



Engineering  
Change Lab  
USA

2023  
Year In Review

»»» *Inspiring* **Leaders of Change**





# Engineering Change Lab – USA **2023 Year In Review**

## Inspiring Leaders of Change

We are at an inflection point. Technological advancement, societal shifts, and environmental concerns are all converging, presenting challenges that society must address. At the heart of this transformative landscape is the engineering community, which must rapidly evolve to guide society through these challenges.

Engineering Change Lab – USA (ECL) is a social change lab founded in 2017 that convenes change leaders from across the engineering community. ECL, through its multi-disciplinary, deep-dive approach to important issues, is working to be a leading force in this evolution.

In 2023 ECL continued its work to convene and inspire leaders of change to accelerate progress and advance the engineering community in support of a resilient, thriving society.

You can learn more about ECL at our website, which includes a comprehensive library of learning from our work ([www.ecl-usa.org](http://www.ecl-usa.org)). We are looking forward to the future, and we invite you to join us in this work.





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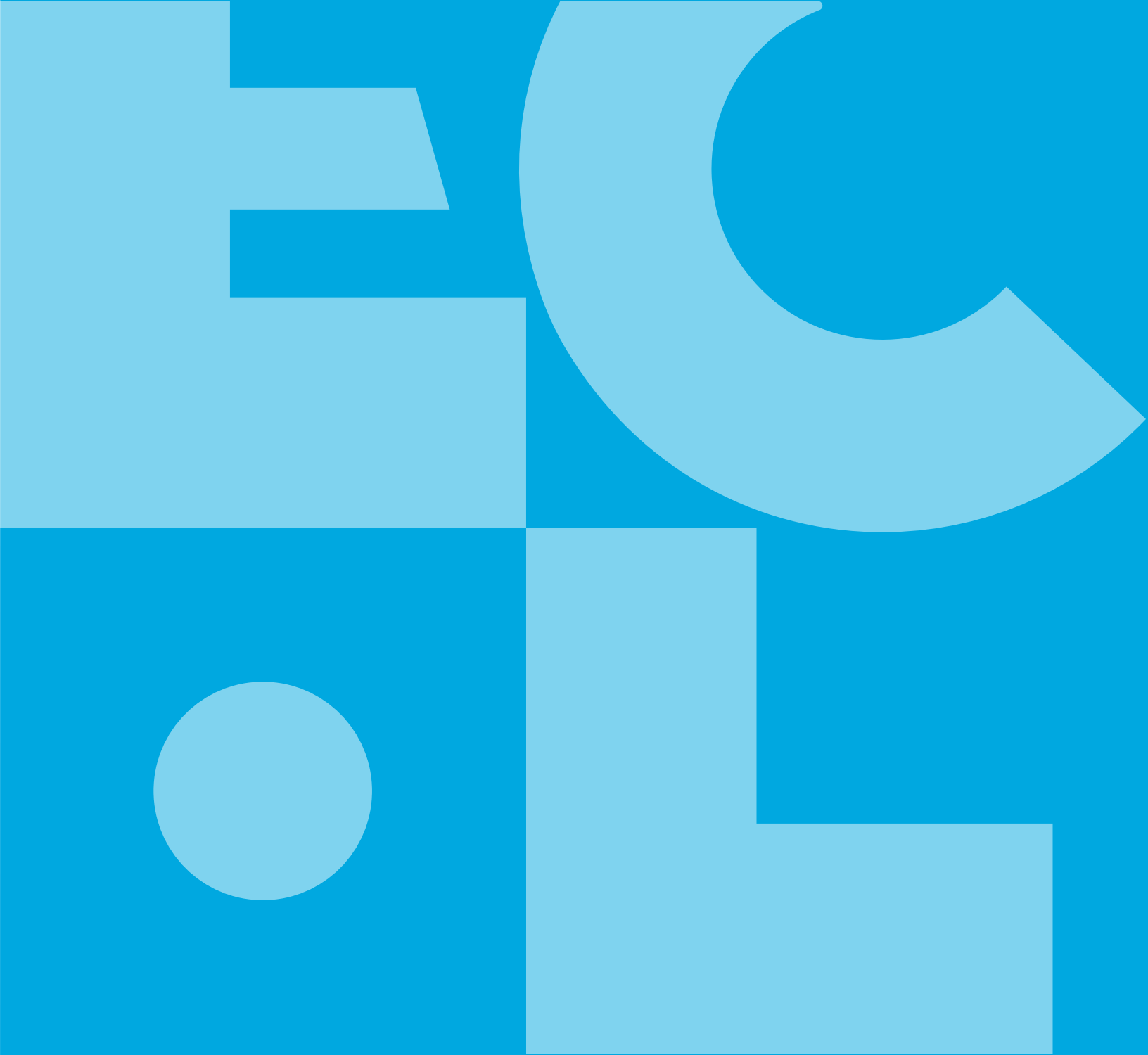


