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SOLAR FARMS IN GEORGIA: WHY WE NEED TO START THINKING ABOUT THE END

Erica L. Welsh*

ABSTRACT

Despite the lack of a renewable energy mandate or a statewide carbon-cutting goal, Georgia's renewable energy development, particularly utility-scale solar installations, is expected to increase exponentially. In the rush to join this renewable energy development surge, utilities, solar developers, and local governments must prudently consider how to manage this growth wisely and prevent avoidable costs in preparing for the inevitable decommissioning of these solar installations. Although Georgia is one of the nation's leading states for solar power with its abundant land and sunshine, it lacks statewide policies addressing decommissioning concerns.

A statewide decommissioning policy that requires some form of decommissioning plan and financial assurance can protect developers from unanticipated litigation that could detrimentally affect solar development. This Note examines the potential challenges utilities, developers, and local governments may face at the decommissioning stage and proposes a statewide decommissioning policy that would protect Georgia's economy and communities with a predictable regulatory environment.

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INTRODUCTION

In the United States, a significant surge in renewable energy development is on the horizon.[1] The catalyst is widely considered to be the Inflation Reduction Act of 2022 (IRA), which President Biden signed into law on August 16, 2022.[2] Biden's goal of cutting "greenhouse gas emissions to half of 2005 levels by 2030 and to net zero by 2050" will require rapid expansion of clean energy infrastructure.[3] To meet these goals, the U.S. needs to "quickly . . . replac[e] fossil fuel powered electricity generation with renewable sources of electricity like wind and solar."[4] The IRA will have a particularly substantial impact on the expansion of the solar industry.[5] Utility-scale solar development is essential for putting the U.S. on the fastest "path to a clean energy future."[6]

In some parts of the country, the move to renewables has already begun to accelerate.[7] Goals of reducing carbon emissions led some

1. *See* Gayathri Vaidyanathan, *Scientists Welcome 'Enormous' US Climate Bill — but Call for Stronger Action*, NATURE (Aug. 16, 2022), https://www.nature.com/articles/d41586-022-02223-8 [https://perma.cc/R6LF-WLA5].

2. *Id.* The IRA allocates the "biggest chunk of money" to clean energy. *Id.* Businesses will receive "tax credits over the next decade for . . . shifting to greener power sources, such as solar." *Id.* "In the last decade, solar energy experienced an average annual growth rate of 42%." Michael R. Brassett II & Benjamin M. Parks, *The Sky's the Limit: Application of Correlative Rights and the Accommodation Doctrine to Operations of a Solar Energy Company*, 10 LSU J. ENERGY L. & RES. 401, 401 (2022). Over the past two decades, "[o]ne of the main drivers of the growth of renewable energy in the United States . . . has been the adoption of clean energy and decarbonization policies at the federal, state, and local levels." Alexandra B. Klass, *Evaluating Project Need for Natural Gas Pipelines in an Age of Climate Change: A Spotlight on FERC and the Courts*, 39 YALE J. ON REGUL. 658, 674 (2022).

3. Rayan Sud & Sanjay Patnaik, *How Does Permitting for Clean Energy Infrastructure Work?*, BROOKINGS (Sept. 28, 2022), https://www.brookings.edu/research/how-does-permitting-for-clean-energy-infrastructure-work/ [https://perma.cc/NAU9-8V7M].

4. *Id.*

5. Timothy C. Brightbill, Laura El-Sabaawi & Paul A. Devamithran, *The Inflation Reduction Act Provides Potential Game-Changing Benefits for U.S. Solar Industry*, WILEY REIN LLP (Aug. 15, 2022), https://www.wiley.law/alert-The-Inflation-Reduction-Act-Provides-Potential-Game-Changing-Benefits-for-US-Solar-Industry [https://perma.cc/PZ5G-4CEY] (pointing out that "the Act's provisions not only incentivize increased installations of solar energy, but provide key benefits for companies manufacturing solar products").

6. *Utility-Scale Solar Power*, SOLAR ENERGY INDUS. ASS'N, https://www.seia.org/initiatives/utility-scale-solar-power [https://perma.cc/R847-GG4C].

7. *See* Andrea Hsu & Mary Louise Kelly, *How Georgia Became a Surprising Bright Spot in the U.S. Solar Industry*, NPR, https://www.npr.org/2019/06/24/733795962/how-georgia-became-a-surprising-bright-spot-in-the-u-s-solar-industry [https://perma.cc/7FRV-T9ED] (June 24, 2019, 3:22 PM).

states to implement their own renewable energy mandates.[8] For example, "[i]n July 2021, the Oregon legislature increased the state [clean energy standard] to a 100% clean energy share of sales by 2040."[9] Market forces drove new investment in other states.[10] Although Georgia, like most states in the Southeast, has neither a renewable energy mandate nor a statewide carbon-cutting goal, it continues to expand its renewable energy development.[11] Specifically, Georgia has increased its development of utility-scale solar installations—also known as solar farms—due to the abundance of sun and space, particularly in the more rural parts of the state.[12] For example, Meta (formally known as Facebook) chose to build its new data center in Newton County, Georgia, in large part because of the "[a]ccess to renewable energy at a competitive price."[13] Meta's move to Georgia created jobs, and other "like-minded companies" followed suit in search of similar opportunities for renewable resources.[14] With Meta, the financial opportunity, rather than concern about climate

8. *Id.*

9. Richard Bowers, *Five States Updated or Adopted New Clean Energy Standards in 2021*, U.S. ENERGY INFO. ADMIN.: TODAY IN ENERGY (Feb. 1, 2022), https://www.eia.gov/todayinenergy/detail.php?id=51118# [https://perma.cc/3K54-3N9X].

10. *See* Hsu & Kelly, *supra* note 7.

11. *Id.* Georgia is currently ranked seventh in the nation for solar power generation growth. SOLAR ENERGY INDUS. ASS'N, STATE SOLAR SPOTLIGHT: GEORGIA (2022), https://www.seia.org/sites/default/files/2023-03/Georgia.pdf [https://perma.cc/5LDA-YNGJ]; Press Release, Solar Energy Industries Association, Advocates Celebrate Wins for Clean Energy in Georgia, Urge Action on Rooftop Solar (July 21, 2022) [hereinafter SEIA Press Release], https://www.seia.org/news/advocates-celebrate-wins-clean-energy-georgia-urge-action-rooftop-solar#:~:text=The%20state%20is%20home%20to,over%20the%20next%20five%20years [https://perma.cc/EH38-RKRJ].

12. *See* Hsu & Kelly, *supra* note 7. A utility-scale solar installation collects and distributes solar energy. Memorandum from the Ga. Pub. Serv. Comm'n on the Decommissioning of Solar Farms in Georgia app. I, at 3 [hereinafter GPSC Memorandum], https://cepl.gatech.edu/sites/default/files/2020-06/PSC%20Report%20on%20Decommissioning%20of%20Solar%20Farms%20in%20Georgia.pdf [https://perma.cc/VS66-3DM7]. "These facilities are generally more than two acres in size and have capacities in excess of one megawatt. These facilities are typically connected to the local utility power grid in order to supply electricity to the grid and power multiple properties." *Id.* For a full glossary of definitions, see *id.* at app. I, at 2–3.

13. Hsu & Kelly, *supra* note 7.

14. *Id.*; Chris Crowell, *Facebook's First Solar Farm in Georgia Is Commissioned*, SOLAR BUILDER (Dec. 20, 2019), https://solarbuildermag.com/news/facebooks-first-solar-farm-in-georgia-is-commissioned/ [https://perma.cc/T49T-DCT9] (discussing how Georgia's economy benefitted from the project).

change, is what persuaded the farmer to sell his land for the installation.[15] Companies are looking for cleaner energy at an affordable price.[16] The availability of solar resources at the right price suggests that the growth of utility-scale solar installations in Georgia is just getting started.

The combined forces of the IRA, state-level climate policies, and market forces portend a kind of renewable energy "gold rush."[17] Companies, investors, and landowners are all interested in jumping on the bandwagon while they can.[18] Who can blame them? But in this rush to join the frenzy, there are policy makers, commentators, and scholars who urge that we need to give prudent consideration to how communities can manage this growth wisely while smartly preparing for the inevitable obsolescence of hardware used to deploy the renewable energy facilities.[19]

Although utility-scale renewable energy sources like wind and solar have been around since the mid-2000s in some areas, most installations are still too new to need decommissioning.[20] Right now, with the anticipated "rapid expansion" of renewable energy systems, the focus

15. Hsu & Kelly, *supra* note 7. *But see* Iulia Gheorghiu, *Facebook Meets 100% Renewable Energy Goal with Over 6 GW of Wind, Solar, 720 MW of Storage*, UTIL. DIVE (Apr. 15, 2021), https://www.utilitydive.com/news/facebook-meets-100-renewable-energy-goal-with-over-6-gw-of-wind-solar/598453/ [https://perma.cc/Y48F-P7BJ] (noting that "the goal posts are also moving for what companies should do to promote good stewardship of the climate, as the public's understanding of emissions is becoming more sophisticated"); Daniel Newman, *How Leading Global Companies Are Using Sustainability as a Market Differentiator*, FORBES (July 24, 2020, 9:07 AM), https://www.forbes.com/sites/danielnewman/2020/07/24/how-leading-global-companies-are-using-sustainability-as-a-market-differentiator/?sh=58d287d81ff3 [https://perma.cc/F7U2-994A] (noting that younger generations prefer companies that "make a difference in the environment and the world").

