

SECURING SOLAR ENERGY AIRSPACE PROPERTY RIGHTS

1.3 SECONDS TO SUCCESS!

ALL THINGS IN MODERATION

AND

DO NO HARM...

(A day without sunshine, is like, well, NIGHT!)

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ABSTRACT
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Renewable energy resources, such as energy from the sun, is here to stay, has become cost competitive² and is a viable optional supplemental energy resource. As such, defining property rights in such energy resource is no less of importance than the historical defining of property rights regarding mineral energy resource assets such as oil and natural gas.

This paper provides a refresher and new look at sunshine property rights (*right to light*) and the airspace through which it travels - which historically has been confusing and erratic. While the paper is based much on United States jurisdictional particulars, many of the principles discussed are universally applicable.

A guiding principle put forward as a foundational Charter of such rights is to invoke the concept of:

ALL THINGS IN MODERATION AND DO NO HARM...

The paper:

- Restates what the solar potential is all about;
- How the unique property characteristics (its wave/particle duality) of solar energy influences sunshine property right definition as well as the logical application of the rule of capture;

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² ...“Renewable energy technologies are now a major global industry. Wind and solar PV have led recent growth in renewables-based capacity... Renewables have overtaken coal as the largest source of power generation capacity and are the second largest source of electricity supply. Renewables make a modest contribution to heat and transport and while progress is slower they have huge potential in their sectors....Renewables bring environmental, economic and energy security benefits....The competitiveness of renewable energy is rapidly evolving, with falling costs set against the broader energy system developments....”, International Energy Agency, *World Energy Outlook 2016* (2016).

- Summary of the history of solar property right advocacy (from ancient Rome/Greek days to the present and beyond);
- A new age for defining and valuing solar/airspace property rights;
- A suggested new age methodology for determining the foundation and resolution of solar property rights and its value and invoking the ***ALL THINGS IN MODERATION AND DO NO HARM***, principle; and
- *1.3 seconds to success* is in reference to the quantity of sunshine energy that strikes the earth every day that is equivalent to the same total energy demand consumed on earth for an entire day.

THE SOLAR POTENTIAL

The history of energy consumption on earth transitioned from burning renewable wood (a 'carbon' fuel) to predominately consuming non-renewable fossil fuels – either way, a technology understood carbon economy. And from a bang for your buck view point, a gallon of fossil energy derived gasoline has more energy punch than a gallon bucket of wood or a gallon of sunshine.

In addition to profit motivated values associated with energy resources, there has been since the beginning (and that's a long time ago) on-going debates and disputes over property rights as to, *Who owns energy resources?*

During smoky wood burning days, there was plenty of wood to cut down and the rule of capture prevailed (you owned what you could harvest, assuming no trespass on land owned by another). Essentially little capture competition, given low population numbers. (On occasion a lazy wood hunter would conveniently steal by stealth, or confrontation, sometimes deadly, and cart away a cord of wood whose labor was expended by another to capture such). Thus wood ownership was pretty well defined.

In time, smoky wood energy resource was displaced by preferred, more bang for your buck, fossil fuels (exchanging undesirable smoky combustion exhaust emissions for desirable transparent carbon dioxide emissions). However, finding coveted fossil fuels hidden in the ground, is expensive, requires unique technical and commercial skills and is located in much smaller geographic areas (think finding a needle in a hay stack). Consequently, defining property right ownership in fossil fuels (aka mineral resources) became much more complex than wood ownership rules, and debates and disputes (think World War II) continued to refine ownership rights.

In contrast, while wood and fossil fuels have qualities of being touchable (tangible assets), and ownership rules more readily understood when one can hold and possess an asset, comparable property right ownership rules regarding intangible solar and wind energy resources have historically been subject to much confusion and erratic decisions. 'Owning' wind or sunshine has been fraught with skepticism, even though sunshine warmth and light were coveted assets in ancient Rome and Greek times. (Thank goodness for that solar option, else the space programme would be grounded because of the impracticality of attaching a huge fossil fuel tank to power space shuttles, space stations and other intergalactic vessels).

The earth's economies will continue to be reliant on carbon fuels for quite some time because of the legacy use of carbon based energy resources and its associated development of technologies and markets dependent on carbon. Even so, supplementing non-renewable carbon fossil fuels with renewable alternative fuels, including solar and wind, is good business. Optionality in any economy is good and results in an efficient market when there are choices. In addition, developing renewable non-carbon reliant energy sources at a measured pace is a smart thing to do to allow a sustainable³ and methodic

³ Sustainable: meeting the needs of the present without compromising the ability of future generations to meet their own needs.

advancement in technology, cost reduction and transition to a dominate renewable energy economy when non-renewable source supplies eventually become depleted. And regardless how strongly one feels about the cause and effect of carbon emissions into the atmosphere and the greenhouse effect, derived from burning fossil fuels, supplementing energy demands (think sunshine energy displacing smoky wood) with ‘pollution free’ energy resource supplies, is not a bad thing to pursue.

Just as important, natural sunshine and wind renewable energy resources are ‘free’ of charge, or at least included.

The International Energy Agency World Energy Outlook 2016 report cites for 2020 the world’s estimated total energy demand at 14,576 million tons of oil equivalent (Mtoe), or 578 quadrillion BTUs⁴ per **year** (comprised of 87% from oil, gas, coal and nuclear and the balance of 13% from renewable energy sources: hydro, bioenergy, other (solar, wind, etc.)). On a daily basis, (578/365) 1.58 quadrillion BTUs/d are consumed.

In contrast, the universally recognized quantity of extraterrestrial (outside the earth’s atmosphere) solar radiation energy from the sun (its irradiance or power), also known as the solar constant, striking the outer atmosphere every **day** is approximately equal to 1366 Watts per square meter (W/m²). When that solar irradiance passes through earth’s atmosphere, some of it is (absorbed by water vapor, ozone, carbon dioxide, or deflected), resulting in the average quantity of terrestrial solar irradiance striking the earth’s surface (when the sun is directly overhead, noontime) at 1000 W/m². Based on the earth’s diameter of 7,917.5 miles, the average quantity of solar irradiance power energy striking the earth’s outer atmosphere every day is approximately 142,000 quadrillion BTU/day⁵ and approximately 104,000 quadrillion BTU/day⁶ striking the earth’s surface. And for every second, [104,000/(24hrx60minx60sec)], 1.2 quadrillion BTU/sec strikes the earth surface.

Consequently, each **day** the earth receives ‘free’ solar energy in excess of an equivalent 180 times (104,000/578) the total **yearly** energy demand of the world! I’ve been told that’s a lot of equivalent wood to burn... And that’s just the quantity of solar energy striking the earth. There is one hec’ of a lot more than that not striking the earth⁷ (0.03 quadrillion quadrillion BTU/day – and that makes me dizzy just to think about).

