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MODERN LIGHTS

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This Article functions as a companion to a piece, Solar Rights*, concurrently published in the* Boston University Law Review.[1] *In that piece, the author analyzed the absence of a coherent legal framework for the treatment of solar rights—the rights to access and harness the rays of the sun. The growing popularity of, and need for, solar collector technology and other solar uses calls for reform.*

Answering the call for reform in Solar Rights*, this Article proposes a framework within which a solar rights regime might be developed. First, as a baseline, any regime must recognize the natural characteristics of sunlight. Sunlight travels in beams, often across multiple legal parcels, meaning that while a solar right benefits one parcel, it also likely burdens others. Any solar rights regime must weigh the relative value of various property interests and reject frameworks that attempt to implement absolutist approaches. In addition, solar rights must address topographic, latitudinal, and other location-specific conditions. In other words, the rules for solar rights should be flexible, drawing from water law to combine strategies of exclusion and governance to manage sunlight, a fugitive resource like water.*

Second, in addition to accommodating the natural characteristics of sunlight, solar rights must clarify both the identity of the holder of the initial entitlement and the nature of the

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1. The title to this Article was inspired by the English "ancient lights" rule, dating back to at least the sixteenth century, which provides for the creation of prescriptive easements for solar access. *See* Prescription Act, 1832, 2 & 3 Will. 4, c. 71, § 3 (Eng.) (codifying this rule by establishing a permanent easement for property owners whose uninterrupted access to light lasts for twenty years). Although the ancient lights rule was never adopted in the United States, a modern approach to solar rights is needed.

entitlement itself. In recognition of the public benefits of protecting solar access, solar rights should initially be assigned to the party who can put the solar right to the highest socially beneficial use: the solar collector owner, rather than the potential obstructer. Along with the assignment of the initial entitlement, and in recognition of the relativity of solar rights, we must embrace liability rules (as opposed to property rules), which compensate burdened landowners.

A solar rights regime that both recognizes the natural characteristics of sunlight and adequately articulates the nature of the initial entitlement may be difficult to formulate. This Article suggests that instead of creating new legal forms that may further complicate an already complicated task, we rely on existing property forms within the numerus clausus*. It advocates a regime that draws from principles in water law, sets the initial entitlement so as to produce socially beneficial results, and adequately compensates burdened landowners. Although much work remains to refine and implement a functional solar rights regime, this Article aims to restart a discussion that has remained "in the shadows" for too long.*

INTRODUCTION

It is curious that a natural resource as valuable as sunlight—increasingly valuable in the age of the solar collector[2] and the climate change crisis—remains almost entirely unregulated in the United States. Myriad laws comprehensively address the allocation of access rights to other natural resources, such as oil, gas, minerals, air, and water. Several other countries, including Japan and England, have successfully created solar rights regimes.[3] Despite various informative legal models in domestic natural resource laws and foreign solar regimes, few jurisdictions in the United States have even attempted to

2. A solar collector is a device that converts sunlight into energy or electricity, whether such a device takes the form of photovoltaic panels, heating and cooling systems, water heating systems, or otherwise.

3. *See supra* note 1 (describing the English rule). *See generally* Gail Feingold Takagi, *Designs on Sunshine: Solar Access in the United States and Japan*, 10 CONN. L. REV. 123 (1977) (comparing the American and Japanese systems). Ancient Roman and Greek civilizations also had such regimes. *See*, *e.g.*, Borimir Jordan & John Perlin, *Solar Energy Use and Litigation in Ancient Times*, 1 SOLAR L. REP. 583, 592 (1979) ("Roman sun rooms were common enough to provoke disputes over solar rights and judicial decrees to settle them.").

develop a solar rights regime.[4] Where solar rights are recognized, they are often so burdensome or expensive to obtain that property owners may not bother seeking them.[5]

Still more curious is our government's pursuit of policies that encourage investment in solar collectors while simultaneously failing to protect these investments by recognizing solar rights. For example, over two dozen states have passed tax incentives to harness solar energy, including depreciation allowances, lower tax rates for solar collectors, property or sales tax exemptions, and income tax credits.[6] Government-sponsored low-interest loans and grants have also been used to generate investment in solar energy.[7] Congress has passed a tax credit for 30 percent of expenditures for solar electric installations,[8] and the 2009 federal stimulus package promises to do much more for sustainable technologies.[9] As other

4. *See generally* Sara C. Bronin, *Solar Rights*, 89 B.U. L. REV. 1217 (forthcoming 2009) (critiquing express agreements, governmental allocations, and court assignments as inadequate in light of the pressing need for solar rights, and recounting many scholars' similar criticisms).

5. This cost is difficult to quantify because many of the factors that comprise cost are site-specific. Even when they do pursue solar rights, property owners must often turn to costly and time-consuming litigation. *See* Franklin Gevurtz, Comment, *Obstruction of Sunlight as a Private Nuisance*, 65 CAL. L. REV. 94, 106 (1977) (observing that "[t]he persistence of litigation over the obstruction of sunlight is solid evidence of its value to society today").

6. *See* N.C. Solar Ctr. & Interstate Renewable Energy Council, Database of State Incentives for Renewables and Efficiency, http://www.dsireusa.org/searchby/index.cfm?ee=1&RE=1 (last visited July 13, 2009) (select "Solar (All)" from "Select a Technology" drop-down menu; then follow "Click Here to Search" hyperlink) (listing thirty states with property tax incentives, twenty-three states with sales tax incentives, and twenty states with personal tax incentives, among many other incentive types).

7. *See, e.g.*, Leslie Kaufman, *Harnessing the Sun, With Help from Cities*, N.Y. TIMES, Mar. 15, 2009, at A16, *available at* http://www.nytimes.com/2009/03/15/science/earth/15solar.html?hp (describing how a half-dozen California municipalities have been experimenting with solar financing programs, such as a program in Palm Desert, California, which lends property owners money for solar installations, to be repaid as a part of property taxes over a twenty-year period).

8. 26 U.S.C. § 25D(a)(1)–(2) (2006).

9. *See* U.S. HOUSE OF REPRESENTATIVES COMM. ON APPROPRIATIONS, SUMMARY: AMERICAN RECOVERY AND REINVESTMENT ACT CONFERENCE AGREEMENT 4 (2009), *available at* http://appropriations.house.gov/pdf/PressSummary02-13-09.pdf (summarizing the various provisions in the stimulus package relating to energy efficiency technologies, including: eleven billion dollars for research, development, and projects that would make the electricity grid more efficient and build new power lines to transmit renewable energy; six billion dollars for loans for renewable energy power generation and transmission projects; over six billion dollars for state and local governments to invest in improving energy efficiency and reducing carbon emissions; and two and one-half billion dollars for energy efficiency and renewable energy research, development, and projects). For

commentators have recognized for decades, none of these economic measures can convince individuals to abandon conventional means of obtaining energy without legal assurance of long-term solar rights.[10]

Whatever the reason for this deficiency, the evolution and promotion of solar collection technology suggests that it is time to formulate a definition of, and legal framework for, solar rights. This Article revisits the suggestions of scholars who offered solutions to the solar rights dilemma two decades ago but failed to convince policymakers to act.[11] After considering various alternatives, this Article proposes a flexible legal framework that responds to physical and political realities and maximizes efficiency among affected individuals.

As a baseline, any regime must recognize the natural characteristics of sunlight. Sunlight travels in beams whose path varies depending on the time of day. To reach a particular destination, these beams often travel across multiple legal parcels. A solar right, held by the owner of the destination parcel, would likely require that a neighbor or neighbors refrain from erecting any obstruction that would obstruct the path of sunlight to the destination parcel. Accordingly, a solar rights regime must recognize and balance competing interests. In addition, solar rights must address topographic, latitudinal, geographic, and other location-specific conditions. Consequently, the rules for solar rights should be flexible. In this respect, we can draw from another body of natural resources law, water law, which at least one scholar believes reflects the

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the effects on the solar collector industry, see, for example, Kate Galbraith, *Here Comes the Sun. Right?*, N.Y. TIMES, May 3, 2009, (N.Y. edition), at BU1, *available at* http://www.nytimes.com/2009/05/03/business/energy-environment/03solar.html?em, which profiles an Oregon-based solar collector producer whose business increased because customers took advantage of 2009 legislation that created grants for businesses, utilities, and homeowners who install solar collectors.

10. *See*, *e.g.*, Janice Yeary, *Energy: Encouraging the Use of Solar Energy—A Needs Assessment for Oklahoma*, 36 OKLA. L. REV. 136, 139 (1983) ("Product standards and tax credits will not influence consumers to give up conventional energy sources and rely on solar renewable energy unless there is genuine assurance of continuing access to the power source, the sun.").

11. *See* COLLEEN MCCANN KETTLES, FLA. SOLAR ENERGY RESEARCH & EDUC., SOLAR AMERICA BOARD FOR CODES AND STANDARDS REPORT: A COMPREHENSIVE REVIEW OF SOLAR ACCESS LAW IN THE UNITED STATES 2 (2008), *available at* http://www.solarabcs.org/solaraccess/Solaraccess-full.pdf (reporting that "[d]uring the height of the 1978–1985 tax credits for solar energy equipment, a host of articles and books were published promoting solar conscious land use planning," which were "not widely adopted").

future of property law, in part because it deals with "the most thoroughly advanced form of property," water.[12] Water law has developed differently around the country: one regime in the East, where water is abundant, and another regime in the West, where water is scarce.[13] Water law, which has long incorporated strategies of exclusion and governance to rank and manage different uses, can inform a flexible approach to solar law.

In addition to accommodating the natural characteristics of sunlight, solar rights must clarify both the identity of the holder of the initial entitlement and the nature of the entitlement itself. In recognition of the public benefits of protecting solar access, solar rights should be assigned initially to the person who can put the solar right to the highest socially beneficial use: the solar collector user, and not the potential obstructor.[14] The ranking of uses after the solar collector use should be clarified by each relevant jurisdiction in light of public policy priorities.

Rather than seeking to create new legal forms, which may further complicate an already complicated task, this Article considers ways to protect solar rights using existing property forms within the *numerus clausus*.[15] This Article advocates a

12. Eric T. Freyfogle, *Context and Accommodation in Modern Property Law*, 41 STAN. L. REV. 1529, 1530 (1989).

13. *See, e.g.*, Carol M. Rose, *Energy and Efficiency in the Realignment of Common Law Water Rights*, 19 J. LEGAL STUD. 261, 266 (1990) (describing the riparian rules of the eastern states, whose inhabitants used a plentiful water supply primarily for power—rather than consumptive uses—and the prior appropriation rules of the western states, where water was scarcer and the need for bright-line rules greater). *But see* WELLS A. HUTCHINS, HAROLD H. ELLIS & J. PETER DEBRAAL, WATER RIGHTS LAWS IN THE NINETEEN WESTERN STATES 1 (2004) (identifying seventeen states which utilize prior appropriation but observing that only eight of these states rejected riparian principles altogether, suggesting that broad generalizations about the geographic generalizations relating to the two regimes oversimplifies reality).

14. *See infra* text accompanying notes 101–04 (discussing the policy justification for giving preference to solar collection).

