

# EVENT SUMMARY REPORT



## Organizers:

### **E4 Carolinas**

Lukas Brun  
David Doctor

### **Southern Alliance for Clean Energy**

Stan Cross

### **Natural Resources Defense Council**

Luis Martinez

**July 2021**



## Participating Organizations

### **E4 Carolinas**

E4 Carolinas, Inc. is the trade association for companies and organizations having an energy interest in the Carolinas. Founded in early 2012, E4 Carolinas was organized by Carolinas' prominent energy executives as a 501(c)(6) member trade association to “coordinate, develop, grow, expand, market and promote” the Carolinas' energy industry clusters; serving all energy industry members; and, developing for the clusters the areas of economic development, innovation, talent development, policy education and communication.

### **Southern Alliance for Clean Energy**

The Southern Alliance for Clean Energy (SACE) promotes responsible and equitable energy choices to ensure clean, safe, and healthy communities throughout the Southeast. Founded in 1985, SACE has over 30 years' experience as a leading voice calling for smart energy policies in our region that help protect our quality of life and treasured places. Our expert staff is uniquely poised to tackle energy challenges and promote equitable outcomes that help our region's communities harness the environmental and economic opportunities presented by clean, renewable energy.

### **Natural Resources Defense Council**

The Natural Resources Defense Council (NRDC) is an international nonprofit environmental organization with more than 3 million members and online activists. Since 1970, our lawyers, scientists, and other environmental specialists have worked to protect the world's natural resources, public health, and the environment. NRDC has offices in New York City, Washington, D.C., Los Angeles, San Francisco, Chicago, Montana, and Beijing. Visit us at [nrdc.org](http://nrdc.org).

### **Special Acknowledgments**

The Battery Forum organizers wish to extend special thanks to Tony Burrell, Chief Technologist for Energy Storage, US DOE, National Renewable Energy Laboratory for serving as the keynote speaker for the event. Thank you also to our session moderators and discussants:

Becca Smith, Assistant General Counsel, Sunrun  
Charlie Odom, Director of Sales, Celgard  
Chris Chung, Chief Executive Officer, North Carolina Economic Development Partnership  
Chris Conroy, Senior Product Manager Energy Storage, PowerSecure  
Gary Rackliffe, Vice President, Market Development and Innovation, Hitachi ABB Power Grids  
Glen Merfeld, Vice President & Chief Technology Officer, Albemarle Corporation  
Haresh Kamath, Director of Distributed Energy Resources & Energy Storage, EPRI  
Kathy Harris, Eastern Clean Vehicles and Fuels Advocate, Natural Resources Defense Council  
Lori Collins, Principal, Collins Climate Consulting  
Matt Meyer, Assoc. VP, Business Engagement & Partnerships, NC Community College System  
Mike Matthews, Associate Dean for Research and Graduate Studies, University of South Carolina  
Mike Mazzola, Director, UNC Charlotte Energy Production & Infrastructure Center  
Patrick Brindle, Vice President, Project Management, Piedmont Lithium  
Rick Tankersley, Vice Chancellor for Research and Economic Development, UNC Charlotte

Ron DiFelice, Principal, Energy Intelligence Partners  
Sam Watson, General Counsel, North Carolina Utilities Commission  
Scott Carlton, President, Tokai Carbon USA  
Scott McWhorter, Director, Strategic Programs Office, Savannah River National Laboratory  
Zak Kuznar, Managing Director, Energy Storage, Duke Energy

