*Stanford University Uncommon Dialogue*

# Collaboration Agreement on Large-Scale U.S. Solar Development: Integrating Climate, Conservation and Community October 12, 2023

This *Collaboration Agreement on Large-Scale U.S. Solar Development: Integrating Climate, Conservation and Community* ("Collaboration Agreement") represents an important step in accelerating the deployment of large-scale U.S. solar power[1] to achieve critical climate objectives, while simultaneously addressing conservation and community opportunities and challenges. Large-scale solar development involves building and operating solar projects producing electricity at megawatt or gigawatt-scale. Such projects require substantial acreage for power generation and related electricity transmission and storage. Natural and working lands are also important tools in reducing carbon emissions and combatting climate change. The parties to this agreement, listed on page 15, seek to accelerate the clean energy transition through the development of large-scale U.S. solar projects, while also prioritizing conservation and benefiting local communities and community engagement.

This Collaboration Agreement is the result of a twenty-month dialogue, co-convened by Stanford University's Woods Institute for the Environment (within Stanford's Doerr School of Sustainability), the Solar Energy Industries Association (SEIA), and The Nature Conservancy (TNC), to bring together the U.S. solar industry, land conservation and environmental non-governmental organizations (NGOs), tribal nation representatives, agricultural interests, environmental justice and community groups, and government agencies.

In 2022, the U.S. added over 20,000 megawatts of solar energy to the grid, which was over half of all new electricity capacity added in the U.S. that year.[2] By 2033, solar energy is forecast to generate at least 700,000 megawatts of electricity,[3] assuming no new major policy hurdles or commercial challenges. This would be a more than fivefold increase over today's U.S. solar deployment,[4] which in 2022 generated 4.7% of U.S. electricity.[5] Federal incentives and state mandates, as well as declining capital equipment costs, are also driving significant deployment of utility-scale solar across the country. The recent Inflation Reduction Act (IRA), Bipartisan Infrastructure Law (BIL), and CHIPS and Science Act will further accelerate U.S. solar development. Well-planned solar energy deployment, with the investment and job creation it produces, has the potential to help address problems in areas of the U.S. that have suffered from decades of significant unemployment and related poverty.

---

[1] When referring to "solar power" and related terms this Collaboration Agreement includes facilities using photovoltaic technologies and not concentrating solar-thermal power.
[2] Solar Energy Industries Association and Wood Mackenzie, "U.S. Solar Market Insight: 2022 Year in Review" (March 2023), *available at* https://www.seia.org/research-resources/solar-market-insight-report-2022-year-review.
[3] *Id*.
[4] *Id.*
[5] U.S. Energy Information Administration (EIA), https://www.eia.gov/energyexplained/electricity/electricity-in-the-us.php (including utility-scale and small-scale solar)

Every megawatt of large-scale solar capacity installed typically requires between five and ten acres of land and frequently necessitates additional development of new transmission capacity – either upgrades of existing infrastructure or construction of new power lines – requiring substantial additional land. Millions of acres of rural land, much of it agricultural, will be required to accommodate solar at a scale that could contribute significantly to decarbonizing the nation's electricity system, while recognizing that roof-top solar systems and smaller community solar projects will also incrementally add to the nation's low-carbon generating capacity. The buildout of utility-scale solar energy is anticipated to occupy about 0.5%-0.6%[6] of the land surface of the contiguous United States, roughly ten million acres.[7] Legally protected conservation lands currently occupy roughly 13% of U.S. lands (approximately 246 million acres)[8] and agricultural activities currently occupy roughly 52% of U.S. lands (approximately 984 million acres).[9] The low-carbon benefits of large-scale solar development will encounter a variety of land use challenges, including, among others, conversion of agricultural lands, wildlife and habitat impacts, local community opposition, misinformation campaigns, tribal nation interests, and environmental justice concerns. It is anticipated that utility-scale solar and its potential impacts will not be uniformly distributed across the country. While responsible developers typically seek to avoid, minimize, or offset impacts, the parties acknowledge that: there is no such thing as impact-free energy development; individual solar projects can vary significantly in cost depending on site characteristics and how development impacts are addressed; and that natural climate solutions[10] can be a critical part of a comprehensive response to the climate crisis.

