REPEAT Rapid Energy Policy Evaluation and Analysis Toolkit

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PRINCETON UNIVERSITY

ZERO LAB

Zero-carbon Energy Systems Research and Optimization Laboratory

Preliminary Report: The Climate Impact of Congressional Infrastructure and Budget Bills

This version: October 20, 2021

Preliminary Report: The Climate Impact of Congressional Infrastructure and Budget Bills

This preliminary report describes the national-scale impacts of the **Build Back Better Act** being considered in the House of Representatives (H.R. 5376, as reported by the Budget Committee on September 27, 2021) and the **Infrastructure Investment and Jobs Act** (H.R. 3684, as passed by the Senate on August 10, 2021).

It also presents two 'book-end' scenarios, **Existing Policies** and **Net-Zero Pathway,** for comparison.

This report contains macro-energy system modeling results including impact on carbon dioxide emissions, clean energy and electric vehicle deployment, fossil energy use, and more.

Detailed 'downscaled' results, employment, air pollution & public health impact modeling and state-level data portal will be released the week of October 25-29.

A New Toolkit for Evaluating Energy and Climate Policy

The **REPEAT Project** provides regular, timely and independent environmental and economic evaluation of federal energy and climate policies as they're proposed, offering a detailed look at the United States' evolving energy and climate policy environment and the country's progress on the road to net-zero greenhouse gas emissions.

Approach: employ geospatial planning and analysis tools coupled with detailed macro-energy system optimization models to **rapidly evaluate federal policy and regulatory proposals at politically-relevant spatial resolutions** (e.g., state, county, and finer resolutions). A refinement of methods used in the Princeton *Net-Zero America* Study.

Goal: provide independent, timely, and credible information and analysis for broad educational purposes, including as a resource available publicly for stakeholders, decision-makers, and the media.

Funding: Hewlett Foundation

The REPEAT Team

Princeton ZERO Lab: Prof. Jesse D. Jenkins (PI); Prof. Erin Mayfield (co-PI at Dartmouth as of Sept.); Dr. Neha Patankar (research scholar); Dr. Qingyu Xu (postdoc); Annie Jacobson (PhD candidate); Undergraduate research assistants: Claire Wayner, Aneesha Manocha, Riti Bhandakar, Cady Feng

Evolved Energy Research: Ryan Jones, Jamil Farbes (macro-energy systems modeling)

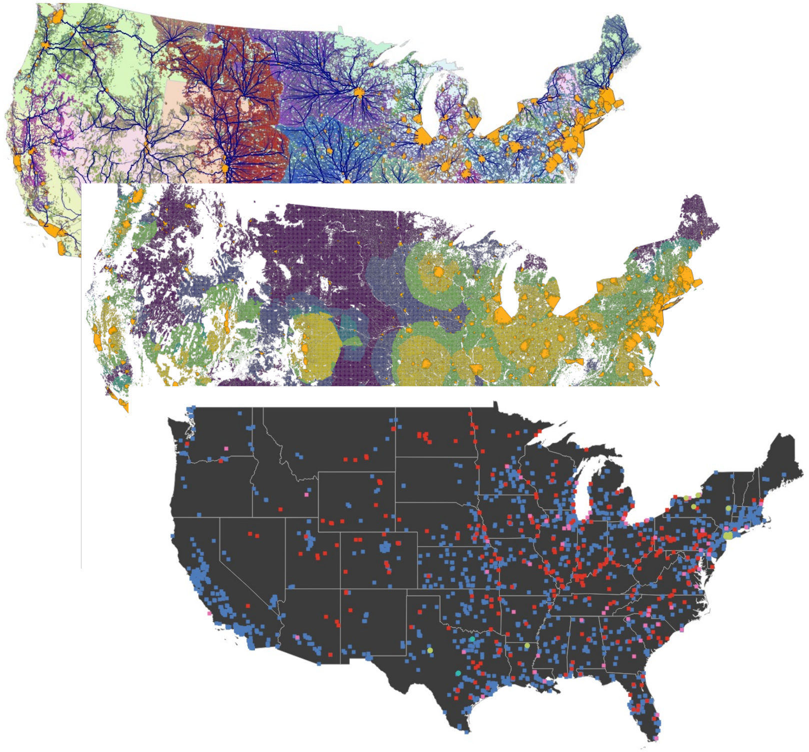
Carbon Impact Consulting: Greg Schivley (scenario inputs, transmission interconnection routing, etc.)

Montara Mountain Energy: Emily Leslie, Andrew Pascale (renewable energy candidate project areas, transmission cost surface)

Hyperobjekt: James Minton, Eliana Mason, Uri Maxima (website development)

Analysis Framework

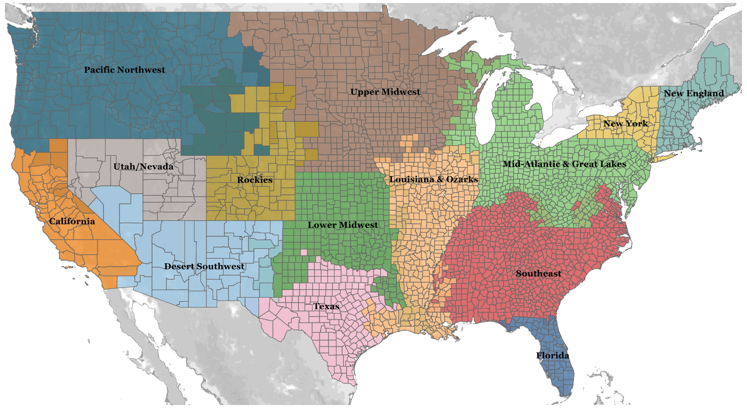
1. Geospatially-resolved inputs



2. Macro-energy systems modeling

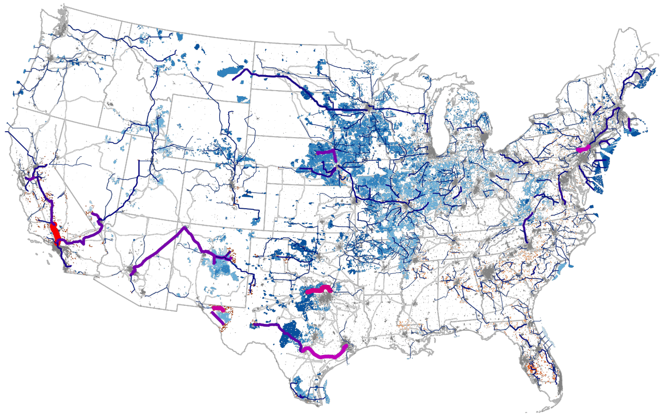
EVOLVED ENERGY RESEARCH

EnergyPATHWAYS
scenario tool
+
RIO
optimization tool

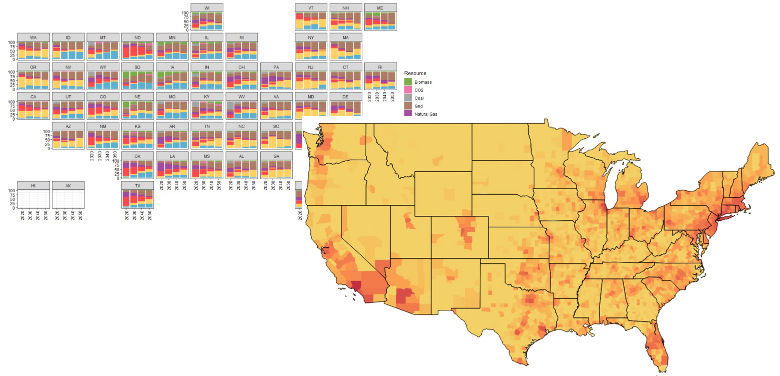


MIT-Princeton GenX model may be used for power-sector specific policies in future

3. Geospatially-resolved downscaling & mapping



4. Impact modeling (employment & air pollution)



Scenarios modeled in this report

Existing Policies Bookend – no new policies or regulations after January 2021.

Net-Zero Pathway Bookend – cost-effective pathway to reduce GHG emissions 50% below 2005 levels by 2030 and net-zero by 2050, consistent with President Biden's climate mitigation goals.

House Build Back Better Act (**BBB**, HR 5376, as referred to Budget Committee for markup on Sept. 25, 2021). https://www.congress.gov/bill/117th-congress/house-bill/5376/text

Variation without Clean Electricity Performance Program (**BBB – CEPP**)

Senate Infrastructure Investment and Jobs Act (**BIF**, 'Bipartisan Infrastructure Framework,' H.R. 3685, as amended by Senate). https://www.congress.gov/bill/117th-congress/house-bill/3684/text

House Build Back Better Act and Senate Infrastructure Investment and Jobs Act package (**BBB + BIF**).

House Build Back Better Act (BBB) modeled policies

Agriculture, Title I, Subtitle C:

Section 12004, Rural Energy Savings program

Section 12005, Rural Energy for America program

Energy & Commerce, Title III, Subtitles A, B, D:

Section 30101, Clean heavy duty vehicles program

Section 30103, GHG Reduction Fund

Section 30114, Methane fee (estimated impact)

Section 30204, Environmental justice and climate justice block grants

Section 30411, Clean Electricity Performance Program (CEPP)

Section 30421, Home energy performance-based, whole house rebates and training programs

Section 30422, High-efficiency electric home rebate program

Section 30431, Weatherization assistance

Section 30432, Critical facility modernization

Section 30442, Electric vehicle supply equipment rebate program

Section 30443, Electric vehicle charging equity program

Section 30445, State energy transportation plans

Section 30461, Transmission lines and intertie grants

Section 30481, Federal energy efficiency fund

Section 30482, Energy efficiency and conservation block grants

Section 30483, Low-income solar

Financial Services, Title IV, Subtitle A

Section 40006, Direct loans and grants for energy or water efficiency or climate resilience of affordable housing

Oversight and Reform, Title VII, Subtitle A

Section 8001, General Services Administration clean vehicle fleet

Section 8003, U.S. Postal Service clean vehicle fleet and facility maintenance

Notes:

Section 12007 Clean Energy Repowering for Rural Utilities funding ($9.7 billion) is not modeled.

Section 30444 State energy transportation plan funding is implicit in/supportive of 'low friction' deployment environment for EVs in RIO.

Potential impact of Section 30451 DOE Loan Program Office funding ($30 billion of loan guarantee authority, $700 million for credit subsidy) is expended before marginal resource modeled, so does not impact marginal deployment in model.

Section 30452 Advanced Technology manufacturing and Section 30453 Domestic manufacturing conversion grants assumed to provide support for expanded domestic supply chain to meet domestic content requirements for EV bonus credits in Ways & Means Title.

Section 30454 Energy community reinvestment financing is implicitly supportive of modeled transition.

Section 30461 Grants for facilitating inter-state transmission, Section 30463 technical assistance grants for RTOs/ISOs, and Section 30464 inter-regional and offshore wind transmission planning, modeling and analysis, and Section 30471 and Section 30472 funding for DOE and FERC environmental reviews are all implicitly supportive of the 'low friction' deployment environment for transmission in RIO.

House Build Back Better Act (BBB) modeled policies (continued)

Ways and Means, Title XIII, Subtitle G

Renewable Electricity and Reducing Carbon Emissions

Section 136101, Extension of credit for electricity produced from certain renewable sources (PTC)

Section 136102, Extension and modification of energy credit (ITC)

Section 136103, Increase in energy credit for solar facilities placed in service in connection with low-income communities

Section 136104, Elective payment for energy property and electricity produced from certain renewable resources (direct pay)

Section 136105, Investment credit for electric transmission property

Section 136106, Zero emission facility credit

Section 136107, Extension and modification of credit for carbon oxide sequestration (45Q)

Section 136109, Zero-emission nuclear power production credit (implicit)

Renewable Fuels

Section 136201, Extension of excise tax credit relating to alternative fuels (biodiesel credit)

Section 136202, Extension of second generation biofuels incentives

Section 136203, Sustainable aviation fuel credit

Section 136204, Clean hydrogen PTC

Green Energy and Energy Efficiency Incentives for Individuals

Section 136301, Extension, increase, and modification of nonbusiness energy property credit (25C)

Section 136302, Residential energy efficient property

Section 136303, Energy efficient commercial buildings deduction

Section 136304, Extension, increase, and modification of new energy efficient home credit (45L)

Greening the Fleet and Alternative Vehicles

Section 136401, Refundable new qualified plug-in electric drive motor vehicle credit for individuals: light duty vehicles

Section 136403, Qualified commercial electric vehicles (45V)

Section 136405, Alternative fuel refueling property credit

Notes:

Section 136501 Extension of the advanced energy project credit (section 48C clean energy manufacturing investment credit) implicitly assumed to support growth of domestic supply chain.

All eligible projects are assumed to qualify for Bonus tax credits (full value) consistent with prevailing wage and apprenticeship requirements through Title XIII

Additional bonus tax credits for domestic content through Title XIII are assumed to cover incremental costs of domestic content when available or to be waived due to inadequate supply, and hence impact on modeled costs is not considered.

All eligible projects are assumed to qualify for direct pay via domestic content or via waivers due to inadequate supply.

Infrastructure Investment and Jobs Act (BIF) modeled policies

Federal-Aid Highways

Section 11401, Grants for charging and fueling infrastructure

Section 11403, Carbon reduction program

Apportionment, National Electric Vehicle Formula program

Energy

Section 40106, Transmission facilitation program

Section 40304, Carbon dioxide transportation infrastructure finance and innovation

Section 40308, Carbon removal (DAC hubs)

Section 40314, Additional clean hydrogen hubs

Section 40323, Civil nuclear credit program

Section 40502, Energy efficiency revolving loan fund capitalization grant program

Section 40541, Grants for energy efficiency improvements and renewable energy improvements at public school facilities

Section 40551, Weatherization assistance program

Section 40552, Energy Efficiency and Conservation Block Grant Program

Other appropriations

Section 71101, Clean school bus program

Note:

We lack modeling capabilities to reflect the net effect of surface transportation investments in highways (which tend to increase on-road vehicle and freight miles traveled) and rail and public transit (which tend to reduce on-road vehicle and freight miles traveled). These significant programs are therefore not modeled in this analysis, an important limitation of our assessment of the Infrastructure Investment and Jobs Act.

