

**Green
Island
Group.**

Vision Paper

Prosumer Energy Will Power Local Development

DER and social ownership will empower local communities to become the most important drivers in the transition to a green economy

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GREEN ENERGY MAKES it possible for consumers to produce their own energy – a phenomenon known as prosumer energy. Distributed energy resources (DER) such as solar and wind can be installed by local prosumer setups and operated at near zero marginal cost. This presents a monumental economic potential for bottom-up development.

While reducing emissions has always been viewed as contrary to economic development, this view has significantly shifted in recent years. The transition to a green economy now holds the promise of embarking on a whole new historic era of economic development.



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A global green energy race

The global race to advance and deploy technologies, grow markets, and establish leadership has led to national policies such as the German *Energiewende* and the Chinese Ecological Civilization. In the United States, a Green New Deal of some shape or form has taken center stage in the national climate debate arguing for a transition characterized by economic stimulus and mobilization.

In other words, transitioning to a green economy has become a promising means to renew growth and drive economic development much like previous industrial leaps.

In Europe, a number of EU policies are put in place to incentivize prosumer energy. And in the Global South, many national governments have introduced regulation to enable feed-in-tariffs specifically targeted at incentivizing DER as a means to accelerate the build-up of a reliable power grid.

Even more remarkable is the evolution that has taken place in the private sector. A rapidly growing greentech ecosystem is increasingly shaping the future of how we live, eat, build, move, communicate, and power our economy. Capital investments in green power capacity has far surpassed that of fossil fuel generation.



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The transformative potential of distributed energy

It is safe to say that transition is underway. But still, it matters how we get there. Prosumer-generated DER can turn the green transition into a catalyst for profound social change.

In the following, we will argue that:

1. DER is the best approach to making a full transition to green energy.
2. The roll-out of DER should rely on prosumer ownership.
3. Prosumer DER holds an incredible potential for local development.

Why distributed networks beat large scale wind farms

Green energy differs from fossil fuel technologies in two important ways: (1) Generation can be scaled down to power anything as small as a single household or even a single device. (2) It is difficult to manage output compared to traditional power plants that can be turned on and off to match demand.

These two important distinctions present both a problem and a solution at the same time.

A giant offshore wind farm only produces when the wind blows. And when it blows too much, it produces more than the grid can handle. However, take each turbine and distribute them in many connected grids, and you can balance production and consumption to maintain overall grid frequency.

Balancing production and consumption can be achieved in local micro-grids. These can operate in connection with the larger grid to ensure security of supply for the local community. For example, the community may have enough capacity to cover 90% of their consumption locally, while relying on the main grid for the remaining 10% – a much more cost-effective way of covering their needs on the whole.

As mentioned, production and consumption do not always go hand in hand, which means that the 90-10 divide, as exemplified above, will always be a fluctuating rate. During peak consumption hours, the community may need to draw more from the main grid, while at other times, they may have the opportunity to support the grid by feeding in excess power. In addition, they may have the option of modelling local consumption (for instance by ramping up production in a given sector) to absorb power from the main grid in times of universal peak renewable generation and low universal consumption. And vice versa, they may lower consumption (for instance by reducing the temperature in local storage facilities) when the situation is reversed.

This means that a community with a micro-grid can provide flexibility to the main grid while also ensuring their own security of supply by being hooked up – a model known as micro-on-macro. Scale this out horizontally, and the result is a distributed network of energy assets contributing to a reliable and resilient green energy system.

Micro-on-macro is a far more cost-effective way of structuring a green energy system as opposed to centralized generation and vertical transmission and distribution (T&D).

This has led many developing nations with a smaller sunk cost in existing T&D infrastructure to prioritize the micro-on-macro approach to building out their energy systems.

But DER is not limited to the developing world. When transitioning from fossil fuels to renewable energy, any nation with a developed power grid is presented

with the fundamental dilemma between considerable T&D investments versus reorganization to DER.

So why do we still see so many megaprojects? The reasoning behind giant wind farms and other renewable energy megaprojects is to centralize as much capacity as possible in order to reap the benefits of economies of scale. This makes sense in a fossil fuel driven infrastructure, and this legacy is still very prevailing in financial markets.

But DER is unique in that it can be scaled horizontally – as opposed to vertically – due to both its technical applicability (down to household level rooftop solar) and its extremely low marginal cost, meaning there is not much to gain from centralizing production.

Altogether, this amounts to a decisive shift in how we organize our entire energy infrastructure and potentially the wider economy.



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Community at the center

DER proposes an energy infrastructure, where production is imbedded close to where it is consumed. Therefore, the overarching challenge facing DER is to make things work in a local context. Local prosumer ownership is the key.

The first question that comes up is how to convince people to accept having energy assets such as wind turbines, solar cells, and biogas plants close to where

they live. Popular resistance often stands in the way of otherwise sound projects. However, when people own and benefit from these assets, resistance tends to fade away, oftentimes replaced by outright enthusiasm.

Distributed generation is made up of several components that work in synergy, relying on circular processes adding value for the system as a whole. Such systems are geared towards collaboration and shared value creation within a local setting.

Green Island Group's first project ever was the design of a full suite fossil free utility solution for a 1300 household greenfield development north of Copenhagen. The project included heating, power, and sewer utilities relying on wind, solar, biogas, batteries, and aquifer thermal energy storage alongside a number of supporting technologies. While the combined setup provided future residents with utility bills far outcompeting neighboring towns, the total number of real-time trades needed to realize the benefits of synergetic design came to more than three hundred.

This number is manageable from an operational point of view – smart management of utility systems has moved the goal post on operational complexity in recent years. Still, without collective ownership of the entire setup, internal conflicting interests would risk undermining the intended synergies. With prosumer ownership, owners can benefit from taking a loss in output from one system if it means increasing output from two other systems by a higher factor. If those systems are owned individually, these synergetic trade-offs may never happen.

Biogas is perhaps the clearest example of how important it is to establish a circular prosumer ownership of DER – and how the failure to do so can undermine a project. Biogas operations are dependent on a steady supply of feedstock (food waste, animal manure, sewerage, etc.). This means that if biogas operators rely on feedstock from external suppliers, they risk being priced out of business. If they instead supply their own feedstock, they have the benefit of a circular value chain giving them a lower – and stable – marginal cost. This presents a compelling argument for prosumer owned biogas such as farmer cooperatives or a local community using their sewerage to run a plant.

Another illustrative example is local microgrids providing flexibility to the main grid. Because they are prosumer owned, they can balance their collective consumption and production behind-the-meter and engage the main grid as one collective unit.

Powering an economic leap forward

For an individual community, transitioning to DER allows for a significantly reduced marginal cost of energy. And with prosumer ownership, the community ensures that this is reflected in the price of energy. This not only amounts to substantial savings for individual households, but also subsequently frees up enormous economic potential by lowering the cost of production of nearly everything else.

Renowned American economist, Jeremy Rifkin, has dubbed this phenomenon the *Zero Marginal Cost Society*, as he predicts that the energy system will eventually be operated at essentially zero marginal cost, thereby turning a new page in the history of civilization and ushering in a new industrial revolution.

Whether green energy is implemented as DER or as large-scale centralized capacity, the technology maintains the promise of a much lower cost of energy.

The question is who the benefits will go to. If the infrastructure is owned by private equity investors, the reduced marginal cost of energy production may not translate to a lower consumer price, but rather higher profits for investors. If that is the case, the green transition risks becoming a catalyst for further centralization of wealth.

But that does not have to be the case. Prosumer owned DER places the benefits in the hands of local communities, serving as a platform for equitable economic development. ■



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