Given these complex dynamics – and with the objective of both minimizing potential adverse impacts of large-scale solar development and maximizing climate, biodiversity, and community benefits – the parties have focused on how to best balance three imperatives in the development and deployment of large-scale U.S. solar projects. We call these imperatives the **"3Cs"**:

- ***Climate change*** – Global anthropogenic climate change poses an urgent and existential threat to life on our planet. As the world's second largest current emitter of global warming gases (and largest historic emitter), the U.S. committed in the 2015 Paris agreement and follow-on accords to large-scale decarbonization of its economy, aggressive associated time frames, major related policy mechanisms, and substantial financial investment. Solar energy is the planet's largest potential source for electricity generation. In recent years, it has seen major reductions in cost and improvements in efficiency, along with increasing availability of an array of technologies to store this intermittent generating resource. It is being deployed commercially, at large scale, and is readily financeable. Solar energy is therefore a critical component of rapidly achieving a decarbonized electricity system. Failing to scale up and accelerate deployment of solar

[6] U.S. Department of Energy, "Solar Futures Study" (Sept. 2021), *available at* https://www.energy.gov/sites/default/files/2021-09/Solar Futures Study.pdf; The Nature Conservancy, "Power of Place-National," (May 2023), *available at* http://www.nature.org/powerofplace.
[7] U.S. Department of Energy, "Solar Futures Study" (Sept. 2021), *available at* https://www.energy.gov/sites/default/files/2021-09/Solar Futures Study.pdf
[8] U.S. Geological Survey, "Protected Areas Database of the United States," *available at* https://tableau.usgs.gov/views/PADUS_Statistics/Dashboard (last accessed July 21, 2023).
[9] U.S. Department of Agriculture, "Major Uses of Land in the United States, 2012" (Aug. 2017), *available at* https://ageconsearch.umn.edu/record/263079, at 3-4.
[10] *See, e.g.*, The Nature Conservancy, "Natural Climate Solutions," *available at* https://www.nature.org/en-us/what-we-do/our-insights/perspectives/natural-climate-solutions/.

and other clean energy sources to meet critical climate goals entails significant risks to human society and nature.

- ***Conservation*** – Along with a climate crisis, we also face a biodiversity crisis in our nation – and globally – that necessitates aggressive approaches to land conservation, species protection, and restoration, that can also yield multiple co-benefits. Conservation of wilderness, recreational, agricultural, forested, and historic lands are longstanding American values. Large-scale solar development is a relatively new use of U.S. land that will be measured in the millions of acres under current scenarios. Public and private land conservation and the responsible stewardship of natural and working lands are key strategies for addressing climate change and the biodiversity crisis. Efforts are required to ensure that clean energy development avoids conserved lands and critical habitat and minimizes conversion of high-priority agricultural lands. Policies and market incentives may also be needed to increase solar siting on disturbed, contaminated, and marginal lands; to expand dual use of land for agriculture and solar; and to conserve more lands necessary to provide critical climate mitigation and adaptation benefits.

- ***Community*** – Large-scale solar development entails significant land use, whether at the edge of suburban development, in farm fields, on disturbed lands, or on other public, private, or tribal acreage. Balancing the many and varied interests – economic development and job creation, agriculture, land conservation, tribal sovereignty, aesthetics, environmental justice, costs of energy, public health, and others – should be done in a transparent, equitable, and efficient manner. Long-term progress toward solar deployment at levels that will significantly cut U.S. carbon emissions will require some local trade-offs among these many interests and important related parties. This involves engaging with a broad array of communities and stakeholders early in the development of large-scale solar projects in two respects: first, in an open and honest fashion; and second, with a focus on timely and objective information, fair decision-making processes at the federal, state, local and tribal levels, and the equitable sharing of benefits. These actions will enhance public involvement and help address the needs of, among others, tribal nations and environmental justice and other disadvantaged communities. These include, in particular, communities of color, and those with low and moderate incomes, that may also be burdened by cumulative environmental impacts and marginalized in public decision-making. Improving community involvement will also help to distribute the benefits of clean energy deployment more equitably, including by creating new and diverse workforces and business opportunities in areas historically reliant on fossil fuel-related employment.

*Background on the Dialogue*

This Uncommon Dialogue was launched in February 2022 by Stanford University's Woods Institute for the Environment, part of Stanford's Doerr School of Sustainability. The Solar Energy Industries Association and The Nature Conservancy are co-convenors of the effort. Participants in this Uncommon Dialogue include solar developers and investors, land conservation and environmental non-governmental organizations (NGOs), tribal nation representatives, agricultural interests, environmental justice and community groups, and government agencies. Six Uncommon Dialogue meetings were held over twenty months to develop this Collaboration Agreement. An earlier

Stanford Uncommon Dialogue on hydropower and river conservation has yielded significant public policy advancements, including almost $2.4 billion in the Bipartisan Infrastructure Law to back implementation of an October 2020 agreement and a current bipartisan Senate bill to reform federal dam licensing, relicensing, and license surrender.

*Working Groups and Related Processes*

Driven by the urgent need to more successfully balance the imperatives represented by the 3Cs, the parties have agreed to create six Working Groups listed in Table 1 and described below. These Working Groups were identified as the most appropriate for in-depth follow-on work by the signatories and additional stakeholders.

