DENTONS

# Dentons' Global Smart Cities & Connected Communities Think Tank

## Annual Report 2025

September 2025

Dentons' Global Smart Cities & Connected Communities Think Tank brings together the resources of the world's largest law firm with leaders of government, businesses, academia, innovators and stakeholders to craft cutting edge legal, economic and policy solutions to societal challenges in an era of accelerating technological change. Think Tank members work with city and community leaders to take advantage of technological developments to enable modernization and coordination of digital, physical and social infrastructure to make delivery of public, private and hybrid services more efficient, cost effective, secure, equitable and socially beneficial.

# In this volume

# Note from the Think Tank Leadership

The Dentons Global Smart Cities & Connected Communities Think Tank was launched eight years ago with the goal of bringing together thought leaders across municipal governments, business, academia, and community organizations all working towards the common goal of harnessing rapid technological advances to meet the challenges of increasing urbanization.

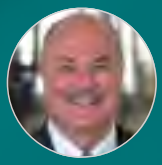
It seems that each year brings more change and disruption than the year before. The past 12 months have been no exception. In the US, the new Presidential Administration is implementing sweeping policy changes that impact just about every sector and industry. Geopolitical shifts are altering longstanding alliances. Projected increased demand for energy and other resources from AI and data centers are leaving aging infrastructure more vulnerable to system outages and physical and cyber security breaches. Massive natural disasters caused by increasingly turbulent weather and climate change are disrupting not only the communities in their paths but are highlighting the urgent need to improve the resilience of infrastructure everywhere.

Against this backdrop, the work of the Think Tank continues to be of utmost importance. This year, we have examined pressing topics ranging from trends in the development of reliable resources to important connections between infrastructure development for space exploration and modernization here on earth.

The Think Tank has grown to over 800 thought leaders from around the world grappling with these and other issues facing cities and communities everywhere. We have continued our partnership with prestigious organizations such as the Keystone Policy Center, and look forward to collaboration with the many other organizations whose leaders are a part of our Think Tank. We continue to expand the reach of the Think Tank's work by bringing together visionaries from government, industry, academia, nonprofits, entrepreneurs, and community leaders for discussions covering all of the Think Tank's Pillars in our webinar series, podcasts and written reports. With each discussion, we seek to take on important challenges facing our cities and communities, and approach them from angles that are under-explored and that reflect the many points of views of the wide variety of stakeholders on each issue.

We are pleased to share this report with you, and look forward to continued engagement with all of our Think Tank members.

## Think Tank Leadership



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Special thanks for their tremendous support of Think Tank activities over the past year to the Keystone Policy Center for their collaboration on the Virtual Roundtable series, and to Think Tank members who contributed to our work. Special appreciation also goes out to Think Tank Administrator Dorinda Graves; Dentons Smart Cities & Connected Communities 2025 Student Fellow Troy Carter; and Think Tank Administrative & Logistics Support Dee McGill, Gay MacLean, Bryan Cooper and Asta Glatz.

# Pillars of Thought Leadership for a Successful Smart & Connected Communities Strategy

A successful smart cities and connected communities strategy will focus simultaneously and in an integrated manner on a number of key Pillars addressing the challenges and implications of infrastructure modernization faced by city leaders and the people and organizations who make up the community. The Think Tank has organized its work into the following areas of thought leadership. We recognize that in our modern era of rapidly accelerating change, there is substantial overlap among these categories, and that at any given time, events may result in certain of these being given more focus. We have sought to structure our Pillars to be flexible to accommodate evolutions in priorities, technologies, and approaches that will invariably be modified across geographies.

### Technology & Innovation

The Technology and Innovation Pillar aims to build bridges to connect advances coming from centers of innovation, such as national laboratories, universities and private enterprises, with cities and communities seeking feasible strategies to design and install systems to support their infrastructure needs and to explore new approaches to both recent and long-standing challenges. At times, the Think Tank will pull out specific developments or trends in technology and innovation into a separate Pillar for individual discussion and collaboration.

### Infrastructure Modernization

Infrastructure modernization is the cornerstone of any smart cities initiative. This Pillar looks at key issues and challenges related to developing and maintaining critical infrastructure from a holistic and integrated perspective. This Pillar also examines best practices related to modernization, deployment and implementation of digital, physical and social infrastructure.

### Energy, Electrification & Resilience

Electric grid modernization is the touchstone of an effective and comprehensive smart city strategy. Without a modern, safe, reliable and resilient grid, implementation of smart technologies is limited. The Think Tank addresses the modernization of electric infrastructure and transitioning to a multi-directional grid with advanced clean technology solutions, including a broad array of distributed energy resources, integration of demand response and efficiency measures.

The Energy, Electrification & Resilience Pillar is dedicated to supporting cities and communities in collaboration with energy companies, customers, regulators, and stakeholders to ensure that affordable, reliable, and sustainable power and fuel resources are provided on an equitable basis as the energy economy is reimagined.

### Government Leadership & Public Policy

Developing engagement strategies at every level of government, including identifying and building relationships with decision-makers and people empowered to execute the necessary components of a smart city, is essential to the success of a smart and connected community.

This Pillar focuses on identifying and tailoring best practices for policymakers to address the needs of a particular community and project, while advancing smart, sustainable, secure, and equitable growth. Regulations need to be designed effectively so as to minimize development costs, expedite technology deployment, and achieve efficient and equitable outcomes for communities. This design can be done both proactively, in the early stages of smart city implementation, and reactively, if legal or administrative structures emerge that may present challenges at a later phase.

### Telecommunications

Advanced telecommunications systems are layered into all physical infrastructure to support smart technologies. The Think Tank works with stakeholders to evaluate and advocate policies that promote the deployment of advanced technologies and the development of compatible firmware and hardware. A focus on facilitating multiple uses for smart infrastructure upgrades is essential to minimizing costs and ensuring that costs are appropriately shared among a broad array of beneficiaries. Equitable access to telecommunications infrastructure also has tremendous benefits in terms of mobility of communities, as daily activities and essential services increasingly take place in a virtual environment.

The mission of the Telecommunications Pillar is to promote the layering of advanced telecommunications onto the modernized grid as the backbone infrastructure for a smart and connected community to ensure cost-effective, equitable and secure access to essential services.

### Transportation & Mobility

When transportation and mobility infrastructure is powered by advanced technologies, cities will realize countless benefits, from reduced emissions and congestion as clean vehicle and ride share use increases, to enhanced public safety and economic development opportunities as underserved communities are connected with employers through efficient, data-driven mass transit.

Because mobility, both physical and virtual, is key to quality of life in cities and communities, this Pillar will keep abreast of the latest physical infrastructure and policy options to support technological advancements in transportation and mobility for the modern economy, including deployment of electric and autonomous vehicles, updated traffic and transit systems, and digital and virtual mobility options.

### Security and Privacy

This Pillar aims to understand and advance the creation of systems to secure critical infrastructure in a world of ever-changing risk, and to protect privacy while allowing for deployment of advanced digital technologies, including frameworks and protocols for data gathering and use. Among other activities, the Pillar will connect thought leaders in these areas and promote educational resources and lessons learned to help cities and communities prepare for, protect against and mitigate cyber and physical disruptions to critical infrastructure systems.

### Data Centers

Because of the need for powerful, large scale data centers to process the digital information required to operate and protect smart infrastructure, data centers have become a central component of a smart and integrated future. From AI-powered technologies employed in everything from multi-directional, self-healing power grids to sensors to transportation to algorithms to improve efficiency and manage transactions to health care and food production and beyond, data centers are the essential facilities that enable the activities that make up our daily lives. However, at present, the need for data centers exceeds current availability and lags behind development of the technologies that depend on them. This Pillar explores this challenge and also looks at the intersection of data centers, technology, power and sustainability.

### Environment & Sustainability

This Pillar brings together leaders from cities and communities, as well as state and federal government agencies, companies, and a variety of organizations, to ensure that environmental strategies support economic opportunity while sustaining natural resources and improving quality of life. Among the many topics addressed by this Pillar are strategies to address a changing climate, including mitigation and adaptation; structural changes that may improve infrastructure while enhancing the environmental quality of cities and communities; and responses to ever-fluctuating societal priorities and demands, including how companies called on by their customers, investors and employees can lead by example in areas where governments have been slower to take action.