15. This term, popularized by an article by Thomas W. Merrill and Henry E. Smith, refers to the limited number of standard forms that are used in property law, as opposed to contract law, which allows a nearly infinite number of arrangements between willing parties. Thomas W. Merrill & Henry E. Smith, *Optimal Standardization in the Law of Property: The* Numerus Clausus *Principle*, 110 YALE L. J. 1, 3–4 (2000) (translating this phrase as "the number is closed" and stating that "with respect to the legal dimensions of property, the law generally insists on strict standardization"); *see also* Nestor M. Davidson, *Standardization and Pluralism in Property Law*, 61 VAND. L. REV. 1597, 1604–09 (2008) (listing numerous property forms relating to different strands of property law, including possessory interests, servitudes, trusts, and intellectual property).

regime that draws from principles in water law, sets the initial entitlement so as to produce socially beneficial results, and adequately compensates burdened landowners. Part I clarifies how the natural characteristics of sunlight must guide any solar rights regime. Part II then addresses the allocation of the initial entitlement and looks to water law for background principles that may guide the assignment of the initial entitlement in solar rights regimes. Part III suggests possible integrations of existing property forms to better allocate solar rights, focusing on the questions of liability rules and adequate compensation. Although much work remains to be done to refine and implement any solar rights regime, this Article aims to restart a discussion that has remained "in the shadows" for too long.

I. RECOGNIZING FUNDAMENTAL CHARACTERISTICS OF SUNLIGHT

To be effective, solar rights must recognize and respond to sunlight's natural qualities. Sunlight can be characterized in many ways, often seemingly contradictory: as diffuse particles falling from the sky or as a beam following a predictable path; as a one-time emission from the sun or as a convertible and reusable form of energy; as an unlimited resource or as a scarce commodity. With respect to solar rights, the most relevant quality of sunlight is the manner in which it travels to the earth and reaches a particular parcel. Because the earth tilts and rotates, sunlight may never hit the same parcel in precisely the same way during the course of a single year. Even if two different parcels share the same latitudinal coordinates, sunlight may fall differently on each, depending on their respective topographies. Just as significantly, because no part of the United States lies on the earth's equator, sunlight never follows a direct vertical path and must travel across at least one other parcel to reach another.

The physical path of sunlight has two implications with respect to developing a solar rights regime. First, it implies that a relative approach—one that recognizes that a solar right almost always benefits one property owner at the expense of another, and then balances these interests against one another—may be more appropriate than the Blackstonian absolutism of natural rights theory, which asserts that certain

rights are unconditional.[16] Second, a solar rights regime must be flexible enough to accommodate natural variations in sunlight's pathways, including variations in time, topography, latitude, and other site-specific factors. As seen in water law, such flexibility may be more readily achievable in regimes that combine dual strategies of governance and exclusion. This Part draws from both water law and natural rights theory to argue that solar rights must embody both relativity and flexibility.[17]

A. Relativity

An introduction to the physical needs of the typical solar collector helps to illustrate why a solar rights regime must embrace the principle of relativity. To collect sunlight, solar collectors must face the sun: in the United States, they point in a southerly direction and operate at a tilt within ten degrees of the latitude of the location.[18] Sunlight enters the collector via a transparent panel (usually glass or plastic), which covers the surface of the collector. After passing through this panel, the sunlight then reaches the intricate mechanical systems—tubes, plates, and the like—which actually convert the sunlight into heat or electricity.[19] Efficient solar collectors demand an

16. BLACK'S LAW DICTIONARY 1323 (7th ed. 1999) (defining a "natural right" as "[a] right that is conceived as part of natural law and that is therefore thought to exist independently of rights created by government or society, such as the right to life, liberty, and property").

17. *See also* ALAN S. MILLER ET AL., SOLAR ACCESS AND LAND USE: STATE OF THE LAW 14 (1977) (stating that, generally, "[a] good law should: . . . [h]ave a built-in flexibility to adapt to the availability of new technologies; . . . [b]e politically acceptable; [and] [p]rovide for all types of property zones").

18. *See* Stephen B. Johnson, *State Approaches to Solar Legislation: A Survey*, 1 SOLAR L. REP. 55, 112 (1979) ("A general rule for proper collector tilt (vertical angle) is that it should equal the site latitude plus or minus 10°. Collectors should be aimed at true south, plus or minus 20°."); Dennis L. Phelps & Richard R. Yoxall, *Solar Energy: An Analysis of the Implementation of Solar Zoning*, 17 WASHBURN L.J. 146, 148 (1977) (stating that "[v]ery litle [sic] of the sunlight collected by solar energy systems approaches the collectors at a direct vertical; rather, solar collectors are commonly placed at an angle").

19. *See* Office of Energy Efficiency & Renewable Energy, U.S. Dep't of Energy, Technologies: Solar Collectors, http://www1.eere.energy.gov/solar/sh_basics_collectors.html (last visited May 5, 2009) (describing, with diagrams, different kinds of solar collectors and the ways they function). Some commentators have predicted that future technology will produce solar collectors that are less dependent on direct rays than current collectors, but this technology has not yet been fully adapted for wide-scale public use. *See, e.g.*, Don Clark, *Solar Industry Gets Aid to Fight Shade*, WALL ST. J., June 30, 2008, at B6 (revealing that National Semiconductor aims to announce technology "designed to sharply reduce the impact of partial shading on solar panels" by lowering the minimum threshold of vol-

unobstructed line-of-sight path to the sun.[20] The sun, however, never shines directly above any piece of property in the United States, with Hawaii at midday coming closest to vertical incidence.[21] A solar right only has value, then, if the owner of a solar collector can enforce the right against the owners of any other parcels over which the sunlight travels.

If solar rights must be enforceable against neighboring parcels, protecting solar access will necessarily restrict burdened landowners' rights. Restricting the rights of neighboring parcels may be fully justified as a matter of policy, just as we accept that property owners must abide by restrictions contained in zoning ordinances or anti-pollution statutes, which are intended to advance public aims. Water law, too, embraces a relative approach, with the rights given to some constricting the rights of others.[22] Imposing burdens typically demands, however, that burdened landowners are protected by procedural safeguards, by the awarding of compensation, or by both. With respect to procedural safeguards, psychological studies have indicated that process may supersede outcomes

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tage needed for a panel's inverter to operate and indicating that other companies are developing microinverters which convert electricity in such a way that the underperformance of one panel does not harm the output of the others); *Tubular Sunshine*, ECONOMIST, Oct. 11, 2008, at 110 (describing the efforts of four firms to produce solar collectors, including panels of multidirectional tubes, which can capture and convert diffuse light for energy).

20. By "efficient," I mean solar collectors with minimum levels of cost payback and energy efficiency; owners of permanently inefficient solar collectors are not entitled to a right.

21. *See* Adrian J. Bradbrook, *Future Directions in Solar Access Protection*, 19 ENVTL. L. 167, 168 (1989) ("Except in tropical latitudes at midday and during certain times of the year only, the sun is never directly overhead at any location. For this reason, solar rays reaching a solar device on a user's land must pass through the sky-space of neighboring properties.").

22. *See* Freyfogle, *supra* note 12, at 1545 ("The private water user's action is now a matter of public concern. Water rights may be private rights, but their exercise is public business. One water user is related to others in a complex web of mutual dependencies."). Professor Freyfogle has gone so far as to claim that the whole body of property law may follow the increasing relativity of water law, with traditional property law concepts like exclusion playing a lesser role. *See id.* at 1531 ("If property law does develop like water law, it will increasingly exist as a collection of use-rights, rights defined in specific contexts and in terms of similar rights held by other people. Property use entitlements will be phrased in terms of responsibilities and accommodations rather than rights and autonomy."). *But see* Henry E. Smith, *Governing Water: The Semicommons of Fluid Property Rights*, 50 ARIZ. L. REV. 445, 456 (2008) (emphasizing that Freyfogle's perspective is limited because it does not account for the exclusionary nature of property rights). This Article applies to solar rights Professor Smith's view that minimal exclusion and elaborate governance work together to allow multiple valuable uses in water law, *id.* at 449–50.

(that is, wins or losses) in importance, and that people are willing to accept an unfavorable outcome if they believe the process has considered their interests.[23] A solar rights regime should set out a process that clearly indicates how interests of the burdened landowners are taken into account. Regarding compensation, which is considered later in this Article, it may be enough to say here that burdened landowners might feel less aggrieved if they are compensated for their losses.[24] As the development of any new property rights regime is likely to encounter opposition from stakeholders who may not benefit under such a regime, the development of appropriate safeguards or compensation requirements may be of particular practical importance.

Of course, political expediency—avoiding the threat of protests by burdened landowners—is not the only rationale for a relative approach to solar rights. Another way to determine if a relativist or balancing approach makes sense is to consider the alternative view: an approach rooted in natural rights theory. Natural rights have been defined as inherent, universal rights that are justified outside of law but may nonetheless find expression in the law.[25] Certain aspects of property ownership have long been recognized as natural rights, created upon the assumption of ownership. The Latin doctrine, *cujus est solum, ejus est usque ad coelum et ad infernos*, translated as "whoever owns the soil owns everything up to the sky and down to the depths,"[26] has served as the fundamental expression of natural property rights codified in Roman, Jewish, German, and French law.[27] Under this concept, property ownership extends from the earth and minerals beneath the surface to the highest usable airspace.[28] The extent of ownership

23. *See, e.g.*, TOM R. TYLER, WHY PEOPLE OBEY THE LAW 72–74 (2006) (citing various studies and stating that "[c]itizens' reactions to government decisions and allocations have . . . been linked to the fairness of the procedures used to distribute outcomes").

24. *See infra* Part III.B.

25. *See, e.g.*, Eric R. Claeys, *Takings, Regulations, and Natural Property Rights*, 88 CORNELL L. REV. 1549, 1568 & n.72 (2003) (describing property itself as a natural right—"inherent, prepolitical, and prelegal . . . because its pursuit secures a wide range of natural goods"—and arguing that property rights "must cover the full range of rights associated with property").

26. BLACK'S LAW DICTIONARY 1628 (7th ed. 1999) (providing the translation).

27. *See* Ralph E. Becker, Jr., *Common Law Sun Rights: An Obstacle to Solar Heating and Cooling?*, 3 J. CONTEMP. L. 19, 22 (1976) (describing this history of natural rights as background for a discussion about solar rights).

28. *But see* United States v. Causby, 328 U.S. 256, 264 (1946) (describing limitations on airspace).

is nonvolitional and nonnegotiable, and only an express alteration or limitation on ownership will change the applicable rights. A corollary of the *ad coelum* principle is the notion that property owners have the right to enjoy their property in its natural condition.[29] Unless the owned property is located underground—say, a mineral estate—access to sunlight is a part of its natural condition. Accordingly, some scholars have considered solar access to be a natural right worthy of protection, at least in fee or surface estates.[30]

The idea that access to sunlight might be considered a natural right attached to property ownership has intuitive appeal. One could argue that the right to use the land in its natural condition should include the right to access the sunlight naturally falling upon it. There are, however, a number of obvious problems with placing solar rights among natural rights. Most significantly, the right to access sunlight conflicts with the most established natural rights: any burdened property owner's right to use her property *ad coelum*.[31] A solar rights regime could not simply state that each property owner is entitled to sunlight as a natural right because two property owners may be fighting for the same solar pathway. In addition, the notion that access to sunlight can be considered a natural right is complicated by the fact that what constitutes productive, valuable access to sunlight may depend greatly on the natural condition of the parcel and the surrounding property.[32] Even the staunchest proponents of natural rights theory have admitted that it cannot be deployed to resolve all problems.[33]

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29. *See* J.B. Ruhl, *The "Background Principles" of Natural Capital and Ecosystem Services—Did* Lucas *Open Pandora's Box?*, 22 J. LAND USE & ENVTL. L. 525, 534–35 (2007) (discussing scholars' approaches toward natural rights with respect to nuisance law, which the author argues might have developed in a way that would promote natural capital and ecosystem services, and advocating that a set of natural rights should protect "a landowner's use of land in its natural condition").

