Energy Innovation Challenge

2023 Prompt Packet

Designing multipurpose projects
for community buy-in

The problem

For years, climate scientists have stated the world must shift its energy consumption away from fossil fuels to avoid the worst impacts of climate change. Countries across the globe recognize the threat posed by climate change and have set targets to decarbonize their economies. The United States has the goal of achieving a carbon pollution-free power sector by 2035,[1] an ambitious goal for a country that, just last year, generated over half of its utility-scale electricity from fossil fuels.[2] Additionally, in order to meet the goals of the Paris Agreement in limiting global warming to 1.5 degrees Celsius, annual additions of renewable power capacity must triple in the next decade.[3] However, even in localities with ambitious climate goals, energy projects are commonly met with delays and community opposition.

Demand for renewable projects continues to outpace fossil fuels. In a recent study from the Pew Research Center, 67% of participants believe that the United States should prioritize the development of alternative energy sources over increasing the production of fossil fuel sources.[4] The process to build and interconnect renewable projects in the US is very vigorous and takes many years to complete all the necessary steps. To develop a utility-scale wind or solar project anywhere in the United States, project developers must receive local and/or state approval. Public comment, an important and necessary part of the local approval process, can provide a forum for concerned community members and groups; however, may delay project timelines. A MIT study in June 2022 identified utility-scale renewable energy projects that were opposed between 2008 and 2021 across 28 states. Of the projects studied, 34% faced significant delays and difficulties securing permits based on project opposition, while 49% were cancelled permanently.[5] These project delays and cancellations accounted for approximately 4.6 GW of lost projects. This lost generation has severe impacts on the nation's ability to meet energy needs and accelerate its transition to a carbon-free grid.

According to the MIT study,[6] 28% of projects at risk of cancellation had local residents and other stakeholders who did not feel their concerns were adequately addressed in the siting process. Some residents expressed opposition for projects, citing concerns such as potential property value decrease, and environmental, health, and safety impacts. Additionally, energy projects can be located far from the populations they serve, meaning different communities shoulder a larger burden from the aesthetic, land use and community changes. While landowners and homeowners who were not compensated tend to harbor more negativity based on a lack of perceived benefits, attitudes of residents who received compensation for project impacts correlate with more positive views towards projects and perceptions that planning processes were fair.[7]

Project developers go to great lengths to mitigate stakeholder concerns through studying environmental impact, complying with permitting requirements and organizing community outreach efforts. There are also positive externalities from projects including increases in local property taxes, immediate construction contracts and ongoing maintenance jobs. Project developers can improve their communications of these benefits to build community support and trust in the energy project.

By integrating communities into the design process of renewable energy facilities, project developers can support an equitable energy transition. Through multipurpose projects, we can identify creative ways to add value to local communities beyond power generation and build the community buy-in required to accelerate the deployment of carbon-free solutions in the U.S. and beyond.

1 https://www.whitehouse.gov/briefing-room/statements-releases/2023/04/20/fact-sheet-president-biden-to-catalyze-global-climate-action-through-the-major-economies-forum-on-energy-and-climate/#:~:text=Putting%20the%20Power%20Sector%20on%20a%20Path%20to%20Net%20Zero%20Emissions&text=President%20Biden%20has%20set%20an,by%20no%20later%20than%202050

2 https://www.eia.gov/tools/faqs/faq.php?id=427&t=3

3 https://www.weforum.org/agenda/2023/03/energy-transition-renewable-capacity-up-in-2022/#:~:text=%22But%20annual%20additions%20of%20renewable,warming%20to%201.5%C2%B0C.%E2%80%9D

4 https://www.pewresearch.org/science/2023/06/28/majorities-of-americans-prioritize-renewable-energy-back-steps-to-address-climate-change/

5 https://www.sciencedirect.com/science/article/pii/S0301421522001471

6 https://www.sciencedirect.com/science/article/pii/S0301421522001471#bib82

7 https://www.brookings.edu/wp-content/uploads/2020/01/FP_20200113_renewables_land_use_local_opposition_gross.pdf

Supporting examples

Figure 1: Lamb-scaping in progress at AES Lāwa'i solar site

Maximizing land-use through agrivoltaics

Agrivoltaics combines agriculture methods with solar energy production on the same area of land to maximize the use of resources and land while addressing challenges related to food and energy production. As renewable energy and sustainable agriculture become increasingly important in addressing both climate change and global food and energy demands, agrivoltaics represents an exciting and innovative approach that aligns with the principles of a greener and more efficient future. AES Hawai'i developed the Lāwa'i Solar and Storage project, which is a 20MW solar farm situated on 150 acres of land.[8] The site was overwhelmed by Guinea grass, an aggressive and non-native grass reaching heights of over 12 feet and is not easily controlled with traditional vegetation management methods. AES collaborated with nearby Omao Farms to facilitate managed grazing by over 300 sheep to maintain the vegetation at the site. The benefits of

this project design go beyond solar generation as the sheep now have access to good grazing pasture while maintaining a non-native grass and avoiding the use of fossil fuels and herbicides used in traditional maintenance methods. Over the project's lifetime, the sheep will also save millions of dollars in labor costs, and prevent PV panel damage from mowing and weed growth.

