Governing Solar Benefits as a Transparent, Local Common Good: The Solar Commons Dashboard

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Abstract. Over the coming decade of energy transition, solar PV will generate billions of dollars in "solar savings" on the electric bills of whomever owns the solar array. Once these savings have paid for the costs of the system, they are "free" and abundant gifts of the sun. What legal, economic, and educational tools do we need to equitably distribute these solar savings as revenue streams governed by and for local communities doing reparative justice work? The Solar Commons Project (SCP) is prototyping tools to own solar assets and benefits as community common wealth trusts. The toolkit includes legal templates and a digital dashboard that provides real time information to all parties of the trust agreement. The dashboard shows the flows of value from the sun's radiance to kilowatt hours, market-valued solar savings, social wealth trust funds and community impacts. The dashboard is an essential tool of the Solar Commons ownership model. This article describes the dashboard being prototyped by the author for three Solar Commons projects in Arizona and Minnesota. It discusses the new economy vision and the essential components that make this dashboard a tool for local, transparent peer governance of solar energy as a common good.

Keywords: Commons · Reparative Justice · Community Solar

1 Introduction

Alongside a dynamic social-ecological landscape, the value and benefits of solar energy technology have changed dramatically over the past seven decades. Solar made an early, whimsical appearance in the 1950s at the beginning of what social scientists call the Great Acceleration. This was a time when the US stepped into the industrial production gap left in the ruins of post-World War Two Europe. America's successful assist in rebuilding Europe's industrial infrastructure and expanding its own rested on its vast supply of fossil fuel energy resources. The Great Acceleration names how we now look back on that time as the beginning of an American-lead acceleration of socio-economic trends that include vertiginous GDP growth and voracious increase in the use of primary energy and water resources. The famous "hockey stick" charts correlate that growth with planetary increases in air and water pollution, loss of forests, ocean acidification and rise in earth temperature (See Fig. 1).

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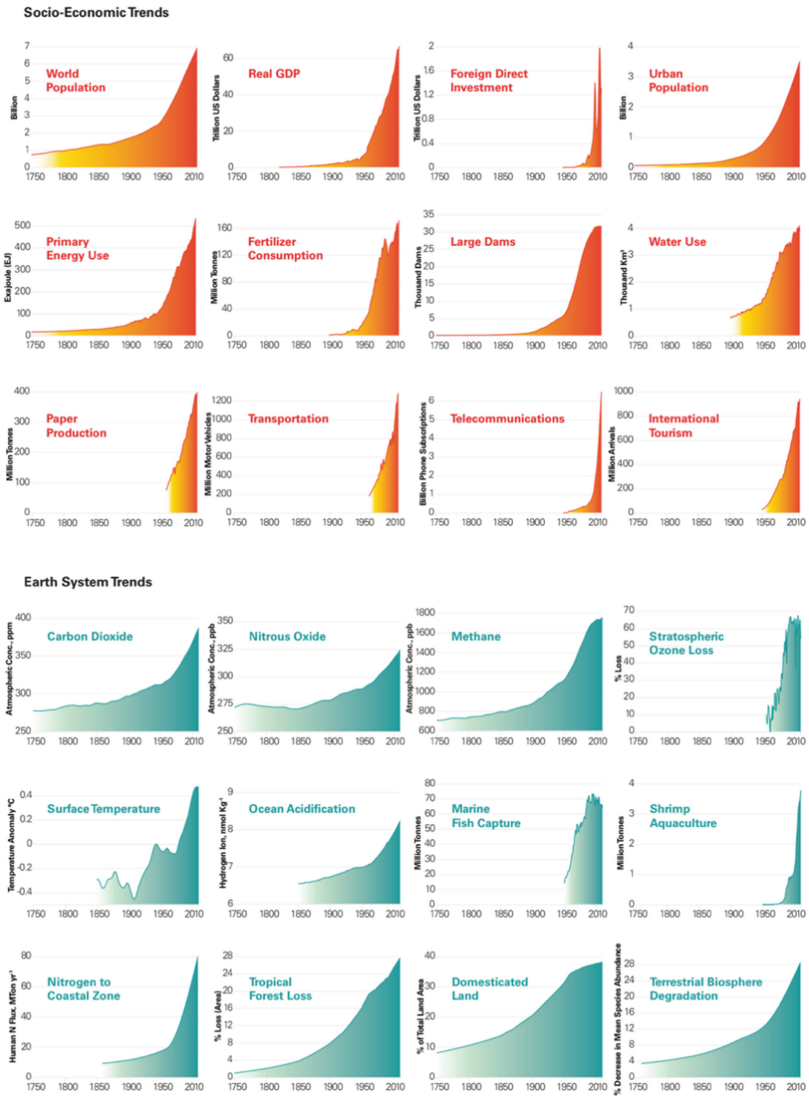

