

Nonprofit Evaluation: Clean Air Task Force

October 2026

Giving Green

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Questions and comments are welcome at hello@givinggreen.earth.

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Summary

- **What is Clean Air Task Force?**

  Founded in 1996, Clean Air Task Force (CATF) is a U.S.-based nonprofit that advances technologies and policies to reduce carbon emissions across the economy. It works across the U.S., EU, Middle East, Africa, Latin America, and Central Asia.

- **How could Clean Air Task Force address climate change?**

  CATF could help reduce emissions by accelerating the deployment of emerging climate technologies, such as nuclear energy, superhot rock geothermal energy, low-carbon hydrogen, and other low-carbon fuels. These technologies need robust investment and supportive policies to scale. CATF helps create these conditions by filling knowledge gaps with technical research, advocating for effective policies, convening stakeholders, and providing technical assistance. If these technologies scale, they could decarbonize sectors that are hard to address with existing tools, such as the power grid, heavy industry, aviation, and shipping.

- **What is Clean Air Task Force's theory of change?**

  CATF's work to advance technological innovation falls into four main areas:

  1. **Technical research and modeling** to identify barriers.
  2. **Policy research and education** to support technological development and market growth.
  3. **Stakeholder engagement** to develop solutions and align strategies to address these barriers.
  4. **Technical assistance** to help utilities and governments put solutions into practice.

  We evaluated four CATF programs that overlap with our prioritized 2025 and 2026 strategies: superhot rock energy, clean electricity, energy and climate innovation in Africa, and transportation decarbonization. For more information, see our strategy reports on *Unleashing Clean Energy in the U.S.*, *Derisking Clean Electricity Investments in Low- and Middle-Income Countries*, *Reducing Maritime Shipping Emissions*, and *Reducing Aviation Emissions*.

- **Is there room for more funding?**

  CATF is focused on building a sustainable revenue base of $45 million to $50 million USD per year from 2025 to 2030. Its operating expense budget for 2026 is about $47 million, and as of September 2026, it has a $5.1 million budget gap for the rest of the year. Several programs have funding gaps that limit their operations and expansion. We think CATF could effectively absorb more money across its program areas and geographies.

- **Are there major co-benefits or potential risks?**

  We think the major co-benefits and potential risks of CATF's work are tied to the technologies it advocates for. For example, moving away from fossil fuels improves air quality, while next-generation geothermal plants carry a risk of induced seismicity.

- **What are the key uncertainties and open questions?**

  Our key uncertainties include the effectiveness of CATF's U.S. federal work under an administration less supportive of climate action, potential challenges from CATF's rapid growth, and the low feasibility of scaling technologies to reduce aviation emissions.

- **What is the bottom line, and what are the next steps?**

  We classify CATF as one of our Top Climate Nonprofits. We think its combination of technical research, policy advocacy, stakeholder engagement, and technical assistance gives it several paths to impact. It could use additional funding to sustain its existing programs, develop new program areas, and expand geographically. We believe CATF's pragmatic, results-driven approach, policy expertise, and proven track record position it well to continue making progress in global climate policy.

  Donors can support its work by either donating to the Giving Green Fund or to Clean Air Task Force directly.

What Is Clean Air Task Force?

Founded in 1996, Clean Air Task Force (CATF) is a U.S.-based nonprofit that advances technologies and policies for economy-wide decarbonization. It focuses on climate technologies that are new or lack widespread civil society support. For example, CATF promotes nascent technologies, such as advanced nuclear energy and superhot rock geothermal, as well as new approaches to hard-to-decarbonize transportation segments that philanthropy has largely neglected (see **Figure 1** for a full list of program areas). Its work falls into four categories: (1) technical research and modeling, (2) policy research and education, (3) stakeholder engagement, and (4) technical assistance. CATF has historically focused on the U.S., but now has teams working across Europe, the Middle East, and Africa.

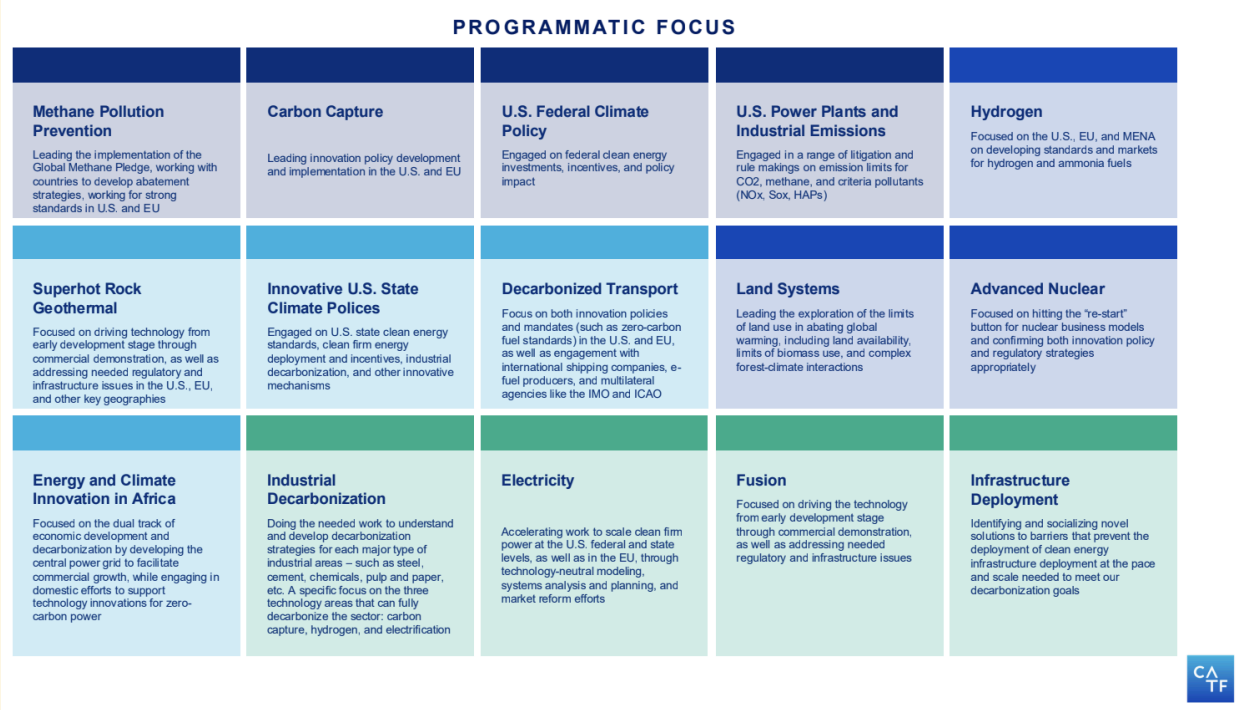


Figure 1: CATF program areas (courtesy of CATF)

CATF has been a Giving Green recommendation since 2020. Our 2020, 2021, and 2022 recommendations focused on its U.S. federal policy work. After the Infrastructure Investment and Jobs Act (IIJA) passed in 2021 and the Inflation Reduction Act (IRA) in 2022, we shifted to a more global lens. Since 2023, we have focused on the CATF programs that overlap with our prioritized strategies: superhot rock energy, clean electricity, and transportation decarbonization. In 2026, we added energy and climate innovation in Africa. For each program, this evaluation describes CATF's strategies and evidence of its ability to execute them, and assesses its theory of change and underlying assumptions. For more information, see our reports on *Unleashing Clean Energy in the U.S.*, *Derisking Clean Electricity Investments in Low- and Middle-Income Countries*, *Reducing Maritime Shipping Emissions*, and *Reducing Aviation Emissions*.

Superhot Rock Energy

Key ideas: Superhot rock energy

- **Superhot rock (SHR) is a proposed energy source that would tap geothermal energy from rocks at around 450°C. If technically and financially viable, it would provide affordable, always-on renewable energy for heat and electricity.** While it has high potential, researchers are still developing the drilling and heat-extraction technologies it requires.
- **CATF promotes SHR research and development through technical research, U.S. and EU policy advocacy, and stakeholder engagement.** We believe these efforts can help increase the number of projects built, lower costs, and boost demand as investor confidence improves.
- **CATF has played a major role in supporting SHR.** Among the few nonprofits focused on geothermal energy, CATF has been the most vocal advocate for SHR, which lacks strong industry support.

Unlocking Geothermal's Potential for a Net-Zero Grid

Geothermal energy can help address climate change by providing carbon-free heat and electricity in place of fossil fuels. It is a source of clean firm power, meaning it can generate electricity at any time, regardless of weather conditions. Clean firm power keeps the grid reliable during long periods of low output from variable renewable energy (VRE) sources such as solar and wind. We view clean firm power and VRE as complementary and think both are essential to a zero-emissions grid.

