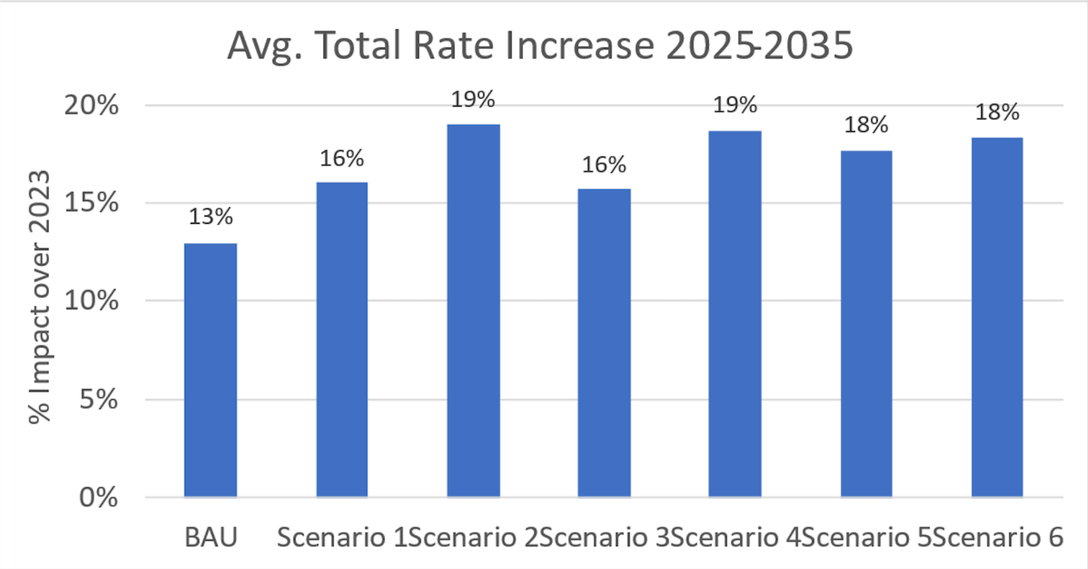
	Net Costs	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
RIM	BAU	15,561,685	15,678,415	17,296,183	22,584,424	27,876,662	31,158,009	36,071,134	45,768,469	53,542,513	62,669,725
RIM	Scenario 1	16,471,444	16,468,753	19,030,659	26,905,974	37,410,351	46,356,839	56,922,989	80,757,776	100,334,099	122,111,301
RIM	Scenario 2	16,471,444	16,468,753	19,030,659	38,821,234	49,932,792	64,588,237	74,581,545	112,386,458	149,253,517	180,844,424
RIM	Scenario 3	16,471,444	16,468,753	15,223,014	23,332,733	33,438,694	42,468,503	52,879,446	76,175,095	95,751,418	117,528,620
RIM	Scenario 4	16,471,444	16,468,753	15,223,014	35,419,509	46,327,749	61,027,172	70,626,628	107,803,777	144,670,836	176,261,743
RIM	Scenario 5	16,471,444	16,468,753	19,030,659	37,100,106	46,161,108	58,797,134	66,280,353	98,317,676	129,227,675	153,891,931
RIM	Scenario 6	16,471,444	16,468,753	15,223,014	35,198,228	49,664,791	65,547,736	70,093,349	104,892,069	142,369,599	178,944,791

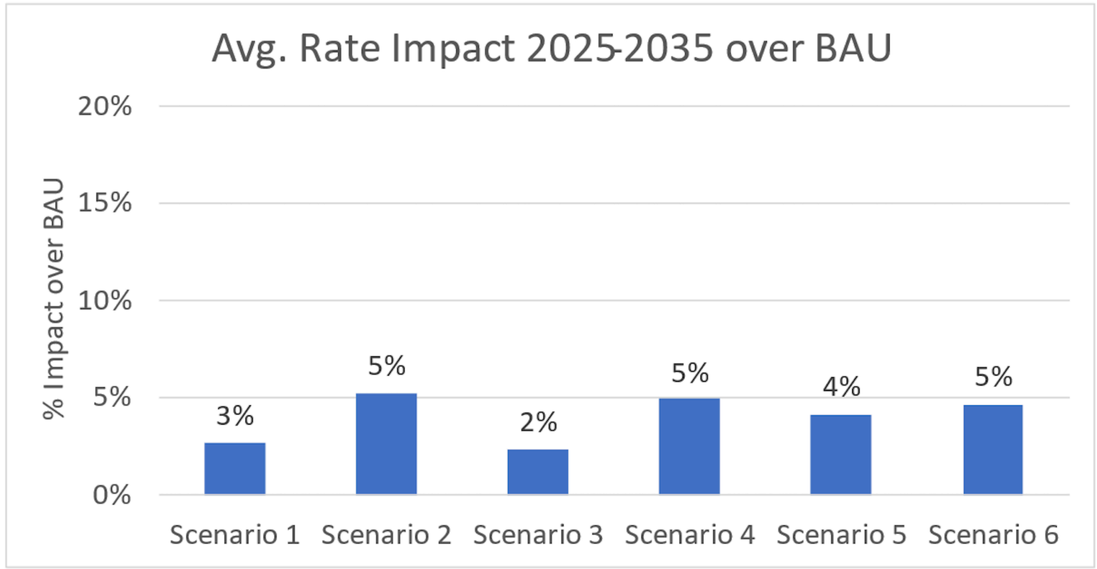
TO DOWNLOAD THE MODEL (BIG FILE) AT THIS LINK, CLICK ON MEETING SIX OF STAKEHOLDER ADVISORY GROUP. HTTPS://PUBLICSERVICE.VERMONT.GOV/RENEWABLES#TECHNICAL%20ANALYSIS. CHOOSE SEA BENEFIT-COST ANALYSIS MODEL UPDATED 11.27.23. OPEN FILE AND CLICK ON RATE IMPACT TAB .

Rate Impact: Average Rate Increase, %

- Rate impact reflects net costs or benefits on VT bills
- Impact increases over time as RES targets increase
- Cumulative average total rate impact, including BAU, shown on the left.
- Rate impact incremental to BAU shown on the right
- Scenario 2, depicted below, has the highest net cost of the six scenarios summarized in this report.

$10/MWh = 1 cent/kWh





VT RES Technical Analysis Final Report 11.27.23 (002).pdf