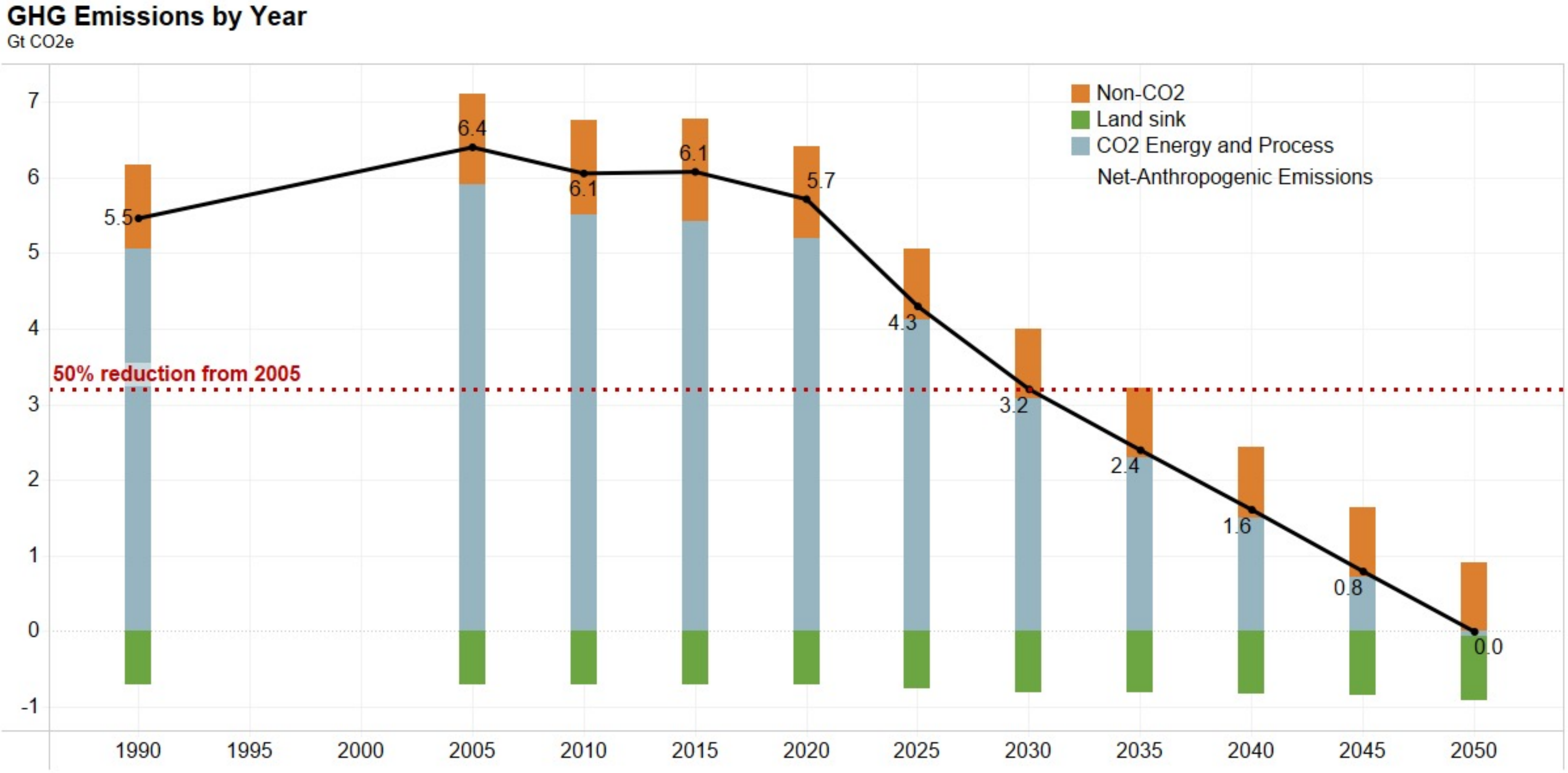
See https://bit.ly/REPEAT-Policies for full description of all considered policies and explanation of treatment in modeling.

Non-CO_2 and land sink assumptions drive modeled CO_2 targets

Gt CO_2-e			
Year	Non-CO_2	Total Land sink	CO_2 Energy and Process
1990	1.10	-0.7	5.06
2005	1.19	-0.7	5.92
2010	1.24	-0.7	5.52
2015	1.35	-0.7	5.43
2020	1.19	-0.7	5.16
2025	0.93	-0.75	**4.12**
2030	0.93	-0.8	**3.08**
2035	0.92	-0.81	**2.29**
2040	0.93	-0.83	**1.51**
2045	0.91	-0.84	**0.72**
2050	0.91	-0.85	**-0.06**

- The non-CO_2 trajectory is based on EPA's 2019 analysis
  - US data from EPA's global non-CO_2 report, **includes all mitigation measures up to \$500 per tCO_2e**
  - Through 2030, **a \$60 per tCO_2e fee on CH_4 would achieve more than half of the reductions** assumed by this trajectory (~130 MMT CO_2e)
  - The American Innovation and Manufacturing Act passed in December 2020 also requires **phase down of HFCs**, which will result in an additional 120 MMT CO_2e reduction in 2030).
- Land sink assumptions are based on a National Academies study
  - Through 2030, land sink increases by ~100 million tCO_2e/y (while BAU would gradually decline).
  - By 2050 existing land sink declines to 300 million tCO_2e/y but incremental measures add 550 million tCO_2e/y resulting in a total land sink of 850 million tCO_2e/y.
- CO_2 energy and process emissions targets achieve net-anthropogenic GHG targets for 2030 (50% below 2005) and 2050 (net-zero)
  - This CO_2 trajectory then becomes the emission constraint on modeled Net-Zero pathway.

Emissions targets hit a 50% reduction in 2030 and net-zero in 2050



CO_2 from energy and industry:
48% below 2005 levels by 2030 (2.84 billion tons).

Non-CO_2 GHGs:
-260 million metric tons CO_2-e from 2005 or 2020.

Land carbon sinks:
Increases by ~100 million metric tons CO_2-e from 2005 or 2020. (BAU would decline gradually).

Vehicle sales methodology overview

The Existing Policy and Net-Zero sales trajectories are scenario based

- Existing Policy tracks AEO 2021 vehicle adoption
- Net-Zero assumes an S-curve change in sales patterns that saturate in 2035, consistent with a comprehensive and sustained effort to achieve economy-wide net-zero GHG at low cost

Policy case sales are based on a co-optimization of energy supply and vehicle adoption to show how lowering vehicle costs can impact deployment of key technologies

- The optimization model chooses vehicle adoption based on overcoming consumer payback curves for investment. Different shares of the market are parameterized with different discount rates and consumers select vehicles based on the cost-effectiveness.
- Vehicle costs are derived using a combination of AEO, ICCT and BNEF data sources, allowing for comparability to AEO reference vehicles while also capturing declining battery and fuel cell cost. Fuel switching and pro-rata shares of charging/fueling station costs are part of the adoption decision in the optimization.
- Vehicle sales were calibrated to 2030 AEO levels of vehicle adoption utilizing a friction factor which accounts for costs not directly captured in the optimization.
- Incentives in the policy cases lower the overall cost of vehicles, including both the capital cost and any associated charging station costs. Changes in incentives result in different vehicle costs, which in turn, changes the vehicle sales share mix over time.

Treatment of policy incentives for other demand-side adoption

For demand-side choices other than vehicles (e.g. heating, cooling, building efficiency), sales trajectories are scenario based in all cases.

- Existing Policy tracks AEO 2021 vehicle adoption
- Net-Zero assumes an S-curve change in sales patterns that saturate in 2035, consistent with a comprehensive and sustained effort to achieve economy-wide net-zero GHG at low cost

For policy cases: we allocate funds from demand-side incentives to specific end-use subsectors and assume these funds “buy our way up the S-curve” of adoption for each technology in Net-Zero pathway.

- We calculate incremental up-front cost of all demand-side subsectors in the Net-Zero scenario vs the Existing Policy scenario (e.g. commercial ventilation, residential building shells, residential heating, etc.).
- We total all available budgets for incentives for each demand-side subsector (with some judgement applied as to allocation of budgets that apply to multiple sub-sectors; see Policy Worksheet for details).
- We reduce effective budget for all demand-side measures (incl. vehicles) by 20% to reflect administration, implementation costs, programmatic inefficiencies, and funding for inframarginal purchases that would have occurred otherwise (a simplifying assumption reflecting that programs are not perfectly efficient in allocating available funds).
- Then we follow the sales curve for the Net-Zero scenario, using the policy funds to cover incremental costs of the subsector in the Net-Zero scenario relative to the Existing Policies scenario until the available funds are exhausted.
- After funds are exhausted, sales shares stay fixed at the highest level achieved at that time.

A note on interpretation of modeled results

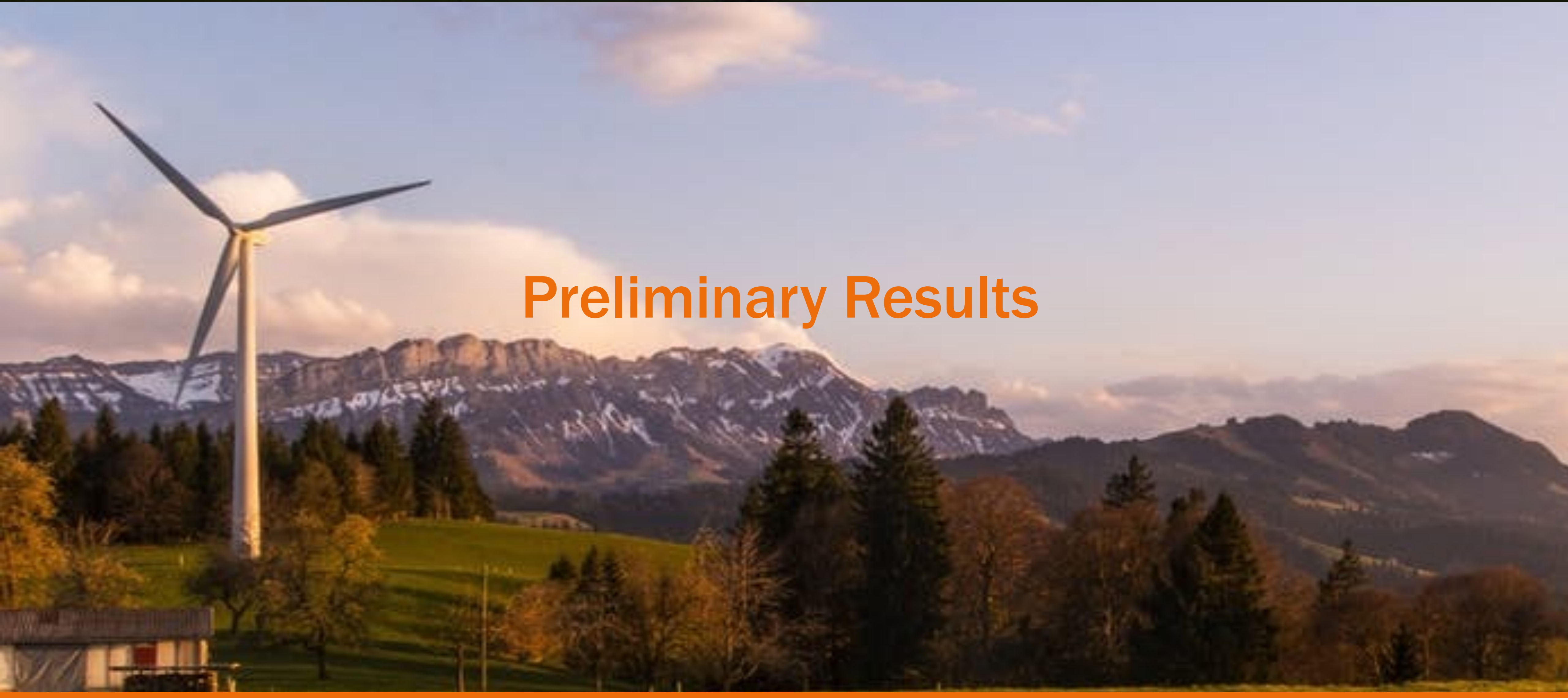
Optimization modeling used in this work assumes rational economic behavior from all actors. The modeling also has limited 'frictions' on deployment of infrastructure (e.g. power generation or transmission capacity), scale-up of industry supply chains (e.g. wind and solar), or consumer adoption of alternative products (e.g. EVs, heat pumps).

Real world outcomes will contend with various non-cost related challenges that may slow pace of change relative to modeled results.

Modeling results should thus be interpreted as indications of the relative alignment of economic incentives as a result of policy changes. In other words, these results indicate what decisions make good economic sense for consumers and businesses to make. This is an important precondition, but whether or not actors make such decisions in the real world depends on many factors we are unable to model.

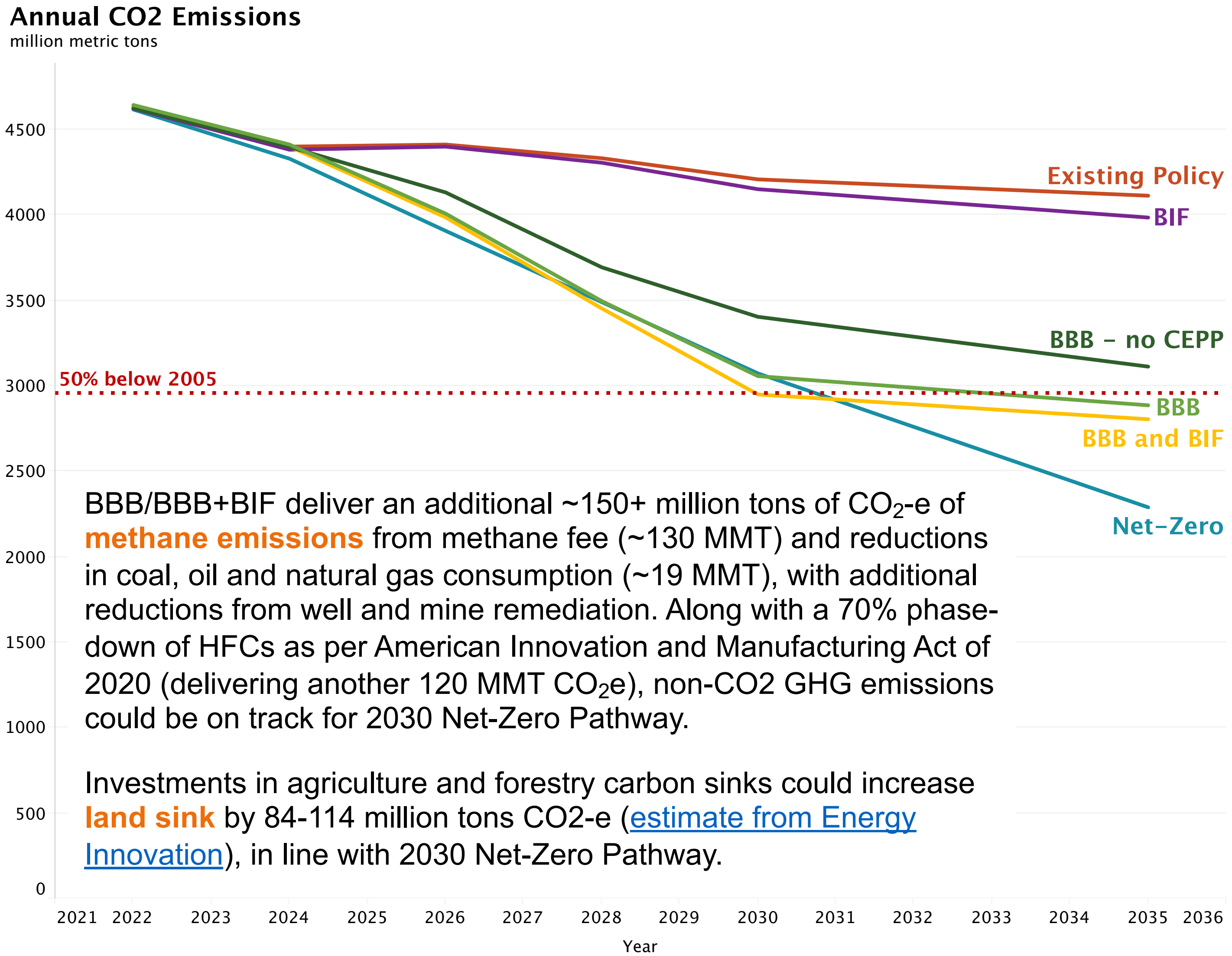
Additionally, modeled outcomes reflect a least-cost optimization process. There are likely many alternative outcomes with near-optimal costs (e.g. similar costs within a few percent of these outcomes) which may offer advantages in terms of other important outcomes related to the distribution of costs and benefits associated with energy systems.