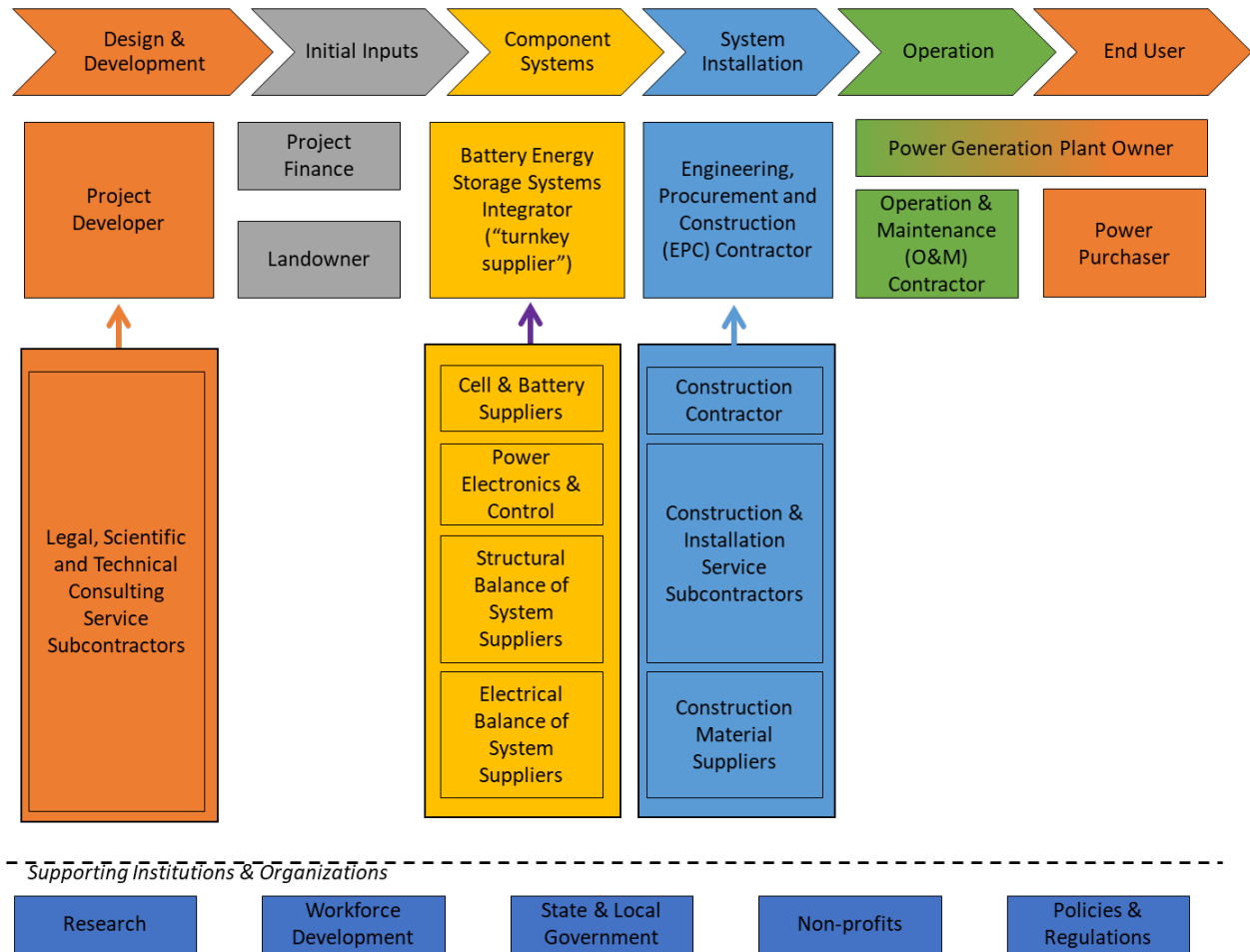
## Introduction

Battery storage technologies are critical to the new energy economy transforming how the Carolinas produces, distributes, and consumes energy. Battery storage systems, when paired with renewable electric power generation, become an arbitrage mechanism between when renewable energy is produced and when it is consumed, increasing reliability, and reducing the "spoilage" of renewable energy production that can not immediately be consumed. In the commercial and industrial (C&I) sector, companies are better able to monetize their solar power generation investments. While in the residential sector, power source reliability from own-source generation will be increasingly realized for household power consumption. In the electric vehicle market, passenger vehicles and commercial trucks will increasingly rely on safe, mobile energy storage systems for fuel. The result will be the optimization of energy capital investments and the reduction of transportation and power generation carbon production, dependent on the central power resource being offset by renewables or drawn upon by electric vehicles.