⁴ Quadrillion equates to a thousand raised to the power of fifteen (10¹⁵); 1 toe = 39.65 MMBtu (million BTU); 14,576 M (10⁶) toe x 39.65 MM(10⁶)Btu/toe = 578 x 10¹⁵ BTU or 578 quadrillion BTUs.

⁵ For simplification purposes, assume a flat disc area of the earth exposed to direct sunlight: Area = $\pi * r^2$ (d/2)² (d=diameter), $\pi * (7,917.5/2)^2$ miles = 49.2x10⁶ square miles or 127 x 10¹⁵ square meter; times 1366 W/m² = 1734 x 10¹⁵ Watts, equivalent to 142,000 quadrillion BTUs/day.

⁶ 142,000 x (1000/1366) = 104,000 quadrillion BTUs/day.

⁷ Surface area of a sphere is $A=4\pi r^2$; The sun is 93 million miles from the earth which equals r (radius of a sphere), so the area on which 1366 W/m² of the sun’s irradiance energy is impinging is 1.09 x 10¹⁷ square miles (2.8 x 10²³ square meters) or 312 x 10²⁶ BTU/day or 0.0312 quadrillion quadrillion BTU/day (x 10³⁰)

Or viewed another way, every 1.3 seconds (1.58 per day/1.2 per second), the quantity of sunshine energy striking the earth's surface is equivalent to a full day of total energy demand consumed on earth.

No wonder solar property rights are important. There's a lot of it...just thinly spread out.

(SOLAR) PROPERTY RIGHTS IN A NUTSHELL

Property Rights in General...

- Perhaps next to human rights, property rights are ranked second to none, especially since property and prosperity are inextricably linked.
- The system of (ideally private) property ownership is the most important guaranty of freedom, not only for those who own property, but scarcely less for those who do not.
- Balancing property right costs and benefits produces efficient outcomes – since the difference between prosperity and poverty, at least in an economic sense, is property.
- Two essential elements of property rights are:
 - (1) the exclusive right of individuals to use their resources as they see fit so long as they do not violate someone else's rights; and
 - (2) the ability of individuals to transfer or exchange those rights on a voluntary basis.
- The first and chief design of every system of government is to maintain justice: to prevent the members of society from encroaching on one another's property (rights), or seizing what is not their own.
- Property right value creation as influenced by (i) the **laws of production** (such as electricity generation from solar energy) and (ii) the **laws of distribution** (such as access to sunlight or distribution of solar energy generated electricity), have been the source of much mischief. The **laws of production** are scientific and immutable, while those of **distribution** are the product of man (the mischief source...) and manipulated through legislation or bargaining (and not physics). It is only because the control of the means of **production** (think unlimited sunshine from the sun) is divided among many people acting independently that nobody has complete authority.

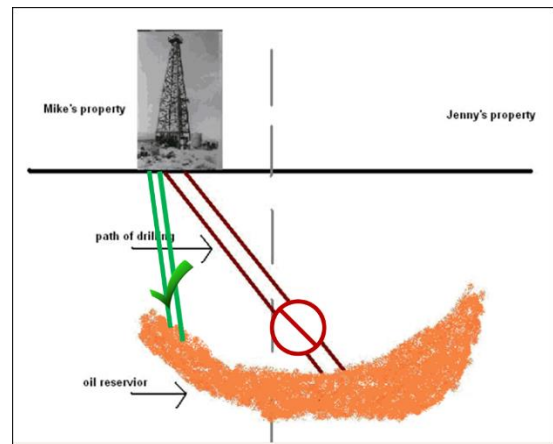
Solar Property Rights in Particular

Access to solar energy property rights, at least regarding the United States legal system, except in a few limited circumstances, has historically not been robustly embraced – as evidenced by the challenges a property owner encounters to enjoy or utilize a defined amount of sunlight on their parcel and to defend that right as against other property owners through whose property the sunlight must travel.

The property law of the **rule of capture** (which this paper argues should be part of the consideration when assessing solar property rights) – and its corollary: first in time – first in right, entails 'ownership' in property, not then 'owned' by anyone, by virtue of a capture effort by the first to do so. Examples include:

- (i) **wild animals** – the prey (unless protected by some rule of law such as ‘bag’ limits or endangered species and property rights of others are honored such as no trespassing) can become owned when captured by a hunter (think deer or duck hunting);
- (ii) **lost property at sea** becomes owned by the efforts of the treasure hunter (think sunken ship generally presumed to be abandoned property and a legally captured treasure trove of chests filled with (hopefully) gold coins; think also one’s garbage which generally is considered intentional abandoned property and the dumpster diving investigator capturing discarded trash that reveals interesting personal information that could be marketed to others);

(iii) **producing oil** (absent some government rule regarding conservation such as pooling or unitization) from an underground pool of the black gold whose subterranean reservoir container spans across the boundary line between two different land and mineral owners, can effectively be drained (rule of capture) by one party from another’s property, provided such drainage is as a consequence of the ‘fungible’ oil migrating across the boundary line and



not by an intentional trespassing act of drilling a (slant) bore hole into another’s property (think two straws in a milkshake and whoever sucks the hardest and quickest will capture – and own - more of the desired delight) ; and

(iv) since sunshine from the sun is likewise subject to the rule of capture – the person who captures it, owns it – but the more honest argument over solar energy property ownership is more about access to the *airspace*⁸ medium through which the sunshine passes, more so than the sunshine itself. So solar energy property rights is really about airspace rights. For example:



- a. Sunshine from the sun that passes directly from outer-space into a person’s airspace property and captured is then owned by that property owner. Even so, since the property owner has limited, height restricted airspace rights in today’s societies (think airplanes that can freely fly over a person’s property in airspace



⁸*airspace*: commonly used term when inside (terrestrial) earth’s atmosphere, and *outer-space* or extraterrestrial being the term used when beyond earth’s atmosphere, since ‘out there’ there is no air.

outside the property owner's height restricted owned airspace), the sunshine capture event can be adversely affected by an airplane's shadow 'legally' obstructing and blocking sunshine...thereby disrupting (even though momentarily), without recourse by the landowner, its desired access to overhead sunshine assets.