16. Hsu & Kelly, *supra* note 7.

17. Nichola Groom, Cole Horton & Simon Jessop, *Analysis: U.S. Renewables Investors See Senate Bill Sparking Gold Rush*, REUTERS (Aug. 10, 2022, 2:45 PM), https://www.reuters.com/business/sustainable-business/us-renewables-investors-see-senate-bill-sparking-gold-rush-2022-08-10/ [https://perma.cc/PQ97-DKEL]; Tina Casey, *Goldman Sachs Ignites Energy Storage Gold Rush*, CLEANTECHNICA (Sept. 15, 2022), https://cleantechnica.com/2022/09/15/goldman-sachs-ignites-energy-storage-gold-rush/ [https://perma.cc/KS2M-FVTB].

18. Groom et al., *supra* note 17.

19. *See* Jessi Wyatt, *Repowering and Decommissioning: What Happens in Communities When Solar and Wind Projects End?*, GREAT PLAINS INST. (Apr. 1, 2020), https://betterenergy.org/blog/repowering-and-decommissioning-what-happens-in-communities-when-solar-and-wind-projects-end/ [https://perma.cc/43KW-G4U4].

20. *Id.*

is on front-end issues such as "planning, permitting, and building of renewable energy sources like solar plants and wind farms."[21] Although these front-end issues are important to address, back-end issues, such as decommissioning, can also be an important preliminary consideration.[22] What happens when the solar installation reaches the end of its life? Planning for the end of a renewable energy facility can prove to be just as valuable as preparing for its development.[23]

Because decommissioning is inevitable, utilities, developers, and local governments need to think critically about the issues they may face when it is time to sunset a utility-scale solar array.[24] This Note addresses the need for landowners and local governments to prepare for the challenges associated with decommissioning. Part I examines the expansion of solar farms in Georgia and the current state of solar decommissioning policies. Part II analyzes the potential challenges utility companies, solar developers, and local governments may face regarding the decommissioning of the utility-scale solar installations. Part III proposes a solution to address those decommissioning challenges and the potential importance of implementing statewide decommissioning policies.

I. BACKGROUND

Renewable energy sources have been around for a long time.[25] Individuals and communities have long harnessed the sun's power for light and energy.[26] However, the technologies developed to channel

21. Sud & Patnaik, *supra* note 3 (noting that rapid expansion "also requires long-distance electric transmission lines to transport clean energy from sparsely populated areas where it is abundant to the urban centers where it is sorely needed").

22. *See* Billy Ludt, *How to Decommission a Solar Array, and Why It's Important to Plan Ahead*, SOLAR POWER WORLD (Mar. 11, 2019), https://www.solarpowerworldonline.com/2019/03/how-to-decommission-a-solar-array-and-why-its-important-to-plan-ahead/ [https://perma.cc/T6UK-46DH].

23. *See id.*

24. *See id.*

25. *See Renewable Energy Explained*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/energyexplained/renewable-sources/ [https://perma.cc/49E2-39KY] (June 10, 2022).

26. RODERICK E. WETSEL & BECKY H. DIFFEN, WIND AND SOLAR LAW § 1.02[2] (LexisNexis 2023).

the energy are more recent.[27] Bell Labs, in 1954, pioneered the capacity to convert solar energy to electricity through the invention of solar panels.[28] However, that invention "was mostly just a curiosity as it was too expensive to gain widespread use."[29] Over time, solar panels became more efficient while their cost slowly decreased.[30] Developers of utility-scale solar installations look for locations with abundant land and sunshine.[31] One of the first solar farms in the U.S. was built on the Carrizo Plain in San Luis Obispo County, California, in 1983.[32] In the last decade, the prices for solar panels have decreased while the demand for solar installations has increased.[33] Georgia furnishes a particularly striking example of a jurisdiction where the deployment of renewable energy resources rapidly expanded as soon as it became economically and technologically feasible to do so.

27. *See* Luke Richardson, *What Is the History of Solar Energy and When Were Solar Panels Invented?*, ENERGYSAGE (May 3, 2022), https://news.energysage.com/the-history-and-invention-of-solar-panel-technology [https://perma.cc/86AP-SRKD].

28. *See id.* A solar panel is "[a] device for the direct conversion of sunlight into electric power." GPSC Memorandum, *supra* note 12. There is some debate about when exactly solar panels were created. Richardson, *supra* note 27. Some bestow credit to Charles Fritts in 1883 for creating the first solar cell made of selenium. *Id.* However, because today's solar cells are made of silicon, many believe that Daryl Chapin, Calvin Fuller, and Gerald Pearson at Bell Labs were the first true inventors. *Id.*

29. Gil Knier, *How Do Photovoltaics Work?*, NASA SCI. (Aug. 6, 2008), https://science.nasa.gov/science-news/science-at-nasa/2002/solarcells [https://perma.cc/Q5CA-R9T8].

30. *See* Richardson, *supra* note 27; *see also* Gabriel Popkin, Opinion, *Are There Better Places to Put Large Solar Farms than These Forests?*, N.Y. TIMES (Sept. 21, 2022), https://www.nytimes.com/2022/09/21/opinion/environment/solar-panels-virginia-climate-change.html [https://perma.cc/B39T-R3VR] ("Utility-scale solar is now as cheap as or cheaper than any other form of power, but it is space-intensive."). Additionally, battery storage technology is increasing the viability of solar as an energy alternative. *See* Cheryl Katz, *In Boost for Renewables, Grid-Scale Battery Storage Is on the Rise*, YALE ENV'T 360 (Dec. 15, 2020), https://e360.yale.edu/features/in-boost-for-renewables-grid-scale-battery-storage-is-on-the-rise [https://perma.cc/B45G-U9EY]. The technological advances are leading to batteries that can hold "ever-larger amounts of energy." *Id.*

31. Hsu & Kelly, *supra* note 7.

32. *The Oldest Solar Farm in the US*, LANDGATE RES. (Sept. 21, 2021), https://landgate.com/news/2021/09/21/the-oldest-solar-farm-in-the-us/ [https://perma.cc/G4UF-52WD]; *see* Patrick Lee, *Arco Sells Last 3 Solar Plants for $2 Million: Energy: The Sale to New Mexico Investors Demonstrates the Firm's Strategy of Focusing on Its Core Oil and Gas Business*, L.A. TIMES (Jan. 12, 1990, 12:00 AM), https://www.latimes.com/archives/la-xpm-1990-01-12-fi-323-story.html [https://perma.cc/V62J-U6XA].

33. Richardson, *supra* note 27.

A. The Expansion of Solar Farms in Georgia

Despite the lack of regulation or incentives, "Georgia has become one of the nation's leading states for solar power."[34] Georgia's focus remains on a "market-driven approach . . . , [particularly] leaning on low-cost utility-scale solar farms."[35] The majority of the state's solar energy is harnessed by utility-scale facilities.[36] Because of the available flat land and sunshine in Georgia, "solar [photovoltaic (PV)] is the state's fastest-growing source of renewable energy."[37] Recently, clean energy advocates in Georgia celebrated the Georgia Public Service Commission's (PSC) approval of "a solar resource plan" that will increase Georgia Power's procurement of solar energy.[38] In a press release from the summer of 2022, leaders in the industry announced a buildout and that "the PSC voted unanimously to create a collaborative Distributed Generation Working Group."[39] This group, "composed of representatives from utilities, the solar industry, and PSC staff [] will develop recommendations for growing the distributed energy market in Georgia."[40] President Biden's climate goals and the

34. James Bruggers, *How Georgia Became a Top 10 Solar State, with Lawmakers Barely Lifting a Finger*, INSIDE CLIMATE NEWS (June 14, 2018), https://insideclimatenews.org/news/14062018/georgia-solar-power-renewable-utility-scale-clean-energy-investments-2018-election/ [https://perma.cc/7YED-EVNJ].

35. *Georgia Solar Panels: Local Pricing and Installation Data*, ENERGYSAGE [hereinafter *Georgia Solar Panels*], https://www.energysage.com/solar-panels/ga/?rc=seia [https://perma.cc/CUN7-R535] (May 20, 2023).

36. *Georgia State Energy Profile*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/state/print.php?sid=GA [https://perma.cc/5PF3-YHGQ] (Jan. 19, 2023). "The four largest [solar facilities] came online since the beginning of 2020." *Id.* Additionally, "compared to distributed, rooftop systems, 'utility[-]scale solar is currently the most cost effective.'" Bruggers, *supra* note 34 (quoting John Kraft, spokesman, Georgia Power).

37. Press Release, Georgia Department of Economic Development, Solar Energy Giant Qcells to Power 470 New Jobs in New Whitfield County Facility (May 26, 2022), https://www.georgia.org/press-release/solar-energy-giant-qcells-power-470-new-jobs-new-whitfield-county-facility#:~:text=Since%202009%2C%20Georgia%20has%20increased,growing%20source%20of%20renewable%20energy [https://perma.cc/SK7G-W752]. "Photovoltaics is the direct conversion of light into electricity at the atomic level." Knier, *supra* note 29.

38. SEIA Press Release, *supra* note 11.

39. *Id.* (internal quotation marks omitted).

