VENKAT SRINIVASAN: Thanks so much to all three of you. I think a few things resonated with me. This idea of the sort of things are evolving rapidly, right. I mean California obviously leading the way, but we’ll be hearing in the next session about some other regions, but different things are going to be going on. I like the idea of diversity of technologies that have to be brought to the table, right. You can’t really be dependent on one, and we probably need different technologies for different parts of this storage ecosystem. So, that really is a fantastic thing to listen to.

And I was kind of thinking about that last question on California sort of pushing the market for long duration, and I think some of that is bound to happen, right. We have to kind of get the people to incentivize them to go to certain markets where we know it’s going to be needed. I’m sure the federal government is thinking about the same thing with BIL and the RFI that came out recently. So, many things going on in this space.

Let’s kind of continue just in the interest of kind of going to the next session, which is going to be talking a little bit more on the regional side of things. This is important because different parts of the states are going to have different needs, and we have to think deeply about what kind of technologies are going to help us decarbonize the different sectors.

I want to ask the moderator, Anna Siefken, who recently joined the Department of Energy, Office of Technology Transitions as a commercialization executive, she’ll be moderating the session. So, Anna, turning it over to you.

ANNA SIEFKEN: Good morning, everyone. Good morning, those of you who are watching virtually this morning. It’s so nice to be here, as Venkat mentioned, and thank you very much for the invitation. I’m Anna Siefken. I’m with the Office of Technology Transitions at the Department of Energy. Although I’m sort of a newcomer, have been diving very deeply into the work at the office since arrival.

There are a couple of projects that we work on at OTT, which are pretty important for many of you. One of them is the TCF, the Technology TCF Fund, commercialization fund, as well as EPIC. So, we do a lot of work with ecosystem building around the country. We also have a key role with Energy I-Corps. And there’s a new set of projects that we’ve been engaged in as well, which have to do with the D&D pathways, and this is a partnership between multiple offices within the Department of Energy, and it also includes the loan program office as well as the new Office of Commercial Demonstrations, OCD.

Those pathways, there are four of them that we’re working on currently. There’s one on hydrogen, another on carbon management, another on advanced nuclear, and very luckily, one on long-duration energy storage. So, the outcome of that research that we’re doing with the industry will be available in the future.

Today’s conversation we’re doing it as a fireside chat because we really wanted to dig in with these regional partners. Several of them are in a regional sort of structure, and a couple of them are additional so that we can also get that national perspective. So, successful commercialization and deployment of energy storage technologies requires the hard work and support from a range of people and organizations working together. We all know this. This panel will explore one example in one region that has brought together technologies, entrepreneurs, policymakers, investors, and others to develop, manufacture, and build energy storage products and projects. So, lessons learned in one region can help us better understand the challenges and opportunities in energy storage technology commercialization across the United States.

And I do want to give a special shoutout to Stephen Hendrickson, who is watching remotely, for his assistance in pulling together the content for this session. So, we have four speakers joining us, and I gave them the honor of not having to sit here while I read their bios, and they’re going to come in.

But first we have Bill Acker. He was the executive director of NYBEST. So, Dr. William Acker is a well-known and highly regarded scientist, business leader, and entrepreneur in the field of energy. He currently serves as the first executive director of NYBEST, the New York Battery and Energy Storage Technology Consortium. Under his leadership, NYBEST has grown its membership to more than 175 companies, created the Best Test and Commercialization Center and new battery prototyping capabilities and has performed pioneering work in advancing markets, policy, technology, and product development. So welcome, Bill. I just need these glasses.

Next, we have AnnMarie Augustus, who is the vice president of operations at Urban Electric Power. So, she is co-founder and senior vice president of operations for Urban Electric Power. She’s previously co-founded a solar investment startup called Park Place Renewables and worked on technology transfer efforts for CUNY Energy Institute, a research lab dedicated to energy innovation. Since 2017, AnnMarie has served as a member on the board for Godrej Americas, a leading manufacturer of equipment for oil and gas, power, and water sectors. And she has 10 years of startup experience and focuses on growth strategy. So welcome.

Next, we have Jennifer de Souza, who’s the vice president of energy solutions, procurement, and leasing at The Raymond Corporation, which is a Toyota Industries company. So, she holds general management responsibility for energy storage solutions and leads Raymond’s alternative energy initiatives, research, and continual evaluation of other viable energy, alternative energies. With more than 20 years of global supply chain and operations experience, de Souza has support world-leading companies. Welcome.