8 https://www.aes-hawaii.com/hawaii

Supporting examples

Figure 2: CopenHill clean energy plant with recreational activity on the exterior

Co-locating recreation with a waste to energy site

The impacts of pollution and climate change affect all communities, but the consequences of poorly integrated energy infrastructure are visible chiefly in cities. Cities, by necessity of their population density, use more resources and are often located on climate vulnerable geography. In the face of these challenges, cities like Copenhagen have embraced dual-use designs that reduce waste and carbon emissions, while also maximizing precious urban space for recreational use. CopenHill, a revolutionary architectural project, maximizes its land use by being both a site for waste-to-energy generation and for recreation. Aligning with Copenhagen's goal of total carbon neutrality by 2025, the facility converts 440,000 tons of waste annually into clean energy, delivering electricity and district heating for 150,000 homes. The scale of waste processing and energy generation itself is a milestone in the effort to reduce waste and municipal GHG emissions, but perhaps most groundbreaking is the design of the facility and its multifunctionality.

CopenHill's exterior was designed to be an epicenter for urban mountain sports, including activities such as skiing and snowboarding, running, hiking, sledding, climbing, and rappelling. The building also provides a recreational area with a café, a restaurant and a music venue at the top, while also showcasing views of the city to visitors. Topping off the design of the building is the aesthetic itself – a façade of aluminum bricks alludes to the older architecture of the historic capitol while also providing a shining example of architect Bjarke Ingels "hedonistic sustainability" – the idea that a sustainable approach can provide a more favorable alternative. Ingels believes that sustainable buildings do not only have to be good for the environment; they can be fun too.[11]

9 https://www.copenhill.dk/en

10 https://urbandevelopmentcph.kk.dk/climate

11 https://www.archdaily.com/925966/copenhill-the-story-of-bigs-iconic-waste-to-energy-plant

Supporting examples

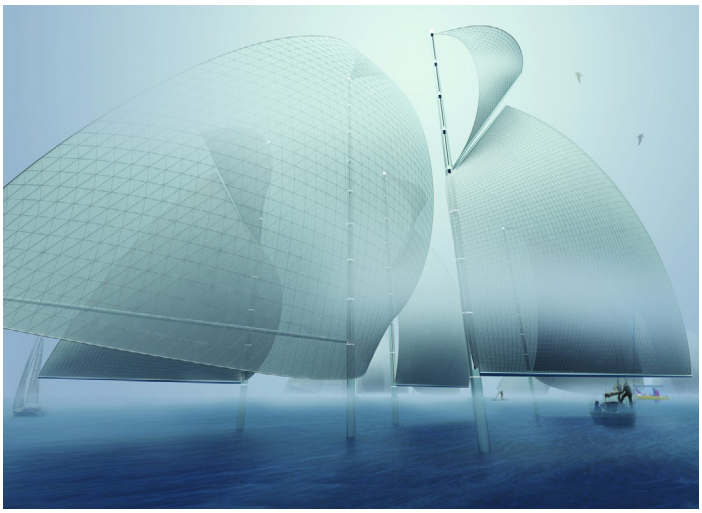

Figure 3: Energy Duck (left) was submitted to the 2014 LAGI competition with PV generation & hydraulic turbines. Regatta H2O: (right) submitted to the 2016 LAGI competition and produces 70 MWh in annual capacity.

Integrating energy infrastructure into community art pieces

Securing community buy-in when designing energy infrastructure is essential. One way to create buy-in is to combine art and engineering to make something both functional and beautiful. For the past decade, the concept of energy-generating art has been steadily gaining popularity, and for good reason. When a piece of infrastructure can be re-designed to work with the local landscape, the project may become a local landmark, thus having a more positive impact on the community, and generating more local support.

A key principle of such energy structures is they fulfill multiple purposes alongside energy production – whether that be a community art piece, a gathering space, a tourist attraction, and/or an educational opportunity. These multiple use cases make the energy transition accessible to everybody in a community and open the door for increased creativity in how the industry thinks of a just energy transition for all. It takes multidisciplinary teams to design structures like the ones below – artists, engineers, community leaders – and everyone's contributions are equally important. If the design is beautiful but not functional, it ultimately won't succeed. However, if it's functional but not well adapted to a local landscape and community, it also won't succeed.

These collaborations are positive representations of how our infrastructure can be reimagined to not only serve a community but also enhance the features of the local landscape. The designs shown below from the Land Art Generator Initiative (LAGI) demonstrate how location and community play a critical role in creating infrastructure that is truly beneficial to all key stakeholders. For example, both the Santa Monica and Copenhagen designs utilize the local coastlines; however, they have completely different generation methods and side benefits that are tailored to the needs of the different communities.

