Using Sustainability Tools to Evaluate Solar, Wind, and Battery Storage Projects

Overview: Key considerations for using and applying sustainability tools to renewable energy projects, including battery storage

OVERVIEW

Sustainability tools, such as the Institute for Sustainable Infrastructure (ISI) Envision tool, "help identify ways in which sustainable approaches can be used to plan, design, construct, and operate infrastructure projects."

The Envision framework assists with understanding and building the sustainability profiles of both individual and entire portfolios of infrastructure projects.

METHODOLOGY

Envision uses 64 sustainability indicators, also known as credits to evaluate projects. Each project receives a score based on these credits. Categories frame project attributes in terms of land use, water use and management, ecosystem services, climate impacts, material re-use/recycling, economic impact, and community leadership. The Envision scoring system uses quantitative measures to compare and evaluate project scenarios. The credits collectively are the basis for meeting sustainability goals and for communicating these goals to stakeholders.

Whether developing a solar, wind or battery storage project, using sustainability tools to evaluate the project before and after development provides investors and developers additional information regarding the project's value proposition and its contribution to larger carbon neutrality and sustainability goals.

ASSUMPTIONS

A new project will be compared to the site location without the project or with an existing project use. For example, if a solar project is slated for development in an agricultural field, then the comparison would be between the site with an agricultural use, and then with a solar facility. If battery storage is also added, that asset would also be taken into consideration. If the solar project is developed on a brownfield or closed landfill, then the comparison would be between a landfill without another use, and then with the solar or battery installed on the cap.

Table 1: Envision Solar Pilot Project—Scope Summary

Major site components of base case (agriculture) versus solar PV case.
Includes site characteristics, energy production, and land use.

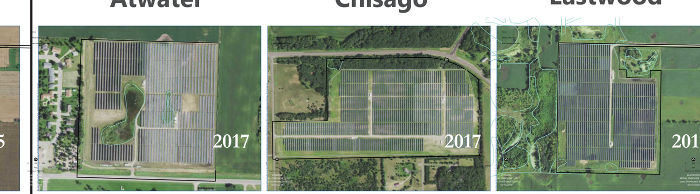
Scoping Parameters	Base Case Scenario: Agricultural Land Use in MN	VS	Solar PV Scenario Solar Production Facilities in MN
Site Aerial	Atwater, Chisago, Eastwood  36 ac + 62 ac + 49 ac		Atwater, Chisago, Eastwood  36 ac + 62 ac + 49 ac
Site Characteristics	36 + 62+49 = **147 Acres of Cultivated Agricultural Land** Monoculture, Cultivated Agricultural Land		36 + 62+49 = **147 Acres Perennial Vegetation w/PV** Diverse Native Plant Species, Pollinator Habitat
On-Site Power Generation	No Energy Production		Electrical Energy from PV 4 MW + 6.5 MW + 5.5 MW = **16.0 MW (nameplate)** Produced: onsite Used: offsite 100% Renewable **Offsets traditional grid mix** 75% Fossil + Nuclear / 25% Renewable
Land Use	Monoculture, Cultivated Agricultural Land		Diverse Native Plant Species, Pollinator Habitat

Table 2: Highlights and Recommendations to Achieve a Higher Rating

Envision categories, envision category components for the base case (agriculture) vs solar PV case
and suggestions to achieve higher ratings