The parties have decided *not* to create a Working Group focused specifically on electricity transmission, noting that a separate Stanford Uncommon Dialogue on transmission has recently been launched and will address, among multiple issues, environmental justice challenges in transmission siting. However, the parties have agreed that this solar Uncommon Dialogue *will* include consideration of development of Generation Interconnection (Gen-Tie) lines – the initial point of connection between large-scale solar generation projects and transmission lines – as well as related decision-making and regulation regarding interconnection of solar projects to the utility-scale electric grid. This Uncommon Dialogue may also consider the relationship between smart solar siting and transmission.

The parties agree to work together in good faith to advance the 3Cs through the Working Groups and other discussions. Within 120 days of finalizing the Collaboration Agreement, the parties will develop a plan to guide their joint efforts, including formation of the Working Groups and related decision-making processes, implementation priorities, roles and responsibilities of individual organizations, timetables, and funding.

Importantly, the parties recognize the need to engage additional stakeholders with expertise and interest in the Working Groups, including, but not limited to: environmental justice and energy equity representatives; environmental and land conservation NGOs; solar developers and investors; agricultural interests; and federal, state, local and tribal governments.

The parties will also establish a "Steering Committee" representing key stakeholders in this Uncommon Dialogue, including but not limited to the three convenors of this effort. The role of the Steering Committee, subject to further discussion and definition, will be to provide input on the development and operation of each Working Group and review and agree upon outputs of the Working Groups before they are shared with external audiences. Working Group outputs that have not been reviewed and approved by the Steering Committee may not be attributed to the Uncommon Dialogue.

The Steering Committee may also adopt operating principles for the Working Groups regarding meeting attendance, deadlines, the circulation and treatment of draft work products, and adoption of shared terminology across the groups. In all of this work, the parties agree to hold in confidence and not disclose to any third party the content of Dialogue discussions, written and virtual draft Dialogue work products, and any other information the disclosure of which could be detrimental to the Dialogue or any Dialogue participant, to the extent permitted by applicable

laws and with limited exception for disclosures compelled by legal process and similar requirements.

The parties also recognize the importance of securing funding for these joint efforts and the work of individual groups. The parties will seek outside funding from government, private sector, and philanthropic sources to help: support coordination, facilitation, and administration of the Steering Committee and Working Groups; develop work products; and reimburse participating organizations for their time and travel expenses.

This agreement is understood to be in effect for 24 months from the date of the final signed agreement, at which point the parties will evaluate progress under the agreement and either commit to continued engagement under the terms above – and modify the effort as appropriate – or conclude implementation activities under this agreement.

*Description of the Working Groups*

Below is an initial description of the six Working Groups. The specific development of each Working Group, following finalization of this agreement, will depend upon priorities across the multiple Uncommon Dialogue focus areas, interests of relevant parties, available resources, overlap across the topics, and other factors.

## Table 1 – Working Groups

1. ***Community and Stakeholder Engagement:*** **Identify and promote best practices in engagement of community, tribal, conservation, business, agriculture, environmental justice, and other affected parties – and related planning, decision-making and benefit-sharing – regarding proposed large-scale U.S. solar projects.**
2. ***Siting:*** **Develop a risk-assessment and decision-making framework – and related best practices – that integrate consideration of social, environmental, and economic issues in siting large-scale solar projects.**
3. ***Energy and Agricultural Technologies:*** **Accelerate research, development, demonstration, and deployment (RDD&D) of technologies and practices to advance large-scale solar development while also protecting important working and natural lands.**
4. ***Information Tools:*** **Advance initiatives to enhance or develop land use-related data and information tools to aid effective siting and operation of large-scale U.S. solar projects and related conservation, agricultural, and environmental justice priorities.**
5. ***Tribal Nations:*** **Analyze and address the opportunities and challenges tribal nations face regarding large-scale solar development and land conservation and related issues of sovereignty, indigenous culture, federal programs and funding, tax policy, and state authority.**
6. ***Policy:*** **Advocate for policies, standards, incentives and other tools – at all levels of government – to advance the initiatives above, including related funding.**

***#1 Community and Stakeholder Engagement Working Group:*** **Identify and promote best practices in engagement of community, tribal, conservation, business, agriculture, environmental justice, and other affected parties – and related planning, decision-making and benefit-sharing – regarding proposed large-scale U.S. solar projects.**

A set of best practices should be developed and promoted to improve engagement of a host community and related stakeholders around a proposed large-scale solar project. Opposition to major solar projects occurs for many different reasons, not all of which can be mitigated by enhanced outreach practices. However, an agreed-upon set of best practices – advanced using an array of potential tools, a few noted below – would encourage developers to proactively inform community members of a project, receive feedback, make appropriate modifications, and provide applicable benefits.