40. *Id.*

recently passed IRA will only add to the move towards solar development.[41]

B. Development to Decommissioning

Renewable electricity development must advance on a quick timeline to meet the Biden Administration's climate goals.[42] Because one goal is to reach net zero by 2050, the obstacles facing projects at the initial development stage are the main topic of discussion.[43] For example, in exchange for supporting the passage of the IRA, Senator Joe Manchin asked Democratic leaders in Congress for their support on an energy infrastructure permit reform bill with the purpose of speeding up the processes of federal permitting.[44] Permitting is one of the main obstacles new solar projects face before they can get started.[45]

Although these front-end issues are important, there are many back-end issues that need to be considered, such as decommissioning.[46] These solar installations "typically have a lifespan of more than [twenty-five] years."[47] "[F]orward-thinking planners and policy makers have raised questions surrounding what will happen at the end of the useful life of these solar farms, and who will be responsible for ensuring that the land is restored to its pre-solar farm condition."[48] "As

41. *See* Vaidyanathan, *supra* note 1; Sud & Patnaik, *supra* note 3.

42. Sud & Patnaik, *supra* note 3.

43. *See id.*

44. *Id.* The bill "aims to speed up federal permitting by setting time limits on environmental reviews, prioritizing certain big-ticket projects, and limiting state powers in permitting related to electric transmission and clean water protection." *Id.*

45. *See id.*

46. *See* MINDY GOLDSTEIN, CAROLINE REISER, RICHARD SIMMONS, MARY HALLISEY, MARCELA MORENO, KERRI METZ, DANIEL GELLER & JASON PERRY, THE GEORGIA MODEL SOLAR ZONING ORDINANCE GUIDE 42–44 (2018), https://bpb-us-w2.wpmucdn.com/sites.gatech.edu/dist/6/1908/files/2021/06/2018-07-30_mso_guide_final.pdf [https://perma.cc/L9PD-PDLM]. Decommissioning is the process of removing the solar energy system when it is no longer in use. *Id.* at 42. This includes "how to remove the system and recycle its parts, and what improvements should be made to the land after removal." *Id.*

47. *End-of-Life Solar Panels: Regulations and Management*, U.S. ENV'T PROT. AGENCY [hereinafter *End-of-Life Solar Panels*], https://www.epa.gov/hw/end-life-solar-panels-regulations-and-management [https://perma.cc/2A67-SF56] (Aug. 28, 2022), *accord* GOLDSTEIN ET AL., *supra* note 46, at 42 (predicting that solar energy systems will operate for approximately twenty to thirty-five years).

48. GPSC Memorandum, *supra* note 12, at 1.

the solar . . . [PV] market grows, so will the volume of end-of-life panels."[49] Decommissioning should be a preliminary consideration for developers and cities.[50] Because the process is expensive, anticipating the inevitable costs upfront can benefit the cities and solar developers.[51]

C. Solar Decommissioning Policies

Georgia has long been engaged in policymaking related to solar energy. The state's first solar-related law was the Solar Easements Act of 1978.[52] However, Georgia does not yet have any statewide solar panel end-of-life policies governing the decommissioning of solar installations.[53] In 2018, representatives of Emory Law School's Turner Environmental Law Clinic, Georgia Institute of Technology's Strategic Energy Institute, and the University of Georgia's Agriculture Technical Assistance Program created the Georgia Model Solar Zoning Ordinance to provide counties and cities with an example for drafting their own local ordinances.[54] In addition, those representatives created the *Georgia Model Solar Zoning Ordinance Guide* that complements the model ordinance and provides additional information and considerations regarding the decommissioning of solar energy

49. *End-of-Life Solar Panels*, *supra* note 47.

50. *See* Ludt, *supra* note 22.

51. *Id.*

52. GA. CODE ANN. § 44-9-20 to -23 (2023). The Act "gave solar owners assurance of continued access to sunlight for their systems." *Georgia Solar Panels*, *supra* note 35.

53. *See* GPSC Memorandum, *supra* note 12, at 2–3. "Typically, solar decommissioning is regulated at the local level; however, states have the authority to enact specific solar decommissioning rules." N.C. Clean Energy Tech. Ctr., State Regulation of Solar Decommissioning (unpublished manuscript), https://nccleantech.ncsu.edu/wp-content/uploads/2018/06/Solar-Decommissioning-Policy-Working-Paper.pdf [https://perma.cc/8SE8-G9RU].

54. TURNER ENV'T L. CLINIC, EMORY L. SCH., STRATEGIC ENERGY INST., GA. INST. TECH. & AGRIC. TECH. ASSISTANCE PROGRAM, UNIV. GA., THE GEORGIA MODEL SOLAR ZONING ORDINANCE 1 (2018) https://bpb-us-w2.wpmucdn.com/sites.gatech.edu/dist/6/1908/files/2021/06/2018-07-30_final_model_solar_ordinance.pdf [https://perma.cc/7LY9-V2Z7].

systems.[55] The guide generally mentions the possible waste concerns that decommissioned solar energy systems will create.[56]

Georgia is not the only state to grapple with decommissioning on a local level. Other states have acted proactively.[57] For example, "[t]he New York State Energy Research & Development Authority (NYSERDA) works with New York counties by providing template ordinances for municipalities to work from when considering solar installations."[58] The National Renewable Energy Laboratory also authored *A Survey of Federal and State-Level Solar System Decommissioning Policies in the United States*.[59]

Shutdown and disassembly of utility-scale power generation facilities is not a new concern. Currently, the decommissioning of legacy power plants, such as coal plants, is increasing.[60] Although these fossil fuel energy generation facilities differ greatly from solar farms, decommissioning those systems could provide insight on some of the challenges renewable energy systems may also face. Some states have passed decommissioning statutes for non-solar power generation facilities.[61] For example, Texas passed a wind decommissioning statute in 2019 that assured farmers and ranchers of proper turbine decommissioning by providing specific requirements for removal of

55. GOLDSTEIN ET AL., *supra* note 46. Cities and counties can choose whether to include decommissioning provisions in their own solar ordinances. *Id.* at 44. Additionally, the model ordinance suggests avoiding the requirement of decommissioning bonds. *Id.*

56. *Id.* at 42–43 (discussing briefly the concern of solar panels ending up in landfills rather than being reused or recycled).

57. Ludt, *supra* note 22.

58. *Id.*

59. *See generally* TAYLOR L. CURTIS, LIGIA E.P. SMITH, HEATHER BUCHANAN & GARVIN HEATH, NAT'L RENEWABLE ENERGY LAB'Y, A SURVEY OF FEDERAL AND STATE-LEVEL SOLAR SYSTEM DECOMMISSIONING POLICIES IN THE UNITED STATES (2021), https://www.nrel.gov/docs/fy22osti/79650.pdf [https://perma.cc/TGL2-E6TK] (discussing the current framework of decommissioning polices implemented in the U.S.). An analysis of the decommissioning challenges could support the need for statewide policies addressing the environmental or economic impacts of decommissioning solar farms. *See id.* at 1–2.

60. *See* Stanley Dunlap, *State Regulators OK Georgia Power Long-Term Plan to Keep Coal Plants, Cap Solar Growth*, CURRENT (July 22, 2022), https://thecurrentga.org/2022/07/22/state-regulators-ok-georgia-power-long-term-plan-to-keep-coal-plants-cap-solar-growth/ [https://perma.cc/T462-EHW6] (discussing Georgia Power's target "to shut down nearly all of its coal-fired power plants by 2028").

61. *See, e.g.*, TEX. UTIL. CODE ANN. §§ 301.0001 to .0004 (West 2023).

the wind turbines.[62] Because of the solar industry's inevitable growth, it is important to analyze the challenges utilities, solar developers, and local municipalities will ultimately face.

II. ANALYSIS

Although the estimated life span of solar panels is between twenty and thirty years, decommissioning could occur much sooner than anticipated.[63] Newer, cheaper, and more efficient solar panels on the market could lead to early replacement, cutting many solar panels' lifespans short.[64] Increased solar development generates an increased amount of solar panel waste.[65] When solar panels reach their end of life, waste associated with them must be properly disposed of.[66] In anticipation of decommissioning utility-scale solar installations, utility companies, solar developers, and local governments would stand to benefit from a plan that addresses and minimizes the environmental impacts to the land and surrounding community.[67]

Because of the rush to stop climate change and switch to renewable energy systems, some speak only of the positives without discussing the negatives.[68] The purpose behind moving from fossil fuels to renewables is to generate power sustainably.[69] Sustainability requires

62. *Id.*; Rod Wetsel, *Experience Is a Dear Teacher—the Texas Wind Decommissioning Statute*, 6 TEX. A&M J. PROP. L. 417, 419 (2020).

63. *See* Atalay Atasu, Serasu Duran & Luk N. Van Wassenhove, *The Dark Side of Solar Power*, HARV. BUS. REV. (June 18, 2021), https://hbr.org/2021/06/the-dark-side-of-solar-power [https://perma.cc/J797-L5LV].

64. *Id.* Early replacement poses a high risk of substantial waste in a short period of time. *See id.*

65. *See* Isaac Kort-Meade & Vinnie Amato, *Circle of Light: Incentivizing Domestic Solar Panel Recycling*, J. ANIMAL & ENV'T L., Spring 2022, at 1, 1, 4 ("By 2050, the United States will have produced over 22 billion pounds of solar panel waste."); *End-of-Life Solar Panels*, *supra* note 47 ("By 2030, the United States is expected to have as much as one million total tons of solar panel waste.").

66. *End-of-Life Solar Panels*, *supra* note 47.

67. *See* Ludt, *supra* note 22.

68. Emily Folk, *Waste in the Renewable Energy Industry and How We Can Sustainably Power Our World*, RENEWABLE ENERGY MAG. (Mar. 5, 2020), https://www.renewableenergymagazine.com/emily-folk/waste-in-the-renewable-energy-industry-and-20200305 [https://perma.cc/VSD9-7JYZ] ("[M]uch of the engineering behind solar is spent on the production and installation of [PV] panels, not their removal and disposal.").