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2023 ECL-USA Virtual Summits

# Scanning the Horizon of Engineering Education: The Sustainability Imperative

**SPONSORED BY NCEES MARCH 14, 2023**

Why is sustainability important to the transformation of engineering education? ECL's virtual summit, *Scanning the Horizon of Engineering Education: The Sustainability Imperative*, held on March 14, 2023, explored this question. The multi-faceted answers to this question lie in **the engineering community's responsibility in protecting our planet**, the massive impact of the work of engineering, engineering student values, employer needs and responsibilities, and the academic community's role in preparing the next generation.



**MICHAEL MILLIGAN**  
**ABET**

Michael Milligan, CEO of ABET offered the opening provocation for the summit. He characterized the challenge of incorporating sustainability into engineering education as a **"systems challenge"** that will require changes to engineering criteria, curriculum, and student outcomes.



# Scanning the Horizon of Engineering Education: The Sustainability Imperative

Participants in the summit engaged in envisioning what engineering education could look like given the deep, positive integration of sustainability into the fabric and values of the engineering educational system.

## CULTURE AND PURPOSE OF ENGINEERING



- The engineering community is more unified in its belief in the importance of sustainability.
- There is an increased recognition that engineering involves more than being good at math and science.
- A commitment to sustainability is viewed as equivalent to our commitment to safety.
- There is greater emphasis on sustainability in licensure exams and continuing education offerings.
- An increased emphasis on sustainability has broadened the diversity of the engineering community.

## EDUCATIONAL INSTITUTIONS



- “De-siloing” of the education system has occurred – breaking down barriers and increasing collaboration within universities.
- Traditional core courses are being re-evaluated based on the concept of identifying what is truly needed.
- Teaching sustainability principles in engineering is recognized for its importance.
- The increased focus on sustainability is supported by universities’ industry partners and by professional societies.

## TEACHING EXPERIENCE



- Faculty have tools and support systems for integration of sustainability into their classrooms, such as the Engineering for One Planet framework.

## LEARNING EXPERIENCE



- Sustainability is integrated across the entire curriculum.
- Incoming students demand sustainability.
- More interdisciplinary, project-based learning opportunities are available.
- Deeper interactions with industry are integrated to clarify and de-mystify students’ perceptions of what it means to be an engineer and to provide real-world project experience.
- Increased learning outside the classroom through internships is part of the student experience.
- Students recognize the impact of their work on people and the importance of communication skills and knowledge of the humanities to their future work.
- Engineering curriculum includes an increased focus on embedded carbon, life cycle costs, and environmental impacts. Students are equipped to address the misconception that sustainability is an additional cost.

# Scanning the Horizon of Engineering Education: The Sustainability Imperative

ECL Creative Director and Lead Facilitator Kyle Davy encouraged participants to learn from the Everett Rogers theory of change, which proposes that if you can convince 20% of a given population that change is needed (the innovators and early adopters), there is a near guarantee that change will sweep across that social system.

The challenges we face in the 21st century, such as sustainability, require greater contributions from the engineering community. Increasing our contributions will require change and adaptation in the way we approach our work. This need is amplified when you consider that today's engineering graduates will spend up to 40 years in their careers and that the projects that they contribute to will last for 75-100 years. **The transformation in engineering education to increase focus on the impacts of our work on people and on the environment needs to start now. All of us in the engineering community can contribute to making this change happen.**

➤ ➤ ➤ [Scanning the Horizon of Engineering Education Summit Report](#)





Engineering & Public Policy  
Leadership



# Engineering & Public Policy Leadership

**JUNE 20, 2023**

To unlock its full potential and fulfill its obligation to serve society at the highest levels, the engineering community needs to answer the “call to service” and step into the public policy arena. In this arena, priorities and funding are set and critical courses of action charted to address many of the engineering challenges of the 21st century. ECL’s virtual summit, Engineering & Public Policy Leadership, explored this imperative, outlined the wide variety of options for engagement, and highlighted the personal satisfaction and sense of purpose that can come with contributing to society through public policy.