There is not a uniform approach to large-scale U.S. solar project development and there are multiple business models at work, some of which may not prioritize or be compensated for robust community engagement. However, over the last decade the broader clean energy development industry has realized that intentional engagement can improve project design, avoid project delays, increase social acceptance and education, prevent negative press coverage, provide more equitable clean energy sources, and mitigate project development risk. For communities and stakeholders, this approach means a chance to have an open and meaningful dialogue with a project developer regarding trade-offs and benefits as well as help shape and monitor adoption of agreed-upon actions. Ultimately, if a developer has executed and documented a robust community engagement plan and made reasonable changes to a project in response to community and stakeholder feedback, a permitting authority is more likely to find that the project serves the public interest, even if there is some remaining opposition.

To increase acceptance by host communities of large-scale solar projects, project developers must be proactive in community and stakeholder engagement. The parties acknowledge that the approach to – and timeline for – community and stakeholder engagement may vary by solar project size, status, or local, state, or federal requirements, but agree that there is a need for a more consistent, formalized community and stakeholder engagement process. The parties also agree that every community is unique, with values, priorities, and historical considerations that will shape its decision-making. In addition, misinformation about the impacts of solar energy development needs to be addressed by those knowledgeable on this subject.

Input from a diverse group of stakeholders is important to develop best practices that are broadly adopted by solar developers and related partners. Furthermore, local governments, NGOs, tribes, environmental justice groups, and others should use their networks to communicate the results of a community and stakeholder engagement process and help monitor adoption of the agreed-upon actions.

*The Working Group should examine a broad array of issues and opportunities in community and stakeholder engagement in large-scale solar projects and, importantly, the best practices that can help address them. These include, but are not limited to:*

- *Identification of key community and stakeholder representatives in a specific project area, e.g., government, local residents, tribal nations, NGOs, environmental justice groups, businesses;*

- *The timing and focus of a developer's initial community engagement and the extent of follow-on efforts in project construction and operation;*
- *The identification of a project's potentially significant adverse impacts and options for avoidance, minimization, and compensation;*
- *How to ensure developer commitments are adhered to and address changes in circumstances, e.g., asset transfer;*
- *Approaches to advancing workforce and community economic development, and related community benefits, in the context of specific large-scale solar projects; and*
- *Approaches to combating misinformation.*

*There is an array of potential tools to advance community and stakeholder engagement including, for example:*

- *A community and stakeholder engagement plan;*
- *A checklist for community and stakeholder engagement;*
- *A system that certifies that a community and stakeholder engagement checklist is followed;*
- *Community Benefits Agreements;*
- *Specialized community engagement practices related to solar sited on agricultural lands, brownfields, mined lands, floating systems, etc.; and*
- *Community and stakeholder networks to facilitate engagement, combat disinformation, and address concerns about solar development.*

*In developing a set of best practices and related tools, the Community and Stakeholder Working Group will coordinate with other relevant Working Groups in this Uncommon Dialogue, including, but not limited to, the Siting Working Group and Information Tools Working Group.*

***#2 Siting Working Group:*** **Develop a risk-assessment and decision-making framework – and related best practices – that integrate consideration of social, environmental, and economic issues in siting large-scale solar projects.**

Addressing the climate crisis and meeting ambitious decarbonization goals will require, among other things, accelerating the development of large-scale solar on up to 10 million acres of U.S. land, or about 0.5%-0.6% of the land surface of the contiguous United States. Utility-scale solar development may be concentrated in areas with the most suitable characteristics, for example a significant solar resource and access to interconnection and transmission, but with greater cumulative impacts in specific regions and communities. Such development should result in significant investments in rural communities, yet may produce conflicts with agricultural, conservation, community, and tribal nation interests, particularly as the speed and scale of solar deployment accelerates.

By taking measures now to avoid lands already in conservation status, and to also avoid or minimize impacts to the most sensitive natural, cultural, community and agricultural lands, we can reduce costly conflicts, minimize the most expensive trade-offs, and accelerate the deployment of solar energy systems to decarbonize the U.S. economy on pace with national goals. Effective siting of large-scale solar projects will involve integrated consideration of social, environmental, and economic issues.

The Working Group will engage and incorporate input from a broad array of parties interested in large-scale solar development, including, among others, tribal nations, environmental justice and energy transition communities, conservation and environmental NGOs, business and agricultural representatives, and government agencies. A key goal is to ensure that any siting recommendations made by the Working Group will both enhance public involvement and address issues faced by, among others, communities burdened by cumulative environmental impacts and historically marginalized in public decision-making.