### Artificial Intelligence

Where the electrical grid and advanced telecom function as the backbone of a smart city, artificial intelligence (AI) is rapidly becoming the brain and nerve center. AI is enabling advancements and efficiencies, as well as rapid adaptation to changing circumstances. AI has the potential to significantly improve public services, planning, mobility and emergency response, among many other things that will improve sustainability and livability in our cities and communities. At the same time, there is a lot of work to be done to build trust in the technologies and build in safeguards against abuses or unintended impacts as advancements are outpacing our ability to harness and control it.

### Community Engagement, Education & Culture

Community social infrastructure is as critical as physical and digital infrastructure in any modernization initiative, but it is often given far less attention. This Pillar brings together community leaders, interest groups, businesses and residents to conduct education and outreach to ensure broad, informed public participation, understanding and buy-in to the benefits that a smart and connected community can offer, and to adapt initiatives to the diverse needs and desires of the community. This Pillar also examines educational opportunities and structures, including K-12 education programs and workforce development, which are essential for communities to benefit from massive economic transformation. This Pillar also explores how cities and communities are addressing systemic inequities in order to earn the confidence and social license necessary to implement and ensure that modernization projects and policies benefit the whole community and advance in step with sweeping technological changes.

### Investment, Finance & Economic Development

Because of the varied benefits that will flow from smart infrastructure, modernization initiatives may exceed the scope of traditional municipal infrastructure projects, creating challenges in financing, city budgeting and planning, capacity and jurisdiction. The Think Tank explores how these challenges are being addressed in communities around the globe. This Pillar is dedicated to identifying optimum funding strategies and solutions from both existing and untapped sources of capital to accelerate the development of smart cities, and to facilitating conversations among industry thought leaders, policy makers and finance professionals on how best to achieve the expected benefits that will flow from smart cities, including improved environmental health, social justice and positive economic outcomes for communities worldwide.

### Water, Wastewater & Waste

Water is essential to the well-being and functioning of any city or community. Water scarcity and quality are two of the greatest challenges that cities and communities will confront in the future, especially as climate change and competing demands impact availability of our water resources everywhere on the planet. The Think Tank brings together technical, legal, and policy experts from government, industry, academia, and NGOs who are at the forefront of water resources planning to develop new approaches to address water, wastewater, and waste issues, including exploring solutions for cities and communities to enhance the abundance and quality of water, to support education and deployment of advanced water technologies, and to mitigate the negative impacts of waste and wastewater.

### NGOs & Universities

Universities, non-governmental organizations, and think tanks often serve as incubators and testing grounds for early adoption of smart technologies. Universities, in particular, are often akin to micro-cities with populations eager to embrace new technologies and with financial and physical structures that enable faster implementation of innovations. Once tested and revised, these innovations may later be deployed on a wider basis in cities and communities. The NGOs & Universities Pillar taps into these organizations to provide intellectual firepower, to nurture public trust in the development of smarter and more connected communities, and to collaborate and learn from the scale models for utilization of smart infrastructure that they are uniquely positioned to provide.

### Health & Safety

This Pillar examines smart delivery of health and safety services, including by maximizing the opportunities offered by the "Internet of Things" to enhance security, safety and operational efficiencies related to healthcare and public safety. In times of disruption or crisis, a smart and connected approach allows interdependent sector and stakeholder engagement to serve the citizens and economy, both holistically and optimally, in times of crisis or uncertainty, by bringing together critical infrastructure cross-sector partners such as utilities, telecommunications, first responders and health care workers, media and government agencies, educators and social workers, and many others to devise collective responses based on lessons learned and best practices.

### Buildings, Cities & Green Space Planning

Smart buildings and an integrated approach to planning are a foundational building block of tomorrow's cleaner, healthier cities and communities. This Pillar aims to encourage the planning and transformation of communities and community spaces that are more sustainable and equitable. Working together with municipalities, real estate developers, architects, engineers, land use experts and other stakeholders, we seek to develop strategies to encourage productivity, energy efficiency and livability in sustainable, safe, and affordable communities.

# Connections and Insights

As we have done in prior years, we invited Think Tank members to respond to questions about current trends related to smart cities and connected communities and to share insights on what they think the future holds. This year, we asked our Thought Leaders to reflect on the tremendous disruptions and challenges that our cities and communities have faced in the past 12 months and to comment on lessons and takeaways from the responses to those challenges in terms of a path forward towards a more resilient, efficient, and sustainable future.

## Paula Glover

President, Alliance to Save Energy
Member of the Board of Directors of Talos Energy

### *Resilience, efficiency, and sustainability; lessons from a year of disruption*

The past year has tested the resilience of our communities in profound ways. From extreme weather to supply chain disruptions, from economic uncertainty to shifting workforce needs, we've been reminded that energy is not just a commodity—it's the foundation that enables all Americans to function and adapt.

One thing to know is that efficiency by its very nature is resilience. When buildings, systems, and infrastructure use less energy to provide the same or better service, we reduce strain on the grid, lower costs for families and create the capacity to respond to emergencies. This holds true in urban centers and in rural and underserved areas where energy burdens are highest.

Second, solutions must be grounded in real community needs. The most effective energy strategies are shaped with direct input from the people they serve, reflecting local priorities and conditions. When programs are built in this way, adoption rates improve, investments go further and benefits last longer.

Third, the workforce is central. Disruptions in the last year have accelerated retirements and exposed skills gaps, underscoring the fact that investing in training is as critical as investing in technology. Energy efficiency jobs are inherently local and a direct path to economic recovery.

Finally, collaboration is essential. Decarbonizing buildings, electrifying transportation, and modernizing the grid require partnerships among policymakers, industry, communities and the public.

The disruptions we've faced, including rising energy prices, are a call to action: embed efficiency in recovery plans, tailor solutions to real-world needs and see workforce development as climate resilience in human form. After all we can't fight climate change, or any of society's other challenges without human capital.

If we take these lessons seriously, we can build a future that is sustainable, responsive, and prepared for what comes next.

## Lorraine Akiba

President and CEO of LHA Ventures
Member of the Board of Directors of the Interstate Renewable Energy Council and Buildings IOT
Advisory Board Member Asia Pacific Regulator Center
Former Commissioner for the Hawai`i Public Utilities Commission, former Member of the Board of Directors of National Association of Regulatory Utility Commissions (NARUC), and former member of the Advisory Council to the Board of Directors of Electric Power Research Institute (EPRI)

### *Innovation in the wake of disaster*

This August marked the second anniversary of the Lahaina wildfire. There is no underestimating the devastating effects of this fire on the residents and businesses of Lahaina, and on the state of Hawai'i as a whole. However, in the middle of any crisis lies opportunity.* Crises frequently create a catalyst for people to think differently. In Hawai'i, there has been a real consciousness of community based on

responses to the fire. Efforts to rebuild are deeply focused on achieving a community vision of a place that was much more than a tourist destination. The recovery and rebuilding process is not just about rebuilding physical infrastructure. First and foremost, it is about repairing the community.

The other story involves how over the past two years, the state has rapidly turned to technology tools to make sure this disaster is never repeated. Hawaiian Electric is using AI powered technology to track climate change and made investments, including alert systems that include AI powered cameras and other protections against wildfire or weather-related events. These are investments that would not have been made so quickly but for the Lahaina fire. Data gathered through these systems is shared with the public in real time, which helps both with grid operation and faster detection and response to potential problems. While at least 10 other states are making similar investments, Hawai'i is often among the first movers in the US to adopt new technologies. The island configuration makes it a perfect proving ground when combining new technologies for a smarter grid and better responsiveness.

**With a nod to Albert Einstein, who is credited with saying*

> *"In the middle of any difficulty, lies opportunity."*

## Marla Westervelt Berg

Principal, CityFi
Experienced Public-Private-Partnership Strategist
Urban Mobility Expert

### *Speed is not always the best approach*

Government reform doesn't fail because people don't care: it fails because we keep skipping the hard parts.