Despite the exciting prospects made possible by battery energy storage, companies and supporting organizations in the industry face important barriers to fulfilling the promise of the Carolinas' new energy economy. Little understanding exists about the companies inhabiting the market space across the value chain, the workforce requirements needed to make the industry more competitive, and the policies that can support its growth. If the Carolinas are to realize the value of these battery technologies and the economic benefits of being home to a significant energy storage cluster, these gaps must be understood and urgently filled. The forum's overarching purpose was to fill in these gaps of understanding across the battery energy storage value chain in the Carolinas, create connections among the members of Carolinas' energy storage cluster, and conceive action benefitting the cluster.

The organizing framework for the conference was the "battery energy storage value chain" (see Figure 1), which describes the industrial ecosystem of organizations participating in pre-production, production, and post-production activities of battery energy storage systems across stationary and mobile end-markets. We convened leaders in R&D, component production, manufacture, workforce, economic development, and other supporting organizations to discuss the current status of battery energy storage in the Carolinas. Representatives from private companies, government, and education shared their insights through panel discussions around each of these phases.

**Figure 1: The Battery Energy Storage Value Chain**



Source: Brun, Lukas & Gary Gereffi (2021) "[Battery Storage: North Carolina's Footprint in the Global Value Chain](#)" National Audubon Society.

The day-long forum on April 23, 2021, provided an overview of current technology development across the utility, commercial/industrial, residential, and vehicle battery markets; company perspectives across the value chain regarding the promise, future growth and adoption barriers to further deployment of the technology in the Carolinas; a description of the workforce and economic development activities undertaken by organizations across the region; and a discussion of policies and activities needed to enhance the competitiveness of this rapidly growing Carolina cluster.

## Keynote address

**Anthony Burrell, U.S. DOE, NREL**

Burrell opened the battery forum by addressing issues relating to the current state and future prospects of battery energy storage in the United States. After an overview of how batteries function, Burrell pointed out that battery **market demand is currently being driven by the electric vehicles (EVs) market**, especially Tesla and other vehicle manufacturers. And while the perception exists that the U.S. is behind in battery manufacturing when compared to China and Europe, the **U.S. leads in battery technology research**, which has been a historic strength due to investments by the U.S. Department of Energy. Burrell emphasized the importance of maintaining the manufacturing supply chain in the U.S. due to the significant multiplier effects of manufacturing, which provide benefits to the economy in terms of jobs and taxes. Competitiveness in manufacturing should be maintained despite challenges from China and Europe. Burrell then identified **control over the battery supply chain as important to U.S. competitiveness, especially control over raw materials essential to battery production: lithium, cobalt, and nickel**. Although lithium production has a presence in the U.S., control over cobalt and nickel are important, particularly control over an ample supply of cobalt which is a source of concern. **Smart recycling technologies and policies can have an important role in maintaining control over raw materials**. Burrell then addressed the need for the energy industry to prepare for the unintended effects of rapid recharging to the grid, especially the rapid recharging of commercial trucks. The draw of electricity for recharging could result in a considerable risk for the electric grid. Finally, Burrell closed with an overview of different battery chemistries and their use applications.

## Panel #1: Battery R&D in the Carolinas

**Moderator: Anthony Burrell, U.S. DOE, NREL**

**Panelists:**

- **Scott McWhorter**, Director, Strategic Programs Office, Savannah River National Laboratory
- **Mike Mazzola**, Director, UNC Charlotte Energy Production & Infrastructure Center
- **Glen Merfeld**, Vice President & Chief Technology Officer, Albemarle Corporation
- **Ron DiFelice**, Principal, Energy Intelligence Partners

The first panel addressed competitiveness topics in battery energy storage R&D. The discussion among panelists can be divided into six main areas. The first part of the discussion identified the stakeholders in battery energy storage R&D. Stakeholders mentioned were: national labs (SRNL, Oak Ridge), universities (Clemson, Georgia Tech, NC State, UNC Charlotte, University of South Carolina), and private industry (Ceylon Nanotechnologies, Spark Power). During the conversation, the importance of faculty hires at universities was mentioned, as it affects what research and development activities are conducted. The panelists mentioned the importance of conducting R&D in battery storage technologies and different chemistries (including lithium iron phosphate and lithium fusion), but also the need to **advance knowledge in safety, balance of plant, and technology testing & validation at the systems level**.