And finally, we have Joe Mastrangelo, who is the CEO of EOS Energy. After serving on the board of advisors, he joined in 2018. So, he is an energy industry leader for the past two decades. He has extensive experience leading diverse teams to develop and deploy commercial‑scale projects around the world. Before coming to EOS, Joe was president and chief executive officer of gas power systems for GE Power, a global business of more than 15,000 employees in 60 plus countries, working to power the world by combining the most advanced gas-fired technologies with digital innovation. So, I am extremely excited that I not only got through those very long bios but also to welcome this esteemed panel. So, thank you again.

What I’d love to do first with the panel is have you all just talk for a minute or two about your organization. I mean that’s really the place where we need to start. And then we’re going to dive into some questions around funding and resources, barriers, challenges, et cetera, things that you’ve needed to help move through so that we as partners in crime, as DOE, as supports of the National Labs can all help you in your endeavors. So, why don’t we start first here, and we’ll just go down the line?

BILL ACKER: Great. Thanks, Anna. New York BEST is a member-driven nonprofit industry organization with a mission to grow the energy storage industry and make New York State a leader in the field. We do a lot of work to grow the industry by developing policy in regulatory environments in New York State to make conducive markets by connecting companies and helping with commercialization through running accelerator, through connecting companies, through putting the right ecosystem in place. Anna mentioned our lab, our prototyping centers. A lot of work with workforce development to create the industry and the workforce needed and work in connecting people in conferences and helping companies in a variety of different ways.

So, we do encourage if you’re interested in New York State, another very important aspect we play is creating the domestic supply chain, working with (unintelligible) through our partners (unintelligible) and New Energy Nexus but also in creatin the right environment in New York State to have companies thrive. So, if you’re interested in factories or manufacturing, please talk to us also. And I’ll turn it over to AnnMarie.

ANNMARIE AUGUSTUS: Thanks, Bill. So, good morning, everyone. AnnMarie. I’m here with Urban Electric Power. We are fundamentally a DOE company. We started out of research funding from ARPA-E at the City College of New York, where we way back in 2009 asked the DOE could we take the traditional primary alkaline battery, the Duracell or Energizer AA battery, zinc manganese dioxide cathode, could we make that technology rechargeable for thousands of times to serve the stationary grid market, and that’s kind of what we did.

So, we spent many years working on that, and we spun the company out of City College of New York. We’re currently based still in New York State. New York BEST, proud New York BEST member. And I’m really excited to talk to you folks today about our journey from the lab into manufacturing through commercialization. So thanks.

JENNIFER DE SOUZA: Good morning, everyone. I’m Jennifer de Souza from The Raymond Corporation. We are a division of Toyota Industries. Raymond manufactures electric lift trucks used in large warehouse distribution operations. So, certainly as we’ve gone through the last two years, we’ve seen our demand increase rapidly as more folks look to shop from home, and they need industrial lift trucks to power large warehouse distribution operations. Energy storage is incredibly important to us, as we have been traditionally electric, relying upon lead acid batteries. The disruptive innovation of lithium has provided us with tremendous opportunities to increase the efficiency of not only our lift trucks but also our customers’ warehouse operations.

So happy to talk with you today about what we see as opportunities in this space not only for Raymond but also for the U.S. as we participate in growing energy storage manufacturing domestically.

JOE MASTRANGELO: Good morning. Joe Mastrangelo. I’m the CEO of EOS Energy Storage. I was going to do a different intro, but I was talking to Simon, one of the last speakers in the back room, and the way he described EOS is a non-flashy company. So, our non-flashy company, we’re headquartered in Edison where we have our R&D and test facilities, and we have our manufacturing in Turtle Creek outside of Pittsburgh in Pennsylvania.

If you were paying attention to Mike Gravely’s presentation this morning, we’re using hybrid batteries, zinc hybrid. Think about the (inaudible) So, we are, as I said, we are a zinc hybrid technology. So, if you were paying attention to Mike Gravely’s presentation, you can draw some connections from what he said this morning.

Where we are in our evolution, you know, we’ve now manufactured 200 energy blocks, 100-megawatt hours of energy storage. We’ve discharged 600-megawatt hours of power, the majority of that coming out in the field. I’ll talk to you today about this evolution of going from idea to invention, invention to a product, product to production, production to scale. It’s quite the journey with its pitfalls and opportunities to learn. And at the same time, we vent a little bit about how difficult it is to do that in our industry. Anna was being kind in my intro. I don’t think I’ve updated it in a while. It’s now three decades, not two decades, not to date myself. So, I can talk a little bit about how challenging that also can be and how important it is for things like Mike talked about this morning with the CEC to really accelerate what the market needs as we look to the future.