*To advance these goals the parties agree to:*

1. *Develop a risk-assessment and decision-making framework and related best practices for large-scale solar siting and covering a wide array of issues related to communities, tribal nations, farmland, wildlife and other resources. The framework would include consideration of the "mitigation hierarchy": avoid first; then minimize; then compensate, where appropriate. Development of the framework should include, among other tasks, evaluating existing renewable energy siting and development frameworks and tools, including their strengths and weaknesses and missing elements.*

   *This task is envisioned as a risk assessment and decision-making framework – and related best practices – at a broad scale. It is not intended to develop a detailed set of design or compensation mechanisms in all landscapes or regions nor in a solar mapping effort (i.e., go/no go zones). However, the effort should provide a useful foundation for additional work on these sorts of mechanisms.*

2. *Analyze and provide recommendations regarding why degraded lands, marginal agricultural lands, lands without high-value cultural resources, and other lower-value locations are not currently being substantially developed with large-scale solar. This effort should provide insights into the economic, liability, transmission/interconnection, construction, and other potential challenges that would need to be overcome to incentivize siting in these areas. This analysis and related recommendations may be provided to the Policy Working Group to develop policy, financial and other incentives to encourage siting on such lands.*

3. *Coordinate with other relevant Working Groups in this Uncommon Dialogue, including the Community and Stakeholder Engagement Working Group and Policy Working Group.*

***#3 Energy and Agricultural Technology Working Group: Accelerate research, development, demonstration, and deployment (RDD&D) of technologies and practices to advance large-scale solar development, while also protecting important natural and working lands.***

Solar energy significantly benefits the environment and our communities by offsetting greenhouse gas emissions, which contribute to the serious effects of climate change. Developers of large-scale solar sites may have the opportunity to expand this benefit by advancing large-scale solar development while also protecting important working and natural lands. This includes both avoiding key lands by developing solar projects on already degraded sites and integrating solar infrastructure with working and natural lands in a way that helps avoid or minimize the negative impacts of solar development and operations.

Innovative practices in large-scale solar project siting, design, construction, and operations, could help reduce land-use conflicts and disturbances and preserve working and natural lands. Examples of these practices include: dual-use solar and agriculture projects ("agrivoltaics"); large-scale solar siting on already degraded lands, such as former mining sites and brownfields ("brightfields"); and large-scale solar siting on reservoirs and other water bodies ("floatovoltaics"). Ecological benefits may include healthier soils, cleaner water, and enhanced wildlife habitat. Agricultural benefits of integrating large-scale solar development with crops, livestock grazing, and pollinator habitat can include increasing farm revenues while keeping land in agriculture, improving drought resistance, and expanding pollination of nearby crops.

Currently, however, innovative solar project development strategies tend to cost significantly more than traditional solar development and may face legal, regulatory and lack of awareness challenges. For example, the National Renewable Energy Laboratory found a significant installed cost premium to raise solar panel heights to support agricultural practices. At the same time, new solar technologies, including transparent photovoltaics, may allow for better integration with agricultural production but are not yet commercially viable at scale.

Further research, development, demonstration, and deployment (RDD&D) is needed to create efficient and cost-competitive technologies, best practices, and market opportunities to advance the ecological and agricultural benefits – and reduce the impacts – of large-scale solar projects. RDD&D regarding the ecological benefits of large-scale solar development could include studying vegetation and soil health, water quality, and improvements to biodiversity. RDD&D regarding "agrivoltaics" might include studying appropriate technologies, farmer acceptance, regional variability, and optimal crop selection and production techniques.

*To achieve these goals and secure these benefits, the parties agree to help identify, support, and advance energy and agricultural RDD&D to:*

1. *Identify solar construction and operational practices that can improve conservation benefits and agricultural values;*
2. *Identify opportunities to enhance the ecological and agricultural benefits of large-scale solar including funding for technical assistance and workforce development;*
3. *Advance efficient, science-based, cost-effective research and monitoring of the beneficial and adverse effects of large-scale solar development and operations on wildlife;*
4. *Incorporate climate-smart land management and soil health practices into large-scale solar design and operations;*
5. *Develop new information tools to improve data collection and use in the development and operation of large-scale solar projects (led by Working Group on Information Tools);*
6. *Identify market-based and/or policy solutions to incentivize the acceleration of these approaches; and*
7. *Coordinate with other relevant Working Groups in this Uncommon Dialogue, including the Community and Stakeholder Engagement Working Group, Information Tools Working Group, and Policy Working Group.*

***#4 Information Tools Working Group:*** **Advance initiatives to enhance or develop land use-related data and information tools that can aid effective siting and operation of large-scale U.S. solar projects and related conservation, agricultural, and environmental justice priorities.**

Land use-related data and tools, like Geographic Information Systems (GIS) and remote sensing technology, can help inform discussions and reduce tensions among decision makers, community members, and other stakeholders over siting and operation of large-scale solar projects. As data methods and models advance to include machine learning, higher resolution satellite imagery, and object-based identification, these systems can further improve the selection of sites for large-scale solar development and intelligent design and operation of the resulting facilities. In turn, these improvements can help maximize ecosystem services, monitor changes in biodiversity post-construction, and address environmental justice concerns in the siting and operation of large-scale solar projects.

