SHADOWS ON THE CATHEDRAL: SOLAR ACCESS LAWS IN A DIFFERENT LIGHT

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Unprecedented growth in rooftop solar energy development is drawing increased attention to the issue of solar access. To operate effectively, solar panels require unshaded access to the sun's rays during peak sunlight hours. Some landowners are reluctant to invest in rooftop solar panels because they fear that a neighbor will erect a structure or grow a tree on nearby property that shades their panels. Existing statutory approaches to protecting solar access for such landowners vary widely across jurisdictions, and some approaches ignore the airspace rights of neighbors. Which rule regime for solar access protection best promotes the efficient allocation of scarce airspace, within the constraints of existing law? This Article applies Calabresi and Melamed's "Cathedral" framework of property rules and liability rules to compare and analyze existing solar access laws and to evaluate a model solar access statute recently drafted under funding from the United States Department of Energy. Surprisingly, the Article concludes that a statute implementing the Cathedral model's seldom-used "Rule Four" is best suited for addressing solar access conflicts.

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INTRODUCTION

There has never been a better time to "go solar." New technologies and government incentive programs have dramatically improved the financial feasibility of small-scale solar power, and landowners are responding at record pace. The number of rooftop solar panel installations

in California has increased one-hundred-fold in the past decade.[1] Total U.S. generating capacity from grid-tied solar panels increased by fifty-two percent in 2008 alone.[2]

The recent expansion of rooftop solar development has brought renewed attention to the issue of solar access. To operate effectively, solar panels need unshaded access to the sun's rays during peak sunlight hours.[3] Because the required line-of-sight path from a solar panel to the sun often crosses through neighbors' airspace, there is a risk that neighbors will erect buildings or plant trees on their properties that shade the panel. Even with financial incentives, it can take twenty years or more to recoup an investment in rooftop solar collectors.[4] Without enforceable solar access protection, this risk of future shading by neighbors can deter landowners from making the investment.

Anticipating more growth in rooftop solar development, state and local governments throughout the United States are searching for better ways to protect solar access.[5] In October 2008, the U.S. Department of Energy's Solar America Board for Codes and Standards released a model solar access statute intended to encourage dialogue on the issue.[6] As of March 2009, most of the twenty-five major U.S. cities enrolled in the Department of Energy's Solar America Cities program were reviewing their solar access laws.[7]

This Article compares and analyzes existing solar access laws and the new model statute, asking which rules will best promote the efficient allocation of scarce airspace within the constraints of existing law. To help highlight the differences between existing solar access laws, this Ar-

1. *See* Felicity Barringer, *With Push Toward Renewable Energy, California Sets Pace for Solar Power*, N.Y. TIMES, July 16, 2009, at A19.

2. *See* SOLAR ENERGY INDUS. ASS'N, US SOLAR INDUSTRY YEAR IN REVIEW: 2008, at 1 (2009), http://www.seia.org/galleries/pdf/2008_Year_in_Review-small.pdf. The president of the Solar Energy Industry Association recently predicted that "[m]uch of the short-term growth for solar energy capacity will come from solar panel installations." Ayesha Rascoe, *Recession Cools Solar Energy Growth*, REUTERS, Mar. 18, 2009, http://www.reuters.com/article/ deborahCohen/idUSTRE52H4PC20090318.

3. WHOLESALESOLAR.COM, SOLAR ELECTRIC MODULES (n.d.), http://www.wholesalesolar.com/pdf.folder/Download%20folder/solar-panels.pdf.

4. A recent study determined that, even after taking into account all available incentives, the upfront capital requirement for installing a residential photovoltaic residential system was between $12,000 and $23,000. *See* JASON COUGHLIN & KARLYNN CORY, NAT'L RENEWABLE ENERGY LAB. TECHNICAL REPORT NREL/TP-6A2-44853, SOLAR PHOTOVOLTAIC FINANCING: RESIDENTIAL SECTOR DEPLOYMENT, at v (2009), http://www.nrel.gov/docs/fy09osti/44853.pdf.

5. *See, e.g.*, HANNAH MULLER, U.S. DEP'T OF ENERGY SOLAR ENERGY TECHS. PROGRAM, SOLAR ACCESS: RECOMMENDATIONS FOR THE CITY AND COUNTY OF DENVER (2009), http://www.solaramericacities.energy.gov/PDFs/Solar_Access_Recommendations_City_And_County_Of_Denver.pdf ("As solar energy systems become more affordable and available to mainstream property owners, solar access is re-emerging as a regulatory area in need of clarification and coordinated, thoughtful enforcement. At least 15 of the 25 major U.S. cities participating in the U.S. Department of Energy's Solar America Cities program are in the process of reviewing their solar access laws.").

6. *See generally* COLLEEN MCCANN KETTLES, SOLAR AM. BD. FOR CODES AND STANDARDS, A COMPREHENSIVE REVIEW OF SOLAR ACCESS LAW IN THE UNITED STATES: SUGGESTED STANDARDS FOR A MODEL STATUTE & ORDINANCE (2008), http://www.solarabcs.org/solaraccess/Solaraccess-full.pdf.

7. MULLER, *supra* note 5.

ticle frames them within Calabresi and Melamed's "Cathedral Model"—the familiar model of property rules and liability rules that remains a versatile analytical tool in law and economics.[8] Surprisingly, there are solar access laws in effect in the United States today that correspond to all four rules in the conventional two-by-two Cathedral Model diagram.[9] Iowa's solar access law,[10] however, is the only state statute that both recognizes landowners' legal entitlement in the airspace above their land and provides landowners an alternative means of purchasing solar access rights from neighbors when voluntary bargaining proves unsuccessful. The Iowa statute applies Rule Four—the most notorious and rarely used rule in the Cathedral Model.

I. BACKGROUND

A. Blistering Growth in Solar Energy Development

The U.S. solar energy industry has grown exponentially in recent years. The generating capacity of photovoltaic (PV)[11] solar collector installations installed in the United States in 2008 was triple the amount installed in 2005 and more than ten times the amount installed in 2000,[12] even though no utility-scale solar power plants came online in 2008.[13] Such rampant expansion has been driven primarily by increases in grid-tied PV generating capacity—modest solar collector systems typically installed on the rooftops of homes and businesses.[14] Globally, grid-tied PV generating capacity has increased by 600% since 2004.[15]

Small-scale solar energy is a particularly attractive energy option. Landowners with installed PV systems usually use the solar-generated power on site,[16] lessening the need for costly transmission facilities[17] and

8. *See* Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules, and Inalienability: One View of the Cathedral*, 85 HARV. L. REV. 1089, 1105–06 (1972).

9. For a summary of how solar access rules applied in existing statutes fit within the Cathedral Model, see *infra* text accompanying notes 55–65.

10. IOWA CODE ANN. §§ 564A.1–.9 (West 1992 & Supp. 2009).

11. For a general description of photovoltaic solar collectors, see *infra* text accompanying notes 23–26.

12. *See* LARRY SHERWOOD, INTERSTATE RENEWABLE ENERGY COUNCIL, U.S. SOLAR MARKET TRENDS 2008, at 4 fig.2 (2009), http://www.irecusa.org/fileadmin/user_upload/NationalOutreachDocs/SolarTrendsReports/IREC_Solar_Market_Trends_Report_2008.pdf.

13. *See* Rascoe, *supra* note 2.

14. RENEWABLE ENERGY POLICY NETWORK FOR THE 21ST CENTURY, RENEWABLES GLOBAL STATUS REPORT 2009 UPDATE 11 (2009), http:/www.ren21.net/pdf/RE_GSR_2009_Update.pdf.

15. *Id.*

16. Although most rooftop-generated solar power is utilized on site, landowners in most states now also have the option of "net metering," which permits excess power from their solar systems to flow onto the electricity grid and be sold to the landowner's utility company. For a more detailed discussion of net metering, see *infra* text accompanying notes 28–29.

17. *See* Bernadette Del Chiaro & Rachel Gibson, *Government's Role in Creating a Vibrant Solar Power Market in California*, 36 GOLDEN GATE U. L. REV. 347, 354–55 (2006) (referencing U.S. Secretary of Energy Spencer Abraham's suggestion that an estimated $50 billion in government and private

reducing transmission-related energy losses.[18] Unlike some other energy strategies, solar power generation does not emit greenhouse gases,[19] threaten protected fish species,[20] or create radioactive waste.[21] Further, solar-generated electricity is most abundantly supplied on hot, sunny days when air conditioners are in use and electricity demands are at their peak.[22]

Recent innovations in PV technology are improving solar panel efficiencies and thereby enhancing the economic viability of rooftop solar installations. Conventional crystalline PV solar panels are modules of small, connected cells comprised of copper, cadmium sulfide, silicon, and other materials.[23] The cells are formulated to facilitate electricity-producing chemical reactions when struck by sunlight.[24] Although most solar panels are still comprised of crystalline PV cells, new "thin film" solar panels are commanding a growing share of the PV market.[25] Some predict that thin film technologies will ultimately make solar energy an economically competitive alternative to fossil fuel-based energy sources, even without government incentives.[26]

expenditures would be needed to improve the existing power transmission grid (citing Ceci Connolly, *Search Is On for Blackout Trigger*, WASH. POST, Aug. 18, 2003, at A3)).

18. *Id.* at 354 ("[R]oughly seven to ten percent of the energy created by the power plant is 'lost' in the process of simply transporting the electrons to the electrical outlet in our home and businesses." (citing Press Release, Oak Ridge National Laboratory, DOE's ORNL Part of Initiative for Superconducting Transformer (Aug. 31, 1998), *available at* http://www.ornl.gov/info/press_releases/get_press_release.cfm?ReleaseNumber=mr19980831-00)).

19. According to the U.S. Department of Energy, electricity-producing facilities in the United States emitted more than 2.4 billion metric tons of carbon dioxide in 2007, accounting for more than forty percent of all domestic carbon dioxide emissions. For a table summary detailing annual carbon dioxide emissions by sector, see ENERGY INFO. ADMIN., CARBON DIOXIDE EMISSIONS FROM ENERGY CONSUMPTION BY SECTOR, 1980–2007 (2008), www.eia.doe.gov/emeu/aer/pdf/pages/sec12_5.pdf.

20. Despite substantial efforts to reduce the impact of hydroelectric power plants on salmon runs, these facilities can still have significant adverse effects on fish populations. *See* Kim Murphy, *Dams Could Fall to Save Salmon*, L.A. TIMES, May 20, 2009, at A17.

21. Waste generated from nuclear power plants can be costly and difficult to store. For detailed information on where and how radioactive waste is stored in the United States, see generally the United States Nuclear Regulatory Commission, http://www.nrc.gov/waste.html (last visited Mar. 16, 2010). Of course, the manufacture and use of solar panels are not completely devoid of environmental risk. *See* Sanya Carleyolsen, *Tangled in the Wires: An Assessment of the Existing U.S. Renewable Energy Legal Framework*, 46 NAT. RESOURCES J. 759, 788–89 (2006) (describing the carcinogenic or toxic attributes of certain chemicals found in solar panels and noting that, "[w]hile the mining and refining of these materials create small amounts of emissions, current technology and federal regulations effectively control these emission levels" (citing Jonathan D. Stoloff et al., *Legal Issues Raised by the Environmental Impacts of Photovoltaic Energy and Wind Energy Conservation Systems*, 11 COLUM. J. ENVTL. L. 379, 384–94 (1986)).

22. *See* Del Chiaro & Gibson, *supra* note 17, at 355 ("[S]olar power is well-suited to reduce peak demand in California since it generates energy at times it is needed most—during heavy air conditioning use.").

23. *See* Carleyolsen, *supra* note 21, at 788 (citing Stoloff et al., *supra* note 21, at 381, 384).

24. *See* Del Chiaro & Gibson, *supra* note 17, at 353.

25. *See generally* Bryan Walsh, *Solar Power's New Style*, TIME, June 23, 2008, at 62, 62–63.

26. *Id.* at 63 (discussing claims by one solar energy company that expects to soon offer thin-film solar panels at $1 per watt, "the point at which power from the sun becomes generally cheaper than coal, without the help of subsidies").

Most of the recent increase in rooftop solar installations is not the result of innovation, however, but of generous state and federal government incentives and financing mechanisms aimed at spurring solar energy development.[27] As of July 2009, forty-two states and the District of Columbia had adopted net metering programs[28] that allow utility customers who generate power on their property (typically from small-scale solar or wind devices) to send excess power onto the electric grid and receive a credit on their electricity bills.[29] In 2008, Congress extended the expiration date on the federal thirty percent investment tax credit for residential solar panel expenses and removed a $2,000 cap on the tax credit amount.[30] State and local government programs offering additional cash and tax incentives,[31] providing discounted financing for PV systems,[32] and creating markets for renewable energy certificates[33] have created further opportunities for cost savings in connection with solar energy systems. Depending on electricity rates, the combination of net metering and various incentives and programs can sometimes allow landowners to recoup the full amount of their investment in a PV system in just twenty years.[34]

27. For a state-by-state summary of renewable energy incentive programs, see generally the Database of State Incentives for Renewables & Efficiency, http://www.dsireusa.org/ (last visited Mar. 16, 2010).

28. *See* Database of State Incentives for Renewables & Efficiency, Summary Maps, http://www.dsireusa.org/summarymaps/index.cfm?ee=0&RE=1 (last visited Mar. 16, 2010) (follow "Net Metering Policies" link).

29. The per-megawatt-hour rate applied in calculating credits under net metering programs can vary by program and is typically either the retail rate (which is more favorable to solar users) or at a lower "avoided generation cost" or wholesale rate. *See* COUGHLIN & CORY, *supra* note 4, at 5. The amount of cost savings available from net metering will depend on the size of the solar collectors installed on the property.

30. *See id.* at 14. The tax credit was initially set to expire at the end of 2007 and had previously been extended to the end of 2008. 26 U.S.C. § 25D(g) (2006). It is now set to expire on December 31, 2017. *See* COUGHLIN & CORY, *supra* note 4, at 14.

31. For example, California's Million Solar Roofs bill contains homeowner incentives aimed at promoting the installation of at least 3000 megawatts of rooftop solar panels in California by 2016. *See* Tawny L. Alvarez, Comment, *Don't Take My Sunshine Away: Right-to-Light and Solar Energy in the Twenty-First Century*, 28 PACE L. REV. 535, 558–59 (2008). Although a detailed discussion of state and local incentive programs is beyond the scope of this Article, a summary of many such programs can be found in COUGHLIN & CORY, *supra* note 4, at 7–11, 15–17.

32. State and local governments are experimenting with numerous new forms of financing to aid purchasers of rooftop PV systems. For a detailed discussion of these programs, see COUGHLIN & CORY, *supra* note 4, at 27–39.

33. Markets for renewable energy credits (or "green tags") help utilities to comply with state or local renewable portfolio standards (RPS). Utilities that are subject to RPS must supply some minimum percentage of their customer electricity demand from qualifying renewable energy sources. Many RPS programs allow producers of renewable energy to sell the "environmental attributes" of generated renewable energy to utilities on a market for cash to enable the utilities to meet the RPS standards. *See id.* at 12–13 (internal quotation marks omitted).

34. *See id.* at 23 (projecting that a landowner in Newark, New Jersey could recover 109% of the initial cost of a PV system over twenty years).

B. Renewed Attention to Solar Access Laws

Most state solar access laws existing today were enacted between 1978 and 1981.[35] The oil embargos of the 1970s are credited with having catalyzed a period of legislative and scholarly interest in solar energy development during that period.[36] Commentators at the time were boldly predicting that solar technologies would soon take a central role in U.S. energy policy.[37] Dozens of state legislatures responded by enacting a wide spectrum of innovative solar access laws.[38] When the energy crisis ended, conventional energy prices settled at lower levels,[39] federal solar subsidies disappeared, and attention to solar energy issues faded. Left in the wake of the energy crisis were dozens of new solar access and solar rights statutes, many of which were inconsistent with each other and some of which seemed to deviate from existing law.