Through reimagining the use of waste-to-energy facilities or designing creative public art installations, energy projects can benefit communities beyond decarbonizing power generation. The recent industry interest in combing agriculture and solar generation through agrivoltaics projects highlights how project developers can add benefits to traditionally designed projects to further support their communities and progress them from development to operation. Projects that fail to meaningfully engage and serve the community may face local opposition that endangers realization of all the potential benefits the project could provide. Developing novel ways that additional benefits can be designed into energy infrastructure projects provides the opportunity to bring more carbon free energy more quickly to communities.

Your task

First round

Your team represents a project development company that is designing an innovative, multi-use energy project to benefit a community in the United States. Your team has been looking to build an energy project in this community for years and has decided to emphasize community benefits, engagement, and multi-use solutions into the design to build community support and ensure approval. To gauge local support, the community board will allow you to present your proposal at a preliminary public hearing where the following stakeholders will be present:

- → Community organizations and leaders
- → Private landowners
- → Concerned citizens
- → Government regulators and officials (local, state, national)
- → Local electric utilities
- → Non-profit organizations

Your team must choose a community to propose a renewable project that addresses specific local issues and capitalizes on the unique benefits that a project could explore at your chosen location. The proposal must be a holistic, novel, and multipurpose solution designed to provide energy and other local benefits to the community. Your team must introduce yourselves and your preliminary project design to the local stakeholders of your chosen community. The proposal should address what the multi-use design will be and how the project will benefit the community through both intentional advantages and positive externalities, including how the benefits will be measured and quantified.

Your team must understand the different perspectives and propose a multipurpose solution that will address concerns the locals may have with traditional energy projects. You must design your presentation to build community buy-in, specifically addressing potential concerns from community stakeholders.

Your team will design a multiuse energy project that considers the following:

Technical Solution – How well does the proposed solution address the prompt? Acknowledge that other solutions were possible and factually explain why the proposed solution was chosen.

Policy Implications – What role does policy play in the structure and implementation of the proposed solution? Does your solution address local needs while contributing to larger state and country goals?

Environmental Impact – Analysis and consideration to both the energy and carbon footprint of proposed solution. This may include land use and impacts on existing real estate, local ecology, or acknowledgement of waste and externalities down the supply chain from the solution.

Financial Feasibility – Can solution costs and potential revenue streams be quantified? How? Is there a reliable and consolidated ROI for the solution? Address qualitative costs when necessary.

Social Impact – Does the proposed solution promote equity in energy in the short and long term? Is community impact incorporated? This may include job loss or creation, community education, land-repurposing, etc.

Effective Multipurpose Design – Is the design a novel approach that has multiple uses? Are the uses distinct and serve the community in distinct ways?

First round deliverable

Prepare a PowerPoint presentation (or preferred virtual presentation-building tool) detailing your solution to the proposed task at hand. On October 12th or 13th, you will have 20 minutes to present as a team to a panel of AES judges followed by a 10-minute question and answer period. All team members must be present and actively participating. 5 teams will be selected to move on to the final round which will take place on October 27th.

Your team must submit your presentation via email to innovationchallenge@aes.com no later than October 11th at 11:59 pm EST.

Please send the presentation in PDF format with the following naming convention "**Team Name_FirstRoundPresentation**".

Your task

Final round

Congratulations! The community board has agreed to bring your design to a formal public hearing. You have been asked to prepare a formal pitch to try to garner additional community support before the community board agrees to move forward. Your team has been hard at work integrating the community's needs into the design process, but you will need to identify and address any concerns that might impact your project's development timeline. This pitch should consider a community benefits plan, as well as a development and execution plan for implementing the project design. Depending on the success of the meeting, your company would like to replicate this design process in other communities.

Implementation, Risks, and Opportunities – Provide clear understanding of logistics, impediments, roles and responsibilities of stakeholders involved, marketing strategy, demonstratable benefits with the proposed solution. Include any challenges that may prevent the project from moving forward (environmental, financial, political, etc.) How will you engage the community to build support from residents?

Metrics of Success – Consider which key indicators will be used to measure the success of your multipurpose design. For your metrics, what is the level that qualifies as success? What qualitative metrics can demonstrate an effective multipurpose design?

Final round deliverable

Prepare a PowerPoint presentation (or preferred virtual presentation-building tool) detailing your solution to the proposed task at hand. As a team, you will have 25 minutes to present to a new panel of AES judges followed by a 10-minute question and answer period. A winner and runner-up will be selected based on these presentations.

Your team must submit your presentation via email to innovationchallenge@aes.com no later than October 26 at 11:59 PM ET.

Please send the presentation in PDF format with the following naming convention "**Team Name_FinalRoundPresentation**".