- b. Now expand this analogy to the airspace also owned by adjacent neighbor property owners through which sunshine passes before entering a landowner desiring to capture such sunshine (think an adjacent landowner who has solar panels from which electricity is generated from sunshine). Like the airplane, can the neighbor landowner 'legally' obstruct or block sunshine – *the shadow knows* - in its own airspace (such as by cultivated trees or building tall structures), without recourse by the adjacent landowner desiring to capture sunshine? After all, sunshine is somewhat ubiquitous and its intensity variable (think likely sunburn at noon vs unlikely sunburn at sunrise or sunset), coming from all directions depending on the time of day (sunrise to sunset) and season (earth's declination due to summer and winter solstices), coupled with natural sunshine blocking effects from cloud cover or lunar eclipse. Consequently, a neighbors obstructing shadow is likewise variable (not including night time when the earth's revolution causes much of the earth itself to block sunshine, thus an unavoidable 'natural' shadow). And unless the landowner desiring to capture sunshine is surrounded by tall shadow producing structures (or is affected by extensive and persistent natural cloud cover), it arguably will always have access to some (intense) sunshine during some parts of a day. So, intermittent sunshine blocking complicates sunshine access right arguments – access to all or some debate unfolds. *How to find a balance...???*

Society, whether by government oversight (statutory) and/or private commercial mutual negotiation (the preferred free market alternative), will be involved in resolving sunshine airspace rights access and use by all relevant stakeholders when solar property rights are desired – since there are many property right issues and values being balanced by all parties concerned. Just like society's decision to accept airplanes as a beneficial technology that led to landowner airspace ownership height limitation restrictions (adjusted by additional restrictions established by sovereign national territories – don't want to accidentally fly over a country's airspace without permission, else there might be an encounter with a ballistic defense device) – in the evolving age of desired renewable energy sources (such as solar and wind), which has been demonstrated as being an optional energy resource to complement carbon based non-renewable energy resource supplies, which can just as effectively define a balanced resolution to airspace right use and access by all parties, no matter where the airspace is located - The ***ALL THINGS IN MODERATION AND DO NO HARM*** principle of equity and fair play.

Two motivating drivers typically cited in support of solar property rights include:

- (i) Solar rights have value and should be protected due to: property resale value; premia for naturally lit property; higher productivity from natural lit work spaces; reduced operating

costs associated with heating, cooling and lighting; food production; and distributed electricity generation; and

- (ii) Solar rights have additional value in most jurisdictions, and in the United States in particular, regarding offsetting its overdependence on (i) fossil fuels and (ii) imported oil and natural gas, (recall foreign oil embargos that disrupted U.S. energy security, prompted U.S. governmental policy promotion of fossil fuel alternatives, renewable energy options such as solar and wind) as well as the green thing to do in regard to reduced greenhouse emissions.
- a. However, U.S. overdependence concerns regarding imported fossil energy sources are now less a concern when considering...
 - i. U.S. policy now permits oil and gas producers to export their U.S. domestic produced oil and natural gas (primarily because of profit motivated enhanced economic value available in non-U.S. foreign markets - and not just because of over supply) ...thus much less concern about overdependence (and energy security) on imported foreign fossil energy sources; and
 - ii. The diplomatic awkwardness (putting aside economic incentives-exchanging oil for U.S. dollars) as to why fossil energy rich countries should be subjected to a one-way flow of fossil energy: *you (the non-U.S. foreign source) must send us (the U.S.) and deplete your oil supplies but we (the U.S.) don't have to send you ours and instead bank ours for future secure use...* does not resonate well in diplomatic circles.

A NEW LOOK AT DEFINING SOLAR PROPERTY RIGHTS AND ACCESS

Access to the right to use or own or possess property (after all, '*possession is nine tenths of the law*') – whether that property is...

- (i) **tangible**, being something that can be touched, such as land or mineral resources extracted from land or a tool or even a stick – or
- (ii) **intangible**, being something that can't be touched but has value and a use, such as a patent or trademark intellectual property right or a song –

are fundamental property right ingredients in the functioning of world's societies.

Property use, ownership or possession have always been defined and regulated by societies...whether as a consequence of evolution (rule of law) or revolution (rule by conquest). ...*This land was made for you and me...* This defining is even more pronounced since, in regard to land, each square foot is unique as there is no other.

Property right rules change over time as societies change. When land was plentiful and the world's population small, there was open space for anyone to freely move about to accomplish desired property use and ownership objectives – be they agricultural, land use development or access to unobstructed sunshine for warmth and light. As the population grew and space became crowded and technology

advanced, property uses changed and with that comes change to society's property right rules. For example, if there were no hydrocarbon energy resources and only solar and wind energy resources, society's solar and wind property right access rules would be quite different. (...*Times they are a changin'*...).

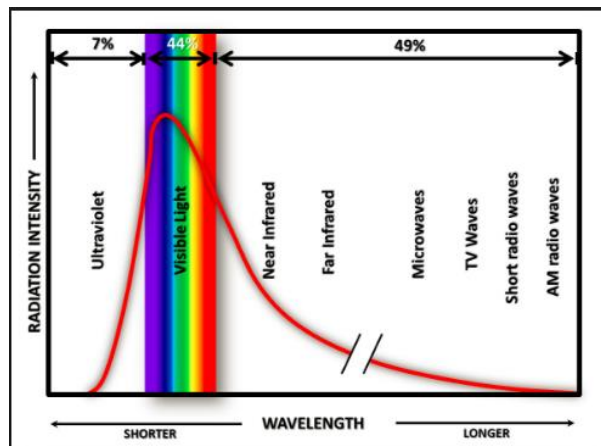
Prior to...

- (i) invention of the incandescent light bulb (followed by modern efficient florescent and then LED lighting – *make light lumens not heat*),
- (ii) modern heating systems,
- (iii) availability of optional energy supply sources (electricity, natural gas, fuel oil, etc.) and
- (iv) transportation mobility promoted by the internal combustion engine,

solar access rights were more critical to normal subsistence and thus enjoyed greater protection.

Societies have long recognized the unique 'non-renewable'⁹, 'one of a kind' value and property rights of 'tangible' energy mineral resources (such as oil, natural gas, or coal), whether in the ground or when extracted. And without society's recognition in some form of property rights in such resources, their value and use would be of no consequence. An old adage in the oil and gas industry is...'*No Lease, No Grease*'...emphasizes the importance of recognized property rights. Mineral ownership property right issues are more robust in the United States, where private ownership of mineral rights is the norm whereas in other jurisdictions, the Government is the sole owner of mineral rights.

In contrast, the spectrum of electromagnetic radiation energy emitted from the sun¹⁰ and that extremely small portion captured by the earth (collectively made up of 'visible' light detected by the human eye, sandwiched in between, long wavelength infrared energy that creates heat, and harmful short wavelength ultraviolet waves that causes sunburn and can damage human cells), conventionally referred to as 'sunlight' or 'solar energy', is just another form of an energy resource, but society's property right recognition of such resource has had an evolutionary legacy of confusion and uncertainty. Perhaps that uncertainty is influenced in part by solar radiation having complex qualities (so say the quantum physicists) of being both a wave (intangible) and particle (tangible) energy resource (- the wave/particle duality).



⁹ Non-renewable: once produced, is for all practical purposes gone forever – since the recipe for making non-renewable hydrocarbons includes a subterranean baking kitchen that requires millions of years of cook time at the right temperature and pressure settings, with the addition of organic matter ingredients such as vegetation or aquatic animal remains.

¹⁰ Sun...earth's solar system nuclear fusion power plant.