We live in an age of convenience. With a few taps on a smartphone, a car appears at the curb, groceries land at the doorstep, or a banking issue is resolved in seconds. These experiences reset our expectations. When a package arrives the same day, waiting 30 minutes for a bus feels unreasonable. When private apps resolve problems instantly, chasing down a government permit for weeks feels absurd.

That frustration with the status quo is not trivial, it is the fuel for innovation. Dissatisfaction disrupts inertia, pushes public servants to rethink old processes, and creates political space for reforms once thought impossible. Congestion pricing in New York, climate-linked budgeting, streamlined digital permitting, each gained traction because the public demanded better. But here is the paradox: while convenience often feels instant, it rarely is. We do not see the decades of work behind "overnight" change. Just as grocery delivery rests on years of logistics and technology investment, congestion pricing in New York required decades of planning, politics, and persistence. Real transformation takes time at all levels of government.

The creation of the Department of Governmental Efficiency (DOGE) risks missing that lesson. In the name of efficiency, it has borrowed from the start-up playbook: move fast, break things, and make the books look better in the short term. I saw a version of this during my time at one company during the pandemic. Executives cut 40 percent of staff in a single sweep, without consulting managers. The short-term numbers improved, but the aftermath was chaos: employees were rehired weeks later, and those who remained struggled to succeed without critical colleagues.

Government cannot afford to treat efficiency the same way. Unlike a start-up chasing quarterly metrics, the government's job is to do the hard, often thankless work of reform, untangling layers of policy, compliance mandates, and cultures of risk aversion. Real efficiency in government is not about quick wins; it is about building the systems that deliver the same kind of reliability and value we expect in every other part of our lives.

## Gilberto Ocañas

Senior Advisory to Dentons'
CEO, Ocañas Group
Vice Chairman, Board of Directors, Mexican American Civil Rights Institute
Board Member, Keystone Policy Center

### *Trust is the key to successful leadership*

> "Ideas have a force — sometimes it's positive, sometimes it's negative. But what people don't always realize is, what's the greatest force? My answer would be personalities... But that starts with good human relations."
>
> — Phil Hardberger, former Mayor and Judge, San Antonio

In a world where metrics and presentations often dominate, Hardberger's words offer a powerful reminder: leadership is fundamentally human. To truly influence—to truly lead—you must first connect.

- Trust isn't built on ideas alone, it's built in conversations, gestures, and how you show up.
- Your personality is your brand—it's what people will remember long after the slide deck is closed.
- Effective leadership begins with humanity—listening, relating, and building real rapport.
- Whether an interaction involves two individuals, a company and its customers, or elected officials and the people they represent, trust is a crucial but fragile contract that all parties need to understand and maintain.

As professionals, whether you're leading teams, pitching ideas, or managing change—never underestimate the power of good human relations. It's not just soft skills—it's strategic leadership.

## Sheri Givens

President and CEO, Smart Electric Power Alliance (SEPA)
Co-Chair and Board Member, RE+

### *Collaboration is essential in an era of accelerating technological developments*

What happens when AI meets an aging grid? We are in a race against time.

After a whirlwind few days at the EPRI Summer Seminar in San Diego, one thing is crystal clear - meeting the explosive demand from AI, data centers, and electrification will take speed, creativity, and unprecedented collaboration.

Key takeaways:

- We can't do this alone – Utilities, tech, policymakers, and communities must move together.
- Flexibility is power – Real-time load shifting, AI-optimized grids, and dispatchable clean energy are no longer "nice to have."
- Build fast, train faster – Infrastructure and workforce growth must go hand in hand.

The next decade will define our energy future—and whether we lead or lag. If we unite purpose, policy, and partnership, we can deliver a grid that's clean, reliable, and a catalyst for shared prosperity.

## Pete Tseronis

Founder and CEO of Dots & Bridges
2-Time Cabinet-Level Chief Technology Officer
Chair, Smart and Secure Cities Utility SuperCluster
Member – Contributor Forbes Business Council

### *Thoughtful adoption of technological advancements can optimize interconnected systems and empower individuals and communities*

Significant challenges face our critical infrastructure, such as aging systems, regulatory changes, and growing cyber-physical risks that could have serious consequences. However, there also are exciting opportunities for modernization, transformation, and innovation, enabling us to reimagine and enhance our interconnected networks and systems.

Emerging technologies such as Artificial Intelligence, IoT Sensors and Surveillance, and Cyber-Physical Security can reduce risks and enhance the resilience of critical infrastructure. For example, in the transportation sector, AI-powered predictive maintenance has helped transportation businesses detect potential issues before they occur, reducing downtime and improving overall efficiency; optimize traffic flow, decrease congestion, and enhance safety; and optimize delivery routes, reducing fuel consumption and lowering emissions. Digital twins are used to optimize infrastructure projects, such as highway construction and bridge design, and simulate and test vehicle performance, reducing the need for physical testing and improving overall efficiency.

By adopting these innovations, we can create safer, more efficient, and more sustainable systems. Partnerships among industry, government, and academia in sharing best practices and guiding investments allow us to combine proficiency, resources, and knowledge to create meaningful change and improvements. It is clear that a collaborative, forward-thinking approach is crucial. By adopting emerging technologies, assessing our current challenges, and fostering cross-sector teamwork, we can develop a more resilient, efficient, and secure infrastructure that enhances the well-being and prosperity of our nation while empowering individuals, communities, and society as a whole to thrive and leaves a lasting legacy of positive impact on humanity.

**Smart AI Governance**

Executives and boards are struggling to keep up with the rapid pace of AI advances, especially on the governance front. Neutral Partners has put out a series of articles that argues that responsible AI governance can be a benefit, rather than a hindrance, for companies. The series argues for adoption of ISO 42001, put out by the International Organization for Standardization and the International Electrochemical Commission, to guide organizations in designing AI systems that incorporate transparency, bias identification, accountability, safety and privacy into the technology. Adoption of the standard helps organizations manage compliance in a manner that is complementary to existing risk management controls, that scales with impact, and may give companies an edge in fast-moving marketplaces that demand proof of responsibility and responsiveness to customers, business partners and regulators. Check out *Compliance Isn't a Barrier. It's a Differentiator,* by Ray Watts, Think Tank Member and Founder of Neutral Partners.

# 2024-2025 Roundtable Recap

## October 2024

### Navigating the Surge: Meeting Growing Demand in Data Centers

Hosted in collaboration with the Keystone Policy Center
*Sponsored by the Data Center Pillar and the Energy, Electrification & Resilience Pillar*

Welcome:
Christine Scanlan, President and CEO, Keystone Policy Center

Opening remarks:
Clint Vince, Chair of the US Energy practice, Co-chair of the Global Transportation & Infrastructure sector for the US Region, and Co-chair of the Global Smart Cities & Connected Communities Think Tank, Dentons

Moderator:
Andrew Mina, Partner, Energy practice, Dentons

Panelists:

- Kelly Speakes-Backman, Executive Vice President, Public Affairs, Invenergy LLC
- Jason Stanek, Executive Director of Governmental Services, PJM
- Rudy Beese, Partner, Real Estate practice, Dentons

The demand for data centers is growing significantly, driven by factors like generative artificial intelligence and increased technology usage. According to Goldman Sachs Research, global data center power demand is expected to more than double by 2030. To meet this load growth, utilities will need to invest around US$50 billion in new power generation capacity. In fact, data centers may account for up to one-third of the anticipated increase in US electricity demand from 2024 through 2026. Data center power demand is estimated to grow by 10 percent to 15 percent annually through 2030, potentially reaching nine percent of overall power consumption in the US. Industry leaders discussed these factors and shared their insights on strategies to prepare for this increasing demand.

Resources are not coming online at the same pace as the tremendous increase in demand. As an example, in 2024, data centers represent four percent of PJM's total load. This number is expected to triple by 2030 to 12 percent of total load. Meanwhile, PJM is experiencing a departure of thermal baseload units – coal, gas, nuclear, diesel, and oil at a fast pace, reducing the resources that can be called on to support new load.

Panelist Kelly Speakes Backman said that if we are to get the investment that is needed to meet this demand, we need an all hands on deck approach. Importantly, investors need certainty and guidance on legislation, and we need to be able to move energy from the source to the demand centers. To do this, we need policies that support additional transmission and transportation, and we need permitting reform to get projects quickly developed and deployed. Transmission is not a fast proposition.

