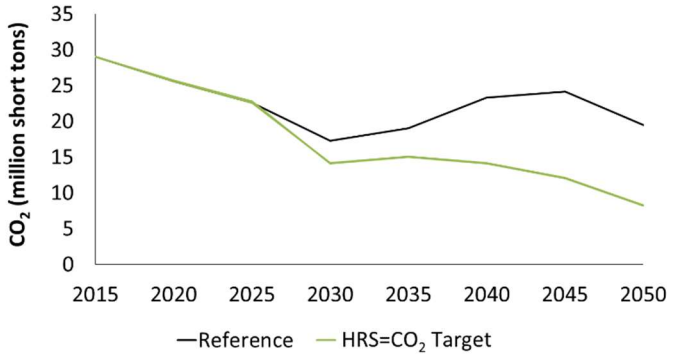
Cost-Effectively Achieving Carbon Goals in Minnesota: Renewable Standards vs. Technology-Neutral Policies

A scenario-based analysis of electric-sector impacts through 2050

Key Insights

- **A technology-neutral carbon reduction policy** (e.g., a CO_2 target) could achieve the same level of CO_2 emissions reduction in Minnesota at lower cost than a high renewable electricity standard of 60% by 2030 and 95% by 2050**, saving $2.7 billion in total electric sector costs** between 2015-2050.
- A **high renewable standard** would likely **require significant investments in new transmission** between Minnesota and neighboring states, more so than a comparable CO_2 target.
- Operating under a **CO_2 target**, Minnesota's generation fleet could **provide the state with more electric sector revenues** than under a comparable high renewable standard.
- A **CO_2 target supports** approximately the **same amount of new Minnesota wind, and more in-state generation investment overall**, than a high renewable standard achieving the same level of carbon reduction.

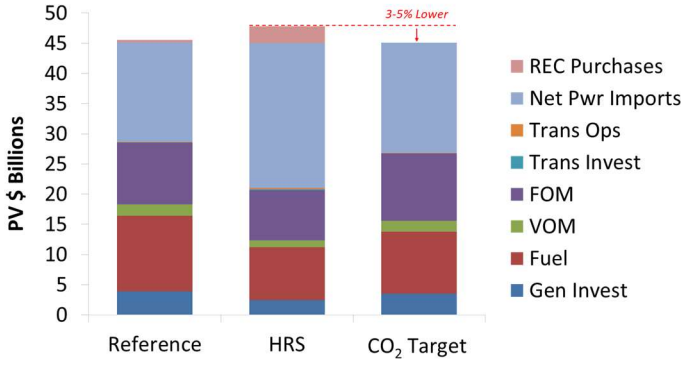
Using the U.S. Regional Economy, Greenhouse Gas, and Energy (US-REGEN) model and a scenario-based approach, this project investigates the cost-effectiveness of renewable energy standards and technology-neutral policies for reducing carbon dioxide (CO_2) emissions from Minnesota's electric power sector through 2050.



Minnesota Electric Sector CO_2 Emissions by Scenario

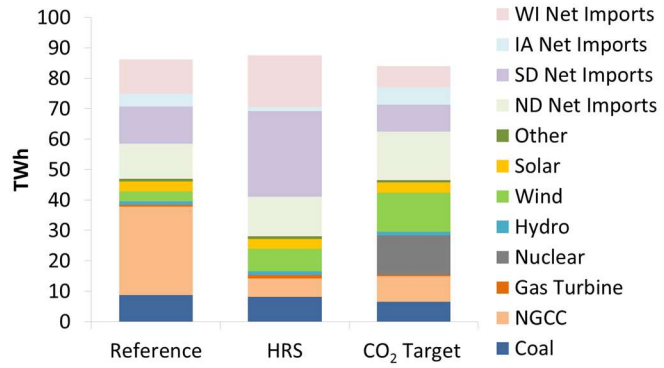
Scenario	Description
Reference	Business as usual
High Renewable Standard (HRS)	MN adopts a new 60% by 2030 and 95% by 2050 RES; rest of country is business as usual
CO_2 Target	MN electric sector CO_2 emissions target equal to resulting CO_2 emissions from HRS scenario; no MN RES; rest of country is business as usual

Results show that an explicit, technology-neutral carbon reduction policy (i.e., a CO2 target) lowers costs for reducing carbon emissions in Minnesota's electric sector by 3-5% (approximately $2.7 billion) between 2015-2050, as compared to a high renewable standard that achieves an equivalent level of CO2 emissions reduction.



Minnesota Electric Sector Total Costs (2015-2050)

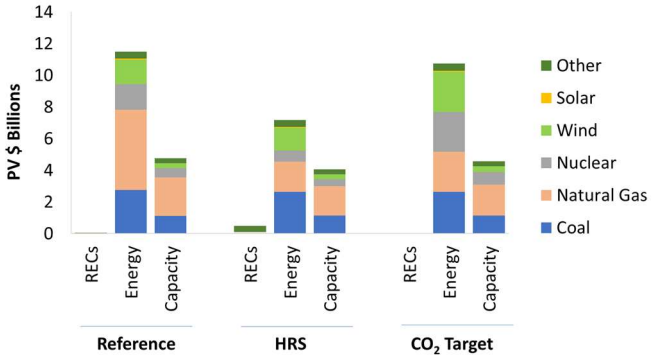
Differences between in-state generation and neighboring out-of-state generation used to meet Minnesota electric demand drive most of the cost disparity between the policy scenarios. To meet demand under the HRS, Minnesota shifts towards importing significantly more power from the Dakotas and from Wisconsin.



In-State vs. Out-of-State Generation Resources Used to Meet Minnesota Demand (2045)

To support the additional power imports, results also show 3 GW (approximately two or three new CapX-sized 345-kV transmission line projects) of new Minnesota-connected interstate transmission capacity, compared to only 0.2 GW under a CO_2 target and zero GW under the Reference.

Finally, a CO_2 target could incentivize more in-state generation investment, balancing fewer net power imports, than an HRS. These in-state investments also provide Minnesota with higher electric sector revenue opportunities—revenues from renewable energy certificate (REC), energy, and capacity sales under the CO_2 target are 30% higher than under the HRS. Additionally, while total new in-state wind investment (GW) is roughly equivalent between the scenarios, most additional revenue from new resources under a CO_2 target comes from in-state wind energy sales.



Minnesota Electric Sector Revenue Sources (2015-2050)

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