Improving information tools and data access is increasingly important with substantial new funding for large-scale solar deployment in the IRA and BIL. However, currently there are significant gaps in data and tools that can identify preferred land for solar project siting, including tools that integrate key stakeholder objectives such as solar resource potential, project cost, available incentives, and impact on biodiversity and agricultural resources. For example, the IRA creates an additional tax credit for projects within "energy communities," including brownfield sites. However, the GIS data available to identify brownfields for redevelopment has conflicting information and inaccuracies.

Solar siting and operations, informed by information tools, can be in greater harmony with conservation, agriculture, and other uses. GIS and remote sensing, for example, can help drive and quantify increases in biodiversity post-construction. More specifically, GIS data can assess the crops grown on a specific property to develop the best site conversion, including a natural and diverse seed mix that can support both pollinators and sheep grazing.

Traditional methods for collecting data regarding solar-wildlife interactions have had difficulties in meeting solar-specific objectives and, when used at potential solar sites, are often costly and time consuming. Large-scale solar development would benefit from exploration of new technologies regarding solar-wildlife interactions, for example artificial intelligence, environmental DNA, and drones for efficient and cost-effective wildlife monitoring. More precise data would also help inform project-specific mitigation strategies. Additionally, sharing anonymized data across projects and landscapes could accelerate better designs and practices, perhaps in coordination with the U.S. Department of Energy, U.S. Department of Agriculture, and their state and local counterparts.

There are two broad options to improve information tools for large-scale solar project siting and operation: build new tools or improve existing ones. The first choice, and the generally cheaper and faster option, should generally be to improve existing tools through additional functionality and/or data inputs. And while there may be a need for some new tools, cost and maintenance should be central to decisions to develop them.

The Geospatial Energy Mapper (GEM) siting tool developed by the Department of Energy's Argonne National Laboratory is a good example of a nation-wide tool where a group of decision-makers and stakeholders could partner to add data to aid consideration of potential large-scale solar sites. At the same time, the GEM would also benefit from adding functionality, for example

providing information about the ability to add a large-scale solar project to a given electricity substation or transmission line.

In addition to considering environmental, agricultural, and conservation features, solar siting tools need to better address environmental justice concerns, particularly in communities that have shouldered an unfair burden from traditional energy development and not benefitted from new clean energy projects. The Environmental Protection Agency's Environmental Justice Screening and Mapping Tool is designed to address such situations but needs further development to better address solar siting and related environmental justice concerns.

The White House Council on Environmental Quality has recently developed a Climate and Economic Justice Screening Tool to identify communities eligible for benefits from federal investments in critical sectors. The National Academies of Science, Engineering and Math (NASEM) recently established a committee that will analyze how environmental health and geospatial data can inform this screening tool. The committee will scan existing tools, evaluate current data availability and quality, note key data gaps, and discuss approaches to process, integrate, and analyze these data. This Uncommon Dialogue Working Group should take account of the committee's work and determine if there are collaboration opportunities.

There are areas of overlap between this Uncommon Dialogue Working Group and the Working Group on Large-Scale Solar Siting, the Working Group on Community and Stakeholder Engagement, and the Working Group on Energy and Agricultural Technology. The four Working Groups should consider coordinating a review of current datasets that stakeholders agree are relevant and useful to developing best practices for low-impact siting of large-scale U.S. solar projects and related community and stakeholder engagement. This review can also identify data that are not available but needed to support the development of best practices that are broadly supported.