Summit participants explored crossing the threshold to public service utilizing polarity mapping, comparing the upsides and downsides of remaining in a technical problem solver role to adopting a greater role in public policy.

## ENGINEERING & PUBLIC POLICY POLARITY MAP

### Technical Problem Solver Upside (L+)

- Staying in our comfort zone.
- Tangible, objective technical solutions compared to the smoke and mirrors of public policy.
- Logic and data prevail.
- Stability and safety

### Public Policy Service Upside (R+)

- Positive contributions to society.
- Rich learning environment. Understand different perspectives.
- Increased scope of influence from one project to entire communities.
- Potential for positive impacts on our reputation. Increased trust.
- Application of technical expertise to policy and to protecting the public.
- Expanded opportunities to apply our technical background.

### Technical Problem Solver Downside (L-)

- People issues and full impacts of work are missed.
- Diversity of solutions is narrow.
- Not everything can be quantified.
- Ineffective communication of technical solutions.
- Isolation.
- Communication skills undeveloped.
- Stereotyped as technicians.
- Trapped in working on the wrong problems defined by someone

### Public Policy Service Downside (R-)

- Professional and reputational risk.
- Motivations questioned.
- Frustrating and less rewarding as ideas are stifled by politics.
- Lower pay.
- Potential for influence to be overridden by those without technical background.
- Loss of technical “edge.”

# Engineering & Public Policy Leadership

## LEARNING & TAKE-AWAYS

### KEY TAKEAWAYS FROM THE GROUP DISCUSSION ARE CAPTURED BELOW.



- The engineering community brings credibility to the public policy arena that can translate into trust from the public. This can generate a virtuous cycle of engagement and trust building between engineers and the public.



- Trust, influence, and recognition will come with consistent involvement.



- Public policy engagement offers the opportunity to increase our impact – from individual projects to problem-solving that involves a much bigger community and larger scale challenges.



- The engineering community can bring an ethical and principled approach that is often missing in policy discussions.



- Engagement in public policy offers the opportunity to develop important skills, including an appreciation for diverse viewpoints and communication to non-technical audiences.



- Involvement needs to start with college education, motivating students to engage in policy issues and building skills to do this successfully.



- Public policy engagement requires a mindset shift – from the stereotypical black-and-white of engineering to a more nuanced view of the world.

The technical knowledge and experience of the engineering community are critical to effective public policy. To have a greater impact in the public policy arena, we will need to move from a sense of disempowerment to empowerment; from believing that we only implement the policies and ideas of others to active engagement in defining the right problems in the right way. We will need to apply this empowerment in new ways, with great respect and empathy for the impact of public policy on people, on communities, and on the environment. By doing so, we will experience a heightened sense of purpose in the work of the engineering community.



2023 Engineering Ideas Institute

# The 2023 Engineering Ideas Institute – Tackling the Challenges Facing Our World Through Scenario Planning & Collaboration

SEPTEMBER 25–27, 2023

*“Blackout Friday” flashed across cell phone screens throughout the US on a Thursday afternoon in 2033 as the weekly reminder that activities involving all discretionary energy use are to be suspended one day a week. This nationwide blackout was just one of a set of dramatic changes agreed to by society in the wake of a pair of devastating hurricanes that struck Miami in 2031, rendering the surrounding region virtually uninhabitable for the foreseeable future. The resulting society-wide awakening to the escalating threat of climate change and extreme weather events sparked a new, shared commitment to transformation...*



*In 2033 “abundance” has replaced “chronic shortage” as a descriptor of the engineering community’s workforce relative to its needs. A new purpose-driven, diverse cohort of workers from an expanding range of engineering educational experiences combined with new means of leveraging emerging technologies to augment workers within this community drove this surprising outcome over the last decade...*

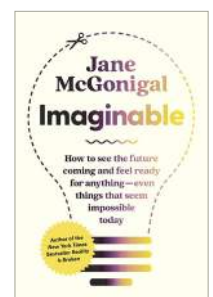


*The last decade has witnessed a steady emergence of powerful state, metropolitan area, and regional coalitions across the US in reaction to continued polarization in national politics and an inability of the federal government to get things done. This shift culminated in the 2032 presidential election of a “Great Unifier” along with substantial numbers of new members of Congress drawn from the ranks of successful leaders populating these coalitions. This new alignment of government actors, at federal, regional, state, and local levels sets the stage for significant action to address long-standing societal challenges...*



These three narratives capture the opening plot lines of three scenarios of the future, created and explored by participants during the ECL 2023 Engineering Ideas Institute, convened in late September 2023 at the Colorado Chautauqua in Boulder, Colorado.