The second topic addressed the ecosystem of battery technology commercialization organizations in the Carolinas. Ron DiFelice noted the difference in perspectives between battery technology developers/start-ups and the investment community. Novel technology providers want the opportunity to prove their technologies whereas the investment community seeks a return on investment which can lead to a herd mentality for what technologies receive investment. Lithium-ion batteries were provided as an example of how the different goals among the two communities led to a predominating technology, achieving economies of scale to reduce battery costs, and improved performance. The important role of consortia in battery validation, balance of plant validation, and testing & validation of battery systems were also mentioned.

The discussion then turned to the availability of lithium supply in the industry and the R&D activities undertaken by lithium raw material producers. Glen Merfeld of Albemarle Lithium noted that lithium availability, like petroleum reserves, is subject to new sources of supply even as consumption of the raw material occurs. The industry perspective is that there is enough lithium currently available for five years and that this level of availability will remain as new sources are discovered and made available for use. Related to availability of supply, the Albemarle Lithium is also addressing supply chain issues to reduce waste in lithium battery production, and technologies that allow the recycling and reuse of lithium-ion batteries at their end of life. The organization is active in other R&D activities, including new material development in partnership with major battery producers to ensure a “technology pull” approach to product development. Mike Mazzola noted that scaling production raises workforce development issues.

The panel discussion then turned to grid applications for electrical vehicles and the technology challenges of using passenger vehicles for grid balancing and resiliency. Tony Burrell noted the technology limitations and economic costs for using passenger vehicles to provide grid balancing and resiliency use cases, particularly that batteries only have a limited number of charge-discharge cycles and vehicle owners are wary of using cycles to provide benefits to the grid. He expressed the view that stationary battery storage is better suited to grid applications than mobile sources. The perspective was supported by others, including Ron DiFelice, Mike Mazzola, and Scott McWhorter who noted studies conducted in 2013-15 by the DOE finding limited economic benefits. However, the use of school busses was noted as a possible effective use-case by Stan Cross. Glen Merfeld noted that the reduced cost of batteries could make the use-case for vehicle batteries more compelling than when analyzed in the past.

Finally, the conversation turned to competing technologies for lithium-ion battery energy storage for grid-scale applications, particularly hydrogen. Scott McWhorter noted the value of thermal hydrogen battery technology developed at SRNL (and recently licensed to two companies) for long-duration energy storage. Mike Mazzola mentioned the value of hydrogen as an alternative to natural gas for electric power generation and as a complement to intermittent renewable energy power generation. The panelists debated the value of hydrogen for different use-cases, notably smaller vehicles, aviation, and other forms of transportation, noting the difficulties of making the economics of hydrogen work due to energy loss throughout the system.

## Panel #2: Battery Markets in the Carolinas

**Moderator: Lukas Brun**, Director of Research & Economic Development, E4 Carolinas

**Panelists:**

- **Zak Kuznar**, Managing Director, Energy Storage, Duke Energy
- **Chris Conroy**, Senior Product Manager Energy Storage, PowerSecure
- **Becca Smith**, Assistant General Counsel, Sunrun
- **Haresh Kamath**, Director of Distributed Energy Resources and Energy Storage, Electric Power Research Institute

The second panel addressed market demand and demand changes projected for utility, commercial & industrial, and residential segments. The panelists also discussed the challenges faced by the different battery markets operating in the Carolinas.

During introductions, Haresh Kamath noted the importance of understanding best practices for implementing storage in a low-cost way to achieve the goal of decarbonization. He stated the need to balance renewable integration with reliable, resilient, and accessible (reasonable cost) energy, and the need to ensure the safety of storage technology.