Readers should discount or interpret modeled results accordingly.



Preliminary Results

Carbon dioxide emissions



BBB/BBB+BIF deliver an additional ~150+ million tons of CO_2-e of **methane emissions** from methane fee (~130 MMT) and reductions in coal, oil and natural gas consumption (~19 MMT), with additional reductions from well and mine remediation. Along with a 70% phase-down of HFCs as per American Innovation and Manufacturing Act of 2020 (delivering another 120 MMT CO_2e), non-CO2 GHG emissions could be on track for 2030 Net-Zero Pathway.

Investments in agriculture and forestry carbon sinks could increase **land sink** by 84-114 million tons CO2-e (estimate from Energy Innovation), in line with 2030 Net-Zero Pathway.

Modeled 2030 Energy and Industrial CO_2

Existing Policy (4,210 MMT): >1.1 billion tons CO_2 short of 2030 target (29% below 2005, 18% below 2020)

Net-Zero Pathway (3,075 MMT): 48% below 2005, 40% below 2020.

BIF (4,153 MMT): nominal reduction below Existing Policy case (57 MMT) if enacted on own (30% below 2005, 20% below 2020)

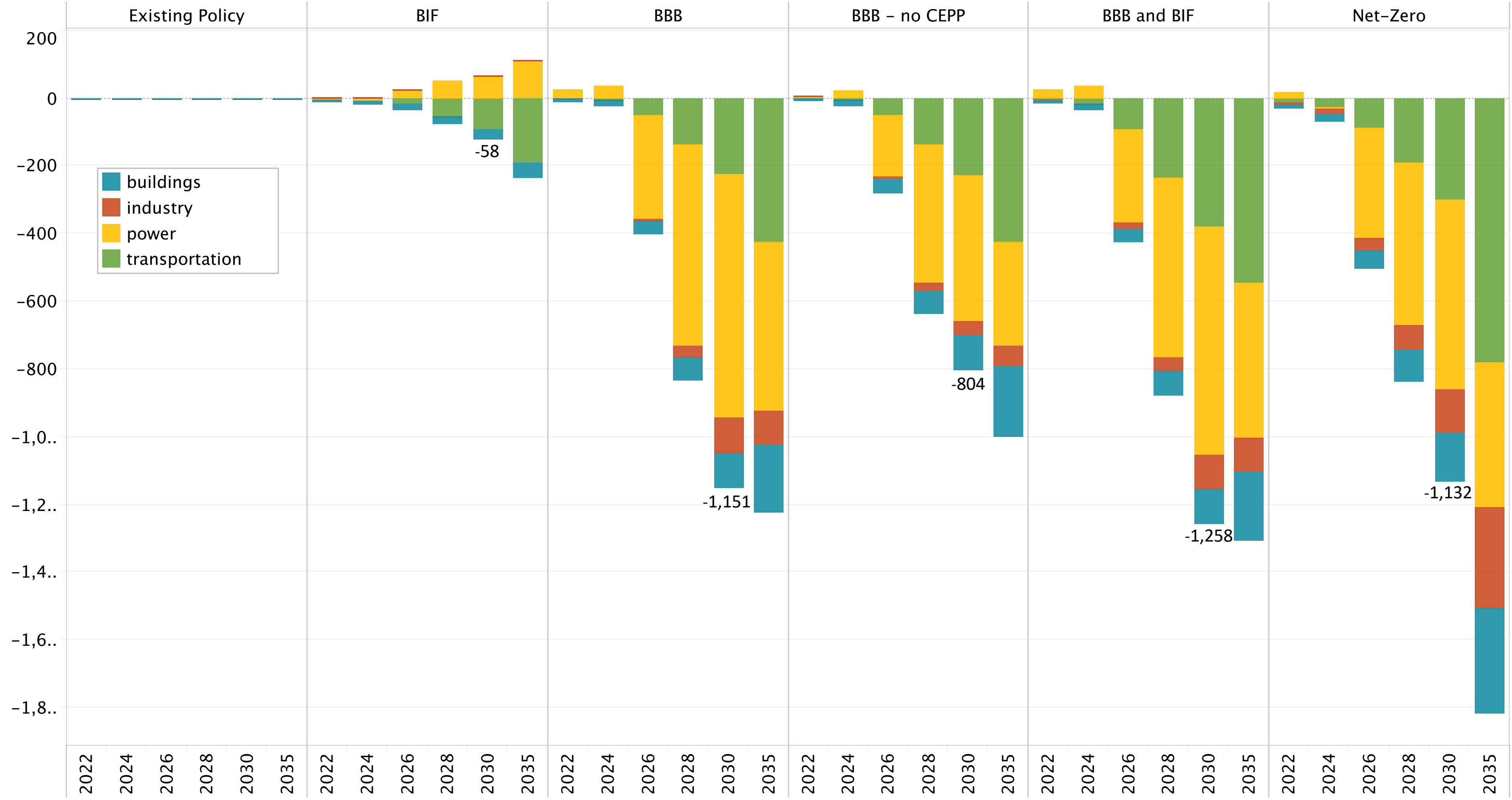
BBB (3,059 MMT): tracks 2030 target closely, 1.6 billion tons below 2020 (48% below 2005, 41% below 2020).

BBB – CEPP (3,406 MMT): Losing CEPP (without replacement) results in +350 million tons greater emissions than full House bill, falling short of 2030 target.

BBB + BIF (2,951 MMT): BBB and BIF are synergistic, delivering greater emissions reductions than BIF on its own (an additional 107 MMT).

Annual CO2 Emissions Relative to Existing Policy

difference in million metric tons



Modeled 2030 Reductions in CO_2 relative to Existing Policy

BIF: 58 million metric tons (MMT)

BBB: 1,151 MMT

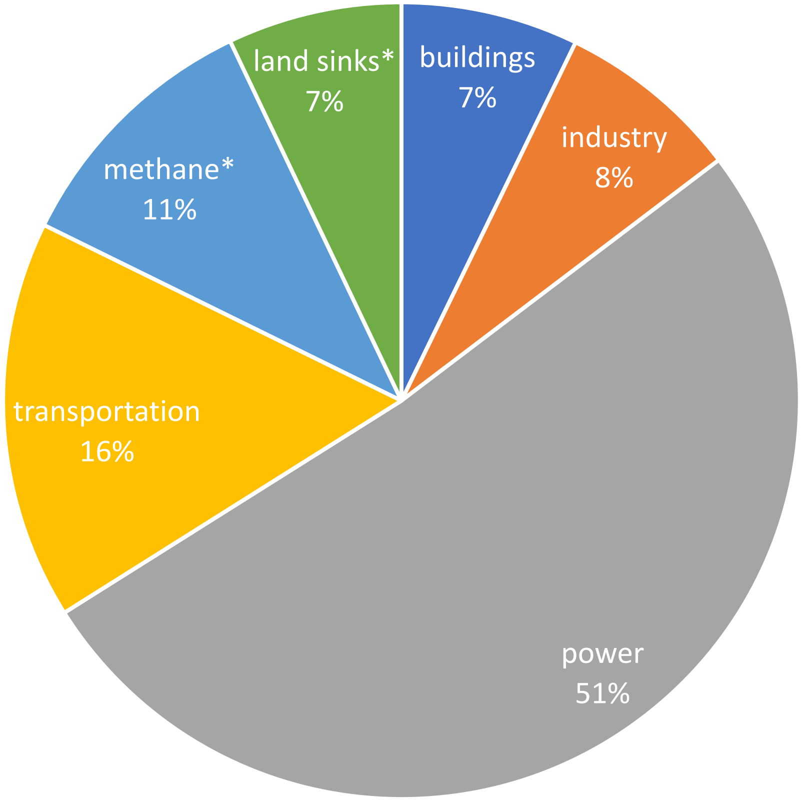
BBB – CEPP: 804 MMT

BBB + BIF: 1,258 MMT

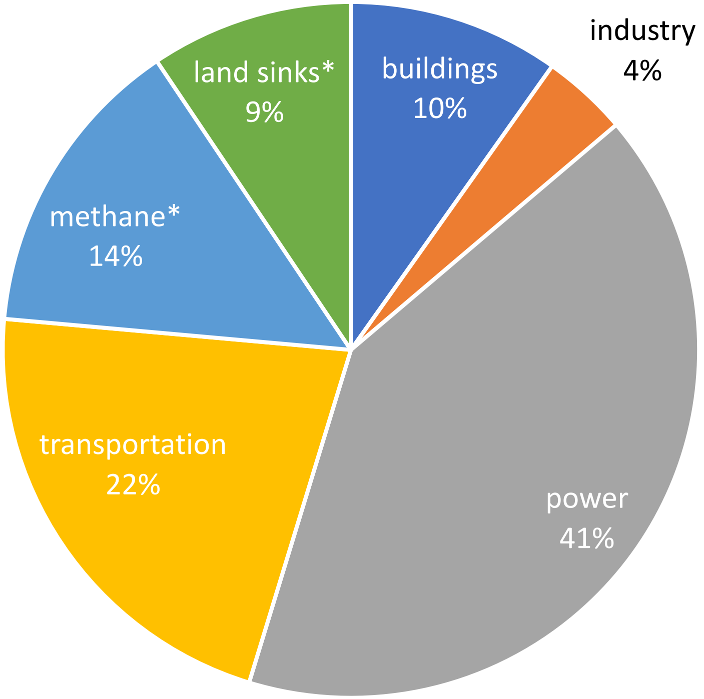
Net-Zero Pathway: 1,132 MMT

Share of CO_2e emissions reductions relative to Existing Policies

BBB
(1,399 MMT CO_2e)



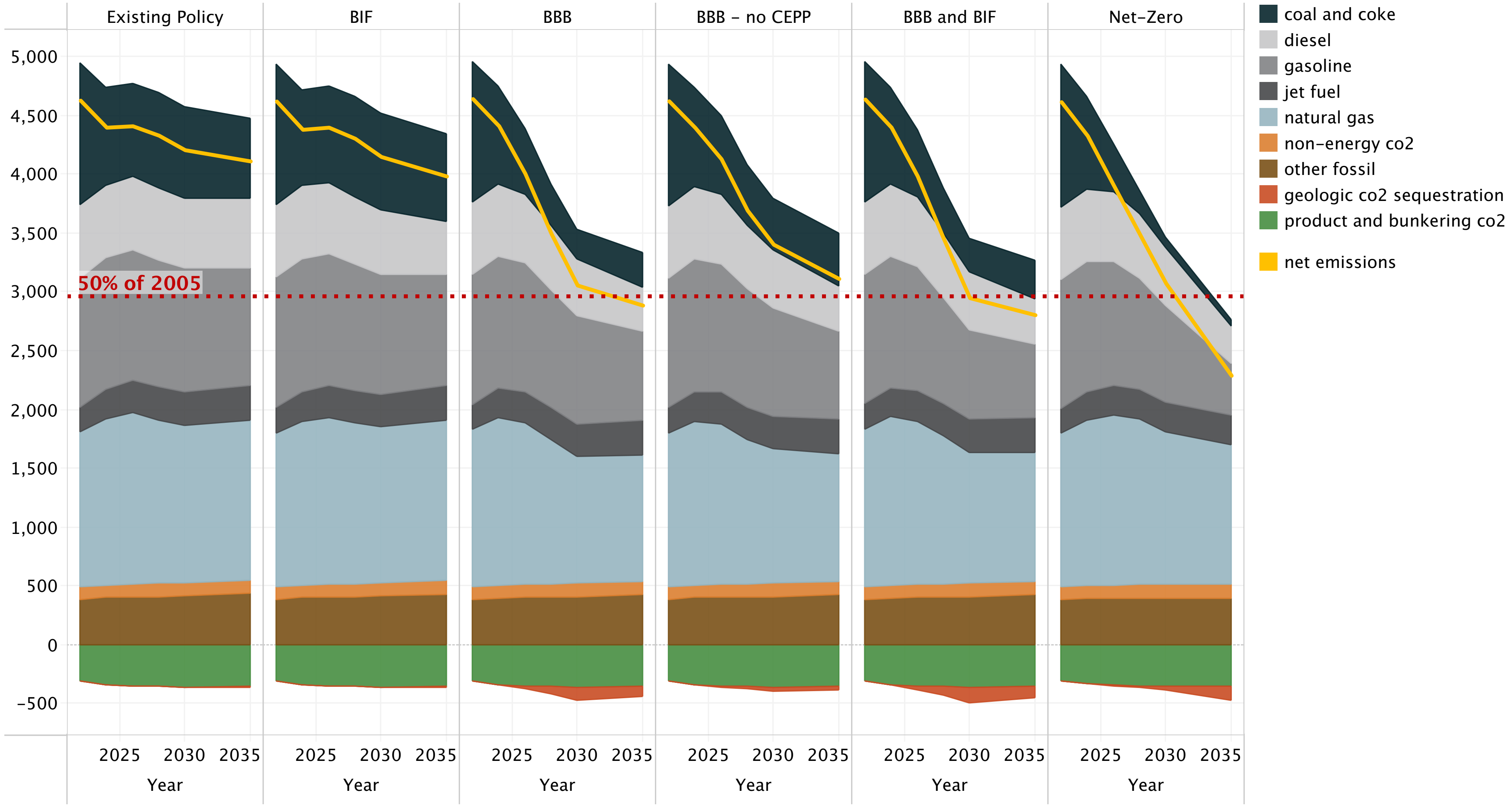
BBB – CEPP
(1,052 MMT CO_2e)



* Estimated reductions (not from optimization modeling); see Slide 17.