ANNA SIEFKEN: I think we’re going to start really with funding because that is an important piece of all of this. And so obviously, Jennifer, this may or may not be a question for you, although you are a purchaser, a large purchaser. So, maybe you can speak to it from that perspective. But can you talk a little bit about any funding issues that you’ve had? How have you gotten either to scale or where are you on the way to scale? How has funding, particularly funding from even the federal government or other sources, allowed you or helped you? So, can you talk a little bit about your funding streams?

BILL ACKER: Well, for New York BEST, we’re a member-driven organization so we get a lot of our funding from our membership, but we also do get funding from both the DOE and SERDA and other sources. SERDA is the New York State Energy Research and Development Authority. But I think, you know, broadening the question to companies themselves, we have 175 member companies, and a lot of them are startup companies so funding for them is very, very important. And so we do a lot of work to connect those companies with (unintelligible) with other people to help them in funding and also work to connect them to the various different governmental funding areas.

And I think this is critically important. The governmental funding is both a great source of funding but a huge verifier for the private sector community. So, the work that California, that Mike was talking about this morning, the work that SERDA does is very similar to California in their funding levels for these kind of the things and the work DOE does. Our government is critical to leverage private funding.

ANNMARIE AUGUSTUS: So, for a company like us, I think we have kind of gone through a few phases with funding. So, certainly the genesis of the company being funded through the federal government but also with a lot of support from New York State. So, support from New York BEST, support from NYSERDA, even support through working with some of the national labs, particularly Sandia, was very crucial to what I would call the first five or six years of the evolution of the company, which was really that crucial kind of R&D period.

And then when we were ready to say okay, we’re high‑fiving, wow, we made the (unintelligible) rechargeable, awesome, and then the board’s like okay, go make a million of them all work the same, which was a totally different challenge and that frankly I think we totally underestimated. And that’s where we were like okay. So, we went out, we raised some strategic financing, which I think is crucial. Venture financing in specifically energy storage has been fraught with some success but mostly failures. So, I think strategic capital is more patient, and that was really crucial to our continued success over the last to be able to kind of survive.

And now finally, while we are a little bit earlier than some of the other companies in terms of commercialization, we have a pilot plant in New York and one in Mumbai that’s been funded by the strategic partners, but now we’re saying okay, we want to do the giga scale factory, how can we get to that level where we’re too late stage for BC funding, too early for private equity, kind of right in the middle of that valley during a scale-up process, which is really difficult to navigate.

And I think some continued support from the DOE, I mean everybody says this word like the headwinds from the recent legislation has created a lot more interest on the strategic and even some PE guys kind of stepping up to the plate. So, I would say absolutely crucial to have the support of the federal and the state government in the beginning. And then I think we’ll talk a little bit about how maybe the fed and the state can help companies in that transition up to scale later in the life of the company.

JENNIFER DE SOUZA: Okay. So, if you think about the life of a lift truck in a warehouse operation, the most important thing is up time, people being on that truck, being able to run that truck, pick goods, package them, get them sent out to where they need to go. That’s where lithium comes in and is very important to us. We started conversations about lithium at Toyota and Raymond seven years ago, and we knew that in order to be able to bring a product to the market, it had to be a mature product. At that point in time, there just wasn’t the infrastructure in place. There wasn’t opportunity to really design and manufacture lithium‑ion batteries in the U.S. with partners. We looked for partners. They weren’t there. We went to universities. Students weren’t available that were trained in what we were talking about. So, we really had to go it ourselves. The bottom line is we had to go it ourselves.

We’re headquartered in Upstate New York. So, I know Bill very well. We talk a lot about this. And really, we started in a place where we understand mode of power, transitioning to EV and lithium. We had to do it ourselves. But as we’ve gone through time, we’re looking for partners. We’re looking to support partners to bring the technology to the U.S. Frankly, because we needed that mature technology for our trucks and we introduced our first lithium solution now about five years ago, we had to have that mature technology, which was only available in Asia. And so from that point on, we also started working with domestic companies, looking at their technology, or in North America to try to begin that localization.

So, when it comes to funding, we see a few things. We see this as a tremendous opportunity for us in the U.S. to be able to begin this type of conversation about manufacturing this technology in the U.S., but we need to educate people. People fear and don’t necessarily understand what battery storage manufacturing means. So, there needs to be concerted effort to make people comfortable with what we’re talking about here with the technology.

Another piece is related to growing the technology itself in the U.S., whether technology transfer, those Asian companies looking for homes in the U.S., which all of them are because they have mature lithium technologies, help with that technology transfer is very important.