After introductions, the panelists discussed market demand and use cases across different end markets. Becca Smith noted that **energy resiliency followed by cost savings are the primary drivers in the residential market** in light of extreme weather events occurring in Texas, California, and Florida. The second demand driver is cost savings, particularly in California, Massachusetts, and Vermont, where residential owners of PV systems can sell power to investor-owned utilities. Chris Conroy noted **emergency backup power and reducing demand charges are the most important drivers in the commercial & industrial market segment**. However, relatively slow adoption of battery energy storage exists in the commercial & industrial segment of the market which can be measured in the single megawatt level in the Carolinas. National projections to 2030 are similarly unimpressive where only 1GW is expected in the commercial & industrial level segment, compared to an estimated 5GW in the residential market, and 10GW expected in the utility market. Challenges to further penetrating this market segment are the prevalence of diesel and other reciprocating engines used for emergency backup power (uninterrupted power supply) and the difficulty of financially valuing energy resiliency. Chris noted that Tier 4 diesel generators, which are the cleanest types of diesel engines, predominate in the commercial & industrial market to achieve the goal of three hours of backup power. However, some PV plus storage is emerging due to competitive levelized cost of energy, which is 28 cents for gas reciprocating engines, 7-17 cents for PV, and 22-32 cents for PV plus storage. In the military sector, Chris commented that Parris Island added a microgrid in 2018, but the further deployment of PV plus solar is limited by the ability to financially account for the value of energy resiliency. Zak Kuznar noted that **peak load shaving/ancillary services, power resiliency, and energy access in remote locations are the most important use cases for battery energy storage in the utility-scale market segment**. Duke Energy uses battery storage to replace peaking plants, improve power resiliency, and provide power access to remote locations where grid extension is



difficult due to trees falling on powerlines. Duke Energy remains interested in long-term energy storage, but Zak noted that lithium-ion technologies are not well suited to provide long-term storage. Although hydro-storage is a good solution, it is difficult to do due to permitting and other costs. Combining wind and storage is difficult because offshore transmission lines are expensive, and thus, in response to a question from the audience, it is unlikely that increased storage will be present on the coasts to help support offshore wind. Haresh noted that a barrier for wind plus storage is that the production tax credit for wind does not include storage as it does for the solar ITC.

The panel then addressed **opportunities for greater deployment of battery technology** across different end markets. Becca Smith stated that the **South Carolina Energy Freedom Act** was an important reason for the rapid deployment of residential solar in South Carolina. **Time of use rates** are beneficial to reduce costs of batteries and benefit utilities by not allowing for the retirement of a fossil fuel generator or not adding transmission lines. **Simplifying the residential permitting/interconnection process** would also help as it is a big part of the soft costs of a residential system. Examples of improved interconnection processes are solar HPP programs (prevalent in the western U.S.) and online permitting applications. The panelists also discussed the **need for enhanced data sharing between project developers and end-use markets** to improve information about battery safety and to understand how batteries can most effectively be deployed for second-life applications.

Finally, the panel addressed equity and access issues related to battery energy storage systems. Becca Smith noted the **importance of deploying PV plus storage to multifamily housing** and that Sunrun has contracted with multifamily housing developers to deploy these systems. She noted that incentives for the multifamily market segment help but are not essential. Haresh Kamath agreed that **the economics for batteries look better at the multifamily and neighborhood level**, which supports the development of microgrids to access energy more equitably.<sup>1</sup>

### Panel #3: Battery Input and Component Production in the Carolinas

**Moderator: Scott Carlton**, President, Tokai Carbon USA

**Panelists:**

- **Patrick Brindle**, Vice President, Project Management, Piedmont Lithium
- **Charlie Odom**, Chief Technology Officer, Celgard
- **Gary Rackliffe**, Vice President, Market Development & Innovation, Hitachi ABB

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<sup>1</sup> Sam Watson of the NC PUC was a panelist in the 4<sup>th</sup> session addressing workforce development, economic development, and regulatory issues. During that session, he commented on points raised in this second panel. His comments can be summarized as 1) NC is not perfect but our electricity rates are low; 2) interconnection is not a problem for rooftop solar; however, for utility-scale PV it does take longer to get an interconnection completed; 3) biggest barrier for energy storage is price; 4) use-case for school busses to provide storage during the summer will be permitted; 5) RTOs are not present in the Southeast generally, and NC specifically.