Note: CO_2e calculations using 100 year global warming potential equivalence as per EPA Inventory of Greenhouse Gas Emissions

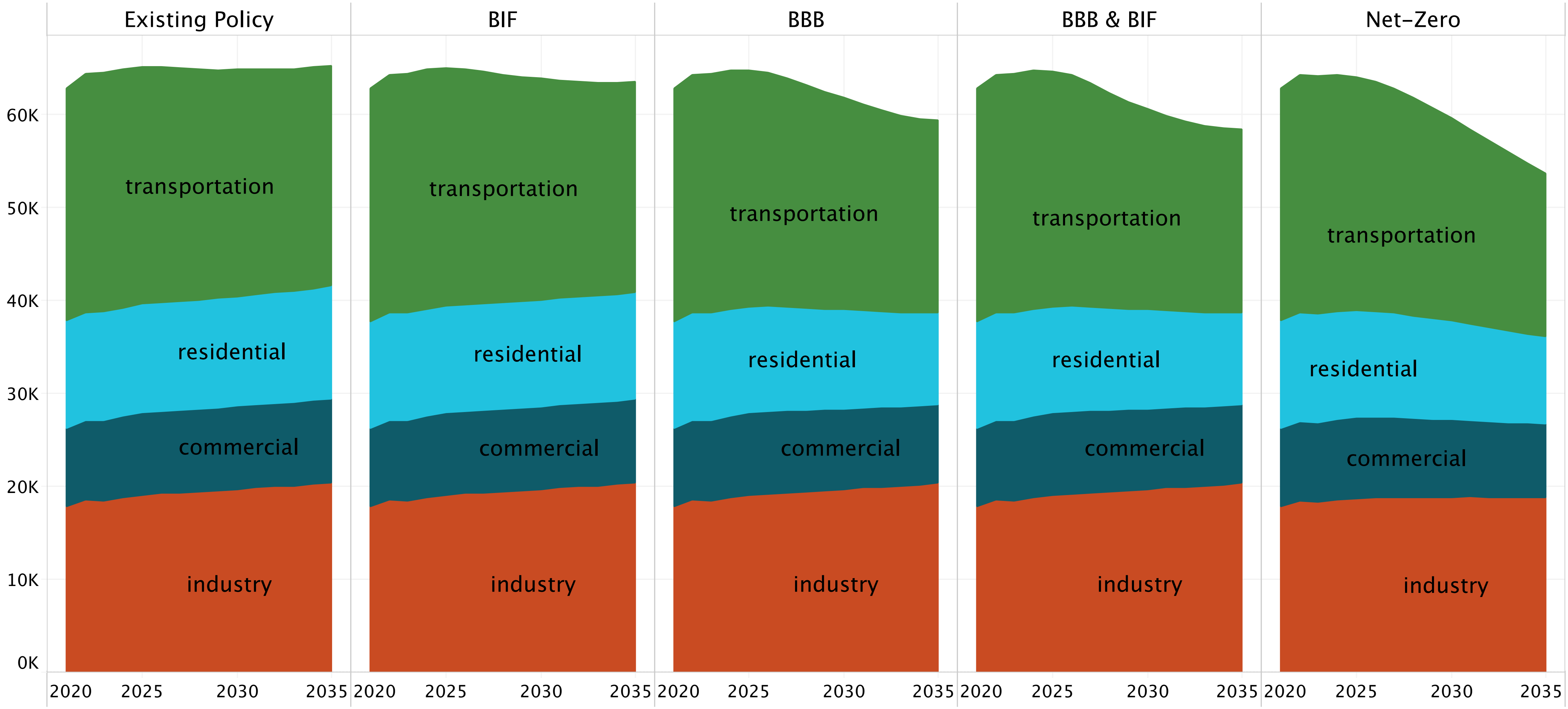
Annual CO2 Emissions
million metric tons



Energy demand

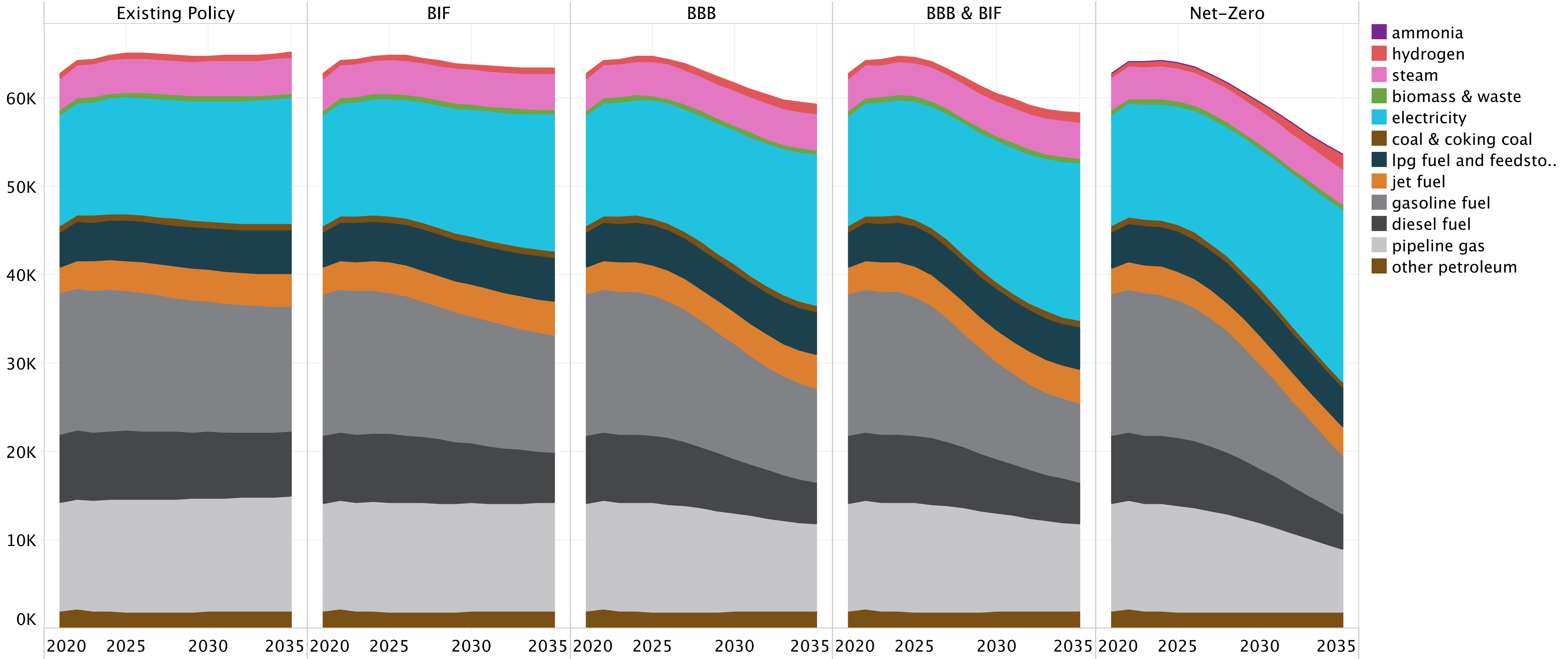
Final Energy by Sector

trillion Btu



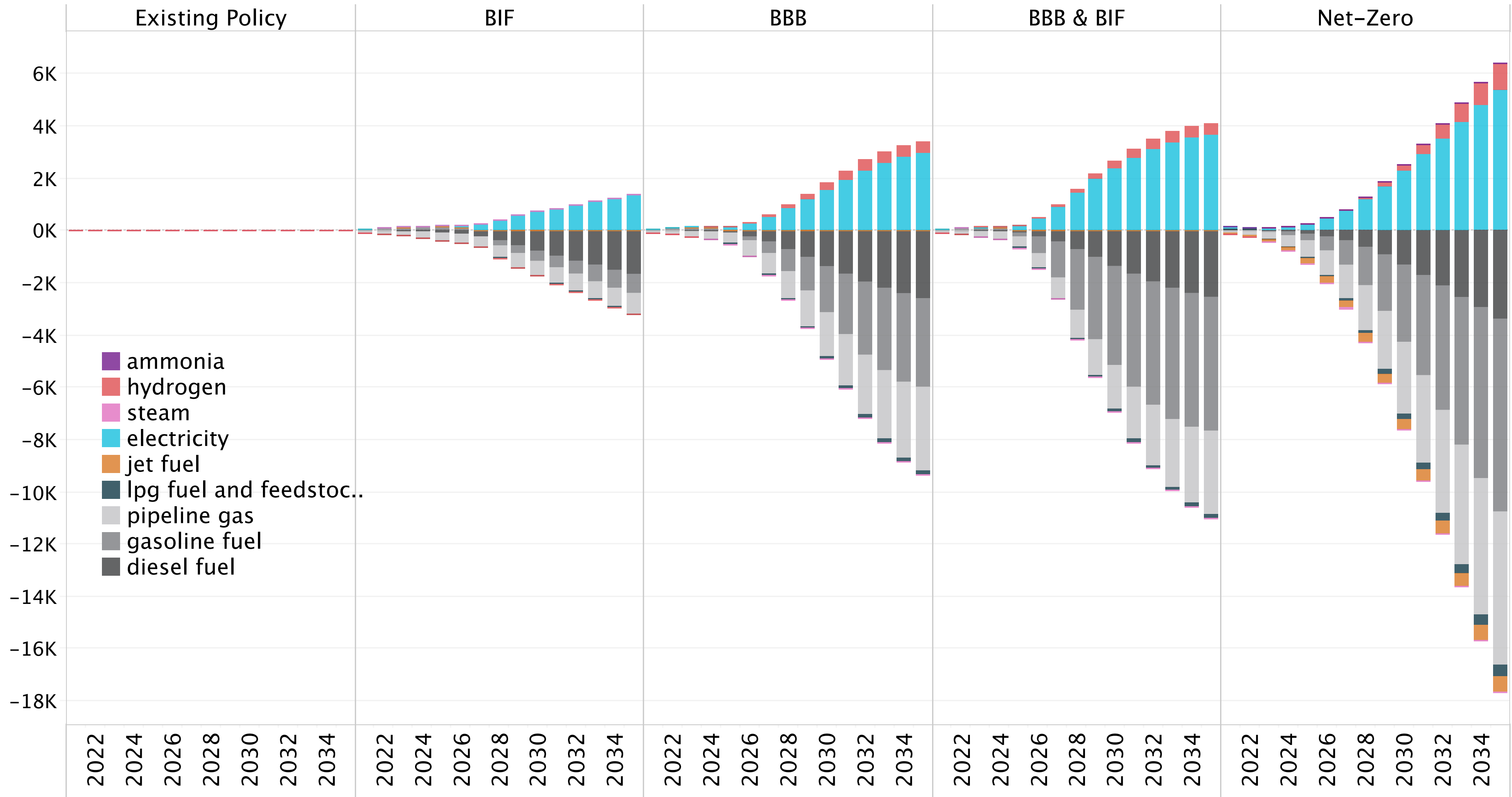
Final Energy Demand by Energy Carrier

trillion Btu



Final Energy Demand Relative to Existing Policy

Difference in TBtu



Modeled Change in Final Energy Demand Relative to Existing Policy

(Quadrillion Btus, Quad)