Fig. 1. The Great Acceleration of human influence on the planet across biogeophysical and social measures. Source: Adapted from Steffen, W. et al. 2015. The Anthropocene Review, 2(1), 81–89.

During this period of "the American Century," a solar cell-powered device was just an advertising gimmick--the "Solar Do-Nothing Machine" appeared in 1954 as part of an advertising initiative of the Aluminum Company of America (see Fig. 2). At a cost of $76US/Watt, solar did not figure among the "cheap" and seemingly inexhaustible energy resources that powered the Great Acceleration [1]. But by 2021, with the cost of utility-scale PV at $1.14/Watt, solar is among the cheapest sources of electric power [2]. While we celebrate this great techno-economic achievement of the solar industry,

we should also pause to reflect on what this all means for how we understand and measure the value of solar today. Should the history of cheap energy that culminates in the US being the largest per capita energy user in human history be the framework for valuing solar energy? [3] Should we be worried about unintended earth systems impacts that might accompany approaching solar technology as both "cheap" and "limitless" energy? What socio-economic assumptions are implied in this framework? What else are we apt to reproduce if we value, own, and govern solar energy within the same 20th century industrial framework that gave us the Great Acceleration? And finally, what opportunities might we miss by valuing solar energy as cheap, clean electricity powering an economy whose success is framed in terms of limitless growth?

Fig. 2. Charles and Ray Eames et al. The Solar Do-Nothing Machine, 1957. Courtesy John and Marilyn Neuhart cited in Barber, D. A. (2013). The World Solar Energy Project, ca. 1954. Grey Room, (51), 64–93. (p. 66)

As we respond to the urgency of the climate catastrophe with massive solar deployment, solar advocates are also seeking to answer these questions. US social justice activists note that the industrial scale roll out of solar energy within the dominant growth economics of monopoly investor-owned electric utilities (IOUs) reproduces economic inequities [4]. There are unnecessary delays and obstacles as IOUs resist smaller scale rooftop and community scale solar for which they are not the owners [5]. Immense, capital-intensive solar farms are causing harm to soil hydrology and displacing prime farmland around the country [6]. Like the sacrifice zones that surround fossil fuel extraction sites, the impacts of industrial scale solar are often considered necessary to get the "efficiencies" of quick and cheap solar deployment. Whether such solar deployments are carried out by public or private entities, viewing the value of solar through the eyes

of industrial scale players and owners brings a legacy of assumptions that many solar advocates claim are not warranted by the distributive nature of the technology itself [7]. The US Department of Energy is aware of these inequities and concerns and is offering new incentives for experimentation with "community solar" ownership and expansion of what we mean when we talk about the value and "benefits" of solar [8].