This session focused on the battery raw materials and component producers in the Carolinas, particularly on the supply chain issues faced by these actors when operating in our area. The discussion began with an overview of market demand in the next 3-5 years for battery raw materials, battery components, and battery systems. Strong to extremely strong demand is expected for the products in this market in the next 3-5 years. Meeting market demand was discussed as was the development horizon of production in different segments of the battery value chain. While software and hardware development can be commercialized within two years, the development of raw material sources requires much longer time horizons. Patrick Brindle offered the experience of Piedmont Lithium in developing lithium mines in North Carolina requiring 8 years to get to the production phase. Brindle noted that the presence of hard rock lithium (spodumene) in North Carolina offers a tremendous opportunity for the region to build around raw materials if developed properly. Scott Carlton noted that as global demand increases for battery raw materials, imports in graphite will come increasingly from China, ceding supply chain control of battery manufacturing. Carlton noted Europe's investment in graphite due to it wanting to maintain control of the supply chain. Similar policy attention should be given in the U.S. and by the region, which is currently focused on the end-user of EVs, especially ensuring the presence of charging stations.

Carlton's perspective was that raw materials need increased policy focus now or it goes abroad. Among the supply chain policy supports discussed were addressing environmental laws and site permitting, ensuring the continued availability of plentiful, inexpensive (and clean) energy to create graphite and closing gaps in the battery production supply chain. Regarding supply chain gaps, the panelists discussed how the lack of cathode active material production capacity in the area requires the shipment of materials from the Carolinas to other areas of the world to produce batteries. Panelists noted that cathode active material production is a low-margin business but that the emission impacts of transshipment are significant, affecting the environmental footprint of battery production. Brindle noted that scope 1, 2, and 3 emissions are an issue for the battery industry. The discussion then turned to technological change in the battery industry, particularly around graphite. While silicone anode development could disrupt graphite demand beyond the 5-year horizon, Carlton noted that the more likely scenario is that solid-state batteries would come online in a decade.

The panel closed with a discussion of ABB Hitachi's perspective on the battery supply chain. As a battery energy storage system integrator, they source batteries from battery manufacturers which have been somewhat strained. ABB sees opportunity at the grid scale and is investing in efforts to standardize offerings at grid-scale battery systems. In North Carolina, ABB performs system design work including determining the requirements for grid integration, implementing the controls to manage the battery energy storage system to serve system functions. ABB is in North Carolina due to its engineering talent, particularly at NC State, and workforce availability remains a reason it has had a long-term presence and has expanded in the state.

## Panel #4: Workforce, Economic Development and Regulatory Perspectives in the Carolinas

**Moderator: Rick Tankersley**, Vice Chancellor - Research & Economic Development, UNC Charlotte

**Panelists:**

- **Matt Meyer**, Assoc. VP, Engagement & Partnerships, NC Community College System
- **Mike Matthews**, Assoc. Dean for Research & Graduate Studies, University of South Carolina
- **Chris Chung**, Chief Executive Officer, North Carolina Economic Development Partnership
- **Sam Watson**, General Counsel, North Carolina Utilities Commission

The session addressed what talent, policy, regulation, or development support is being expressed by the industry, the battery-related activities these organizations working on, and additional resources needed to develop the industry in the Carolinas. The discussion began with an overview of the post-pandemic employment and education trends seen by the panelists. Among the trends mentioned was the reduction in community college enrollments, which is different than previous downturns where enrollment increased. In response to a question from Chris Chung about why enrollments are down, the panelists responded that there are two main theories. The first is that students are taking a "gap year" during the pandemic; the second is that the demand for training has reduced due to demographic/population trends leading to the need to attract non-traditional community college students into the classroom, especially minorities and men (typical community college student in NC is female and white). Upskilling the existing workforce is also needed, especially those employed in the leisure and hospitality industry before the pandemic.

The discussion then turned to how workforce development is addressed in conversations with companies and economic developers. Chris Chung noted that the general process is that the EDP provides statistics on occupational codes requested by the company, followed by a company's private conversation (EDP is not present) with other companies regarding the state of the workforce, especially availability, training, work habits, and rate of pay. Manufacturing, advanced manufacturing, biotech life sciences, and food processing are targeted. When thinking about the workforce, the EDP considers three sources of talent: 1) residents who progress through traditional primary, secondary, and post-secondary education in the state; 2) those exiting the military, and 3) new residents. Related to battery energy storage, EDP's experience is that companies are concerned with the cost of energy, which is attractively priced by Duke Energy with the possible exception of areas touching the TVA service area due to federal subsidies. The mix of energy sources is becoming a more common question as companies are increasingly concerned about their brand's perception in the marketplace. Finally, Chris noted that automotive applications for energy storage are quite large.