We think an energy portfolio that includes clean firm power offers a more feasible path to net-zero emissions than intermittent renewables alone.[1] Several net-zero models suggest the U.S. must quadruple clean firm power, adding 700-900 GW by 2050, to support renewables and rising electricity demand.[2] We also think geothermal could help meet the projected increase in electricity demand from the artificial intelligence (AI)

[1] In general, we believe the U.S. needs more clean, firm capacity to reach net-zero. "System level decarbonization modeling, regardless of renewables deployment, suggests that the U.S. would need significantly more clean, firm capacity to reach net-zero (Figure 3)." U.S. Department of Energy (DOE), 2023

[2] "System-level decarbonization modeling suggests that the U.S. will need to quadruple the existing clean firm power supply available on the grid today, adding between 700 and 900 GW by 2050 to build a decarbonized, functioning grid system capable of supporting wind and solar buildout and increased demand." DOE, 2025

industry and has uses beyond electricity generation (e.g., carbon-free heat to decarbonize heavy industry).[3]

Clean firm power has kept its momentum despite uncertainty around U.S. federal climate policy under the Trump administration. Although the 2025 One Big Beautiful Bill Act sharply curtailed tax credits for wind and solar, it largely preserved them for firm technologies such as geothermal and nuclear, which can still claim the full credit if construction begins by 2033.[4] Geothermal has drawn rare bipartisan support and favorable treatment from the administration, although it remains unclear whether that support will last.[5]

New geothermal technologies that borrow techniques from the oil and gas (O&G) industry could unlock energy in places that were previously out of reach.[6] These next-generation (next-gen) geothermal technologies are less mature than conventional geothermal but are reservoir-independent. For example, enhanced geothermal systems (EGS) use hydraulic fracturing to inject water deep underground, creating artificial reservoirs rather than relying on natural ones. Next-gen technologies such as EGS and advanced geothermal systems could be especially promising for expanding geothermal globally.

Compared to other forms of next-generation geothermal systems, **SHR systems involve drilling to deeper and hotter reservoirs (approximately 450°C) where supercritical**

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[3] Demand for electricity: "Military bases and data centers offer one particular benefit for the geothermal industry as it seeks to get its legs under it: They are facilities that are willing to pay a premium for power that is both clean and always on, even if it is substantially more expensive than more intermittent sources like wind or solar." The Hill, 2024.
Decarbonizing heavy industry: "Instead of using combustion to convert chemical energy in a zero-carbon fuel to heat, zero-carbon heat can also be harvested directly from environmental sources, like solar radiation and geothermal energy." Thiel & Stark, 2021

[4] Wind and solar rollbacks and nuclear credit: "The other big roll backs were to the wind and solar tax credits. The OBBB terminates the section 45Y production tax credit (PTC) and section 48E investment tax credit (ITC) for wind and solar projects placed in service after December 31, 2027, though facilities that begin construction before July 4, 2026, may take the full amount of the credit for the original phase-out period… The few exceptions to the general roll back were the section 45Z clean fuel credit, the section 45Q carbon sequestration credit, the section 45X advanced manufacturing PTC (for non-wind components), and the section 45U nuclear credit." Steptoe, 2025
Geothermal: "Drilling equipment rises against a cloudy sky Geothermal startup Fervo Energy drills deep into the ground in Beaver County, Utah. (Fervo Energy) Geothermal energy was spared in President Donald Trump's sweeping tax and spending law, which made deep cuts to incentives for other forms of clean energy." Canary Media, 2025

[5] "One additional energy source has more quietly but steadily moved during the 2020s from the periphery toward center stage in federal and state energy policy deliberations, bolstered by unusually broad bipartisan support and poised for significant expansion." Brookings Institute, 2026

[6] "Advances in technology are opening new horizons for geothermal, promising to make it an attractive option for countries and companies all around the world. These techniques include horizontal drilling and hydraulic fracturing honed through oil and gas developments in North America." International Energy Agency (IEA), 2025

fluids offer a higher energy yield than traditional water- and steam-based systems.[7] In theory, these systems could be highly efficient, but researchers are still developing the drilling and heat-extraction technologies they require.

For more on Giving Green's approach to commercializing and deploying clean firm power, see our strategy report on *Unleashing Clean Energy in the U.S.*

Superhot Rock Strategies

Technical Research and Modeling

The SHR team identifies research and technology gaps in SHR development. Examples include its *Bridging the Gaps* series, five reports on key barriers and paths forward, and its interactive Superhot Rock Project Map.

Policy Research and Education

CATF advocates for policies that fund and support SHR in both the U.S. and EU.

U.S. policy advocacy: CATF's SHR team uses its technical analysis to urge Congress to fund and support SHR. In 2024, it widened its federal policy scope to support next-generation geothermal technologies more broadly. At the state level, it promotes SHR in Western states, which have the richest geothermal resources in the U.S.[8]

EU policy advocacy: CATF is expanding advocacy for SHR and next-generation geothermal energy across Europe through policy engagement, coalition building, and public awareness work. Its near-term priority is shaping the European Commission's EU Geothermal Action Plan, expected in early 2026 but not yet released. CATF's Brussels presence helps fill a gap in the geothermal advocacy community.

Stakeholder Engagement

CATF builds networks to share resources and knowledge, accelerating innovation and reducing risks associated with SHR projects. It acts as a catalyst and coordinator between technology companies, industry partners, government officials, and potential investors.[9] CATF has introduced SHR at global forums, such as COP30, to drive public

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[7] "Additional innovation will also be required for successful resource utilisation in deeper and hotter reservoirs (sometimes referred to as superhot rock systems), where supercritical fluids offer a significantly higher energy yield than traditional water- and steam-based systems." International Energy Agency (IEA), 2025

[8] For an example, see *Unlocking California's Geothermal Potential: A Strategic Opportunity for Clean, Firm Power*. CATF, 2025

[9] "Act as a catalyst and coordinator, bringing together technology companies, industry partners (including multinational energy companies), government officials, and potential investors to create a network that galvanizes the SHR ecosystem and facilitates a roadmap for SHR research and development and demonstration (RD&D) projects." CATF, n.d.

awareness and convince delegates that SHR is worth supporting.[10] CATF is also partnering with local nongovernmental organizations to influence national geothermal strategies in Poland and Romania, and has launched a working group under the International Energy Agency's (IEA) Geothermal Technology Collaboration to coordinate SHR development across IEA member countries.[11]

Evidence of the Superhot Rock Program's Ability to Execute Its Activities

Technical Research and Modeling

According to CATF, its *Bridging the Gaps* reports and outreach informed SUPERHOT, a $30 million SHR research and development (R&D) program that the U.S. Department of Energy (DOE) Advanced Research Projects Agency–Energy (ARPA-E) launched in 2025.[12] We think this claim is plausible, since CATF is one of the few organizations advocating for SHR. If accurate, it suggests that CATF's technical analysis can shape federal R&D priorities for an emerging technology.

Policy Research and Education

CATF's federal advocacy has helped secure SHR funding and advance bipartisan legislation. Because CATF is one of the few organizations advocating for SHR, we think it helped ensure SHR was included in the IIJA's $74 million for enhanced geothermal systems pilot projects.[13] CATF also proposed ideas that were incorporated into H.R. 8665, a bipartisan 2024 bill that would have funded SHR R&D and supported coordination across next-generation geothermal. It advanced through House committees but did not become law.[14] In spring 2026, CATF's advocacy helped lead to a successor bill, the

[10] "CATF will spotlight the need for greater investment in advanced renewables, carbon capture and storage, advanced nuclear energy, fusion energy, superhot rock geothermal, and zero-carbon fuels." CATF, n.d.

[11] "The Clean Air Task Force (CATF) has announced a collaboration with the International Energy Agency Geothermal Technology Collaboration Progamme (IEA Geothermal) to link existing global efforts on superhot rock geothermal and help all participant projects move faster and more effectively." ThinkGeoEnergy, 2025

[12] "Today, the U.S. Department of Energy (DOE) Advanced Research Projects Agency-Energy (ARPA-E) announced $30 million to increase geothermal power production by unlocking superhot reservoirs deep within the Earth." Advanced Research Projects Agency–Energy (ARPA-E), 2025

[13] Bipartisan Infrastructure Law: "On February 8, 2023, the U.S. Department of Energy (DOE) announced up to $74 million to support enhanced geothermal systems (EGS) pilot demonstration projects called for in President Biden's landmark Bipartisan Infrastructure Law. The legislation authorizes DOE to support up to seven competitively selected pilot projects that collectively demonstrate EGS in different geologic settings, using a variety of development techniques and well orientations." U.S. Department of Energy (DOE), 2024. Inclusion of SHR: SHR was listed as one of the topic areas in DOE's funding opportunity announcement. Ibid.

[14] For more information on H.R. 8665, please see Congress, 2023. Evidence of CATF's engagement: "Ms. Terra Rogers, Program Director, Superhot Rock Energy, Clean Air Task Force, Boston, Massachusetts [H.R. 7053 & H.R. 8665], [Minority Witness]" House Committee on Natural Resources, 2024

Next-Generation Geothermal Research and Development Act (S.4406 and H.R. 8790).[15] The Senate version is the first Senate bill to address SHR, and the House version passed in late July. We think this record shows that CATF can build bipartisan support for an emerging technology over several years, even when an early bill stalls.

CATF has also made progress at the state level. California's 2026-27 budget created a new $20 million geothermal exploration cost-share program, following CATF's *Build Here: How Targeted State Investment in Geothermal Can Fill California's Clean Firm Gap* report.[16] The report recommended that California fund a testbed program to map the subsurface in high-potential regions to help attract private investment. CATF was one of about 30 groups in the coalition that pushed for this funding, so we cannot isolate its contribution.[17] Still, the program closely matches CATF's recommendation, which suggests its analysis can inform state policy design.

Stakeholder Engagement

CATF has built strong international networks for SHR. In 2026, it organized its second SHR-specific summit, which brought experts together to build a roadmap for international technology development.[18] CATF's engagement with the IEA may also be gaining traction: the IEA's March 2026 *The State of Energy Innovation* report featured next-generation geothermal throughout. We think these efforts show that CATF can bring together the experts and institutions that new technologies like SHR need to attract investment. However, the evidence so far is mostly about awareness and coordination. We have not yet seen new projects or funding that we can trace to CATF's convenings.