30. *See*, *e.g.*, John Edward Cribbet, *Concepts in Transition: The Search for a New Definition of Property*, 1986 U. ILL. L. REV. 1, 17 (differentiating nonvolitional rights from volitional rights—rights created by an affirmative act, such as easements, licenses, and covenants).

31. To be sure, the *ad coelum* principle has been limited in a number of important respects; for example, the Supreme Court has said that property owners cannot exclude airplanes from flying a reasonable distance overhead. *Causby*, 328 U.S. at 263–64.

32. *See infra* Part I.B.

33. *See*, *e.g.*, Claeys, *supra* note 25, at 1569 ("[M]embers of society do not enjoy a natural right to every conceivable power of disposition, use, or control that they might enjoy if they had no neighbors.").

~~Futhermore~~Furthermore, conceptualizing solar rights as a subset of natural rights fails to accommodate the balancing of competing interests that a solar rights regime must consider. In rejecting natural rights, some scholars have embraced an alternate view that economics alone should drive the allocation of solar rights and that legal regimes should aim to maximize value for property owners.[34] It is true, of course, that competing solar access claims may raise significant economic valuation issues. However, focusing purely on an economic approach may go too far in the other direction as we seek to prioritize the development of renewable sources of energy.

B. Flexibility

The physical nature of sunlight demands that solar rights regimes be not only relative but also flexible. Returning to the physical requirements of the solar collector may help guide what kind of flexibility is warranted. One might define such requirements by defining a "solar skyspace"—the three-dimensional space necessary for reasonable operation of a solar collector.[35] The scope of the solar skyspace may depend on topography: in hilly areas, the south-facing side of a hill may require more protection than the north-facing side because in the earth's northern hemisphere, light from a southerly direction is stronger and thus more useful for solar collectors than diffuse northern light.[36] It may also be affected by times and

34. *See* Stephen F. Williams, *Solar Access and Property Rights: A Maverick Analysis*, 11 CONN. L. REV. 430, 431 (1979) (advocating for changes that "are as effective as they might be in bringing about the maximization of the value of *all* the resources at stake when solar access is in conflict with other land uses" by asking "what set of rules would be likely to bring about the mix of land uses that an intelligent owner of all the affected parcels would select"). *But see* Dale D. Goble, *Solar Access and Property Rights: Reply to a "Maverick" Analysis*, 12 CONN. L. REV. 270, 271 (1979) (calling Williams's "[w]elfare economics . . . a branch of theology").

35. *See, e.g.*, NEB. REV. STAT. § 66-907 (2008) (defining solar skyspace as "the space between a solar energy collector and the sun which must remain unobstructed in order to assure reasonable operation of the solar energy system"); R.I. GEN. LAWS § 34-40-1(2) (2008) (defining solar skyspace as "the space between a solar energy system and the sun which must remain unobstructed such that on any given clear day of the year, not more than ten percent (10%) of the collectible insolation shall be blocked").

36. J.M. Guldmann, *Solar Energy & Access to Sunlight: An Optimization Model of Energy Supply and Land-Use Design*, 12 ENV'T & PLAN. A 765, 774 (1980) ("Topography will influence the spatial extent of the shadows: these will be less of a problem on the slopes that face towards the south than on those that face towards the north.").

dates, as the sun emits more light around the noon hour in the summer than at twilight in the winter.[37] These considerations are particularly important in view of the fact that solar collectors have different energy-producing (or income-generating) capabilities depending on the characteristics of the land on which they are located.[38] Accordingly, there must be flexibility in solar rights within a single jurisdiction, and from jurisdiction to jurisdiction.[39] The same rules cannot fairly apply to hilly and flat areas or urban (dense) and non-urban locations; nor can they be applied in the same way at all times and dates throughout the year. But how do we achieve such flexibility by and across jurisdictions?

Perhaps the best model for a flexible response to a natural resource is water law, which exists throughout the country in a variety of forms addressing the differing physical manifestations of water.[40] Water law has been considered by many legis-

37. *Id*. at 767 ("With respect to intradaily variations, it is clear that the solar intensity will be at a maximum at about midday and at a minimum at the times of sunset and sunrise. The total daily amount of energy that strikes a collector varies according to the seasonal changes in the declination; and the pattern of variations depends on the collector angle."). Several statutes defining solar skyspace reflect these daily and seasonal variations. *See*, *e.g.*, 30 ILL. COMP. STAT. ANN. 725/1.2(e)(2)–(3) (West 2008) (noting that the term solar skypace term solar skyspace is limited as follows: "(2) Where a solar energy system is used for heating purposes only, 'solar skyspace' means the maximum three dimensional space extending from a solar energy collector to all positions of the sun between 9 a.m. and 3 p.m. Local Apparent Time from September 22 through March 22 of each year; [and] (3) Where a solar energy system is used for cooling purposes only, 'solar skyspace' means the maximum three dimensional space extending from a solar energy collector to all positions of the sun between 8 a.m. and 4 p.m. Local Apparent Time from March 23 through September 21").

38. *See* Barry Lee Myers, *Solar Access Rights in Residential Developments*, 24 PRAC. LAW. 13, 17 (1978) (suggesting that solar rights consider numerous factors, "including the nature of potential obstructions, the changes in the solar angle that occur on a daily and seasonal basis, the topography of the land in the development, the size and location of the solar energy devices to be used, and the technological characteristics of the devices"); Dale D. Goble, Comment, *Solar Rights: Guaranteeing a Place in the Sun*, 57 OR. L. REV. 94, 99–100 (1977) (suggesting that sunlight, which is both variable and diffuse, has an impact on solar collectors which varies greatly depending "primarily upon five factors: the hour of the day, the day of the year, the atmospheric conditions, the latitude, and the altitude of the collector").

39. Others have recognized that this is true. *See, e.g.*, GAIL BOYER HAYES, SOLAR ACCESS LAW: PROTECTING ACCESS TO SUNLIGHT FOR SOLAR ENERGY SYSTEMS 2 (1979) ("There is no single 'ideal' solar access law. Different communities or parts of communities may need different legal approaches.").

40. While it may be possible to compare sunlight to oil and gas, television and radio waves, or weather modification strategies, such comparisons have borne little fruit. *See* Kevin Sean McElhenny, *Common Law Remedies Applicable to Solar Energy Obstruction in Iowa*, 29 DRAKE L. REV. 433, 435 (1979–1980) (recounting

latures and courts and can provide useful parallels from which an emerging solar rights regime can draw.[41] The key legal issue relating to both water and sunlight is *use*, not possession or capture.[42] Both water and sunlight flow can be used without necessarily depleting future capacity.[43] As Henry Smith has argued, water law combines two strategies—exclusion and governance—which work together to create "fluid" property rights that differ from property rights traditionally used for land.[44] Exclusion, on the one hand, relies on boundaries, signaling, and bright-line rules to give water rights holders the power to prevent others from taking their water.[45] Governance, on the other, relies on regulations or private agreements to juggle the uses available to multiple competing parties.[46] Together, governance and exclusion in water law work to allocate rights to a complex fugitive resource. Reviewing several water law regimes with the concepts of exclusion and gover-

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these comparisons). After water, the second most popular analogy used for sunlight is oil and gas. Both resources must be "captured" before their energy potential can be used, but oil and gas supplies are finite, unlike sunlight, and oil and gas law (which focuses on leases and taxation) is probably too technical to apply to sunlight. Bradbrook, *supra* note 21, at 177–78; Comment, *The Allocation of Sunlight: Solar Rights and the Prior Appropriation Doctrine*, 47 U. COLO. L. REV. 421, 428–29 (1976) [hereinafter Comment, *The Allocation of Sunlight*] (arguing that solar rights should not be compared to oil and gas law because oil and gas law deals with ownership (rather than use), involves highly specialized legal forms, and is "hopelessly intermixed" with tax law).

41. John H. Lungren, *Solar Entitlement: A Proposed Legislative Model*, 4 J. ENERGY L. & POL'Y 171, 184 (1983) ("Because case law has not only validated water law legislation, but has also defined the rights of the parties, water law provides an attractive model from which to create solar access legislation.").

42. *See* Bradbrook, *supra* note 21, at 176 ("The main theoretical justification for the analogy is that solar energy is used, rather than captured or sold. Similarly, the issue in water allocation is use rather than ownership."); Carol Polis, Note, *Obtaining Access to Solar Energy: Nuisance, Water Rights, and Zoning Administration*, 45 BROOK. L. REV. 357, 368 (1979) ("A right in water is defined by use rather than by possession. Because of the analogous nature of solar energy, the entitlement to solar energy may also be defined in terms of use."); Debra L. Stangl, Comment, *Assuring Legal Access to Solar Energy: An Overview with Proposed Legislation for the State of Nebraska*, 12 CREIGHTON L. REV. 567, 601 (1978) (stating that rights in water relate to use, not ownership, as is the case with sunlight).

43. *See* Comment, *The Allocation of Sunlight*, *supra* note 40, at 435 (observing that "[t]he sunlight converted to electricity . . . does not diminish the continuing future flow of sunlight to the collector" while "the hydrological cycle of equal evaporation and condensation assures that water is seldom 'lost,' despite variations in its appearance").

44. Smith, *supra* note 22, at 466, 477.

45. *Id.* at 446.

46. *Id.*

nance in mind may help inform the content and form of a regime for rights in another fugitive resource, sunlight.

Surface water, from either ground springs or precipitation, is similar to sunlight in that both are diffuse and can spread across a wide area covering many individually-owned parcels.[47] Rules governing the use of surface water differ greatly depending on the jurisdiction. In some areas, a "reasonable use" rule allows landowners to use surface water in any reasonable manner, even if the use damages neighboring properties or alters the flow of water.[48] Other jurisdictions follow a strict liability rule, which prohibits landowners from using water in any way that could interfere with their neighbors' enjoyment of their property.[49] The common enemy rule, conversely, allows property owners to take actions that interfere with the flow of surface water, even if such actions harm a neighboring property owner or their property.[50] The idea behind this rule is that runaway surface water is a "common enemy" to all property owners, and that each property owner must fend for herself when it comes to diverting it. The range of legal rules that have developed with respect to surface water can shape our approach to solar rights.[51] The common enemy rule—or perhaps a "common friend" rule, if, generally speaking, property owners view sunlight as a friend rather than an enemy—best reflects our current approach to solar rights. Property owners in most jurisdictions can erect any structure that interferes with the flow of sunlight without regard to a neighbor's solar access.[52] But just as the common enemy rule has been increasingly

47. *See* Dean N. Alterman, Comment, *Reflected Sunlight is a Nuisance*, 18 ENVTL. L. 321, 328 (1987) ("Surface water comes from springs or from rain. Sunlight comes from the sky and spreads over a wide area, like rain which diffuses into surface water and permeates the ground it falls on. Sunlight can, therefore, logically be treated like surface water for the purpose of determining liability for harm from reflecting sunlight.") (footnote call number omitted).

48. *See* Shawn M. Lyden, *An Integrated Approach to Solar Access*, 34 CASE W. RES. L. REV. 367, 380 (1983–1984) (calling the reasonable use rule "the middle ground between the civil law and common enemy rules" because "landowners are not totally prohibited from interfering with the natural flow of surface water, nor are they granted a license to interfere with surface water drainage without regard for their neighbor's interests") (internal quotation marks omitted).

