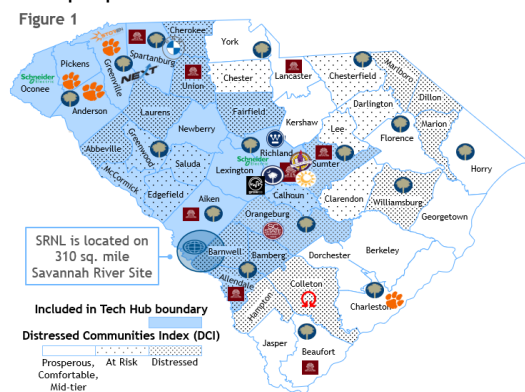


**Summary:** The ambition of *The Nexus for Advanced Resilient Energy (“SC Nexus”)*<sup>1</sup> is to create a globally leading hub driving innovation in core technologies that enable an end-to-end resilient, sustainable energy ecosystem across clean-electricity generation, distribution, and grid-scale storage. The Hub will leverage the region’s dynamic and growing manufacturing base, superior research capabilities, and demonstrated record of public-private collaboration to develop exportable electricity technologies alongside testing and deployment of those technologies, which will accelerate high-quality job growth for a diverse workforce, address the US’ focus on climate and environmental responsibility, help to close infrastructure gaps in rural and distressed communities, and ensure the US grows competitive and globally leading electric-power technologies and industries of the future. This effort is led by the South Carolina Department of Commerce and brings together 30+ members, including public institutions (HBCUs, R1 universities, government agencies), private industry, and the Savannah River National Lab.

SC Nexus’ selected technology focus area (KTFA) aligns with “#9 Advanced Energy,” specifically developing and driving innovative research, design, and manufacturing for components, materials, and control systems fundamental to accelerating the transition to clean energy. These components will support generation (e.g., solar, offshore wind, small nuclear, hydrogen), resilient and digitized distribution, and grid-scale storage. SC’s electricity system is structurally the same as most global systems, providing a testbed for innovation. This effort will drive equitable, environmental-justice-focused outcomes<sup>2</sup> by improving energy reliability, addressing intermittency, and supporting disaster preparedness.

SC Nexus’ defined geography (Figure 1) connects assets of consortium members across the state’s Midlands and Upstate regions, bringing together the tightly interconnected MSAs<sup>3</sup> of Greenville-Anderson, Columbia, Spartanburg, and surrounding counties (e.g., Aiken, Orangeburg). This covers 60%+ of SC’s distressed counties,<sup>4</sup> 60%+ of SC’s Environmental Justice Communities,<sup>5</sup> and 50%+ of SC’s qualified opportunity zones.<sup>6</sup> Activity will be focused in this geography, but impact will cascade across the state and Southeast region with an emphasis on rural and underserved communities.






To spur and support innovation and achieve the impact outlined above, SC Nexus will invest as follows:

- **Technology:** Rapidly design, test, manufacture, and implement components and materials needed for resilient, clean electricity generation, distribution system intelligence and management tools, and new grid- and customer-scale battery storage technologies, demonstrating how reliable battery-integrated electricity grids can operate effectively in broad contexts
- **People:** Build the SC Nexus Energy Workforce Collaborative, aligning the full spectrum of the education system to industry needs, with equitable pathways to in-state, high-paying jobs
- **Entrepreneurship:** Coordinate incubators to launch energy-focused startups in the region

**(1) Technology-based potential:** A key challenge of the clean energy transition is the inability of electricity grids to operate intelligently in real time while leveraging inexpensive intermittent renewables, small nuclear, and grid-scale energy storage. SC Nexus will become globally competitive in addressing these challenges given its inventory of assets, resources, and capabilities. Though small, SC ranks 3<sup>rd</sup> in the US for nuclear power generation,<sup>7</sup> and as a result, 10<sup>th</sup> in share of electricity from clean sources even though renewables rollout is just beginning.<sup>8</sup> SC is 10<sup>th</sup> in manufacturing as a share of state GDP, with advanced manufacturing a key strength. To continue economic growth, the region is already working to rapidly expand electricity supply, given SC’s growing manufacturing sector consumes more energy than any other

sector,<sup>9</sup> and 2 of the 3 coal plants in the region are set to close by 2030. This provides opportunity to innovate, scale, and export new electricity technology and intellectual property as follows:

Technology-focused initiatives	Industry partners	Time to TRL 9
<b>Accelerated manufacturing:</b> Develop innovative and accelerated processes to manufacture, test, and certify components for small nuclear, offshore wind, hydrogen, batteries, and photovoltaic (PV) solar		~1-5 years
<b>Battery innovation and testing:</b> Develop and test next gen stationary battery components and chemistries (e.g., LMFP, vanadium flow, self-healing silicone anode batteries, thermal), with improved safety		~5-10 years
<b>Grid re-engineering:</b> Develop and demonstrate new products/tools using grid-scale storage, AI, and ML to enable efficient, weather- and cyber-resilient distributed generation, system sensing and management, and demand response in the region’s manufacturing-focused grid		~5-10 years

The Savannah River National Lab (SRNL), multiple R1 universities, and industry partners provide market-relevant scientific capacity aligned to support industry in executing these initiatives:

- SRNL, an energy- and deployment-focused lab, is home to a large-scale isolated grid, to be used for testing hardware and software innovation.
- R1 universities’ unique resources focus on demonstration, such as: Clemson University’s (Clemson) Dominion Energy Innovation Center<sup>10</sup> (housing Duke’s Energy eGrid simulating the electrical grid of any country) and The University of South Carolina’s (USC) Center for Electrochemical Engineering<sup>11</sup> (advanced energy-storage materials used in batteries plus battery and manufacturing process design)

SC Nexus’ tech focus is strategically complementary to ongoing state, local, and federal investments,<sup>12</sup> including US Department of Energy (DOE) funding of \$10.4M to Santee Cooper for the SC Grid Resilience Grant Program;<sup>13</sup> the NSF Engine Development Award (Type I) of \$1M to CLEAN Carolinas, advancing clean energy delivery and storage systems supporting grid integration;<sup>14</sup> Duke Energy’s multi-million dollar ongoing Grid Improvement Plan;<sup>15</sup> approval from the US Nuclear Regulatory Commission for Westinghouse to test its AP300 SMR;<sup>16</sup> and US DOE’s potential SE Hydrogen Hub<sup>17</sup> application for a green H<sub>2</sub> network. SC also continues improving broadband connectivity, especially for rural communities.<sup>18,19</sup>

SC Nexus’ efforts will generate significant economic opportunity: the electric power market segments of small nuclear, grid infrastructure, and utility-scale energy storage are conservatively expected to grow by at least 7%<sup>20</sup> annually, reaching a global (excluding China) and US market size of \$675B and \$136B respectively in 2032.<sup>21</sup> Given the region’s growing manufacturing industry and private industries’ investment to advance these technologies, SC Nexus aims to capture \$10-12B, with exports of \$3-5B by 2032.<sup>22</sup>

Clean energy jobs are expected to increase by >14,000 in SC by 2030, with EDA’s investment potentially accelerating direct job growth by ~15% (2,500+ added jobs), with additional indirect job creation given private investment, supporting industries, and infrastructure needs. Jobs span educational entry points and pay 25% over national median wages, including construction, manufacturing, and professional services as well as advanced degree areas such as nuclear operators, battery scientists, and engineers.<sup>23</sup>

**(2) Role of private sector:** More than 10 private sector companies, at various stages of maturity, already serve as members of SC Nexus, with additional firms in consideration for Phase II. SC Nexus will coordinate industry partners to advance energy innovation to Technology Readiness Level (TRL) 9<sup>24</sup> and collectively address workforce development challenges (e.g., BMW, as one of the largest regional employers, can help inform workforce initiative design and execution). In 2022 alone, SC Commerce secured ~\$3.8B in capital investment and >6,000 new jobs in SC Nexus’ defined geography.<sup>25</sup> Additionally, SC ranks first among states in EDA’s Atlanta region for energy-related VC funding per \$1M GDP.<sup>26</sup>

Each industry partner plays a critical role in SC Nexus. StorEn (flow battery startup), Westinghouse (nuclear power company with thermal battery tech), and W International (wind turbine components) can leverage the region’s manufacturing capabilities and infrastructure to test and scale components for small-to-micro nuclear reactors and batteries. Pomega (utility-scale battery manufacturer) and Albemarle (lithium-ion producer) will develop and test new chemistries making batteries more efficient and cost effective. Schneider Electric (smart grid digital energy management provider) and Rolls Royce Power Systems (microgrid provider) will integrate technologies into the grid. Utility partners (Santee Cooper, Central Electric Power Cooperative and Power Team, Duke Energy, and Dominion Energy) are interested in opportunities to validate proof of concepts and test innovations that could potentially be scaled through their networks, focusing on rural electric utility co-ops.