And then the third piece, of course, is related to organically growing the technology in the U.S. as we have seen some of that success as well. So, that’s where we see the funding could be tremendously helpful. Also at the university level, to help people not only be trained in chemistry and growing battery chemistries in the U.S., but also battery system design. Whether it's EVs or whether it’s stationary storage, that knowledge we don’t have. So, building that technology, that systems technology, bringing together mechanical electrical software all together into one so we have that systems capability is so very important to us. Thank you.

JOE MASTRANGELO: So, building off of what everyone said, and I’m in full agreement with what we just heard, especially what Jennifer said as far as EOS going from this venture capital into the abyss and trying to come out from commercialization. The two things I would say is the search for funding never stops. Prior to EOS, I worked for GE for 26 years. And what you learn when you come out and you’re in a small organization, a small startup company, not having a brand behind you makes it a steeper hill to climb. And when you’re external, especially for those of you here that are inside the DOE, what I would say like I didn’t realize inside of GE is that no doesn’t mean no in a big company or a big organization. No means come back and ask again, reposition, keep moving, there’s funding always somewhere. The organization will continue to exist. In a small company, no means no. And the first time someone says no to you, it’s the most depressing thing in the world. And then you’re going to go out and hear no 2,000 times before you find somebody that actually wants to take a chance on you. So, you’ve got to keep moving, right.

Then I think another point that Jennifer made, you know, what I would say is that the majority of what you look at around batteries and energy storage, there’s been more failures than successes, and you’re always lumped into that are you telling me everything’s going to be great in four years, but it’s a shifting four years so it never comes.

One of the other most important things about funding is how you manage your capital. So, when you’re in a small company, like when I was in GE, if you were running a technology program, and you guys probably have thought about this too, right, you sit there and say this is what we want to do, let’s take two paths, three paths, and we’ll see which one works and we’ll have an offramp. You don’t have that luxury in a small company, right. So, you’re sitting there with a limited amount of capital, trying to do something that’s never been done, trying to make a decision where you don’t have the luxury to have a plan B. So, you spend a lot of time, and I think what I’ve learned in the last four years, I’ve gotten a lot better at making capital allocation decisions and technology decisions because my life and the life of the 300 people in the organization depends on that decision.

Now, what you have to do is you have to have the courage to be able to do this, but what we did in EOS is we really went back and looked at where others have failed before us. And the majority of energy storage and battery companies have failed is they never made that jump from a great idea in the lab to a product on the factory floor to assist them out in the field and really driven by a couple of things. One is everybody wants to build this great big factory and go out and say when I get my factory, volume will come. It doesn’t happen that way.

So, the way we designed EOS is we said we’re going to do this so that we build our factory in phases. So, we do this in like 200-megawatt hour chunks of volume because we don’t want to choke on the cost of the factory without buying. So, today we stand at 800‑megawatt hours of capacity. That 800-megawatt hours of capacity costs us $50 million. So, we also looked at how do you do this so it doesn’t cost you a lot of money, money that you don’t have, and then scale as you go and scale as you build up your backlog.

So, you’re constantly running and saying I’ve got to chase the funding to keep growing the company and then I’ve got to have my capacity chase the backlog or the volume that I have, versus having capacity sitting there and you’re looking for volume. That’s when companies fail. And you just need people to help you bridge. So, like for me, the grant program from the DOE, the LPO program, these are great things for us to be able to continue the leadership in the United States around the energy infrastructure and important for this next phase of development.

ANNA SIEFKEN: AnnMarie, I’d love to actually have you ’cause you mentioned scale-up and your sort of journey, since Joe sort of went into that, can you talk about sort of where you are with your organization and sort of kind of what your trajectory looks like?

ANNMARIE AUGUSTUS: Sure. So, yeah, we I think tried to take a similar approach. We learned from some of the companies that like if you build it, they will come strategy absolutely did not work, and a bunch of startups just a few years ahead of us kind of died on the vine that way. So, that was definitely a big lesson. I think what Joe’s talking about is really important.

And from our perspective, so we have a pilot plant in New York that is there to – can do about 30-megawatt hours a year right now. And what we’ve used that facility to do is to install some systems in New York State, some in Arizona with Sandia National Lab, some in California in order to kind of roll out and say look, the technology works, how can we get offtake agreements to kind of support scaling the manufacturing to the next phase.