Sunshine property right confusion is even more pronounced when viewed from the perspective that solar radiation, having played a part in producing (i) vegetation (via photosynthesis) and (ii) climate promoted land and water animal reproduction (via vegetation eating organisms – the first vegans - then being consumed by organisms eating organisms – the meat eaters, and so goes the food chain), which were legacy hydrogen and carbon ingredients (sourced from vegetation and organism organic remains) required for manufacturing subterranean oil, natural gas and coal – in effect the conversion of solar radiation into hydrocarbons. (As an aside, solar radiation is also part of the building block for wind energy). The confusion continues since in a value sense...a gallon of gasoline derived from fossil energy has intrinsically more fuel value¹¹, more bang for the buck if you will, than a gallon of sunshine. Claiming ownership in a gallon of gasoline (or oil, natural gas, or coal energy resource) has historically been a readily recognized tangible property right, than ownership in a gallon of intangible sunshine.

Further, solar energy is a composite of various wave lengths of electromagnetic radiation energy (long wavelength infrared used for heating; x-rays shorter wavelength than ultraviolet used in the medical field; and in between wavelengths is visible light – what us humans need to see at night). And then there are semi-conductor solar cells that:

- utilize the photoelectric effect to produce electricity, by photons (energy ‘quanta’ packets of electromagnetic radiation) of visible light striking the solar cell and
- causing semi-conductor material electrons, when energized by the photon quanta, to move as current or electricity.

This photoelectric effect takes place when sun radiation is close to the wavelength of visible light, since longer (infrared) wavelengths don’t have sufficient quanta energy capacity to cause electrons to move; and too short a wavelength (ultraviolet) are too small and too high quanta energy and passes through the solar cell. Thus there is even confusion as to what ‘part’ or component of the electromagnetic radiation spectrum is ‘owned’ and having value – value for heat (long wavelengths), value for electricity (medium wavelengths), value for medical technology (short wavelengths)?...(the three bears trilogy and the weighing of too cold, too hot or just right).

Historically, conventional tangible recognized land property rights has had an influence on the obligations a land owner has in regard to sunshine flowing freely through one’s property unobstructed so that a neighbor has access to such light. (Such captured sunshine by the neighbor then used for valued lighting or electricity generation or heating or aesthetic purposes).

¹¹ The extent of higher fuel value is a little misleading: The gasoline fueled internal combustion engine found in most cars is called a heat engine (it creates heat) and governed by the laws of thermodynamics and the Carnot cycle. It is interesting that the combustion of gasoline is desired to produce heat to create power, yet for various reasons the same system includes a water cooling radiator system designed to simultaneously take away heat which was the initial objective of the combustion process – this is sort of like trying to start that pesky camp fire while your camp partner is simultaneously spraying water on you in the process. This is part of the reason heat engines are only about 25% efficient, only a quart of gasoline out of a gallon paid for and burned, actually ends up being used to create power to move the car from point A to point B (...waste not, want not).

Sunshine property right access confusion is further exacerbated since solar energy is for all practical purposes renewable (will be around so long as the sun fusion power plant is in operation). And since only a small portion of the sun's renewable resource actually strikes the earth, there is an argument that those that wish to use and possess such 'asset' should merely reach out beyond the earth and gain access to essentially an infinite resource extraterrestrial supply (solar energy capturing satellites that beam energy back to earth – reverse of *beam me up Scotty*). Admittedly a more complex alternative...but does have some defense merit if the only other argument is that a few hundred square meters of a neighbor's unfortunate strategically placed one of a kind land airspace property and sunshine obstructions is the only (or at least materially relevant) claimed sunshine asset access route.

ALL THINGS IN MODERATION...DO NO HARM...as there is scant reasoned argument against why sunshine energy resource property rights should not have similar traits as property rights as oil and gas minerals, since 'No Sun, No Fun' like 'No Lease, No Grease' adage would be equally recognized as a sunshine property right.

HISTORICAL CLAIMS FOR SOLAR RIGHTS

With today's societies gracefully recognizing a place for alternative, renewable forms of energy – especially solar - given advances in that technology and cost reductions - to supplement the energy demands of us humans, property rights to sunshine airspace access is of importance.

Balancing the sunshine airspace property rights of one party against the property rights of a neighbor, desiring access to airspace sunshine (especially if light access is required to generate electricity from solar panels) that passes through a neighbor's property – in effect a negative right; (placing limitations against shade creating vegetation or structures that cast shadows on another's property) – are equally competing issues...and finding an equitable balance is not easy and fraught with pitfalls.

History of right to light...a trip down memory lane...

The journey of solar property rights has been bumpy (...*think desired tan vs undesired sunburn*...)...

Early Broad Ownership Rights

When land was plentiful and population small, a land owner could, absent directly harming their neighbors (such as release of objectionable odors, smoke, sound, etc.), use and develop one's property as one saw fit. The maxim *Cujus est solum ejus est usque ad coelom et ad inferos* was the law of the land – *The owner of the soil owns also to the sky and to the depths* was followed in legal systems as early as the 13th century. Thus a land owner in effect 'owned' the sunshine that landed on one's property. With the introduction of airplanes, as an example society change, broad ownership right maxim's had to change with the times – now land owners have airspace height restrictions in which they can claim 'ownership' and the *ad coelom* maxim no longer broadly accepted as law of the land.

Ancient Light Doctrine and Other Early Practice

Sunshine had recognized property value associated with lighting, heat and even aesthetics, and societies in special cases recognized certain property rights to light which could affect the conduct of neighbors in regard to not blocking sunshine that passed through one's property onto another's.

The Roman's enjoyed sun rooms and enforced solar rights as an important source of light and heat, protected through prescriptive easements (discussed later), government allocations and court decrees.

Ancient Greeks protected solar rights through rigid land planning schemes that oriented streets and buildings to take advantage of light and passive solar heat.

The English doctrine of *ancient lights* became applicable whereby if a landowner could demonstrate that for a period of [20] years they had continuous unobstructed access to light, the doctrine could be invoked to prevent a neighbor from doing anything on its property (a negative easement) that would obstruct such established access. The amount of light protected was measured by the amount of indirect sunlight required to illuminate half a room beyond the "grumble line" – the point beyond which a normal person might complain about lack of light. In modern times this doctrine has been rejected in most jurisdictions, mainly based on grounds of impeding competing land use development.

Private Easement Rights

Next came mutual negotiations (by way of a grant, covenant, lease or agreement) between parties, primarily via *easements*, to contractually determine ('guarantee') rights to light (i.e., letting free market bargaining principles determine right to light terms and conditions).

An easement is a beneficial right which one landowner, the 'dominant tenant,' has on or over the real property of a neighbor, the 'servient tenant'. Such legal agreements often are restrictions or burdens on land use (so called 'covenant running with the land') which requires subsequent owners and assignees to likewise comply with easement terms and conditions. (The covenant easement contrasts with a personal easement which is only enforceable among the original parties who established the easement).

Easement negotiations can oftentimes be difficult to reach consensus especially if the servient tenant believes the grant of an easement could adversely affect the price and desirability of their property (potential buyers might see the burden of an easement as being detrimental to the value and use of the property). Negotiated easements can be time consuming to conclude, can have high transaction costs normally involving attorneys and need to understand and comply with (sometime ambiguous) local laws.