49. *See id.* at 378–79.

50. *See id.* at 379.

51. *See id.* at 382–83 (arguing for a solar right analogous to surface water rights because "both sunlight and surface water flow naturally across property lines, and, when the natural path of either is altered, the interests asserted by adjoining landowners are the same") (footnote call number omitted).

52. Bronin, *supra* note 4 (describing the near-absence of laws in the United States that address or define solar access, much less protect it).

abandoned in water law, a different approach in solar law may be needed. The common enemy rule fails to embrace the relativity and flexibility principles that this Article argues are essential to a solar rights regime. A strict liability approach to solar law, which would prevent anyone from interfering with the solar access of a neighboring property owner, may swing too far in the other direction while being similarly inflexible. Reasonable use rules present a better approach to solar rights because they are both flexible and relative.

Just as sunlight has been analogized to surface water, sunlight has also been analogized to watercourses, such as rivers and streams. Both sunlight and watercourses follow defined and predictable paths, flowing away from their sources.[53] With respect to watercourses, as was the case with surface water, a variety of legal rules have emerged.[54] Riparian rules allow a property owner who abuts a watercourse to make reasonable use of the water.[55] Whether a use is reasonable typically depends on the property owner's needs, the benefit of the use, and any injuries that might result to others.[56] Although riparian

53. *See* Alterman, *supra* note 47, at 321–22. Alterman goes on to add:

> The sun follows a predictable path through the sky, even though the amount of sunlight to reach a spot depends on cloud cover and can vary from season to season. In this respect sunlight is like a watercourse, which also flows predictably from season to season in a defined path, even though the amount of flow may change from day to day. As water flows downhill (and therefore its direction can be predicted), sunlight flows in straight lines away from its source.

Id. at 329 (footnote call numbers omitted).

54. *See* Gevurtz, *supra* note 5, at 104 (describing the English rule, which prevents any change in the watercourse's natural condition, either in quantity or quality, and asserting that "[i]f a similar rule were applied to sunlight, any obstruction whatsoever would be prohibited," and "[t]his result would be far too extreme").

55. *See* BLACK'S LAW DICTIONARY 1328 (7th ed. 1999) (defining "riparian right" as "[t]he right of a landowner whose property borders on a body of water or watercourse" "to make reasonable use of the water"); Martha Freeman, *Securing Solar Access in Maine*, 32 ME. L. REV. 439, 452–53 (1980) ("[A] riparian, or owner of shoreline or riverbank property, has a right to the natural water flow subject to the reasonable use of the water by all other riparians.").

56. *See* RESTATEMENT (SECOND) OF TORTS § 850A (1979) (evaluating reasonable uses based on the purpose of the use, its suitability and value, and general justice principles); Polis, *supra* note 42, at 369 ("Entitlement to water may be further restricted by requiring that the use itself be similar to that of the other proprietors of the stream. The reasonable use rule, thus qualified, could be adapted to protect the use of solar streams for common energy purposes."). For a critique and explanation of the vague standards used in reasonable use jurisprudence, see Carol M. Rose, *Energy and Efficiency in the Realignment of Common-Law Water Rights*, 19 J. LEGAL STUD. 261, 264 (1990), which argues that riparian rules became vaguer as more demands were placed on water, in contrast to the widely ac-

rules appear to be a primarily governance system, they also rely on exclusion—exclusion of property owners who do not abut a watercourse and exclusion of certain uses from protection.[57] Under riparian principles, a property owner seeking a solar right could argue that she deserves access rights to any sunlight that naturally flowed to her property.[58] In most circumstances, as long as that property owner used the sunlight in a way that was to some degree reasonably necessary and did not impinge too greatly on a neighboring property owner's rights, a decision-maker would deem the use reasonable, and the use would be protected under riparian principles.

Alternatively, the prior appropriation doctrine governs watercourses in a way that does not depend on property ownership. To obtain water rights in a prior appropriation jurisdiction, an individual must: demonstrate an intent to use the water, give notice of such intent, comply with state laws, actually divert water from a watercourse, and, finally, apply the diverted water to a beneficial use.[59] These five steps are often codified in statutes that allow for the transferability of rights received by those who first appropriate the water.[60] Thus in prior appropriation jurisdictions, both exclusion and governance are combined: exclusion, in that one user is given the right to use water to the detriment of other users, and gover-

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cepted view that property rights become sharper when a resource becomes scarcer.

57. Smith, *supra* note 22, at 449, 473 (arguing that "the riparian system, like other property systems, employs exclusion as a first cut at the problem of water overuse").

58. Alterman, *supra* note 47, at 329 (asserting that under riparian rules, "a landowner should have a right to the ordinary flow of sunlight to his property").

59. Stangl, *supra* note 42, at 603 ("[T]he first three requirements of an appropriation—intent to appropriate, notice of the appropriation and compliance with state statutes—are accomplished by following the procedures for permit application or initiating court action. The fourth requirement is that there be an actual diversion of the water from a natural stream. . . . The final requirement is that the water be applied, with reasonable diligence and within a reasonable time, to a beneficial use."). *But see* Polis, *supra* note 42, at 371 (describing the rule in only two elements: "not only must the appropriator be first in time to be first in right, but the use of the appropriated resource must be beneficial").

60. *See, e.g.*, ALASKA STAT. §§ 46.15.040–.140 (2009) (establishing application and notice requirements and describing how a recipient can forfeit appropriative rights through nonuse); ARIZ. REV. STAT. ANN. § 45-152(A) (2009) (setting forth an application process by which appropriative rights are granted and by which parties intending to make beneficial use of water are required to signal their intent to do so by applying for a permit).

nance, in that the usufructuary right may be routinely monitored, measured, and changed.[61]

Many commentators have advocated for the application of this "first-in-time, first-in-right" approach to solar rights, and in fact several jurisdictions have experimented with it.[62] Under these rules, a potential solar user can apply for a permit to guarantee that amount of access that will be beneficially used.[63] Because physical differences exist between sunlight and water, however, the prior appropriation rules do not apply in exactly the same way in both contexts. Transferability in water law regimes, for example, means that the water right can be transferred either from one user to the other or from one use to another. Transferability in solar rights refers to transferability to subsequent property owners, or even transfers in uses, but does not refer to transferability between neighbors, given the physical nature of sunlight. Despite the differences, however, transferability is as important in solar rights regimes as it is in water regimes.[64]

A few scholars have dismissed the notion that sunlight and water can be compared at all.[65] One of the earliest commentators on the subject argued that, unlike water, whose use can be physically measured, the extent of sunlight use is difficult to determine.[66] Moreover, sunlight access may involve burdening a neighbor's property, while water access might not.[67] Some

61. Smith, *supra* note 22, at 449, 468–70 (arguing that prior appropriation, "which is conventionally thought of as a parcelized system of private exclusion rights, in fact relies heavily on the governance strategy").

62. *See, e.g.*, Comment, *The Allocation of Sunlight*, *supra* note 40, at 447 (arguing that because "[i]n prior appropriation states, the water law is well-developed," "[t]his body of law appears suitable for adaptation, in whole or in part, to solar questions"). New Mexico and Wyoming draw from water law's prior appropriation (first-in-time, first-in-right) approach. *See* N.M. STAT. ANN. §§ 47-3-1 to -5 (LexisNexis 2008); WYO. STAT. ANN. § 34-22-103 (2008).

63. *See infra* Part II.A; *see also* Polis, *supra* note 42, at 374 (suggesting that "a solar user [using appropriative right principles] cannot enforce a greater degree of solar access than necessary to satisfy his bona fide energy needs").

64. *Cf.* Freyfogle, *supra* note 12, at 1543 (observing that economists have criticized water law for being "economically inefficient and socially undesirable" to the extent that in some jurisdictions water rights are not easily transferable).

65. *See, e.g.*, Bradbrook, *supra* note 21, at 179 ("The nature of sunlight and the development of solar access laws should be regarded as sui generis.").

66. 7 WILLIAM HOLDSWORTH, A HISTORY OF ENGLISH LAW 340 (1926) (calling the analogy between sunlight and water "not a very complete analogy"). Of course, Holdsworth was not aware, in 1926, of coming technological advances that would make measurements of sunlight commonplace.

67. *See* John William Gergacz, *Legal Aspects of Solar Energy: Statutory Approaches for Access to Sunlight*, 10 B.C. ENVTL. AFF. L. REV. 1, 19 (1982) ("[U]se of

scholars are particularly wary of applying prior appropriation rules to sunlight because in the western states, where prior appropriation has been used to govern water use, sunshine is plentiful while water is scarce,[68] and because it may be difficult to identify an "appropriation" of sunlight.[69] Indeed, more permits may be issued in a solar prior appropriation regime than in a water regime because many individuals may take advantage of sunlight without diluting it, which is not the case with water.[70] There is also the concern that prior appropriation regimes, which generally favor development, will result in a race to appropriate sunlight. This concern arises because prior appropriation can work against water conservation in jurisdictions where governments reject a governance approach to rights that have already been awarded. Farmers, for example, have no incentive to embrace drip irrigation if governments do not mandate ongoing anti-waste rules and if doing so will force a forfeiture of their water rights.[71] When it comes to solar rights, at least one scholar has rightly argued that the risk of

water does not involve limiting the use of a neighbor's property. . . . Since the sun changes position throughout the day and with the seasons the stream of sunlight striking the solar collector also changes location. . . . Water users other than the first user may also utilize the water. Once a sunlight access path has been allocated, however, any additional solar collectors blocking that path would act as impermissible obstructions.").

68. *See* Melvin M. Eisenstadt, *Access to Solar Energy: The Problem and its Current Status*, 22 NAT. RESOURCES J. 21, 36 (1982) (admitting that "[n]evertheless, certain water law concepts apply to the solar access problem" such as "beneficial use, prior appropriation, and transferability").

69. Williams, *supra* note 34, at 448 (listing three difficulties of applying the prior appropriation rule to sunlight: "(1) [d]ifficulties in the definition of an effective appropriation; (2) the tendency of the rule to stimulate premature development of water supplies; and (3) a likelihood of wasteful uses"). *But see* Goble, *supra* note 34, at 291–92 (expertly rebutting all of Stephen Williams's points).

70. *See* Bradbrook, *supra* note 21, at 176 (asserting that "the vagueness of the principle of beneficial use could result in great practical difficulties"); Karin Hillhouse & William Hillhouse, *New Mexico's Solar Rights Act: A Cloud Over Solar Rights*, 1 SOLAR L. REP. 751, 757 (1979) (asserting, *inter alia*, that "[s]ince each use of sunlight is site-specific, it seems unlikely that the New Mexico . . . [statute for solar permits based on prior appropriation principles] intended to use transferability in this latter sense").

71. The California Supreme Court in 1989 attempted to remedy the problem of rights-hoarding, at least in limited contexts, by authorizing the state board that evaluated riparian rights to use broad discretion in ensuring that such rights were compatible with state goals. *See In re* Water of Hallett Creek Stream Sys., 749 P.2d 324, 337 (Cal. 1988) (holding that the federal government's proposed riparian uses may be evaluated by the state "in the context of other uses and . . . in light of the state's interest in promoting the most efficient and beneficial use of the state's waters"), *cert. denied*, California v. United States, 488 U.S. 824 (1988).

overdeveloping solar collectors to appropriate sunlight "seems exaggerated and [is] worth taking."[72]

On the other hand, others argue that because water and sunlight share so many physical characteristics, "the different standards applied to water and light cannot logically be explained on the basis of the nature of the property rights involved."[73] Prior appropriation rules may be especially appropriate in situations where two or more solar collectors are pitted against each other. For example, one can imagine a dense urban neighborhood in which a property owner must elevate her roofline to maximize input into a solar collector. The elevated roofline, however, may reduce the sunlight hitting the solar collector of a neighbor. In this case, assuming that it would be very rare for both neighbors to be simultaneously building solar collectors, a first-in-time approach may be appropriate, giving the initial entitlement to the first neighbor to use the solar collector for its intended purpose.