The conversation continued with a discussion of the types of educational credentials, pathways to employment, and the needs of the community college system to provide adequate training. Apprenticeships were identified as an important pathway to employment for historically underserved populations and apprenticeship resources (ApprenticeshipNC.com) available in NC were discussed. However, one problem with apprenticeship programs is that they increase

measures of time to degree and cost of degree. Another program addressed was the “bridge to doctorate” in which companies seeking a more diverse workforce in technical fields sponsor internships, summer positions, and professional conference sponsorships. Greg Monty (NC A&T) mentioned federal funding his university received to help fund energy apprenticeships and requested anyone interested to contact him. Regarding the community college system needing to ensure an adequate pipeline of students, Matt Myer noted reducing the stigma of going to community college, increasing teacher pay, and accessing specialized, up-to-date equipment to train the workforce as important steps. The panelists also noted that educational institutions need to maintain a healthy balance between domestic and foreign students to address national security, intellectual property protection, and taxpayer value concerns.

Mike Matthews closed the session by noting the importance of **flowing down skills currently at the postgraduate level to those working in battery storage with technical college degrees**. He noted that a Michigan and Indiana convening on battery energy storage found that two-thirds of the workforce was going to be at the technical college level. The relevant needed skills for a competitive battery storage workforce are present in North and South Carolina but at the post-graduate level. The skills in the region that Mike noted are knowledge about battery materials, battery performance, battery modeling, power electronic systems, particularly modeling for ships, which have batteries, and generators. The new skills needed are data science and artificial intelligence to help these systems perform in highly dynamic environments, such as self-driving cars. The point made was that the knowledge and tools were developed at the post-graduate level, but they must “flow down” quickly down to the undergraduate and technical levels to be applied in the industry.

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*“At some point, that knowledge and those tools that develop may be at a very high level, they have to become tools that move down to the undergraduate level, to the technical level, and they've got to become tools that can be employed quickly. You can't always go to a Ph.D. program, and say, help me model a highly dynamic battery system in a grid with renewable and steady-state inert resources and things like that. They've got to move down the tools where the ordinary employees and policymakers can look at those with the appropriate AI interface to make decisions. So, there's a continuum of knowledge creation, this has got to flow down, it's got to flow all the way down to the technical college level.”*

– Mike Matthews

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## Panel #5: Moderated discussion of opportunities, collaboration, and next steps

**Moderator:** Lori Collins, Principal, Collins Climate Consulting

**Panelists:**

- **Lukas Brun**, Director, Research & Economic Development, E4 Carolinas
- **Stan Cross**, Electric Transportation Policy Director, Southern Alliance for Clean Energy
- **Kathy Harris**, Eastern Clean Vehicles and Fuels Advocate, Natural Resources Defense Council
- **Ward Lenz**, Executive Director, North Carolina Sustainable Energy Association

The forum concluded with a discussion by panelists and participants on key takeaways and next steps. Key themes from the discussion are summarized below.

**Key takeaways.** Ward Lenz stated that the key takeaways for him are: 1) the opportunity identified by Ron DiFelice's 2009 presentation to the NC government was not taken; 2) apprenticeships in energy already exist and he appreciated the connection to Greg Monty, and 3) the discussion about RTOs to increase resiliency through competitive markets is something that NCSEA remains interested in.

Kathy Harris noted the wonderful collaboration in the forum and suggested extending invitations to vehicle charging companies, manufacturers of heavy and medium-duty trucks, additional corporations interested in this space, local governments, and offshore wind experts, if the forum reconvenes another session. NRDC sees utility involvement in this space as very important. While the day included some discussions about storage, another component that is equally as important is shifting charging to off-peak hours to help offset some of the need for storage. She noted that local governments should be engaged on storage to grid efforts (V2G) for school buses.

Stan Cross stated the need to coordinate state-level policy to: 1) provide incentives to develop the supply chain in the region, 2) accelerate the light, medium, and heavy-duty EV markets, 3) engage utilities to maximize the benefits of EV and distributed battery storage-grid integration, and 4) ensure that the transition to electric transportation addresses environmental justice impacts from and equitable access to energy resources. To achieve these goals, the identification of cross-sector alignment of interests is needed. Kathy Harris commented on the importance of also paying attention to federal policy.