Four common historical 'common law' recognized 'negative' easements (agreements of a property owner not to do something – such as agreement not to obstruct the passage of sunshine through the servient tenant's airspace onto a dominant tenant's property, in contrast to affirmative easements where a dominant tenant has the right of access or use of a servient tenant's property, such as use, by an adjacent land locked dominate tenant, of a road located on a servient's tenant's property)

include protection of:

1. Flow of air (servient tenant can't build structures that unreasonably obstructs the flow of air across its property, preventing such air from reaching the dominant tenant property);
2. Light access;
3. Artificial streams of water; and
4. Ensure the subjacent and lateral support of buildings or land (servient tenant can't dig holes on its property that could cause the adjacent dominant tenant property to be damaged such as cave in or sloughing off)

Most easements are intentional acts of mutual agreement...though in some very limited cases an implied (prescriptive) easement may be enforced because of special circumstances. For example, 'prescriptive easements' have been defined as the process of acquiring an easement by continuous use, rather than by asking the owner of the property...Prescription applies to easements, as 'adverse possession' (so called 'squatter's rights') applies to real (land) property. Some jurisdictions don't consider lack of access of light from adjoining property as being a prescriptive right since such lack of access is not considered an adverse taking (doesn't have squatter rights characteristics since the servient tenant is not actually taking light from within the dominant tenant property airspace). Further, many jurisdictions in the U.S. follow the classic 1959 *Fontainebleau*¹² case that holds there is no implied easement to light and air. (Implied easements are unusual and typically require (i) *unity* of ownership in property, (ii) parties *intent* to create an easement by their action and (iii) *necessity* for the easement, with the classic implied easement example being a roadway for ingress and egress in regard to a land locked parcel of land. These elements, especially *necessity*, makes it challenging to justify a right to light solar implied easement (especially where *necessity* is tempered by the typical solar energy access case, some sunshine is always available to strike a party's property during the day depending on the overhead location of the sun – thus the debate focusing on balancing all or some *necessity* arises).

In regard to a negative easement granting a dominant tenant access to light, should the servient tenant breach the easement agreement (in effect causing light obstructions contrary to the agreed negative easement term and conditions, be they plant growth or intentional tall infrastructure development shading) the dominant tenant has available enforceable remedies associated with (i) damages, lost value of not being able to produce electricity from solar panels, and/or (ii) injunctive relief, whereby the servient tenant is served a court order to prevent or eliminate light obstruction circumstances (and failing to do so can result in fines or even incarceration (cross bar hotel jail time) until the ordered act is complied with).

As an aside, where both parties to a negotiation have made substantial investments and cannot conveniently relocate, they may be equally motivated and forced into *Bilateral Monopoly Bargaining* – the economics of each position requires they bargain in good faith to getting to a mutual yes outcome.

¹² *Fontainebleau Hotel Corp. v. Forty-Five Twenty-Five, Inc.*, 114 So. 2d 357 (Fla. Dist. Ct. App. 1959).

Statutory Easement Rights

Some jurisdictions have enacted government approved statutory laws (i.e., a Permit system, Zoning ordinances, Statutory light easements, etc.) that specifically authorize the creation of solar energy (airspace) access easements – and while not necessarily influenced by free market negotiations, does provide a determinate process for securing light access. For example: zoning ordinances could promote sunshine access by influencing building height restrictions, property boundary line set back requirements or size restrictions.

Typical Permit based statutes or ordinances include:

- Before a solar system can be installed, a solar Permit must be granted;
- On application by a solar developer, adjacent landowners to the solar project in which right to light may affect the use of their property, are given notice and an opportunity for a hearing to object to the Permit;
 - Hearing considerations can include: (i) will grant of the Permit unreasonably interfere with land use development expectations in the community; (ii) have neighboring properties already incurred prejudicial expenses or commitments toward conflicting development activities; (iii) will benefits of the Permit applicant and the public exceed any burdens established by grant of the Permit

Once a Permit is granted, it is typically recorded in government land title and notice records and becomes a permanent right to receive unobstructed sunlight in accordance with the Permit (which may have a term limit). Breach of the Permit terms and conditions by an adjacent landowner (or its assignees) can result in the following remedies: damages, costs, injunctive relief and attorney's fees.

Permit Statutes are capable of being subject to being challenged as being too broad and an unconstitutional *taking* of property without just compensation...Governments have the unquestionable right to regulate land use through the use of police powers (what is in the best interest of the public and protection of their health, safety, morals, convenience, order, prosperity and general welfare); however, too much regulation could be interpreted as an unconstitutional *taking* and need for just compensation (similar to eminent domain proceedings and as an example, taking private property for a public road).

A corollary to statutes, are home owner associations (HOAs), which passes quasi-government rules often created for bona fide purposes associated with uniformity or uphold a community's aesthetic standard. However, HOA rules can also impose restrictions (also referred to as *Locally Undesirable Land Uses* or LULUs) which can have adverse effects on solar energy development and access to light, and likewise subject to unconstitutional *taking* challenges.

It is instructional to consider the public nuisance based California Public Resources Code, *Solar Shade Control Act (Assembly Bill 2321) (the Act)*, as a reference for seeking a balance among different owner property rights and access to light – an illustration of addressing: **ALL THINGS IN MODERATION AND DO NO HARM**, principle.

The Act provides *limited* protections for solar collector owners whose devices are shaded by neighboring trees and shrubs. These protections are limited because the Act contains specific requirements that determine which solar collectors are eligible for protections under the Act, including the function of the collector, the manner in which it was installed on the building, and the date an offending shade producing tree or shrub was planted.

The Act cites it is the policy of the state to promote all feasible means of energy conservation and all feasible uses of alternative energy supply sources. The Act prohibits certain tree owners from planting or allowing a newly planted tree or shrub to cast a shadow over more than ten percent of a solar collector on a neighboring property at any one time during the hours of 10:00 a.m. and 2:00 p.m. (as opposed to sunrise to sunset) a some vs all standard of access.

However, the Act allows trees and shrubs (as well as subsequent replacement trees and shrubs) to grow and shade solar panels without penalty as long as the original tree or shrub predated the neighboring solar collector. Also, the Act specifically exempts all trees planted, grown, or harvested on timberland or on land devoted to the production of commercial agricultural crops. Other Act exemptions include: (i) tree or shrub that is subject to a city or country ordinance (exemption applies only to trees planted and maintained by the municipality itself, and not to trees owned by private citizens); and (ii) owners of passive solar systems (architectural designed green buildings which optimize heating and cooling affects such as by orientation to the sun, building materials used and energy efficient windows and glass, often associated with Leadership in Energy and Environmental Design (LEED), a rating system devised by the United States Green Building Council (USGBC) to evaluate the environmental performance of a building and encourage market transformation towards sustainable design) that would cast a shadow over a solar collector on an adjacent property, if the court finds that the net energy savings from the passive solar system would exceed those of the shaded solar collector.