69. *See id.*

discussing those negative impacts, such as waste.[70] "A sustainable approach to renewable energy waste requires the creation and implementation of a circular economy."[71]

A "circular economy is a business model with [the] potential to generate competitiveness in conjunction with innovation and sustainability."[72] In a circular economy, "the key principle" is to keep materials "at their highest value at all times."[73] The system is designed to keep "resources in circulation for as long as possible," through regenerative methods, to reduce waste.[74] The European Union (EU) prioritizes following the circular economy model, as it is "among the most efficient solutions to guarantee sustainable development."[75]

A. The Dark Side of Clean Energy

At first glance, solar energy—"more promising than ever"—seems to bring only benefits.[76] Although thought to be environmentally friendly, solar panels have the potential to generate enormous amounts

70. *Id.*

71. *Id.* "In the circular economy, instead of taking resources from the earth, using them once, and disposing of them in [a] landfill, we keep them in use for as long as possible." *WRAP and the Circular Economy*, WASTE & RES. ACTION PROGRAMME, https://wrap.org.uk/taking-action/climate-change/circular-economy [https://perma.cc/EN84-594C]. This economy ensures that we gain the "maximum benefit . . . while reducing negative environmental impacts." *Id.* For a helpful illustration of a circular economy for PV system materials, see TAYLOR L. CURTIS, HEATHER BUCHANAN, LIGIA SMITH & GARVIN HEATH, NAT'L RENEWABLE ENERGY LAB'Y, A CIRCULAR ECONOMY FOR SOLAR PHOTOVOLTAIC SYSTEM MATERIALS: DRIVERS, BARRIERS, ENABLERS, AND U.S. POLICY CONSIDERATIONS 3 fig.1 (2021), https://www.nrel.gov/docs/fy21osti/74550.pdf [https://perma.cc/MQ6Q-QFK9].

72. *The Circular Economy*, ENEL GREEN POWER, https://www.enelgreenpower.com/learning-hub/sustainable-development/circular-economy [https://perma.cc/SR7N-Q2ZR].

73. Ira Feldman, Reid Lifset, Timothy Ellis, Wayne Rifer & Roger D. Feldman, *The Circular Economy: Regulatory and Commercial Law Implications*, 46 ENV'T. L. REP. 11009, 11010 (2016) (quoting Ira Feldman, president and senior counsel, Greentrack Strategies).

74. *Id.* "A more circular PV economy would both divert large quantities of PV waste from landfills and provide valuable source materials for new solar modules . . . ." Harrison Dreves, *Working Out the Details of a Circular Solar Economy*, NAT'L RENEWABLE ENERGY LAB'Y (Apr. 22, 2022), https://www.nrel.gov/news/program/2022/working-out-the-details-of-a-circular-solar-economy.html#:~:text=Most%20envision%20a%20circular%20economy,life%20for%20reuse%20or%20recycling [https://perma.cc/KXU6-DV6A].

75. *The Circular Economy*, *supra* note 72.

76. Conor Prendergast, *Solar Panel Waste: The Dark Side of Clean Energy*, DISCOVER (Dec. 14, 2020, 1:28 PM), https://www.discovermagazine.com/environment/solar-panel-waste-the-dark-side-of-clean-energy [https://perma.cc/6CCK-9NDJ].

of waste, both physical and chemical.[77] The decommissioning stage of utility-scale solar installations handles the waste created from the solar panels.[78] Two major considerations for decommissioning include the disposal of the panels and returning the land to its predevelopment condition.[79] Currently, the ideal disposal for the panels is recycling and reusing them as much as possible.[80] Without proper standards, the land that holds the solar installations could be at risk for negative environmental impacts, such as hazardous waste leaks.[81]

The two main types of solar panels are crystalline-silicon and thin-film, with the former being the most common type.[82] If recycled, both types of solar panels must undergo different recycling processes due to the different materials contained in them.[83] Some of the materials contained in the panels, specifically the crystalline-silicon panels, are toxic and can cause environmental pollution if leaked.[84] The "looming

77. *See id.*; *The Mounting Solar Panel Waste Problem*, INST. FOR ENERGY RSCH. (Sept. 12, 2018), https://www.instituteforenergyresearch.org/renewable/solar/the-mounting-solar-panel-waste-problem/ [https://perma.cc/CN3L-BUT3] ("The International Renewable Energy Agency estimated that there were about 250,000 metric tons of solar panel waste in the world at the end of 2016 and that the figure could reach 78 *million* metric tons by 2050.").

78. *See What Happens When a Solar Facility Is Decommissioned?*, AM. CLEAN POWER ASS'N [hereinafter *What Happens When*], https://cleanpower.org/wp-content/uploads/2021/12/Final_What-happens-when-a-solar-project-is-decommissioned_Fact-Sheet.pdf [https://perma.cc/NJL9-L7XE].

79. GPSC Memorandum, *supra* note 12, at 1.

80. *See id.* at 3; *Solar Panel Recycling*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/hw/solar-panel-recycling [https://perma.cc/FW8A-KL3B] (Mar. 22, 2023); Jacob Marsh, *Solar Panel Recycling: What You Need to Know*, ENERGYSAGE, https://news.energysage.com/recycling-solar-panels/ [https://perma.cc/5S8N-ZZE6] (Mar. 1, 2023).

81. *See* Prendergast, *supra* note 76; *End-of-Life Solar Panels*, *supra* note 47.

82. *End-of-Life Solar Panels*, *supra* note 47. Silicon solar panels are made from crystalline-silicon and "contain small amounts of valuable metals . . . including silver and copper." *Id.* These panels are "efficient, low cost, and have long lifetimes, with modules expected to last for [twenty-five] years or longer." *Id.* In contrast, thin-film solar panels have "thin layers of semiconductor material . . . layered on supporting material such as glass, plastic, or metal." *Id.* The manufacturing processes for these panels are low-cost but less efficient than silicon solar PV. *Id.* Because a thin-film solar system is a few micrometers thick, it "allows for greater flexibility to install the solar energy system on products like rooftop shingles and tiles, building facades, the glazing for skylights, and other building integrated materials." GOLDSTEIN ET AL., *supra* note 46, at 21.

83. *Solar Panel Recycling*, *supra* note 80.

84. Mark Peplow, *Solar Panels Face Recycling Challenge*, 8 ACS CENT. SCI. 299, 299 (2022). For example, lead "can leach out as [the panels] break down." Maddie Stone, *Solar Panels Are Starting to Die. What Will We Do with the Megatons of Toxic Trash?*, GRIST (Aug. 13, 2020), https://grist.org/energy/solar-panels-are-starting-to-die-what-will-we-do-with-the-megatons-of-toxic-trash/ [https://perma.cc/7P6F-ZJY7].

tsunami of PV waste" has sparked a race among companies and researchers to find solutions that support sustainability and reduce costs and environmental impacts.[85]

1. The Panels: Recycling Shortcomings

To support the circular economy goal, encouraging recycling and reusing solar panels, as opposed to sending them to landfills, remains crucial for renewable waste management to work effectively.[86] Some believe there should be a substantial salvage value in utility-scale solar projects.[87] This value comes from the metal, wiring, and other materials that can be recycled and reused.[88] However, the current value of a salvaged panel is "[not] enough to make up for the [current] cost of transporting and recycling it."[89] The complicated process combined with recycling methods that lack the needed sophistication for success continue to present the biggest obstacle.[90]

At present, recycling is not economically viable, as the recycling cost is higher than the landfill cost.[91] Convenience and high recycling

85. Peplow, *supra* note 84.

86. Folk, *supra* note 68. Although dedicated PV recycling facilities seem premature at the moment, the speculated "surge in PV waste volumes" in 2030 shows the approaching need for those facilities. Kelly Pickerel, *It's Time to Plan for Solar Panel Recycling in the United States*, SOLAR POWER WORLD (Apr. 2, 2018), https://www.solarpowerworldonline.com/2018/04/its-time-to-plan-for-solar-panel-recycling-in-the-united-states/ [https://perma.cc/X9RL-9KWX] (quoting Cara Libby, senior technical leader of solar energy, Electric Power Research Institute).

87. *See, e.g.*, Justine Calma, *Dead Solar Panels Are About to Become a Lot More Valuable*, VERGE (July 8, 2022, 1:21 PM), https://www.theverge.com/2022/7/8/23200153/solar-panel-value-recycling-renewable-energy [https://perma.cc/UNB4-5EFK].

88. Chris Bolt, *Solar Panel Disposal: What You Need to Know*, GREENCITIZEN, https://greencitizen.com/blog/solar-panel-disposal/ [https://perma.cc/GU3D-MNQH].

89. Calma, *supra* note 87.

90. *See id.* The materials contained in the solar panels are not hard to recycle. Marsh, *supra* note 80. Rather, the process of separating the materials and "uniquely recycling them is a complex and expensive process." *Id.* "[T]he process in which materials are separated can be tedious and requires advanced machinery." Tom Schoder, *Can Solar Panels Be Recycled?*, GREENTECH RENEWABLES, https://www.greentechrenewables.com/article/can-solar-panels-be-recycled [https://perma.cc/GQZ8-6CWD].