Envision Category Components	Credit Highlights (Three Sites)		Achieving a Higher Rating (Three Sites) Solar PV Case (Current)
	Base Case (Ag)	Solar PV Case (Current)	
Land Use	Low point values: Assumes industrial agriculture High point values: Assumes sustainable agricultural use	Inclusion of pollinator habitat, National Renewable Energy Lab (NERL) vetegetation studies, and other long-term vegetaton practices; comparable score to base case	Includes additional community involvement in planning and decision-making around sustainable land use and increasing success of long-term vegetation management practices
Water Use and Management	Low point values: Assumes industrial agriculture High point values: Assumes sustainable agriculture	With deployment of pollinator habitat, NREL vegetation studies, and other long-term vegetation practices, comparable score to base case; life cycle water footprint 93% lower than Minnesota grid mix electricity	Reduce run-off, manage sites during construction, assure long-term best practices for vegetation monitoring
Ecosystem Services	Low point values: Assumes industrial agriculture High point values: Assumes sustainable agriculture that protects soil health and preserves farmland long-term	With deployment of pollinator habitat and other long-term vegetation practices results in long-term soil health and preservation of farmland; avoids impacts of fossil fuel power generation	Creating partnerships to gain support for pollinator habitat and other vegetation practices; includes monitoring and maintenance of vegetation practices; include ongoing improvement of land use, water and vegetation practices that promote long-term soil health, resilience, and reduced carbon emissions
Climate	Low point values: Assumes industrial agriculture High point values: Assumes sustainable agriculture promoting resilience and adoption of innovative technologies to reduce climate impacts	With a solar PV system, contributes to energy generation that has carbon emissions; 91% lower than Minnesota grid mix electricity	Have already maximized reduction of carbon emissions as a result of this project; reuse/recycle materials for more benefit; can garner more points if panels are upgraded for greater production and improved durability

Figure 1: Sustainability Framework

Overall Project Levels of Recognition Based on Envision Scoring System

20% Verified — 30% Silver — 40% Gold — 50% Platinum

Project is Scored within Envision Categories

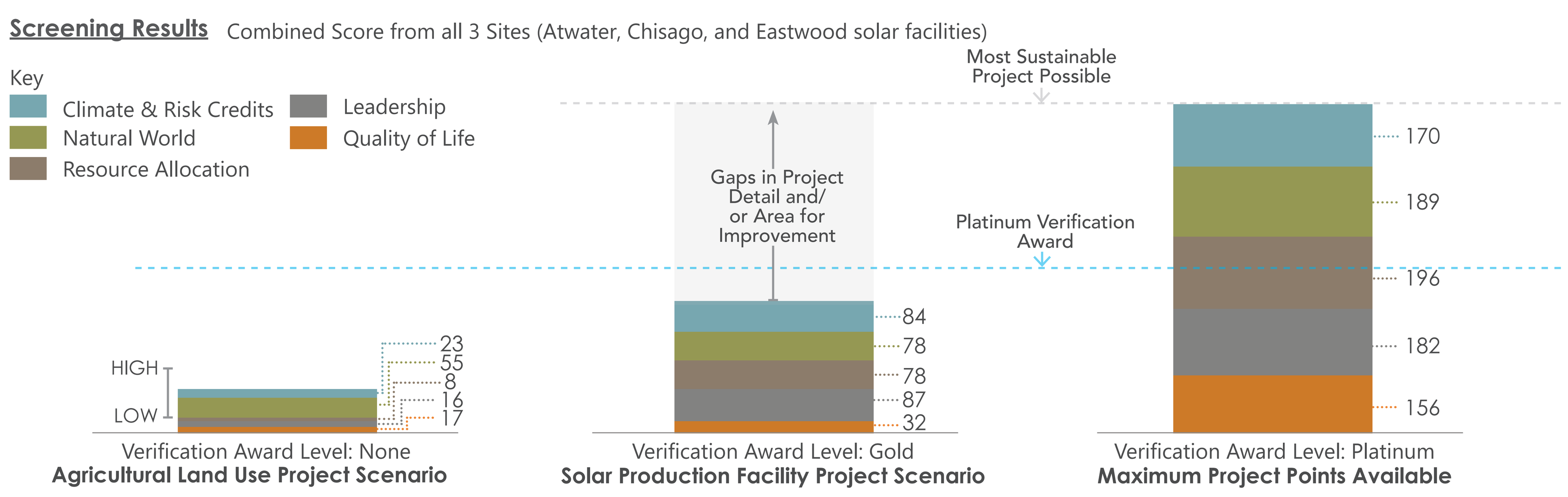
Category	Credits within Category
Climate & Risk Credits	*Emissions, Resilience*
Natural World	*Siting, Conservation, Ecology*
Resource Allocation	*Materials, Energy, Water*
Leadership	*Collaboration, Planning, Economy*
Quality of Life	*Wellbeing, Mobility, Community*