Violations constitute a private nuisance (and not a criminal violation). The solar collector owner is solely responsible for enforcing the protections afforded by the Act. This is essentially a two-step process. First, the affected solar collector owner must provide the tree owner written notice requesting compliance with the requirements of the Act. Second, if the tree owner fails to comply with the written notice requesting compliance with the Act, the affected solar collector owner may bring a private nuisance suit under the Act against the neighboring tree owner to remedy the solar shading.

Nuisance (Private and Public)

The common law maxim, *sic utere tuo ut alienum no laedas*, requiring landowners to use their property “in such a manner as not to injure that of another”, helps form the basis for nuisance law. Nuisance involves the intentional invasion of one’s property that causes significant harm of a type that would be suffered by a normal person in the community or by property in normal condition and used for a normal purpose. (Thus, nuisance claims brought in regard to a person’s property being occupied by shade producing trees or a second-story addition permitted under applicable land use laws, are often dismissed

since courts can rule a neighbor reasonable land use exists that can't support a common law nuisance claim for blocking sunlight). In the absence of an easement, some landowners may possess a private (limited to discrete parties – example claim being a 'spite fence' motivated by malice) nuisance claim in contrast to a public nuisance claim in which the public as a whole is affected. Thus, in the solar world, a nuisance claim is generally based on unreasonable and intentional obstruction of access to sunlight flowing across a neighbor's property resulting in interference with an adjacent landowner's use of sunlight for solar energy. Courts are conflicted with nuisance claims as a consequence of

balancing ...

- (i) the social utility of employing solar energy systems outweighing the conflicting airspace use, and whether or not a court should protect the solar energy user by enjoining the solar interference...

against...

- (ii) prevention of the stifling of land development, especially if the claimed nuisance involves large and extensive use of the servient tenant land, which outweighs the dominant tenant social utility of solar energy; as well as...
- (iii) contrasting solar panels as 'hypersensitive' land use and like outdoor movie theatres not being permitted to benefit from a nuisance claim (and to the contrary, solar panel glare reflections impacting automobile drivers, reflective heating of adjacent buildings, neighbor irritation, may be viewed as a reverse nuisance claim).

Case Law

Various U.S. centric case law, involving claims for access rights to light, generally encompasses:

- A balance between easy and rapid development of property vs the social utility of renewable (solar) energy access...**ALL THINGS IN MODERATION!**;
- Rights of landowners to use property as they wish --within limits that do not cause physical damage to a neighbor;
- Is sunlight being valued for aesthetic purposes or for illumination or energy generation?;
 - [under a Government's police power in regard to society's enjoyment of aesthetic appearances, a 'taking' is not at issue – and thus compensation is not due - if the exercise of the police power **only incidentally** (i) restricts a use, (ii) diminishes value or (iii) imposes a cost in connection with the property]; and
- The extent of a constitutional 'taking' of airspace property and need for payment of just compensation vs exercise of uncompensated police power to manage land use for the public good

NEW AGE DEFINING AND VALUING SOLAR/AIRSPACE PROPERTY RIGHTS

Solar property right definition and valuation can be complex. Bargaining between parties to establish their respective entitlements and value is one of the oldest traditions...no less perfected by negotiating adept North African Berbers and their willingness and patience to defer resolution of an issue for future generations or the bargaining skill of silk road trade route fine linen and spice merchants. While 'Fair



Market Value' principles are relevant...*what a willing buyer is willing to pay to a willing seller and such willing seller is willing to accept an offer, and neither are acting under any influence or compulsion to enter into a transaction...* valuation and defining solar property rights are not convenient processes to establish.

For example, valuation and solar ownership right theories and processes encompass the following list of methodologies:

Fundamental characteristics of sunshine when developing a solar governance regime (consulting learnings from water law and associated riparian rights), includes,

- (i.) focusing on the *use* of the solar energy, and not mere *possession or capture*;
- (ii.) in the absence of mutual agreement, consideration given to granting initial (solar right) entitlements to the party with the most socially beneficial use – or weighing the benefits of a first-in-time first-in-right application standard (either valid so long as there is a social beneficial use); and
- (iii.) protect the initial entitlement through a 'liability' rule – requiring the holders of the solar rights (or the government) to compensate and/or award procedural safeguards (ex. time limits, space restrictions) to any burdened ('loser') party (the property owner whose property airspace is restricted by the solar right holder).

The selected regime should ...

1. Recognize the '**relativity**' of the solar energy resource: a solar right generally benefits one property owner at the expense of another, and then balances these interests against one another; and
2. Recognize the '**flexibility**' needs regarding the capture and use of the sunshine resource (due to sunshine's travel path across many airspace properties affected by topographic, latitudinal, geographic and other location-specific conditions).
 - a. And drawing on legacy learnings – depending on the jurisdiction - from water law (ranging from: **reasonable use rules**-even if damage to a neighbor; **strict liability rule** prohibiting use of water that in any way adversely affects a neighbor; **common enemy rule** allowing use of water even if adverse impacts to neighbors or the users property; **prior appropriation doctrine** – by following strict procedures, any party – does not have to be a property owner - can obtain water rights) , and
 - b. Such **flexibility** is achievable in regimes that combine dual strategies (designed to allocate rights to complex fugitive resources) of...
 - i. **Governance Strategy**, for example, by government permitting or zoning regulations, or by private agreement, or
 - ii. **Exclusion Strategy**, where property boundaries are recognized that owners cannot 'cross' (ex.: prevent neighbors from taking water; prevent solar owner from restricting its neighbor's solar airspace)

Entitlements subject to self-made options (ESSMOs), requires one party to package their subjective valuation (of their solar property right) in the form of an option, while allowing the other party to act unilaterally on that option. A bargained for outcome.

Cosean bargaining is voluntary bargaining between parties (whereby if transaction costs between parties are sufficiently low and an entitlement (solar property rights) has been assigned to one of them, the parties will negotiate the transfer of the entitlement to its highest-valued user).

A change in **Pareto efficiency**: if it makes at least one person better off without making any person worse off, which is in contrast to the **Kaldor-Hicks efficiency**, that requires merely that the aggregate social benefits of a change exceed the aggregate social costs (which infers some of the participants can be harmed while others benefit, netting an overall net neutral or positive result).

Tiebout-Hypothesis emphasizes the utility-maximizing benefits of neighborhood differentiation, which enables citizens to seek out communities with packages of tax, land use, and other policies that best suit their individual preferences. Variations in local laws can increase social welfare by allowing citizens to “vote with their feet” in selecting and moving to communities to reside, that best suit their own respective preferences. Criticisms of Tiebout-Hypothesis include an underlying assumption of perfect mobility of the citizenry and perfect information.

Calabresi and Melamed Cathedral Model (which this papers suggest, admirably approaches the **ALL THINGS IN MODERATION AND DO NO HARM**, principle) – is a framework of entitlements, property rules and liability rules; a device for comparing and analyzing resource allocation rules. Details follow...