91. Idiano D'Adamo, Michela Miliacca & Paolo Rosa, *Economic Feasibility for Recycling of Waste Crystalline Silicon Photovoltaic Modules*, INT'L J. PHOTOENERGY, June 27, 2017, at 1, 2. "IRENA, the

costs have led some companies to export the dead panels to developing countries.[92] It is hard to consider the renewable energy industry as "truly sustainable" when the waste is just shipped to other countries.[93]

Solar panel recycling mitigates the risk that used panels pose on the environment and community.[94] Although few and far between, "effective methods do exist."[95] For example, America's largest solar company, First Solar, designs modules for "high-value recycling" and recovers over "90% of module materials for reuse."[96] Unlike European manufacturers, U.S. manufacturers are not "required to handle their product recycling," but "several private companies are working on their [own] practices and technologies."[97] Some companies that solely recycle panels include We Recycle Solar and Veolia.[98] However, with no overarching policy game plan in place, the U.S. will continue to lag behind Europe's solar recycling advancements.[99]

International Renewable Energy Agency, anticipates that a rapid increase in the number of decommissioned solar panels by 2050 will provide the recycling industry with a platform for growth." Tina Casey, *Old Solar Panels: E-Waste Today, Gold Mines Tomorrow*, CLEANTECHNICA (June 21, 2016), https://cleantechnica.com/2016/06/21/recycling-old-solar-panels-e-waste-today-gold-mines-tomorrow/ [https://perma.cc/875N-6XQH]. However, the current cost-benefit ratio for recycling "a typical 60-cell silicon panel can yield somewhere in the region of $3 worth of recovered aluminum, copper, and glass," while "the cost of recycling the entire panel . . . [is] between $12 and $25." Christopher McFadden, *Renewable Energy Paradox: Solar Panels and Their Toxic Waste*, INTERESTING ENG'G (Sept. 30, 2021, 9:14 AM), https://interestingengineering.com/science/renewable-energy-paradox-solar-panels-and-their-toxic-waste [https://perma.cc/P5AL-VDHW]. Conversely, the cost to "dump an old panel" is "less than $1 (depending on the state)." *Id.*

92. Prendergast, *supra* note 76; *Is Solar Panel Recycling a Problem?*, WE RECYCLE SOLAR, https://werecyclesolar.com/is-solar-panel-recycling-a-problem/ [https://perma.cc/9FYA-FX4P].

93. Folk, *supra* note 68 (pointing out that renewable energy waste is being "shipped to developing countries such as Ghana, Vietnam and Pakistan").

94. Prendergast, *supra* note 76.

95. *Id.*

96. *Powering a Circular Economy*, FIRST SOLAR, https://www.firstsolar.com/en/Solutions/Recycling [https://perma.cc/EXM9-FV2Z]; *accord* Prendergast, *supra* note 76.

97. Marsh, *supra* note 80.

98. *Id.* With two processing plants in the U.S., We Recycle Solar "uses a combination of mechanical and chemical methods to extract as many of the raw resources from their panels as possible." *Id.* Veolia, a French waste company, "opened their first recycling plant in 2018, where robots separate glass, silicon, plastics, and metals from solar panels." *Id.*

99. *See id.*

2. The Land: Hazardous Waste Risks

When solar panels are discarded, some "are considered hazardous waste, and some are not."[100] The panels contain toxic heavy metals, such as lead and cadmium, known to be harmful to human health and the environment should they leak out of the panels.[101] If the quantity of toxic metals in the solar panels is high enough, they could be considered hazardous waste under the Resource Conservation and Recovery Act (RCRA).[102] If governments classify solar panels as hazardous waste, numerous expensive restrictions will attach.[103] The RCRA requires a Toxicity Characteristic Leaching Procedure (TCLP) test to determine if the discarded materials are hazardous waste.[104] Solar panel manufacturers use different materials for the semiconductors which can cause the TCLP test to pass some panels off as non-hazardous waste while classifying others as hazardous waste.[105]

The current federal guidelines and regulations for solar decommissioning are "lacking."[106] Currently, decommissioning is governed by the RCRA, which uses generalized testing to classify

100. *End-of-Life Solar Panels*, *supra* note 47.

101. *Id.*; Yan Xu, Jinhui Li, Quanyin Tan, Anesia Lauren Peters & Congren Yang, *Global Status of Recycling Waste Solar Panels: A Review*, 75 WASTE MGMT. 450, 453 (2018); Isaac Orr, *Solar Panels Produce Tons of Toxic Waste—Literally*, AM. EXPERIMENT (Jan. 5, 2020), https://www.americanexperiment.org/solar-panels-produce-tons-of-toxic-waste-literally/ [https://perma.cc/SYL5-9UR9].

102. *See* 42 U.S.C. §§ 6901–6908a. The RCRA governs "the proper management of hazardous and non-hazardous solid waste." *Resource Conservation and Recovery Act (RCRA) Laws and Regulations*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/rcra [https://perma.cc/S7EF-CLYW] (Nov. 15, 2022). The Act defines hazardous waste as waste that could "cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or pose a substantial . . . hazard to human health or the environment when improperly . . . managed. § 6903(5).

103. Atasu et al., *supra* note 63. For example, "hazardous waste can only be transported at designated times and via select routes." *Id.*

104. *End-of-Life Solar Panels*, *supra* note 47. The TCLP "test is designed to simulate landfill disposal and determine the risk of hazardous substances leaching out of the landfill." *What Happens When*, *supra* note 78.

105. *End-of-Life Solar Panels*, *supra* note 47.

106. *The State of Solar Decommissioning: Current Regulations and Top State Actions*, LEYLINE RENEWABLE CAP., https://leylinecapital.com/news/the-state-of-solar-decommissioning-current-regulations-and-top-state-actions [https://perma.cc/NZ6S-4KKW].

waste as solid or hazardous.[107] Under the RCRA, solar facility owners or operators may face civil or criminal liability during decommissioning for improper disposal of solar panels.[108] In some states, there are efforts to classify solar panels as universal waste rather than hazardous waste.[109] Universal waste has looser requirements compared to other hazardous waste because it is more commonly generated and poses "a lower immediate risk to people and the environment."[110] The dispute over classifying waste as universal or hazardous is not new. In *City of Chicago v. Environmental Defense Fund*, the Environmental Defense Fund sued the City of Chicago for disposing of its municipal waste combustion ash into landfills that were not licensed for hazardous waste.[111] The City believed the ash did not constitute hazardous waste under the RCRA, but the Court ultimately disagreed.[112]

"Studies have shown the heavy metals in solar panels — namely lead and cadmium — can leach out of the cells and get into groundwater . . . ."[113] This risk poses "detrimental effects on human health" as well as the surrounding plant life.[114] Cadmium telluride, a common component of solar panels, is a known carcinogen and is toxic to plants.[115] This heavy metal's toxicity can inhibit efforts to convert land back into its predevelopment agricultural use.[116] The deconstruction and removal of the solar installation equipment can

107. *Id.*

108. *See* 42 U.S.C. § 6928.

109. *See, e.g.*, Rachel Kisela, *California Went Big on Rooftop Solar. Now That's a Problem for Landfills*, L.A. TIMES, https://www.latimes.com/business/story/2022-07-14/california-rooftop-solar-pv-panels-recycling-danger [https://perma.cc/4TC2-ZTAR] (July 15, 2022, 7:13 PM). Even if classified as universal waste, disposal is still economically more viable than recycling. *See id.*

110. *Managing Hazardous Waste*, DEPT. TOXIC SUBSTANCES CONTROL, https://dtsc.ca.gov/universal-waste-fact-sheet/ [https://perma.cc/C3BK-TJVR]; *see also Differences Between Universal Waste and Hazardous Waste Regulations*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/hw/differences-between-universal-waste-and-hazardous-waste-regulations [https://perma.cc/5R7G-YDRY] (Feb. 1, 2023).

111. City of Chicago v. Env't Def. Fund, 511 U.S. 328, 330 (1994).

112. *Id.* at 334–35, 337.

113. Prendergast, *supra* note 76.

114. *Id.*

115. *Id.*; Mike Carroll, *Can Solar Energy Production Be Converted to Farmland?*, N.C. COOP. EXTENSION, go.ncsu.edu/readext?827052 [https://perma.cc/7UL8-Z4ZN] (Mar. 8, 2023).

116. Carroll, *supra* note 115.

represent only part of the decommissioning cost.[117] In some situations, the remaining expense involves returning the land to its original use or ensuring it is ready for redevelopment.[118] This work on the land can include top soil replacement, revegetation, and soil sample reports.[119] If toxic heavy metals have leached out of the panels during this process and into land that was previously agricultural, the land will not be able to return to its predevelopment condition, or it will cost a lot of money to get it there.[120]

When the solar installation is decommissioned, the panels are moved and taken to be discarded or recycled.[121] Although the panels are well-sealed while in use, moving the panels during decommissioning creates "the potential for environmental contamination."[122] This can occur during the process of transporting the panels or while the panels are breaking down in a landfill.[123] Although some of the panels containing toxic materials may be sent to landfills "with extra safeguards [to protect] against leakage," those landfills will eventually reach capacity.[124] Without much guidance for decommissioning solar panels, the risks of hazardous spills and environmental contamination may continue to increase as solar panels fill the landfills.[125]

B. Decommissioning Bonds

Decommissioning bonds provide financial assurances to landowners and local governments to "guarantee the availability of

117. *See* Wyatt, *supra* note 19.

118. *Id.*

119. Mike Carroll, *Considerations for Transferring Agricultural Land to Solar Panel Energy Production*, N.C. COOP. EXTENSION, https://craven.ces.ncsu.edu/considerations-for-transferring-agricultural-land-to-solar-panel-energy-production/ [https://perma.cc/2PLQ-UYVK].