In the past, transmission planning and construction was on a 10 year horizon, but now it can take up to 20 years. We do not have the luxury of taking this long. Additionally, the critical infrastructure that is needed will be influenced by policy decisions at the state and federal levels and will require unprecedented coordination in terms of timing and cost allocation.

Jason Stanek commented that a key will be permitting reform, which is a significant obstacle, in addition to cost allocation, to building the necessary infrastructure. Last year, for example, only 55 miles of high voltage transmission lines were built in the US. PJM alone has a system of 80,000 miles. We need to do better. As a start, regulators need to be on the same page. Backstop authority coming out of Washington may help, but more is needed.

Speakes-Backman urged better communication between developers and local populations who are affected by or will benefit from projects. Interregional coordination is also needed to meet reliability challenges. We have new technologies that can help if we can bring them online.

Rudy Beese of Dentons said that it is not just data centers, but also other large loads that are contributing to demand. These sustained loads are changing the marketplace rapidly in ways that regulation and development are struggling to keep up with. There is a great need for policy reforms to help with financing these projects in order to mitigate ratepayer burden. Developers would benefit from having a "one stop regulatory shop," at least at state level, so that they do not need to go back and forth between state and local authorities regulators, sometimes for a number of years, to obtain the approvals needed for a project and to respond to all concerns.

Speakes-Backman suggested that a variety of models might be appropriate. For example, the merchant transmission model which is based on subscriptions is useful in ensuring that the entire cost burden is not on ratepayers at large, but is proportionately placed on the key beneficiaries. Legislation such as renewable tax credits spur investment but do not solve problems such as ratepayer burden or the need to bring this much power online so quickly.

The panel discussed the need for greater public understanding of data centers and other large users of the grid in terms of need and long term community benefits. Historically, investment in manufacturing or large industry is viewed through the lens of jobs and incentives. Data centers may not leave a community with net new jobs over time, unless the project continues for several years and requires other infrastructure to be built with it. Even so, there are trade-offs (noise). Large hyperscalers also need to communicate more clearly why these data centers or other large loads are so critical, and communities need to find ways to form beneficial partnerships to be sure that the project participants are active in the communities to ensure net benefits to the communities they are impacting.

The discussion concluded with perspectives on the current inadequacy of investment in the electrical system. Data centers and the huge demand is highlighting a long-standing problem that is only getting worse. We urgently need to solve multiple problems at once – investment to ensure that our electrical system is sufficient to meet demand, we need to fix permitting challenges and delays, and we need to resolve the cost allocation problem.

The recording of this discussion is found here.

Click **here** for a recent discussion of how we are powering our energy future where Dentons' Washington, DC Energy partner Andrew Mina shares insights on the surging electricity demand from AI and cloud computing and the regulatory and market forces shaping the industry's future.

Think Tank Members recently participated in a press briefing hosted by the United States Energy Association on the challenges to utilities posed by the data center boom. The discussion was hosted by Llewellyn King and included Dentons' Smart Cities & Connected Communities Think Tank Co-Chair, Chair of the US Energy practice and Co-chair of the Global Transportation & Infrastructure sector for Dentons' US Region Clint Vince, and representatives from Pacific Gas & Electric, the National AI Association, Distributed Sun and truCurrent, Solomon Partners, Redland Energy Group, the Electric Power Research Institute, among other organizations. Senior energy reporters from the Wall Street Journal, PBS, Reuters, Politico's E&E News, and Energy Central attended and questioned the panel. The panel discusses challenges and strategies to address the need for speed in meeting the massive power demands of data centers while maintaining grid reliability and managing costs for other utility customers.

An overview of the press briefing is available **here**:

## November 2024

# What to Expect with a New Congress and Administration — Navigating the Future of Energy Transition

*Sponsored by the Energy, Electrification & Resilience Pillar and the Government Leadership & Public Policy Pillar*

A week after the historic 2024 presidential and congressional elections, the Think Tank convened two panels to look at the political and policy-related implications of the election results, and to look forward, to the 119th Congress, to preview the path forward for must-pass legislation and the most likely priorities of the incoming Administration, including the critical role of energy transition in shaping future policies. The second panel also tackled how policy will drive energy and climate policy, specifically, decarbonization and clean technology.

Welcome and opening remarks:
Clint Vince, Chair of the US Energy practice, Co-chair of the Global Transportation & Infrastructure sector for the US Region, and Co-chair of the Global Smart Cities & Connected Communities Think Tank, Dentons

Moderator:
Linda Willard, Counsel, Energy practice and Executive Director of the Global Smart Cities & Connected Communities Think Tank, Dentons

Panel One:

- Joe Crowley, Senior Policy Director, Dentons and Former Chairman of the Democratic Caucus and Member of the US House of Representatives

- Jeff Denham, Senior Policy Director, Dentons and Former Member of the US House of Representatives

Panel Two:

- Karen Wayland, Chief Executive Officer, GridWise Alliance
- Kellie Donnelly, Executive Vice President, and General Counsel, Lot Sixteen
- Nicole Buell, Senior Director, Environmental Defense Fund

### Overview of the election results

The November 2024 election clearly proved to be a sweeping victory for the Republican Party. Republicans secured a 53-47 majority in the Senate, picking up four seats from Democrats (with two seats held by Independents). In the House of Representatives (the House), the Republican victory proved to be much narrower, with a slim 219-213 majority.

The Panel opened with remarks by Dentons' Senior Policy Directors Jeff Denham and Joe Crowley. Denham, a Republican, represented California's 10th and 19th districts in the House (2011-2019). Crowley represented New York's 14th district for twenty years (1999-2019), and served as Chair of the House Democratic Caucus. Both Denham and Crowley agreed that while the Republicans secured majorities in both Houses, successful governance would require working across the aisle to pass major legislative reforms.

The election results could also be interpreted to be less of a victory for Republicans, and more of a mandate for a Trump Presidency. President Trump, for his part, is moving quickly to assemble a cabinet. But a second Trump Administration will be markedly different from the first one, particularly with respect to how the Executive Branch engages with Congress. First, there has been a change in Republican party leadership in both chambers along with a number of open lower-level leadership positions within the party that will need to be filled. Second, with the benefit of experience, the second Trump Administration is poised to be more effective in navigating procedural pitfalls associated with appointments and nominations.

Substantively, the Trump Administration has a clear, albeit ambitious, agenda for the first 100 days in office. It appears that the Trump Administration will focus on trying to make the tax cuts enacted during the first Trump term permanent. Budget reconciliation and tackling the debt limit will come up early in the legislative calendar. Border security, immigration, and reforms to drilling, permitting, and tariffs, are also expected to be addressed.

Beyond the first 100 days, it is likely the Trump Administration will focus on boosting the US technology industry and accelerate efforts to streamline government efficiency and bureaucracy.

### Outlook for energy regulations under the Trump Presidency and the 119th Congress

The second Panel discussed challenges facing the energy industry, the potential for regulatory reforms, including a possible revision of the Inflation Reduction Act (IRA), CHIPS and Science Act, and Bipartisan Infrastructure Law (BIL) funding, as well as the overall outlook for the sector. Panel participants included Karen Wayland, Chief Executive Officer, GridWise Alliance; Kellie Donnelly, Executive Vice President, and General Counsel, Lot Sixteen; and Nicole Buell, Senior Director, Environmental Defense Fund.

The overriding view is that the energy industry is actively embracing the energy transition and that utilities will continue to invest in renewables, as they are the cheapest and fastest to bring online, regardless of any potential regulatory changes during the 119th Congress. Energy producers and transmission operators will accelerate their investments in new technologies and R&D. The one area where Congress could decisively impact the electricity sector is permitting reform, which does not appear to be on the table.

The future of the IRA is uncertain. While no Republicans voted for the IRA in 2022, and many have criticized the Act for its high level of spending, a number of Republican states have benefitted from IRA tax provisions and expenditures. In August 2024, 18 members of the House Republican Conference wrote a public letter to Speaker Johnson imploring him to "prioritize business and market certainty" when contemplating "efforts that repeal or reform the IRA." The Republican members expressed continued support for an "all of the above" approach to energy development and acknowledged that many US companies are using sector-wide energy tax credits, and these tax credits have spurred innovation, incentivized investment, and created jobs throughout the country. In response to the letter, Speaker Johnson indicated he is keen to "use a scalpel and not a sledgehammer."