**(3) Regional coordination and partnerships:** SC Governor McMaster’s June 2023 [Executive Order](#)<sup>27</sup> created “PowerSC,” an interagency working group, with a vision to grow SC’s energy capacity and infrastructure, close gaps in energy workforce, and boost electricity generation. This executive order accelerated alignment of SC Nexus’ members to their own co-developed strategic vision, resulting in a more than 30-member consortium greater than the sum of its parts given the broad range and complementary nature of resources, expertise, and experience across workforce, scientific capacity, innovation, and equity:

<b>Higher ed</b>	<a href="#">Benedict</a> , <a href="#">Claflin</a> , <a href="#">Clemson*</a> , <a href="#">SCSU*</a> , <a href="#">SC Technical College System*</a> (SCTCS), <a href="#">USC*</a>
<b>Govt.</b>	<a href="#">SC Department of Commerce</a> (SC Commerce)*, <a href="#">SC Office of Resilience</a>
<b>Industry</b>	<a href="#">Albemarle</a> , <a href="#">Central Electric Power Cooperative/Power Team</a> , <a href="#">Pomega</a> , <a href="#">Rolls Royce Power Systems</a> , <a href="#">Santee Cooper</a> , <a href="#">Schneider Electric</a> , <a href="#">StorEn</a> , <a href="#">Westinghouse</a> , <a href="#">W International</a>
<b>Econ. dev.</b>	<a href="#">Commission for Minority Affairs</a> (CMA), <a href="#">SC Assoc. for Comm. Econ. Dev.</a> (SCACED), <a href="#">SC Council on Competitiveness*</a> (SC Competes)
<b>Labor/workforce</b>	<a href="#">Governor’s School for Science and Math</a> , <a href="#">SC Dept. of Education</a> , <a href="#">SC Dept. of Employment and Workforce</a>
<b>National lab</b>	<a href="#">Savannah River National Lab*</a> (SRNL)
<b>Other</b>	<a href="#">Conservation Voters of SC</a> , <a href="#">Core SC</a> , <a href="#">GrowCo</a> , <a href="#">Next SC</a> , <a href="#">Office of Rural Health</a> , <a href="#">SCiii Foundation</a> , <a href="#">SC Research Authority</a> (SCRA), <a href="#">SustainSC</a>

SC Nexus brings together members that have worked together for years as well as organizations that have not historically collaborated, with this broad partnership formalized in early 2023 under the leadership of SC Commerce. SC Commerce is uniquely positioned to lead given its record-setting recruitment of capital investment through the cultivation of a business-friendly environment that emphasizes job growth and economic development in rural communities.<sup>28</sup> SC Commerce oversees the consortium’s shared governance model, distributing decision-making across 7 core members (indicated by \*). SC Nexus’ collaboration model will task members as initiative leads responsible for monitoring progress and reporting. Roles will be finalized in Phase II, with SC Commerce consolidating aggregate reporting. Private sector partners will join the shared governance decision-making group in Phase II.

Fearn Gupton, SC Commerce’s Rural Development Manager, will serve as Regional Innovation Officer (RIO), bringing a differentiated skillset to the role. Her work focuses on promoting community development, particularly in rural and lower-income areas; developing workforce initiatives, like SCTCS’ Apprenticeship Carolina program; and managing large-scale grants, including the \$65M Rural Initiative Grant Program.

**(4) Equity and diversity:** SC Nexus is committed to equitably distributing benefits, with a goal of >40%<sup>29</sup> of new jobs sourced from underserved and rural communities. Fifteen of the 24 counties in SC Nexus’s geography are distressed or at-risk,<sup>4</sup> 299 of SC’s 455 Environmental Justice Communities,<sup>5</sup> and 71 of SC’s 135 qualified opportunity zones are included,<sup>6</sup> linking commercialization of tech with equity. SC Nexus’ tech solutions will improve reliable electricity access and enhance the quality of life for these rural and

distressed communities in SC, with global applicability. Additionally, SC Nexus has actively engaged 2 HBCUs (SCSU, Benedict), SCiii Foundation (supports all of SC's 4-year HBCUs with the private partnership needed to fully maximize each institutions' capabilities and impact),<sup>30</sup> CMA, four regional Councils of Government (Appalachian, Central Midlands, Lower and Upper Savannah), and SCTCS.