120. *See id.*

121. *See End-of-Life Solar Panels*, *supra* note 47; *What Happens When*, *supra* note 78.

122. *Solar Energy Development Environmental Considerations*, SOLAR ENERGY DEV. PROGRAMMATIC ENV'T IMPACT STATEMENT [hereinafter *Solar Energy Development*], https://solareis.anl.gov/guide/environment/ [https://perma.cc/2LY3-CL2Q].

123. *See* Kisela, *supra* note 109.

124. *Id.*

125. *See Solar Energy Development*, *supra* note 122; Atasu et al., *supra* note 63.

funds for system removal."[126] They are typically required from developers and are often attached to leases at the beginning of the project.[127] "The bond amount equals the decommissioning and reclamation costs for the entire system."[128] These financial assurances "must remain valid until the decommissioning obligations have been met."[129]

Controversy surrounds decommissioning bonds.[130] Some states and local governments require decommissioning bonds from the solar developers while others do not.[131] Requiring bonds entails a "tradeoff"—providing local governments with more protection but potentially deterring development due to increased overall cost.[132] From a solar developer's perspective, requiring bonds can be frustrating because some other commercial and industrial developments do not have to post bonds.[133] Opponents claim that bonds "unfairly subject[] renewable energy to stricter controls than other energy projects."[134] Some consider bond requirements "an

126. N.Y. STATE ENERGY RSCH. & DEV. AUTH., N.Y. SOLAR GUIDEBOOK FOR LOCAL GOVERNMENTS 171 (2023), https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Programs/NY-Sun/2023-Solar-Guidebook.pdf [https://perma.cc/7FA6-EG6H].

127. *See id.*

128. *Id.*

129. *Id.*

130. *See, e.g.*, Elizabeth Ouzts, *North Carolina Environment Board Will Set Rules for Retiring Solar Farms*, ENERGY NEWS NETWORK (July 23, 2019), https://energynews.us/2019/07/23/north-carolina-environment-board-will-set-rules-for-retiring-solar-farms/ [https://perma.cc/6Q4P-S28U] (highlighting a debate over a proposed bill in North Carolina, with many worrying that requiring bonds "would make renewable energy projects prohibitively expensive").

131. HEIDI KOLBECK-URLACHER, CTR. FOR RURAL AFFS., DECOMMISSIONING SOLAR ENERGY SYSTEMS RESOURCE GUIDE 5–6 (Teresa Hoffman, Rhea Landholm, Catharine Huddle & Liz Stewart eds., 2022), https://www.cfra.org/sites/default/files/publications/Decommissioning%20solar%20energy%20systems%20WEB.pdf [https://perma.cc/6JH6-WAJG] (providing Nebraska and Minnesota as examples of states that require decommissioning bonds).

132. *Id.*

133. *See Our Opinion: There's Hidden Costs with Renewables*, TIMES OBSERVER (May 3, 2022), https://www.timesobserver.com/opinion/our-opinion/2022/05/our-opinion-theres-hidden-costs-with-renewables/ [https://perma.cc/PF73-7Y9S] (pointing out that "oil and gas wells were woefully underbonded").

134. Peggy Kirk Hall, *Ohio Legislature Passes Solar and Wind Project Siting and Approval Bill*, OHIO ST. U. FARM OFF.: FARM OFF. BLOG (July 1, 2021), https://farmoffice.osu.edu/blog/thu-07012021-254pm/ohio-legislature-passes-solar-and-wind-project-siting-and-approval-bill [https://perma.cc/X3UH-9TNF].

extreme and unnecessary burden for developing solar energy."[135] If financial assurance is required for the project, developers favor an approach that allows the bond to be paid over the course of the project rather than before the project operates.[136] This approach allows the bond to be "absorbed as operating costs rather than upfront capital cost."[137]

On the other hand, community members are concerned with what happens to a facility when its production life ends.[138] Local residents who have dealt with abandoned but not properly closed energy facilities want accountability.[139] In *Neighbors Opposing Pit Expansion, Inc. v. New Richmond Development Corp.*, more than one hundred Clermont County, Ohio, residents are suing the owner of a former coal plant under the RCRA claiming that the open dumping of coal ash is threatening to cause an environmental catastrophe.[140] The coal plant decommissioning concerns voiced in *Neighbors Opposing Pit Expansion* are examples of concerns that might arise with solar facilities.[141] Often, local residents believe that decommissioning is critical to any solar project and must be addressed during the planning phase due to the expected long lifespan of the solar energy projects.[142] Requiring bonds helps mitigate some of the financial loss and public health risks associated with decommissioning.[143]

135. GOLDSTEIN ET AL., *supra* note 46, at 43.

136. KOLBECK-URLACHER, *supra* note 131, at 5.

137. *Id.* at 5–6.

138. *See* Hall, *supra* note 134 (explaining that some community members in Ohio support decommissioning bonds because it allows them to "protect their individual property rights as well as the fate of the community").

139. *See* Lance Collins & Dietrich Hoefner, *Louisiana Solar Decommissioning Law Comes with Big Exception for Utilities*, JD SUPRA (July 15, 2022), https://www.jdsupra.com/legalnews/louisiana-solar-decommissioning-law-1565088/ [https://perma.cc/PAZ5-JXZA].

140. Complaint for Declaratory & Injunctive Relieve & for Civil Penalties with Demand for Jury Trial at 1–2, Neighbors Opposing Pit Expansion, Inc. v. New Richmond Dev. Corp., No. 1:21-CV-00792 (S.D. Ohio Dec. 21, 2021), 2021 WL 6064434 ("This action concerns ongoing, dangerous disposal of toxic waste that threatens human health and the environment in an Ohio River community.").

141. *See id.*

142. Lea Maamari, *Decommissioning of Solar Sites: A Key Consideration of the Project*, SOLUNESCO (Sept. 10, 2018), https://solunesco.com/2018/09/10/decommissioning-of-solar-sites-a-key-consideration-of-the-project/ [https://perma.cc/PP77-8UPX].

143. *Research Memorandum: Solar Panel Recycling*, COUNCIL ST. GOV'TS (Oct. 18, 2022), https://www.csg.org/2022/10/18/research-memorandum/ [https://perma.cc/JH5T-EAYE].

When solar farms need to be decommissioned, someone has to pay for it. If the funds are not there or no party is held responsible in the agreement, a costly lawsuit could result.[144] In *In re Application of Champaign Wind, L.L.C.*, the Ohio Power Siting Board ordered Champaign Wind to post a decommissioning bond to "ensure that adequate funds exist[ed] to remove the turbines [from the wind farm] when no longer in use."[145] Champaign Wind claimed that the board's formula for calculating the bond amount differed from the formula originally used to approve a wind farm and would "result in a much higher decommissioning bond."[146] Because there was no legal authority or statutory guidance prohibiting the board's formula for calculating the bond, the court found an implicit grant of discretion and held that the board's formula was not objectively unreasonable.[147] This case presents an example of litigation that could be avoided if statutory guidance existed. Additionally, in *Zero Point Development, Inc. v. Town of Charlton Planning Board*, the court dismissed a solar developer's appeal challenging an increased decommissioning bond that a local planning board imposed because the developer expanded its solar project to include storage-battery arrays.[148] Lawyers are expensive, and litigation is an unexpected cost that could be avoided if details are discussed up front.

Although decommissioning bonds for solar projects are not abundantly required, we can watch and learn from another renewable energy source: wind.[149] "Requiring financial assurances from parties in a position to cause environmental harm is not a new concept."[150]

144. *See, e.g.*, John R. Moses, *City Drops San Juan Generating Station Lawsuit in Favor of Arbitration*, FARMINGTON DAILY TIMES (Oct. 8, 2022, 5:11 AM), https://www.daily-times.com/story/news/2022/10/08/city-farmington-drops-san-juan-generating-station-lawsuit-in-favor-arbitration/69547723007/ [https://perma.cc/J58E-3ZXY].

145. *In re* Application of Champaign Wind, L.L.C., 58 N.E.3d 1142, 1158 (Ohio 2016).

146. *Id.*

147. *Id.*

148. Zero Point Dev., Inc. v. Town of Charlton Plan. Bd., No. 20 Misc. 000291, 2022 WL 122947, at *1–2 (Mass. Land Ct. Jan. 12, 2022).

149. *See* Wetsel, *supra* note 62, at 418–19, 422.

150. Dominique R. Scalia, *I'll Take the Benefits if You Pay the Costs: Weighing the Equities of Public and Private Funding Sources for Hydroelectric Dam Decommissioning*, 2 AM. INDIAN L.J. 354, 369 (2014).

Although wind and solar were equally popular a few years ago, solar power has become more popular than wind and is now winning "the race to develop renewable energy."[151] However, we can still learn from wind energy's past.

Similar to solar farms, wind farms must deal with decommissioning when the lives of the wind turbines end.[152] Wind farms also run into issues with recycling and waste, so it makes sense that they would struggle with decommissioning too. Without decommissioning bonds, there is little protection for landowners or communities.[153] For example, if the wind energy market plummets and companies go bankrupt before the decommissioning date, then "the landowner would be stuck with a wind turbine on his or her property until the costs of decommissioning the turbines were paid by someone else."[154] For this reason, some states have adopted laws addressing decommissioning costs and implemented a bond requirement.[155]

Texas, with a history in the oil and gas industry, has learned from its past.[156] Texas implemented a wind decommissioning statute that provided requirements for removal of wind turbines.[157] However, Texas lawyers have been adding bond provisions in landowner leases since the start of the Texas "wind boom."[158] Because wind and solar share many similarities, Texas recently extended its wind decommissioning legislation to also apply to solar.[159] History suggests past decisions could be helpful for deciding present challenges.