At the very least, however this look at the substantive dispute about applicable legal principles is resolved, water law confirms that one size might not fit all—that it may be appropriate and feasible to employ different conceptual frameworks for solar rights in different communities. Different regimes governing water emerged in different parts of the country, arguably because each was more suited to local conditions such as topography, economy, and state of development. Similarly, the age and density of a community, and the topography and latitude of the parcel of land, can lead to variations in solar rights. Solar rights must be flexible enough to accommodate these variations and adapt to new ones. More broadly, solar rights must recognize the balance between right holders and the neighbors they burden.

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72. Vernon N. Kerr, *New Mexico's Solar Rights Act: The Meaning of the Statute*, 1 SOLAR L. REP. 737, 744 (1979) ("Critics warn of a race to develop, either to install a solar device before nearby property is developed or to develop property before a solar collector can be installed by a nearby landowner.").

73. Gevurtz, *supra* note 5, at 105 (citing, with respect to the proposition that courts have weighed conflicting land and water uses, Labruzzo v. Atl. Dredging & Constr. Co., 54 So. 2d 673 (Fla. 1951) and O'Leary v. Herbert, 55 P.2d 834 (Cal. 1936)). *Labruzzo* dealt with a conflict between a user of subterranean water as a spring and a neighbor whose excavation of land for the purpose of creating a basin would interfere with such water use. *Labruzzo*, 54 So. 2d at 676. *O'Leary*, however, dealt with a conflict between the owner of a mine digging an underground tunnel and neighbors who used an underground spring for water. *O'Leary*, 55 P.2d at 835.

II. THE INITIAL ENTITLEMENT

Over the last fifty years, legal scholarship has clarified that the assignment of an initial legal entitlement matters, especially where one party's rights may burden another party—as is the case in the solar rights context.[74] Indeed, assigning entitlements to the wrong party may lead to inefficient or undesirable results. Before determining how to assign initial entitlements to solar rights seekers, it is important to understand, at least in brief, the theory behind entitlement assignments and how this theory might apply to solar rights. As a secondary matter, it may also be beneficial to review relevant principles of water law that might assist in developing a solar rights regime.

After analyzing the initial entitlement question through theory and analogy, this Part asserts that, for policy reasons, we should grant initial entitlements in solar rights to the party with the most socially beneficial use. When a solar collector is involved, the owner of the solar collector should be deemed to have the highest socially beneficial use among all parties potentially competing for conflicting solar rights. Beyond the solar collector use, uses should be identified and ranked depending on the needs of the jurisdiction.

A. Entitlement Theory

In theory, the assignment of the initial entitlement in any legal regime should not matter because the parties will always bargain to reach the most efficient result, with the entitlement going to the party who most values it. Ronald Coase, the scholar most associated with this view, imagined a world without transaction costs—that is, a world without the administrative, information-gathering, monitoring, or other costs associated with an exchange.[75] He posited that, in a world without trans-

74. The academic debate on this issue focuses on a 1960 article by Ronald H. Coase. *See* Ronald H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1 (1960).

75. *See* David M. Driesen & Shubha Ghosh, *The Functions of Transaction Costs: Rethinking Transaction Cost Minimization in a World of Friction*, 47 ARIZ. L. REV. 61, 68, 84 (2005) (arguing that "the literature uses inconsistent and widely varying definitions of transaction costs" and offering a definition of "transaction cost[s]" as "the costs of making and enforcing both governmental and private decisions"); Pierre Schlag, *The Problem of Transaction Costs*, 62 S. CAL. L. REV. 1661, 1674–76 (1989) (recounting others' definitions of transaction costs and calling "the

action costs, the most efficient outcome and allocation of resources would result through bargaining by and among affected parties.[76] In such a situation, a right would always end up in the hands of the party who valued that right most.[77]

Of course, we live not in the world of Coasean theory but in a world with transaction costs associated with the most minor of exchanges. In the "real" world, the Coase theorem has been read to imply that the law should aim to minimize transaction costs.[78] As economist Robert Cooter put it, the Coase theorem implies that "the structure of the law should be chosen so that transaction costs are minimized, because this will conserve resources used up by the bargaining process and also promote efficient outcomes in the bargaining itself."[79] Under this view, the more the law can minimize transaction costs, the better the ultimate outcomes. Cooter joins many others who, over the last fifty years, have contributed to the voluminous literature on Coasean bargaining by emphasizing the cost-minimization approach to law.[80]

Scholars' calls for cost minimization have focused the initial entitlement debate on the question of which party is likely to value the right most—that is, the party who, in a world without transaction costs, would have successfully bargained to obtain the right. The rationale for this approach relies on the possibility that bargaining will not occur or will not produce the most efficient result. In theory, the holder of a legal right will choose to bargain with others who want to obtain it. However, in practice, bargaining may be costly and inefficient; and bargaining might not occur at all if there are too many parties or if a key party chooses not to bargain. Because bargaining to the best result is not guaranteed, it is important to determine which party most likely deserves the entitlement at the outset.

Determining where to place the initial entitlement may be particularly difficult with respect to solar rights, which neces-

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concept of transaction costs . . . something of a black hole" because of the apparent disagreement about what kinds of costs are included in the definition).

76. *See* Coase, *supra* note 74.

77. *See* ROBERT COOTER & THOMAS ULEN, LAW & ECONOMICS 85 (3d ed. 2000) (articulating this well-worn characterization of Coase's theorem). This articulation of the Coase theorem has been termed the "positive" Coase theorem. *Id.*

78. *Id.* at 93. This articulation of the Coase Theorem has been termed the "normative" Coase theorem. *Id.*

79. Robert Cooter, *The Costs of Coase*, 11 J. LEGAL STUD. 1, 14 (1982).

80. *See* Driesen & Ghosh, *supra* note 75, at 68 (indicating that "[t]he goal of reducing or eliminating transaction costs has strongly influenced both scholarship and public policy" and calling the goal ubiquitous).

sarily benefit one party while burdening another (or others). In the solar rights context, such disparities occur primarily because sunlight may fall across multiple parcels before reaching its destination, with the owners of each parcel possibly being able to make the case for a right.[81] In addition to the problem of competing rights, the number of bargaining parties—as few as two, but (especially in urban settings) potentially many more—presents special problems in Coasean analysis. Even a negotiation that involves only two parties may be difficult, for such a negotiation would arise from a bilateral monopoly—a situation in which there is only one possible party on each side of the transaction. Bilateral monopolies thwart efficient bargaining because of the risk that one party may use her monopoly to extort the other or refuse to bargain altogether. As the number of bargainers increases, so do transaction costs.[82]

Perhaps because of these difficulties, very few jurisdictions have identified the recipient of the initial entitlement of a solar right.[83] A party wishing to install a solar collector often does not know whether she should pay a neighbor not to exercise the right to block her collector or whether the neighbor should pay her for violating her right if the neighbor does block. Robert Ellickson and others might argue that in such situations, the assignment of the initial entitlement does not matter—even in a world with transaction costs. Ellickson explains that private individuals do not necessarily rely on the legal system to determine their entitlements and instead make agreements with each other without government interference, especially in close-knit communities.[84] Accordingly, Ellickson asserts, Coase's legal centralism ignores the realities of individuals' bargaining on the ground.[85] While Ellickson's critique may hold true for close-knit communities, it does not explain the

81. *See supra* Part I.A.

82. *See, e.g.*, William M. Landes & Richard A. Posner, *Salvors, Finders, Good Samaritans, and Other Rescuers: An Economic Study of Altruism*, 7 J. LEGAL STUD. 83, 91 (1978).

83. *See supra* text accompanying note 52.

84. ROBERT C. ELLICKSON, ORDER WITHOUT LAW: HOW NEIGHBORS SETTLE DISPUTES 4 (1991) (summarizing research which revealed that ranchers in a close-knit community "achieve cooperative outcomes not by bargaining from legally established entitlements, as the parable supposes, but rather by developing and enforcing adaptive norms of neighborliness that trump formal legal entitlements").

85. *Id*. (explaining that in adopting the "view that the state functions as the sole creator of operative rules of entitlement among individuals . . . Coase repeated a blunder that dates back at least to Thomas Hobbes").

near absence of evidence demonstrating the existence of express agreements between neighbors—perhaps the closest of mini-communities—allocating solar rights.

In the absence of an explicit solar rights regime, and often lacking information about who owns the right in the first place, parties must either bargain among themselves to create an express agreement or resolve their disputes in court. Both methods may involve significant transaction costs. Express agreements, such as express easements or covenants, require each of the bargaining parties to invest time and money to ensure that required formalities are met. In court battles, legal fees and opportunity costs can be substantial. Even where government allocates solar rights (that is, explicitly identifies the recipient of the initial entitlement), a solar rights seeker's petition for such rights may be very costly.[86] Excessive transaction costs in all solar rights regimes make assigning an initial entitlement all the more important.

B. Determining Initial Entitlements in Solar Regimes

As noted above, default rules, which grant entitlements at the outset to parties who value them most, will have the effect of reducing bargaining and thus reduce transaction costs. However, there is an alternative view: that we should assign the initial entitlement to the party who will use it to produce the most socially beneficial effect. To determine how to consider these possibly competing views about which users deserve a solar right most, we might do well to review relevant principles in an analogous area of law: water law, particularly as applied to watercourses and streams.[87] Because solar rights are necessarily relative (that is, benefiting one party while burdening another), the most salient examples from water law are those in which one use of water is weighed against another.

In riparian jurisdictions, governed by a reasonable use approach, such weighing occurs when demand for water exceeds supply, such as when rivers and streams begin to dry up.[88] A use that may be reasonable during a rainy season may not

86. Bronin, *supra* note 4, at 1218–22 (introducing and summarizing the issues relating to transaction costs of express agreements, government allocations, and court assignments of solar rights).

87. *See* Lungren, *supra* note 41, at 184 ("Because case law has not only validated water law legislation, but has also defined the rights of the parties, water law provides an attractive model from which to create solar access legislation.").

88. *See supra* text accompanying notes 55–58.

necessarily be reasonable during a drought. During a drought, a court or decision-maker will likely distinguish between natural uses, which include uses absolutely necessary to existence, and artificial uses, which include other uses such as irrigation and the operation of machinery.[89] The right to use the water belongs, at the outset, to the riparian owner using water for natural purposes, to the extent that the quantity of water used is reasonable. Other riparian owners will receive water rights in proportion to both the nature of the use (natural versus artificial) and their reasonable need. In this way, as Carol Rose has explained, riparian rules balance the interests of both individual property owners and the general public in allocating a scarce resource.[90]

Riparian rules can provide some guidance for emerging solar regimes, but they are not perfectly compatible. The natural-artificial distinction, for example, cannot be easily made for solar uses: some might view solar collectors as the quintessential natural use as they form part of an alternative energy solution, which many believe is essential to human survival; others might deem solar collector uses to be artificial, especially if a property owner is also connected to the conventional electric grid. Riparian rules also misalign with solar rights because solar rights are relative to each other only with respect to benefits and burdens, and not necessarily relative to each other with respect to the substance of the right. In other words, while one property owner's water usage may conflict with the water usage of another property owner, the use of sunlight does not necessarily compete with other uses of sunlight.[91] Rather, the use of sunlight conflicts primarily with development goals.[92] The reasonable use approach in water law is not intended to resolve disputes among property owners with very different competing uses, as might be required in the allocation of solar rights.[93]

89. Evans v. Merriwether, 4 Ill. 491, 496 (1842) (asserting the general rule that where "there is not sufficient [water] for each proprietor living on the stream," "the question must be left to the judgment of the jury" of whether a use is natural or artificial).