We also have a strategic partner in India where we have a sister plant in Mumbai that does about 100-megawatt hours a year, and that plant is largely to service the Southeast Asian market. So, it is to displace lead acid in India with a zinc alternative. And basically, what we have done is we have kind of learned from that plant scale-up a lot of really valuable lessons, and the IP flows back to us, for how we want to scale here in the U.S. And we did submit for – we’re kind of out there right now looking to raise funding to kind of take the company to the next level where we’re hoping to reach kind of the gigawatt hour per year per shift and kind of trying to have that online within the next two or three years, which has largely been driven by demand, and trying to align that strategy with demand is most crucial.

ANNA SIEFKEN: So, thank you for that. It makes me think a lot about the introductions in the ecosystem that you’re a part of. So, I’m going to actually ask a question since we’re talking about regional strategies here. You all are a part of an ecosystem. Can you talk about what the most important part of that was? What was the aspect that was most beneficial: You’re the builder of part of the ecosystem so I’m not sure if you want to address it from that perspective.

BILL ACKER: Well, I think what you’ve heard here to a large extent is that there are immense challenges for scaling of these technologies, and a lot of those challenges depend upon getting confidence in the technology, getting confidence of the customers, getting confidence of the funders. So, we tried to create an ecosystem that addresses some of those needs. So, creating the test laboratory to add third-party validation, creating prototyping facilities to be able to prototype on commercial equipment.

We recently won an award with the federal government in New York State to create over a hundred-million-dollar center in Endicott, New York that is going to do workforce development, have a large pile of manufacturing capabilities, really address a lot of the challenges that are around this. But also connecting supply chains. We have one of the greatest economic opportunities in the history of the United States in front of us right now. We have an incredible opportunity here. We need to connect the supply chains with that. And that’s something that New York BEST is working very hard on is there are a lot of organizations in the country, to be able to bring those together because, you know, the ecosystem really requires having a lot of companies involved in this together so you have mobility of workers, you have robust domestic supply chains, and that’s what we’re trying to achieve.

ANNA SIEFKEN: Other comments?

JOE MASTRANGELO: The only thing I would add is it’s extremely important to have a good ecosystem. So, you know, when you look at where our factory is located, we’re in the original campus of Westinghouse. So, that’s where we manufacture from in Eastern Pennsylvania. When we did this strategy, so when I first came to EOS, the plan was manufacture batteries in China, bring them to the U.S., and when we looked at just the economics of this, like if you scaled the company up to half a gigawatt hour production a year, you’d have $300 million dollars’ of inventory somewhere on a ship at any point in time. So, it made no sense financially. It would have bankrupted the company in a matter of months.

So, we moved in, and what we wound up doing is we’re now an 80 percent, going to 90 percent supply chain. So, having suppliers that can produce, and a lot of these suppliers are former really horizontal drilling oil and gas suppliers that we repurposed their facilities to build raw material for us to then manufacture in Pittsburgh.

But bigger that we have to think about is this is an opportunity to create jobs. So, three years ago we moved into the factory, we had two employees. Today we have 264 employees working for the company. And when you look at the makeup of those employees, 50 percent minority, 20 percent women, 20 percent U.S. veteran in an area that’s economically depressed when you look at this. So, this is a great opportunity to be able to do this.

So, one of the most important things that you should be able to think that you have to think about is creating that workforce. And it’s not just going out and saying I’m just going to go out and hire people. You’ve got to develop, train, and give life skills. The people we’re hiring are at best high school graduates who are working on the shop floor, and you’re getting them and like for some of them we’re getting them bank accounts, drivers licenses, teaching them how direct deposit works and how you can pay your bills from the internet. I mean this is basic stuff, but it’s a great workforce that every week sets a new production record, but you got to put a lot of work into it to develop it.

JENNIFER DE SOUZA: The other thing I would add is that what’s contributed to our success is really repurposing legacy supply chains. So, when you think about batteries, you have to think about there’s a cell, there’s the module, and there’s the pack certainly if you’re talking about lithium. Those are the three main stages. The cells, the cell technology related to chemistry, obviously, is the piece we’re talking about, technology primarily offshore today. But when you go from the mod, from the cell to the module, to the pack, there’s tremendous opportunity to repurpose legacy supply chains. So, what you’re talking about here is stamping sheet metal, metal fabrication, harnesses.

So, many of these industries were left behind 20 years ago when significant offshoring occurred, but what we’ve seen is we’ve been very successful with taking those same companies and shifting their focus to energy storage and working with those companies to shift so they can be successful in this space, and they really have been. Certainly, Upstate New York area, a ton of those companies looking for new opportunities, very eager. They’ve come a very long way with automation and robotics in the last several years. And so we’ve been able to repurpose those supply chains, and we’re really proud of that. We’re really excited about that.