SC Nexus will build on historical equity commitments and successes: workforce efforts have and will continue emphasizing participation of minorities, women, veterans, and underrepresented populations in STEM. SRNL is the only national lab in the US with an HBCU as one of its managing partners. It directly recruits students from SCSU's nuclear program and manages the Minority Serving Institutions Partnership Program for the US DOE Office of Environmental Management<sup>31</sup> that builds, and maintains, a diverse talent pipeline. SCTCS' apprenticeship program, an evidence-driven equity and inclusion effort, emphasizes training for local communities. For example, Denmark Technical College's Nuclear Fundamentals Certificate trains residents of Bamberg, Barnwell, and Allendale (distressed counties) to serve as nuclear operators,<sup>32</sup> a job paying ~40% above the median income in SC.<sup>33</sup>

**(5) Regional workforce:** The current regional workforce of 2.2M employed individuals<sup>34</sup> is diverse and talented, with ~136,000 (6.5% of state workforce) in energy jobs.<sup>35</sup> SCSU's BS in Nuclear Engineering is the only offered by an HBCU in the US, and it launched its Mechatronics<sup>36</sup> program in 2022 per industry needs, complementing SCTCS' existing program already serving >1,000 students. USC's students intern with employers to supplement classroom experience while conducting research with engineering faculty, 40% of which focus on energy topics. Clemson awards >1k engineering degrees annually and offers certificate programs focused on renewable energy generation and power systems engineering.

However, EDA funding is needed to address three workforce challenges: 1) Low labor force participation rates, especially in rural and socioeconomically disadvantaged communities; 2) Higher ed graduates seeking employment outside the SC Nexus region and state; and 3) Tighter alignment between programs of study and jobs of the future, meeting employer needs in energy-related fields.

SC Nexus will establish an Energy Workforce Collaborative, guided by workforce development best practices,<sup>37</sup> to inform the design of pathways across the full education lifecycle and scale the workforce. The Collaborative will facilitate efforts between technical colleges, HBCUs, higher ed, industry partners, and workforce development programs and orgs representing workers, including CMA and SCiii. These community-based orgs will engage in design of the following initiatives to represent regional workers:

<b>Workforce-focused initiatives</b>
<b>PreK-12:</b> Expand existing, proven STEM programming/educator training with emphasis on underserved areas (e.g., Project Lead the Way's <sup>38</sup> engineering/electronics program; All Girls Auto Know <sup>39</sup> advancing women in STEM; Anderson Institute of Technology's <sup>40</sup> "lab," Clean Energy Technology <sup>41</sup> curriculum)
<b>Technical training:</b> Expand existing programs to skill/upskill/re-skill non-college degree bearing workforce to grow access to higher paying jobs (e.g., SCTCS' nationally renowned readySC program trains employees for new industry, serving >300k since 1961; <sup>42</sup> Apprenticeship Carolina serves adult learners and K-12, with >45k completed since 2008 <sup>43</sup> across 37 partnerships); funding can scale AESC & BMW's joint battery operations <sup>44</sup> and Apprenticeship Carolina's Nuclear Fundamentals Certificate
<b>Higher ed:</b> Expand and formalize advanced STEM degree pathways in energy-related domains via industry partnerships, with clear off-ramp to jobs in state, emphasizing diverse and underrepresented populations (e.g., SCSU one of US' leaders in African American graduates and only HBCU in US with Nuclear Engineering; USC's Fall 2022 class is its largest and most diverse in its 221-year history <sup>45</sup> )

To grow and evolve its competitive clean energy workforce (e.g., electrical engineers, battery technicians), SC Nexus will leverage the state's R1 universities, 8 HBCUs, numerous colleges, and a technical college system. Almost 10k new STEM graduates joined the workforce in 2021 alone, including 7k+ bachelor's, 1k master's, and hundreds of professional degree awardees.<sup>46</sup> The Workforce Scholarships

for the Future program, providing free tuition at SCTCS for high-demand fields, further expands the technical workforce.<sup>47</sup> Another lever of workforce growth is talent attraction: SC consistently ranks in top 5 US states for net migration, and the state’s 5% growth in labor force from 2015-20 ranked 11<sup>th</sup>.