90. Rose, *supra* note 56, at 265–66.

91. Gevurtz, *supra* note 5, at 104–05 (asserting that "in water cases the conflict is usually between competing uses of water, whereas in light cases, the conflict is between the use of land and the use of sunlight").

92. *Id.*

93. Polis, *supra* note 42, at 371 (arguing that the reasonable use rule "does not provide a basis for resolving disputes among private parties who have dissimilar use requirements, as typically occurs in urban areas").

Although the reasonable use principle does not perfectly anticipate entitlement assignment in solar regimes, water law presents another alternative that may assist: the beneficial use rules that govern prior appropriation jurisdictions.[94] In such jurisdictions, water rights are granted on the first-in-time, first-in-right principle to those users who first capture water and put it to a beneficial use.[95] The right only lasts for as long as the use remains beneficial; if the owner does not use it beneficially for a certain period of time, she loses her right, and the right reverts back to the state.[96] The concept of beneficial use remains broadly defined; very few uses of water have been conclusively found to be non-beneficial.[97] Moreover, beneficial uses do not assist with what may be the central task of an initial assignment of a solar right: the weighing of different uses. Unlike riparian regimes, prior appropriation regimes allocate rights primarily based on the timing of the assertion of the right and not on the nature of the right itself. Prior appropriation rules for water could not assist, for example, with weighing whether a solar collector that powers a hot tub is beneficial (because solar collectors use clean energy) or non-beneficial (because the collector is enabling an arguably non-essential recreational activity). As is the case with the reasonable use rules, beneficial use rules might not provide a ready-made solution for the grant of the initial entitlement in solar law.

However, by combining some aspects of these two major strands of water law, we may be able to come to a workable solution for the assignment of an initial entitlement in a solar rights regime. Specifically, we can learn from riparian principles the ranking and prioritization of certain uses in the interest of the public good; from prior appropriation principles, we can learn the notion that rights last only as long as uses are beneficial and the first-in-time principle for similar uses (such as competing solar collectors). Incorporating these ideas in a

94. *See supra* text accompanying notes 59–61.

95. *See* THOMAS W. MERRILL & HENRY E. SMITH, PROPERTY: PRINCIPLES AND POLICIES 360–61 (2007) (describing prior appropriation regimes); Goble, *supra* note 34, at 292 (emphasizing that water rights in prior appropriation regimes only occur if a use is beneficial).

96. Polis, *supra* note 42, at 374 ("If an appropriator ceases to utilize all or part of the appropriation right, with the intention of wholly or partially abandoning that right, the appropriation is deemed abandoned to that extent.").

97. MERRILL & SMITH, *supra* note 95, at 360 (identifying *Tulare Irrigation Dist. v. Lindsay-Stratmore Irrigation Dist.*, 45 P.2d 972, 1007 (Cal. 1935), as one of the few cases narrowing the beneficial use principle because it deemed flooding land to drive out gophers not to be a beneficial use).

solar rights regime would respect the relativity of solar rights and support a flexible array of legal options for the solar rights seeker.

To articulate these concepts more fully, it is important to recognize the kinds of competing uses that should be accommodated in a solar rights regime. In some cases, one solar use—that is, a use that could not exist without sunlight—could be pitted directly against another solar use. In theory, the two competing solar uses could both involve solar collectors, with one neighbor erecting her solar collector in such a way that it would obstruct the solar path to the collector of another. In these situations, where the uses are equally beneficial and equally reasonable, the prior appropriation first-in-time principle may be most appropriately applied to give more weight to the owner of the first-installed collector. The application of this principle has not yet been tested, as no such disputes have been reported in either the popular press or the courts. But solar collectors are not the only solar use. As a more realistic example of a dispute involving two solar uses, the *New York Times* recently reported a dispute involving two neighbors—one who used the sun to grow redwood trees in his backyard, and the other who argued that the growth of the redwoods blocked sunlight from reaching his solar collectors.[98] Both the growing of trees and the use of solar collectors require sunlight, and both uses benefit the environment. Although the competing values were compellingly close, the state in which the suit was brought, California, has enacted legislation that prioritizes solar collectors over tree growth, and the owner of the trees lost his battle in court.[99] In water law, the result might have been different, as the redwood-growing use (a natural use) might have received higher priority over the solar collector use (arguably an artificial use). The statute's hierarchy of uses, which protects the artificial use of the solar collector as a reflection of the state's energy efficiency goals, represents one of the few legislative attempts to address solar rights. The hierarchy accounts at least in part for the relativity and flexibility that this Article advocates.

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98. Felicity Barringer, *Trees Block Solar Panels, and a Feud Ends in Court*, N.Y. TIMES, Apr. 7, 2008, http://www.nytimes.com/2008/04/07/science/earth/07redwood.html?_r=1&oref=slogin.

99. *See* CAL. PUB. RES. CODE §§ 25980–25986 (Deering 2007) (naming as a public nuisance any tree or shrub which, during the hours of 10:00 a.m. and 2:00 p.m., shades more than ten percent of the area around a previously installed solar collector).

While the redwood-solar collector case involved two solar uses, non-solar uses—that is, uses that do not wholly rely on sunlight for their existence—may also present challenges to a solar rights regime. For example, the desire to develop property or to build a structure to a certain height (both non-solar uses as the term is used in this Article, although access to sunlight, of course, may have a significant effect on property values) may be incompatible with a solar right awarded to a neighbor for a solar collector use that prevents such development from occurring.[100] In such cases, the value of the right may change for each party depending on economic conditions or other factors. If the neighbor owning the solar right was granted the initial entitlement, the real estate developer could potentially bargain with the neighbor to purchase that right. Until the developer valued the right enough to set a price that the neighbor would accept, the right would protect a socially desirable use. A more difficult case might arise where the non-solar use involves a critical community need—say, a children's cancer center where no other such center existed for hundreds of miles around. A well-formulated, ranked list might allow critical community needs to supersede solar collector uses in priority and allow changes to these exceptions over time.

The ranking of uses is a central feature of both riparian and prior appropriation rules. Regardless of which body of law a solar regime draws from, solar collector uses should be at the top of any list of desirable uses. The public benefits of solar collector uses are difficult to deny.[101] Solar collectors provide a clean source of energy with minimal impact on the environment. Expansion of their use would reduce the American dependency on fossil fuels and thereby reduce financial support to groups and governments that have undermined American security abroad. Moreover, the costs of solar collectors relative to the power they generate, as supplemented by government incentives, have decreased in recent years.[102] Indeed, the very

100. *See* Gregory Sergienko, *Property Law and Climate Change*, 22 NAT. RESOURCES & ENV'T, Winter 2008, at 25, 27 (2008) ("Because the rising and setting sun casts a long shadow, absolute priority for the solar developer would veto many developments, . . . unjustifiably interfer[ing] with other property owners.").

101. *See* Bronin, *supra* note 4, at 1223 (summarizing the value of increased solar collector usage to the United States as a whole).

102. Various industry studies show a significant cost decrease. *See* Ted Nesi, *Study: Solar 'Cheaper than Grid' by 2012*, PROVIDENCE BUS. NEWS, Mar. 11, 2009, http://www.pbn.com/stories/40807.html?sub_id=40807&print=1 (citing JOONKI SONG ET AL., THE TRUE COST OF SOLAR POWER: RACE TO $1/W, *report available for*

fact that we so heavily subsidize solar collectors demonstrates that their proliferation is a national priority. Yet they are dramatically underutilized, with only 1 percent of our electricity supplied by solar collectors.[103] Solar rights must encourage investment in solar collectors through a policy preference that gives the initial entitlement in a solar right to the solar collector user.[104] Spelling out such preferences in a statute, whether the statute is based on riparian or prior appropriation principles, would be ideal.

The public policy approach to assigning initial entitlements is superior to the cost-maximization approach, but it is possible that both may reach the same result. To minimize transaction costs, a legal regime should assign the initial entitlement to the party who values it most. Although no comprehensive study has precisely measured such benefits, a solar right is valuable to a solar collector user for many quantifiable reasons, including savings in energy costs and potential income from selling electricity to neighbors and local utilities. With the exception of agricultural uses, few if any other solar uses have a quantifiable, commodifiable value. And in the case of agricultural uses, unless the agricultural site is extremely small (say, an urban rooftop), the award of a solar right to a neighbor will not necessarily result in a dramatic decrease in the productive viability of the site. It is easy to imagine, therefore, that a solar collector user (or potential user) would value the right more than other solar users. The fact that so few users have negotiated and bargained for solar rights may indicate that transaction costs raise the price of the rights too high or that the initial entitlements assigned by our current laws are by and large in the wrong place. As for non-solar uses, this Ar-

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purchase at http://www.photonconsulting.com/the_true_cost_of_solar_power_race_to_1w.php#ExecutiveSummary, and describing a race to the bottom on prices); businessGreen.com, Report: Solar Panel Prices to Plummet, (June 2, 2009), http://www.businessgreen.com/business-green/news/2243366/report-solar-panel-prices (citing IC INSIGHTS, SOLAR ENERGY: GROWTH OPPORTUNITIES FOR THE SEMICONDUCTOR INDUSTRY, *report available for purchase at* http://www.icinsights.com/prodsrvs/specialstudies/solarenergy/solarenergy.html, and concluding that prices will drop by a quarter this year alone).

103. Galbraith, *supra* note 9 ("Even with federal support and positive buzz, only a fraction of 1 percent of the electricity in the United States comes from solar panels, leaving ample room for the market to grow.").

104. *See* KETTLES, *supra* note 11, at 1 (2008), *available at* http://www.solarabcs.org/solaraccess/Solaraccess-full.pdf ("As our energy policies shift to advancing solar energy as a significant source of our energy portfolio, the conventional view . . . must yield to guaranteeing access to sunlight to the fullest extent possible.").

ticle takes the position that non-solar uses should not be prioritized over solar collector uses in a solar rights regime, although, of course, not every use of land can be anticipated by a solar rights regime. After solar collector uses, solar rights should be allocated to uses ranked by significance to the jurisdiction.

III. CREATING LEGAL HYBRIDS WITHIN THE *NUMERUS CLAUSUS*

The allocation of the initial entitlement is only the first step in determining how a solar rights regime might be created. The second step is identifying how such an allocation finds expression in the law. It would not be impossible to create a new property form outside of the *numerus clausus*. Several new property forms, such as the timeshare, have been created over the last fifty years, joining standard forms like the easement and the leasehold in the property canon.[105] As Nestor Davidson has pointed out, the dynamism of the *numerus clausus*, with respect to the addition and deletion of forms and the content of the forms themselves, is often overlooked.[106] In this case, however, creating a new property form is not necessary, as an adequate solar rights regime may be created by integrating existing property forms. Scholars addressing the solar rights issue two decades ago reached a consensus that an integration of existing property forms is the only conceivable way to achieve solar rights.[107]

Today, their conclusion still resonates: the best solar rights regime would combine and modify existing property forms to provide several options to solar rights seekers. More specifically, a hybrid solar rights system should facilitate private agreements by and among property owners and should authorize

105. *See* Davidson, *supra* note 15, at 1611.