BIF: -1.01 Quad; -2%

BBB: -3.05 Quad; -5%

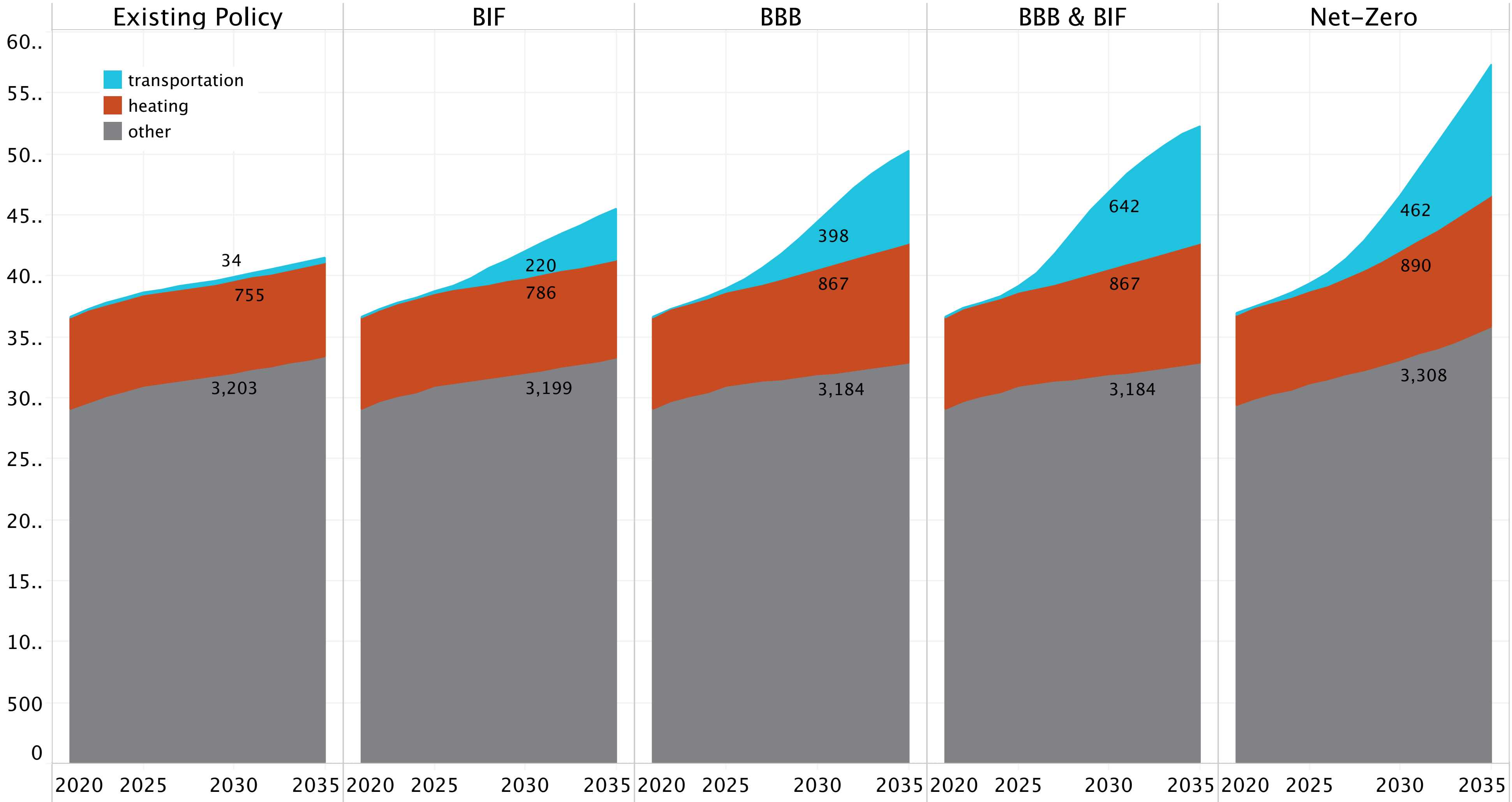
BBB + BIF: -4.2 Quad; -7%

Net-Zero Pathway:
-5.2 Quad; -8%

Existing Policy Final Energy Demand in 2030: 64,759 TBtu

Annual Electricity Demand

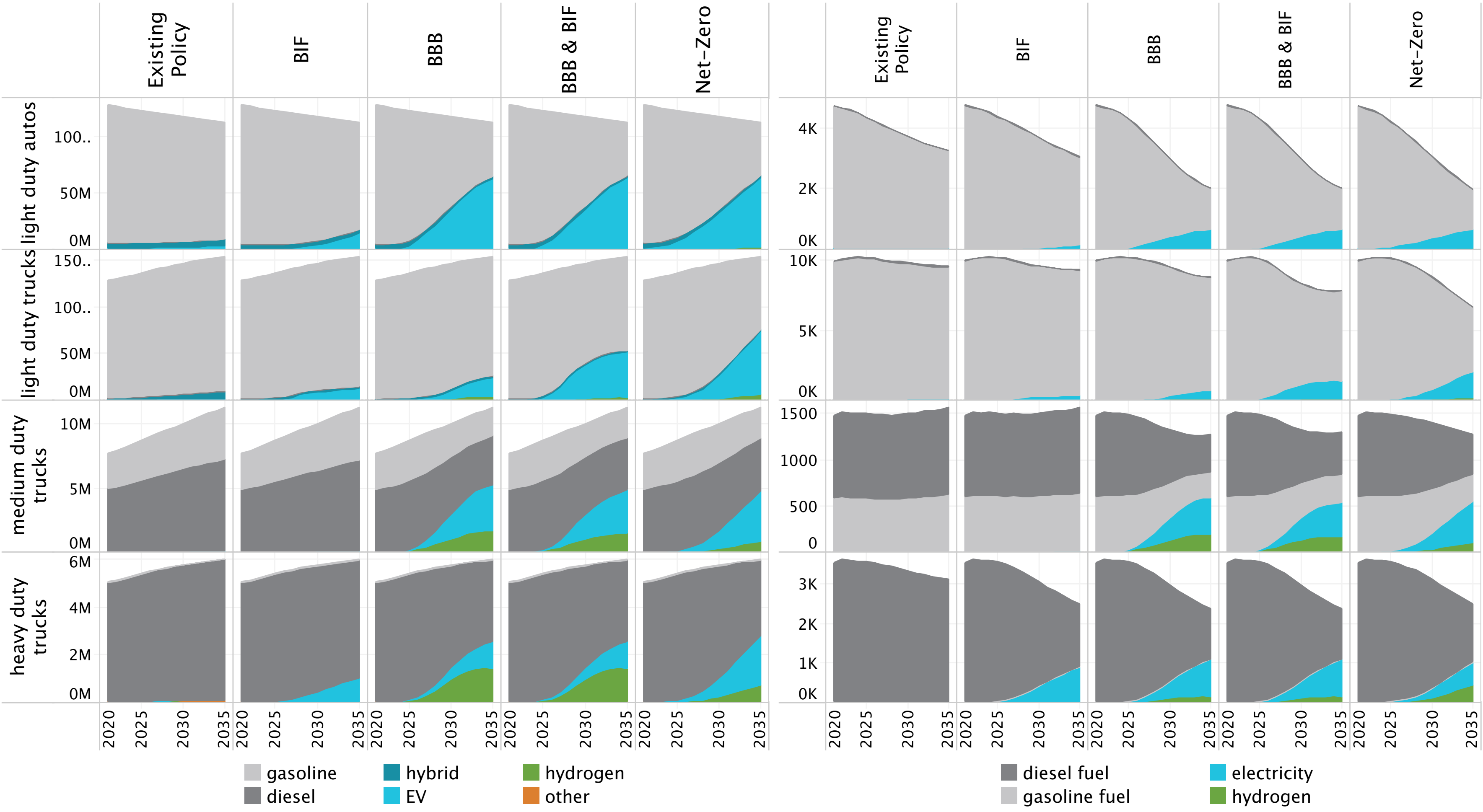
TWh



Transportation

Stock
vehicles

Energy
trillion Btu



Impact of BBB

Light duty autos: ~100% EV sales reached, ~35 million EVs in 2030.

Light duty trucks/SUVs: ~30% EV sales reached, ~8 million EVs in 2030.

(EVs are 16% of LDVs on road in 2030)

Medium and heavy trucks: ~100% of sales are EV or fuel cell vehicles.

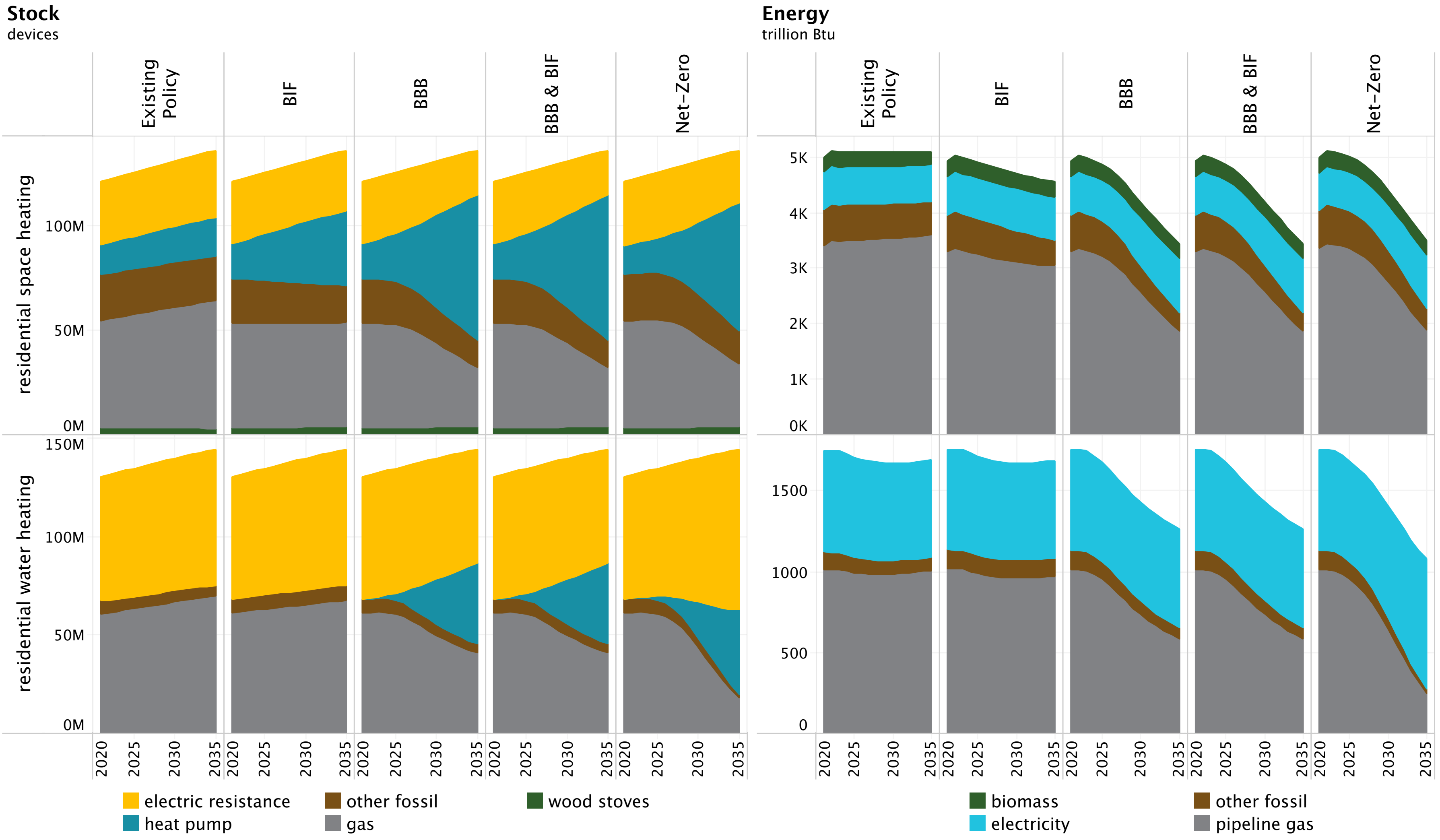
Final energy demand: 15% below 2021.

Fossil fuel demand: 23% below 2021.

Notes:

Vehicle sales are optimized based on relative cost of ownership and distribution of required payback periods across purchasers. Incentives provided in BBB are sufficient to make zero-emissions light duty autos and medium and heavy trucks lower cost than internal combustion alternatives, making clean vehicles the 'rational' economic choice for all consumers. Real purchase decisions may of course depart from modeled results.

Residential



Impact of BBB

Space heating: ~80% of new sales are electric heat pumps in 2030, nearly saturating demand outside coldest climate zones. ~44 million residences with heat pump space heating by 2030.

Water heating: ~33% of new sales are electric heat pump in 2030. ~23 million residences with heat pump water heating by 2030.

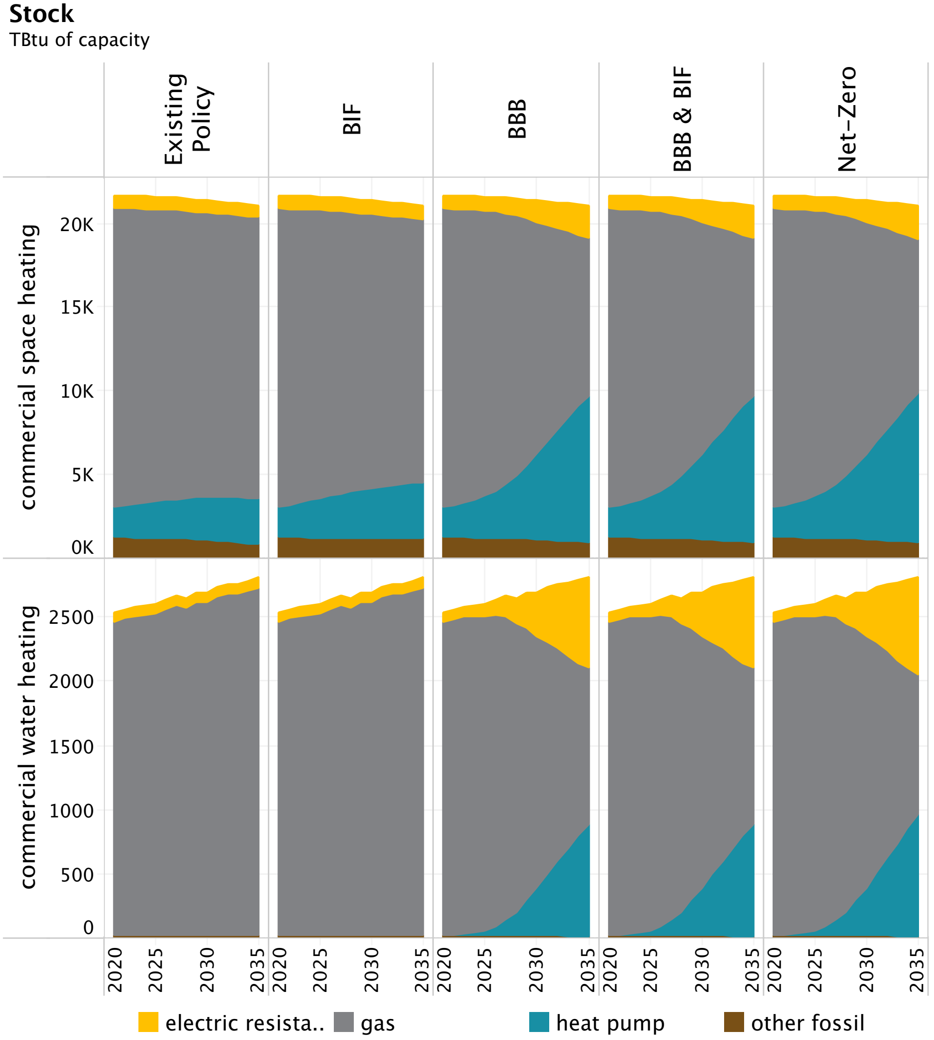
Final energy demand: 16% below 2021.

Fossil fuel demand: 24% below 2021.

Notes:

Heat pump adoption based on applying available grant and tax credit funding (less 20% for administrative cost, inefficiencies, etc.) to cover incremental costs of the subsector in the Net-Zero Pathway relative to the Existing Policies scenario until the available funds are exhausted, at which point sales shares remain constant.

Commercial



Impact of BBB

Space heating: ~69% of new sales are electric heat pumps in 2030. ~23% of commercial building space heated with heat pumps by 2030.

Water heating: ~47% of new sales are electric heat pump in 2030. ~14% of commercial building water heated with heat pumps by 2030.

Final energy demand: 12% below 2021.

Fossil fuel demand: 19% below 2021.