151. Dominic Dudley, *Solar Overtakes Wind Energy for First Time in Global Rush for Renewables*, FORBES (Apr. 12, 2022, 5:56 AM), https://www.forbes.com/sites/dominicdudley/2022/04/12/solar-overtakes-wind-energy-for-first-time-in-global-rush-for-renewables/?sh=500f097769a9 [https://perma.cc/B8T4-DD9W].

152. Wetsel, *supra* note 62, at 419–20.

153. *See* Joshua Conaway, *Be Aggressive with Wind Energy: Blow Away the Decommissioning Fears*, 2 OIL & GAS, NAT. RES., & ENERGY J. 621, 640–41 (2017).

154. *Id.*

155. *Id.* at 639, 644.

156. *See* Wetsel, *supra* note 62, at 421–22.

157. *Id.* at 419; TEX. UTIL. CODE ANN. §§ 301.0001 to .0004 (West 2023).

158. Wetsel, *supra* note 62, at 422.

159. TEX. UTIL. CODE ANN. §§ 302.0001 to .0005 (West 2023).

III. PROPOSAL

After acknowledging the future challenges and legal ramifications of decommissioning utility-scale solar installations, legal scholars have presented various approaches for addressing the growing concerns. One federal agency, some state legislatures, and the EU have also addressed some of the decommissioning concerns with varying policies.[160] However, the benefits of decommissioning policies to local communities must be weighed against the associated costs developers will face.[161] With "such a diverse patchwork of policies across the grid, [] it's difficult for developers to know how to incorporate them into the project development timeline."[162] But despite these challenges for developers who typically favor local policies, we are seeing increased statewide standardization.[163]

A. Existing Decommissioning Polices Across the United States

One suggested approach is to implement solar decommissioning policies nationwide.[164] Currently, only one federal agency, the Bureau of Land Management (BLM), has a solar decommissioning policy.[165] For solar projects on public lands, BLM has implemented a solar decommissioning policy that requires the developer to "submit a decommissioning plan and proof of financial assurance to BLM" before the project's approval.[166] In the BLM decommissioning plan

160. CURTIS ET AL., *supra* note 59, at 1, 6; Md. Shahariar Chowdhury, Kazi Sajedur Rahman, Tanjia Chowdhury, Narissara Nuthammachot, Kuaanan Techato, Md. Akhtaruzzaman, Sieh Kiong Tiong, Kamaruzzaman Sopian et al., *An Overview of Solar Photovoltaic Panels' End-of-Life Material Recycling*, ENERGY STRATEGY REVS., Jan. 2020, at 1, 1 (2020).

161. *See Solar Experts Weigh in on Decommissioning Requirements*, LEYLINE RENEWABLE CAP. [hereinafter *Solar Experts*], https://leylinecapital.com/news/solar-experts-weigh-in-on-decommissioning-requirements [https://perma.cc/4FEK-8AHE].

162. *Id.* (quoting Maggie Clark, Pine Gate Renewables).

163. *Id.* (explaining that developers prefer local efforts because they "prioritize developer education and implementing favorable policies from elsewhere, and that is beneficial to the broader solar industry" (quoting Maggie Clark, Pine Gate Renewables)).

164. *See id.*; CURTIS ET AL., *supra* note 59, at v (noting that most existing U.S. policies are directed at utility-scale projects).

165. CURTIS ET AL., *supra* note 59, at 6.

166. *Id.*

requirement, "a description of the reclamation and restoration activities as well as a reclamation cost estimate" must be included.[167] Additionally, the policy requires a substantial decommissioning bond at $10,000 per acre with an inflation adjustment every ten years.[168] The bond requirement "has led to project delays and project cancellations."[169] Some solar developers criticize national guidelines as unhelpful unless those guidelines provide for a "menu of options" that are "adaptable to each state's or region's specific reality."[170] It is important that a national guideline does not negatively impact revenue.[171] Solar Energy Industries Association (SEIA) created "a national decommissioning model bill . . . for utility scale solar."[172] However, this model bill might be best used as guidance for the state to adopt and customize to match its specific needs.[173]

Another approach is to implement statewide decommissioning policies. As of April 2021, "[fifteen] U.S. states have solar decommissioning policies in place."[174] Additionally, some states are drafting solar decommissioning regulations, while others have proposed them.[175] SEIA and some solar developers consider a 2021 Texas bill the "gold standard for decommissioning."[176] The new legislation is considered "straightforward" and "commercially reasonable."[177] Texas's solar decommissioning requirements are similar to those imposed on wind when the state passed its wind

167. *Id.*
168. *Id.* at 7.
169. *Id.*
170. *Solar Experts*, *supra* note 161 (quoting Blair Kendall, Urban Grid). "Any national guidance would also need to carefully balance any bonding requirements by allowing salvage value to be calculated into the security and by allowing a gradual phased approach with the security. It has to work for both sides, the renewable energy industry and the local communities." *Id.*
171. *Id.* It is also important to ensure that "costs align with risks" and "that financial commitments don't occur too early in the project lifetime." *Id.* (quoting Maggie Clark, Pine Gate Renewables).
172. *Id.* (quoting Will Giese, SEIA).
173. *Id.*
174. CURTIS ET AL., *supra* note 59, at v.
175. *Id.*
176. *Solar Experts*, *supra* note 161 (quoting Will Giese, SEIA); *see* TEX. UTIL. CODE ANN. §§ 302.0001 to .0005 (West 2023).
177. *Solar Experts*, *supra* note 161 (quoting Will Giese, SEIA).

decommissioning statute in 2019.[178] Solar experts suggest that Texas's guidelines are the ones to replicate because they benefit the solar industry and clarify the rules around decommissioning solar sites.[179]

Two common requirements shared among the currently enacted statewide policies are decommissioning plans and decommissioning bonds. Although the policies vary by jurisdiction, they often require developers to create a decommissioning plan that includes restoration details, a cost estimate, and information on site reclamation.[180] The Texas law mandates that "solar power facility agreements . . . include specific provisions describing a grantee's responsibility to remove project facilities from the landowner's property."[181] Additionally, the law requires the grantee to "[c]lear, clean, and remove the foundation of any solar energy device, transformer, or substation and buried cables," as well as the devices, transformers, substations, and lines themselves.[182] If requested by the landowner, the grantee must also clear any roads that the grantee constructed on the property.[183] Lastly, the law allows the landowner to make "a *reasonable* request" for the land to be restored to its predevelopment condition, including removing rocks and filling in all holes.[184]

Furthermore, several jurisdictions often require financial assurance, mostly in the form of bonds, from solar developers "to guarantee funds will be available for system decommissioning activities and site restoration."[185] Some policies "mandate a preferred financial assurance instrument," "an issuance date for when the financial

178. *Compare* TEX. UTIL. CODE ANN. §§ 301.0001 to .0004 (West 2023) (wind), *with* TEX. UTIL. CODE ANN. §§ 302.0001 to .0005 (West 2023) (solar); Kara Hayenga, Jennifer Pier & Brian Pullin, *Texas Legislature Expands Decommissioning Requirements to Solar Power Facility Agreements with Enactment of SB 760*, JD SUPRA (Aug. 25, 2021), https://www.jdsupra.com/legalnews/texas-legislature-expands-4566455/ [https://perma.cc/LSV5-LPNL].

179. *Solar Experts*, *supra* note 161.

180. CURTIS ET AL., *supra* note 59, at 11.

181. Hayenga et al., *supra* note 178.

182. *Id.*

183. *Id.*

184. *Id.*

185. CURTIS ET AL., *supra* note 59, at 14.

assurance is due," and "a specific calculation method."[186] The new Texas law requires solar power facility agreements to "include provisions indicating that the solar owner will be financially able to complete its [decommissioning and] restoration obligations."[187] The forms of financial assurance accepted "include a parent company guaranty . . . , a letter of credit, a bond, or another form of financial assurance reasonably acceptable to the landowner."[188] The amount of required financial assurance varies. The calculation depends "on the amount by which the estimated cost of the grantee's removal and restoration obligations exceeds the salvage value of the solar power facilities less the value of the solar power facilities pledged to secure outstanding debt."[189] An independent engineer licensed in Texas must determine these calculations.[190] The grantee must cover the cost to obtain the estimates.[191] The restoration estimate is required "on or before the [tenth] anniversary of the commercial operations date of the solar power facilities; and . . . at least once every five years . . . for the remainder of the term of the agreement."[192] Financial assurance must be delivered to the landowner by the solar power facility agreement's termination date or "the [twentieth] anniversary of the commercial operations date," whichever is earlier.[193] Similar to nationwide policies, statewide policies must balance encouraging solar industry growth and development with protecting local communities.[194]

186. *Id.* The "preferred financial assurance instrument[s]" include surety or performance bonds. *Id.* Issuance dates can be "prior to facility construction, at a specified point during facility operation, [or] along with the decommissioning plan." *Id.* Some calculation methods include "using a cost estimate, liability insurance, or salvage value of the facility infrastructure." *Id.*

187. David Wagman, *Solar Decommissioning Rules Are Coming to Texas*, PV MAG. (Aug. 26, 2021), https://pv-magazine-usa.com/2021/08/26/solar-decommissioning-rules-are-coming-to-texas/ [https://perma.cc/ZMV7-M2VX]; *see* TEX. UTIL. CODE ANN. § 302.0005 (West 2023).