The prediction was that a wholesale repeal of the IRA was unlikely, although key provisions (*e.g.*, EV credits and select technology-neutral tax credits) could be rolled back through procedural machinations. The IRA was initially passed through budget reconciliation, a process that cuts out the minority party by design. And tax policy fits very neatly into the reconciliation process; the Trump-era Tax and Jobs Act was also passed through reconciliation. With the 119th Congress slated to address the Trump-era tax cuts that are set to expire in 2025, select IRA-related tax provision could very well be scaled back through reconciliation.

The panel also discussed whether federal funding sanctioned under the IRA and the Infrastructure Investment and Jobs Act (IIJA), which is more commonly known as the Bipartisan Infrastructure Law (BIL), would be scaled back. It is procedurally "easier" to repeal IRA funds, as only about US$6.9 billion—or 12 percent of the IRA's authorized funding—had been spent. The billions in IRA funds that were yet to be committed could very well be cancelled. However, it is considerably more challenging to claw back spending associated with the IIJA, as the law was passed through a "normal" legislative process, rather than through reconciliation. Congress could potentially claw back IIJA funds that have not yet been obligated, but it would be nearly impossible to repeal already-obligated funds.

One of Trump's campaign promises was a commitment to reduce energy bills by half. The panelists agreed that this is an unrealistic proposition with respect to electricity, as many factors shaping electricity rates are determined at the state level.

As for the outlook for energy regulations, panelists agreed that the oil and gas industry would likely benefit from deregulation while expectations for the electricity industry were more nuanced.

By far, the most urgent challenge facing the electricity industry is meeting the growing load from data centers, domestic manufacturing and EV chargers. The demand load from data centers and crypto-miners is immediate and must be addressed in a matter of months and years, rather than decades. To both satisfy demand and upgrade existing networks, utilities are investing in renewables. Solar, in particular, is among the cheapest and fastest source of generation to bring online. Regardless of any Congressional or Presidential action, investment in renewables and energy efficiency upgrades will accelerate. That said, Congress could stymie the pace of renewable development. Any change to trade policy that results in a sizeable increase in tariffs on imported solar panels, solar panel components, or disruptions to global supply chains would delay project realization and bludgeon project economics, increasing tariffs for consumers.

Siting and permitting remain a major challenge, especially as meeting burgeoning demand

requires a diversified, "all-of-the-above" energy mix that includes natural gas-fired generation and perhaps also more nuclear. Resolving the siting and permitting issues requires coordination with local, state, and federal governments. The panelists agreed that reforming the permitting process requires a wholistic reform to the entire system of energy federalism, and there appears to be no appetite for such an undertaking. Any major reform to permitting and siting rules would invariably encounter jurisdictional issues across Congressional committees, which have different oversight responsibilities for various statutes, and with state governments.

The recording of this discussion is found here.

### Smart Flood Mitigation

Copenhagen has developed a "sponge city" flood mitigation plan that includes hundreds of projects to protect urban areas threatened by sea level rise and increased rainfall. Among the technologies used, a subterranean infrastructure network of pipes, tanks, and treatment plants absorbs excess water and either stores it, or treats it and diverts it back to the sea. The concept originated in China, where at least 30 projects are in place in specific vulnerable neighborhoods, but Copenhagen reportedly is the first city-wide approach. Japan has constructed a nearly 400 km concrete tsunami wall backed up with over nine million deep-rooted trees to protect coastal towns. Known as the "Great Forest Wall", the structure reduces the energy in tsunami waves or storm surge, protects against rising sea levels, protects against soil erosion, and also provides a habitat for wildlife. Netherlands also has developed a smart sea wall that heals itself and grows stronger with each wave that strikes it. The wall is made of modular blocks that release calcium ions that attract shell-building marine organisms that attach themselves and strengthen the wall. Tests in the North Sea show that the wall can withstand a category 3 hurricane. It is also being tested in Venice and Singapore, two cities susceptible to sea level rise.

January 2025

## Beyond the Horizon: How Space Exploration Will Define the 21st Century

*Sponsored by the Technology and Innovation Pillar*

Opening remarks:
Clint Vince, Chair of the US Energy practice, Co-chair of the Global Transportation & Infrastructure sector for the US Region, and Co-chair of the Global Smart Cities & Connected Communities Think Tank, Dentons

Welcome:
Linda Willard, Counsel, Energy practice and Executive Director of the Global Smart Cities & Connected Communities Think Tank, Dentons

Moderator:
Max Oglesbee, Principal, Monstarlab

Panelists:

- Dylan Hixon, President, Arden Road Investments
- Scott Nolan, CEO, General Matter and Partner, Founders Fund

### Introduction

This Dentons Smart Cities Panel explored the burgeoning commercial landscape in outer space. Moderated by Max Oglesbee, Principal, Monstarlab, this fireside chat featured insights from Dylan Hixon, President, Arden Road Investments, and Scott Nolan, CEO, General Matter and Partner, Founders Fund, both of whom have a long history investing in space-focused companies and approached the subject with complementary vantage points.

Dylan Hixon oversees diversified public and private investments at Arden Road, including a direct venture portfolio; he previously worked as an engineer and is the author of several technical papers and four US patents.

Scott Nolan  backs engineering-led companies across energy, infrastructure, transportation, and biotech; previously, he was an early SpaceX engineer on Falcon propulsion and Dragon subsystems.

The commercial space segment has ballooned over the past two decades, driven by a combination of technological progress, public-private collaboration, and entrepreneurial innovation. Today, space-based satellites provide internet to billions of users around the world, and the space industry is highly diversified in terms of the scope of business verticals and number of stakeholders. In the future, it appears the space industry will continue its growth trajectory, pursuing further efficiencies and cost reductions, amplifying the supply chain, and pursing exploration to more distant orbits, including to the Moon and potentially Mars.

### Early development of the space industry

The discussion kicked off with highlights of early development of the modern space industry, which dates back only 30 years or so when global positioning systems (GPS) technology became accessible to non-government actors for a variety of civilian uses. This technological development emerged alongside a shift in perspective, with space increasingly viewed as a public-private endeavor.

High launch costs proved to be the initial major barrier to entry, but technological developments including reusability of components have brought costs down and have allowed commercialization. For example, at the consumer level, the global satellite internet constellation network known as Starlink, is a compact, portable kit designed to provide high-speed, low-latency internet for a modest cost of about US$100 per month. At a macro-level, Starlink's operational model is unique in that it leverages over 8,000 satellites deployed in low earth orbit. These satellites communicate with ground stations to "pull" data from earth, and then "push" that data around to various spots around the globe, feeding "user terminals" with internet on the ground.

This satellite-based system allows customers who are in remote, suburban, and urban locales to retrieve internet data directly to their dish. While there are technical limitations to using Starlink in densely-populated urban areas, such as New York City, Starlink is ideal for civilian use in suburban and rural areas. Starlink has also been leveraged for military applications.

## Current and future trends in space segment

### Reaching farther-out orbital zones

Currently, most of the commercial satellites are in "low earth orbits" (LEO), or around 300 miles from earth. LEO is generally ideal for commercial satellites that are constantly orbiting the earth, as they do not confront a lot of latency, the zone is relatively close, and orbiting within LEO does not demand a lot of power. The international space station and spy satellites operate at a slightly lower orbit, which makes them prone to drag, while satellites at higher orbits risk colliding with space junk.

The medium-earth-orbit ("MEO") range is around 5,000 miles from earth. Satellites in MEO have a much wider field of view and can reach more of earth. However, MEO is a much more difficult environment to navigate, with higher levels of radiation. Global GPS technology generally operates in MEO and many new communications constellations that are being proposed are for MEO, as their range allows for fewer satellites to be deployed to effectively cover the same area.

Geostationary orbit ("GEO") is about 22,236 miles from earth. According to Hixon, GEO is currently filled with larger, "old school bus size" satellites. There is also an emerging new market within GEO called "micro-GEO," wherein a relatively small satellite can be deployed to serve on specific, geographic areas.