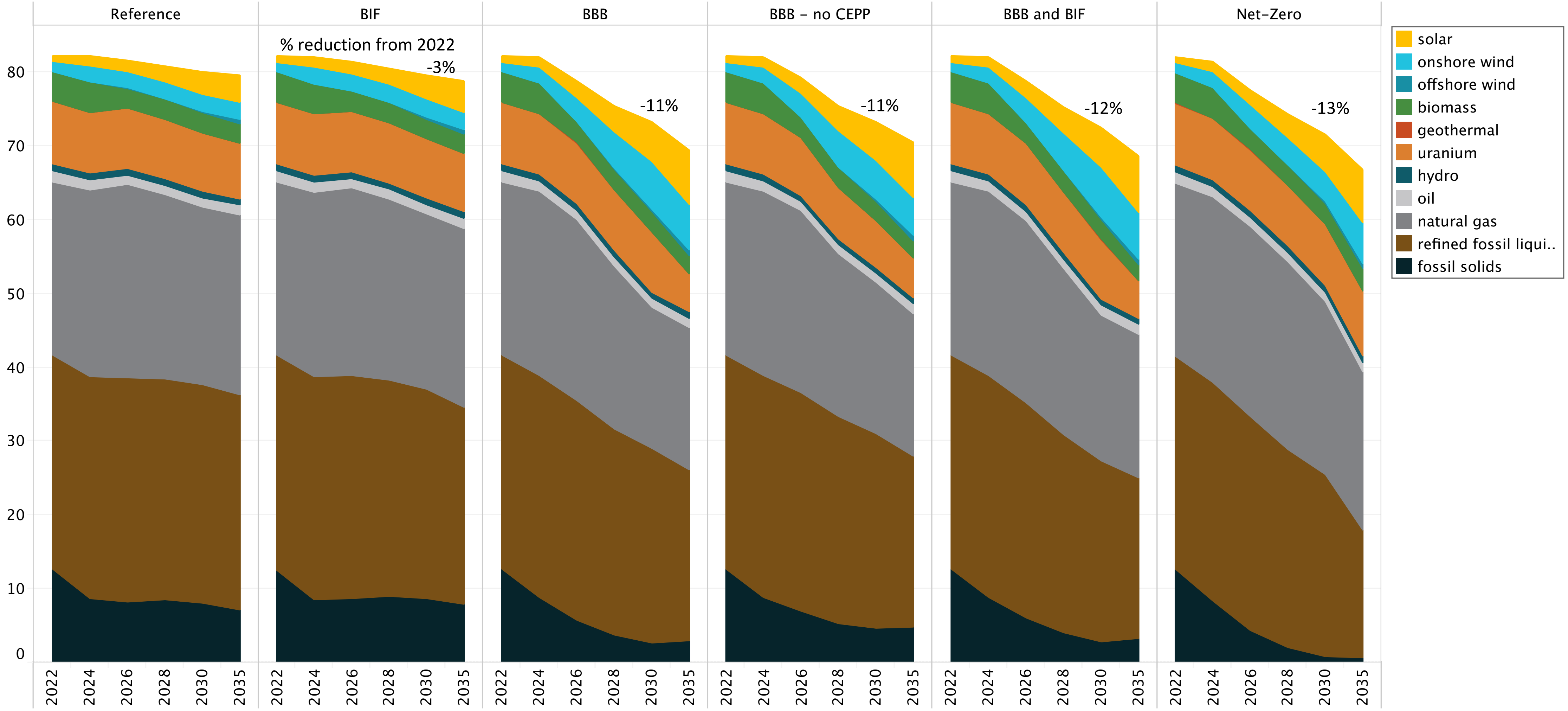
Notes:

Heat pump adoption based on applying available grant and tax credit funding (less 20% for administrative cost, inefficiencies, etc.) to cover incremental costs of the subsector in the Net-Zero Pathway relative to the Existing Policies scenario until the available funds are exhausted, at which point sales shares remain constant.

Primary Energy Supply

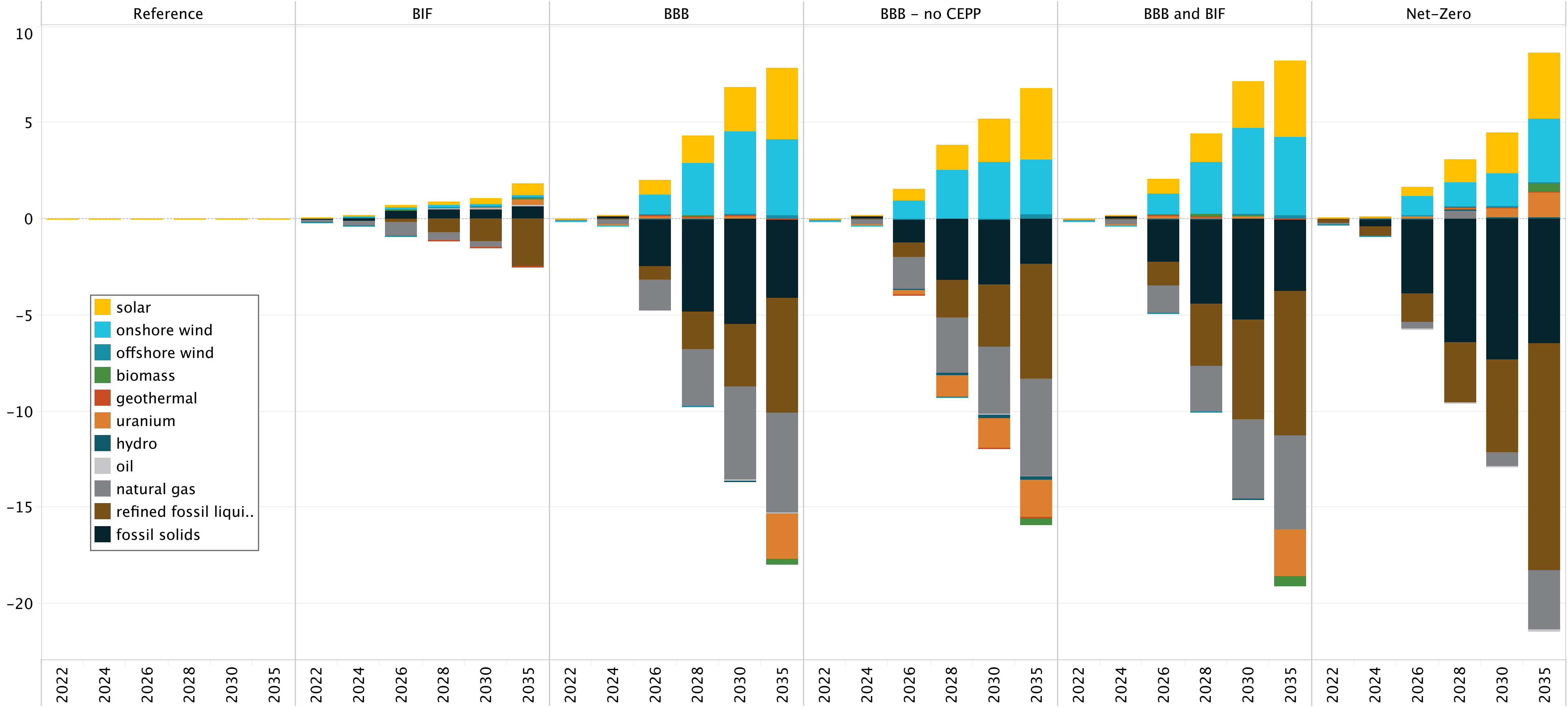
Primary Energy

quads

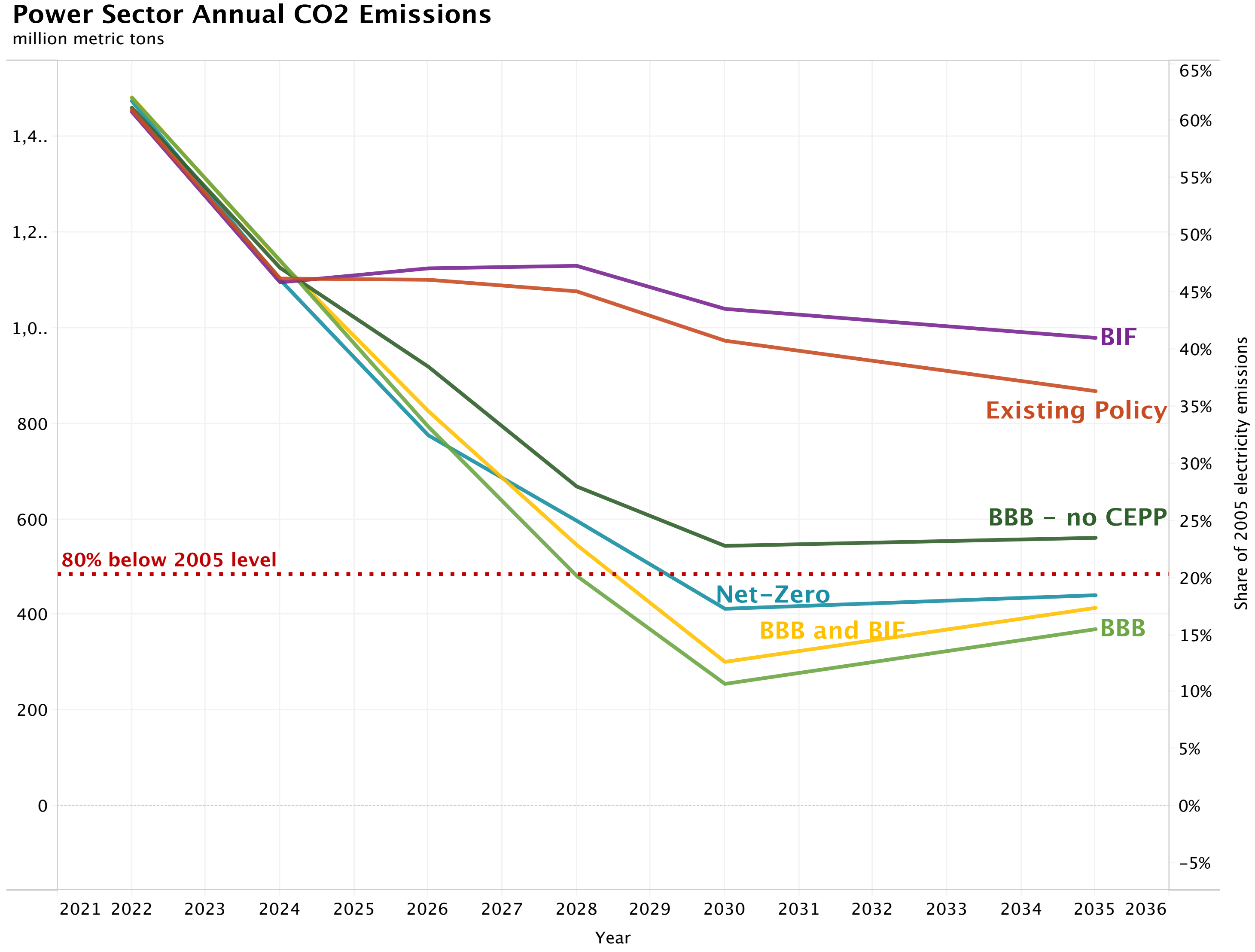


Primary Energy Relative to Existing Policy

trillion Btu



Electricity



Modeled 2030 Power Sector CO_2

Existing Policy (973 MMT): 60% below 2005 emissions.

Net-Zero Pathway (413 MMT): 83% below 2005 emissions.

BIF (1,040 MMT): 57% below 2005 emissions; above Existing Policies as BIF drives electrification of transportation without accelerating decarbonization of electricity supply.

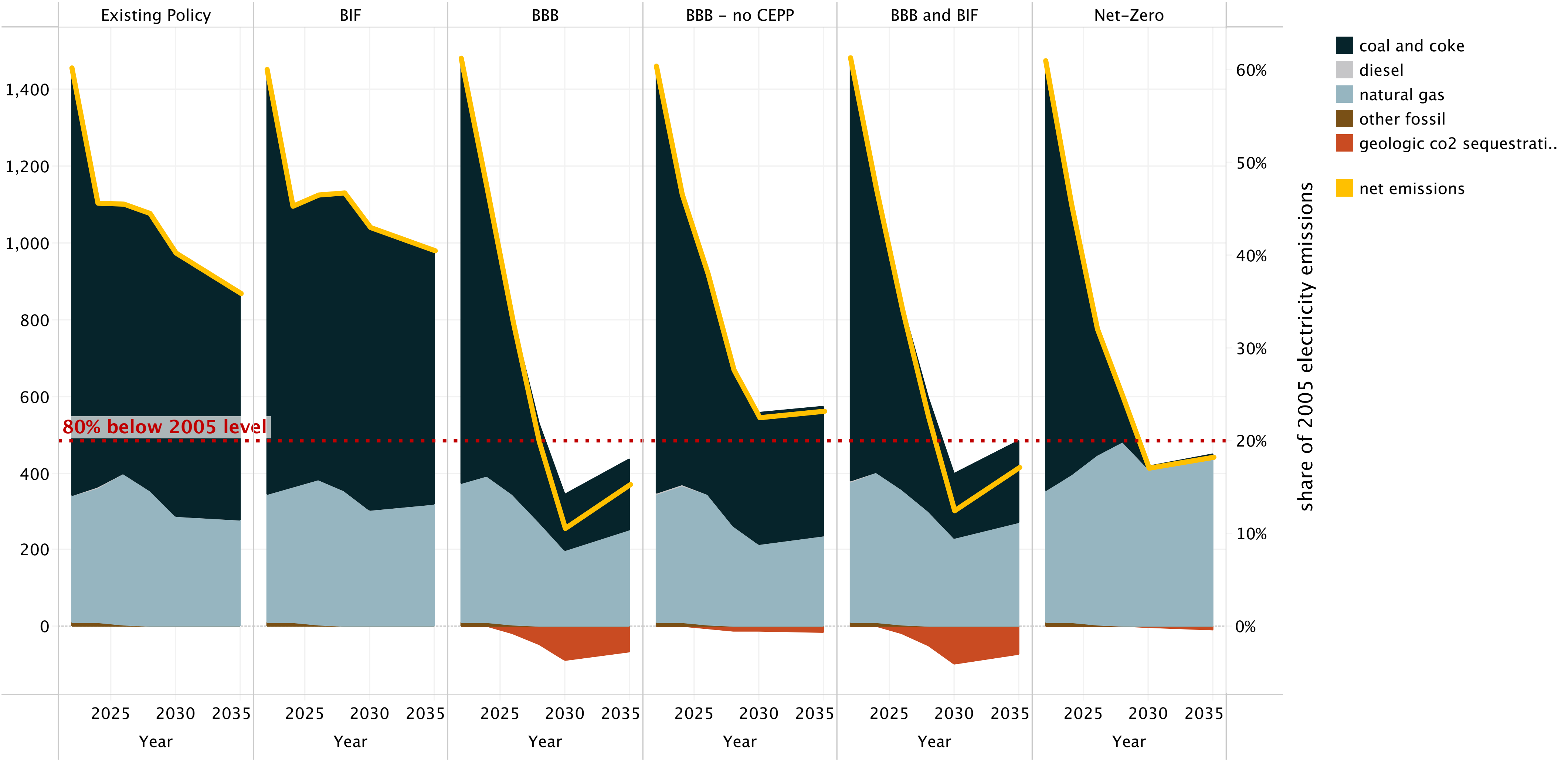
BBB (256 MMT): 89% below 2005 levels.