Theory of Change for the Superhot Rock Program

We developed a theory of change for CATF's SHR program to evaluate how it can reduce greenhouse gas (GHG) emissions (**Figure 2**). For each assumption, we rank our certainty level: low, medium, or high.[19] Our assessment is based on both primary and secondary

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[15] S.4406: "A bill to amend the Energy Independence and Security Act of 2007 to direct research, development, demonstration, and commercial application activities in support of next-generation geothermal systems in various conditions, and for other purposes." Congress, 2026
H.R. 8790: "This bill directs the Department of Energy (DOE) to support the development of next-generation geothermal systems, such as closed-loop geothermal systems in supercritical conditions." Congress, 2026

[16] "Sonoma Clean Power (SCP), the public power provider for Sonoma and Mendocino counties, today announced a major milestone in California's clean energy transition as Gov. Newsom signed a final budget agreement committing an additional $10 million for geothermal exploratory wells, bringing total state support to $20 million." California Community Choice Association, 2026

[17] Sonoma Clean Power "assembled a diverse coalition of groups in support of the effort to secure state funding," and listed about 30 organizations, including CATF. California Community Choice Association, 2026

[18] "That is what brought researchers, developers, investors, and policymakers to Banff, Alberta from June 5–7 for the second Superhot Rock Geothermal Summit, co-hosted by Clean Air Task Force and the Bezos Earth Fund." CATF, 2026

[19] We describe our certainty as low/medium/high to increase readability and avoid false precision. Since these terms can be interpreted differently, we use rough heuristics to define them as

evidence, as well as our general impression of the assumption's plausibility. Importantly, several stages of the theory of change may be hard to measure or quantify, lack a robust evidence base, or have not yet occurred.

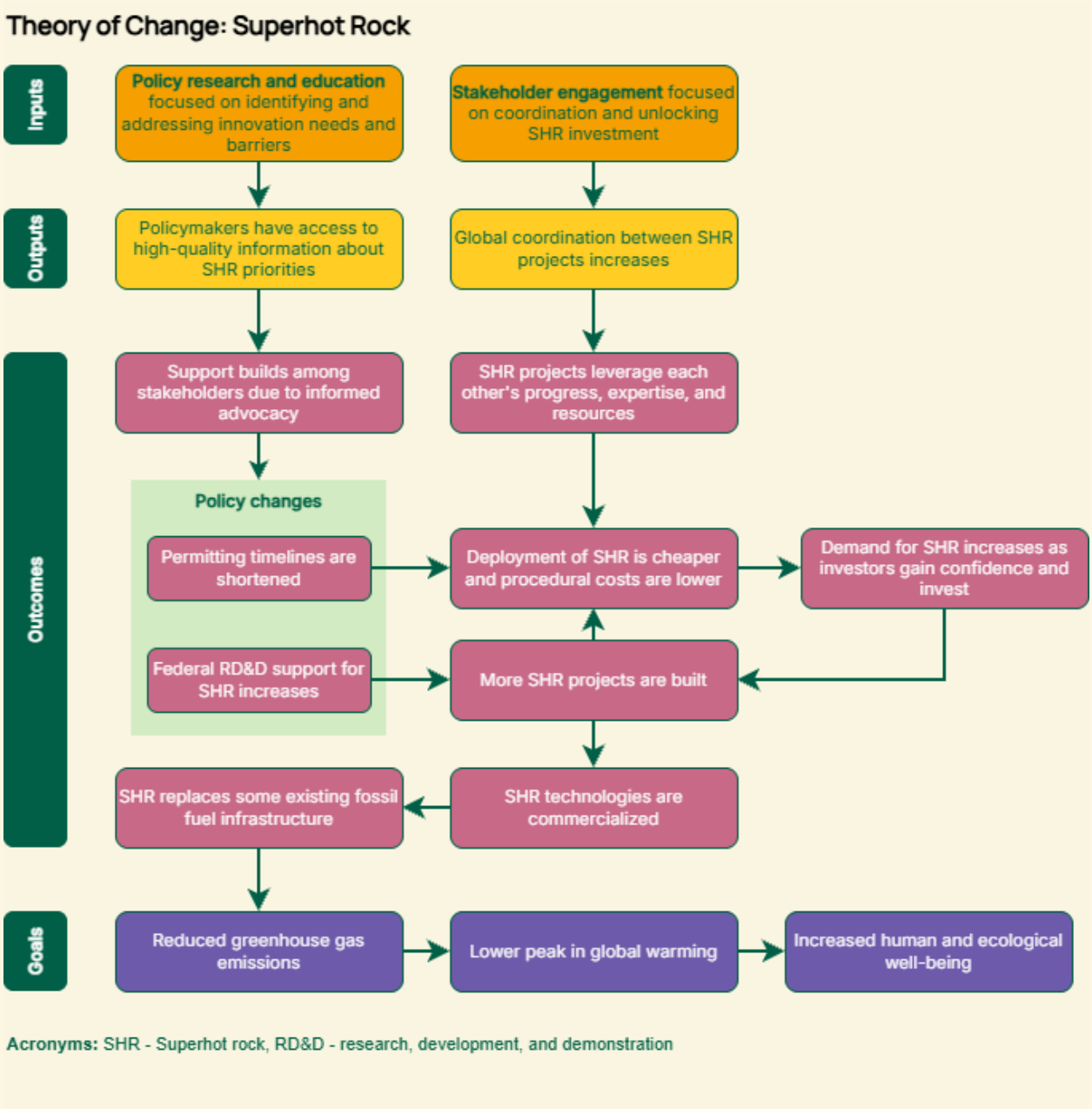


Figure 2: Theory of change diagram for CATF's SHR program

percentage likelihoods the assumption is, on average, correct. Low = 0-60%, medium = 60-80%, high = 80-100%

Examining the Assumptions Behind the Superhot Rock Program's Theory of Change

We note two key assumptions in our theory of change for CATF's SHR program:

1. CATF's work increases the likelihood that supportive policies for SHR are passed and speeds up R&D relative to the counterfactual (high certainty)

We believe that without CATF, advocacy for SHR policies would be lacking. Among the limited number of nonprofits supporting geothermal energy, CATF has been the most outspoken advocate for SHR.[20] Because SHR is a specialized technology, we also believe the few companies working on it lack a strong advocacy platform. Geothermal experts and funders have told us that CATF has played a crucial role in raising public awareness of SHR. We have also heard from sources within DOE that CATF's technical reports have been valuable in mapping out SHR's future.[21]

2. Supporting SHR R&D will increase the likelihood of its commercial viability (medium certainty)

Supporting SHR R&D should improve the technologies needed to access SHR and increase the odds that it becomes commercially viable, but we are not certain SHR will ever be viable. SHR is at an earlier stage of development than other next-generation geothermal technologies, which may be able to compete with it on cost. However, predicting the learning curve of any new technology is inherently uncertain. SHR also faces competition from other clean firm technologies, such as nuclear or batteries, which could fill a similar role on the grid. Giving Green believes investing in SHR is worthwhile, though we acknowledge uncertainty around its long-term commercial prospects. We discuss these tradeoffs in our section on key uncertainties and open questions.

[20] Our understanding is that Project InnerSpace is more focused on deploying next-generation geothermal technologies that are further along in RDD&D and less focused on SHR. Other geothermal organizations represent the interests of both conventional geothermal technologies and next-generation technologies and are less focused on SHR compared to CATF.
[21] While it restricts our transparency with readers, we frequently engage in confidential conversations where we promise to protect the identity of our sources. As a result, we cannot disclose the names of these specific sources.

Clean Electricity

Key ideas: Clean electricity

- **Widespread, multifaceted clean energy efforts are essential to building a modern, decarbonized U.S. grid.** Decarbonizing the U.S. grid while meeting growing demand will require broad clean energy efforts, from clean firm power to faster transmission buildout.
- **CATF's clean electricity programs promote clean energy deployment through technical research and modeling, as well as policy research and education.** We believe these efforts can help build more clean energy projects, specifically clean firm projects, and increase the deployment of crucial energy infrastructure, such as transmission. We think CATF has the expertise and credibility to educate policymakers, advocates, and the private sector.

Decarbonizing the Grid in the U.S. and Europe

CATF supports general clean energy efforts across two programs: electricity and clean energy infrastructure deployment. We refer to them together as CATF's "clean electricity programs." While most of CATF's work focuses on the U.S., its clean electricity programs also include work in Europe.

Decarbonizing the power sector is central to limiting warming. Electricity generation is a major source of GHG emissions, and a clean grid is a prerequisite to cutting emissions in other sectors, since electrifying vehicles, buildings, and industry only reduces emissions if the electricity itself is clean. At the same time, electricity demand is rising, driven partly by data centers and electrification. Without enough clean power to meet this demand, utilities may keep fossil fuel plants running longer or build new ones.

CATF's clean electricity programs target three barriers to a clean grid. First, CATF builds support for clean firm power, complementing variable sources like wind and solar. Second, it accelerates transmission buildout, which connects new clean energy projects to the places that need power. Third, it removes siting and permitting barriers that delay or block clean energy projects.