Almost thirty years later, another spike in energy prices[40] and unprecedented government support for renewable energy have thrust solar power—and the legal issues associated with it—back into the spotlight. In 2007, the U.S. Department of Energy formed the Solar America Board for Codes and Standards (Solar ABCs) for the purpose of "resolving solar codes and standards issues."[41] Solar ABCs promulgated a report in October of 2008 providing a comprehensive review of U.S. solar access laws, descriptions of "best practices," and a model statute.[42] According to the report, the model statute was "intended to serve initially as a *straw man* for discussion among stakeholders and will be revised to reflect feedback based upon their needs."[43] Although the model statute and best practices are a useful starting point for a discussion on solar

35. *See* Carleyolsen, *supra* note 21, at 761 ("Much of the existing [renewable energy] legislation was passed in the late 1970s and early 1980s in response to the global oil crisis.").

36. *See id.*; Edna Sussman, *Reshaping Municipal and County Laws to Foster Green Building, Energy Efficiency, and Renewable Energy*, 16 N.Y.U. ENVTL. L.J. 1, 30 (2008) ("Following the oil embargo in the 1970s, there was a flurry of activity and legislation passed in various states addressing solar energy.").

37. *See, e.g.*, John H. Minan & William H. Lawrence, *Preface and Acknowledgments* to LEGAL ASPECTS OF SOLAR ENERGY vi, viii (John H. Minan & William H. Lawrence eds., 1981) ("Solar energy is currently on the fringe of economic viability."); *see also* SANDY F. KRAEMER, SOLAR LAW 8 (1978) ("The sun is now rising on the solar age."). In the late 1970s, even President Jimmy Carter was making broad visionary statements extolling the virtues of sunlight as an energy source. *See* Barry Satlow, *Overview* to LEGAL ASPECTS OF SOLAR ENERGY, *supra*, at xi, xi ("We have got a . . . nuclear powerplant that serves us well. It is one [on] which [many people] would like to see the future energy technology built. It is in a safe place—92 million miles away—and the name of it is the sun." (quoting President Jimmy Carter) (alterations in original)).

38. *See* Sussman, *supra* note 36, at 30.

39. For a chronological chart depicting fluctuations in oil prices from 1947 to 2008 and more specific information regarding oil prices over that period, see WTRG Economics, Crude Oil Prices, http://www.wtrg.com/oil_graphs/oilprice1947.gif (last visited Mar. 16, 2010).

40. *See id.*

41. Thomas P. Kimbis, *Greetings!*, SOLAR ABCS NEWSL. (Solar Am. Bd. for Codes & Standards, Washington, D.C.), Nov. 2007, *available at* http://archive.constantcontact.com/fs029/1101870375436/archive/1101889625288.html.

42. *See generally* KETTLES, *supra* note 6, at iii.

43. *Id.*

access policy, they perpetuate certain aspects of existing solar access laws that diverge from prevailing common law principles and promote the suboptimal allocation of airspace rights.[44]

II. ANALYZING SOLAR ACCESS LAWS: THE CATHEDRAL MODEL

The disparities among existing solar access laws and shortcomings of these laws are clearer when viewed within the "Cathedral Model"—a framework of entitlements, property rules, and liability rules set forth by Guido Calabresi and A. Douglas Melamed in 1972.[45] The Cathedral Model can be a valuable device for comparing and analyzing resource allocation rules.[46] Applying the Cathedral Model involves determining (1) which party should hold the scarce legal "entitlement" at issue and (2) whether to protect the entitlement with a "property rule" or a "liability rule."[47] An entitlement is protected with a property rule if "other parties wishing to acquire the entitlement from its holder can do so only by purchasing it in a voluntary transaction at a price acceptable to" its holder.[48] An entitlement is protected with a liability rule if a party other than the entitlement holder has a right to purchase it at a price equal to its objective value as determined by a (usually governmental) third party.[49]

A. Illustrating the Model

The Cathedral Model can be more easily understood through a simple example. Suppose that one party (polluter) discharges pollution into the air that causes[50] injury to other parties (victims). Applying the Cathedral Model to the parties' conflict would involve first determining whether the polluter should be entitled to pollute or whether the victims

44. For a more detailed discussion of the model solar access statute, see *infra* text accompanying notes 245–51.

45. *See generally* Calabresi & Melamed, *supra* note 8.

46. The author recently published a Cathedral Model analysis of the issue of wind turbine wake interference in the context of commercial wind energy development. *See generally* Troy Rule, *A Downwind View of the Cathedral: Using Rule Four to Allocate Wind Rights*, 46 SAN DIEGO L. REV. 207 (2009). Because this Article applies the same model and a similar analytical approach, portions of the basic model description and some structural elements from the wind rights article have been adapted as appropriate.

47. Calabresi & Melamed, *supra* note 8, at 1093; *see also* Rule, *supra* note 46, at 215.

48. Rule, *supra* note 46, at 215–16; *see also* Calabresi & Melamed, *supra* note 8, at 1092.

49. *See* Calabresi & Melamed, *supra* note 8, at 1092; Rule, *supra* note 46, at 216.

50. Ronald Coase observed that causality can be viewed as "reciprocal" rather than directional. For example, a "polluter" can be viewed as the injured party rather than the party inflicting the injury. *See* R. H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1, 2 (1960) ("The question is commonly thought of as one in which A inflicts harm on B . . . . But this is wrong. We are dealing with a problem of a reciprocal nature. To avoid the harm to B would inflict harm on A. The real question that has to be decided is: should A be allowed to harm B or should B be allowed to harm A? The problem is to avoid the more serious harm."). Placing rules within the framework of the Cathedral Model, however, requires a presumption that one or the other parties "causes" the harm. *See* Lee Anne Fennell, *Property and Half-Torts*, 116 YALE L.J. 1400, 1422 (2007) ("[Cathedral Model's] framework subtly diverges from a Coasean notion of reciprocity.").

should be entitled to pollution-free air. Once the entitlement is assigned, one must then determine whether to protect the entitlement by a property rule or a liability rule. Applying these two steps yields a total of four possible rules, conventionally enumerated as follows:

Rule One: The *victims* are entitled to pollution-free air, and their entitlement is protected by a *property* rule (the victims can obtain an injunction stopping the pollution without having to compensate the polluter);[51]

Rule Two: The *victims* are entitled to pollution-free air, and their entitlement is protected by a *liability* rule (the victims are entitled compensatory damages from the polluter but cannot obtain an injunction stopping the pollution);[52]

Rule Three: The *polluter* is entitled to pollute, and her entitlement is protected by a *property* rule (the victims can neither obtain an injunction stopping the pollution nor claim damages);[53] and

Rule Four: The *polluter* is entitled to pollute, and her entitlement is protected by a *liability* rule (the victims have the right to purchase an injunction by paying the polluter its costs of stopping the pollution).[54]

B. Applying the Model to Solar Access

The Cathedral Model can be easily applied to the problem of solar access. A landowner whose trees or structures shade solar collectors on neighboring property is analogous to a *polluter*. A landowner whose solar collectors are shaded by a neighbor is a *victim*.[55] The unwanted shade that damages solar collectors' productivity is analogous to pollution. Figure A is a table describing the four possible Cathedral Model rules in the solar access context. Interestingly, various state statutes currently in force correspond to all four rules.

The Coase Theorem suggests that, if transaction costs are sufficiently low, any of the four rules described above would generate an efficient outcome because all four rules assign competing airspace rights to either one of the two parties and protect them by some legal rule.[56] However,

51. *See* Calabresi & Melamed, *supra* note 8, at 1115–16; *see also* Rule, *supra* note 46, at 216.

52. *See* Calabresi & Melamed, *supra* note 8, at 1115–16; *see also* Rule, *supra* note 46, at 216.

53. *See* Calabresi & Melamed, *supra* note 8, at 1115–16; *see also* Rule, *supra* note 46, at 216.

54. *See* Calabresi & Melamed, *supra* note 8, at 1115–16; *see also* Rule, *supra* note 46, at 216.

55. Because solar shading can occur only in a south-to-north direction within the continental United States, it is generally impossible for two neighboring landowners at such latitudes to switch roles as polluter and victim. Land in Puerto Rico and Hawaii lies within the Tropic of Cancer, where during the summer months mild north-to-south shading occurs. For a general discussion of the direction of sun shading in tropical areas, see generally Surapong Chirarattananon, Asian Institute of Technology, Solar Radiation and Sunshading: The Position of the Sun Relative to a Location on Earth, http://www.serd.ait.ac.th/ep/mtec/selfstudy/Chapter1/position.html (last visited Mar. 16, 2010).

56. *See* Coase, *supra* note 50, at 2–8. The Coase Theorem predicts that, so long as an entitlement has been assigned to one of two parties, the parties will negotiate the transfer of the entitlement to its highest-valued user if transaction costs are sufficiently low. *Id.*; *see also* Louis Kaplow & Steven Sha-

FIGURE A

	Property Rule	**Liability Rule**
Entitlement to Solar User ("S")	Rule One: S may preclude N from shading S's solar panels **(See statutes in New Mexico,[57] Wyoming,[58] Wisconsin (vegetation),[59] and Massachusetts)[60]**	Rule Two: S is entitled to damages from N for the reduced productivity of S's solar panels caused by N's shading **(See statutes in California (vegetation)[61] and Wisconsin (structures))[62]**
Entitlement to Neighboring Airspace Owner ("N")	Rule Three: S has no claim against N for an injunction or for damages **(See *Fontainebleau*; current law in most states)[63]**	Rule Four: S has a right to purchase an injunction or easement preventing N from having structures or trees on N's property that shade S's solar panels. **(Current law in Iowa)[64]**

as Figure A shows, current solar access laws vary greatly across jurisdictions. This disparate statutory treatment and the infrequency of solar access cases can create uncertainty as to whom the rights are legally assigned. Even in jurisdictions where assignment of the entitlement is clear, the potential transaction costs of neighbor negotiations are too great for policymakers to expect Coasean bargaining to consistently and

vell, *Property Rules Versus Liability Rules: An Economic Analysis*, 109 HARV. L. REV. 713, 732 (1996) (arguing that if transaction costs are sufficiently low, the choice between liability rules and property rules is of less importance because rational parties will bargain to reach an allocatively efficient outcome regardless of which rule is selected).

57. *See* N.M. STAT. § 47-3-4 (1995).

58. *See* WYO. STAT. ANN. §§ 34-22-101 to -104 (2009).

59. *See* WIS. STAT. ANN. § 66.0403(7)(b) (West 2003 & Supp. 2009).

60. *See* MASS. ANN. LAWS ch. 40A, § 9B (LexisNexis 2006); *see also infra* note 152 and accompanying text.

61. *See* CAL. PUB. RES. CODE §§ 25982–25983 (West 2007 & Supp. 2010).

62. *See* WIS. STAT. ANN. § 66.0403(7)(a).

63. Fontainebleau Hotel Corp. v. Forty-Five Twenty-Five, Inc., 114 So. 2d 357 (Fla. Dist. Ct. App. 1959).

64. *See* IOWA CODE ANN. §§ 564A.4–.5 (West 1992).

efficiently allocate competing airspace rights.[65] A more careful examination of the unique attributes of solar access conflicts is thus required to determine which of the four Cathedral Model rules best promotes the efficient allocation of competing airspace rights.

III. CHOOSING THE ENTITLEMENT HOLDER

The first step in applying the Cathedral Model involves determining which party should hold the scarce legal entitlement at issue. There has been some disagreement and confusion among policymakers regarding what "entitlement" is involved in a solar access conflict.

A. Defining the Entitlement: Sunlight or Airspace?

The legal entitlement at issue in the solar access context is not an entitlement to sunlight itself. Unlike water, oil, gas, or minerals, sunlight is not sufficiently "scarce" to warrant property right protection.[66] On average, the earth receives enough sunlight in one hour to satisfy global energy needs for an entire year.[67] The amount of sunlight reaching a given rooftop would not materially diminish even if solar panels were capturing solar energy from every other rooftop on the planet.[68] Indeed, the non-scarcity of sunlight is largely what makes it such an attractive potential energy source. For all practical purposes, solar resources are not location specific, either. At most latitudes, for several hours each day, sunlight radiates onto every exposed inch of the earth's surface. Although certain regions of the country have more solar resources than others,[69] the sunlight shining upon a rural field contains roughly as much energy as

65. Behavioral law and economics scholarship has identified numerous limits on rational behavior that can impede Coasean bargaining. Imperfect information, endowment effects, or other matters could undermine adjacent landowners' ability to consistently negotiate arrangements that allocate airspace rights to their highest valued user. For a discussion of bounded rationality and related behavioral law and economics concepts, see generally Christine Jolls et al., *A Behavioral Approach to Law and Economics*, 50 STAN. L. REV. 1471 (1998). Other factors, such as the "bilateral monopoly" characterizing most private solar access negotiations, can also prevent efficient Coasean bargains. For a more detailed discussion of potential impediments to voluntary bargaining for solar access, see *infra* Part V.A.

66. Not surprisingly, other commentators have observed that sunlight is not scarce like many other natural resources. *See, e.g.*, John William Gergacz, *Legal Aspects of Solar Energy: Statutory Approaches for Access to Sunlight*, 10 B.C. ENVTL. AFF. L. REV. 1, 18 (1982) ("Every lot has its own supply of solar energy. It is not a scarce resource.").

67. *See* Lynn Yarris, U.S. Department of Energy Berkeley Lab, Tapping into Solar Energy Riches: Berkeley Lab's Helios Project and the Solar Energy Research Center, http://www.lbl.gov/Publications/YOS/Apr/ (last visited Mar. 16, 2010).

68. *See* Gergacz, *supra* note 66, at 18.

69. The National Renewable Energy Laboratory (NREL) has generated maps showing estimated solar resource potential throughout the United States. Not surprisingly, states in the southwest and southeast regions of the country have the greatest potential for solar energy development. A downloadable version of NREL's photovoltaic resource potential map is available at http://www.nrel.gov/gis/images/map_pv_national_lo-res.jpg.

that shining on a downtown office building or suburban home within the same geographic area.[70]

In contrast, exclusive *access* to the direct sunlight radiating onto a specific location *is* scarce. Typically, the surface of only one object may capture direct sunlight in any given location and moment. All items situated behind that object are in its shadow and do not receive direct radiation from the sun. Access to direct sunlight dramatically improves the energy productivity of PV cells and is thus of critical importance in solar energy development.[71]

A landowner can exclude others from trespassing onto its land to shade solar collectors, thereby protecting solar access in some cases, but a landowner's right to exclude ends at the property boundary line with respect to shading.[72] Often, solar panels are situated close enough to southerly property lines and the altitude of the sun at relevant hours of day is sufficiently low that there is a risk of shading by neighbors.[73] A landowner who is contemplating installing solar collectors thus often demands assurances that neighbors will not position structures or vegetation in their airspace that would shade the collectors. Owners of neighboring properties, however, are usually reluctant to agree to restrict their rights in the airspace above their land without receiving compensation in return.

Because solar access conflicts are ultimately disputes over use of *airspace*, not sunlight, the entitlement in a Cathedral Model analysis of these conflicts must be defined accordingly. Should landowners who have installed or seek to install solar panels on their property (Solar Users) be legally entitled to an easement or other restriction across their neighbor's airspace to protect solar access? Or, should owners of properties near a Solar User (Neighbors) be entitled to exercise rights in the airspace above their property without liability for shading nearby solar collectors?

70. It should be acknowledged that, even within a given geographic region, property near large bodies of water or at different elevations might be characterized by different amounts of cloud cover that could affect the productive efficiency of a solar panel. *See, e.g.*, ADRIAN J. BRADBROOK, SOLAR ENERGY AND THE LAW 41 (1984) (noting that "clouds are the major natural source of shading" and that, although cloud cover cannot be prevented, "the statistical incidence of cloud cover in the relevant locality can be studied by a solar user" and can inform decisions as to whether to install a solar collector in a given location).

71. *See id.*

72. For a discussion of prevailing law on the issue of shading, see *infra* text accompanying notes 115–19.

73. *See* BRADBROOK, *supra* note 70, at 41 ("Except at midday at certain times of the year in tropical latitudes . . . the sun is never overhead at any location. The effect of this is that sunlight reaching a solar device on the solar user's land will have to pass through the skyspace of one or more neighbouring properties. . . . [T]he lower the apparent position of the sun in the sky, the greater is the likelihood of shading.").