106. *Id.* at 1600 (arguing that "[e]xisting accounts of the numerus clausus either ignore this dynamic aspect or treat the content of the forms primarily as the artifact of private ordering").

107. *See*, *e.g.*, HAYES, *supra* note 39, at 4–9 (explaining the possibility that governments could facilitate private agreements, protect solar access only in new residential developments, remove barriers in existing land use controls, enact state-level enabling legislation, add solar access elements to comprehensive plans, use transferable development rights, rezone, adopt solar envelopes, enact statewide solar access laws, or enact federally mandated solar access laws); Lyden, *supra* note 48, at 393 ("A private nuisance action, combined with a solar access easement statute and land use planning legislation, is the ideal approach to solar access.").

government allocations of rights through permitting or zoning schemes. This Part describes how such a solar rights regime might provide for express agreements and, where bargaining is unsuccessful, protect the initial entitlement through liability rules, requiring the holders of solar rights (or the government) to pay any burdened parties. Compensating deserving losers is necessary to a functional and fair solar rights regime, and different means of compensation may be required for different communities. One approach to compensation in high-density or highly regulated communities, where it may be most difficult to establish a solar rights regime, is the governmental allocation of transferable development rights—privately tradable credits which can be awarded to individual property owners.

A. Liability Rule Solutions

Without pushing for a new form in property law, this Article advocates an integrated approach using forms of express agreements and governmental allocations already in our legal repertoire. This integrated approach may allow for the prioritization of solar rights as a matter of policy, grant individuals the ability to choose among various paths toward solar rights, offset possible unjustified windfalls, and reduce costs for all parties involved.

As noted in the companion piece to this Article, there are three possible means of creating solar rights.[108] The first, express agreement, involves negotiations among two or more individuals (or groups of individuals), as allowed by law, which result in some mutually agreeable allocation of solar rights. The second, governmental allocation, involves government at any level awarding a solar right to a private party through an established program, such as a permit scheme or a zoning ordinance. The third, a court assignment of solar rights, involves one party suing another to create a solar right based on theories such as nuisance, prescriptive easements, or implied easements. The companion piece concluded with the argument that court assignments are "the least efficient and most costly method of obtaining a solar right,"[109] and create little but confusion.[110] Accordingly, this Article proposes an approach that

108. Bronin, *supra* note 4, at 1221–22.

109. *Id.* at 1221.

110. *See* Lungren, *supra* note 41, at 186 ("The multiplicity of doctrines and confusion of the common law pertaining to protection of solar access rights requires a

avoids the courts and focuses instead on a hybrid system that gives solar rights seekers the ability to choose from at least one kind of express agreement, explicitly authorized by law, and at least one government allocation scheme.

As a starting point, all jurisdictions should make provisions for property owners to bargain to a mutually agreeable solution. Because solar rights are property rights, any express agreements that involve solar rights must be articulated using forms such as easements, covenants, and leases—all within the *numerus clausus*.[111] Requirements for the drafting and format of such forms are, by and large, articulated by state legislatures. States often require, for example, that covenants be attached to the deed of a legal parcel and recorded on the land records kept by the local government. Although the need for state guidance on the issue has become increasingly clear, many state legislatures have failed to explicitly authorize the use of even one form within the *numerus clausus* for solar rights.

A more interesting question is what happens when parties cannot agree to allocate solar rights among themselves. In this circumstance, government should assign the initial entitlement to a solar right to the highest-value solar user, with certain protections that benefit the holder of that entitlement in case of a dispute. Calabresi and Melamed addressed this question in their now-famous article, *Property Rules, Liability Rules, and Inalienability: One View of the Cathedral*.[112] Their article distinguished between assignments of entitlements and the assignments of modes of protecting those entitlements, asserting that there are three modes of protection in a dispute: (1) a property rule by which someone can only destroy an initial entitlement if the entitlement holder agrees to release it; (2) a liability rule by which someone can destroy the initial entitlement if he is willing to pay an objectively determined value for it; and (3) an inalienability rule by which no one can destroy the initial entitlement because transfer cannot occur even if there is a willing buyer and seller.[113]

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definite frame of legislative reference establishing a foundation for confirmation of property rights . . . .").

111. *See* Bronin, *supra* note 4, at 1225.

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

113. *See id.* at 1105–06.

For our purposes, the key question is whether a property rule or a liability rule is the most appropriate means of protecting the initial entitlement. With liability rules, one party can force the result that she wants, and the other party is compensated for his or her damages. Such a result has the advantage of allowing one party to have its way, while softening the blow to the other party. Liability rules become sensible when the identity of the cheapest-cost avoider is known or when one of the parties should receive the initial entitlement for policy reasons. Property rules can help to protect subjective values and owner autonomy—they do not capture values that are not considered in court-determined prices. Property rules can also minimize administrative costs and more strongly protect the rights of the entitlement holders. Numerous scholars have debated which of these two rules costs less, primarily through the transaction cost framework.[114]

Although some have pointed out that property rules may be more prevalent in property law than liability rules,[115] liability rules make more sense in the solar rights context. As solar rights are themselves relative, the remedy must be relative. Moreover, liability rules allow for compensation of losers, who may be greatly affected by a solar rights scheme. Key to the success of these liability rules is a related ranking of competing uses, drawing from water law principles described in Part I.B.

A few examples of liability rules in a solar context may illuminate why these rules work so well in protecting initial entitlements. A law might, for example, allow a property owner with a highly-ranked solar use to create an affirmative easement over a noncooperating landowner's property for solar access. Such a scheme may not be so far-fetched, as approximately half of the states allow private taking of easements by landlocked property owners, as long as such owners pay just

114. *See* Driesen & Ghosh, *supra* note 75, at 68–69 ("Scholars debate which rule creates the lowest transaction costs, and therefore the least impediment to bargaining around inefficient judicial decisions. Implicitly, these scholars endorse the view that the choice between property and liability rules should reduce the transaction costs of bargaining around judicial decisions.").

115. *See*, *e.g.*, Henry E. Smith, *Property and Property Rules*, 79 N.Y.U. L. REV. 1719, 1732 (2004) (explaining that property law primarily involves property rules, not liability rules, and that "[r]ecently the pro-liability rule literature has challenged these positions by arguing that liability rules would be superior to property rules even in securing the traditionally cited benefits of property").

compensation to the burdened landowner.[116] While this first example involved a privately-created easement, the approach also works in governmental allocation schemes. Iowa and Wisconsin, for example, have both enacted laws that allow a private party to apply to an administrative board for the creation of easements without the burdened landowners' consent.[117] One of the key elements of these states' legislation is the requirement that the private party applicants pay compensation to burdened property owners.[118] In each scenario, the protection of the initial entitlement via a liability rule allows the solar right holder to exercise her rights while also compensating the loser at least something for her losses. A property rule would be too harsh on prospective losers, allowing the winner to take all. A property rule might, for example, allow one property owner the absolute right to erect a solar collector without having to compensate her neighbor; the reverse property rule would allow a neighbor to prevent the same property owner from erecting her solar collector and give the property owner no recourse against the neighbor. For the reasons described in Part I.A., using property rules would be detrimental to a fair solar rights regime.

In any regime, flexibility is very important: individuals must be allowed to choose among different possible paths to solar rights. There may be no "one size fits all" approach to the allocation of solar rights. Just as there are multiple regimes governing the use of water, which vary according to region, there may be reason to apply different solar rights regimes in different types of settings—according to density, rural character, and land use, for example. It may be difficult, for example, to enact solar access laws in places where land use controls change frequently, development is very dense, disparities already exist in building heights, or vegetation is not regulated.[119] Default rules should be carefully crafted to allow for

116. *See* MERRILL & SMITH, *supra* note 95, at 986 (indicating that about half of the states allow for such forced easement statutes); *see, e.g.*, WASH. REV. CODE § 8.24.010 (2009).

117. IOWA CODE ANN. §§ 564A.1–.9 (West 2008); WIS. STAT. ANN. § 66.0403 (West 2007).

118. *See* IOWA CODE ANN. § 564A.5(3) (West 2008) (setting board-adjudged compensation at "the difference between the fair market value of the property prior to and after granting the solar access easement"); WIS. STAT. ANN. § 66.0403(5)(b) (West 2007) (allowing local governments to establish, as a condition for granting a permit, "requirements for the compensation of persons affected by the granting of the permit").

119. *See* HAYES, *supra* note 39, at 24–26.

creative alternate solutions and should create a baseline that facilitates the achievement of public policy goals.

B. The Compensation Mechanism

For a solar regime to be politically viable, adequate and fair compensation must be paid to individuals burdened by another party's receipt of a solar right. Compensation, of course, can take many forms—money, tradable credits, the permission to engage in certain activities—and can be calculated in many different ways. For simplicity's sake, this Article uses the fair market value of the affected property as the measure. Whatever form the compensation takes, efficiency often requires that compensation be paid to "losers" (that is, burdened parties). In property law, the most widely accepted measure of efficiency is the Kaldor-Hicks model: a change in allocation of resources is efficient if those who gain from the change value their gains in an amount greater than the losers value their losses.[120] Kaldor-Hicks efficiency requires the possibility that compensation could be made from the winners (or perhaps a third party) to the losers.[121] If the award of a solar right keeps a neighbor from disposing of her property as she sees fit, efficiency could be achieved by the solar right holder compensating the neighbor for her inability to use the property as she desired.

Compensation schemes must necessarily differ depending on the characteristics of the benefited and burdened properties. The amount may depend on the scale of the solar use. For example, a solar-powered water heater may require only the smallest of solar panels, and the limitation on a neighbor's use of her property may be very minor.[122] Similarly, in low-density

120. *See generally* RICHARD POSNER, ECONOMIC ANALYSIS OF LAW 12–15 (7th ed. 2007). An alternative measure of efficiency, Pareto optimal efficiency, signifies that a change in an allocation of resources is efficient if at least one individual is better off, without making any other individual worse off. *See id.* at 12–13. This measure of efficiency is not typically used in property law because property disputes almost always produce losers; very often, the loser is made worse off, without compensation. Although this Article disregards Pareto optimal efficiency, a compensation mechanism that at least resulted in losers' maintaining their pre-solar-rights-award status might qualify the solar rights regimes advocated herein to be deemed efficient under Pareto optimal rules.

121. *Id.* at 13.

122. Note that drawing a line as to which size solar collectors merit protection and payment and which do not would be too costly, so this Article would allow for any size solar collector to have the same treatment.

or undeveloped areas, compensation may be relatively small because the award of a solar right might not actually create significant burdens. For these areas, compensation may most easily be factored into the price of the solar right itself and paid directly by the holder of the solar right. For higher-density areas, the compensation mechanism is more complicated. It is important to note that in some cases—even in high-density communities—compensation may not be owed at all if the activity in which the burdened party is prohibited from engaging would not have raised the value of her property if she had been allowed to undertake such activity. For example, a neighbor who was prohibited from erecting a giant treehouse in her backyard because the treehouse would block an adjacent solar collector would not necessarily be owed compensation if the erection of the treehouse would not raise her property's value. In other words, if a burdened party's loss is measured by fair market value (and not the subjective value the party places on her burden), then sometimes the burdened party will be owed nothing.[123]

However compensation is calculated, identifying the party who pays the compensation may be a difficult proposition. Burdened parties may turn to the government for compensation. Government compensation may, however, be politically infeasible. Even if the allocation of the solar right provides some public benefit, voters may not want government to so directly subsidize private parties' solar rights. The law of takings allows (and, in fact, requires) government to compensate private property owners when a government action has effected a taking.[124] In that circumstance, the party doing the taking (and presumably also the benefitting, albeit on behalf of the general public) is government itself. When it comes to solar rights, disputes will most often involve private parties, not public entities.