**(6) Innovative ‘lab to market’ approaches:** SC Nexus has many programs to overcome commercialization barriers: the SC Fraunhofer USA Alliance (managed by SC Competes) advances applied research and promotes economic competitiveness through grants, technical support, and skilling.<sup>48</sup> Scalable investments are underway in energy-related areas, such as fuel cell technologies, with established collaboration between SC Fraunhofer USA Alliance, industry, and university researchers all within SC Nexus’ defined geography. SC Commerce’s 3PhaseSC program helps innovative, disruptive technology startups access Small Business Innovation Research and Small Business Technology Transfer funding, securing >\$33M since launching 5 years ago.<sup>49</sup> SRNL is a newly independent national lab that enables commercial deployment in part through public-private partnerships.<sup>50</sup> R1 universities have business favorable tech and intellectual property (IP) transfer: since 2018, USC transitioned 33 science and engineering technologies (of 35 total) to industry and secured \$73M in funding for SC businesses (over half of which was science and engineering focused); Clemson has ~100 active IP licenses and from 2015-20 formed 19 startups and issued 64 patents. SCRA’s SACT Grant Program provides funding for translational research.<sup>51</sup> To continue growth, SC Nexus will use EDA funding to:

**Entrepreneurship:** Set up energy incubator(s) in partnership with SC Commerce, higher ed, and existing incubators (e.g., NextSC, GrowCo, SCRA) to accelerate advanced energy entrepreneurship

**(7) Impact on economic/national security:** SC Nexus will advance national priorities from the National Security Strategy,<sup>52</sup> including onshoring manufacturing and establishing energy security by accelerating real-world implementation of energy technologies and advancing a resilient, clean electricity grid in a regulated supplier, manufacturing intensive context. First, SC Nexus will spur the region’s manufacturing expertise to make certified, tested battery materials and device components—strengthening domestic supply chains—to speed development and installments of new generation and grid-scale storage technologies. SC Nexus’ efforts directly respond to China, which today outpaces the US in rapid iteration, scaleup, and production of energy storage technologies. Second, SC Nexus will execute demonstration tests of commercial scale electricity generation and storage devices in the region’s local grid and SRNL’s isolated grid. Third, SC Nexus will develop and host the first regional-scale implementation of control systems and systems designs that enable resilient local grids and microgrids, integrating renewables and storage into SC’s electricity system. These products and tools can be implemented across the US and build credibility through export to other countries, particularly developing nations lacking energy resources. Last, SC Nexus will achieve this in a way that transforms the region, driving equitable job creation and economic growth.

SC Nexus is designed to serve regional and broader US economic goals. The region’s robust manufacturing industry is already building components across electricity generation, transmission and distribution, and grid-scale storage. In the last year alone, SC intentionally attracted EV and battery companies across the supply chain, generating >\$5B<sup>53</sup> of capital investment in the state. SC Nexus will continue investment by prioritizing grid-scale storage, which has overlap in suppliers, with plans to further replicate business attraction efforts for innovations in nuclear, wind, and solar, along with smart grids.

**Closing:** EDA’s investment in SC Nexus is critical to national security interests, with direct support of the [“2022 National Security Strategy.”](#) Clean power is crucial for the US to regain technological leadership, as China and Europe are widely perceived ahead of the US, and is foundational to advancing all other sectors (e.g., manufacturing, technology, life sciences). The technologies of an end-to-end resilient, sustainable energy ecosystem across generation, distribution, and grid-scale storage will accelerate the US transition to a clean electricity grid, reinforce US export strength, address climate and environmental responsibility needs, and create and provide equitable economic opportunity.