B. Arguments for Assigning the Entitlement to Solar Users

Any rule assigning the entitlement at issue in solar access conflicts to Solar Users would conflict with Neighbors' existing rights in those portions of the airspace above their land that Solar Users would require for solar access (Airspace Entitlement). The *ad coelum* rule under common law provides that "[t]o whomsoever the soil belongs, he owns also to the sky and to the depths."[74] Accordingly, the Supreme Court of the United States has held that a "landowner owns at least as much of the space above the ground as he can occupy or use in connection with the land. The fact that he does not occupy it in a physical sense—by the erection of buildings and the like—is not material."[75] Neighbors seem to already hold the Airspace Entitlement under existing law. Some other countries, however, appear to have assigned the entitlement to Solar Users,[76] and several arguments can be made that Neighbors' airspace rights should be restricted or weakened to accommodate the need for solar access.

1. Private Nuisance Theory

Arguments based on the *ad coelum* doctrine in the solar access context have been countered with another common law maxim, *sic utere tuo ut alienum no laedas*, requiring landowners to use their property "in such a manner as not to injure that of another."[77] Shading a rooftop so as to substantially reduce its potential solar energy productivity might be viewed as injuring Solar Users in violation of the *sic utere* maxim.

The *sic utere* maxim helps to form the basis for nuisance law, which some commentators have advocated as a means of addressing solar

74. BLACK'S LAW DICTIONARY 453 (4th rev. ed. 1968). The full legal maxim is "*cujus est solum ejus est usque ad coelum et ad inferos.*" *Id.* (emphasis added).

75. United States v. Causby, 328 U.S. 256, 264 (1946) (citation omitted); *see also* People *ex rel.* Hoogasian v. Sears, Roebuck & Co., 287 N.E.2d 677, 677–80 (Ill. 1972) (refusing to enjoin construction of a 110-story building, even though the building would interfere with television reception in nearby areas, on the ground that a landowner has the right to construct buildings on its property at any desired height, subject to applicable land use regulations).

76. For example, Japan's solar access law appears to apply a combination of Rules One and Two. *See generally* Steven S. Miller, Note, *Let the Sunshine In: A Comparison of Japanese and American Solar Rights*, 1 HARV. ENVTL. L. REV. 578 (1976), *cited in* ROBERT C. ELLICKSON & VICKI L. BEEN, LAND USE CONTROLS: CASES AND MATERIALS 522 (3d ed. 2005).

77. Steven M. Cherin, Recent Development, *Casting a Shadow on a Solar Collector—A Cause of Action Recognized; An Alternative Resolution Framework Suggested:* Prah v. Maretti, 68 CORNELL L. REV. 941, 944 (1983) (citing Tenant v. Goldwin, (1705) 92 Eng. Rep. 222 (Q.B.)). One of the first modern cases relevant to the solar access debate also discusses the *sic utere* maxim. *See* Fontainebleau Hotel Corp. v. Forty-Five Twenty-Five, Inc., 114 So. 2d 357, 359 (Fla. Dist. Ct. App. 1959). Indeed, shading rooftop solar collectors could conceivably be characterized as infringement of Solar Users' right under the *ad coelum* rule to maintain airspace that is free from undesirable interferences. *See* Henry E. Smith, *Exclusion and Property Rules in the Law of Nuisance*, 90 VA. L. REV. 965, 1016 (2004) (describing use of *ad coelum* rule to argue for exclusion of "unwanted objects, odors, and so on from the column of space around the land"); *see also* Prah v. Maretti, 321 N.W.2d 182, 188 (Wis. 1982) (citing *Causby* for the notion that the airspace rights afforded to surface owners under the *ad coelum* rule are "not unlimited").

access disputes.[78] The *Restatement (Second) of Torts* defines a private nuisance as a "nontrespassory invasion of another's interest in the private use and enjoyment of land."[79] To qualify as a private nuisance, the invasion must be intentional[80] and cause a significant harm of a type "that would be suffered by a normal person in the community or by property in normal condition and used for a normal purpose."[81] At first glance, Neighbors' shading of installed solar panels across a property line might reasonably be characterized as a private nuisance under the Restatement definition. Noise, aesthetic blight, and odors traveling across a property line can each constitute a private nuisance entitling the injured party to damages.[82] But many courts are also likely to consider the reasonableness of Neighbors' use of airspace in analyzing a nuisance claim.[83] To occupy airspace with an ordinary tree or a second-story addition permitted under applicable land use laws seems a reasonable use that is less likely to support a common law nuisance claim for blocking of solar access.

Another obstacle to claiming that solar collector shading is a private nuisance is the possibility that a court may view rooftop solar power generation as an unusually sensitive or "hypersensitive" use. Drive-in movie theaters are a common example of a hypersensitive use involving light. Because low-level ambient light that adversely affects picture quality at some drive-in theaters would not inflict injury on a landowner using the land for a "normal purpose," theater owners cannot successfully bring private nuisance claims against neighbors who emit light at those levels.[84] Although solar energy development is rapidly expanding, less than 0.5% of homes have rooftop solar collectors,[85] and shading could injure only

78. *See, e.g.*, Gergacz, *supra* note 66, at 27 ("A better alternative would be to make solar collector obstruction a private nuisance. In this way each party would have to consider economics in deciding whether to enforce his rights . . . ." (footnote omitted)); Shawn M. Lyden, Note, *An Integrated Approach to Solar Access*, 34 CASE W. RES. L. REV. 367, 395–96 (1984) ("A solar easement statute coupled with a private nuisance action is an ideal means of ensuring solar access for sited solar systems. . . . A private nuisance action will serve as a powerful bargaining tool—the threat of a lawsuit should encourage good faith negotiations concerning solar easements and increase the likelihood of a peaceful, low-cost resolution. As a last resort, if an easement cannot be obtained and solar obstruction appears imminent or actually occurs, the solar user would file a nuisance suit." (footnotes omitted)).

79. RESTATEMENT (SECOND) OF TORTS § 821D (1977).

80. *Id.* § 822(a).

81. *Id.* § 821F.

82. *See* Smith, *supra* note 77, at 992 (citing W. PAGE KEETON ET AL., PROSSER AND KEETON ON THE LAW OF TORTS §§ 86–91 (5th ed. 1984)).

83. *See, e.g.*, Sans v. Ramsey Golf & Country Club, Inc., 149 A.2d 599, 605 (N.J. 1959) ("The essence of a private nuisance is an unreasonable interference with the use and enjoyment of land. . . . The question is not simply whether a person is annoyed or disturbed, but whether the annoyance or disturbance arises from an unreasonable use . . . ."), *cited in* ELLICKSON & BEEN, *supra* note 76, at 514.

84. *See* Dean N. Alterman, Comment, *Reflected Sunlight Is a Nuisance*, 18 ENVTL. L. 321, 322 n.3 (1988) (citing Belmar Drive-In Theatre Co. v. Ill. State Toll Highway Comm'n, 216 N.E.2d 788 (Ill. 1966); Lynn Open Air Theatre, Inc. v. Sea Crest Cadillac-Pontiac, Inc., 294 N.E.2d 473 (Mass. App. Ct. 1973); Amphitheaters, Inc. v. Portland Meadows, 198 P.2d 847 (Or. 1948); Sheridan Drive-In Theatre, Inc. v. Wyoming, 384 P.2d 597 (Wyo. 1963)).

85. Debbie Arrington, *Sun's Again Rising for Area Solar Industry*, SACRAMENTO BEE, June 20, 2009, at D1.

that small percentage of owners. Based on these small proportions, solar power generation could arguably still constitute a hypersensitive use unprotected by modern nuisance law.[86]

2. Changed Circumstances

Technological advancements and societal changes might seem to be reasonable grounds for revising existing laws to reassign the Airspace Entitlement to Solar Users. Some commentators have argued that property laws must evolve to adapt to societal needs, questioning the efficiency of broad property rights protection in a modern urban setting where there is "more heated competition over land uses" than ever before.[87] Subscribers to this ideology might advocate a more restrictive land use regulatory regime capable of ensuring that landowners "internalize the complex externalities that now exist."[88] Throughout history, new private property rights have emerged in response to "the development of new technology and the opening of new markets, changes to which old property rights are poorly attuned."[89] Have laws prioritizing Neighbors' entitlement in airspace rights over the needs of Solar Users become outmoded in an era of solar energy technology?

Prior to invention of the light bulb and modern heating systems, solar access rights were more critical to normal subsistence and thus enjoyed greater protection. A right to reasonable sunlight was protected in ancient Rome.[90] Under the common law English doctrine of ancient lights, a landowner "acquired, after 20 years of uninterrupted use, an easement preventing a neighbor from building an obstruction that blocks light from passing through the landowner's window."[91] The doctrine of

86. *See id.* ("Only about one-half of 1 percent of U.S. homes have plugged into solar power, according to the Solar Energy Industries Association."). The dissenting opinion in *Prah* noted the possibility that solar collectors were a hypersensitive use. *See* Prah v. Maretti, 321 N.W.2d 182, 197 (Wis. 1982) (Callow, J., dissenting) ("I conclude that plaintiff's solar heating system is an unusually sensitive use. In other words, the defendant's proposed construction of his home, under ordinary circumstances, would not interfere with the use and enjoyment of the usual person's property.").

87. Carol M. Rose, *Property Rights, Regulatory Regimes and the New Takings Jurisprudence—An Evolutionary Approach*, 57 TENN. L. REV. 577, 592 (1990).

88. *Id.*

89. Harold Demsetz, *Toward a Theory of Property Rights*, 57 AM. ECON. REV. 347, 350 (1967).

90. *See* Stephen Christopher Unger, Note, *Ancient Lights in Wrigleyville: An Argument for the Unobstructed View of a National Pastime*, 38 IND. L. REV. 533, 542–43 (2005) (describing Roman civil laws protecting sunlight access and requiring builders "to have a servitude over neighboring land if he were not to leave his neighbors a minimum or reasonable amount of daylight" (citing Borimir Jordan & John Perlin, *Solar Energy Use and Litigation in Ancient Times*, 1 SOLAR L. REP. 583, 592–93 (1979))); *see also* Note, *Solar Access Rights in Florida: Is There a Right to Sunlight in the Sunshine State?*, 10 NOVA L. J. 125, 127 (1985) ("Given the Roman community's desire to promote solar energy use, courts often concluded that a landowner's need for solar access outweighed a neighbor's right to build on adjoining property." (citing Jordan & Perlin, *supra*, at 593)).

91. BLACK'S LAW DICTIONARY 95 (8th ed. 2004), *cited in* SCOTT ANDERS ET AL., ENERGY POLICY INITIATIVES CTR., CALIFORNIA'S SOLAR SHADE CONTROL ACT: A REVIEW OF THE STATUTES AND RELEVANT CASES 3 (2007), http://www.scribd.com/doc/3491381/Legal-Solar-California-Shade-Control-Act-Manual-Cases-070123sscapaperfinal001.

ancient lights, however, has long been rejected by U.S. courts.[92] The Florida District Court of Appeals in the famous *Fontainebleau Hotel Corp. v. Forty-Five, Inc.* case in 1959 declared unequivocally that "the English doctrine of 'ancient lights' has been unanimously repudiated in this country."[93] Exceptions are made only for cases where the parties have expressly negotiated for solar access or where Neighbors block sunlight out of spite.[94]

After the oil embargos of the 1970s and the advent of new PV technologies, commentators began arguing that changed circumstances warranted fundamental changes in existing solar access policies.[95] This argument proved influential in *Prah v. Maretti*, a Wisconsin Supreme Court case decided in 1982.[96] In *Prah*, the plaintiff filed a suit against a southerly neighbor to prevent construction of a two-story home that would shade the plaintiff's solar collector.[97] The defendant moved for summary judgment on the ground that shading the solar collectors was not legally cognizable as a private nuisance.[98] The *Prah* court refused to grant summary judgment on the issue, stating that the "factual circumstances and social priorities" that had previously informed the court's decisions on solar access were "now obsolete."[99] According to the court, society in recent years had "increasingly regulated the use of land . . . for the general welfare," and "access to sunlight ha[d] taken on a new significance . . . . as a source of energy."[100]

But a substantial departure from established legal precedent inevitably imposes costs, and policymakers must weigh all costs and benefits of redistributing airspace rights before taking such an action.[101] Discussions

92. *See* Gergacz, *supra* note 66, at 6–7.

93. Fontainebleau Hotel Corp. v. Forty-Five Twenty-Five, Inc., 114 So. 2d 357, 359 (Fla. Dist. Ct. App. 1959).

94. *See* Prah v. Maretti, 321 N.W.2d 182, 188–89 (Wis. 1982) (discussing the "spite fence" exception for access to light and the court's previous unwillingness to otherwise recognize a right to sunlight access "in the absence of an express agreement"). In Louisiana, landowners may also be able to acquire solar access rights through "acquisitive prescription" upon a showing that, among other things, they have possessed the right for thirty uninterrupted years. Palomeque v. Prudhomme, 664 So. 2d 88, 92 (La. 1995) (citing LA. CIV. CODE ANN. art. 742 (1977)). For a more detailed discussion of solar access by prescription in Louisiana, see generally Terenia Urban Guill, Recent Development, Palomeque v. Prudhomme*: The Louisiana Supreme Court Rules on Acquisitive Prescription of Servitudes of Light and View*, 70 TUL. L. REV. 1675 (1996).

95. *See, e.g.*, Donald N. Zillman, *Common-Law Doctrines and Solar Energy*, *in* LEGAL ASPECTS OF SOLAR ENERGY, *supra* note 37, at 25, 26 ("[T]he law does react to changes in technology. . . . As solar energy gains widespread acceptance, ancient legal doctrines can be changed or abolished.").

96. *See Prah*, 321 N.W.2d 182, 190 (Wis. 1982).

97. *Id.* at 184.

98. *Id.*

99. *Id.* at 189.

100. *Id.* For a more detailed discussion of the *Fontainebleau* and *Prah* cases, see generally Unger, *supra* note 90, at 539–45.

101. *See* Melvin M. Eisenstadt & Albert E. Utton, *Access to Sunlight: A Legislative Approach*, *in* LEGAL ASPECTS OF SOLAR ENERGY, *supra* note 37, at 45, 47 ("Such changes . . . must be made carefully, with the burdens and benefits of solar-access guarantees weighed and compared."); *see also* Carol M. Rose, *Crystals and Mud in Property Law*, 40 STAN. L. REV. 577, 578 (1988) (critiquing the *Prah* court's application of nuisance law to solar access as an example of where courts "substitute fuzzy,

of the emergence of new property rights in solar access are misguided because the airspace rights involved are already held by Neighbors under an existing private property regime.[102] Technological advancements and societal changes that have increased the value of the Airspace Entitlement do not justify reassigning it to Solar Users.

3. Correcting a Market Failure

Another plausible argument for assigning the Airspace Entitlement to Solar Users is that broader solar access protection would help to correct market failures causing an undersupply of solar energy generation. Landowners may not fully consider the positive external benefits associated with their installation of solar collectors, leading them to underinvest in solar equipment.[103] Governments can take steps to correct these market failures by reducing costs borne by Solar Users through direct cash subsidies, tax benefits, or financing incentives to Solar Users. However, such incentive programs require significant government funding. The recent economic downturn has already tightened most budgets throughout the country.[104] Although correcting market failures in solar energy development is a worthy goal, government entities might prefer to pursue it through policies requiring less public expenditure. One less-expensive policy would be to statutorily assign the Airspace Entitlement from Neighbors to Solar Users.[105]

Although a law entitling Solar Users to solar access across Neighbors' airspace would reduce Solar Users' up-front expenses and require less government funding than direct financial incentives, it would likely impose far greater social costs. Such a law would protect one singular type of use of airspace—solar access—by subordinating to it property right protection for countless other possible uses that could often be

ambiguous rules of decision for what seem to be perfectly clear, open and shut, demarcations of entitlements"); Stephen F. Williams, *Solar Access and Property Rights: A Maverick Analysis*, 11 CONN. L. REV. 430, 458 (1979) ("Historically courts have taken the view that property rights should be settled and free from tinkering . . . . If property rights are revised to accommodate solar users, this value will be undermined.").