For more information, see our strategy report on *Unleashing Clean Energy in the U.S.*

Clean Electricity Strategies

Technical Research and Modeling

CATF's clean electricity programs produce economic research on financing and project bankability for the private sector, academics, and advocates. Examples include:

- **Identifying the best financing method for transmission:** The clean energy infrastructure deployment team studied how different transmission financing mechanisms in California would affect ratepayers.
- **Valuing clean firm power:** The electricity team's 2025 report explains the drawbacks of the Levelized Cost of Energy (LCOE), a widely used method for comparing energy projects. The team is also modeling the financial and societal benefits of clean firm power in different U.S. regions.

Policy Research and Education

Federal policy: CATF's clean energy infrastructure deployment program uses its technical expertise to inform federal transmission permitting policy. It has partnered with other organizations, such as the Niskanen Center, to research the biggest pain points in transmission permitting and the effects of expanded federal permitting authority.[22] Its current work builds on these findings and identifies knowledge gaps that could support well-designed federal permitting policies.

Regional and state policy: Both clean electricity programs work on regional and state policy:

- **Strengthening grid planning and markets for clean energy growth:** The electricity program uses its research to help policymakers design reforms that improve grid planning, modernize electricity markets, and support clean firm technologies.
- **Advancing state and regional transmission policy:** The clean energy infrastructure deployment program researches and educates policymakers on permitting, siting, transmission authorities, and financing. For example, the team has researched state transmission authorities and worked with Colorado and New Mexico to support transmission deployment.

State and local policy: The clean energy infrastructure deployment program works on siting and permitting policies that bridge the state and local levels. The team has tracked existing clean energy permitting and siting restrictions and conducted joint research with other organizations on state-specific restrictions. It now focuses on state-specific permitting and siting policy efforts, as well as best practices for local policies.

[22] Niskanen Center, 2024

Evidence of the Clean Electricity Programs' Ability to Execute Their Activities

Technical Research and Modeling

CATF's research has informed state transmission financing policy. Building on its California financing study and research on transmission authorities, CATF proposed public financing mechanisms for transmission infrastructure in California. The state adopted these mechanisms through SB 254, a transmission financing bill that passed in 2025, and CATF estimates they could save ratepayers up to $3 billion per year. We think SB 254 is a strong example of CATF's research directly shaping policy design. CATF's LCOE report and clean firm modeling are newer, so it is too early to judge their influence.

Policy Research and Education

CATF's research and engagement have helped shape state policy. In New York, after years of CATF engagement with the New York State Energy Research and Development Authority through staff meetings and written comments, the state's 2025 energy plan included nuclear power in its modeling for the first time. The plan showed that including nuclear power would significantly lower the cost of meeting the state's 2040 clean energy goal. At the federal level, CATF staff have testified on the group's transmission permitting research before the Senate Environment and Public Works Committee.[23] We think these examples show that state agencies and Congress take CATF's research seriously. Compared to CATF's federal work, its state work has produced clearer results so far. Federal permitting reform has not yet passed, and its impact will depend on whether a bipartisan bill, such as the Bipartisan American Affordability and Jobs Act of 2026, advances in the 119th Congress. We also think CATF's siting and permitting work could help counter growing state and local restrictions on clean energy, but we have not yet seen evidence of specific policy changes.

[23] U.S. Senate Committee on Environment & Public Works

Theory of Change for the Clean Electricity Programs

We developed a theory of change to evaluate how CATF's clean electricity programs can reduce GHG emissions (**Figure 3**).

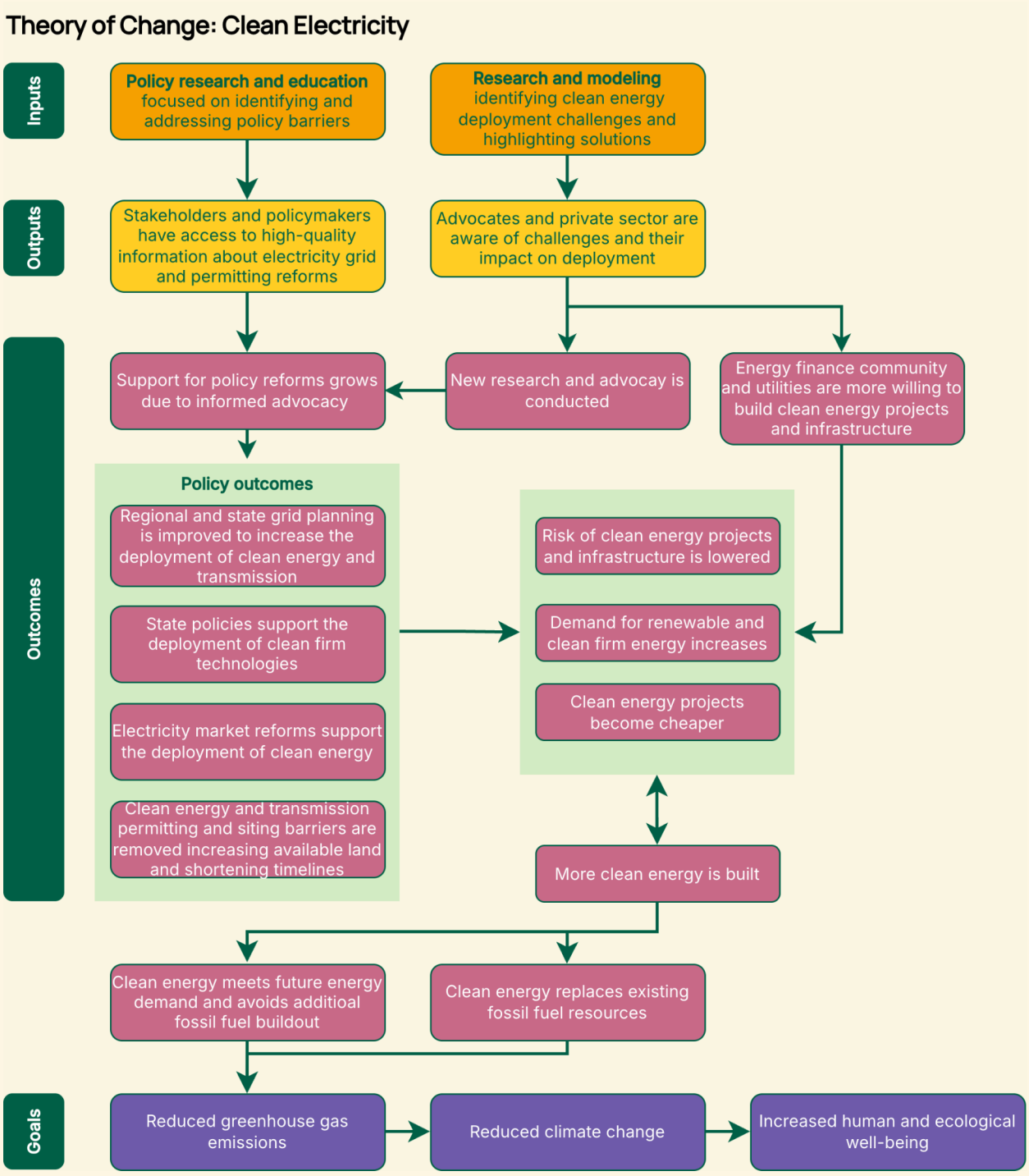


Figure 3: Theory of change diagram for CATF's Clean Electricity programs

Examining the Assumptions Behind the Clean Electricity Programs

We note two key assumptions in our theory of change for CATF's clean electricity programs:

1. CATF's work will make policies that increase clean energy and transmission deployment more likely to pass (high certainty)

Local, state, and federal policymakers have several opportunities to remove barriers to clean energy and transmission deployment. We believe CATF has the technical expertise and credibility to capitalize on these opportunities and shape policy by educating constituents and policymakers. Alongside other influential voices, we think CATF's work will make progress on several policies more likely.

Current U.S. political dynamics could limit CATF's influence. Congress has rolled back several clean energy incentives through the One Big Beautiful Bill Act (OBBBA), and federal permitting reform has not yet passed. However, we think CATF can still make progress at the state level, where it has already shaped California's SB 254 and New York's energy plan, and continues to work with states such as Colorado and New Mexico on transmission. At the federal level, CATF frames its work around issues with bipartisan appeal, such as energy affordability, grid reliability, and faster permitting. We think this framing can keep lawmakers engaged even when climate is not a shared priority.

2. CATF's research will influence the decisions of advocates and the private sector (medium certainty)

We are more confident that CATF's research will influence advocates than the private sector. Advocates and policymakers already use CATF's analysis to shape their priorities, as with its transmission financing research, which informed California's SB 254. For the private sector, CATF's work on project bankability could reduce perceived risk for clean firm and transmission investments. Its 2025 report on the limits of LCOE could also change how investors compare clean firm power with other resources. However, research alone rarely drives investment decisions. Companies also respond to interest rates, tax incentives, and permitting timelines, and OBBBA's cuts to clean energy tax credits may make some projects less attractive regardless of CATF's analysis.

Energy and Climate Innovation in Africa

Key ideas: Energy and climate innovation in Africa

- **In much of sub-Saharan Africa, weak grids and financially strained utilities make it hard to finance and build clean energy.**
- **CATF's energy access initiative supports African utilities, primarily in the West African Power Pool, through research, education, and technical assistance.** We believe these efforts can help utilities plan and run their grids better, positioning them to attract clean energy investment. We think CATF's technical expertise and relationships with utilities position it well to help reforms take hold.

Expanding Energy Access in Sub-Saharan Africa

CATF's Energy and Climate Innovation in Africa program aims to reduce energy emissions across Africa while supporting economic development. The program covers a wide range of work, from cutting methane pollution to producing clean hydrogen. We focus on its energy access initiative, which aims to attract clean energy investment and expand access to power, because it overlaps with our strategy of derisking clean electricity investments in low- and middle-income countries (LMICs).