Finally, what Hixon refers to as "cislunar space," refers to the area beyond GEO extending to the Moon. Lunar exploration is now a priority for the space community, as the Moon is abundant with critical minerals such as platinum, palladium, iridium, rhodium, and water.

### Improving logistics and services in space

Some start-ups are focused on providing refueling services and "uber-like" transportation services to facilitate deliveries and logistics between satellites already deployed in space. Some companies are experimenting with new forms of propellants manufactured from water, while others are experimenting with companies that would effectively serve as outer-space "garbage truck" collectors or "refueling agents" that would collect trash and/or resupply vehicles already in orbit.

Other companies are contemplating ways to improve energy efficiency. Interestingly, most of energy expended traveling anywhere in the solar system is expended traveling the 300 miles up to low earth orbit. Once a rocket is outside of the gravity well, it can travel throughout the solar system with relatively low fuel expenditure needs.

On the consumer side, pharmaceutical companies are experimenting with manufacturing a crystalline structure in outer space. The microgravity environment that exists in outer space allows for pharmaceuticals to be produced in much higher yields, and potentially at a lower cost, than conditions on earth.

### Global competition

The global space race that existed during the Cold War continues to the present day. The Chinese lunar program is now ahead of NASA, and China has already sent a rover mission to the moon.

In the US, NASA continues to work with the private space-based community across a number of initiatives, but is inherently constrained by funding and resource availability. NASA is productively partnering with the private sector, which can generally focus on specialized initiatives in a more targeted, effective, and efficient manner.

### Managing space junk

One of the foremost challenge facing the space segment centers on mitigating the risk of collisions with space junk (i.e., large, dead satellites) in low-earth orbit. The "space junk" problem is a traditional "tragedy of the commons", as outer

space is effectively a "public" space with no single sovereign wielding unlimited jurisdiction. Mitigating the space junk problem will invariably require a collective solution.

A number of companies are developing collision avoidance software for satellites already in orbit. This software is designed to both prevent future collisions and ensure that future satellite launches do not generate additional space junk.

There are also companies trying to figure out how to deorbit huge pieces of the old dead satellites that are effectively indefinitely orbiting in space. The challenge is not the engineering, but figuring out a viable business model. State action can play a larger role, with governments perhaps requiring companies launching satellites to have a deorbiting plan and insurance. An alternative solution is for the military to deploy resources to clear the space junk, so as to ensure control over a clean operational theatre.

A recording of this discussion is found here.

## February 2025

### Getting to Know AI's Revolutionary Potential and Vulnerabilities, Part III: AI and Critical Infrastructure — Balancing Innovation, Risk and Readiness

Hosted in Collaboration with the Keystone Policy Center

*Sponsored by the Artificial Intelligence Pillar, the Technology & Innovation Pillar and the Community Engagement, Education & Culture Pillar*

Welcome:
Christine Scanlan, President and CEO, Keystone Policy Center

Moderator:
Clint Vince, Chair of the US Energy practice, Co-chair of the Global Transportation & Infrastructure sector for the US Region, and Co-chair of the Global Smart Cities & Connected Communities Think Tank, Dentons

Panelists:

- Lewellyn King, Executive Producer and Host "White House Chronicle," *InsideSources* Syndicate Columnist, Contributor to Forbes and SiriusXM Radio Energy Central Commentator
- Kelli Andrews, Senior Director, Cybersecurity & Lawful Access Policy, Microsoft Corporation
- David Derigiotis, President, Brokerage/Head of Insurance, Flow
- Sacha Fontaine, Global Head of Utility AI, SAS Institute

The February 2025 Smart Cities & Connected Communities Think Tank Virtual Roundtable brought together leading experts to examine the profound ways artificial intelligence is transforming critical

infrastructure sectors including utilities, energy, insurance, and emergency response, against the backdrop of rapid AI innovation sweeping across the economy.

Lewellyn King, Executive Producer and Host of "White House Chronicle," set the stage by emphasizing the unprecedented pace at which AI technologies are being integrated into infrastructure systems—an evolution that is outstripping existing regulatory and policy frameworks. King highlighted the critical need for cross-sector collaboration to establish best practices and coordinated leadership capable of managing the risks and opportunities presented by AI's expanding role in public and private infrastructure.

Kelli Andrews, Senior Director of Cybersecurity & Lawful Access Policy at Microsoft, detailed how AI adoption is proceeding at a breakneck speed across a broad array of operational domains, including cybersecurity, energy management, compliance, and competition. She likened the scale and speed of this transformation to historic technological shifts such as the advent of the internet and smartphones, but noted that AI is advancing much faster. Andrews also stressed Microsoft's ongoing commitment to responsible AI development, underscoring transparency through public documentation, red-teaming exercises, and implementation of guardrails to mitigate malicious uses of AI.

The energy and utility sector was a focal point of the discussion, with Sacha Fontaine, Global Head of Utility AI at SAS Institute, providing an in-depth analysis of AI's disruptive potential in a traditionally risk-averse industry. He described a complex "split reality" where utilities, while cautious about adopting AI features in official corporate software environments, simultaneously see employees leveraging generative AI tools on personal devices for coding, document summarization, and research. Fontaine emphasized that the US energy grid faces immediate challenges, with much of its infrastructure already 40 to 50 years old. AI-powered solutions such as predictive maintenance, small wire circuit analysis, and dynamic line rating are enabling utilities to anticipate equipment failures, optimize transmission capacity, and extend grid lifespan in real time. Fontaine was clear that these applications are not hypothetical but currently operational and accessible even to smaller utilities that have historically lacked large budgets, provided they apply existing data with appropriate models.

Addressing the darker side of AI's rapid deployment, David Derigiotis, President of Brokerage and Head of Insurance at Flow, illuminated the dual-use nature of AI technologies. He cautioned that the same sophisticated models enabling creativity and productivity can be exploited to produce highly convincing phishing emails and perpetuate harmful biases, which can have serious legal and ethical repercussions. Derigiotis called for comprehensive oversight strategies combining rigorous quality assurance, human-in-the-loop review systems, and clearly defined accountability frameworks. He emphasized the essential role of government regulators in establishing and enforcing these standards, with private sector firms acting as committed partners rather than passive vendors.

The panel also explored the intersection of AI policy and global strategic competition. Andrews noted the significance of the White House's recent Executive Order on AI and Energy Dominance, which strategically links AI development, data center energy consumption, and national technology leadership goals. Fontaine added that AI innovation is becoming increasingly decentralized, with major contributions emerging not only from traditional powers like the US and China but also from unexpected global players and regional utilities. The panelists collectively warned that while regulatory oversight is critical, premature or overly rigid regulation risks stifling innovation and undermining resilience-building efforts before technical and ethical standards stabilize.

In their closing remarks, the panelists concurred that AI will continue to be a powerful force reshaping infrastructure operations, regulatory landscapes, and emergency response frameworks. Several overarching themes emerged: governance is currently lagging behind AI's rapid evolution, transparency and public accountability will be

vital for responsible AI adoption, the energy grid urgently requires modernization through AI-assisted planning and optimization, and human oversight remains indispensable, particularly in safety-critical or public-facing applications. The discussion underscored a growing consensus that AI should not be viewed simply as an add-on technology but as a foundational layer of modern infrastructure. As the United States confronts mounting demands driven by data center growth, climate adaptation challenges, and cyber threats, the integration of AI must be deliberate, secure, and inclusive to ensure resilience and equitable outcomes.

A link to the recording of this discussion is found here.