188. TEX. UTIL. CODE ANN. § 302.0005 (West 2023).

189. Hayenga et al., *supra* note 178.

190. *Id.*

191. *Id.*; TEX. UTIL. CODE ANN. § 302.0005(d) (West 2023).

192. TEX. UTIL. CODE ANN. § 302.0005(c)(2) (West 2023); *accord* Hayenga et al., *supra* note 178.

193. TEX. UTIL. CODE ANN. § 302.0005(e) (West 2023); *accord* Hayenga et al., *supra* note 178.

194. *See Solar Experts*, *supra* note 161.

B. The European Union's Approach to Solar Decommissioning

Another approach to overcoming some of the challenges posed by solar decommissioning is to create a regulatory framework for electronic waste that covers collecting and recycling PV modules.[195] Currently, the federal government has not taken measures to specifically regulate the collection and recycling of solar panel waste.[196] Regulations aimed at solar panel waste would serve to create a "mandatory market for PV module recycling" and thus decrease the amount of waste produced.[197] These suggested regulations mirror the standards set forth in the EU.[198]

The EU's Waste from Electrical and Electronic Equipment Directive (WEEE Directive) mandates PV module recycling.[199] The EU "was the first to adopt PV-specific waste regulations by mandating the recycling of all solar panels" that have reached the end of their life.[200] "In Europe, the current raw material recovery rate for recycling PV modules is 65[%]-70% . . . and is in line with the EU WEEE Directive."[201] The WEEE Directive's goal is to "limit the negative influence of the persistent growth in PV waste volume and to implement solar module recycling."[202]

In the EU, all manufacturers of PV panels who supply components to the European market must pay for the costs of collecting and recycling in advance.[203] However, it is important to note that countries outside of the EU are taking little action on recycling due to the current low volume of PV panel waste that is available to recycle, thus making

195. Chowdhury et al., *supra* note 160.

196. *See supra* note 106–08 and accompanying text; Xu et al., *supra* note 101, at 456–57.

197. *See* Parikhit Sinha, Sukhwant Raju, Karen Drozdiak & Andreas Wade, *Life Cycle Management and Recycling of PV Systems*, 38 PHOTOVOLTAICS INT'L 26, 26 (2018).

198. *See id.*

199. *Id.*

200. *Id.*; *see also* Xu et al., *supra* note 101, at 451.

201. Sinha et al., *supra* note 197, at 27–28.

202. Chowdhury et al., *supra* note 160, at 2. Because the ratio of solar PV waste to new installations is expected to increase, methods of dealing with solar PV waste, such as recycling, must be established by 2040. *Id.* at 9.

203. Manuela Franz & Gerhard Piringer, *Market Development and Consequences on End-of-Life Management of Photovoltaic Implementation in Europe*, ENERGY, SUSTAINABILITY & SOC'Y, Dec. 2020, at 1, 16; Chowdhury et al., *supra* note 160.

the cost of recycling disproportionate to the benefit.[204] Additionally, only a few PV panel processing and recycling facilities exist because of the low demand.[205] Management of solar panel decommissioning is still a new field, so further research and development is needed.[206]

Another recycling approach under the WEEE Directive requires "all producers or importers of solar PV materials . . . to register under a product consent scheme" that requires manufacturers to provide all the information on the panels.[207] Additionally, these "producers and importers have to accept responsibility for the [end-of-life] treatment of their products or they are subjected to large fines."[208] In the UK, "all the PV panels produced or imported into the UK market [are required] to have a registered product conformity plan, and all manufacturers . . . must provide all of the critical data related to the panels."[209] In Germany, manufacturers and importers must "register their products and assume obligations for end-of-life treatment" or "face huge fines."[210] This "extended producer responsibility system has . . . proven to be an effective approach for the management of many types of waste, especially electronic waste."[211]

Furthermore, Europe has banned the export of waste.[212] Aside from the "economic, environmental[,] and social implications" of the prohibition, it also promotes recycling.[213] Environmental researchers explained that "[t]he WEEE Directive aims to avoid unwanted shipments of non-functional electrical and electronic equipment to developing countries."[214] Unlike some U.S. policies, the WEEE Directive provides regulations that promote recycling initiatives but do not cover the financing aspect of decommissioning.[215]

204. Xu et al., *supra* note 101, at 451.
205. *Id.*
206. *Id.*
207. Chowdhury et al., *supra* note 160, at 8.
208. *Id.*
209. Xu et al., *supra* note 101, at 456.
210. *Id.*
211. *Id.* at 457.
212. Chowdhury et al., *supra* note 160, at 2.
213. *Id.*
214. Franz & Piringer, *supra* note 203, at 17 (footnote omitted).
215. *See id.* at 18.

C. The Solution: A Statewide Solar Decommissioning Law for Georgia

Decommissioning planning is an inevitable component of solar development. The Texas law is an excellent decommissioning model for Georgia as it is considered "commercially reasonable" and creates more protections for local communities and landowners.[216] Policies that are too restrictive could stunt solar development.[217] Because solar farms have lower levels of risk than coal ash dumps or nuclear waste facilities, it is important that any legislation passed "balance[s] the level of risk mitigation with the actual level of risk."[218]

First, the solar decommissioning law should require solar developers to submit decommissioning plans to a state regulatory entity.[219] Because most solar projects are made through a lease between the developer and the landowner, the solar power facility agreements should include "specific provisions describing [the developer's] responsibility to remove [solar] project facilities from the landowner's property."[220] A decommissioning plan that includes a timeline, cost estimate, removal methods, and restoration details will keep everyone from guessing about what to do in the end. By requiring the landowner to make a reasonable request for some of the actions, such as rock removal, more control is put back into the landowner's hands over their property.[221]

Next, similar to Texas's law, Georgia's solar decommissioning law should also have a commercially reasonable financial assurance requirement for solar developers.[222] Because financial assurance requirements can cause solar projects to be "prohibitively expensive," bonds or other financial assurance instruments should not be higher

216. *Solar Experts*, *supra* note 161 (quoting Maggie Clark, Pine Gate Renewables).
217. *See id.*
218. Ouzts, *supra* note 130 (quoting Steve Kalland, executive director, North Carolina Clean Energy Technology Center).
219. *See* CURTIS ET AL., *supra* note 59, at 11–12 (providing examples of states that require decommissioning plans).
220. *See* Hayenga et al., *supra* note 178 (noting that this is a requirement of the Texas law).
221. *See id.*
222. *See Solar Experts*, *supra* note 161.

than the actual anticipated costs.[223] To assist solar developers, Georgia should accept multiple types of financial assurances. Calculations of the assurances should mirror Texas's law by including the salvage value of the solar facility.[224] The financial assurance should be delivered to the landowner on either "the date the solar power facility agreement is terminated" or "the [twentieth] anniversary of the commercial operations date," whichever is earlier, with the restoration estimate due by the tenth anniversary.[225] The property value of the solar farm location should also be taken into account when requiring financial assurances. For example, decommissioning bonds should only be required for properties in predevelopment conditions of value, like pristine farmland, rather than properties built on land of little to no value. The goal is to provide financial assurances while continuing to promote solar development.

Lastly, although recycling should be a goal for both Georgia and the nation, the low demand and high cost for recycling solar panels suggest that the state may not be ready for legislation that mandates it. In comparison, the EU has an established system for recycling solar panels.[226] Further research into recycling methods and an increase in facilities offering collection and recycling services should occur before legislation is passed. Decommissioning standards that cover all types of energy production "will create and maintain a predictable regulatory environment" for solar developers and the community.[227]

223. *See* Ouzts, *supra* note 130.

224. *See* TEX. UTIL. CODE ANN. § 302.0005(b) (West 2023). By taking into account the salvage value, the bond amount is reduced. *See Solar Experts*, *supra* note 161.

225. TEX. UTIL. CODE ANN. § 302.0005(e), (c)(2) (West 2023).

226. Sinha, *supra* note 197. Some positive components of the EU's WEEE Directive include placing more responsibility on the manufacturers by requiring detailed information about the panels and incentivizing them to engineer products that produce as little waste as possible. *See* Xu et al., *supra* note 101, at 457. The waste concerns can be mitigated by focusing on minimizing waste at the early production stage. *See id.*

227. Tyler Corder, *Neglecting Decommissioning Standards Risks Undoing Green Energy Progress*, TEX. PUB. POL'Y FOUND. (Mar. 2, 2021), https://www.texaspolicy.com/neglecting-decommissioning-standards-risks-undoing-green-energy-progress/ [https://perma.cc/CG63-FHJC].

CONCLUSION

Georgia's rapid growth of solar development and lack of statewide decommissioning polices present concerns for local communities and governments. Because the goal is to manage the growth wisely while preventing avoidable costs, decommissioning concerns should be addressed sooner rather than later.[228] The decommissioning of power plants has spurred litigation regarding hazardous waste designation and financial assurance.[229] Georgia can protect its communities and economy with a predictable regulatory environment by following the example of other states—such as Texas—who are leading in utility-scale solar development. States with solar decommissioning legislation are commonly requiring some form of decommissioning plan and financial assurance.[230] This area of the law is still developing, and further research is needed to create a complete regulatory framework. However, the recent solar development growth in Georgia indicates an increasing need for conversations about statewide decommissioning policies.

228. *See* Wyatt, *supra* note 19 (explaining that "[c]areful planning and early education" is crucial).
229. *See supra* notes 111–12, 138–48 and accompanying text.
230. CURTIS ET AL., *supra* note 59, at 11–16.