Some landowners are reluctant to invest in solar panels because they fear that a neighbor will erect a structure or grow a tree on nearby property that shades their panels. Existing statutory approaches to protecting solar access for such landowners vary widely across jurisdictions, and some approaches ignore the airspace rights of neighbors.

Calabresi and Melamed's¹³ "Cathedral" framework of property and liability rules, a versatile analytical tool in law and economics, can be used to compare and analyze and evaluate solar access statutes and resource allocation rules.

An excellent paper on a discussion of the Cathedral framework is found at: Troy A. Rule, *Shadows on the Cathedral: Solar Access Laws in A Different Light*, 2010 U. Ill. L. Rev. 851 (2010). Key messages from that excellent article (annotated by the author of this paper) are summarized below.

Applying the Cathedral Model involves determining ...

¹³ Guido Calabresi & A. Douglas Melamed, Property Rules, Liability Rules, and Inalienability: One View of the Cathedral, 85 HARV. L. REV. 1089, 1105-06 (1972)

- (1) which party should hold (own or use) the scarce legal "entitlement" (the solar property airspace access right) at issue; and
- (2) whether to protect the entitlement with a "**property rule**" or a "**liability rule**".

An entitlement is protected with a **property rule** if "other parties wishing to acquire the entitlement from its holder can do so only by purchasing it in a voluntary transaction at a price acceptable to 'its holder.'

An entitlement is protected with a **liability rule** if a party other than the entitlement holder has a right to purchase it at a price equal to its objective value as determined by a (usually governmental) third party.

The Cathedral Model can be more easily understood through an example. Suppose that one party (polluter) discharges pollution into a publicly accessible water-way that causes injury to other parties (the public victims). Applying the Cathedral Model to the parties' conflict would involve first (1) determining whether the polluter should be entitled to pollute or whether the victims should be entitled to pollution-free water. Once the entitlement is assigned, one must then (2) determine whether to protect the entitlement by a **property rule** or a **liability rule**. Applying these two steps yields a total of four possible rules, enumerated as follows:

1. Rule One: The victims are entitled to pollution-free water, and their entitlement is protected by a **property rule** (the victims can obtain an injunction stopping the pollution without having to compensate the polluter);
2. Rule Two: The victims are entitled to pollution-free water, and their entitlement is protected by a **liability rule** (the victims are entitled compensatory damages from the polluter but cannot obtain an injunction stopping the pollution);
3. Rule Three: The polluter is entitled to pollute, and their entitlement is protected by a **property rule** (the victims can neither obtain an injunction stopping the pollution nor claim damages);
4. Rule Four: The polluter is entitled to pollute, and their entitlement is protected by a **liability rule** (the victims have the right to purchase an injunction by paying the polluter its costs of stopping the pollution).

The Cathedral Model can be applied to the problem of solar access. A landowner whose trees or structures shade solar collectors on neighboring property is analogous to a polluter. A landowner whose solar collectors are shaded by a neighbor is a victim. The unwanted shade that damages solar collectors' productivity is analogous to pollution. The below table illustrates the four possible Cathedral Model rules in the solar access context. Various state statutes correspond to all four rules.

	PROPERTY RULE	LIABILITY RULE (Provides a back-up when mutual negotiation – 'Coasen bargaining' – fails; Government favours as low cost rule to
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		them; Though can be administratively and legally expensive to parties; remedial damages can be undervalued)
Entitlement to Solar User (“S”, or victim)	<p>Rule One: S may prevent N from Shading S’s solar panels (an injunction)</p> <p>Public nuisance claims; Public notice rights derived from real estate easement or restriction records (defeats bona fide purchase without notice defense)</p> <p>(Example statutes: New Mexico, Wyoming, Wisconsin, Massachusetts)</p>	<p>Rule Two: S is entitled to damages from N for the reduced productivity of S’s solar panels caused by N’s shading.</p> <p>Private nuisance claims</p> <p>(Example statutes: California, Wisconsin)</p>
Entitlement to Neighboring Airspace Owner (“N”, or polluter)	<p>Rule Three: S has no claim against N for an injunction or for damages.</p> <p>(See Fontainebleau¹⁴; current law in most states; no implied right to light/sunshine access)</p>	<p>Rule Four: S has a right to purchase an injunction or ‘negative’ easement preventing N from having structures or trees on N’s property that shade S’s solar panels.</p> <p>Prone for abuse by ‘free riders’ resulting in activists carrying the cost and negotiation burden</p> <p>(Iowa)</p>

The application of whether Property Rule or Liability Rule should apply is affected on how to define what “entitlement” is (in this paper, entitlement is in reference to one’s property access right to airspace associated with access to sunshine passing through both owned and unowned property).

One argument against an entitlement claim, is that sunshine is not sufficiently “scarce” to warrant property right protection, yet such non-scarcity is largely what makes it such an attractive energy resource. In contrast, exclusive access to the direct sunshine (and the airspace through which it flows) radiating onto a specific location, is unique and scarce.

A landowner, can exclude others from trespassing onto the landowner’s land, with intent by the trespasser to shade the landowners solar collectors, thereby protecting solar access in some cases, but historically a landowner’s trespass claim right to exclude ends at the property boundary line with respect to shading.

¹⁴ Fontainebleau Hotel Corp. v. Forty-Five Twenty-Five, Inc., 114 So. 2d 357 (Fla. Dist. Ct. App. 1959).
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Often, solar panels are situated close to southerly property lines, and the altitude of the sun at relevant hours of day is sufficiently low, that there is a risk of shading by neighbors. A landowner who is contemplating installing solar collectors thus often demands assurances that neighbors will not position structures or vegetation in their airspace that would shade the collectors. Because solar access conflicts are ultimately disputes over use of airspace, not sunlight, the entitlement in a Cathedral Model analysis of these conflicts must be defined accordingly.

Since there can be a substantial departure from established legal precedents, as discussed in the *History of Light* above, policymakers must weigh all relevant costs and benefits of redistributing airspace rights before taking action, the essence of **ALL THINGS IN MODERATION AND DO NO HARM**, principle.

One less costly policy would be to statutorily assign the Airspace Entitlement from Neighbors to Solar Users. Although a law entitling Solar Users to solar access across Neighbors' airspace would reduce Solar Users' up-front expenses and require less government funding than direct financial incentives, it would impose extreme social costs and impacts. Such a law would protect one singular type of use of airspace—solar access—by subordinating to it property right protection for countless other possible uses that could often be more valuable. Such 'draconian' assignment measure is arguably too extreme (questionable constitutional 'taking' compliance; not necessarily in the best interest of society in regard to land use development) when balancing property rights of all stakeholders...not just the solar developer. Further, although Solar Users can be found at nearly every point along the socioeconomic spectrum, there are reasons to believe that the average Solar Users are wealthier than their Neighbors. The up-front cost of solar collectors (though costs continue to decline) and the uncertainty and long recoupment period associated with investing in them make them potentially a 'luxury' item to many landowners. More affluent landowners are more likely to have the cash required to purchase solar collectors or to easily obtain financing. A rule assigning the Airspace Entitlement to Solar Users could thus be characterized as regressive policy, further enriching a more affluent group to the detriment of a poorer one. This unilateral taking option is inconsistent with the **ALL THINGS IN MODERATION AND DO NO HARM**, principle.