In this short essay, I discuss a community solar project that addresses many of the concerns outlined above. The Solar Commons Project, which I founded and direct, is a community-engaged experiment with a new (and ancient) way of owning, governing and, in the end, viewing solar technology and its benefits. We use strategies of community trust ownership which allow a solar host to own the solar array while the solar savings on the host's electric bill are owned by an underserved community group (See Fig. 3). Our first, small (14.5 kW) Solar Commons prototype was interconnected to the grid in Tucson, AZ in 2018. It was awarded a US DoE Sunny Award for Equitable Community Solar in 2023. We have two other 500 kW prototypes under development in rural and urban Minnesota. After describing the basic elements of our community trust solar ownership model, I focus on the digital dashboard tool we have built to visualize the flows of wealth in the solar energy system. This is a peer-governance dashboard tool used by all parties to a Solar Commons Trust agreement. We are testing the dashboard over the next two years with community partners in our "living lab" prototype sites. By discussing the design and use of this digital dashboard tool, I can best demonstrate how solar technology, when owned as a civic sector "commons," can generate new kinds of equitable solar benefits and, importantly, can make visible a paradigm shift from the twentieth century view of cheap energy as an engine for limitless growth to a twenty-first century view of energy as abundant common wealth and as a vehicle for regenerative, local wealth-building.

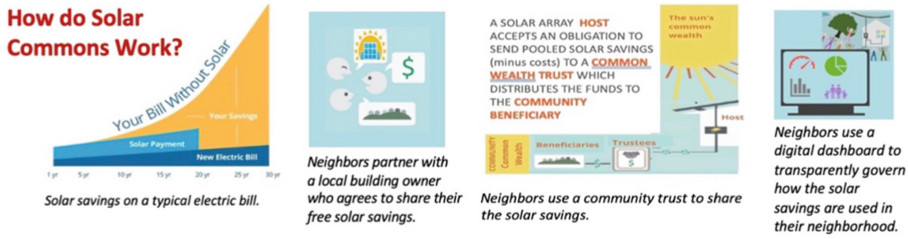

Fig. 3. Infographic of Solar Commons Community Trust Ownership Model.

2 Commons and Solar Commons

Commons are an enduring social form at hand for shaping the socio-economic potential of solar energy. In the English language and the experience of English folks, commons refer to ancient and persistent forms of local community economy. From collective agricultural fields to shared forests for food, energy and housing needs, commons involve customary (informal) social rules of access, just portion, and stewardship. Historically, commons have been diminished or disappeared as modern forms of power

divided nature's common wealth into either public or private property [9]. Over the last centuries, natural resource extraction occurred at ever larger scales requiring capital investments of large private entities or sovereign states. The build out of massive twentieth century fossil fuel and nuclear energy infrastructures are part of this history of the disappearance local energy commons. But the distributive nature of the photovoltaic technology that emerged in the 1950s along with the popularity of the "appropriate technology" movement that arose in the 1970s made community scale energy ownership experiments popular in industrialized countries and helped to reawaken the social form of commons [10].

There are many features of solar technology that lend itself to the vocabulary of commons. The sun shines for everyone. Photovoltaics capture the sun's common wealth and turn it into clean electricity. To become a solar commons, the common wealth benefits—which need not include the actual electricity—need to be locally governed and equitably distributed. The Solar Commons™ ownership model does this through a twenty-five-year Solar Commons Trust Agreement using industry standards to calculate a building host's solar savings and a trust-based method to share those savings with a community beneficiary. The agreement is subject to a Creative Commons License establishing social equity and reparative justice as general guiding principles for using the trust funds [11]. When the Rocky Mountain Institute analyzed the Solar Commons ownership model in 2018 using data from Arizona, Minnesota, and Colorado, it found that current net-metering rules created net present positive financial value when not scaled beyond five hundred kilowatts. Larger scales would add administrative costs and risks that would take money away from the trust beneficiary [12, 13]. Around this locally manageable size and equitably guided agreement, Solar Commons researchers have built one other commons tool to create transparency and accountability for all parties to the trust: a digital flow-of-values dashboard.

3 The Solar Commons Dashboard

At its 500 kW scale, we understand that a Solar Commons system in Minnesota could make approximately $70,000 a year for its trust beneficiary. But this sum only represents the market value of the solar savings flowing annually over the twenty-five-year lifespan of a solar array under a Solar Commons Agreement. But if we begin to count the value of the stability of the revenue stream flowing over time to the underserved neighborhood, or the common good that the community beneficiary builds in their neighborhood with the trust funds, we need a different way of accounting for the values and benefits of solar energy, one which sees solar technology embedded in ecological, technological, and social relationships that generate a flow of diverse values. To see this, the Solar Commons team created an interactive "Flow of Values" digital dashboard tool that is used by all parties to a specific Solar Commons Trust Agreement—solar host, trustees, beneficiaries and trust protectors. Below is our prototype dashboard for the 14.5 kW Solar Commons host in Tucson (See Fig. 4).