102. The property rights in Native American hunting lands discussed by Demsetz in his well-known discussion of the emergence of property rights were not otherwise already subject to property right protection. *See* Demsetz, *supra* note 89, at 351–53.

103. *See* Williams, *supra* note 101, at 432–36 (describing external costs and benefits relating to solar energy production that might not be internalized by a party that contemplates installing solar collectors or acquiring solar access rights).

104. A report released in June 2009 found that forty-one out of fifty states had addressed or were facing shortfalls in their 2010 fiscal budgets. *See* ELIZABETH MCNICHOL & IRIS J. LAV, CTR. ON BUDGET AND POLICY PRIORITIES, STATE BUDGET TROUBLES WORSEN 1 (2008), http://www.cbpp.org/archiveSite/9-8-08sfp.pdf.

105. *See* Williams, *supra* note 101, at 436 ("It may be assumed . . . that market failures justify some government assistance. The question then becomes one of what form this assistance might take. One basic form is direct subsidy, such as tax advantages or cash grants for solar uses. But government assistance also may take the form of a restructuring of existing private property rights since under present doctrine solar access rights can be obtained only through private agreements.").

more valuable. Further, most external benefits of solar energy generation are shared by all U.S. citizens, so federally funded incentive programs are arguably a more equitable means of correcting the externalities.[106]

C. Arguments for Assigning the Entitlement to Neighbors

The arguments for assigning the Airspace Entitlement to Solar Users seem outweighed by arguments in favor of assigning it to Neighbors. A rule assigning competing airspace rights to Neighbors leads to less litigation over solar access, is less vulnerable to constitutional attack, and arguably has a more progressive socioeconomic impact.

1. Minimizing Litigation

A solar access law that recognizes Neighbors' airspace rights is likely to generate less litigation than a rule assigning the rights to Solar Users. Because the common law generally recognizes Neighbors' Airspace Entitlement and does not make exceptions for solar access, Solar Users rarely bring claims against Neighbors for nuisance or implied rights to solar access across Neighbors' airspace. Existing laws in most jurisdictions rely on clearly established property boundaries to allocate the Airspace Entitlement among landowners, rather than relying on a more nebulous, circumstances-based approach.[107] Under a rule regime providing that shading of solar collectors constituted a nuisance or entitled Solar Users to some statutorily provided remedy, Solar Users who suffered damages from shading would more frequently bring their Neighbors into court.[108] Calculation of damages for solar panel shading can be fact spe-

106. At least one other commentator has made this argument. *See, e.g.*, Williams, *supra* note 101, at 458 ("[I]t seems appropriate that the burden of the aid [to Solar Users] be borne by the nation's taxpayers as a whole rather than by people who find themselves accidentally owning property to the south of a solar user. This argument is based on the equitable premise that the beneficiaries of a scheme should normally bear its costs.").

107. Debbie Leonard & Denise Pasquale, *Legal Tools to Protect Access to Solar and Wind Resources*, NEV. LAW., July 2009, at 14, 15.

108. For example, at least three published cases and a fourth highly publicized case have arisen out of California's Solar Shade Control Act. *See* Zipperer v. County of Santa Clara, 35 Cal. Rptr. 3d 487, 495–96 (Ct. App. 2005) (holding that a county may exempt itself from the Solar Shade Control Act); Kucera v. Lizza, 69 Cal. Rptr. 2d 582, 591–92 (Ct. App. 1997) (holding that the Solar Shade Control Act does not preempt local ordinances restricting the growth of trees from unreasonably blocking views and sunlight unrelated to solar collectors); *see also* Sher v. Leiderman, 226 Cal. Rptr. 698, 707 (Ct. App. 1986) (holding that the Solar Shade Control Act does not apply to passive solar devices); DAVID DOCKTER, CAL. URBAN FOREST COUNCIL, THE "TREES VS. SOLAR" ISSUE PUT TO REST IN THE CAPITOL (n.d.), http://energycenter.org/uploads/Trees%20vs%20Solar_art1.pdf (describing recent case in which landowners in Sunnyvale, California, were criminally prosecuted under the Solar Shade Control Act and forced to trim the tops of the redwood trees in their back yard, ultimately paying $37,000 in legal fees).

cific and expensive.[109] If urban solar development continues to rapidly expand and average densities of real estate development increase, solar access conflicts will be increasingly common.[110] A rule providing that Neighbors are not liable for shading is a far less litigious approach, avoiding the additional litigation-related costs that would accompany a rule assigning the Airspace Entitlement to Solar Users.

2. Constitutional Law

A solar access law that assigns the Airspace Entitlement to Neighbors is also more likely to withstand constitutional challenge because it does not restrict or burden Neighbors' airspace rights without compensation. Some commentators have questioned the constitutionality of solar access statutes.[111] Their constitutionality questions typically focus on whether the more aggressive solar access statutes exceed a State's police power and whether they authorize the taking of Neighbors' airspace without just compensation.[112]

a. The Police Power

The arbitrary, lot-by-lot nature of some state solar access statutes arguably makes them more susceptible to constitutional scrutiny.[113] Land use restrictions aimed at promoting solar access are certainly capable of falling within the scope of a State's police power.[114] In most cases, a land use restriction is within the police power if it can be shown to bear a real or substantial relation to the public health, safety, morals, or general wel-

109. *See* Adrian J. Bradbrook, *Future Directions in Solar Access Protection*, 19 ENVTL. L. 167, 183–84 (1988) (explaining that damages are of little value to solar users because they do not end the shading).

110. *See* Douglas Fox, *Which Is Greener—Sun or Tree?*, CHRISTIAN SCI. MONITOR, Mar. 18, 2008, at 20 (quoting a California lawyer stating that the frequency of solar access cases has recently increased and predicting that the legal system "will see [more of] these cases in the near future" (alteration in original)).

111. *See, e.g.*, GAIL BOYER HAYES, SOLAR ACCESS LAW: PROTECTING ACCESS TO SUNLIGHT FOR SOLAR ENERGY SYSTEMS 136 (1979) (arguing that the "first-person-to-develop-wins nature" of some statutory approaches to solar access "may lead to challenges on constitutional grounds"); Gergacz, *supra* note 66, at 15 (arguing that New Mexico's solar access statute "ignores the property rights of adjoining landowners in a manner which may violate the fifth amendment to the United States Constitution"); Note, *supra* note 90, at 138 ("It is the author's opinion that this enthusiastic approach is unconstitutional. Specifically, the failure of either statute to provide 'just compensation' for the taking of an adjoining landowner's property seems to defy constitutional requirements.").

112. *See*, *e.g.*, Gergacz, *supra* note 66, at 21–22 (analyzing these two constitutionality issues in connection with the original version of the California Solar Shade Control Act).

113. Specifically, courts are less likely to view lot-by-lot statutes as securing the "average reciprocity of advantage" that can bolster arguments that a land use regulation is not a compensable taking. *See, e.g.*, Penn Cent. Transp. Co. v. New York City, 438 U.S. 104, 147 (1978) (Rehnquist, J., dissenting) (quoting Penn. Coal Co. v. Mahon, 260 U.S. 393, 415 (1922) (internal quotation marks omitted)).

114. *See* Kucera v. Lizza, 69 Cal. Rptr. 2d 582, 588 (Ct. App. 1997) ("The preservation of sunlight has been recognized for nearly 40 years as a valid police-power purpose supporting height limitations."), *cited in* Alvarez, *supra* note 31, at 554–55.

fare.[115] Statutes in New Mexico, Wyoming, California (as to vegetation), Wisconsin, and Iowa each provide means by which Solar Users can acquire solar access protection across particular Neighbors' airspace (Lot-by-Lot Statutes). To be a valid exercise of a State's police power, a land use restriction must bear a "real or substantial relation to the public health, safety, morals or general welfare."[116] Because Lot-by-Lot Statutes protect solar access for a singled-out, private Solar User rather than for an entire jurisdiction or for a zoned area within a jurisdiction, some have argued that the statutes serve only the interests of individual Solar Users and not the general welfare.[117]

Given the increasing number of solar collector installations in recent years, the growing recognition of the social benefits of renewable energy generation, and the increasingly broad nature of land use restrictions, it seems likely that even Lot-by-Lot Statutes are within a State's police power.[118] Some state and local governments have also fortified their solar access legislation against police power-based challenges by including statutory language expressly declaring that the legislation's purpose is to promote the public health, safety, morals, and welfare.[119] Still, a Lot-by-Lot statute allowing Neighbors to retain their airspace rights rests on even more solid legal ground.

b. The Takings Clause

Another constitutional question is whether some solar access statutes violate the Takings Clause under the Fifth and Fourteenth Amendments. The Takings Clause restricts States' exercise of eminent domain power to takings of private property for "public use" and requires just compensation to affected landowners.[120]

Solar access statutes that do not involve an express taking of private property under the eminent domain power probably fall outside the Takings Clause. Some solar access statutes merely prohibit the granting of building permits within airspace being utilized for solar access or impose additional height restrictions or setbacks on parcels situated southerly of

115. *Kucera*, 69 Cal. Rptr. 2d at 588–89.

116. *Id.* at 588.

117. *See* Gergacz, *supra* note 66, at 23 ("[The Solar Shade Control Act] benefits only self-selected individual landowners. It is only through attenuated reasoning that it can be said to benefit the welfare of the public.").

118. *See* HAYES, *supra* note 111, at 144 ("Normally, the greater the number of persons using solar equipment, the greater the public purpose—and hence validity—of a police power control.").

119. For a more detailed discussion of this issue and language used by some state legislatures to ward off police power challenges, see Alvarez, *supra* note 31, at 555–56.

120. The Fifth Amendment of the United States Constitution requires that "[n]o person shall be . . . deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation." U.S. CONST. amend. V. The Fifth Amendment applies to the states by virtue of the Fourteenth Amendment. Haw. Hous. Auth. v. Midkiff, 467 U.S. 229, 231 (1984).

a solar panel.[121] Such restrictions generally do not create a "total regulatory taking," are not a permanent physical occupation of property, and do not involve land use exactions.[122] Thus, the applicable takings analysis for such statutes is that set forth in the case of *Penn Central Transportation Co. v. New York City*.[123] Under the *Penn Central* test, a court analyzing whether a taking has occurred considers numerous factors, including (1) "[t]he economic impact of the regulation on the claimant," (2) "the extent to which the regulation has interfered with distinct investment-backed expectations," and (3) "the character of the governmental action."[124] Case-by-case analysis is required to determine whether the balance of these factors supports a finding that a regulatory taking has occurred with respect to a given statute and solar access conflict.[125] The *Penn Central* Court, however, rejected the concept of conceptual severance and refused to hold that a landmark preservation ordinance had affected a taking of lucrative airspace rights in New York City's downtown core.[126] In comparison, the economic impact and investment-backed expectations involved in a typical solar access dispute seem even less likely to support a regulatory takings claim.[127]

In the event that a statute transferring the Airspace Entitlement to Solar Users was characterized as an exercise of eminent domain power, such a statute would seem capable of meeting the "public use" requirement of the Takings Clause. In its controversial decision in *Kelo v. City of New London* in 2005, the Supreme Court of the United States held in favor of a broader definition of "public use" that covers takings for a "public purpose,"[128] strengthening the argument that solar access statutes would satisfy the public use requirement if ever challenged on that ground. Condemning an airspace right for a Solar User has been com-

121. *See* Alvarez, *supra* note 31, at 544, 556; Gergacz, *supra* note 66, at 10–11.

122. Alvarez, *supra* note 31, at 553 (citing Lingle v. Chevron U.S.A. Inc., 544 U.S. 528 (2005) (internal quotation marks omitted)). The case most often cited for the "total regulatory taking" category of regulatory takings is *Lucas v. South Carolina Coastal Council*, 505 U.S. 1003 (1992). A case commonly cited for the "complete physical taking" category of takings is *Loretto v. Teleprompter Manhattan CATV Corp.*, 458 U.S. 419 (1982). Cases frequently referenced with respect to land use exactions in the regulatory takings context are *Nollan v. California Coastal Commission*, 483 U.S. 825 (1987), and *Dolan v. City of Tigard*, 512 U.S. 374 (1994).

123. 438 U.S. 104 (1978).

124. *Id.* at 124.

125. *Id.*

126. *Id.* at 137–38.

127. Some state statutes seem to take investment-backed expectations into account in providing solar access. *See, e.g.*, WIS. STAT. ANN. § 66.0403(5)(a)(2) (West 2003 & Supp. 2009) (requiring as a condition to issuance of a solar access permit that "[n]o person has demonstrated that she or he has present plans to build a structure that would create an impermissible interference by showing that she or he has applied for a building permit prior to receipt of a [solar permit] notice . . . has expended at least $500 on planning or designing such a structure or [has submitted] any other credible evidence").

128. *See* Kelo v. City of New London, 545 U.S. 469, 480 (2005) (internal quotation marks omitted). Several states passed reactionary legislation in the wake of the *Kelo* decision, some of which may make it more difficult to satisfy the "public use" requirement in the solar access context. For example, New Hampshire amended its constitution to prohibit takings where the taking is "for the purpose of private development or other private use of the property." N.H. CONST. art. 12-a.

pared to a public utility's condemning a sewer line for a home, which constitutes a valid public use.[129] A solar access statute with language stating that it furthers a public purpose of promoting cleaner energy generation or protecting the environment is likely to support a finding of public use.

The Takings Clause also requires just compensation to private individuals whose property rights are condemned through eminent domain. Assuming that Neighbors presently hold the Airspace Entitlement, rules providing that Neighbors retain that entitlement are far less likely to violate the just compensation requirement. In contrast, solar access statutes applying Rules One and Two transfer airspace rights from Neighbors to Solar Users, without providing for just compensation to Neighbors for their forfeited rights.[130]

3. Socioeconomic Effects

A decision to assign the Airspace Entitlement to Solar Users would enrich Solar Users at the expense of Neighbors. Under the Coase Theorem, so long as transaction costs are sufficiently low and the competing airspace rights are assigned to one of two parties, the parties will bargain such that the resource ultimately rests with its highest valued user. But the party that takes initial assignment of the Airspace Entitlement is better off, even after Coasean bargaining, than if such party had not initially held the rights.[131] Allocative efficiency may be achievable regardless of to whom the initial property right is assigned, but the distributive consequences of the initial assignment of the right also warrant attention.

Although Solar Users can be found at nearly every point along the socioeconomic spectrum, there are reasons to believe that the *average* Solar Users are wealthier than their Neighbors. The steep up-front cost of solar collectors and the uncertainty and long recoupment period associated with investing in them make them a luxury item to most landown-

129. *See* KRAEMER, *supra* note 37, at 146 ("For those jurisdictions that have adopted the 'broad' view of public use, the acquisition of solar access easements by condemnation would seem to present a public *use* similar to that of condemnation by public utilities for rights of way. . . . [A] public utility can condemn a right of way for a sewer line even though the only beneficiaries are the residents of one apartment building.").

130. Rule Four would arguably satisfy the just compensation requirement by providing for Neighbors' compensation. Rule Three-based solar access laws do not provide for involuntary solar access protections across Neighbors' airspace and thus would not raise issues under the Takings Clause.

131. To illustrate, suppose that the aggregate value of competing airspace rights to the Solar User is $5000 and the aggregate value to the Neighbor is $3000. If policymakers initially assign entitlement in the airspace rights to the Solar User, the Solar User will retain the rights and have $5000 in wealth. The Neighbor's wealth will be $0. If policymakers instead assign the airspace rights to the Neighbor, the Solar User will purchase the rights from the Neighbor at some price "*X*" between $3000 and $5000. The Solar User's wealth will be only ($5000 – "*X*"), or some amount between $0 and $2000. The Neighbor's wealth will be "*X*" (an amount between $3000 and $5000).

ers.[132] More affluent landowners are more likely to have the cash required to purchase solar collectors or to easily obtain financing.[133] A rule assigning the Airspace Entitlement to Solar Users could thus be characterized as regressive policy, further enriching a more affluent group to the detriment of a poorer one.[134]

IV. ENTITLEMENT TO NEIGHBORS: DISMISSING RULES ONE AND TWO

The weight of the factors discussed in Part III above favors a rule under which Neighbors are entitled to reasonably use the airspace above their properties without liability for shading nearby solar collectors. Such a rule is more consistent with existing law, would be less vulnerable to constitutional attack, would lead to comparatively less litigation over solar access conflicts, and would arguably have a more progressive socioeconomic impact. This Article thus proceeds on the assumption that Neighbors of Solar Users are entitled to reasonably exercise rights in the airspace above their properties without liability for shading.[135]

A determination that Neighbors should hold the Airspace Entitlement eliminates from consideration the first two of the four possible Cathedral Model rules described in Figure A. Rules One and Two each would have provided that Solar Users were entitled to solar access rights across Neighbors' airspace. The Rule One and Rule Two approaches to solar access are the most favorable toward solar development, and there are laws in some U.S. jurisdictions applying each of these approaches. In such jurisdictions, legal changes would be necessary to reassign the Airspace Entitlement from Solar Users to Neighbors.