So, we can use those suppliers and purchase modules and do pack assembly close to the point of consumption because packs are so heavy. That’s very, very important to us, and we’re pretty proud of our ability to be able to do some of that and grow some of those economically depressed areas.

ANNA SIEFKEN: So, I’m particularly pleased that within the ecosystem conversation we’re talking not only about workforce but also about supply chain. When we talk about supply chain, I’m going to dig into that one for just a minute, and I do want to mention that we have the opportunity for a couple of questions if people are interested, and there might be questions that have come in virtually as well.

In terms of supply chain, obviously we have a number of international disruptors right now in the supply chain. It’s been going on for years, but it’s getting worse, maybe not better. What do we really need to be doing and thinking about in terms of positioning ourselves to grow in this long-duration energy storage space domestically? What are some thoughts that you have on not only the disruptors themselves but also what we should be doing and thinking 5, 10 years into the future?

ANNMARIE AUGUSTUS: Sure. So, I think, you know, we’re kind of at this interesting stage as a country, right, where it’s like we’re not going to trade 10 percent of our GDP, give or take, depending on what you include or don’t include, for our oil and natural gas in our ground for solar panels and lithium cells made overseas. No. That’s a really, really bad idea. It was bad from the start. We’re in it now. It could only get worse.

So, I think a lot of the Infrastructure Act that supported domestic manufacturing is crucial, but there’s also a big piece of that that the DOE did a good job of touching on, which is around supply chain, processing, making those raw materials battery grade. There’s a reason why we don’t do it in the U.S. I mean the current processes are really not the best. So, I think there’s a huge opportunity not only to re‑shore our manufacturing, but also there’s a huge opportunity in zinc. We’re not the only player in the country right now focused on zinc. One of the largest zinc minds in the world is in Alaska. I mean that’s something that we have access to right now. It can be tapped. It can work for grid-based storage. A bunch of companies are doing it. I think really trying to say what is it that we have that works, what is it that we have that’s safe. I mean I’m sorry, like Moss Landing, this is just the beginning of some of the problems that we may see using lithium for large stationary-based systems where it may not be ideal.

And zinc exists now. It’s very safe. It’s a part of the supply chain that we can really tap into. So, I think the DOE has a lot of support. Obviously, transportation rollout for EVs is going to be crucial. We need a plan for that. Lithium works for that. But there’s a huge opportunity for zinc, many different zinc companies for stationary storage. It’s a raw material that we have today, and we really need to be putting a lot of attention and focus on that opportunity to exploit.

JOE MASTRANGELO: I just will build off of that two examples. You can’t just focus on, you know, like I can’t sit here and just think about what does EOS need. So, two examples are zinc and bromine suppliers, a U.S.‑based company. What we use in our electrolyte is very similar to what you use for horizontal drilling fluid. So, they’re applying for an LPO loan, and we’re assisting them on what it means and how you scale up. At the same time, I said we’re going to be at 90 percent supply chain, and there’s 10 percent that’s missing.

We found a company in West Virginia that creates foam from coaldust. We want to replace our graphitized felt in our battery with the CFOAM, and we’re creating a grant application, but we’re going to work with the State of New York, State of New Jersey, State of Pennsylvania, State of West Virginia to develop this new product along with universities and other players inside the supply chain. I think that’s going to be the key thing as we move forward. It’s almost like an item‑by-item approach, and we’re going to have to start looking for alternate materials that are going to be able to deliver and new technologies.

We’re spending a lot of time talking about the battery, the physical product that we’re all making. The other piece on top of this I would add is just on the software side because that’s really when you get out in the field and you start deploying things, the software then creates a whole new suite of challenges you have to overcome that we also have to think about.

ANNA SIEFKEN: Thank you for those comments. A quick note that the DOE is technology neutral. There are lots of opportunities, and I appreciate those perspectives. What are some things that you all feel that could be done to accelerate your organization’s work? Just like point blank, what could happen with additional funding or maybe it’s the right connections, et cetera? What’s next for you?

BILL ACKER: I’ll take a crack and try to speak for the membership of New York BEST, which is a diverse group, to your point about technology. And by the way, on the technology front, I think the point you just heard was to a large extent the U.S. is great at innovation. We have the ability to leapfrog in a lot of technologies. That applies directly to lithium-ion, it applies to zinc, it applies to all of these new technologies. And so, you know, investing in our ability to jump ahead of the competition is going to be really, really important. In doing that, you got to de-risk them. You’ve got to have ways, you have to have paths to do that. So, supporting large-scale demonstration projects, supporting things that are things at scale, supporting the supply chain development for these technologies, as Jennifer said, supporting the entire range of the supply chain, bringing those companies into the supply chain.