**Appendix:**

- <sup>1</sup> Underlined items refer to specific criteria required for designation in EDA's NOFO
- <sup>2</sup> [Executive Order on Revitalizing Our Nation's Commitment to Environmental Justice for All](#)
- <sup>3</sup> [EIG](#) ranks Greenville-Anderson as #1 and Columbia as #12 MSAs in US for Tech Hub selection based on innovation potential and economic need
- <sup>4</sup> [Distressed Communities Index \(DCI\)](#)
- <sup>5</sup> [US EPA Environmental Justice Screening and Mapping Tool](#); based on % of Federal Information Processing Series (FIPS) codes within SC Nexus' boundaries with 1+ index above 80<sup>th</sup> percentile in US
- <sup>6</sup> [SC Opportunity zones based on Tax Cuts and Jobs Act of 2017](#)
- <sup>7</sup> [US Energy Information Administration](#)
- <sup>8</sup> Clean energy: nuclear, wind, solar, and hydro
- <sup>9</sup> [SC State Energy Plan](#)
- <sup>10</sup> [Dominion Energy Innovation Center](#)
- <sup>11</sup> Not comprehensive of universities' relevant scientific capacity; see Letters of Support for additional capabilities and further detail
- <sup>12</sup> List of ongoing investments is not exhaustive
- <sup>13</sup> [SC Grid Resilience Grant Program](#)
- <sup>14</sup> [SCRA Selected to Participate in NSF Engines](#)
- <sup>15</sup> [Duke's Public Service Commission docket](#)
- <sup>16</sup> [Westinghouse AP300 SMR](#)
- <sup>17</sup> [Southeast Hydrogen Hub](#)
- <sup>18</sup> [Broadband Infrastructure Program](#)
- <sup>19</sup> [SC Broadband Office ARPA Investment](#)
- <sup>20</sup> [Rocky Mountain Institute's X-change: Electricity Report 2023](#); Analysts such as RMI are expecting faster and greater growth in electric power sectors, based on their S-curve analysis
- <sup>21</sup> [International Energy Agency's World Energy Investment Report 2022](#), global addressable, annual investment (excluding China) in relevant electric power sector (grid infrastructure, utility-scale energy storage, and downscaled nuclear) is \$315B in 2022 and estimated to grow on average ~7% YoY to reach \$675B in 2032. The US market size was estimated at ~\$70B (grid, \$60B; batteries, \$6B; nuclear, \$3B) in 2022, assuming same YoY growth, the US market is expected to grow to \$136B in 2032
- <sup>22</sup> [SC leads the nation as top exporter of tires and completed passenger motor vehicles](#), with SC's 2022 export sales totaling ~\$30B, with ~\$10B from exporting passenger vehicles; SC aims for electric power sector exports to grow to a comparable size
- <sup>23</sup> [National Renewable Energy Laboratory State Employment Projections](#); initial projections based on SC economic growth without additional investment; estimate increase in job creation based on NREL's jobs multipliers for ~\$65M initial investment
- <sup>24</sup> [Technology Readiness Levels Guidelines](#)
- <sup>25</sup> [SC's Record-Breaking Year](#)
- <sup>26</sup> Pitchbook (206 Industry Codes mapped for startups receiving funding)
- <sup>27</sup> [Gov McMaster Executive Order](#)
- <sup>28</sup> [SC's Record-Breaking Year](#)
- <sup>29</sup> [Justice40 Initiative to deliver 40% of benefits of climate investments to disadvantaged communities](#)
- <sup>30</sup> SC HBCU Institutes of Innovation and Information (SCiii) supports all of SC's 4-year HBCUs with the private partnership needed to fully maximize each institutions' capabilities and impact
- <sup>31</sup> [SRNL Minority Serving Institutions Partnership Program through US Department of Energy](#)
- <sup>32</sup> [Nuclear Training Program](#)
- <sup>33</sup> Bureau of Labor Statistics; ERI Salary Assessor
- <sup>34</sup> SC Department of Employment and Workforce
- <sup>35</sup> [US Energy and Employment Report by State 2022](#)
- <sup>36</sup> Combination of electrical and industrial engineering
- <sup>37</sup> [U.S. Department of Commerce Workforce Development Best Practices](#)
- <sup>38</sup> [SC Department of Education: PLTW Curriculum](#)
- <sup>39</sup> [Southern Automotive Women's Forum](#)
- <sup>40</sup> [Anderson Institute of Technology](#)
- <sup>41</sup> [Clean Energy Technology Curriculum](#)
- <sup>42</sup> [readySC](#)
- <sup>43</sup> [Apprenticeship Carolina](#)
- <sup>44</sup> [readySC training opportunities](#)
- <sup>45</sup> [USC welcomes largest, most diverse class](#)
- <sup>46</sup> Integrated Postsecondary Education Data System
- <sup>47</sup> [SC Workforce Scholarships for the Future](#)
- <sup>48</sup> [State Alliance Program](#)

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49 [3Phase](#)

50 [Savannah River National Laboratory Homepage](#)

51 [SCRA SACT Program](#)

52 [The Whitehouse National Security Strategy 2022](#)

53 [SC's Record-Breaking Year](#) and [SCpowersEV](#)