A rule assigning competing (monopoly?) airspace rights to Neighbors leads to less litigation over solar access, is less vulnerable to constitutional attack, and arguably has a more progressive socioeconomic impact. However, such unilateral right puts unbridled discretion into one's neighbors, who, without some form of tempering guidelines, has the capability to fully thwart solar property rights. The **ALL THINGS IN MODERATION AND DO NO HARM**, principle is equally violated by this unilateral monopoly option.

The general weight of Cathedral Rule, have historically leaned toward Neighbors being entitled to **reasonable** use of the airspace above their properties without liability for shading nearby solar collectors. Such a rule is consistent with existing law, and would be less vulnerable to constitutional attack, would lead to comparatively less litigation over solar access conflicts, and would arguably have a more progressive socioeconomic impact. This assumes that Neighbors of Solar Users are entitled to reasonably exercisable rights in the airspace above their properties without liability for shading.

Troy Rule's and Sara Bronin's papers suggests in jurisdictions with a strong interest in promoting solar energy development, statutory solar access protections mirroring the principles of Rule Four of the Cathedral Model seems to best promote the efficient allocation of scarce airspace between Neighbors and Solar Users in a manner consistent with prevailing law. Rule Four acknowledges Neighbors' existing legal entitlement to the airspace above their properties. Yet, in recognition of a strong public policy interest in promoting solar energy development, Rule Four protects Neighbors' entitlement with a liability rule, enabling Solar Users to purchase solar access rights through government intervention if private negotiations fail. This option is closer to the **ALL THINGS IN MODERATION AND DO NO HARM**, principle.

Quoting Mr. Rule..." The prevailing common law approach to solar access in nearly every state recognizes landowners' property rights in the usable airspace above their land. But protecting those rights with a property rule makes it impossible for Solar Users to purchase the solar access rights across neighboring airspace needed to protect their investment in solar collectors when voluntary bargaining with Neighbors proves unsuccessful. Solar access statutes in some states attempt to address this deficiency by reassigning airspace rights from Neighbors to Solar Users without compensation. A solar access statute applying Cathedral Model Rule Four seems better suited for resolving solar access conflicts because it recognizes landowners' existing airspace rights yet provides a backup means for Solar Users to acquire necessary solar access protection. Although Calabresi and Melamed noted that Rule Four could have great value under the right circumstances, courts and legislatures have long ignored the rule when addressing private disputes. ...Rule Four should not be overlooked as new resource allocation issues emerge in the years to come."

Quoting Ms. Bronin..."...advocates a regime that draws from principles of water law, sets the initial entitlement so as to produce socially beneficial results, and adequately compensates burdened landowners".

CONCLUSION

The World's technology and commercially established non-renewable carbon based energy economy (having transitioned from wood to fossil fuels) will continue for quite some time. But it is depletable.

Supplementing non-renewable energy supply resources with optional cost competitive renewable and non-depletable energy from the sun (or wind), is good for the economy, and no matter your convictions on global warming from carbon emissions, is a good green thing to do. And in this case, *green* can have both climate and U.S. dollar advantages. Plus, renewable energy resources are plentiful (daily sunshine energy striking the earth is 180 times more plentiful than a year's worth of the world's total energy consumption) and there for the taking (rule of capture), even though a gallon of gasoline has more punch than a gallon of sunshine, requiring a balanced shift of how energy resources are managed and developed.

Ownership in sunshine has been a confusing and volatile debate.

Unlike established conventional and enforceable rules of production and rules of distribution property ownership rights associated with easily identifiable tangible assets, such as land or mineral resources, property rights associated with intangible solar energy and its associated airspace have been a subject of much debate.

Much of the confusion has been impacted by:

- How to define (understand?) property rights to sunshine and the airspace through which it flows; It has both conventional tangible and unconventional intangible property characteristics (wave-particle duality); Solar irradiation is a spectrum made up of various energy components that has different values and uses (heating, medical, electricity generation, etc.);
- 'Light' is really not owned, more so than the need to have access to the airspace through which solar energy travels and then 'use' of that captured resource for the benefit of society (for heat, electricity generation or chemical generation);
- A property owner can by the rule of capture - first in time, first in right – capture sunshine that falls on its property, but such capture is influenced by any interfering (shadow producing) events associated with neighboring property airspace obstructions (such as trees or tall structures) and since sunshine can be captured at various angles depending on the sun's overhead location, to what extent must access be recognized? (all the time or some of the time?);
- The need to balance competing property development rights – who, if anyone, has priority use?

The confusion is documented in the history of volatile sunshine right advocacy: ancient Roman and Greek recognition of society's benefits to the enjoyment of access to sunshine heat, light and aesthetics; conflicts with the Ad Coleum maxim (freedom to use one's property as one wishes so long as neighbors are not harmed); invoking the ancient light doctrine (long term access to light established an implied easement); private party free market mutual easement negotiations; public necessity recognition by way of Statutory easements; private and public nuisance claims (over lack of access) and conflicting case law judgments (such as recognition of implied or prescriptive easement rights – complemented by the Fontainebleau decision against implied light easements).

Valuation and recognition of property rights are further influenced by: water law principles, ESSMOS (Entitlement Subject To Self-Made Options) negotiations; Cosean free market bargaining and settling on the highest valued user; Pareto and Kaldor-Hicks efficiency negotiations where there is a mixture of winners and losers in a negotiation; Tiebout-Hypothesis and parties settle on value and entitlement interest by voting with their feet (locate in ideal desired geographic environment) and Calabresi and Melamed Cathedral Model for comparison and analysis of property value options.

This paper suggests that sunshine and its airspace access ownership property rights should be subject to finding a balance by honoring the **ALL THINGS IN MODERATION and DO NO HARM** principle.

The author poses that such principle is honored with a system that recognizes:

- Property rights to sunshine and the airspace through which it flows;

- Rule of capture applies and First in Time – First in Right be acknowledged balanced with consideration given to granting initial (solar right) entitlements to the party with the most socially beneficial use;
- Cosean free market mutual bargaining be the preferred initial process for establishing an enforceable sunshine and airspace property right, complemented with endorsement of Rule Four of the Calabresi and Melamed Cathedral Model; and
- In conjunction with the Cathedral Model, resolution of an impasse be advanced by considering a Rule Four Statutory resolution, taking into account principles of relativity and flexibility and a strategy of equitable Governance, and as an example adopting similar principles as applied in the California Public Resources Code, *Solar Shade Control Act (Assembly Bill 2321)*.

A rational resolution steered toward securing solar energy airspace property rights, is destined to cure solar energy access right blurred vision maladies.

After all, a little bit of sunshine is a great disinfectant.

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