The work at the Institute followed a process design combining traditional scenario planning elements with a set of concepts for imagining the future explored in Jane McGonigal’s book, Imaginable. In addition, presentations from seven provocateurs added insights and helped the group move beyond



# The 2023 Engineering Ideas Institute – Tackling the Challenges Facing Our World Through Scenario Planning & Collaboration



**Signals of Change** – examples of how the world could one day be different

<p><b>Climate Change</b> – impacts (severe weather, water shortages, wildfire smoke, global climate migration); emissions reduction efforts and responses.</p>	<p><b>Politics</b> – China, Elon Musk, Donald Trump.</p>	<p><b>Disparities</b> – rising homelessness, opioid epidemic, income inequality.</p>	<p><b>Economic</b> – inflation and the rising cost of living.</p>
<p><b>Misinformation / Disinformation</b> – declining trust in institutions, rise of influencers, book wars, anti-woke legislation, mistrust of higher education.</p>	<p><b>Workforce</b> – impact of unions, push for four-day work week, shortages, turnover (e.g., nursing).</p>	<p><b>Education</b> – percentage of population that values education, declining enrollment in higher education, student engagement, rise in technicians, changes in educational methods.</p>	<p><b>Technology</b> – AI impact on jobs, AI regulation and policies, rise of robots, brain-computer interface, utilization of 3-D printing, digital twins, use of Bitcoin.</p>



**Future Forces** – significant trends like to have a disruptive or transformative impact on society

<p><b>Climate change.</b> Reaching the tipping point.</p>	<p><b>Disparities / Inequality.</b> Income inequality and access to AI and other digital technologies.</p>	<p><b>Shifts in Workforce Priorities.</b> – more purpose driven. Prevalent in younger generations.</p>
<p><b>AI</b> – positive or negative or both?</p>	<p><b>Political polarization.</b></p>	<p><b>Fragility of technology.</b> Cyber security threats.</p>



**Critical Uncertainties** – events whose outcomes are uncertain

<p><b>Political landscape</b> and the future of democratic society in the U.S. and beyond. Will it get better or worse?</p>	<p><b>Extreme climate events.</b> Was this the best year we can expect in the next 10 years? How do we come together to make progress? Can the engineering community play a major role?</p>	<p><b>Future workforce issues.</b> Will diversity in engineering increase? What enrollment trends in engineering programs will emerge?</p>	<p>Will <b>innovation</b> solve current challenges with renewable energies; carbon capture; decarbonization of building materials, industry, agriculture, etc.?</p>
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# The 2023 Engineering Ideas Institute – **Tackling the Challenges Facing Our World Through Scenario Planning & Collaboration**

## CONCLUSION AND NEXT STEPS

It is our hope that the scenarios developed at the Engineering Ideas Institute can be utilized across the engineering community to generate thinking and action centered on elevating the contributions of the engineering community in any future that may unfold. If you or your organization would like assistance in these discussions, reach out to us.

As technologist Kevin Kelly notes in his book, *What Technology Wants*, “the future is unfolding, not as a ‘distinct whole’ that can be immediately perceived, understood, and acted upon. But rather like a complex messy, living, adaptive system with its own unconscious needs and tendencies.” To contribute at a higher level to society, the engineering community must develop its capacity for sensing, making sense, and acting appropriately within the context of Kelly’s unfolding, messy world. The 2023 Engineering Ideas Institute left many participants feeling more hopeful about both the present and the future and believing that they have more agency to help shape the unfolding future in desirable ways.

