

# Section V – Public Policy

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## INTRODUCTION

Despite its relatively tiny scale at present, the solar industry has attracted a great deal of attention from all levels of government in the United States as well as from many foreign governments. Various policies to support the deployment of solar and other renewable electricity generation technologies have been adopted in the European Union; at the federal, state, and municipal levels in the United States; and in at least 138 nations around the world. The U.S. government has provided federal funding for solar research, development, and demonstration (RD&D) since the 1970s. In the last two chapters of this report, we explore the role of public policy in advancing solar energy technology. Specifically, Chapter 9 analyzes policies that create demand for solar technologies, so-called market pull approaches such as renewable portfolio standards. Chapter 10 considers policies that aim to improve solar generating options, so-called technology push approaches — it focuses on federal investment in solar RD&D. Both chapters are shaped by our broader view, articulated in Chapter 1, that human-caused climate change is a profoundly important problem, that it is accordingly vital that global carbon dioxide (CO<sub>2</sub>) emissions be substantially reduced, and that greatly increased reliance on solar energy for electricity generation can play a critical role in reducing global emissions if (and most likely only if) the costs of solar electricity can be substantially reduced relative to the costs of other electricity generation technologies. In other words, what is required is that solar generation become competitive with other generation technologies when deployed at large scale with much lower per-kilowatt-hour subsidies than are currently in force in the United States.

It follows from this view that the division of any given level of spending between “market pull” and “technology push” efforts should reflect expectations about the determinants of future costs. If, for instance, one expects that RD&D is unlikely to deliver significant technology breakthroughs and that future cost reductions will come primarily from efforts by manufacturers and installers, policies that focus on deployment become relatively more attractive. Alternatively, if one believes that RD&D on solar generation and complementary technologies could achieve dramatic reductions in the overall future cost of solar electricity, investment in RD&D becomes more attractive on the margin, relative to subsidizing deployment of currently available technologies. While most members of the MIT study team favor shifting some spending from deployment to RD&D, our analysis in Chapters 9 and 10 concentrates on how any given level of spending on deployment and on RD&D can be more efficient and effective.

Public policies to support solar energy, whether they focus on market pull or technology push, respond to two significant market failures. The first market failure has to do with the damages caused by CO<sub>2</sub> emissions. To reduce current as well as future emissions, we favor putting an explicit or implicit price on CO<sub>2</sub> emissions through a comprehensive cap-and-trade system, a tax on emissions, or (less desirably) regulatory mandates. But the United States has not yet adopted such a comprehensive policy, and under these circumstances subsidizing the deployment of solar and other generation technologies with negligible CO<sub>2</sub> emissions might be part of a desirable

second-best emissions reduction policy. In addition, having some assurance that there will be a market for solar electricity will encourage private firms to engage in profit-seeking R&D aimed at reducing its cost and will contribute to the resolution of the institutional problems discussed in Chapter 4 and the integration problems discussed in Chapter 8.

Chapter 9 demonstrates, however, that the multitude of deployment subsidies that currently exists at the federal, state, and local levels in the United States adds up to an extremely inefficient policy regime: alternative regimes could substantially increase the value of solar electricity per dollar of subsidy. Chapter 9 argues that the fact that residential rooftop photovoltaics (PV) are subsidized at a far higher rate per kilowatt-hour of generation than utility-scale PV is particularly problematic.

The second market failure commonly cited to justify public investment in technology RD&D arises because private firms cannot capture all the benefits of these efforts (instead some of these benefits “spill over” to competing firms and society as a whole). As a consequence, the private sector does not invest enough in advancing technology. The case for government RD&D support is strongest when technologies are at the basic, pre-commercial level, since this is the stage at which private firms are least able to capture the benefits of success. Governments do not have a good track record of carrying out the development activities necessary to translate advances in basic science and technology into commercially viable products, and private firms can capture a larger share of the total returns to society of investments in developing better products or manufacturing processes once a technology has passed beyond the early R&D stages.

While these arguments apply broadly, advances in solar technology are particularly attractive to society because, as discussed in Chapter 1, solar energy has the potential to meet a large fraction of global electricity demand with virtually no CO<sub>2</sub> emissions. We argue in Chapter 10 that U.S. policy with respect to public RD&D investment should take a longer view than at present and aim to produce substantial advances in the performance of concentrated solar power (CSP) technologies as well as new, lower-cost PV technologies. Incremental reductions in the cost of today’s technologies may not make it politically possible to increase solar deployment enough to enable a substantial reduction in global CO<sub>2</sub> emissions.

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