So, you know, I love the quote Simon had of bet on the race, not the horse. We really need to be investing in this in order to grow the entire supply chain across the board because this is the biggest economic opportunity we’ve almost ever seen in our lifetimes, and it’s incredibly important for strategic reasons as we know now.

JOE MASTRANGELO: The only thing I would add is energy’s always been about a mix, to build off what you said about being – it’s not about being technology neutral. To me, it’s we need multiple technologies to do everything. I’d love to say EOS can do everything. It can’t. We can do one part of the sliver. So, there’s a difference between any technology we have, different operating cases.

The only thing I would say, I would just say like what I tell my team all the time and something to reflect upon is yeah, we’re betting on the race. So, I want you to think about this. If we went out in the parking lot and ran a footrace and I won, it just means I’m faster; it doesn’t mean I’m fast. So, there’s someone out there moving faster than we are, and that’s what we got to think about because now is the time for our country to continue to own the technology. Like when I look at where I used to be in gas turbines, we are the preeminent country for gas turbine technology. You don’t see, plainly speaking, a Chinese gas turbine because it’s hard. Now’s the time when we have to invest in this next generation and continue the leadership that the country’s always had in the energy infrastructure.

ANNA SIEFKEN: Are there any questions, questions from the audience?

MALE SPEAKER: (unintelligible) from Argonne. All of you touched a little bit on workforce so I have a two‑part question on that. First part is what sort of breakdown you see high school, college grade, PhDs and whatnot? So, there’s the demand question. And then where do you see (unintelligible)?

ANNMARIE AUGUSTUS: I mean we are having a really hard time right now finding specifically electrical engineers. So, it’s one thing to make battery cells and battery modules; it’s another thing to put 10,000 or even 100,000 individual cells together and make an operational system. And that requires a slew of really, really smart hands-on electrical engineers, and for our company right now, that’s been the most challenging part of the scaleup is, you know, having really senior folks and really junior folks in the field trying to make these systems happen and work. And then there’s this huge gap in the middle, and I think that is a huge opportunity really on the electrical side is where we’re seeing a big gap.

JENNIFER DE SOUZA: Yeah. I would just add to that and reiterate something I mentioned earlier. Being that we’ve been in this now for about seven years, we see the need for all of those various levels of training. We see technician for assembly. We see the four-year degree to come in for the electrical and systems engineering to go from cell to module to pack, extremely important. And we also see the need at the PhD level and advanced levels for the chemistry side, to continue to develop the chemistry side.

But it’s all evolving very, very rapidly. And to be able to design systems for all the applications, whether it’s over the road, mode of power, or whether it’s stationary power, we need to get our universities mobilized to be able to meet all of these needs, understand the need, get high school students excited about the opportunities in energy storage and what that means for us. It’s tremendous.

So, we talk very much. We work with New York BEST, we work with New York State to try to get out to the high schools, to get out to the vocational schools, to the two-year degree, the four-year degree, the advanced engineering degrees to see all of the possibilities available here. We’ve had some success in getting micro-credentials put in place in some of the two‑year schools. Some of the four-year schools haven’t been as quick to join, but we see some EV club programs going on, but we would love to see certificate programs or majors in battery systems, engineering, chemistry agnostic, of course, to meet all of our needs, right.

But we’re all very passionate about this, and I think the more that this is in mainstream, this electrification concept is in mainstream conversation, we will bring academia with us to help support the transition.

BILL ACKER: I certainly support and agree with everything that was just said. On the front of the technicians and manufacturing workforce, one of the things we’re just now doing in New York State with this new energy in New York investment, we brought together a whole group of community colleges licensed in technology curriculum from Europe and have our CUNY systems helping to further develop curriculum so that we’ll be able to share across the community colleges in New York State and set some curriculum for battery certificates and things of that nature. I think that those kind of things and those learnings can be spread much more broadly and populated much more broadly.

ANNA SIEFKEN: So, I think we’re almost out of time. I’m going to have each of you give us sort of your final thought for today, like some insightful bit, something that maybe you didn’t say yet that you want to make sure you get across to our audience. Do you want to start here and we’ll go down to the end?