Lukas Brun identified five areas related to economic development and competitiveness in battery energy storage that stood out during the day's discussion. First, major players in the global economy have identified battery energy storage as a target industry for development and a core competency in which they want to be global leaders. Both Tony Burrell and Scott Carlton mentioned that control over the supply chain is critical, particularly control of raw materials. The example from Europe was instructive on how, when faced with that same challenge, it developed an industrial plan to make sure that European countries were not ceding their competitiveness in battery energy storage to other regions of the world. Second, the risk appetite for testing and validating new technologies should be addressed. Lukas urged thinking critically across education,

government, and corporations about how to increase the risk appetite and to lean forward on new technology development and adoption. EPRI and the Joules Accelerator are likely part of that solution. Third, workforce and better linking the needs of companies with the training at technical colleges were discussed in the forum. The fourth area is around policy. Policies mentioned during the supply chain conversation arose regarding how to make sure that advanced manufacturing is kept in the area, including bonus depreciation and some of the environmental issues of producing things like graphite in the area. Finally, environmental topics occurred throughout the conversation. One takeaway was that while batteries help reduce the carbon footprint of energy use, producing batteries and deploying them at a large scale produce environmental externalities that were not well addressed in the forum. Recycling and reuse solutions were discussed throughout, which warrants additional consideration about how the region can be competitive in that portion of the supply chain.

**Next Steps.** The session closed with the proposed next steps. Among ideas discussed were:

- Direct engagement with companies around workforce development and policies related to renewables and storage
- Engagement with the wind energy industry regarding deployment of storage tied to increased economic development efforts in NC and contiguous states
- Engagement with local governments regarding long duration storage tie to community resilience efforts and energy management
- Developing a value chain map with battery companies in the region to address their importance related to jobs.
- Creating working groups among willing collaborators around supply chain, workforce, technology adoption, recycling and reuse, and policy topics.

## Future Actions

### E4 Carolinas

Since 2016, E4 Carolinas, at the direction of its Board of Directors, has targeted energy storage as one of its focus industry clusters. Our continued work on this topic will be supplemented by future actions planned to help develop the energy storage industry in the Southeast U.S. We will do our work to:

- **Convene** working groups around critical topics identified during the Battery Energy Storage Forum. Potential working groups would be organized around issues related to the supply chain, workforce development, technology adoption, recycling & reuse, and regulation & policy education.
- **Collaborate** with industry, education, and other non-profits in the battery energy storage ecosystem to identify joint initiatives that complement our strengths as the energy industry's leading voice in the Southeast
- **Engage** with economic development organizations at the state, local, and regional levels to share our knowledge and energy industry expertise to demonstrate the importance of the energy economy to the continued vitality of the Southeast's economy.

In addition, E4 Carolinas is the recipient of four federally funded research grants on Alternative Fuel Vehicles, Advanced Nuclear Technology, Clean Energy Innovation and Commercialization, and Green Hydrogen that will support and enhance our activities in energy storage.

### Southern Alliance for Clean Energy

To move this initiative forward, SACE is pursuing related opportunities, including:

- Engaging with utilities and regulators advocating for transportation electrification investments that enhance equitable access to EV ownership, support fleet electrification, and innovate rate design to maximize grid benefits and put downward pressure on rates for all customers
- Tracking and reporting on transportation electrification market expansion across the Southeast including EV sales, charging infrastructure deployment, capital investment, job growth, utility and government expenditures
- Conducting consumer and local government outreach via our Electrify the South program including our Driving on Sunshine Roadshow and EV Policy Toolkit
- Supporting regional state agency EV planning and implementation efforts
- Advocating for regional market-supporting executive actions and legislative policies

## **Natural Resources Defense Council**

NRDC is active in a number of initiatives on energy and the energy transition. Relevant projects include:

- Engaging with utilities to promote transportation electrification and long-term sustainable rate design and load management to maximize the benefits to the grid and put downward pressure on rates for all customers.
- NRDC is also engaging in vehicle-grid-integration working group and discussions throughout the country
- Exploring and developing regional opportunities for collaboration and engagement in electrifying transportation and transitioning to clean energy.