Although sub-Saharan Africa currently accounts for a small share of global emissions, its electricity demand is expected to grow substantially as populations and economies expand and more people gain access to power. Whether that demand is met with clean energy or fossil fuels will shape the region's emissions for decades, because power plants and grid infrastructure built today can operate for decades. By helping utilities run their grids better and become more creditworthy, CATF aims to make clean energy easier to finance and connect, so that more of the region's growing demand is met with clean power.

CATF's energy access initiative focuses on sub-Saharan Africa—specifically the Eastern and Western Africa power pools—with current efforts in Kenya, Tanzania, Ghana, Nigeria, The Gambia, Benin, and Senegal.[24]

[24] "Power pooling is used to balance electrical load over a larger network (electrical grid) than a single utility. It is a mechanism for interchange of power between two and more utilities which provide or generate electricity" UN, n.d

The Energy and Climate Innovation in Africa Program's Strategies

Policy Research and Education

CATF has analyzed the challenges sub-Saharan utilities face and developed strategies to reform operations and improve clean energy deployment. Building on this work, CATF plans to develop a Utility Investment Resilience Index (UIRI). This tool benchmarks West African Power Pool (WAPP) distribution utilities on their readiness for new investment. CATF plans to use this tool to identify each utility's barriers to investment and recommend specific reforms. While CATF will develop and refine the UIRI tool using WAPP's feedback, the larger goal is to replicate and adjust it for use in other power pools across Africa.

Stakeholder Engagement

The CATF Africa team takes a regional approach to engaging utilities. It convenes an annual utilities roundtable for the WAPP, bringing together roughly 50 utilities across 11 countries. Through its convening, CATF shares analysis and recommendations with utilities, regulators, and other decision-makers on grid management, energy access, and clean energy integration. It also connects decision-makers from across the continent who would not otherwise share lessons learned.

Technical Assistance

CATF provides one-on-one technical assistance to countries that need more hands-on support. This work has focused on two services:

- **Feasibility and planning studies:** Most countries have capable engineers, but lack the capacity for system-wide assessments and long-term holistic plans. CATF fills this gap by reviewing WAPP utilities' grids, identifying overlooked inefficiencies, and recommending best practices that local staff can implement to connect new clean energy.
- **Demand-side support:** CATF helps WAPP utilities reliably serve large electricity offtakers, who are key to a profitable grid. It conducts grid analytics to ensure supply can meet demand and reviews utilities' rates, business plans, and grid plans so they can serve offtakers' needs without operating at a loss.

Evidence of the Energy and Climate Innovation in Africa Program's Ability to Execute Its Activities

Policy Research and Education

CATF's research is promising but too early to assess. CATF has published analyses of the challenges sub-Saharan utilities face, but its main planned tool, the UIRI, is still in development. We think the UIRI could help utilities and financiers prioritize reforms, and building it with WAPP feedback should help utilities trust and use it. However, we have not

yet seen evidence that CATF's research has changed utility decisions on its own, apart from its convenings and technical assistance. In future evaluations, we will look for signs of uptake, such as utilities or investors using UIRI results.

Stakeholder Engagement

CATF reports several examples of utilities applying lessons from its convenings. For example, decision-makers from Sierra Leone shared that the country updated its approach to transmission and generation in response to the information shared at CATF's convening and, as a result, secured investment for an additional 50 megawatts of hydropower. This example suggests CATF's convenings can lead to concrete investment decisions. Because the claim is self-reported and we cannot isolate CATF's role, we place limited weight on it. Still, a roundtable that reaches roughly 50 utilities across 11 countries gives CATF a broad platform to repeat this kind of result.

Technical Assistance

CATF reports early wins from its technical assistance. In Ghana, CATF reports that a utility adopted its recommendations to lower distribution losses, which led to 7,400 new connections and $1.56 million in savings that the utility reinvested into the grid. We think this is the strongest evidence for the Africa program because it shows a measurable improvement. However, it is a single, self-reported case, and lasting impact depends on utilities following through on reforms. Additional examples, ideally verified by the utilities themselves, would increase our confidence.

Theory of Change for the Energy and Climate Innovation in Africa Program

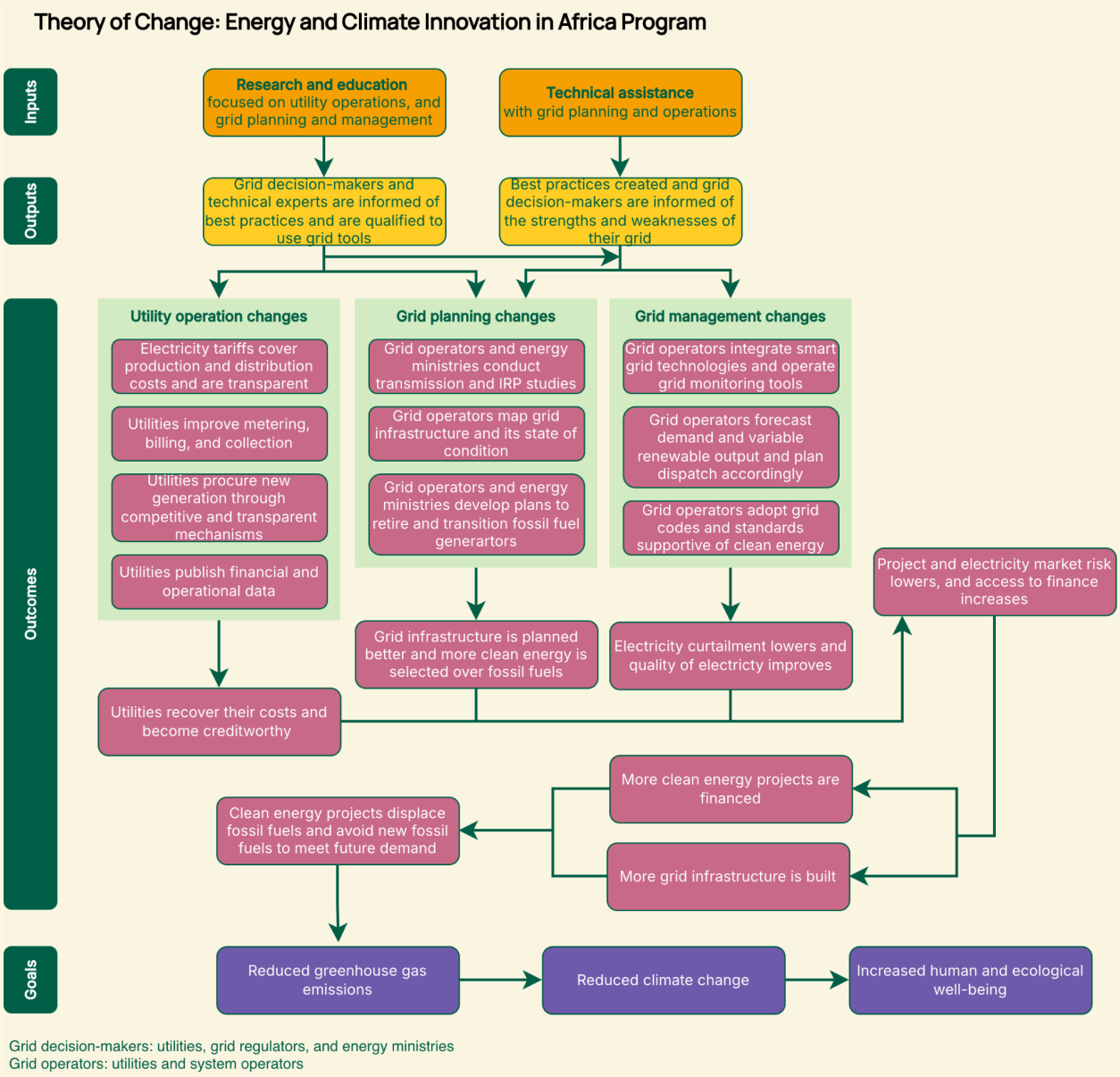


Figure 4: Theory of change diagram for CATF's Energy and Climate Innovation in Africa program

Examining the Assumptions Behind the Energy and Climate Innovation Program's Theory of Change

1. CATF's work will lead utilities to adopt best practices that increase clean energy investment (medium certainty)

CATF's analysis and recommended best practices can improve how a utility plans and operates its grid and, in turn, attract more financing. However, CATF's ability to drive measurable change depends on whether utilities adopt and successfully implement its recommendations. Political conflicts and competing priorities, such as industry interests or affordability concerns, may keep decision-makers from acting on them. Despite this, we think CATF can build relationships with decision-makers outside its convenings through consistent engagement and increase the likelihood of reform over time, in part because it has already seen success. For example, CATF reports that a Ghanaian utility cut distribution losses after adopting its recommendations (described above). Although not every engagement will lead to change, we think CATF has the expertise to make progress.

2. CATF's technical analysis will lead to improved grids that integrate more clean energy (medium certainty)

As we discuss in our *Derisking Clean Electricity Investments in LMICs* strategy report, clean energy technologies cannot be financed and deployed at scale in LMICs without improved grids. CATF's technical analysis, such as distribution efficiency and least-cost studies, helps identify barriers and provides pathways to improve grid development and operation. However, these improvements could also support the development of new fossil fuel resources. Even so, we think that CATF's work will largely benefit clean energy deployment for two reasons. First, CATF's experience and technological expertise are in clean technologies, so its recommendations are more likely to help a country meet its priorities with clean technologies. Second, the price of clean energy technologies, such as solar and wind, has dropped significantly, making them a cost-competitive energy resource that also increases a country's energy security during supply chain turmoil. As a result, we think many LMICs are inclined to build more clean energy, and efforts such as CATF's can help clean energy deployment significantly outpace new fossil fuel resources.