As an alternative to government compensation, the party who benefits most from the allocation of a solar right may be tasked with payment. This assignment of payment, too, may be worrisome. If the benefitting party owns a solar collector,

123. Even if no compensation is due under a fair market value analysis, it may nonetheless be important to provide a small amount of compensation to offset administrative costs of the burdened party or mitigate emotional damage incident to the imposition of the burden.

124. Note that advocates for private takings, that is, condemnation by private parties, have begun to emerge. *See, e.g.*, Abraham Bell, *Private Takings*, 76 U. CHI. L. REV. 517 (2009).

then it is very likely that she will make the initial investment in the installation of the solar collector at a financial loss. Adding compensation to neighbors to her installation costs may dampen solar collector investment, except in circumstances where the rules on compensation are very clear and the amount of compensation is very small. At the same time, requiring that private parties directly compensate burdened parties may skew development incentives. On the positive side, property owners in low-density areas, who would otherwise be interested in installing solar collectors, may race to do so to avoid having to pay compensation if the area becomes more developed. In addition, liability rules requiring benefited parties to pay might thwart socially undesirable solar collector uses—that is, collectors used to offset the cost of development that, in the aggregate, harms society more than the energy savings helps it. For example, the cheap energy produced by solar collectors might be used to subsidize sprawl, whose impact on the environment in terms of increased demands on non-electricity utility infrastructure (such as roads or water lines) is significant. Liability rules imposing costs on the creators of such developments may cause them to think twice about their investment.[125] On the negative side, property owners who fear undercompensation may engage in a race to overdevelop their properties, building higher or taking up more area than they might otherwise so as to vest their rights to the detriment of future solar collector users.

One possible solution for letting the market take care of compensation in high-density areas, particularly in situations where a solar user who receives the right is the winner and a neighbor who wishes to develop is the loser, are transferable development rights ("TDRs"). Local or state governments may allocate TDRs to compensate property owners who may be burdened by solar access regimes such as permit systems or zoning ordinances.

In brief, a TDR gives one property owner the ability to convey certain rights to develop her parcel to someone else, usually a neighbor in the immediate vicinity, for use on that person's parcel.[126] Put another way, TDRs are marketable, quantifiable

125. In reality, the number of cases where solar collectors would be used to facilitate socially undesirable development where it would not otherwise occur is very small.

126. *See* Goble, *supra* note 38, at 127 ("In a TDR system, land ownership is divided into two components: ownership of the physical land and ownership of the

units of development potential, which may be granted to a property owner by a governmental entity to compensate the property owner for restrictions (such as conservation or preservation restrictions), which that governmental entity has placed on the property. These rights represent the difference between the maximum development permissible for the original parcel and a lesser amount of development permissible under restrictions specific to the parcel. Under typical TDR regimes, the property whose owner obtains TDRs may be developed to a greater extent than existing laws would otherwise permit. Although governments initially allocate TDRs, the value of TDRs is determined by private parties who may trade or sell them. Such rights are explicitly authorized in about half of the states.[127] It may be important to note that although the Supreme Court has considered cases involving TDR regimes twice, it has never ruled on the constitutionality of TDRs themselves.[128]

To be sure, TDRs may be difficult to implement. One scholar has summarized the issues as follows: "TDR proposals include major administrative and bureaucratic procedures. The administering authority must identify the sites from which the development rights . . . [have been] transferred. A basis must be determined for selection" and "[t]he authority must identify where the development rights may be transferred."[129] Aside from the logistical concerns, TDRs would not necessarily be

development potential traditionally associated with land. Under this approach, an initial level of permissible development is specified . . . . If the local zoning board determines that a tract of land may be developed to a density lower than the standard, the owner of the land thus designated is permitted to sell the unusable development potential.").

127. Andrew J. Miller, *Transferable Development Rights in the Constitutional Landscape: Has* Penn Central *Failed to Weather the Storm?*, 39 NAT. RESOURCES J. 459, 468 & n.49 (1999) (indicating that twenty-two states authorize TDRs).

128. *See* Suitum v. Tahoe Reg'l Planning Agency, 520 U.S. 725, 728 (1997) ("[W]e have no occasion to decide, and we do not decide, whether or not these TDR's may be considered in deciding the issue whether there has been a taking in this case, as opposed to the issue whether just compensation has been afforded for such a taking."); Penn Cent. Transp. Co. v. New York, 438 U.S. 104, 122 (1978) (declining to decide on the question of "whether the transferable development rights afforded appellants constitute 'just compensation' within the meaning of the Fifth Amendment").

129. SANDY F. KRAEMER, SOLAR LAW: PRESENT AND FUTURE, WITH PROPOSED FORMS 160 (1978); *cf.* Jesse L. Matuson, Note, *A Legislative Approach to Solar Access: Transferable Development Rights*, 13 NEW ENG. L REV. 835, 854 (1978) (arguing that likely transferees could include property owners outside of the area burdened by the solar regime, who own "land where their use will not be objectionable due to a solar permit").

valuable in all locales: they work best in dense urban areas, where land is scarce and values are high, because in those situations, the ability to build more densely than normally allowed is especially valuable. Some scholars have indicated that even where they are implemented, TDR programs do not generate much activity in trading development rights, and the activity that is generated does not necessarily achieve the substantive goals of the programs.[130] Criticisms of TDRs are serious and many have merit. Yet in the absence of alternative creative means of compensating losers in dense areas where solar regimes are perhaps most difficult to enact, TDRs remain a useful possible route to achieving efficiency and compensating losers in a fair manner.

Indeed, though seldom used, TDRs have been effective in controlling development in large, densely populated cities, in environmentally sensitive areas, in areas that house endangered species, and in historic neighborhoods.[131] In the historic preservation context, for example, a property owner might find that a local preservation ordinance prevents her from constructing a second-story addition to her one-story historic house, even though the zoning ordinance would otherwise allow homes "with heights up to two stories" in that zone. Instead of simply denying her petition for an addition, the local preservation board might allocate a TDR consisting of "one story of development" for her to sell to neighbors whose properties do not fall under historic preservation review. A neighboring owner of a two-story new home, who would otherwise be unable to construct a third story because of the two-story restriction of the zoning ordinance, could purchase the TDR and construct a third story. A TDR thus has great value to both its giver and its recipient. Moreover, TDRs function to save restrictions on development from unconstitutional takings challenges, because they represent "just compensation" for regulatory restrictions

130. Ari D. Bruening, *The TDR Siren Song: The Problems with Transferable Development Rights Programs and How to Fix Them*, 23 J. LAND USE & ENVTL. L. 423, 424 (2008) (citing statistics which demonstrate this point).

131. *See* W. Wade Berryhill & William H. Parcell III, *Guaranteeing Solar Access in Virginia*, 13 U. RICH. L. REV. 423, 442 (1979) (observing that "[t]his sparsely used concept has been applied to control development in larger cities and to preserve environmentally critical areas and historical sites"); Miller, *supra* note 127, at 466 ("TDRs are being used to protect drinking water supplies, endangered and threatened species' habitat, and valuable agricultural land . . . .").

on property.[132] More broadly, TDRs counteract the losing party's negative perception of the windfall received by the winner in other types of governmental allocations.

Although TDRs have been used in a few locales, they have never been used in the solar context. In theory, they could be given to property owners barred from building because of solar access rights obtained by another property owner.[133] The TDR could provide the burdened property owner with the ability to transfer a right to develop that represents the difference between the rights that the property owner had under the prior rules and the lesser rights she now has under the solar access regime. In the imagined scenario, a TDR could be issued to a property owner upon a petition and hearing to determine the size of her burden.[134] By adjusting the TDR to the size of the burden, the psychological impact of excessive windfalls to the benefited party could be mitigated, while simultaneously preventing the opposite result (unjust burdens).[135] In the ideal situation, TDRs could resolve inequities among landowners that result from governmental allocations of solar rights by providing some compensation to burdened landowners.[136]

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132. The *Penn Central* takings case has influenced lower courts to uphold local governments' uses of TDRs even though the Supreme Court declined to opine on whether the TDRs represented "just compensation" under the Takings Clause in that case. *See Penn Cent. Transp. Co.*, 438 U.S. at 122; *see also* MILLER ET AL., *supra* note 17, at 10 (explaining that TDRs might avoid takings challenges but that takings challenges "would probably only arise in commercial and industrial zones where a building could be higher without shading its neighbor, but where expansion is constrained by a development rights restriction"); Matuson, *supra* note 129, at 838 (arguing that in the solar rights context TDRs could "prevent[ ] a solar access law from being invalidated as an unconstitutional 'taking without just compensation' due to restraints on an adjoining landowner's ability to intensely develop his land").

133. *See* HAYES, *supra* note 39, at 208 (suggesting that TDRs could be applicable "[w]here there is no present shading, but shading would occur if structures were built up to present zoning limits" and "[w]here the authorized but unused density in a zone adjoining the zone with solar units . . . [is] close enough to block solar access"); Goble, *supra* note 38, at 127–28 (describing a system of solar zoning whereby "[a]n owner who wished to construct a building in . . . [ways] that would obstruct more than the base level of insolation would be required to purchase enough . . . [TDRs] to cover the amount of obstruction above the base level").

134. *See* Matuson, *supra* note 129, at 871 (suggesting that a landowner who attends a hearing and "who can show 'substantial reliance interests' should be given transferable development rights").

135. *Cf.* MILLER ET AL., *supra* note 17, at 9 (identifying another unjustified windfall issue addressed by TDRs: "unjustified windfalls to the owners of lots allowed more intense development").

136. *See* JOHN COSTONIS, PROCEEDINGS OF THE AMERICAN BAR FOUNDATION WORKSHOP ON SOLAR ENERGY AND THE LAW, AN INTERIM REPORT SUBMITTED TO THE NATIONAL SCIENCE FOUNDATION 20 (1975) (suggesting that TDRs "may

CONCLUSION

This Article concludes by considering again why a natural resource as valuable as sunlight has gone virtually unregulated in the United States. As the preceding discussion makes clear, one explanation might well be the complexities involved with the allocation and administration of solar rights. With some creativity, these legal complexities may be overcome. Other obstacles, too, may be surmounted, as political forces have begun to focus on maximizing the social utility of natural resources. In the case of sunlight, political attention has concentrated on the solar collector, a clean energy generator that can help free the American economy from its dependence on fossil fuels. Rapidly deteriorating environmental conditions have inspired government to actively promote their use, and a clear solar rights regime can work hand in hand with government incentives to facilitate their adoption.

This Article, drawing from various theories and bodies of law, has identified several key considerations for developing a solar rights regime. It advocates an approach that recognizes sunlight's natural qualities, assigns the initial entitlement to the property owner whose use of sunlight will most benefit society, and works within existing legal forms. Whatever form solar rights take, the default rules matter both to the individuals seeking guidance as to their rights and obligations, and to those who work around the defaults. In offering a fresh perspective on the solar rights dilemma, this Article aims to inspire others to reengage in this critically important question.

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provide a basis for permitting a landowner not permitted to achieve certain densities to receive the cash equivalent for his loss"); Berryhill & Parcell III, *supra* note 131, at 443 (arguing that TDRs address inequities among landowners).