BILL ACKER: Well, I’ve said a few times that this is the greatest opportunity we’ve ever had, and of course, it has other big ramifications here. But in order to capitalize on it, we really, really need to make significant investments in a couple of areas, and the DOE is really starting to do that. What’s happened with the infrastructure of the (unintelligible) bill and all that’s very, very important, but what the DOE is doing is going to be absolutely vital in making this happen. We need to have the DOE invest much more greatly in certain aspects of the energy storage field. It’s this delicate balance, and you guys know very, very well that you can’t pick winners, but we’ve got to see much, much more investment in the scaleup, in the supply chains, in the demonstration projects for large‑scale storage, and in the workforce creation.

ANNMARIE AUGUSTUS: I would say too I think it’s really important when we talk about like what are we doing here, what is the DOE trying to do, right. We’re trying to tackle this issue around a changing climate and emissions. And it’s important absolutely for us to think about a domestic policy for supply chain or manufacturing for implementation of all that, but the issue with climate change is global. And a big reason, you know, if all of Europe, let’s call the whole EU block, does not emit another CO2 molecule into the atmosphere, we will still his two degrees Celsius, right, because of all of the coal and other emissions that are coming from all the developing nations on the world.

So, whatever solution that the U.S. brings to market that works for us, I think we also need to think about does it work globally, and for it to work globally, it needs to be cheap, frankly, it needs to be very affordable for these nations, it needs to be very abundant, so access in multiple continents for everyone, and it needs to be something that’s safe. So, I think we have a lot of work to do, and the U.S. could potentially be a leader in bringing some of these new technologies to market that work for us but more globally if we do care about solving, truly solving the global problem that we have.

JENNIFER DE SOUZA: Totally agree with the comments already made. This is a once-in-a-generation opportunity for us to develop technology and localize manufacturing in the United States. We certainly have tremendous demand. In addition to the dollars, I think there’s an opportunity for us from the DOE perspective to look at the commercial and regulatory aspects of the supply chain and legislation related to the supply chain, what the amount of content is that needs to be produced in the United States, looking at how all of these energy storage components are categorized commercially as Department of Justice or Department of Commerce type of sourcing. That is very, very important. That controls what can be offshored and what needs to be manufactured domestically. I think that really needs to be considered overall. And if we have some levers we can pull there to encourage more domestic manufacturing once we get the supply chains in place, so those are triggers that we can pull. But overall, we have to make sure there map to support this demand and how this is all going to come together and that we have a circular supply chain, whether we’re talking about lithium or whether we’re talking about zinc, whether we’re talking about hydrogen. There are so many aspects to be built out, and I really think we have to separate EV from stationary storage to really understand the broad implications of all those things, but we have a tremendous opportunity here. And it’s so great that we’re even talking about it in the room and how we’re going to make this successful here in the U.S.

JOE MASTRANGELO: Yeah. I would just add what gets me excited is the shift was happening before we got a policy framework in place. So, when you look at the industry, the industry was moving this way because of the economics and because of what we have to do from a climate standpoint. We have now a framework, and it’s something to celebrate, but we need to realize like the framework is the equivalent of an idea in the lab. So, there’s a lot of hard work in front of us to get product out in the field, right.

So, when you think about what we have to do moving forward is when I look at this, you don’t want this to be like when solar had an uptake and all of a sudden you’re importing every solar panel into the United States. We’ve got to continue to work on enabling and giving people the opportunity to earn the right to grow.

What I would say like when I look at this personally, you know, predominantly I’m a hydrocarbon energy person, right, and I used to have to answer tough questions from my children when I was in those jobs. The questions I answer now are a lot different today than what I was doing before. So, it’s an opportunity where like we can create this next generation of leaders. So, going back to the question on how do you recruit people, we have a sense of purpose here, and the sense of purpose is making the world better. I get excited because what we’re doing every day is something that’s never been done before.

And then the third piece of this is, I’ll go back to the people that work on our factory floor building our product, we’re creating a path to middle class for people, and it’s not about creating jobs; it’s giving people a career. So, this is something that’s going to be here for a while. It gives us the opportunity to do something beyond. Like if technology is what gets you excited, if helping the climate gets you excited, we have those things.

The third piece of this is if we’re smart and we implement this correctly, we’re going to create not just jobs but careers that are going to change people’s lives the way this happened a hundred years ago. And there’s someone in this ecosystem that is the next Tesla the Man, the next Edison, the next Westinghouse, and that’s very exciting.

ANNA SIEFKEN: Thank you. I appreciate those comments, and I certainly do think that this is an important time in history. We really do have this opportunity. Thank you to all of our panelists for being here today. Much appreciated. And looking forward to talking with you all in – there’s a commercialization breakout that we’re doing later this afternoon where we can get sort of additional feedback, but thank you very much to the panel.

**[End of File]**