The dashboard makes visible, in real time, information about the sun's changing radiance (orange); data from the Tucson host's solar inverter and the solar savings seen on host's monthly electric bill (yellow). The dashboard sets those values into a relationship

with the ecological value of averting C02 emissions (blue), the volatile market value/price of electricity (dark green), and the stable social values created by the SC Trust Agreement which include the accumulated SC trust funds (light green) and the common good created by the neighborhood beneficiary (pink) who upload photos to report their community work. In Tucson, kids from an elementary school in the trust beneficiary neighborhood are distributing the annual Solar Commons funds using a school "participatory budgeting" process that brings radical democracy and community decision-making into the social form of twenty-first century commoning.

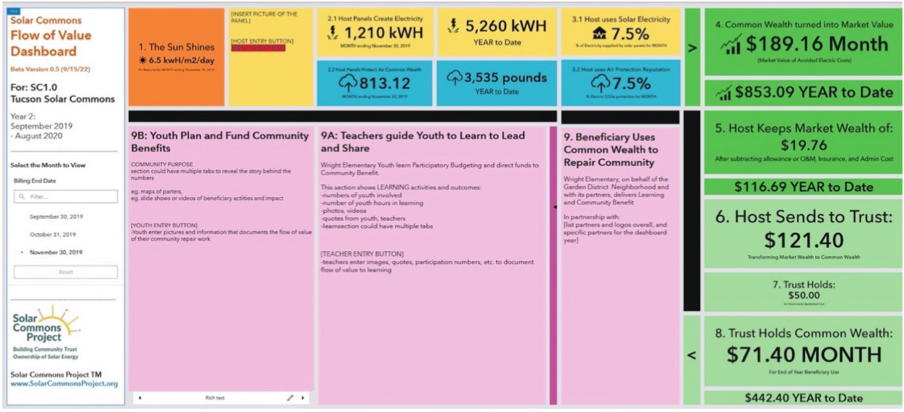

Fig. 4. The interactive Solar Commons Dashboard Tool showing real time flow of values from the sun's radiance to kWhs of solar electricity generation to market value and the to social trust value and finally to common good in the beneficiary neighborhood.

Over time Solar Commons researchers are gathering data and monitoring good governance for how communities use the Solar Commons Dashboard. Our belief is that the dashboard will create the transparency and accountability needed by all parties to the SC Trust Agreement. As we test and improve the dashboard tool with community feedback, we will be increasing the trustworthiness of our Solar Commons legal and peer-governance toolkit and coming closer to co-creating Solar Commons as a robust institution of a commons economic sector. What are the benefits of solar that appear using a Solar Commons ownership model? They will be as diverse as the local solutions that the myriad Solar Commons beneficiaries come up with to build and govern community wealth in their neighborhoods.

4 Conclusion: Shaping Solar Technology for Livelihoods that Value the Abundance and Regenerative Capacity of Nature

The Solar Commons dashboard is part of a commons sector governance structure that visualizes the work of nature, the work of technology, and the mutual aid work of community members. Over time, the dashboard is part of what builds social trust. The Solar Commons dashboard centers the value of solar energy in common wealth: the

shared common wealth of the earth's physical and social systems. The market value of solar is but one among many forms of value that the sun's common wealth passes through. Importantly, tools like the Solar Commons dashboard make visible a paradigm shift from the modern twentieth century view of cheap energy as an engine for extractive economies fashioned for limitless growth to a twenty-first century view of energy as abundant common wealth and a vehicle for resilient, diverse forms of locally governed community wealth.

In 2023, solar energy is no longer a background toy to the Great Acceleration. But it is also more than an industrial tool to stop climate pollution. The value of solar includes its great potential to be governed to power a more equitable, resilient future.

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