Levels of Achievement within Individual Credit - Points Vary Per Credit*

**See appendix for an example credit evaluation. Each credit includes evaluation criteria, scoring, and documentation guidance.*

Improved	Enhanced	Superior	Conserving	Restorative
A+B Performance that is above conventional	A+B+**C** Sustainable performance that is on the right track	A+B+C+**D** Sustainable performance at a very high level	A+B+C+D+**E** Performance that has achieved essentially zero negative impact	A+B+C+D+E+**F** Performance that restores natural or social systems

Figure 2: Sustainability Results



SUMMARY

The figures and tables summarize an example project results. They include Envision Solar Pilot Project Framework and Results (Figure 1), Envision Solar Pilot Project—Site Evaluation Highlights and Recommendations to Achieve a Higher Rating (Table 2), and Envision Solar Pilot Project—Recommendations for Next Steps (Figure 3). Scores for each applicable credit were added together for a total score. The final score represents a percentage of the total compared to the possible applicable points.

Table 2 identifies some areas where points may be missed due to gaps in documentation, detail, or project understanding. To overcome such gaps, we looked at a range of scoring outcomes One can examine how best-case and worst-case scenarios might affect the score outcomes. Table 2 includes highlights and recommendations to achieve a higher rating on an example project. Scores may or may not include any formal submissions, documentation, or audit review by the ISI. Results should specify all assumptions.

FIGURE 3: RECOMMENDATIONS FOR NEXT STEPS BY PROJECT DEVELOPMENT STAGE

Step-wise process by project development stage to achieve a higher rating

Example Recommendations to enhance project sustainability profiles of solar PV projects (this preliminary list could be developed in more detail if needed)

Planning:

Consider conducting a pilot life cycle economic evaluation of a typical solar PV project to understand the tradeoffs between social, environmental and economic costs and benefits.

Present investment return period calculations both with and without the social cost of carbon included in the accounting. Consider how the existing/alternative land use of PV projects changes the return on investment (agricultural land versus infill/brownfield redevelopment, for example).

Design:

Consider improving technical specifications to promote construction practices that protect and improve soil health & infiltration capacity.

Construction staging, soil loosening and soil amendments can greatly increase soil's ability to support perennial vegetation and promote rainwater infiltration (in place of constructed stormwater basin-like best management practices).

Procurement:

Develop a list of screening criteria to prioritize solar PV manufacturers with more favorable sustainability practices, ranging from recycled content to PV module toxicity and worker transparency.

Screen potential solar PV vendors against the Silicon Valley Toxics Coalition Solar Scorecard, and other industry benchmarking resources.

Construction:

Consider mapping Envision credit performance criteria against typical project technical specifications, looking for both alignment and gaps

Consider increasing contractor requirements for on-site construction waste separation and recycling, if possible. Consider additional methods to reduce temporary inconveniences (hauling, dust, noise, etc.) to stakeholders during construction

O&M:

Develop and execute monitoring and maintenance plans with clear funding allocation, metrics, goals, milestones and responsibilities.

Consider reviewing and improving bid documents and vegetation maintenance vendor solicitations. Add qualifications-based elements. Allocate adequate funding and contingency to provide sufficient O&M resources, especially during vegetation establishment.

End of Life:

Consider during planning how different end-of-life scenarios and durability assumptions factor into the project's return-on-investment. Identify key risk factors that affect solar PV project durability.

Consider how climate change vulnerability might increase risk during the life of the solar PV project due to extreme precipitation and drought, and mitigate this risk with site design, better soil health, and increase vegetation where possible. Consider how coupling energy storage with PV can provide risk reduction to communities in the event of a power grid failure due to extreme weather.

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