## March 2025

### Special Edition: The Growing Influence of State Attorneys General

Hosted in Collaboration with the Keystone Policy Center

*Sponsored by the Government Leadership & Public Policy Pillar*

Welcome:
Christine Scanlan, President and CEO, Keystone Policy Center

Moderator:
Clint Vince, Chair of the US Energy practice, Co-chair of the Global Transportation & Infrastructure sector for the US Region, and Co-chair of the Global Smart Cities & Connected Communities Think Tank, Dentons

Panelists:

- Sam Olens, former Georgia Attorney General and partner in Dentons' Regulatory, Public Policy and Government Affairs practice
- Dan Gibb, former Kansas Assistant Attorney General and member of Dentons' Regulatory, Public Policy and Government Affairs practice

In a special edition of Dentons' Smart Cities and Connected Communities Virtual Roundtable, co-hosted with the Keystone Policy Center, legal and policy leaders explored the increasingly influential role of State Attorneys General (AG) in the United States. The discussion, moderated by Clint Vince of Dentons, featured former Georgia Attorney General Sam Olens and former Kansas Assistant AG Dan Gibb, with opening and closing remarks from Christine Scanlan, CEO of the Keystone Policy Center.

Sam Olens opened the conversation by tracing the evolution of the AG role from colonial times to its current prominence. He cited the 1998 Tobacco Master Settlement Agreement as a turning point, marking the first time state AGs collaborated nationally to produce a sweeping public policy outcome. Since then, AGs have taken the lead on other major issues such as the mortgage crisis and opioid litigation. As Congress passes fewer laws and partisanship deepens, AGs are increasingly shaping policy through litigation. While this shift has elevated the importance of AGs, Olens also warned of rising partisanship, noting that many AGs now use the office as a springboard to higher political roles.

Dan Gibb provided an overview of the current political distribution—23 Democratic and 28 Republican AGs—arguing that this near-even split reflects broader national polarization. Gibb emphasized the expanding scope of AG authority, citing examples from his own experience in Kansas, including litigation over the Keystone Pipeline and online consumer protection. He stressed that as federal agencies become less active, AGs are stepping in to fill the policymaking void, coordinating across states and using litigation as a tool to advance or resist federal agendas.

The panel discussed how legal advocacy by state AGs has improved in recent years. Olens noted that when he was elected in 2010, only a few states had Solicitors General capable of arguing before the US Supreme Court. Following feedback from justices about the quality of state arguments, many AGs began recruiting former Supreme Court clerks, greatly enhancing their constitutional advocacy. This professionalism has coincided with a sharp rise in the cost and competitiveness of AG elections, with outside political spending reaching unprecedented levels.

Gibb and Olens both remarked on the evolving litigation landscape in response to the return of the Trump Administration. Gibb said the current administration is more strategic and legally prepared than in 2016, issuing executive orders that appear pre-vetted. Democratic AGs, in turn, have been equally strategic, preparing briefs and legal strategies well in advance. Recent Supreme Court decisions, such as one allowing US Agency for International Development (USAID) funds to be released, reflect these complex legal battles. While that case was brought by nonprofits, Gibb noted it is emblematic of the type of high-stakes litigation AGs often pursue.

The discussion turned to structural legal issues, such as the increasing frequency of national injunctions from district court judges and the broader implications of the dismantling of Chevron deference. Olens warned that allowing single judges to halt national policy forces the Supreme Court to intervene earlier than expected. Both panelists agreed that the end of Chevron, long a goal of conservatives, may now offer Democrats a tactical tool to challenge executive action by the Trump Administration. Olens cautioned that although the change may favor Republicans now, its long-term consequences will impact both parties equally. He argued that Congress must do a better job of writing clear legislation, but also acknowledged the expertise of federal agencies in administering complex policy.

Responding to a question on Foreign Corrupt Practices Act (FCPA) enforcement, Gibb said he expects AGs—particularly Democratic ones—to fill in gaps left by a less active federal government. He highlighted the Consumer Financial Protection Bureau (CFPB) as an area where state AGs can step in, especially after the removal of its previous director. States like New York, with its powerful Martin Act, are particularly well-positioned to tackle complex financial issues such as cryptocurrency regulation. Olens added that federal laws often explicitly give AGs concurrent jurisdiction, citing environmental statutes like the Clean Air and Clean Water Acts as prime examples.

The panel noted that Republican AGs are likely to continue legal challenges to key Biden-era policies, particularly in areas like student debt relief, corporate transparency, DEI and Environmental, Social, and Governance (ESG) initiatives, and energy policy. Olens pointed to litigation aimed at nullifying rather than simply opposing previous administrative actions. He explained that major laws like the CHIPS Act and EV incentives are now in the legal crosshairs, with broad implications for the energy and transportation sectors. He also raised concerns about new tariffs on Canada and Mexico, which could drive up costs and further complicate domestic energy policy.

In terms of AG strategy, Gibb explained that decisions to pursue litigation are influenced not just by legal merits but also by political and practical considerations. AGs with more funding and staff, often in states with aligned governors and legislatures, are more active litigants. Venue selection is also strategic, with states in more favorable appellate circuits (like Washington, Massachusetts, and California) taking leading roles. Gibb pointed out that in some states, like North Carolina, political conflicts between AGs and legislatures are actually limiting AG authority to sue the federal government.

Toward the end of the discussion, Gibb raised an issue of particular interest to the Smart Cities audience: increased legal activity by municipalities that sometimes overlaps or conflicts with state AG actions. He cited the opioid litigation as a prime example of how local governments and AGs can

pursue the same defendants for the same conduct, complicating settlement efforts and introducing jurisdictional tensions.

In conclusion, both panelists agreed that stakeholders—including corporations and NGOs—are more engaged with AGs than ever before. Gibb explained that Dentons' AG practice now advises both on defending investigations and proactively educating AGs about clients' operations. As AGs become more central in policymaking and enforcement, this engagement is becoming a critical part of corporate legal strategy.

Christine Scanlan wrapped up the session by emphasizing the growing media and public focus on AGs and calling for future conversations to continue the dialogue. Clint Vince echoed her sentiment, noting the sheer volume of legal developments that had occurred since their last meeting and praising the insights offered during the discussion.

A recording of this discussion is found here.

# March 2025

## The Role of Energy Storage in Meeting the Needs of the Electric Grid

Hosted in Collaboration with the Keystone Policy Center

*Sponsored by the Energy, Electrification & Resilience Pillar and the Infrastructure Modernization Pillar*

Welcome:
Emma Hand, Co-chair of the Global Energy sector for the US Region, and Co-chair of the Global Smart Cities & Connected Communities Think Tank, Dentons

Moderator:
Clint Vince, Chair of the US Energy practice, Co-chair of the Global Transportation & Infrastructure sector for the US Region, and Co-chair of the Global Smart Cities & Connected Communities Think Tank, Dentons

Panelists:

- David Owens, Board of Directors, ESPX; Former EVP & COO, Edison Electric Institute
- Dr. Todd Strauss, Chief Analytics Officer, ESPX
- Jeff Weiss, Executive Chairman, Distributed Sun and truCurrent
- Joanna Martin Ziegenfuss, General Manager Energy Storage Strategic Market Development, AMER, Wärtsilä Energy Storage
- Dennis Duffy, General Counsel and Vice President, Energy Management, Inc.

The Long-Term Reliability Annual Assessment published by North American Electric Reliability Corporation (NERC) in December 2024, states that most of the North American Bulk Power System (BPS), for the next 10 years, will face mounting resource adequacy challenges as surging demand growth continues along with the retirements of existing thermal and nuclear plants. Massive amounts of renewable (solar PV and wind), battery, and hybrid projects have been proposed, overwhelming electric transmission interconnection queues. Furthermore, the performance of these new resources is more variable and weather dependent than the generators they are replacing. As a result, less overall effective capacity, particularly dispatchable capacity, is being added to the system than what is projected and needed to meet future demand.

This panel discussion focused on comparing energy storage (short-duration lithium-ion battery storage and long-duration energy storage) as alternative resources to peaking natural gas-fired power plants. We compared resource attributes, including infrastructure siting requirements, investment risk, development timelines and milestones, timing and quantities of actual power deliveries, and market

compensation. We discussed how this comparative approach can be integrated into financial decision-making relevant to ISOs/RTOs, utilities, and regulators.

Jeff Weiss of Distributed Sun and truCurrent noted that demands on the grid are expected to triple, which will require trillions of dollars of investment not only for resources to meet this demand but also to address reliability. The core components of our society depend on it. It is critically important to understand that the role of energy storage is not only to meet the needs of the grid but also it is the centerpiece of the future grid.