Transportation Decarbonization

Key ideas: Transportation decarbonization

- Unlike most road vehicles, aviation and shipping vessels cannot be easily electrified. **Reducing aviation and shipping emissions relies on nascent technological pathways, such as alternative fuels, zero-emissions vessels, and flight rerouting.**
- CATF seeks to reduce aviation and shipping emissions through technical research and modeling, policy research and education, and stakeholder engagement.
- **We think CATF's technical analysis is especially strong, providing critical evidence to address key research gaps and shift the narratives around low-carbon transportation.** CATF's cross-sectoral expertise, along with its industry and policy engagement channels, strengthens its analysis and could help turn research into action.

Decarbonizing Aviation and Shipping

CATF's transportation decarbonization program aims to reduce transportation sector emissions to zero by mid-century. **It focuses on hard-to-electrify modes, such as aviation and maritime shipping, which are predicted to rely on alternative energy carriers like hydrogen, e-fuels, and ammonia.**[25] The team supports work to develop and scale low-carbon fuels, vehicles, and the infrastructure they need.

CATF's transportation decarbonization program focuses mainly on the U.S. and EU because it thinks these geographies (1) hold the most feasible political opportunities and investments to launch alternative fuel markets and (2) are centers of influence for relevant international bodies such as the International Maritime Organization (IMO) and International Civil Aviation Organization (ICAO).

We also include CATF's work on hydrogen in this program because **clean hydrogen is a key component in most of the main alternative propulsion technologies for long-distance aviation and shipping**.[26] The hydrogen team primarily works to reduce

[25] "Great progress has been made in battery-based electrification, but certain vehicles – including heavy-duty vehicles like long-haul trucks, transoceanic marine vessels, and aircraft – will be difficult or impossible to power with batteries and will require the use of low- and zero-carbon fuels like hydrogen and ammonia to decarbonize" CATF, n.d. [accessed 30 Oct 2025]
[26] The main technologies we describe for aviation are cryogenic hydrogen, cryogenic methane, and sustainable aviation fuels. For shipping, they are ammonia, methanol, and hydrogen. For more

emissions from existing hydrogen production and end-use deployment in sectors such as steel, chemicals, ammonia for fertilizers, methanol, and oil refining. Its secondary focus is promoting low-carbon hydrogen for scaled next-generation applications, such as aviation fuel and ammonia for shipping. Its efforts have mainly focused on the U.S., EU, and Middle East, but it plans to continue expanding globally.

Transportation Decarbonization Strategies

Technical Research and Modeling

CATF analyzes the technical and market barriers facing each transportation pathway. For example, it has studied how ammonia ships compete on cost with conventional fuel oil under EU maritime fuel standards. It has also analyzed enabling technologies for net-zero aviation and recommended ways to minimize aviation's non-CO_2 effects. In 2026, it found that reducing fossil-based kerosene use at a small number of high-impact airports could substantially reduce contrails and public health risk. On hydrogen, CATF has built models of lifecycle emissions and production costs.

This research helps direct scarce low-carbon resources, such as hydrogen and biomass, to sectors that need them most. For example, CATF concluded that hydrogen is unlikely to be economically viable at scale for power generation compared with options like solar. It also urges shipping to look beyond biofuels to fuels like e-ammonia.[27] Shipping has more alternatives for decarbonization than aviation, and competing for limited biofuels could drive up costs.[28]

Policy Research and Education

CATF promotes incentives, mandates, and performance standards that support low-carbon transportation.

U.S. policy: Under the Biden Administration, CATF developed a proposal for a federal carbon-intensity-based fuel standard for all transportation fuels. Since January 2025, CATF has shifted this work to state-level opportunities, most notably low-carbon fuel standards, because federal action has become less feasible. Its hydrogen team also works on federal hydrogen policy, including the 45V tax credit and the U.S. hydrogen hubs, and it advocates for connecting hubs with end-use sectors like shipping and steel.

EU policy: For aviation, CATF focuses on clean fuels, contrail mitigation, the role of carbon removal, and strengthening the EU Emissions Trading System (ETS), including dedicating ETS revenue to aviation decarbonization. For shipping, it supports low-carbon

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information, see our strategy reports on *Reducing Aviation Emissions* and *Reducing Maritime Shipping Emissions*.

[27] E-ammonia is ammonia produced using renewable electricity, hydrogen, and nitrogen gas.

[28] "As such, the aviation industry will want to mitigate the related financial and logistical challenges by maximizing its use of bio-SAF, so it is unlikely to get outbid for the available supply of biofuel, especially by industries that can turn to other options." CATF, 2025

vessels and fuels and stronger FuelEU Maritime implementation.[29] It also advocates for guardrails on hydrogen and biofuels use.

International policy: CATF works with partners to build support for ambitious regulations, providing insights into U.S. opposition to the IMO's proposed Net Zero Framework.

Stakeholder Engagement

CATF works with vehicle manufacturers, fleet operators, fuel suppliers, and technical experts to accelerate the commercialization of low-carbon heavy transportation. It tests its analysis with industry to identify key innovations and market gaps, supports demonstrations of new technologies such as zero-emission vessels, connects fuel producers and buyers to secure purchase agreements, and works with airlines and air traffic managers on contrail mitigation.

Evidence of the Transportation Decarbonization Program's Ability to Execute Its Activities

Technical Research and Modeling

CATF's tools and reports fill critical technical gaps. Based on our review of its publications and conversations with external experts, we think CATF's technical analysis is exceptionally strong. It addresses gaps where research is still ongoing, where information is hard for policymakers and civil society to access, or where standards and policies need technical support. For example, its analysis of ammonia-fueled ships found that, under EU carbon pricing, these ships could meet FuelEU Maritime targets at a lifetime cost equal to or below that of a conventional heavy fuel oil ship.

Policy Research and Education

CATF's hydrogen team has shaped federal policy, though recent policy changes have limited its impact. CATF says it played a key role in designing the federal 45V hydrogen production tax credit, and it helped establish the U.S. hydrogen hubs.[30] Since 2025, however, the OBBBA has moved 45V's construction deadline from 2032 to the end of 2027, a decision states are challenging in court.[31] DOE has also canceled funding for two

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[29] "Green maritime shipping corridors are an avenue for coordinating across stakeholder groups in specific high-potential geographies to align incentives, test-drive new technologies, target investments, and build public-private partnerships." Our Shared Seas, 2023

[30] "Following substantial engagement from CATF and its partners, the U.S. Department of the Treasury released its long-awaited proposed regulations for the Section 45V Hydrogen Production Tax Credit (PTC) in late 2023 — a major step toward building a credible clean hydrogen market in the United States. We also played a key role in shaping the final guidance throughout 2024, advocating for policies that promote truly clean hydrogen while preventing loopholes that could increase emissions." CATF, 2025

[31] "The Act accelerates the termination of this credit by providing that the 45V credit will not be available for projects on which construction begins after December 31, 2027. That is five years earlier than the IRA sunset date." Sidley Austin, 2025

of the seven hubs, and its July 2026 spending plan does not allocate new money for the rest.[32] As a result, this work will likely reduce fewer emissions than we expected when these policies passed. Still, it shows the team's expertise, and the rules it helped shape could still guide future U.S. hydrogen policy.

CATF has a broader track record of policy wins in the U.S. and EU. It helped secure climate provisions in the bipartisan Energy Act of 2020, provided technical input to the IIJA, and advocated successfully for IRA provisions on methane, neglected low-emissions technologies, and stackable incentives.[33] Some of these wins have since been scaled back: Congress repealed the rule implementing the IRA's methane fee in 2025, and the OBBBA cut short many of the IRA's clean energy tax credits.[34] In the EU, CATF has helped secure the EU Methane Regulation and has long engaged on the ETS, focusing on ensuring strong support for scaling sustainable aviation fuel (SAF) and elevating contrail mitigation in negotiations. We think this record shows that CATF can turn technical expertise into policy wins on both sides of the Atlantic.

Stakeholder Engagement

We have not tracked the impact of CATF's stakeholder engagement in transportation. We see this as a supplementary strategy to strengthen CATF's analysis and policy engagement, rather than a core part of its impact strategy**.** We think CATF's cross-sector expertise and pragmatic approach make it a credible industry partner, and think that its connections to industry also strengthen its policy work. For example, CATF has worked with industry partners to bring the private sector voice to federal and state policy discussions. We have not seen non-policy outcomes that we can trace to this work, such as purchase agreements or demonstration projects.

Theory of Change for the Transportation Decarbonization Program

We developed a theory of change to evaluate how CATF's transportation decarbonization program can reduce GHG emissions (**Figure 5**).

