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A Bright Long-Term Vision Clouded by Shortsighted Policy Recommendations

The GW Solar Institute Examines MIT's Solar Study

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The Massachusetts Institute of Technology Energy Initiative (MITEI) recently released its long anticipated *Future of Solar Energy* study, entering into solar policy debates at every level of government. For all of the report's deep analyses and great technical insights, its policy recommendations include several misleading suggestions that appear at odds with its analytical results. Most notably, the report delivers an unbalanced treatment of distributed generation and investment-based incentives.

That is unfortunate because they cloud what otherwise would be a bright long-term vision with which we generally agree:

- Mitigating anthropogenic climate change will require a massive increase in solar energy use.
- Modernizing the U.S. electric grid and deploying new solar technologies will become increasingly important over the coming decades but require considerable investments today.
- Reforming electricity rates to be more representative of the full, real-time costs and benefits from generation, transmission, and distribution is essential.
- Continuing federal and state support beyond 2016 is critical for solar to emerge as a main energy source by mid-century.

In our view, the *Future of Solar Energy* offers several shortsighted recommendations because it does not fully account for a number of key market failures and policy goals and instead focuses primarily on capturing the benefits of positive research spillovers and avoiding the costs of carbon emissions. There are undoubtedly a myriad of economic imperfections in current electricity markets and policies, so any discontents with the economic efficiency of solar policies need to be evaluated in that broader context and should not justify eliminating successful policies in isolation. Had the study taken such a broader view, its policy recommendations likely would have differed.

Below are five critical points that the *Future of Solar Energy* missed:

1) Net metering policies currently provide a fair proxy for the value of distributed generation in most regions.

While net metering may need to be revisited when distributed generation accounts for a significant share of electric supply, there is no urgency today or justification for prematurely ending a critical policy mechanism. The study's analysis actually supports this view, despite its recommendation to end net metering.

At low levels of solar PV penetration, which is the case nearly everywhere in the U.S. today, MITEI finds that electricity is roughly 10-13% more valuable during the day when solar PV generates electricity. Yet, MITEI appears to ignore the current benefits of daytime generation in its critique of net metering policies.

Even in cases without any energy storage, MITEI finds that the total costs of having solar PV on the U.S. distribution grid are only a couple of percentage points higher than in the case of no solar PV on the grid. This result holds until solar PV accounts for about 20 percent of electricity generated. In other words, there will be virtually no meaningful increases in total network costs due to solar PV additions anytime soon.

Utilities commonly recover a large portion of fixed distribution system costs as a small percentage of the overall kilowatt-hour rate. The study singles out solar users for paying fewer existing network costs because they use less electricity. This flawed logic could extend to any user who consumes less electricity, such as those in energy efficient buildings or a smaller home. Solar produced and consumed behind the meter is identical to any other avoided electricity use. The fraction of solar energy not consumed behind the meter can be treated as if it were, until solar accounts for large percentages of supply and starts imposing additional network costs.

Moreover, had MITEI's analysis considered a more expansive list of benefits that many previous studies and state commissions attribute to distributed solar (e.g. alleviating grid congestion, deferring capacity additions, or avoiding environmental damages), the mismatch between MITEI's analyses and recommendation to terminate net metering would be even more striking.

2) The costs of modernizing the electric grid should not fall disproportionately on new users.

Given the chance to start from scratch, no one would design the grid as it is today. The frustration with the current grid inspires projects like the Solar Electric Power Association's (SEPA) 51st State Challenge. With over a century of law, regulation, and investment favoring a centralized and convoluted one-way power system, policies such as net-metering are needed to level the playing field and facilitate new market entrants. Because current centralized power users do not pay for but benefit from legacy investments, distributed users should also not have to shoulder the full burden of investments for a more diverse, resilient, and competitive grid.

As the nation upgrades and reinvests in its aging grid, it should elect a balanced path like the one Secretary of Energy Moniz outlined in the recent Quadrennial Energy Review, which called for balanced support of centralized and decentralized power and public investments in the nation's grid.

3) Policies should catalyze the innovation chain across all stages, from research to deployment.

If maximizing carbon reductions in the electricity sector were the only policy goal, the study's recommendations regarding the superiority of production-based incentives and utility-scale solar may be valid. MITEI takes a broader view on innovation only when considering the allocation of research spending between immediate incremental gains and future breakthroughs.