BBB – CEPP (544 MMT): 77% below 2005 emissions. Losing CEPP (without replacement) results in +290 million tons greater emissions than full House bill, falling short of 2030 target.

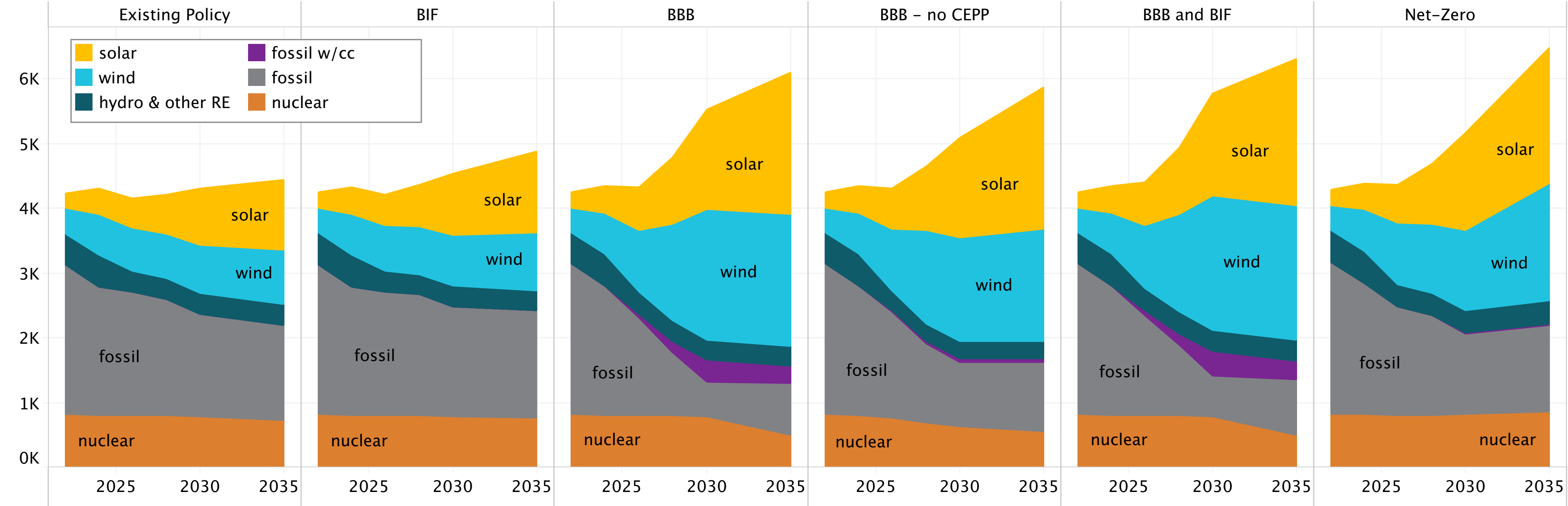
BBB + BIF (302 MMT): 88% below 2005 emissions.

Power Sector Annual CO2 Emissions

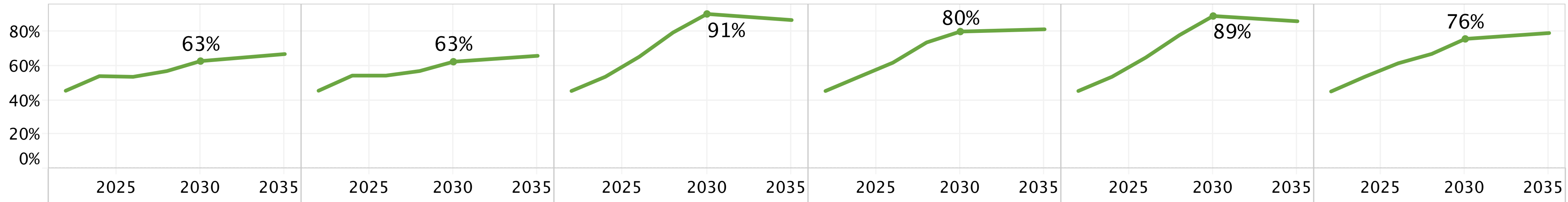
million metric tons



Electricity Generation
TWh

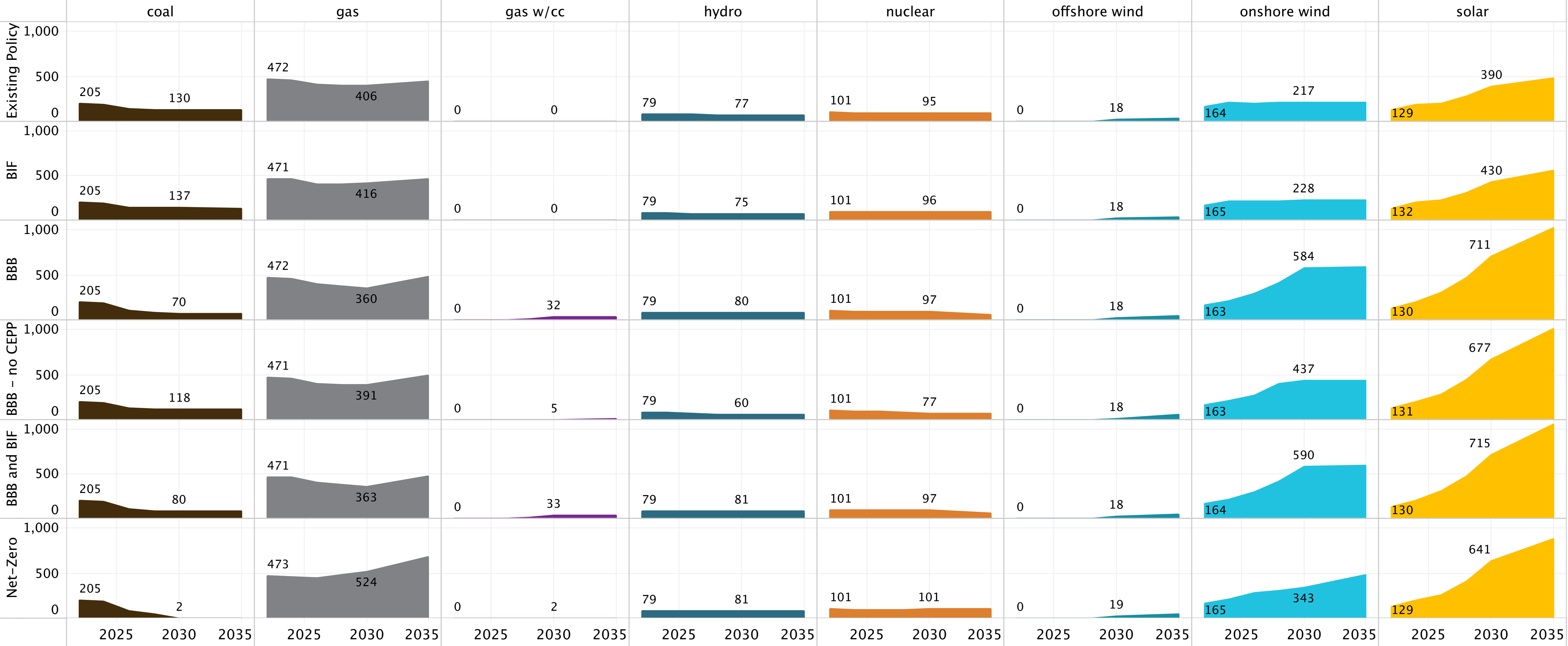


Share of Clean Generation



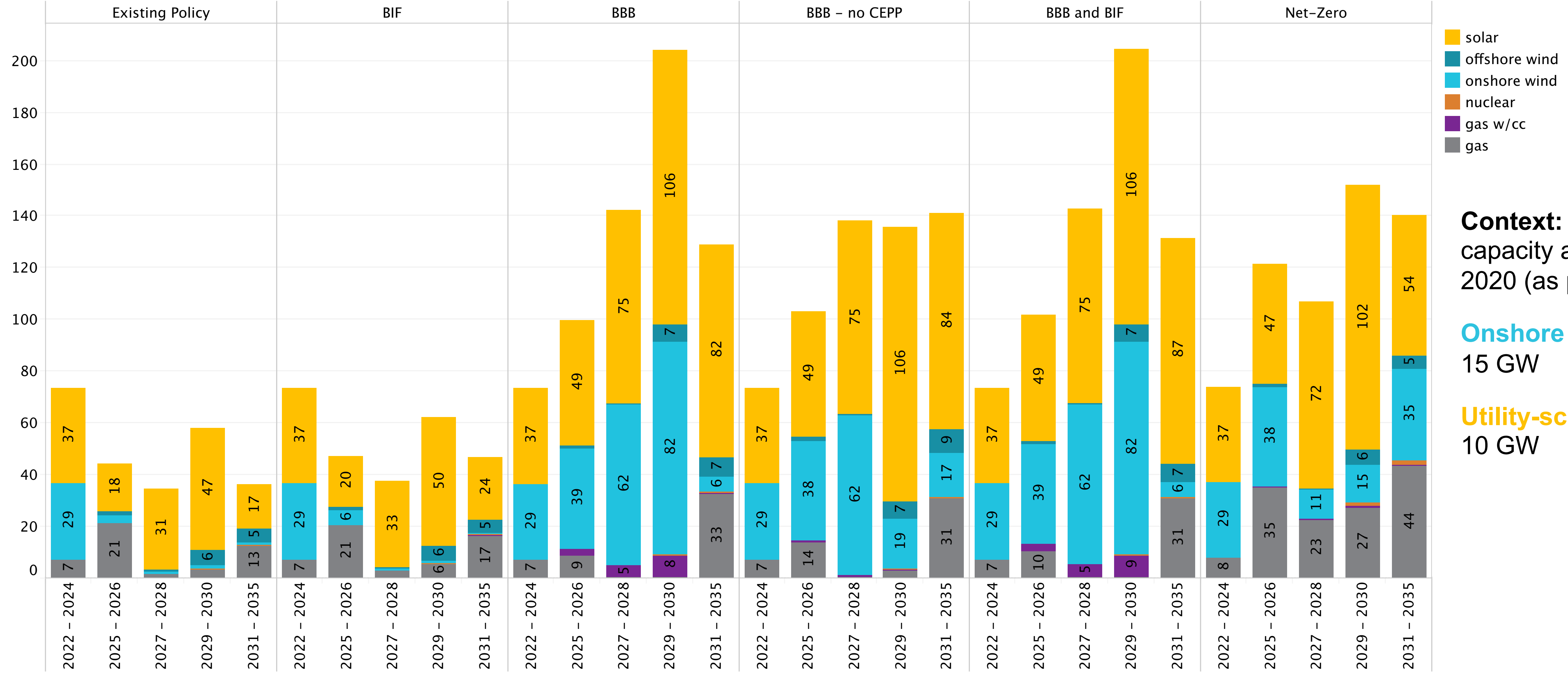
Capacity

GW


coal
gas
gas w/cc
hydro
nuclear
offshore wind
onshore wind
solar
Existing Policy
BIF
BBB
BBB – no CEPP
BBB and BIF
Net-Zero
1,000
500
0
205
130
472
406
0
0
79
77
101
95
0
18
164
217
129
390
205
137
471
416
0
0
79
75
101
96
0
18
165
228
132
430
205
70
472
360
0
32
79
80
101
97
0
18
163
584
130
711
205
118
471
391
0
5
79
60
101
77
0
18
163
437
131
677
205
80
471
363
0
33
79
81
101
97
0
18
164
590
130
715
205
2
473
524
0
2
79
81
101
101
0
19
165
343
129
641
2025
2030
2035

Annual Average Capacity Additions

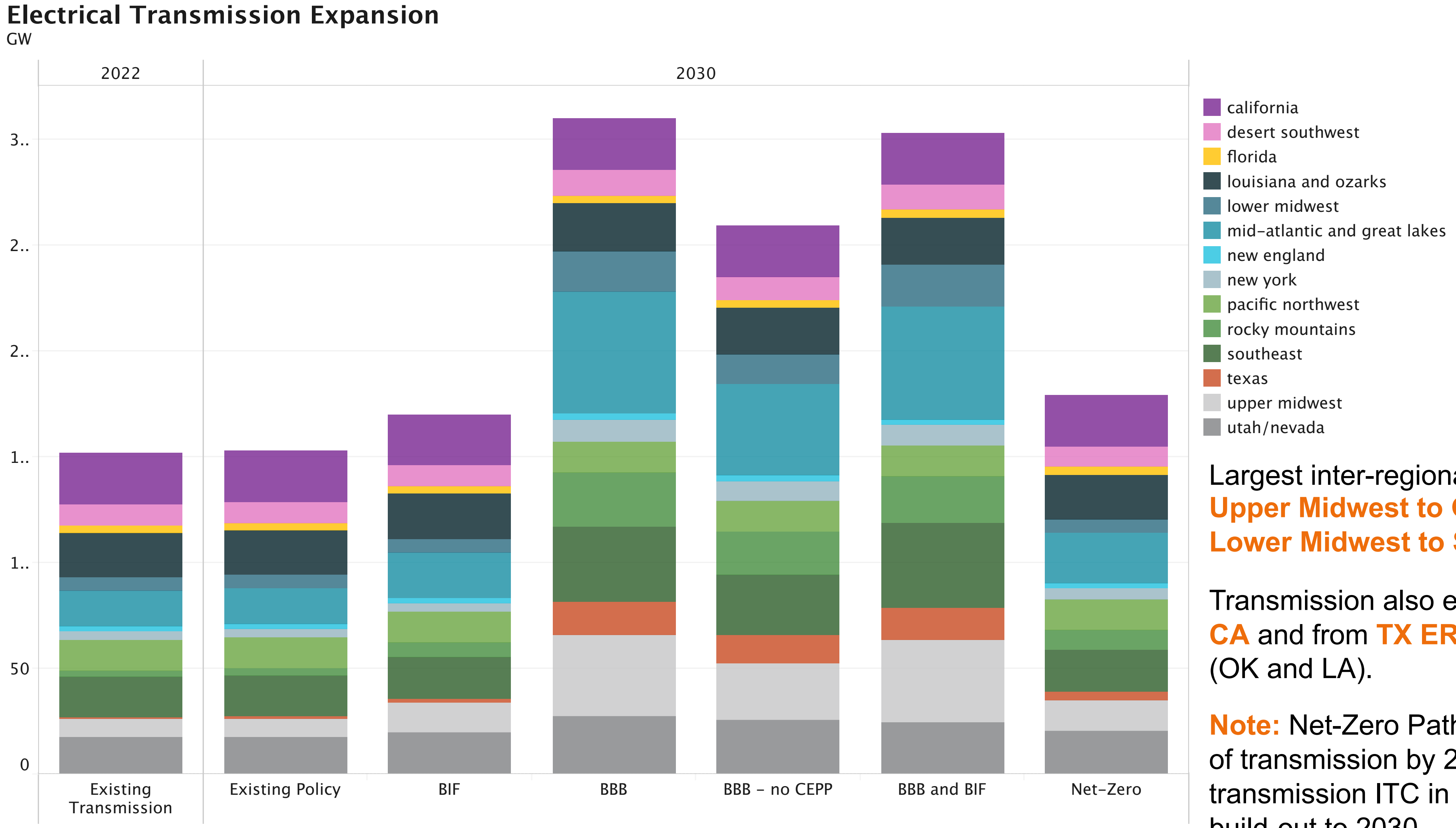
GW



Context: Total annual capacity additions in 2020 (as per EIA):