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[32] Canceled projects: "Last week, as part of a list of 321 grants revoked in the name of saving $7.5 billion in spending, the Department of Energy rescinded $2.2 billion in awards to two of the seven regional hydrogen hubs established under the bipartisan Infrastructure Investment and Jobs Act." Canary Media, 2025; state challenges: "California Attorney General Rob Bonta led a 13-state coalition in a separate lawsuit filed in February 2026, challenging DOE's cancellation of a wider group of energy and infrastructure awards that included the hydrogen hub terminations" Environment+Energy Leader, 2026
2026 spending: "The Office of Management and Budget's (OMB) most recent apportionment spend plan for DOE, released on July 17, 2026, indicates that the agency intends not to spend additional funds on the Hydrogen Hubs this year." DOE Alumni Network, 2026
[33] Energy Act of 2020: CATF (2020); IIJA: CATF (n.d.) IRA: CATF (2022)
[34] "Under the joint resolution and by operation of the CRA, the 2024 WEC Final Rule now has no legal force or effect." Federal Register, 2025

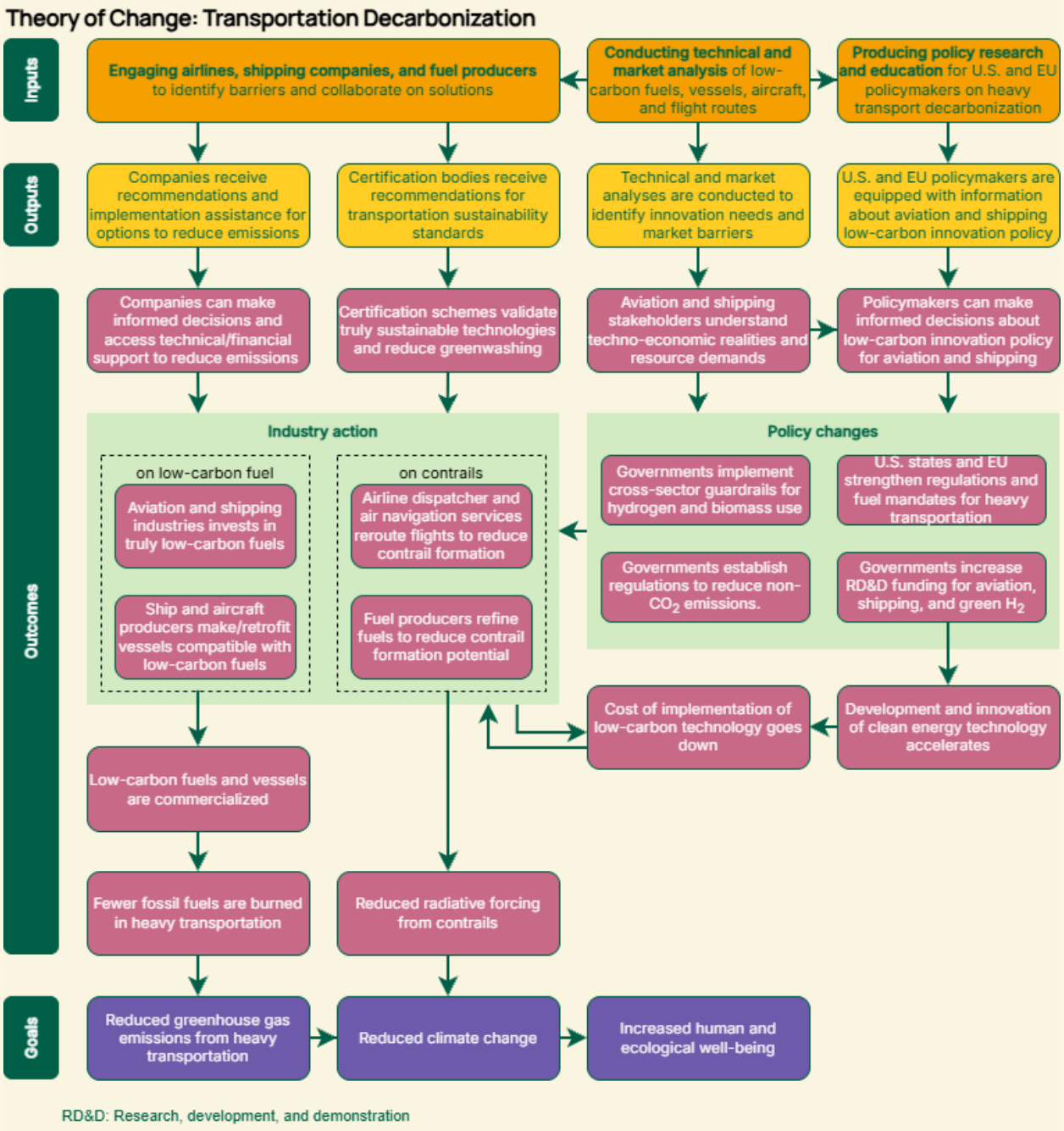


Figure 5: Theory of change diagram for CATF's Transportation Decarbonization program

Examining the Assumptions Behind the Transportation Decarbonization Program

We note four key assumptions in our theory of change for CATF's transportation decarbonization program:

1. CATF's research and analysis influence transportation narratives, policies, and industry action (medium certainty)

As described above, we think CATF's technical analysis is exceptionally strong and addresses critical technical gaps. We also think CATF's research has shifted incumbent narratives and promoted high-impact, neglected pathways. For example, it has made novel arguments on hydrogen and biomass prioritization and contrail mitigation. CATF's upcoming research on the role of carbon removal in reducing aviation emissions will also fall into this category.

2. CATF's policy research and education efforts make impactful policies more likely to be adopted (medium certainty)

As described above, CATF has a strong track record of contributing to climate policy in the U.S. and EU, though some of its U.S. wins have been scaled back.

We are not confident CATF will achieve major wins in the transportation sector under the current U.S. political climate. However, we believe CATF's ambitious federal measures may become feasible again under a future administration, and we think it is valuable to maintain the team's capacity so it can respond quickly to future policy windows. We also see opportunities for near-term progress in key states, such as California.

We think the EU is a particularly important geography for reducing aviation and shipping emissions, with some of the world's most progressive transportation policies. For example, the 2026 revision of the EU ETS included a proposed geographical expansion to international flights, and the world's first measures to move beyond contrail monitoring, reporting, and verification toward mitigation.[35] Although the EU is a policy leader for green transportation, it has shown less openness toward climate action since the 2024 election, and significant pushback is expected for many of the policy windows highlighted above.[36] We think CATF's pragmatic approach could resonate with current EU priorities for industrial competitiveness. With expertise both in the U.S. and EU, CATF could also counter U.S. pushback on policies with international reach, such as expanding the ETS.[37]

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[35] "The new proposed changes bring aviation some consequential updates: a wider geographic net, the first-ever mechanism to address non-CO2 climate effects, extended SAF support, and a handful of structural changes that will hit airline compliance costs directly." Estuaire, 2026

[36] "EU policymakers have dealt several critical blows to their much-vaunted European Green Deal since the end of 2023, when opinion polls suggested a significant rightward shift before the 2024 parliamentary elections." The Guardian, 2025

[37] "With a fresh opportunity to price aviation's pollution on the horizon, the EU must not let history repeat itself and stand true to its principled commitment to climate action in spite of inevitable, and

3. Regulations will influence the private sector to transition to low-carbon technology (high certainty)

We think policy is a necessary lever to influence private-sector decarbonization trends. For example, pricing emissions can narrow the green premium for low-carbon shipping technology, strengthening the business case for e-fuels. Furthermore, well-designed policies with ambitious targets, such as the FuelEU Maritime initiative, can provide long-term market signals and reduce investor uncertainty. The IMO's proposed fuel intensity targets have signaled a shift toward low-carbon fuels, since incremental solutions would likely become uncompetitive by the mid- to late 2030s. However, uncertainty about whether and how ambitiously they will be adopted may lead some investors to wait.[38] IMO's session to adopt the Net Zero Framework was adjourned for one year in October 2025, and a vote is expected by the end of 2026.

Because the industry is early in its transition, strong policy signals can shift incentives and deter the industry from locking into infrastructure that relies on transitional or conventional fuels, such as biofuels and liquefied natural gas for the shipping industry.[39] Preventing such lock-in is crucial given that these fuels are cheaper and more mature than e-fuels but offer less climate mitigation potential, and shipping vessels have lifetimes of several decades.[40]

The IMO's global role in international coordination also reduces the risk of carbon leakage, where firms shift activity to avoid stricter national or regional rules. Harmonized regulations ensure a level playing field across the sector, increasing the certainty of demand for low-carbon technology.

4. Low-carbon technologies for shipping and aviation can become cost-competitive and scale to meet the needs of the sectors (medium certainty)

Both low-carbon shipping and aviation currently come with high green premiums compared to conventional technologies.

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likely intensive, US pressure – Senator Thune, architect of the anti-ETS bill, is today the majority leader in the Senate." Carbon Market Watch, 2025

[38] "The introduction of a fuel intensity target (base GFI), which sets to decrease by at least 65% by 2040, means that incremental solutions are unlikely to remain competitive in the mid/late 2030s" "This raises concerns about whether the fund will be able to simultaneously support early deployment of ZNZs and deliver the promised support for a just and equitable transition. This may therefore lead to a cautious, wait-and-see approach." IDDRI, 2025

[39] "If investors expect pressure to reduce carbon emissions (regulatory or otherwise) to be delayed or weak, transition pathways that can make use of mature but less-scalable or sustainable elements (e.g., bioenergy, LNG) may gain an advantage. If expectations are that the speed of the transition will be in line with the 1.5-degree pathway described in Chapter 1, then these pathways may feature risks of disruption and stranded assets." UMAS, 2021

[40] "Given that the life of shipping investment spans over several decades, there is therefore a risk of carbon lock-in and/or stranded assets to public and private investors in the sector." IDDRI, 2025

For shipping, we have medium certainty that low-carbon fuels will reach price parity with fossil fuels, as their costs fall and regulations make fossil fuels more expensive. Forecasts suggest e-fuels could reach parity with fossil fuels between 2030 and 2040.[41] Notably, CATF found that under existing regulations, e-ammonia ships built today could already achieve cost-competitiveness over their lifetime compared to conventional vessels.[42] We think reducing costs for low-carbon shipping depends heavily on scaling renewable energy, increasing the availability of green hydrogen, and building out global e-fuel infrastructure.