A. Existing Laws Applying Rule One

Under a Rule One-based solar access law, Solar Users can obtain the equivalent of an injunction preventing Neighbors from having structures or vegetation within their airspace that would shade Solar Users'

132. Even when factoring in the numerous government incentives now available for rooftop solar energy systems, the out-of-pocket cost to purchase a system ranged from $12,000 in Newark, New Jersey to $23,000 in Sacramento, California, in a recent study. COUGHLIN & CORY, *supra* note 4, at v.

133. *See id.* at 1 ("Traditionally, homeowners have financed [solar energy] systems with cash, home equity loans, or refinanced mortgage loans.").

134. For the same reason, many of the subsidies, tax benefits, and assisted financing programs now available to encourage urban solar development are also arguably regressive because wealthier landowners are better able to take advantage of them. One might make counterarguments about the regressive nature of pro-solar policies by observing that, even after accounting for all available financial incentives, many Solar Users still suffer a net loss on their investment. *See id.* at 23 (showing that landowners in three states recouped between 76% and 109% of their initial costs in installing photovoltaic solar collectors).

135. The one obvious exception to this approach, consistent with existing law, involves cases where Neighbors shade solar collectors unreasonably or out of spite. *See supra* text accompanying note 94.

solar collectors. Below are descriptions of some existing laws that seem to apply Rule One to protect solar access.

1. Public Nuisance Statutes

The equivalent of an injunction stopping the offending activity is often available as a remedy in public nuisance cases, so solar access protections based upon a public nuisance theory seem to fall under Rule One.

Prior to its recent amendment, California's Solar Shade Control Act used a public nuisance approach to protecting solar access. As originally enacted in 1978, the Act prohibited landowners from allowing trees or other vegetation to shade existing solar collectors on neighboring properties.[136] Solar Users who complied with the Act's setback rules[137] and installed a "solar collector" fitting the Act's definition[138] automatically acquired solar access rights (with respect to shading from trees or vegetation) across their Neighbors' airspace. If Neighbors violated the Act, Solar Users could sue to enjoin the shading as a public nuisance.[139] Neighbors who were found guilty of violating the original statute could be cited with criminal fines of up to $1,000 per day until they removed the offending vegetation.[140]

Various shortcomings of the Solar Shade Control Act were eliminated by the California state legislature in 2008.[141] Political support for the amendments arose after a highly publicized neighbor dispute involving the Act generated popular criticism toward some of its provisions.[142] In December of 2007, a court convicted a couple of violating California's Solar Shade Control Act by allowing their trees to shade a neighbor's solar panel.[143] After seven years of hearings and $37,000 in legal fees, the couple finally trimmed the trees.[144] Under the amended statute, violators are no longer subject to criminal prosecution on a public nuisance theory

136. CAL. PUB. RES. CODE § 25982 (West 2007). For a detailed summary of California's Solar Shade Control Act, see generally ANDERS ET AL., *supra* note 91.

137. CAL. PUB. RES. CODE § 25982.

138. CAL. PUB. RES. CODE § 25981.

139. Recent amendments to section 25983 of the statute removed its public nuisance provision and replaced it with language providing for only civil liability under a private nuisance theory. CAL. PUB. RES. CODE § 25983 (West 2007 & Supp. 2010). For a critique of the "public nuisance" aspect of the original Solar Shade Control Act, see Gergacz, *supra* note 66, at 24–25.

140. CAL. PUB. RES. CODE § 25983.

141. *See* S.B. 1399, 2007–08 Cal. Reg. Sess. (as amended Mar. 24, 2008). S.B. 1399 was signed into law in July of 2008 and took effect on January 1, 2009. Although most critiques of the original legislation argued that it was overly strong and oppressive to Neighbors, some advocates of solar power argued that the statute could have gone even further in protecting solar access. *See, e.g.*, Bradbrook, *supra* note 109, at 184 (arguing that the statute's weakness is that it "applies solely to shading from trees and shrubs and does not encompass shading caused by buildings or other structures").

142. For a more detailed description of the Sunnyvale neighbor dispute, see generally Fox, *supra* note 110.

143. Felicity Barringer, *Trees Block Solar Panels, and a Feud Ends in Court*, N.Y. TIMES, Apr. 7, 2008, at A14.

144. *Id.*; Fox, *supra* note 110.

and can only be civilly liable—likely in the form of damages (Rule Two) rather than injunctive relief (Rule One).[145]

Some local solar access ordinances in California still provide property rule protection to Solar Users through a public nuisance approach.[146] Even after its recent amendments, the Solar Shade Control Act itself continues to assign the Airspace Entitlement to Solar Users because it still unilaterally grants rights to Solar Users across their Neighbors' airspace without compensation.[147] Critics of the Act have attempted to question its constitutionality on that ground.[148] A decision in California to reassign competing airspace rights to Neighbors would require the state legislature and those local governments with public nuisance-based local solar access provisions to add statutory language requiring Solar Users to compensate Neighbors for relinquished airspace rights.[149]

2. Permit-Based Statutes

Statutes in Massachusetts and Wisconsin authorize municipalities to adopt ordinances under which they can grant "permits" that effectively create solar access easements across properties situated near Solar Users.[150] An ordinance in Boulder, Colorado, establishes such a permit system within certain areas of that city.[151] Permit-based solar access statutes

145. Among other changes, Neighbors whose airspace rights may be affected by nearby Solar Users are now also entitled to written notice. For a discussion of statutory amendments enacted in S.B. 1399, see DOCKTER, *supra* note 108. Also, the original version of section 25982 exempted only "trees and shrubs which at the time of installation of a solar collector or during the remainder of that annual solar cycle cast a shadow upon that solar collector." CAL. PUB. RES. CODE § 25982. Under the revised version of section 25982, all trees and shrubs placed or grown after installation of the solar collector are exempt. CAL. PUB. RES. CODE § 25982 (West 2007 & Supp. 2010).

146. *See, e.g.*, CLAREMONT, CAL. MUN. CODE § 16.145.020 (2010).

147. CAL. PUB. RES. CODE § 25983 (West 2007 & Supp. 2010).

148. *See* Gergacz, *supra* note 66, at 21–23 (arguing that the Solar Shade Control Act might "involve a 'taking' of a neighbor's airspace without just compensation"). *But see* Penn Cent. Transp. Co. v. New York City, 438 U.S. 104, 130, 138 (1978) (rejecting conceptual severance of an estate and refusing to find that a regulation effectively prohibiting development of valuable airspace constituted a compensable taking).

149. Multiple commentators have argued that a provision for compensation to Neighbors who relinquish airspace for solar access purposes makes a solar access statute less vulnerable to constitutionality challenges. *See, e.g.*, KRAEMER, *supra* note 37, at 154 ("If a sovereign regulates access to sunlight along the lines of the Appropriation doctrine, a question of a taking without compensation arises due to the effects on the airspace rights of various landowners near the solar collector. . . . If these regulations are severe enough to be a taking, compensation would be required under the Fourteenth Amendment to the Constitution."); Bradbrook, *supra* note 109, at 200–01 ("[S]ome forms of solar access protection in the United States . . . raise questions of unconstitutional takings in violation of the fifth amendment. For these reasons, an equitable system of compensation for affected landowners must be found."); Gergacz, *supra* note 66, at 15 ("It is possible that the unilateral creation by the solar user of a solar access right over his neighbor's land so diminishes the value of that land that it requires some form of compensation."). For additional discussion of Rule Four as a solar access tool, see *infra* text accompanying notes 228–39.

150. MASS. ANN. LAWS ch. 40A, § 9B (LexisNexis 2006); WIS. STAT. ANN. § 66.0403(2) (West 2003 & Supp. 2009).

151. *See* BOULDER, COLO., REV. CODE 1981 § 9-9-17(h) (Supp. 101, 2009). The permit provisions of Boulder's solar access ordinance do not apply to areas that are subject to "solar fence[s]"—shade-

generally prohibit Neighbors from obstructing any solar collectors described in Solar Users' permits. Neighbors have no right to compensation for their consequent loss of airspace rights.

To the extent that permit-based solar access laws provide property rule protection for the easement rights granted to permit-holding Solar Users, these statutes apply Rule One.[152] Amendments adding a compensation requirement would reassign the Airspace Entitlement to Neighbors, converting these statutes to versions of Rule Four.[153]

3. Prior Appropriation-Based Statutes

Rather than expressly assigning the Airspace Entitlement to either Solar Users or their Neighbors, statutes in New Mexico and Wyoming purport to use a "first-in-time" rule analogous to the prior appropriation doctrine in water law.[154] Because the effect of these statutes is to assign competing airspace rights to Solar Users, the statutes are versions of Rule One.[155]

In New Mexico and Wyoming, a landowner can unilaterally acquire solar access rights across Neighbors' airspace, without compensating Neighbors, by being the first to make "beneficial use" of the airspace.[156] A landowner who installs a qualifying solar collector,[157] records a valid solar right instrument or declaration with the county clerk,[158] and satisfies statutory neighbor notice requirements under these statutes[159] acquires "solar rights." Solar rights acquired under these statutes are not rights in sunlight itself or in some other scarce resource for which private property rights did not previously exist. The New Mexico and Wyoming statutes define a "solar right" as a property right "to an unobstructed line-of-sight path from a solar collector to the sun, which permits radiation from the

based setback/height restriction requirements that are generally applied throughout designated areas in the city. *Id.* § 9-9-17(d).

152. Although the Massachusetts statute does not specify remedies, it provides that the permits may "create an easement to sunlight over neighboring property," suggesting that such a right is grouped with generic easements and entitled to property rule protection. MASS. ANN. LAWS ch. 40A, § 9B. Wisconsin's statute authorizes injunctive relief to remove offending vegetation, classifying the statute as "Rule One" in that regard. *See* WIS. STAT. ANN. § 66.0403(7)(b). Damages are the only remedy for shading by structures, grouping the balance of the statute with Rule Two. *See* WIS. STAT. ANN. § 66.0403(7)(a). Boulder's statute does not directly address remedies for shading by structures but does expressly provide for injunctive relief for vegetative shading. *See* BOULDER, COLO., REV. CODE 1981 § 9-9-17(h)(14).

153. The possibility of converting a Rule One- or Rule Two-like solar access statute to a Rule Four statute is described in greater detail later in this Article. *See infra* text accompanying note 241.

154. *See* N.M. STAT. §§ 47-3-1 to -12 (1995 & Supp. 2009); WYO. STAT. ANN. §§ 34-22-101 to -106 (2009).

155. Iowa's statute arguably also has a time-of-use element but is grouped with Rule Four because it requires Neighbors compensation.

156. Under each statute, "[b]eneficial use" is "the basis, the measure and the limit of the solar right." *See* N.M. STAT. § 47-3-4(B)(1) (1995); WYO. STAT. ANN. § 34-22-103(b)(i).

157. *See* N.M. STAT. § 47-3-3(A); WYO. STAT. ANN. § 34-22-102(a)(i).

158. *See* N.M. STAT. § 47-3-9(A); WYO. STAT. ANN. § 34-22-106.

159. N.M. STAT. § 47-3-9(B); *see* WYO. STAT. ANN. § 34-22-106.

sun to impinge directly on the solar collector."[160] In essence, a solar right is an easement across a Neighbor's airspace for the specified purpose of solar access. New Mexico's statute even has language requiring that a solar right "be considered an easement appurtenant."[161]

In solar access disputes in New Mexico and Wyoming, "priority in time" supposedly "[has] the better right."[162] Unfortunately, solar access conflicts are rarely disputes over competing solar access easements in which one Solar User erects a solar collector in the solar access path of another Solar User. Instead, such disputes are almost always between Solar Users seeking to obtain or enforce solar access rights and Neighbors with no interest in installing solar collectors who seek only to preserve existing airspace rights. In nearly every circumstance, Neighbors were "first-in-time" with respect to the Airspace Entitlement because they hold title to the surface estate directly below the airspace at issue. Although the New Mexico and Wyoming statutes are a well-intended effort to innovatively promote solar access, they ignore Neighbors' existing airspace rights and misapply the prior appropriation doctrine.[163] The statutes seem based on the presumption that neither Solar Users nor their Neighbors already possess rights in the airspace at issue. In truth, Neighbors of Solar Users do hold such rights under common law.[164]

The New Mexico and Wyoming statutes are not the first-in-time rules they purport to be, but they do adjust or reallocate existing property rights among landowners based on priority in time of use. They can thus generate many of the same unintended consequences associated with first-in-time rules. California's Solar Shade Control Act and the Wisconsin and Massachusetts permit-based solar access statutes are like the New Mexico and Wyoming statutes in this regard. All of these statutes enable Solar Users to unilaterally acquire rights in or impose restrictions on Neighbors' airspace, but *only to the extent* that the airspace is not already occupied.[165] Such approaches promote solar energy development by motivating Solar Users to install solar collectors quickly before Neighbors make use of the airspace needed for solar access. They

160. N.M. STAT. § 47-3-3(B) (internal quotation marks omitted); *see also* WYO. STAT. ANN. § 34-22-102(a)(ii).

161. N.M. STAT. § 47-3-8.

162. *Id.* § 47-3-4(B)(2); *see also* WYO. STAT. ANN. § 34-22-103(b)(ii).

163. The use of prior appropriation doctrine to promote solar access has been critiqued on numerous other grounds. For a discussion of several other criticisms of this approach, see HAYES, *supra* note 111, at 187–92.

164. *See* Gergacz, *supra* note 66, at 7.

165. Some statutes also do not extend solar access rights across portions of airspace that are *soon to be* occupied. *See, e.g.*, WIS. STAT. ANN. § 66.0403(5)(a)(2) (West 2003 & Supp. 2009) (requiring as a condition to issuance of a solar access permit that "[n]o person has demonstrated that she or he has present plans to build a structure that would create an impermissible interference by showing that she or he has applied for a building permit prior to receipt of a [solar permit] notice . . . has expended at least $500 on planning or designing such a structure or [has submitted] any other credible evidence"); *see also* CAL. PUB. RES. CODE § 25984 (West Supp. 2010) (exempting all trees and shrubs placed or grown before installation of the solar collector).

may also, however, encourage opportunistic landowners to install solar panels with ulterior motives of acquiring a view easement across Neighbors' property or of preventing or delaying Neighbors' more productive uses.[166] The rules might also motivate Neighbors to overdevelop their properties with trees or structures to avoid forfeiting their airspace rights to new Solar Users.[167] Because they impose individualized burdens based on the needs of individual private landowners and without compensation, the rules are also more vulnerable to constitutional challenge.[168]

4. Zoning and Shade-Based Setbacks

One other Rule One-like approach to promoting solar access is to impose setbacks and height restrictions in zoning ordinances designed for the sole purpose of protecting solar access.[169] For example, the City of

166. *See* Adrian J. Bradbrook, *Australian and American Perspectives on the Protection of Solar and Wind Access*, 28 NAT. RESOURCES J. 229, 262–63 (1988) ("Under New Mexico law, the installation of a small solar hot water system could by itself prevent a large commercial or industrial development from occurring on neighboring land." (citing Deborah Zamora Grout, Note, *Access to Sunlight: New Mexico's Solar Rights Act*, 10 N.M. L. REV. 169, 171–74 (1980)). It should be noted that New Mexico's statute does expressly limit its applicability in areas where there are no height restrictions or where height restrictions allow for tall buildings. *See* N.M. STAT. § 47-3-11 ("No solar right shall be obtained against property which has or could have improvements constructed in excess of thirty-six feet in height unless so provided in a local ordinance or agreed to by contract.").