*To advance the siting and operation of large-scale U.S. solar projects and related conservation, agricultural, and environmental justice priorities, the parties agree to:*

1. *Identify strategic partnerships to: (a) address gaps or limitations in existing datasets and develop new datasets and (b) enhance existing information tools and develop new tools;*
2. *Use these datasets and tools in multistakeholder discussions to improve siting and operation of large-scale solar projects while also advancing conservation, environmental justice, and agricultural objectives;*
3. *Identify and address gaps or limitations in existing datasets or tools to take advantage of significant solar funding provided by the IRA and BIL, including advancing solar development in disadvantaged communities;*
4. *Help to standardize data collection methods for biodiversity, soil health monitoring, and other ecosystem services;*
5. *Focus new tool development on better understanding the complexities of solar projects that provide multiple services, e.g.,"agrivoltaics" rather than creating "go/ no go" maps;*
6. *Evaluate the costs and benefits of improving large-scale solar project siting tools by adding a dataset on transmission capacity;*
7. *Evaluate the potential for development of a community information tool that provides accurate information, transparency, and facts and data to dispel misinformation about large-scale solar development; and*

8. *Coordinate with other relevant Working Groups in this Uncommon Dialogue, including the Community and Stakeholder Engagement Working Group, Siting Working Group, Working Group on Energy and Agricultural and Energy Technology, and the Policy Working Group.*

***#5 Tribal Nations Working Group:*** **Analyze and address the multiple opportunities and challenges tribal nations face regarding large-scale solar development and land conservation and related issues of sovereignty, indigenous culture, federal programs and funding, tax policy, and state authority.**

Native American Tribal lands, held by 574 federally recognized tribes, comprise 5.8% of contiguous U.S. lands and hold an estimated 6.5% of the total national utility-scale solar technical potential.[11] The Navajo Nation, with the largest tribal land base in the U.S., is estimated to hold the greatest potential tribal solar generation of more than 1.8 billion megawatt-hours per year. Tribes across the nation have begun to develop this significant resource. The Moapa Tribe in Nevada opened the first utility-scale solar plant (250 megawatts) on tribal lands in 2017, powering homes and selling electricity to the Los Angeles Department of Water and Power. Tribes may take advantage of significant current investment opportunities in solar development under the recent Inflation Reduction Act, Bipartisan Infrastructure Law, and other funding to advance large-scale solar development and related transmission on their lands.[12]

At the same time, tribes face a long history of extractive economies on their lands, related energy poverty, desecration of sacred sites, a loss of prime conservation lands, and regulatory barriers.[13,14] There are issues related to the siting of solar facilities on tribal lands that are distinct from conventional climate, conservation, and community concerns. For example, a tribal landscape itself may be sacred and any use other than its natural state may be counter to a tribe's beliefs and culture. Often, tribal concerns are lumped in with conventional environmental concerns of NGOs, with tribes not having a separate seat at the table.

Successful utility-scale solar development on tribal lands requires attention to many factors including, among others: tribal sovereignty and values; community, economic and infrastructure needs of federally and non-federally recognized tribes; the specific solar resource and transmission requirements; related land conservation imperatives and opportunities; and complex land tenure, project development, and natural resource governance issues across trust lands, tribal fee lands, and other land designations pertaining to tribes. There are existing models for tribal engagement that may advance effective tribal partnerships and project development.[15,16]

*A Tribal Working Group of the Solar Uncommon Dialogue will address the multiple opportunities and challenges in developing and operating utility-scale solar projects on tribal lands and related conservation and community issues. The Parties agree to pursue various approaches in this regard including:*

[11] Milbrandt, Heililler, and Schwabe, "Techno-Economic Renewable Energy Potential on Tribal Lands."
[12] Department of Energy, "Tribal relevant programs in IRA."
[13] Krol, "Tribes Want Biden to Balance Technology and Cultural Issues in Renewable Energy Projects."
[14] Beshilas et al., "Addressing Regulatory Challenges to Tribal Solar Deployment."
[15] Department of Energy Nuclear Energy Tribal Working Group, https://www.ncsl.org/research/energy/ncsl-nuclear-energy-tribal-working-group
[16] The Federal Communications Commission, https://www.fcc.gov/sites/default/files/workshop-09132022-session-4.pdf

1. *Analyzing unique tribal issues related to the siting and operation of large-scale solar facilities that are distinct from conventional climate, conservation and community concerns of utility-scale solar projects;*
2. *Identifying business opportunities and challenges that tribes may face in advancing the manufacturing of solar energy-related technologies, technical assistance, and the development of solar energy projects on or off tribal lands including: access to technical assistance and development funding and investment; foreign trade zones; tax levies; infrastructure needs; and economic reforms;*
3. *Developing ways to advance and improve incentives in the federal tax code that tribes can leverage to meet their unique energy, climate, infrastructure and financing needs and address related issues including: developing capacity to access incentives; determining whether/how non-federally recognized tribes might participate; and creating funding structures to improve collaborative partnerships with tribes;*
4. *Coordinate with other relevant Working Groups in this Uncommon Dialogue, including the Community and Stakeholder Engagement Working Group, Siting Working Group, and Policy Working Group; and*
5. *Coordinate with a separate and broader Uncommon Dialogue launched at Stanford on Tribal Renewable Energy.*

***#6 Policy Working Group:*** **Advocate for policies, standards, incentives and other tools – at all levels of government – to advance this Uncommon Dialogue's initiatives, including related funding.**

The parties agree that this Collaboration Agreement and our shared climate, conservation and community (3Cs) goals will not be meaningful without significant public policies to implement them. Aligning a range of potential federal, state, local and tribal nation policies, briefly described below, is not without precedent in the context of the Uncommon Dialogue. The Uncommon Dialogue on Hydropower and River Conservation yielded significant public policy advancements, including almost $2.4 billion from the Bipartisan Infrastructure Law to back implementation of the agreement and a current bipartisan Senate bill to reform federal dam licensing, relicensing, and license surrender.