Onshore wind:
15 GW

Utility-scale solar:
10 GW

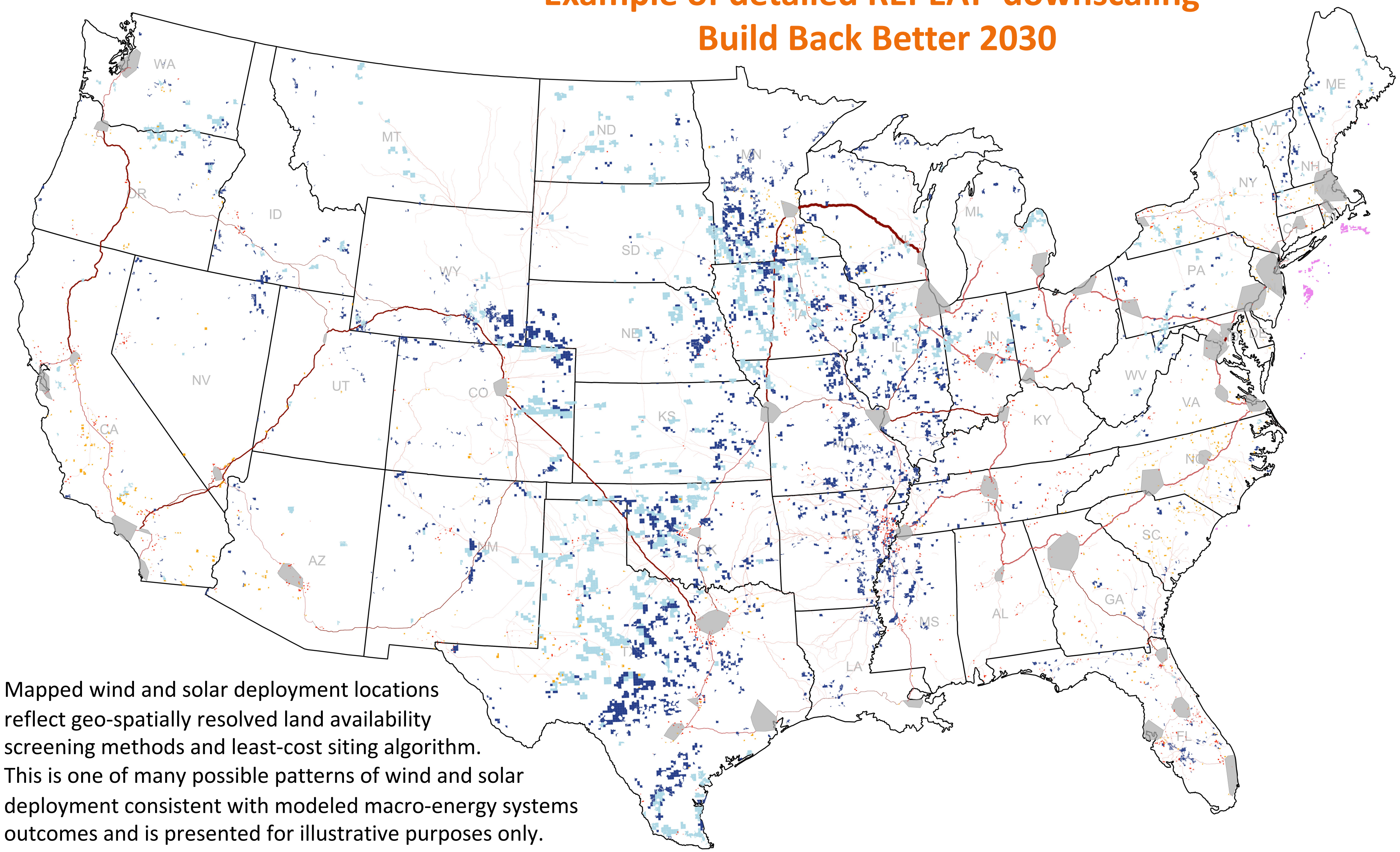


Largest inter-regional transmission build-out is from **Upper Midwest to Great Lakes/Mid-Atlantic** and **Lower Midwest to Southeast**.

Transmission also expands from **UT/NV and AZ to CA** and from **TX ERCOT to Eastern Interconnect** (OK and LA).

Note: Net-Zero Pathway builds an equivalent amount of transmission by 2040; grant funding and transmission ITC in BBB accelerates transmission build-out to 2030.

Example of detailed REPEAT 'downscaling' Build Back Better 2030



Existing Utility-scale Solar

Existing Onshore Wind

Inter-regional transmission (>500 kV HVDC)

New Utility-Scale Solar

New Onshore Wind

Intra-region transmission (<500 kV,>240 kV)

New Offshore Wind - Preferred

New Offshore Wind - Non-preferred

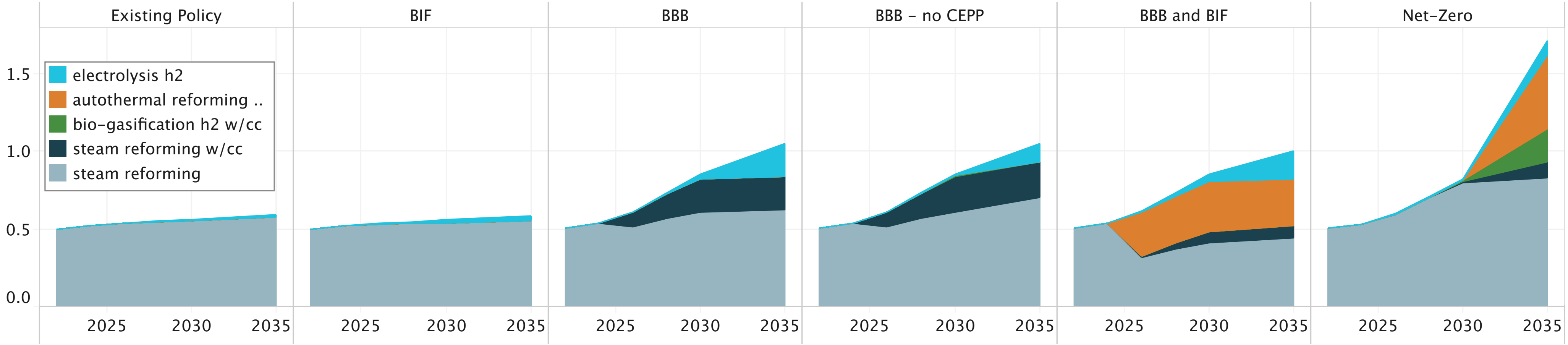
CPA-substation to metro-substation (240 kV)

Mapped wind and solar deployment locations reflect geo-spatially resolved land availability screening methods and least-cost siting algorithm. This is one of many possible patterns of wind and solar deployment consistent with modeled macro-energy systems outcomes and is presented for illustrative purposes only.

Hydrogen and CO_2 Capture and Storage

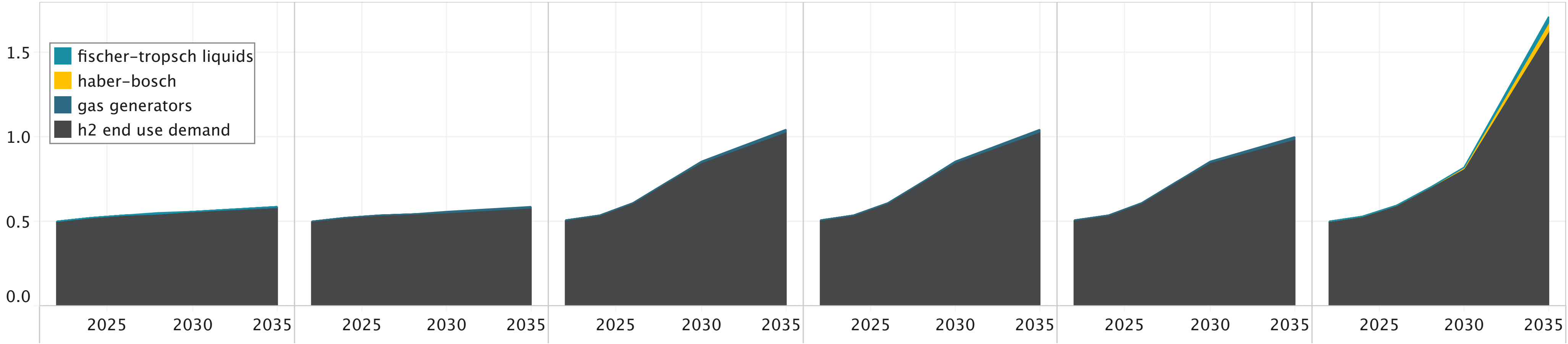
H2 Supply

Quads



H2 Demand

Quads

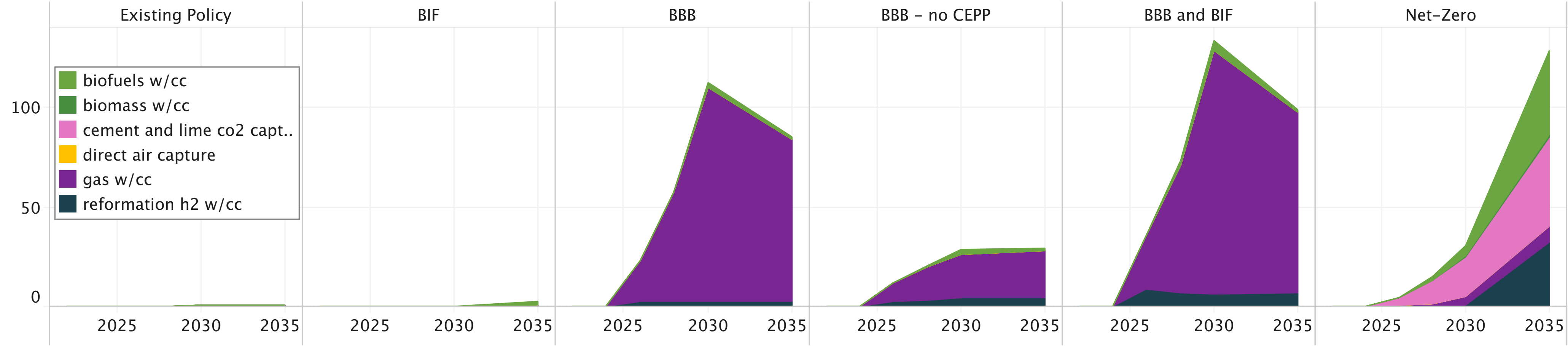


Notes: BIF funding for hydrogen hubs results in installed capacity of autothermal reforming w/CCS and electrolysis, but marginal costs of production are greater than steam reforming and so these units do not run.

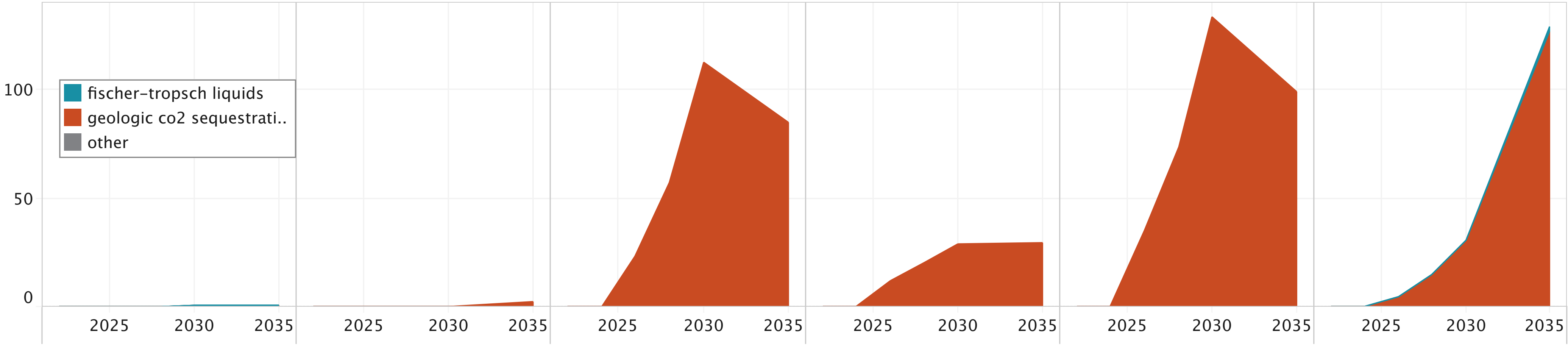
With hydrogen production tax credit in BBB, marginal production cost of clean hydrogen is lower than conventional steam methane reforming.

Net-Zero scenario features hydrogen production from biomass gasification w/CCS after 2030, which is not present in policy pathways.

Captured CO2 Sources
million metric tons



CO2 Destination
million metric tons



Notes: Natural gas oxy-fueled power plants (Allam cycle) are assumed to be available beginning in 2025 and are deployed in BBB policy scenarios due to extension and direct pay availability for 45Q tax credit for CCS.

CEPP drives additional deployment of gas w/CCS (see Slide 37).

Net-Zero Pathway features CCS on cement production which is not present in policy pathways due to inadequate incentives for CO2 capture and storage (e.g. $50/t 45Q incentive)

REPEAT Rapid Energy Policy Evaluation and Analysis Toolkit

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