167. Well-placed trees can themselves offer significant benefits to a property by acting as a windbreak and by shading structures to reduce air conditioning loads. *See* BRADBROOK, *supra* note 70, at 45.

168. Commentators have criticized the arbitrary nature of some solar access statutes that restrict Neighbors' airspace rights on a lot-by-lot basis. *See, e.g.*, HAYES, *supra* note 111, at 181 ("[T]hese approaches share an arbitrary quality: whether one has a right to light or a right to develop is an accident of time. They also share the central failing of all approaches offering protection on a lot-by-lot basis: unequal burdens are imposed on similar land parcels."). See *supra* text accompanying notes 115–18, for a discussion of constitutionality issues raised by the arbitrary aspect of lot-by-lot solar access laws.

169. It is worth noting that statutes in some jurisdictions also require developers to consider solar access issues in subdivision applications. *See, e.g.*, CAL. GOV'T CODE § 66473.1(a) (West 2009) (requiring that subdivision designs "provide, to the extent feasible, for future passive or natural heating or cooling opportunities in the subdivision"); CONN. GEN. STAT. ANN. § 8-25(b) (West 2001 & Supp. 2009) ("[A]ny person submitting a plan for a subdivision . . . [must] demonstrate . . . that such person has considered, in developing the plan, using passive solar energy techniques which would not significantly increase the cost of the housing to the buyer, after tax credits, subsidies and exemptions."). The orientation of homes within a subdivision can be designed to reduce the likelihood of solar access if one or more purchasers eventually elects to install solar collectors. Although subdivision conditions promoting solar access fall outside the analysis of this Article, the conditions can be a useful in the context of new real estate development and are worthy of mention.

Under some subdivision solar access statutes, developers must only show that they reasonably considered solar access in their designs. Such a rule promotes solar access while still enabling developers to balance it among the dozens of other considerations that can affect subdivision layouts. Other statutes are more aggressive, potentially requiring a subdivision developer to dedicate solar access easements benefiting for all parcels within a proposed subdivision as a condition to plat approval. *See* CAL. GOV'T CODE § 66475.3. Commentators have rightly pointed out that subdivision conditions are a simple and inexpensive means of encouraging solar access in new developments because their cost can largely be passed along to home purchasers. *See* HAYES, *supra* note 111, at 129 ("The implementation of subdivision regulations is relatively simple, the costs involved could be passed on to purchasers rather than to the city, and regulations could be written to give clear notice of rights and duties."); *see also* Lyden, *supra* note 78, at 399 ("Subdivision regulation as a means of ensuring solar access would be simple to implement and its cost would be absorbed by the purchasers of lots in a subdivi-

Ashland, Oregon, has adopted a Solar Access Ordinance that imposes "[s]olar [s]etbacks" on nearly all private property within that jurisdiction.[170] Under the ordinance, newly constructed structures must not cast a shadow taller than a certain height at the north property line.[171] Greater structure heights are allowed at greater distances from northerly boundary lines.[172] The City of Boulder, Colorado, has adopted similar provisions for certain zones within that city, referring to these height and setback requirements as "solar fence[s]."[173] In both cases, the applicable height limitations vary among zones within the jurisdiction, allowing for greater building heights in certain commercial or industrial zones.

At first blush, shade-based setbacks are appealing in that they largely avoid the arbitrariness and strategic behavior problems that characterize some Lot-By-Lot Statutes. The rules apply uniformly within a given zone, like any ordinary setback or height restriction. They may also be less administratively burdensome than Lot-By-Lot approaches and may provide greater certainty to landowners.[174]

Nevertheless, statutes that impose shade-based setbacks on all properties within an area—not just those situated near solar panels—are probably not cost justified. If the aggregate value of all the myriad airspace uses prohibited by a shade-based setback rule exceeds the aggregate value of solar access it preserves, the rule is likely inefficient. Less than 0.5% of residential rooftops in the United States presently hold solar panels.[175] Thus, more than 99% of the time, Solar Users that hold the scarce Airspace Entitlement under these statutes do not exist. Until rooftop solar systems become far more prevalent, it seems a dubious pre-

sion, rather than the local government."). Subdivision conditions, however, may not be enforceable after a subdivision is completed. *See* HAYES, *supra* note 111, at 129 ("[O]nce a subdivision development is complete and sold, the subdivision laws no longer apply to it. Thus, unless restrictive covenants provided otherwise, the new owners could plant trees anywhere they liked or could make whatever structural additions they wished as long as they complied with other ordinances."). For a more detailed discussion of subdivision regulations as a solar access tool, see HAYES, *supra* note 111, at 125–37; KRAEMER, *supra* note 37, at 90–92.

170. *See* ASHLAND, OR. CODE § 18.70.040 (2009). The City of Ashland adopted its ordinance for the express purpose of preserving "the economic value of solar radiation falling on structures, investments in solar energy systems, and the options for future uses of solar energy." *Id.* § 18.70.010.

171. *Id.* § 18.70.040.

172. *Id.*

173. *See* BOULDER, COLO., REV. CODE 1981 § 9-9-17(d)(1) (Supp. 101, 2009); *see also* Village of Soldier's Grove, Wis., Ordinances § 2.06 (May 8, 1980), *available at* http://www.smartcommunities.ncat.org/codes/soldiers_gb.shtml ("Solar Access shall be protected in the following manner. No structure, whether Principal Use or Accessory Use; and no plant materials, whether trees, shrubs or other; and no permanently fixed equipment shall be of such a height that it would cast a shadow during daylight between 9 A.M. and 3 P.M. of the winter solstice on any potion [sic] of another building or the buildable area of a parcel if no building exists. Compliance with this standard must be graphically shown in Application for Zoning Permit.").

174. *See* Bradbrook, *supra* note 109, at 189 (criticizing lot-by-lot permit-based systems for solar access protection on the ground that they "involve[] the creation of a new bureaucracy and [are] costly and time-consuming" and arguing that such an approach "vests substantial discretion in the local council, which means that difficulty arises in predicting the likely outcome of disputes").

175. *See* Arrington, *supra* note 85.

sumption that the solar access protected under broad shade-based setbacks is of greater social benefit than the endless number of other legal uses of airspace within a jurisdiction that are prohibited by the setbacks.[176]

B. Existing Laws Applying Rule Two

Laws in some jurisdictions apply a Rule Two approach to solar access protection. In these jurisdictions, Solar Users are unable to prevent Neighbors' shading but are entitled to damages for resulting reductions in a shaded solar panel's productivity. As discussed above with regard to Rule One, a state or local government's decision to assign the Airspace Entitlement to Neighbors would require rejecting or revising these Rule Two approaches in favor of laws applying Rules Three or Four.

1. Private Nuisance

The most straightforward example of Rule Two for solar access is a rule declaring that solar panel shading is a private nuisance entitling the Solar User to compensatory damages. As already mentioned, the Wisconsin Supreme Court in *Prah* denied summary judgment on the issue of whether access to sunlight may constitute a private nuisance.[177] Although the plaintiff in *Prah* sought both an injunction and damages, courts are likely to deem damages alone to be an adequate remedy in most solar access cases, so private nuisance protection for solar access can be categorized as an application of Rule Two.[178]

The dissenting opinion in *Prah* argued among other things that solar collectors were a hypersensitive use,[179] and few courts have chosen to fol-

176. The need to balance solar access protection with other airspace uses is commonly noted in discussion of broad-based solar setbacks. *See, e.g.*, Peter C. Hoffman, *Mandating Solar Hot Water by California Local Governments: Legal Issues*, 1 UCLA J. ENVTL. L. & POL'Y 71, 101 (1981) ("In attempting to guarantee solar access for new construction in existing neighborhoods, a very difficult balance must be struck between the recognized need to protect the solar user's right to meaningful use of his solar hot water system and the neighboring homeowners' rights to use their property in a reasonably unrestrained fashion. In many communities, the existing height limitations and setback requirements may be adequate to protect solar access.").

177. Prah v. Maretti, 321 N.W.2d 182, 192 (1982). For a more detailed discussion of the *Prah* case, see *supra* text accompanying notes 96–100.

178. One commentator acknowledging that damages were likely the only available remedy nonetheless argued that damages were unsatisfactory because it would not stop the shading. *See* Bradbrook, *supra* note 109, at 183 (describing private nuisance theory discussed in *Prah* and noting that "under established principles the remedy applied (if any) is likely to be money damages rather than an injunction" and that the "award of damages would not end the shading, and thus would be of little value to the solar user" (footnote omitted)).

179. *See* Lyden, *supra* note 78, at 377 (describing argument made in dissenting opinion in *Prah* that "a private nuisance action is unsupportable because a landowner using a solar energy system is putting his property to an unusually sensitive use" (citing *Prah*, 321 N.W.2d at 196–97)).

low *Prah*.[180] To recognize a private nuisance claim for solar panel shading would assign the Airspace Entitlement in competing airspace above Neighbors' land to Solar Users. For all the reasons discussed above,[181] the entitlement should rest with Neighbors.

2. Statutory Applications of Rule Two

Only a couple of state statutes appear to apply Rule Two to protect solar access. Wisconsin's permit-based solar access statute provides injunctive relief in cases where a Neighbors' vegetation shades a solar panel but provides only damages in cases involving an existing structure.[182] The newly amended version of California's Solar Shade Control Act—which has always applied only to shading by vegetation—has substituted private nuisance for public nuisance as the applicable cause of action for shading, suggesting that damages are now the likely remedy under that statute.[183] Legislatures in Wisconsin and California could reassign the Airspace Entitlement under these statutes to Neighbors by adding a Neighbors compensation requirement, converting the statutes into versions of Rule Four.

V. CHOOSING A PROTECTIVE RULE

Having determined that the Airspace Entitlement should rest with Neighbors rather than Solar Users, the question remains whether to protect the entitlement with a property rule (Rule Three) or a liability rule (Rule Four).[184]

A Rule Three approach to solar access protection assigns the Airspace Entitlement to Neighbors and protects it with a property rule. Under Rule Three, voluntary private negotiations with Neighbors are Solar Users' only means of obtaining solar access protection across Neighbors' airspace. The most familiar Rule Three case for solar access is *Fontainebleau*, a Florida case decided in 1959.[185] In *Fontainebleau*, the Eden Roc Hotel in Miami Beach, Florida sued a neighboring hotel owner to enjoin construction of a fourteen-story addition that would cast a large shadow on the Eden Roc Hotel's beachfront property. The court

180. For more detailed discussion of private nuisance theory in the solar access context, see *supra* text accompanying notes 77–86.

181. *See generally supra* text accompanying notes 110–34.

182. *See* WIS. STAT. ANN. § 66.0403(7)(a)–(b) (West 2003 & Supp. 2009).

183. *See* CAL. PUB. RES. CODE § 25983 (West Supp. 2010).

184. It is worth noting that there are other conceivable means of allocating the Airspace Entitlement that would fall outside the Cathedral Model diagram. For example, in her review of this Article, Lee Fennell noted the intriguing possibility of a rule giving Neighbors a put option or right to sell their Airspace Entitlements to the local government for eventual resale to Solar Users. Aimed primarily at analyzing solar access disputes from a new angle, this Article does not provide comprehensive coverage of all regulatory possibilities.

185. *See* Fontainebleau Hotel Corp. v. Forty-Five Twenty-Five, Inc., 114 So. 2d 357 (Fla. Dist. Ct. App. 1959).

refused to recognize a nuisance claim, stating that U.S. courts had rejected the English doctrine of Ancient Lights and that the Eden Roc had no legal right to the free flow of light and air from adjoining land.[186]

Although the *Prah* court raised questions about the appropriateness of *Fontainebleau* in an era of solar panels,[187] the *Fontainebleau* holding remains the prevailing common law rule in most jurisdictions, and there is no compelling evidence that the rule has significantly stifled solar development.[188] Nonetheless, solar energy advocates view Rule Three as the least favorable approach to solar access because it fails to provide an alternative means of obtaining solar access when private easement negotiations fail.[189] The rigid property rule protection provided under Rule Three offers no alternatives to Solar Users in such situations.

Rule Four-based solar access statutes assign the Airspace Entitlement to Neighbors and protect it with a liability rule, giving Solar Users a right to acquire solar access rights from Neighbors upon payment of fair market value when voluntary bargaining proves unsuccessful. The Rule Four approach also mitigates constitutionality concerns because it provides for compensation to Neighbors who relinquish their airspace rights. Iowa's solar access statute is the only known state statute that applies a Rule Four approach.[190]

There has long been debate in legal scholarship regarding the superiority of property rules or liability rules in various situations. Commentators have identified numerous factors as relevant to determining when one of the two rules is more suitable,[191] several of which warrant consideration in the solar access context.

186. *Id.* at 359.

187. For a more detailed discussion of *Prah*, see *supra* notes 78–79, 96–101 and accompanying text.

188. It is difficult to empirically measure the effects of existing solar access laws on small-scale solar development because the financial and other incentives available for such development vary widely across jurisdictions and change over time and because the intensity of sunlight differs significantly among states. With the exception of California, however, the states with the most aggressive solar access laws are not national leaders in terms of solar generating capacity. *See* SHERWOOD, *supra* note 12, at 7 tbl.3 (showing the top ten states in per capita installed PV generating capacity through 2008, in order, as California, Nevada, Hawaii, New Jersey, Colorado, Arizona, Connecticut, Delaware, Oregon, and Vermont).

189. *See, e.g.*, Note, *supra* note 90, at 144 (criticizing Florida's solar access statute because it "fails to offer an alternative when an adjoining landowner refuses to negotiate a solar access easement"); *see also* MULLER, *supra* note 5 ("Under [the private solar easement negotiation] process, one unsupportive neighbor can prevent a property owner from obtaining an effective solar easement."); Hoffman, *supra* note 176, at 100 ("The transaction costs are too high [for parties to negotiate for a solar easement]—especially in situations in which the cost effectiveness of the system is marginal in the first place.").

190. *See* IOWA CODE ANN. §§ 564A.1–.9 (West 1992 & Supp. 2009). For a description of Iowa's Rule Four-like statute to protect solar access, see *infra* text accompanying notes 228–34.

191. *See* Richard R.W. Brooks, *The Relative Burden of Determining Property Rules and Liability Rules: Broken Elevators in the Cathedral*, 97 NW. U. L. REV. 267, 272–73 (2002) ("Commentators have based arguments for and against property rules and liability rules on efficient allocation, investment, bargaining, transaction costs, revealing information, concealing information, victim behavior, injurer behavior, undercompensation, overcompensation, risk aversion, loss aversion, endowment effects,

A. Potential Impediments to Coasean Bargaining

One of the primary justifications offered for liability rule protection is that it provides a backup means of efficient transfers of legal entitlements in situations where voluntary Coasean bargaining fails.[192] Property rule protection under Rule Three leads to a deadweight loss in every instance where Solar Users value the Airspace Entitlement more than Neighbors and voluntary negotiations fail.[193] Arguments that liability rule protection is cost justified are strengthened as the incidence and magnitude of such deadweight losses increase.[194] Numerous factors can reduce the likelihood of efficient voluntary bargaining in solar access conflicts, some of which are worthy of discussion.

1. Administrative and Legal Costs

The costs of legally describing the airspace subject to a solar access easement and of drafting, negotiating, and recording the easement instrument can reduce the likelihood of successful voluntary bargains.[195] Airspace is often more difficult to legally describe than a two-dimensional area of land, and the slope and latitude of property can further complicate such descriptions.

State and local governments may be able to reduce the cost associated with private solar access easements through legislation allowing parties to legally describe solar access easement areas in a more simple

holdouts, and unconscionability." (footnotes omitted)). Brooks' article focused on yet another line of argument—the relative costs of administering each of the rules. *Id.* at 274.