 [2023 Engineering Ideas Institute Report](#)





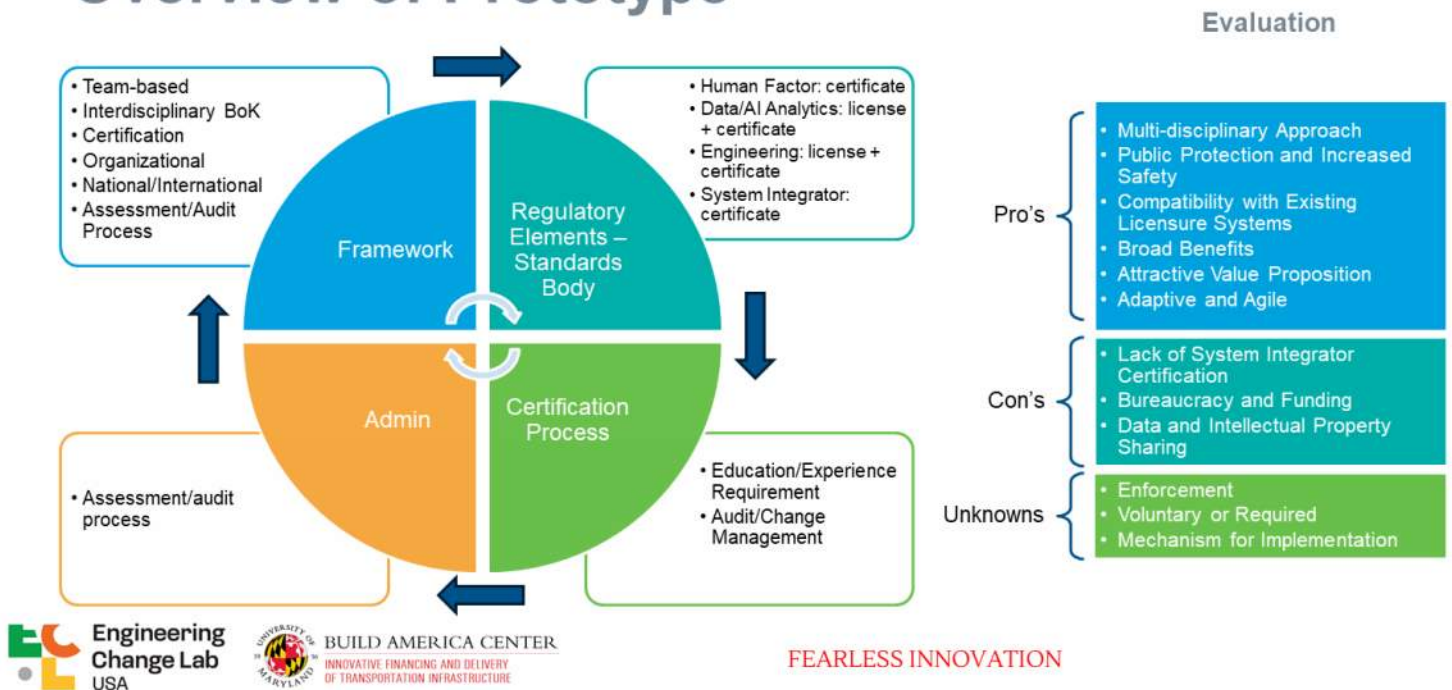
Initiatives, Supporters, &  
Looking Ahead

# ECL-USA Focused Initiatives

**Future of Licensure Initiative.** Work continued in 2023 on our Future of Licensure initiative, which seeks to create and deploy a prototype for possible advances to our regulatory system that would address the threat to licensure from emerging technologies. Work on this initiative is being guided by a Steering Committee which includes representatives of NCEES and NSPE. An early decision by the Steering Committee was to focus on an area of multi-disciplinary engineering practice that is proving problematic to regulate under the current engineering licensure model. The Steering Committee selected the practice of mobility engineering as an area of practice that met these criteria.

In 2023 we continued our examination of mobility engineering with our academic research partner, Dr. Qingbin Cui of the Build America Center at the University of Maryland. At a workshop held in June, we developed a draft framework for a certification model for mobility engineering. This draft framework was presented to the NCEES Board of Directors at their annual meeting in August.

## Overview of Prototype



The final results of our examination of mobility engineering and its implications for other areas of multi-disciplinary practice will be presented at a virtual briefing in February 2024. [Learn more at this link.](#)

**Thank you to NCEES for their financial support of the Future of Licensure initiative.**





# ECL-USA Focused Initiatives

**Engineering Equitable Communities Initiative.** The history of engineering is full of the positive contributions that we have made to society. There is, however, another part of our history that is not always discussed, and that is our history of contributing to inequity. Examples include development that has segregated residential neighborhoods, siting of industrial and infrastructure facilities in poor neighborhoods, freeways that have divided neighborhoods, and unequal access to clean water and sanitation. As an outcome of the 2021 Engineering Ideas Institute, ECL is leading a pilot project that will explore this issue and look to develop strategies on how the engineering community can change to contribute to creating more just and equitable communities.