This broader view should be applied consistently across the innovation cycle to fuel innovation in addition to reductions of carbon emissions. While MIT and other universities like the George Washington University provide vital contributions to the nation's innovation system, the greatest gains in technological change often occur in industrial research because it combines innovators, funding sources, and probable end users under one firm.

Unlike MITEI's linear depiction of innovation primarily occurring at the research and development stages, the innovation cycle is generally nonlinear and interconnected. Accordingly, balanced deployment policies that recognize and support innovation are more likely to drive economic growth. Investment-based policies, such as accelerated depreciation and the investment tax credit, may not be economically optimal in reducing emissions today, but they are more likely to drive further innovation than production-based policies that are commonly implemented in the U.S. Without these investment-based policies, current solar PV technologies would not have achieved their current scale, associated

cost reductions, and market competitiveness. Scaling future innovative solar and other energy technologies will also need similar support.

4) Political and pragmatic realities should be important considerations and applied consistently.

Future of Solar Energy invokes pragmatic and political realities somewhat haphazardly. Its recommendation to reform net metering policies sooner rather than later, for example, rests on an argument of political expediency instead of its actual analytical results.

The argument that distributed solar should concede to the net metering backlash, generated largely by utilities facing unwelcome competitive pressures, is tantamount to arguing that industrial ratepayers should unilaterally increase their rates to match residential rates to avoid potential criticism against their industry. Although fairer and more accurate pricing in electricity markets is a worthy goal, rate reform should be pursued across the board and within its broader complicated context.

In line with many economists, MITEI's top choice for a deployment policy is a carbon tax. Although a price on carbon, if priced and structured properly, could address the externality of carbon pollution, barriers to technology commercialization, diffusion, and scale would remain without further deployment policies.

MITEI's second tier choices for deployment are output-based and pricing-based policies. The former takes the form of a national portfolio standard, which, as MITEI concedes, is "unlikely to do much to encourage solar generation" or generation from any other emerging technology without explicit carve-outs. The resulting micromanagement of the nation's electricity mix from carve-outs would inevitably lead to economically suboptimal outcomes. Relatedly, it is far from obvious how feed-in-tariffs or feed-in-premiums might work for the fragmented regulatory and market structures within the U.S., or how they might be more politically viable than a carbon tax.

5) Unlike other proposed measures, the investment tax credit supports emerging technologies, geographic diversity, and a more equitable distribution of taxpayer dollars.

With the support of the federal investment tax credit (ITC), the solar industry has scaled up and reduced costs from over $7 per watt of installed capacity in 2009 to roughly $2 per watt today. As these costs have fallen precipitously so has the amount of federal support per watt of capacity. This automatic adjustment of support based on cost ensures the majority of investment comes from private funds, regardless of the technology's level of maturity.

In addition to supporting emerging technologies more in nominal support, the ITC supports solar equally across geographies. Any national solar policy, particularly one using funds from all American taxpayers, should not limit its benefits to Hawaii and a handful of southwestern states that have the greatest solar resources. Climatic impacts are indifferent to the location of carbon emissions, so it would be economically efficient to address carbon pollution by deploying solar where it is cheapest. Evaluating the ITC only through a carbon pollution lens, however, would be shortsighted.

Geographic parity is not just positive for fostering broader political support but also for using the states as laboratories of policy and grid innovation. States like New Jersey, Massachusetts, and North Carolina that enacted leading solar policies have been able to lead in deployment and associated solar job growth, even though they do not have the highest solar potential. Wider solar deployment will allow for more efforts to integrate solar into different grid types, consistent with one of MITEI's recommendations, and provide more time to prepare for high solar penetration by not concentrating solar in one geographic location.

MITEI identifies a few other imperfections with the current ITC structure that are perfectly valid. Refundability or tradability of the ITC would be an important reform to address the inefficiency and

inflexibility of tax equity. The relative investment incentive between distributed and centralized power would be another reasonable aspect to consider, though many models find utility-scale solar to be more sensitive to the ITC level and individual solar owners are likely disadvantaged because they cannot take advantage of accelerated depreciation.

Congress could address all of these issues with targeted solutions that are as politically feasible as any production-based policy. For example, a technology-neutral ITC, which automatically sunsets with market maturity and encourages innovation and new market entrants, offers one promising path forward.

The George Washington University (GW) Solar Institute generates and shares pragmatic policy solutions to catalyze the adoption and scale of solar energy.

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