192. *See* James E. Krier & Stewart J. Schwab, *Property Rules and Liability Rules: The Cathedral in Another Light*, 70 N.Y.U. L. REV. 440, 452 (1995) (describing the favoring of liability rules in high-transaction-cost situations as the "conventional view"). The authors quoted Richard Posner as stating that "where transaction costs are high, the allocation of resources to their highest valued uses is facilitated by denying property right holders an injunctive remedy against invasions of their rights and instead limiting them to a remedy in damages." *Id.* (citing RICHARD A. POSNER, ECONOMIC ANALYSIS OF LAW 29 (1972)).

193. To illustrate, suppose that, after factoring in financial incentive programs, electricity prices, and all other factors, a Solar User (S) values twenty years of guaranteed solar access across the airspace of a Neighbor (N) at $3000. S estimates that it will cost $500 to draft up and record a solar access easement and would thus be willing to pay up to $2500 for solar access rights across N's airspace. Because zoning and height restrictions already limit N's current development options within the airspace, N values the airspace at only $2000. Under Rule Three, assuming that N and S act rationally and that all other transaction costs are zero, they will strike a Coasean bargain whereby S purchases the solar access rights from N at a price between $2500 and $3000 and the rights end up with the highest valued user. Transaction costs, however, will rarely be zero in such situations. Impediments to Coasean bargaining reduce the likelihood that neighbors will reach a voluntary agreement. If they fail to reach agreement, the airspace rights will remain with N, resulting in a $500 deadweight loss.

194. For an analysis of some of the costs associated with using liability rule protection under Rule Four in the solar access context, see *infra* text accompanying notes 210–22.

195. *See* HAYES, *supra* note 111, at 55 n.4 ("Transaction costs for private solar access provision could include the expenses connected with bargaining, giving notice, drawing up a contract (lawyers' fees), surveying, and recording fees."); *see also* Williams, *supra* note 101, at 437 ("Some [voluntary solar access] agreements that would be efficient will not be made. In some cases, inevitably, the costs of bargaining will exceed the gain that the bargain would produce, and none will occur.").

and low-cost manner.[196] User-friendly, standardized forms might further help to reduce transaction costs.[197] Not all landowners, however, may be aware that such forms are available or may still find solar access easement negotiations to be a daunting exercise requiring the expensive help of attorneys and other professionals.

2. Bilateral Monopoly Bargaining

The noncompetitive bilateral monopoly posture that characterizes most private solar access negotiations can also increase transaction costs and deter voluntary bargains. A "bilateral monopoly" exists whenever two opposing parties' "previous investment in their present position [is] sufficiently substantial and irreversible" such that bargaining with each other is "a better solution than simply picking up stakes and moving elsewhere."[198] In such situations, transaction costs are "presumably higher . . . than in competitive markets" because it is difficult for either party to bargain with anyone else over the entitlement at issue.[199]

Landowners in a typical solar access conflict must engage in bilateral monopoly bargaining. In most cases, Solar Users lack the option of installing solar panels elsewhere on their rooftops so as to avoid needing solar access from prickly Neighbors. Although bargaining is certainly not impossible in such situations, bilateral monopolies in the solar access context put these negotiations "in the middle range of transaction costs."[200] Inevitably, such a negotiation posture impedes some Solar Users and Neighbors from reaching voluntary agreements.

3. Imperfect Information

Imperfect information about the legal effect of a grant of a solar access easement, about the economic value of solar access protection, or regarding other issues surrounding solar access conflicts can prevent voluntary agreements between landowners that might otherwise occur. Because most landowners are likely to negotiate for solar access only once

196. For a discussion of means of simplifying descriptions of easement rights, see *infra* text accompanying note 239.

197. *See* Williams, *supra* note 101, at 438 (arguing in reference to voluntary solar easement negotiations that "[a]s standard forms develop . . . with variations suitable for recurrent situations, these transactions should become comparatively simple" (footnote omitted)); *see also* HAYES, *supra* note 111, at 198 n.7 ("In simple situations (typical installations on level sites), these costs [of negotiating private solar access easements] might be avoided by using model easement forms prepared by solar experts, perhaps provided by the local or state government. Comparable forms are available for separations, divorces, wills, etc. If these were properly designed for the locality in question and accompanied by appropriate explanations of when professional advice would be wise, they could cut costs without much risk to the parties.").

198. Herbert Hovenkamp, *Rationality in Law & Economics*, 60 GEO. WASH. L. REV. 293, 298 (1992).

199. *Id.* at 300.

200. *See* Williams, *supra* note 101, at 439.

or twice during their lifetimes, the majority of parties engaged in such negotiations are likely doing so for the first time. Many landowners may not even have a personal contact that has negotiated solar access before and could offer free advice.

Disseminating information to landowners about solar easements and solar access laws can improve the information held by parties to a solar access negotiation. Such efforts, however, are unlikely to equip landowners with the perfect information they are presumed to hold under the Coase Theorem.[201]

4. Holdout Problems

When a large number of parties collectively hold an entitlement, there is greater risk that one or more of them will hold out, refusing to sell their share of the entitlement at a reasonable price in hopes of extracting additional wealth from the transaction.[202] Such holdout problems can increase transaction costs and further reduce the likelihood of successful Coasean bargaining.[203] Liability rule protection under Rule Four would enable Solar Users who required solar access across several Neighbors' airspace to force Neighbors to sell the access rights at fair market value, making it more difficult for Neighbors to hold out for a higher price.

Admittedly, Solar Users typically need solar access from a small handful of Neighbors at most, meaning there is a relatively low risk of holdout problems that might favor liability rule protection.[204] Any risk of holdout problems that may exist in private solar access negotiations is probably too low to independently justify liability rule protection.

5. The Endowment Effect

The endowment effect may cause some Neighbors to seek inefficiently high prices for solar access easements, deterring efficient voluntary arrangements. An endowment effect is manifest when an individual's

201. *See id.* at 438.

202. For example, a State needing to acquire ten specific parcels for a public road may have difficulty convincing all ten property owners to sell their properties for a reasonable price. Existing law gives the State the power of eminent domain, which (subject to constitutional limitations) protects the property rights of such landowners vis-à-vis the State with a liability rule. The State can use its eminent domain power to condemn title to those properties over which voluntary negotiations fail, paying just compensation to landowners who relinquish their entitlement to the properties.

203. *See* Williams, *supra* note 101, at 438.

204. *See id.* ("[I]t seems probable that in the typical established residential zone, someone seeking reasonable assurance of solar access will have to deal only with one neighbor to the south, or perhaps in a rare case, a few such neighbors."). *But see* HAYES, *supra* note 111, at 198 ("A solar collector owner would often have to include several neighboring property owners in easement negotiations if solar access is to be protected adequately. As the number of people increases, the probability of reaching an economically feasible arrangement diminishes." (footnote omitted)). The sizes of the relevant parcels and the size and position of the solar collector can all affect the number of Neighbors involved in a given solar access negotiation.

irrational aversion to losing a personally held entitlement causes the individual to demand an excessively high price to sell it.[205] This unjustifiably high sale price can impede parties from reaching a Coasean bargain.[206] Although endowment effects in unoccupied airspace rights for solar access are not likely to be strong,[207] they could impose some additional transaction costs in some cases.

B. Disadvantages of Liability Rule Protection

For the reasons just described, voluntary bargaining for solar access rights is likely to fail in a substantial number of cases. Liability rule protection can promote the more efficient allocations of competing airspace despite failed bargaining by providing a secondary means for Solar Users to acquire the airspace when they value it more than Neighbors. Still, liability rule protection can also create inefficiencies of its own. Below is a discussion of some of the common criticisms of liability rules and an analysis of whether such criticisms are cause for concern in the solar access context.

1. Underestimation of Damages

One of the primary critiques of liability rule protection is that it leads to inefficiency whenever a government entity applying it underestimates damages.[208] Under Rule Four, Solar Users can compel Neighbors to sell solar access rights at market value.[209] A designated court or government entity must determine the value of those rights. The most sensible means of value measurement—and the one used in Iowa[210]—is to calculate the difference between the fair market value of Neighbors' property before and after the solar access rights are granted.[211] Some Neighbors might attach particular sentimental or otherwise subjective value to a tree that is blocking solar access. Such subjective valuations

205. *See* Daphna Lewinsohn-Zamir, *The Choice Between Property Rules and Liability Rules Revisited: Critical Observations from Behavioral Studies*, 80 TEX. L. REV. 219, 250–51 (2001).

206. *Id.* at 251.

207. For a more detailed discussion of endowment effects in the solar access context, see *infra* text accompanying notes 217–20.

208. *See* Kaplow & Shavell, *supra* note 64, at 730 ("A . . . criticism of liability rules concerns the possibility that a court might set damages systematically below average harm. The liability rule might then be inferior to property rule protection of victims because excessive harm will occur under the liability rule.").

209. *See supra* Figure A.

210. *See* IOWA CODE ANN. § 564A.5.3 (West 1992) (providing that compensation to be paid to Neighbors "shall be based on the difference between the fair market value of the property prior to and after granting the solar access easement").

211. *See* HAYES, *supra* note 111, at 202 ("While there are several methods for calculating just compensation for an easement, the method used most often evaluates the property both before and after the easement is taken and sets the compensation at the difference between the two values.").

are not taken into account when Neighbors are compensated under Rule Four to trim the tree.[212]

On the other hand, Neighbors are not likely to attach significant subjective value to a tree or structure that is not yet in existence, and their presently unoccupied airspace will still be unoccupied after the granting of any solar access rights, so arguably they suffer no tangible loss in such situations that could be expected to have significant idiosyncratic value. The risk of undercompensation to Neighbors under a liability rule can largely be mitigated through statutory exemptions for trees or structures that are already in existence when the solar collector is installed.[213]

2. Implementation Costs

Local governments probably incur greater implementation costs under a liability rule-based solar access ordinance than under a property rule. Under a Rule Three approach, if voluntary bargains for solar access rights fail, Solar Users have no right to seek government intervention to force a sale of rights. Under Rule Four, Solar Users have such a right, and local governments must process applications for solar access rights in such situations and determine fair market value. To the extent that using a liability rule requires additional fixed costs that are absent under a property rule, a greater frequency of solar access conflicts is required to justify using liability rule protection. A liability rule's benefit in facilitating otherwise-failed Coasean arrangements must be of a sufficient magnitude to outweigh the additional implementation costs it requires.

Jurisdictions that presently have permit-based solar access statutes or statutes based on the prior appropriation doctrine have already instituted a solar access protection regime requiring significant government involvement. Simply adding the task of calculating and ensuring payment of Neighbors compensation would move these statutes into the Rule Four category, and the resulting implementation cost differential would seem justifiable.[214]

212. *See* KRAEMER, *supra* note 37, at 147 ("In residential neighborhoods and other areas where there is no readily ascertainable market value for the rights taken, the most likely amount of compensation due will be the difference between market value of the property before and after taking. Under this rule every element which affects market value is to be considered, but not sentimental or other value peculiar to the owner." (footnote omitted)); *see also* Kaplow & Shavell, *supra* note 64, at 730–31 ("We do suspect that damages are too low when there are components of loss that are hard to estimate, including idiosyncratic elements of harm. For example, when a person's home is destroyed, courts normally limit damages to market value even though the person might have attached special additional value to the home." (footnote omitted)).

213. At least one jurisdiction already exempts existing vegetation. *See* CAL. PUB. RES. CODE § 25984(a) (West Supp. 2010).

214. For a discussion of the possibility of converting an existing permit-based solar access statute to a Rule Four-like approach, see *infra* text accompanying note 241.

Arguments favoring liability rule protection are weaker in regions with less-intense sunlight, low electricity rates, substantial natural tree shading, or large amounts of low-density rural development. Existing setback requirements, height restrictions, tree regulations, and other land use controls unrelated to solar access that inadvertently provide significant solar access protection can further weaken the case for heavier government intervention under a liability rule. Low land use densities in some rural areas can enable Solar Users in those areas to avoid most shading risk by setting back solar panels from their southerly property lines. All of these factors reduce the prevalence of solar access conflicts, making the potential aggregate deadweight loss from failed Coasean bargaining smaller and arguably diluting justifications for more expensive liability rule protection under Rule Four.

Still, even within the jurisdictions just described, existing governmental incentive programs expend large sums of public money in an effort to address a perceived underdevelopment of solar energy generating capacity that results, *inter alia*, from failed bargaining under Rule Three.[215] Compared to those expenditure-heavy approaches, liability rule protection seems a relatively inexpensive way for governments to promote rooftop solar development in the face of market failures. Further, Rule Four-like solar access statutes can be drafted such that implementation costs are more incremental than fixed.[216] When solar access disputes in such jurisdictions do arise, the social benefits of a Rule Four approach still may outweigh the incremental costs.

3. Intensified Endowment Effects?

Some empirical studies suggest that liability rules can generate a greater endowment effect for the protected entitlement than exists under a property rule.[217] If these studies are correct, stronger endowment effects associated with the Airspace Entitlement under Rule Four's liability rule protection might impair Neighbors' ability to voluntarily bargain with Solar Users.

Yet, other empirical studies have found no intensification of endowment effects for assets protected by liability rules,[218] and some commentators have challenged whether a significant endowment effect really

215. For a detailed summary of state and local government incentives for grid-tied solar energy development, see generally COUGHLIN & CORY, *supra* note 4.

216. *See, e.g.*, IOWA CODE ANN. § 564A.3 (West 1992) (providing that, in cities or counties where no "solar access regulatory board" has been designated, the district court in that jurisdiction is authorized instead to receive and act on applications for solar access easements).

217. *See* Lewinsohn-Zamir, *supra* note 204, at 222 ("[E]xperimental findings support the argument that owners exhibit a *stronger* endowment effect when their entitlement is protected by a liability rule than when it is protected by a property rule.").

218. *See, e.g.*, Jeffrey J. Rachlinski & Forest Jourden, *Remedies and the Psychology of Ownership*, 51 VAND. L. REV. 1541, 1574–75 (1998), *cited in* Lewinsohn-Zamir, *supra* note 204, at 254.

exists at all.[219] Further, most grid-tied PV solar panels are installed on nonresidential property.[220] Nonresidential Neighbors are probably less likely than residential Neighbors to view unused airspace as a personal entitlement and are thus less susceptible to endowment effects. Neighbors also cannot experience strong loss aversion for a tree or structure that is not yet in existence, and their presently unoccupied airspace will remain unoccupied after the granting of any solar access rights, so they experience no tangible loss. Assuming there are statutory exemptions for existing trees and structures,[221] endowment effects will be relatively weak, so any risk of liability rule protection magnifying these effects seems nominal at best.

4. Free Riding

Some commentators have reasoned that courts rarely use Rule Four in innocent polluter cases because such cases often involve several victims and thus are prone to free riding problems.[222] When several parties must collectively pool their funds to acquire an entitlement under a liability rule, one or more of the parties may be tempted to "free ride," not contributing funds to the pool or undercontributing in hopes that others will cover the rest of the cost. This free riding by victims operating under Rule Four can prevent the pooling of sufficient funds to pay the polluter to stop and thus preclude the efficient outcome.

Using a liability rule to protect Neighbors' Airspace Entitlement would not generate costly free riding problems. Typically, only one Solar User at a time seeks solar access across a given airspace. Solar Users would seldom need to engage in collective fund-raising to acquire solar access rights under a liability rule.

5. Other Strategic Behavior

Liability rule protection for Neighbors' Airspace Entitlement under a Rule Four approach could arguably promote inefficient strategic behavior by both parties to a solar access conflict. Neighbors hoping to avoid losing airspace rights under Rule Four might file a permit for a second-story addition with no real intent of building, seeking solely to inflate the

219. *See, e.g.*, Charles R. Plott & Kathryn Zeiler, *Exchange Asymmetries Incorrectly Interpreted as Evidence of Endowment Effect Theory and Prospect Theory?*, 97 AM. ECON. REV. 1449, 1462–63 (2007).

220. *See* SHERWOOD, *supra* note 12, at 4 (stating that "[r]esidential installations" accounted for only "27% of all new grid-connected PV systems installed in 2008").

221. *See, e.g.*, CAL. PUB. RES. CODE §§ 25983–25984 (West Supp. 2010).