The first phase of the pilot project will be a workshop for engineering practitioners that will focus on urban development and urban infrastructure in the Denver area. The workshop was held on December 18 and 19, 2023, at Metro State University's CAVEA Theater in downtown Denver. Participants included representatives of ECL and local and national engineering organizations. Look for communication soon regarding the results of the workshop and next steps.

Major sponsors of the workshop included:



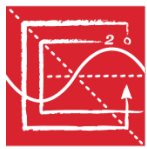
[For more background on our approach, see this link.](#)



## ECL-USA Financial Supporters

We are grateful to the National Council of Examiners for Engineers and Surveyors for their continued financial support of ECL. In 2023 we were also fortunate to receive financial support from The Lemelson Foundation that is supporting our five-year goal to build our internal capacity.

We are also grateful for the engineering firms that joined NCEES in providing financial support in 2023.



**NCEES**  
advancing licensure for  
engineers and surveyors



## 2023 Outreach in the Engineering Community

Over the past year, we shared our message and our work through presentations to numerous engineering organizations, reaching over 1,100 members of the engineering community. Highlights included:

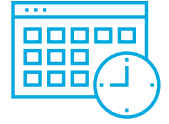
- 2023 ABET Symposium – Challenges of the 21st Century and Engineering Leadership Workshop and Plenary Panel
- SAME Joint Engineering Training Conference – Challenges of the 21st Century and Engineer Leadership Panel Discussion with ECL Stakeholders Rick Guerra, Tricia Hatley, and Gary Raba
- ACEC Wisconsin – Challenges of the 21st Century Mini-Summit, Co-facilitated by ECL Board member Amy Squitieri
- ASCE Civil Engineering Department Chairs Conference Presentation
- CONVERGE 2023 – Challenges of the 21st Century and Engineering Leadership Workshop, Co-facilitated by ECL Stakeholders Alison Wood and Charlie O'Donnell
- NCEES Annual Meeting – Future of Engineering Panel Discussion with Michael Milligan of ABET and Jenna Carpenter of ASEE

In 2023 our work was also featured in the publications of NSPE ([Winter 2023](#) and [Summer 2023](#)), [ASABE](#), [Geoprosessionals Business Association](#), [Society of Women Engineers](#), [The Circuit](#), and [ENR](#).

If you are aware an organization that would be interested in learning about the work of ECL-USA, please contact Mike McMeekin ([mikemc@ecl-usa.org](mailto:mikemc@ecl-usa.org)).

## 2024 Events

Join us in 2024 for one of our upcoming events.



- **Future of Licensure Initiative (Virtual Briefing) – February 13, 2024**
- **Moving from Cyber Security to Cyber Resilience: The Role of the Engineering Community (Virtual Summit) – March 19, 2024**
- **The Engineering Workforce of the Future: Challenges, Key Leverage Points, and Innovative Strategies (Virtual Summit) – June 18, 2024**
- **2024 Engineering Ideas Institute: Engineering Practice in a VUCA World (The Colorado Chautauqua, Boulder, CO) – September 23-25, 2024**

[Learn more and register for all these events is through the ECL website.](#)

## Expanding Our Impact

A largely volunteer driven effort since our launch in 2019, ECL's impact has grown as our programs have reached an ever-wider audience of change leaders from all engineering disciplines, all sectors (public, private, nonprofit, academic, industry, and research), and all age groups. Now we look to expand our reach and impact, dramatically increasing our influence over the discussion about the role the engineering community can and should play in designing the future.

Our strategic goals for the next five years:



- We will significantly increase stakeholder engagement by leveraging direct and indirect connections.



- We will spark meaningful conversations and changes in the engineering community through diverse and dynamic programs that tackle complex issues and promote community-building.



- We will actively collaborate with a wide array of organizations, mutually benefiting from shared content, resources, and ideas.



- We will offer robust outreach, using multiple platforms to inform, educate, and engage both the engineering community and the broader public.



- We will offer effective post-event training and a well-organized repository of knowledge, tools, and insights for ongoing learning and development.

When we achieve these goals, we hope that our impact will be seen through an increased interest in the engineering community from young people, increased respect from the public, and an increase in the value that we provide through our work. We invite you to join us.

Remember to check out the ECL-USA website – [www.ecl-usa.org](http://www.ecl-usa.org) and the ECL-USA LinkedIn page – <https://www.linkedin.com/company/engineeringchangelabusa/> for information on our work.