For aviation, we have low certainty that either alternative fuels or hydrogen-based aircraft can scale to meet the needs of the sector:

- **Scaling biofuels will be challenging due to feedstock constraints**, including the low availability of waste feedstocks and the emissions associated with land-use change in crop-based biofuels.[43]
- **We do not think a promising route to scaling e-kerosene production has been demonstrated, given its high cost and energy demand.**
- **Hydrogen aviation is still in its infancy**, and the field will require significantly more support from philanthropic and public funds to accelerate its commercialization. We are not certain the field will attract sufficient funds to reach a high-innovation scenario with substantial mitigation impact.

We address the feasibility of decarbonizing aviation as a key uncertainty and discuss leading technologies in our strategy report on *Reducing Aviation Emissions*.

What Is CATF's Cost-Effectiveness?

Cost-effectiveness estimates for CATF, expressed in dollars per metric ton of CO_2-equivalent reduced or avoided, are being finalized and will be added to the report upon completion.

Is There Room for More Funding?

CATF's 2026 expense budget is approximately $47 million, and as of September 2026, it has a $5.1 million budget gap through year-end. This budget fits within the range CATF has said it wants to stabilize its revenue at: $45 million to $50 million per year from 2025

[41] "Some estimates show that such policy support could help achieve price parity between green ammonia and current fossil fuels between 2030 and 2035." ClimateWorks, 2025; Fuel production cost estimates and assumptions. Lloyd's Register, 2019

[42] "All three ammonia fueled ships evaluated were able to comply with or outperform the new FuelEU Maritime targets at a cost equal to or below that of a conventional heavy fuel oil powered ship." CATF, 2024

[43] Waste availability: "However, demand is approaching the supply limits of the most-used wastes and residues." IEA, 2022; biofuel: "In the high-demand scenario where jet fuel is eliminated, we'd need around 300 million hectares of cropland. That's an area the size of India." Sustainability by Numbers, 2023

to 2030. We think CATF's focus on a sustainable revenue base matters, given its many multi-year strategies that need long-term funding.

Several CATF programs have gaps in already budgeted activities and could expand with additional funding. For example:

- **SHR:** The program has a $250,000 gap for ongoing activities. Beyond this, additional funding would support next-generation geothermal in the western U.S., awareness-building and multipartisan message testing on SHR in Europe, federal policy recommendations on financing, a data management system with the National Laboratory of the Rockies, and work on financing SHR testbeds.
- **Clean electricity:** The clean electricity programs have a $330,000 gap for ongoing activities in the U.S. and Europe. Beyond this, additional funding would support more clean firm modeling, a larger U.S. state-level presence, and work integrating clean firm power onto the grid in Europe.
- **Transportation:** The program has a $150,000 gap for ongoing activities. Beyond this, additional funding would support more modeling of clean fuel standards in the U.S., new work to limit the widespread adoption of liquefied natural gas for trucking in India, modeling emissions reductions from warehouses through Indirect Source Rule enforcement, and more technical capacity on alternative fuels and propulsion for aviation and shipping.

CATF has used past funds from Giving Green donors to support and grow existing programs and launch new initiatives. For example, CATF has cited Giving Green's fundraising as critical to supporting its international expansion to Europe, Africa, and the Middle East.

Given the existing funding gaps and ambition of CATF's work, we think CATF could effectively absorb more money across its programs.

Are There Major Co-Benefits or Potential Risks?

We think the major co-benefits and potential risks of CATF's work are tied to the technologies it advocates for.

- **Superhot rock energy:** Co-benefits include geothermal power plants' smaller land footprint compared to other energy-generating technologies, improved air quality compared to continued fossil fuel usage, and job opportunities for former fossil fuel workers. Potential risks include contaminated groundwater and induced seismicity.
- **Transportation decarbonization:** Co-benefits of low-carbon aviation and shipping include reduced air pollution and technological spillover to other low-carbon technologies. Potential risks include high resource intensity and toxicity risks for e-ammonia.
- **Clean electricity:** Co-benefits of deploying additional clean energy include improved air quality compared to continued fossil fuel usage. Potential risks

include the land needed to meet growing demand and potential environmental degradation associated with specific projects.

For more information, see our strategy reports on *Unleashing Clean Energy in the U.S.*, *Derisking Clean Energy Investments in LMICs*, *Reducing Maritime Shipping Emissions*, and *Reducing Aviation Emissions*.

Key Uncertainties and Open Questions

- **Effectiveness of U.S. federal policy advocacy under an administration less supportive of climate action:** Although the 2024 election set back U.S. climate efforts, we think policy advocacy can still make progress in several areas. For example, CATF's work on advancing clean firm technologies such as SHR and its ongoing effort to streamline regulations for faster clean energy deployment have bipartisan support. CATF has also expanded its work at the state level, allowing it to target geographies where it sees higher feasibility. Overall, we think CATF can still be effective under the current administration and Congress.
- **Consequences of CATF's rapid growth:** CATF grew rapidly from a total revenue of almost $20 million in 2020 to $46.7 million in 2023.[44] We think this rapid growth led to both internal growing pains and fundraising challenges, because its expansion assumed steady budget growth. The departure of several key technical staff in 2024 raised our concerns about its capacity to complete important projects. In 2025, CATF made senior hires and organizational management changes to adjust to its new size. It also set a goal to stabilize its budget between $45 million and $50 million per year from 2025 to 2030. As of 2026, we think CATF has made adequate progress in this area, but we will continue to monitor this area.
- **Feasibility of scaling technologies to reduce aviation emissions:** Aviation is one of the most difficult sectors to decarbonize, as there is no clear, viable technological pathway. Sustainable aviation fuels (SAFs) face major hurdles: sustainable biomass supply for bio-SAFs is limited, e-SAF production is expensive, and zero-emission aviation still needs major technological breakthroughs. As a result, aviation may not fully decarbonize, and philanthropic dollars might do more good funding carbon removal to offset the remaining emissions.[45]
- **Betting on a specific next-generation geothermal technology:** We are uncertain about which next-generation technologies will yield the greatest impact relative to investment: those nearing commercial development (e.g., enhanced geothermal systems) or those that are further from commercialization, but could be substantially more efficient (e.g., SHR). We hedge by supporting CATF and Project InnerSpace, which take different approaches. Project InnerSpace focuses on next-generation technologies further along than SHR, CATF's primary focus. We

[44] 2020 budget: "Total Revenue $19,594,322" CATF, 2020 2023 budget: "Total Revenue $46,711,331" CATF, 2025

[45] "This is difficult in practice, and CDR could start well before 2050 to accommodate a more feasible trajectory of emissions reduction. It is followed by an increasing removal effort due to the rising RF induced by the fleet." Sacchi et al., 2023

think SHR's development trajectory is less clear, but it could offer cheaper, abundant, carbon-free energy if it becomes commercially viable. Because of this uncertainty, we think it is important to remain technology-agnostic and diversify the next-generation geothermal technologies we support.

Bottom Line and Next Steps

Giving Green classifies CATF as one of our Top Climate Nonprofits. Across its superhot rock, clean electricity, Africa energy access, and transportation programs, CATF combines technical research and modeling, policy research and education, stakeholder engagement, and technical assistance to advance emerging climate technologies that lack strong industry or civil society support.

We recommend CATF for three main reasons. First, it works on neglected technologies, such as superhot rock geothermal, where it is one of the few organizations advocating at all. Second, its technical analysis is exceptionally strong and has directly shaped policy, including California's transmission financing law and federal SHR legislation. Third, its work spans the U.S., Europe, and Africa, giving it several paths to impact even when one stalls.

Key accomplishments include:

- **Securing key climate provisions in the bipartisan U.S. Energy Act of 2020.**
- **Providing technical input on authorization and funding measures in the IIJA.**
- **Shaping Inflation Reduction Act provisions** on methane reduction, low-emissions technologies, and stackable tax incentives.
- **Enabling about 7,400 new grid connections and $1.56 million in utility savings in Ghana** through CATF-recommended power-distribution efficiency reforms with WAPP.

Our main uncertainties are whether CATF can make progress at the federal level under the current administration, and whether technologies like SHR and low-carbon aviation fuels will become commercially viable. CATF could use additional funding to close current program gaps, sustain its existing work, and expand geographically.

Explore ways to give to CATF and more.

Giving Green

Giving Green was founded to help donors cut through the complexity of climate philanthropy and direct their resources for maximum impact.

Our founder, Dan Stein, Ph.D., spent 15 years developing evidence-based strategies in global philanthropy. He saw people eager to fight climate change but paralyzed by its scale. In 2019, with support from IDinsight, he launched Giving Green to rigorously evaluate solutions and share clear guidance.

What began as a side project is now a team directing tens of millions of dollars to high-impact initiatives. Our success is shared—with donors ranging from kids donating allowances to retirees investing in a better future. We believe anyone can start small and still make a huge difference.

Thank you for joining us on the path to net zero. Together, we keep moving forward.