222. *See* Krier & Schwab, *supra* note 192, at 468 ("[R]ule four is paradoxical in that it reintroduces the very problem it is meant to solve" because most cases where it would arise involve a very high number of victims who will face collective action problems in pooling enough funds to pay the polluter to stop); *see also* A. Douglas Melamed, Remarks, *A Public Law Perspective*, 106 YALE L.J. 2209, 2209 (1997) ("[T]he *Spur Industries* case did not have a large number problem; maybe that is why it was able to find a use for Rule [Four]." (footnote omitted)).

value of their airspace or to qualify the airspace for a statutory exception.[223] Neighbors might also plant tall trees solely to protect airspace from being taken by Solar Users. Although such opportunistic behavior may be more likely under a Rule Four approach, permit filing fees can help to deter frivolous filings, and the net social costs of any additional tree planting seem nominal at best.

Similarly, landowners desiring a view easement might abuse a liability Rule Four approach to solar access by installing solar collectors for the ulterior purpose of protecting the view. Rule Four, however, requires compensation to Neighbors, so rational Solar Users would only engage in strategic abuses of the statute if they valued the view easement more than the sum of (1) the easement's fair market value to the Neighbor and (2) the net cost of installing solar panels and otherwise complying with the solar access statute. Airspace above view properties is likely to have a greater objective market value.

C. The Spur Industries *Case*

To some, serious consideration of Rule Four in the solar access context may seem startling because Rule Four is the most rarely applied rule on the Cathedral Model's familiar two-by-two diagram. The commonly cited case applying Rule Four is *Spur Industries, Inc. v. Del E. Webb Development Co.*,[224] a coming-to-the nuisance case involving two Arizona landowners. The defendant in *Spur Industries* had long operated a cattle feedlot on its land.[225] The plaintiff was a real estate developer whose development had gradually approached the feedlot over a period of several years until the feedlot's foul odors became a deterrent to potential home purchasers. The *Spur Industries* court seemed to recognize that the feedlot operator was an innocent polluter because it had long held an entitlement to operate on its property.[226] The optimal outcome was for the feedlot to relocate, but voluntary bargaining after the lawsuit was unlikely to produce that result. Rather than applying Rule Three and dismissing the developer's nuisance claim, the court applied Rule Four, ordering the cattle feedlot owner to relocate and ordering the developer to pay the feedlot's relocation cost.[227]

Like the cattle feedlot owner in *Spur Industries*, Neighbors in solar access conflicts are "innocent" polluters—parties holding a legal entitlement to exercise property rights in ways that sometimes impose unjustifi-

223. For example, under Wisconsin's statute a solar access permit may not be granted if an affected Neighbor has spent at least $500 on plans to build a structure that would impermissibly interfere with the permit. *See* WIS. STAT. ANN. § 66.0403(5)(a)(2) (West 2003 & Supp. 2009).

224. 494 P.2d 700 (Ariz. 1972).

225. *Id.* at 704.

226. *See id.* at 708 ("Spur is required to move not because of any wrongdoing on the part of Spur . . . .").

227. *See id.*

able costs on nonentitled victims. The liability rule protection for such innocent polluters under Rule Four provides a second chance at achieving the allocatively efficient outcome in cases where parties are unable to reach it through private negotiation. Weighing all of the factors described above, a statute applying Rule Four seems best equipped to promote both rooftop solar development and the efficient allocation of scarce airspace rights when solar access conflicts arise.

VI. RECOMMENDATIONS

In jurisdictions with a strong interest in promoting solar energy development, statutory solar access protections mirroring Rule Four of the Cathedral Model seem to best promote the efficient allocation of scarce airspace between Neighbors and Solar Users in a manner consistent with prevailing law. Rule Four acknowledges Neighbors' existing legal entitlement to the airspace above their properties. Yet, in recognition of a strong public policy interest in promoting solar energy development, Rule Four protects Neighbors' entitlement with a liability rule, enabling Solar Users to purchase solar access rights through government intervention if private negotiations fail.

A. Implementing Rule Four for Solar Access

Jurisdictions desiring to implement a Rule Four approach to solar access protection can look to Iowa's statute for guidance in drafting. Jurisdictions with statutes corresponding to Rules One or Two might consider converting those statutes to a Rule Four approach through amendments providing for compensation to Neighbors.

1. Rule Four in Iowa

In Iowa, prospective Solar Users have the right to acquire solar access easements from Neighbors at market value when voluntary bargaining proves unsuccessful.[228] An Iowa landowner wishing to install solar collectors applies to a locally designated "solar access regulatory board" for an order granting a solar access easement.[229] The easement application requires, among other things, legal descriptions of the dominant and servient estates and proposed easement area, names and addresses of the affected Neighbors, and descriptions of the type, size, and proposed location of the solar collector.[230] By requiring applicants to gather and provide the information relevant to the proposed easement, the statute helps to minimize the administrative burden imposed on local governments.

228. IOWA CODE ANN. § 562A.5 (West 1992).
229. *See id.* § 564A.4(1).
230. *See id.*

Iowa's solar access application also requires applicants to make certain affirmative statements aimed at minimizing abuses of the statute. For example, a statement by the applicant certifying that the solar collector's location and design reasonably minimize impacts on Neighbors' rights helps to deter requests for excessively broad easements.[231] Similarly, a required statement affirming that the applicant has endeavored and failed to negotiate voluntary solar access easements with Neighbors encourages landowners to attempt voluntary Coasean bargaining before seeking government intervention.[232]

Solar access regulatory boards in Iowa hold a hearing on each solar easement application, with notice to affected landowners, verifying among other things that the proposed easement has been tailored to minimize the impact on Neighbors and does not impair Neighbors' preexisting construction plans.[233] Whenever the board enters an order authorizing the grant of a solar access easement, it must "determine the compensation that may be awarded to the servient estate owner if the solar access easement is granted."[234] By requiring Neighbors compensation, the Iowa statute acknowledges Neighbors' entitlement to their airspace rights, classifying the statute as an application of Rule Four of the Cathedral Model.

2. Improving upon Iowa's Statute

Although Iowa's solar access statute as currently drafted goes a long way in balancing the goal of promoting solar energy development against the airspace rights of Neighbors, the statute could still be improved. For example, the current statute potentially requires Neighbors to remove existing vegetation to accommodate new solar collectors.[235] In what seemed a response to popular criticism, the California legislature recently amended its Solar Shade Control Act to add an exemption for trees or shrubs in existence upon a solar collector's installation.[236] As already mentioned, protecting existing trees from removal reduces the risk of undercompensation to Neighbors or of costly endowment effects.[237]

The Iowa statute would also be better tailored if it expressly limited the duration of easements granted under its provisions. By authorizing

231. *See id.* § 564A.4(1)f.

232. *See id.* § 564A.4(1)(h).

233. *See id.* § 564A.5(1).

234. *Id.* § 564A.4(2). Solar Users are also responsible for having solar access easements recorded with the county recorder. *See id.* § 564A.5(4).

235. *See id.* § 564A.5(1) (requiring only that the airspace burdened by a board-ordered solar access easement not be "obstructed by anything *except vegetation* that would shade the solar collector at the time of filing of the application" (emphasis added)); *see also id.* § 564A.4(1)(i) (requiring only that applicants affirm that the proposed burdened airspace is presently unoccupied "by anything other than vegetation").

236. *See, e.g.*, CAL. PUB. RES. CODE § 25984(a) (West Supp. 2010).

237. For analysis of these issues, see *supra* text accompanying notes 208–13, 217–21.

perpetual easements to protect solar access, the Iowa statute allows Solar Users to acquire more rights than are necessary to protect an investment in solar collectors. The statute would be more narrowly tailored to achieve its objectives if it limited the durational term of the solar access right to the life expectancy of the solar collector.[238] After that period, the parties would be free to negotiate for new solar access rights if they desired and would be able to take into consideration new technological changes, gentrification in the neighborhood, or other factors that might influence the value of the airspace. If voluntary negotiations to renew the easement for an additional term again proved unsuccessful, Solar Users could again seek to obtain solar access rights through the statutory procedure.

Provisions allowing parties to describe solar access easements in a simpler and less costly manner would further improve Iowa's solar access statute. Iowa's statute relies on easements for solar access, requiring a detailed legal description of the easement area. Writing a legal description for airspace can be difficult and costly, and such an approach is not necessary to provide solar access protection. The statute would better encourage solar access arrangements if it permitted parties to also use simpler, less expensive means describe the scope of the burden on the Neighbors' property. For example, it could provide a time-based description, prohibiting shading of the panels during certain hours of the day, as permitted under the Wisconsin solar access ordinance.[239] Some parties may prefer to use a negative covenant instead of an easement, so the statute should also expressly allow that approach.

Jurisdictions fearing strategic landowner behavior or potential abuses of the Iowa statutory approach could add provisions that more strongly dissuade landowners from filing frivolous solar easement applications. Although the Iowa statute does require easement applicants to pay all of the solar access regulatory board's costs "in copying and mailing the application and notice" to Neighbors,[240] those costs are likely to be very low. A modest bond requirement might help to further deter frivolous applications or abuses of the statute.

3. Transforming Existing Laws into a Rule Four Approach

By enacting Rule One or Rule Two approaches to solar access, Wyoming, New Mexico, Wisconsin, Massachusetts, and California seem to have already displayed a preference for actively pro-solar policies.

238. The Boulder, Colorado solar access ordinance uses this useful life approach to limit the durational term of solar access rights obtained through its permit process. *See* BOULDER, COLO., REV. CODE 1981 § 9-9-17(h)(11) (Supp. 101, 2009).

239. *See* WIS. STAT. ANN. § 66.0403(1)(e) (West 2003 & Supp. 2009). Such flexibility in describing solar access rights is one of the positive features of the Solar ABCs model statute. *See* KETTLES, *supra* note 6, at 12–14.

240. *See* IOWA CODE ANN. § 564A.4(3).

These states might consider converting their statutes to Rule Four approaches by adding language providing for compensation to Neighbors who relinquish their airspace rights. Adding a compensation element to a Rule One or Rule Two solar access statute reassigns the Airspace Entitlement from Solar Users to Neighbors, helping the statute to more efficiently allocate airspace rights and bringing it more into line with prevailing property law.[241]

4. Promoting Voluntary Coasean Bargaining

Numerous states have enacted statutes recognizing the enforceability of voluntary solar access easements, thereby reducing legal uncertainties that might otherwise deter voluntary Coasean arrangements.[242] Such statutes often expressly require that voluntary solar access easements be treated like conventional easements and describe terms and provisions that should be included in the granting document.[243] Some statutes also expressly provide for injunctive relief or damages in the event that a Neighbor violates rights under a voluntary solar access easement.[244] Such statutory provisions reduce transaction costs and promote voluntary bargaining and are thus a valuable addition to any solar access statute.

B. The Solar ABCs Model Statute

The recently issued Solar ABCs model statute (Model Statute)[245] is a useful starting point for a new round of discussions on solar access laws after more than twenty-five years of relative silence on these issues. But the Model Statute makes no reference to Iowa's solar access statute, nor does it provide compensation to Neighbors who are forced to relinquish airspace rights to accommodate Solar Users. The following are some suggestions for improving the Model Statute.[246]

241. Wisconsin's statute provides that local governments granting solar access permits "may" include "requirements for the compensation of persons affected by the granting of the permit." WIS. STAT. ANN. § 66.0403(5)(b) (West 2003 & Supp. 2009). But the statute falls short of requiring compensation, arguably confining the statute classification as Rule One. An amendment to the Wisconsin statute expressly requiring compensation would clearly assign the competing airspace entitlement to Neighbors, thereby converting the statute to Rule Four.

242. For a lengthy list of state statutes falling within this category recently compiled by another commentator, see Alvarez, *supra* note 31, at 547 n.90.

243. *See*, *e.g.*, COLO. REV. STAT. ANN. § 38-32.5-101 (West 2007) ("Any easement obtained for the purpose of exposure of a solar energy device shall be created in writing and shall be subject to the same conveyancing and instrument recording requirements as other easements; except that a solar easement shall not be acquired by prescription."). Section 38-32.5-102 describes the elements that such instruments should include. *Id.* § 38-32.5-102 (West 2007).

244. *See, e.g.*, WASH. REV. CODE ANN. § 64.04.170 (West 2005) (providing that, if a privately negotiated solar easement does not specify remedies, a court may choose to award an injunction against the interference, damages, and/or attorney fees).

245. KETTLES, *supra* note 6, at 12–14.

246. Some other useful solar access tools found in the Model Statute exceed the scope of this Article but are nonetheless worthy of mention. Sections Three and Four of the Model Statute prohibit community associations and municipalities from unduly restricting the installation of solar energy sys-

The Model Statute's solar access easement provision borrows heavily from the Massachusetts statute, employing a Rule One-like, permit-based approach.[247] Under the provision, a municipality's zoning ordinance "may provide for special permits to protect access to direct sunlight for solar energy systems," and such permits may "create an easement to sunlight over neighboring property."[248] The Model Statute does not require compensation to Neighbors for such easements[249] and is thus less desirable for the reasons described in this Article. If the Model Statute retains a permit-based approach rather than adopting an approach based on Iowa's statute, language should be added requiring Solar Users to compensate Neighbors upon issuance of any solar access permit that materially reduces Neighbors' airspace rights. The Model Statute already entitles Neighbors to notice and the opportunity for a hearing,[250] so adding a compensation requirement arguably would not create a substantial increase in implementation costs.

The Model Statute merely authorizes local governments to enact their own solar access ordinances and provides only general descriptions of the nature of such ordinances.[251] There may be benefits to having local governments to enact their own ordinances for solar access, but such an approach arguably creates the need for a model local ordinance to accompany the Model Statute. In the meantime, local governments looking for guidance in drafting a solar access ordinance might find Iowa's statute to be a useful reference. It contains detailed provisions governing the application process for a solar access easement,[252] hearing and notice requirements,[253] conditions to granting of an easement,[254] and payment of compensation.[255] The Wisconsin solar access statute[256] and City of Boulder, Colorado ordinance[257] also have some provisions worthy of review by drafters of a local ordinance for solar access.

tems. *Id.* at 14. Community association covenants and local government provisions that restrict solar installations are often motivated by aesthetic concerns. Aesthetic valuations are difficult to measure, but when reasonable efforts are made to minimize the visual impact of solar collectors, the costs their unsightliness might impose on a community seem unlikely to exceed the social benefits they provide. In most cases these Model Statute provisions are probably cost justified.

247. *Compare id.* at 13, *with* MASS. ANN. LAWS ch. 40A § 9B (LexisNexis 2006).
248. KETTLES, *supra* note 6, at 13 (Model Statute § 2.B).
249. *Id.*
250. *Id.*
251. *Id.* at 13–14.
252. *See* IOWA CODE ANN. § 564A.4(1) (West 1992).
253. *Id.* § 564A.4(2).
254. *Id.* § 564A.5(1).
255. *Id.* § 564A.5(3).
256. WIS. STAT. ANN. § 66.0403 (West 2003 & Supp. 2009).
257. BOULDER, COLO., REV. CODE 1981 § 9-9-17 (Supp. 101, 2009).

CONCLUSION

As rooftop solar development continues to expand, solar access will become an increasingly important issue. Examining existing solar access laws within the framework of the Cathedral Model helps to expose their differences and shortcomings. The prevailing common law approach to solar access in nearly every state recognizes landowners' property rights in the usable airspace above their land. But protecting those rights with a property rule makes it impossible for Solar Users to purchase the solar access rights across neighboring airspace needed to protect their investment in solar collectors when voluntary bargaining with Neighbors proves unsuccessful. Solar access statutes in some states attempt to address this deficiency by reassigning airspace rights from Neighbors to Solar Users without compensation. A solar access statute applying Cathedral Model Rule Four seems better suited for resolving solar access conflicts because it recognizes landowners' existing airspace rights yet provides a backup means for Solar Users to acquire necessary solar access protection.

Although Calabresi and Melamed noted that Rule Four could have great value under the right circumstances,[258] courts and legislatures have long ignored the rule when addressing private disputes. This Article and a recent article advocating Rule Four in the commercial wind energy context[259] are reminders that Rule Four should not be overlooked as new resource allocation issues emerge in the years to come.

258. *See* Calabresi & Melamed, *supra* note 8, at 1117 ("[Rule Four] may sometimes make more sense than any of the three competing approaches.").

259. *See generally* Rule, *supra* note 46.