JOINT STATEMENT OF THE EDISON ELECTRIC INSTITUTE, THE NATURAL RESOURCES DEFENSE COUNCIL AND THE SOLAR ENERGY INDUSTRIES ASSOCIATION ON SOLAR POWER'S BENEFITS AND PROSPECTS

SUBMITTED TO THE NATIONAL ASSOCIATION OF REGULATORY UTILITY COMMISSIONERS (FEBRUARY 15, 2022)

EEI, NRDC and SEIA share the goal of achieving a dramatic increase in solar electricity production as a vital part of America's clean energy transition, and we present here jointly held views on the remarkable progress already achieved and anticipated, while also addressing questions that we are encountering frequently among policymakers and siting authorities.

Solar energy is expanding, and will continue to expand to meet net-zero carbon goals as a safe technology with low end-of-life impacts.

- The mix of resources used to generate electricity in the United States has changed dramatically over the last decade and is increasingly cleaner. Over the past eight years, more than half of the industry's investments in new electricity generation have been in wind and solar generation resources,[1] and 40 percent of America's electricity in 2020 came from carbon-free resources, including nuclear energy, hydropower, solar energy from roof-tops and large-scale projects, and wind.[2]

- Electric power sector emissions were 40 percent below 2005 levels as of the end of 2020, their lowest level in more than 40 years, and reductions in sulfur and nitrogen emissions were greater still (80-90%).[3] These reductions will continue: four dozen EEI members have announced forward-looking carbon reduction goals, more than half of which include a net-zero by 2050 or earlier equivalent goal. SEIA has announced a goal for solar energy from rooftops and large-scale projects to reach 30% of generation by 2030 as the U.S. transforms the electric grid and builds a robust clean energy economy.

[1] *See* EIA, *Nearly Half of Utility-Scale Capacity Installed in 2017 Came from Renewables* (Jan. 10, 2018), https://www.eia.gov/todayinenergy/detail.php?id=34472; *see also* EEI, Industry Data, Statistical Highlights: Capacity and Generation (2018), http://www.eei.org/resourcesandmedia/industrydataanalysis/industrydata/Pages/default.aspx.
[2] *See* EIA, n.1, *supra*.
[3] EIA, Monthly Energy Review (Mar. 2021), https://www.eia.gov/totalenergy/data/monthly/.

- In the last decade alone, solar has experienced an average annual growth rate of 42%. Thanks to strong federal policies like the solar Investment Tax Credit, rapidly declining costs, and increasing demand across the private and public sector for clean electricity, there are now more than 100 gigawatts (GW) of solar capacity installed nationwide, enough to power 18.9 million homes.

- In May of 2021, the Solar Energy Industries Association, The Solar Foundation and the Interstate Renewable Energy Council released the 11th annual National Solar Jobs Census, which shows that the U.S. solar industry employed 231,474 workers in 2020. This is a 6.7% drop from 2019, largely due to pandemic restrictions and increased labor productivity. To reach the Administration's clean energy target, the nation needs over 900,000 solar jobs, and now is the time to advance policy solutions that provide the long-term certainty that is needed in order to hire and train that workforce.

- The cost to install solar has dropped by more than 70% over the last decade, leading the industry to expand into new markets and deploy thousands of systems nationwide. An average-sized residential system has dropped from a pre-incentive price of $40,000 in 2010 to roughly $20,000 today, while recent large-scale system prices range from $16/MWh - $35/MWh, competitive with all other forms of generation. Supply chain constraints pushed those prices higher in 2021 but did not eliminate solar power's competitive advantages in retail and wholesale markets.

- As solar energy has expanded, states have begun to address end-of-life questions. Extensive experience with solar panels demonstrates that they are safe to handle, install, operate, decommission, re-use and recycle. Solar panels contain no liquids and cannot spill anything. Modern panels consistently are characterized as nonhazardous under the EPA's Toxicity Characteristic Leaching Procedure (TCLP) which tests leaching of toxic chemicals.[4]

- PV modules may start to reach the end of their warranty periods in 20-30 years, but typically do not reach end-of-life until at least 40 years.[5] We recommend a "circular economy" approach that aims to reuse solar equipment where possible, or otherwise safely and appropriately recycle that equipment. For this to be successful, significant new infrastructure, logistics and processes need to be created, developed and further implemented in the many areas where solar will thrive. We will work together with other stakeholders to help make this happen.

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[4] Such leach tests create conditions that are much more extreme than solar field conditions and typically involve chopping up solar panels into tiny pieces, submerging them in an acidic solvent, then agitating the solvent for some period of time and measuring the content for dozens of toxic chemicals. Even in those extreme conditions, solar panels do not represent a significant risk of toxic leaching. For additional references, see Appendix I.

[5] See, e.g., *Energy Analysis: Useful Life: Solar*, National Renewable Energy Laboratories [https://www.nrel.gov/analysis/techfootprint.html]; *What to know about a solar panel warranty*, Energy Sage LLC [https://news.energysage.com/shopping-solar-panels-pay-attention-to-solar-panelswarranty]; *SunPower Module 40-year Useful Life* [https://us.sunpower.com/sites/default/files/media-library/white-papers/wp-sunpower-module-40-year-useful-life.pdf].

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APPENDIX

References:

- ***Health and Safety Impacts of Solar Photovoltaics - NC Solar Center:*** http://ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2017/10/Health-and-Safety-Impacts-of-Solar-Photovoltaics-2017_white-paper-1.pdf.

- ***Sustainability of Photovoltaics*** https://www.sciencedirect.com/science/article/pii/S1364032109000896.

- ***Life Cycle Impact Analysis of Cadmium in CdTe PV Production***: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.558.4686&rep=rep1&type=pdf.

- ***Final Report on the Activities Conducted to Establish a Regulatory Program for the Management and Decommissioning of Renewable Energy Equipment - NC DEQ*** https://files.nc.gov/ncdeq/Environmental%20Management%20Commission/EMC%20Meetings/2021/jan2021/attachments/AttachA-21-05-H329---FINAL-REPORT-Ellen--1-.pdf.

- ***Assessment of Leaching Tests for Evaluating Potential Environmental Impacts of PV Module Field Breakage - IEEE Journal of Photovoltaics:*** https://ieeexplore.ieee.org/document/7283538/.

- ***Evaluation of Potential Health and Environmental Impacts from End-of-Life Disposal of Photovoltaics - Nova Science Publishers, Inc.:*** https://www.researchgate.net/publication/273448212_Evaluation_of_Potential_Health_and_Environmental_Impacts_from_End-of-Life_Disposal_of_Photovoltaics. Sinha, V. L. Trumbull, S. W. Kaczmar, and K. A. Johnson, Photovoltaics, ch. 2, pp. 37{51. Nova Science Publishers, Inc., 2014.