It is important to note that since the Uncommon Dialogue on Large-Scale U.S. Solar Development and Land Conservation officially launched in early 2022, a significant shift occurred in the solar policy landscape. The enactment of the IRA in August 2022 provided substantial new federal tax credits for commercial and residential solar projects, including for certain costs related to grid interconnection and electricity storage. The IRA also authorizes significant new resources for federal agencies to implement the law including grants, loans, and loan guarantees (as well as funds for permitting and associated staffing) that could be used for solar projects in areas ranging from low-income communities to areas served by rural co-ops to existing electrical and fossil fuel infrastructure. The 2021 BIL also contains significant new investments in clean energy and related infrastructure, including significant funds for solar development and deployment. The opportunities to shape policy within these new funding regimes are significant, but we should be mindful not to duplicate areas already potentially covered by these laws.

Therefore, as an initial matter, the Working Group should identify meaningful policy gaps that remain following these developments and potentially others. One obvious gap is that the IRA and

BIL do not directly address state or local permitting issues or land conservation opportunities. In addition, the Working Group should solicit policy proposals from the other Uncommon Dialogue Working Groups. Overall, the Policy Working Group should establish a process by which to identify the broad range of policy options and prioritize follow-up work.

If the Working Group arrives at consensus policy options to pursue, and if an option entails government action, the Working Group should also assess the feasibility of that opportunity with appropriate government officials and other experts. Policy options should also be reviewed to determine their potential effects on, among others, environmental justice, energy equity, and tribal interests, and should reflect direct input from such experts.

*The parties agree that the following policy options, among others, should be considered to both deploy additional large-scale solar generation projects and advance land conservation, community interests, and other shared values of the Uncommon Dialogue:*

1. *Evaluate the effects of state, county or local programs, legislation, or ordinances on 3C large-scale solar siting and operation (e.g., existing programs, ordinances, incentives, restrictions, and bans);*
2. *Benefits assessment programs for solar facilities that advance the 3Cs with appropriate flexibility for developers;*
3. *Incentives, regulation and related decision making regarding the interconnection of large solar projects to the electric grid and related "Gen-Tie" lines;*
4. *Policies that address environmental justice and energy community opportunities and challenges;*
5. *Economic and workforce development programs that benefit both utility-scale solar projects and environmental justice, energy communities, and tribal nations;*
6. *Federal, state and local tax incentives for solar projects that offer energy, agricultural, and/or ecosystems services;*
7. *Federal and state liability incentives and protections for deploying solar on previously disturbed lands, such as mined lands, brownfields, and landfills, with due consideration for ultimate remediation and reducing impacts on surrounding communities; and*
8. *Increased funding for federal and state programs that support land conservation and natural climate solutions.*

*The Policy Working Group will coordinate with other Working Groups in this Uncommon Dialogue to assist with or implement their work, including legislative, regulatory and funding opportunities.*

*Conclusion*

In sum, the parties agree that maximizing solar energy's climate benefits, while also addressing conservation and community challenges, will be advanced through a collaborative effort focused on implementing the specific actions developed in this dialogue via the six Working Groups. The parties commit themselves to seizing these critical and timely opportunities to help avoid the catastrophic effects of climate change, while also promoting critical conservation and community interests.

**Conveners of the Collaboration Agreement**


Stanford University Woods Institute for the Environment


Solar Energy Industries Association


The Nature Conservancy

**Parties to the Collaboration Agreement**

*American Farmland Trust*
*Appalachian Voices*
*Association of Fish and Wildlife Agencies*
*Climate Adaptive Infrastructure*
*EDP Renewables*
*energyRe*
*Intersect Power*
*Invenergy*
*Land Trust Alliance*
*Lightsource bp*
*National Audubon Society*
*National Wildlife Refuge Association*
*Natural Resources Defense Council*
*North American Indian Center of Boston*
*Pine Gate Renewables*
*Solar Energy Industries Association*
*The Lyme Timber Company*
*The Nature Conservancy*
*Theodore Roosevelt Conservation Partnership*
*Union of Concerned Scientists*
*WE ACT for Environmental Justice*