One challenge that is not frequently discussed is that current energy policy is designed around four-hour batteries, which were among the first on the market. Now we are looking for extended periods of 12 hours or longer, but the regulatory system is designed to maintain current assets. Longer-duration batteries are a different technology and have a different interoperability with the grid and may not fit neatly within existing regulation. Time to development is also critical. Practicable storage solutions should be deployable in a two to four year time frame, which matches solar development.

Less than a decade ago, storage was not viewed as economically viable, but storage costs have declined dramatically over past few years, even with trade policy supply chain and critical minerals issues (down at least 70 percent, possibly more). In the last century, we relied on peaker plants, but today, storage is in the money.

David Owens of ESPX Global explained that resource adequacy is also a significant issue. The US has added 32 GW of solar in 2025, a 30 percent increase over prior year, and expects a 19 percent increase in 2026. Over the next several years, we expect 35 GW of storage to be added to the grid, which helps with the intermittency of the solar resources, but is not independently valued, for purposes of resource adequacy or in the capacity markets. NERC does not consider it reliable because state of charge is not sufficiently visible so it is not predictable. Once we learn more about operational performance of battery storage, this view may change.

Todd Strauss of ESPX Global said that storage is the centerpiece of the future grid because it is a small resource in terms of all resources on the grid, but has an outsized influence because of its flexibility to play both generation and consumption roles. However, it is not necessarily valued properly. The cost for energy storage is deeply intertwined with the engineering operations and market prices of the grid. Because operational decisions and costs are so intertwined, the grid operator needs to have transparency. At present, there are information gaps between what the grid operator sees and what the resource developer sees. As for cost, storage is different from other resources, where the cost is an exogenous fuel cost. The cost for energy storage, however, is the cost to charge, which is the cost of energy at some other time than when it is discharged. This timing is unique.

Joanna Martin-Ziegenfuss of Wärtsilä added that the value of battery storage goes even further because it can provide several services. It provides flexibility of electricity in time, but also can contribute to ancillary services on the grid such as maintaining frequency or voltage. This means it has the potential to be monetized in various markets. However, additional visibility is needed into the operational characteristics in order to optimize which markets to bid in at the right time and at the right level of charge.

Dennis Duffy of Energy Management, Inc. compared storage to peakers. A peaker is usually less efficient, operating only in times of system stress. Some only operate a few hours a year. The challenge is that the operator has to match combined generation with combined consumption, which requires the system to be overbuilt. By moving energy from low demand low price hours to peak demand and high cost hours, storage allows a reduction in the overall build out of the system. Storage can also help in other ways. NERC requires that of every 10 minutes of reserves required to be kept in each market, half must be spinning reserves, which are synchronized and able to respond immediately. Storage can do this; a peaker cannot. This flexibility is a more valuable service to the pool and economically more valuable to the market. Storage can also do

more with revenue stacking than a peaker can. Many peakers are old, and have higher failure rates, challenging maintenance, and are subject to emissions restrictions. Batteries do not face these risks. Batteries also have reduced fuel risk.

Joanna Martin-Ziegenfuss agreed, and added that battery storage does not define the end of gas peakers – they are complementary technologies. In areas where gas peakers are not well monetized, adding battery storage might help open additional revenue streams.

The panel discussed the cost of batteries, how they are viewed in different jurisdictions in the US, and the need to address both hardware and software aspects of storage when determining value and forging a path to wider deployment. They all agreed that policy changes and market adjustments need to be made to accommodate battery storage, especially longer duration storage. Overregulation raises costs, and regulation tends to look backwards, not forwards, which makes it difficult to assess what is needed for system reliability (as opposed to plant reliability) in the market. There also is not a consistent view on whether battery storage is critical infrastructure, which affects regulation and investment incentives.

A recording of this conversation is found here.

## April 2025

## Interconnected Challenges of Energy and Water Management — Addressing Water Demand and Scarcity Amidst Rising Power Needs

Hosted in Collaboration with the Keystone Policy Center

*Sponsored by the Water, Wastewater & Waste Pillar and the Data Center Pillar*

Welcome:
Christine Scanlan, President and CEO, Keystone Policy Center

Opening remarks:
Clint Vince, Chair of the US Energy practice, Co-chair of the Global Transportation & Infrastructure sector for the US Region, and Co-chair of the Global Smart Cities & Connected Communities Think Tank, Dentons

Moderator:
Justin Mirabal, Partner, Energy practice, Dentons

Panelists:

- Dr. Nathan Barasa Wangusi, Founder and CEO, BlueCredit
- Christa McJunkin, Director of Water Strategy, Salt River Project
- Marc Dettmann, Manager, Corporate Water Engagement, World Resources Institute (WRI)
- Jim Oliver, Industrial Water Solutions Director, Black & Veatch

As the demand for power surges, the necessity for water resources also escalates, highlighting the interconnected challenges of energy and water management. Our discussion addressed the critical

issue of water scarcity that arises from energy demand to support generation and data centers.

The panel began by defining terms to ensure a coherent discussion, distinguishing between water scarcity and water stress. Dr. Barasa Wangusi of BlueCredit explained that these are not merely questions of water availability. Water may be available, as the earth is 70 percent water. The issue is availability in the quantity and quality needed, in the location needed, and at the time and for the duration required. This may be a question of infrastructure to get the water to where it is needed, or it could be a question of timing. For example, snow pack atop a mountain may represent available water, but it may not be in the form, quality or place where it is needed.

The conversation then turned to the data center boom and its connection to water stress. Panelist Jim Oliver of Black & Veatch explained how data centers have evolved over just a few years, from small centers that primarily store information to support for cloud computing, which involves more interactive computing. Today, when we speak of data centers, we usually mean buildings and whole campuses built by hyperscalers to support AI. These data centers consume a huge amount of power, but they also require a tenfold increase in water for cooling than was needed by their simpler counterparts. To put this into perspective, a data center for simpler computing might need 300,000 gallons per day for cooling purposes. A data center for today's processing requires three million gallons per day, roughly the same quantity used by a 3,000 home suburban subdivision.

The quantity of water is based on what is required for evaporative cooling, *i.e.*, running water over filtration paths to lower the temperature of chips that become very hot as data is processed. Fan cooling, and hybrid facilities do exist, but water is the most efficient coolant. Oliver also explained that in selecting a site for a data center, the number one criteria is the availability of power. Availability of water is second, and land is third.

Panelist Christa McJunkin of Salt River Project recounted the experience of the Phoenix area following a big push to attract data centers. There was interest in tax revenue and construction jobs, but municipal leaders gave little thought to water supply. Once the problem was evident, it took some time for data center developers and municipal water providers to come to terms with just what was needed. Municipal water supply providers plan in terms of the quantity that is needed to serve a community for a year. Data center developers had not previously had to calculate their annual needs, and they tended to simply calculate their peak day requirement by 365, which resulted in quantities greater than what the local supplier planned for the entire service area for a year. After some back and forth, they have learned to speak in terms of common metrics that make more sense. In fact, the quantity of water that a data center actually needs for its cooling operations is influenced by a host of factors, not the least of which is climate. She also noted that there have been tensions in the community regarding job density in proportion to the area of land taken up by a data center and the quantity of water that it consumes.

Dr. Wangusi remarked that data centers represent high value users of water, but are not the biggest consumers (in spite of the size of a data center campus). Agricultural use, for example, consumes far more. In response to a question about uses for water after it is used for cooling, he explained how water for evaporative cooling may go through between three and eight cycles before it is discharged, depending on the quality of the source water (e.g., concentration of minerals or salts in the water supply). Even when discharged, some water may actually still be potable; however, local requirements may result in it being categorized as industrial waste, necessitating discharge rather than recycling or reuse. The water may also be too hot to discharge into local streams or rivers without upsetting local ecosystems.

Marc Dettmann of WRI discussed the consumptive use problem on a global scale and reminded the audience that there will always be tensions and tradeoffs. Water use does not happen in a vacuum. He also noted that while AI appears to be the source of the problem right now, it also has the

potential to help solve the water challenges at the local and global level. WRI is doing important work around corporate water stewardship from a broad perspective. That is, they are working to ensure that large users think not only about "Scope 1" impacts (*e.g.*, in the case of data centers, water to cool the facility as data is processed), but also about "Scope 2" effects (*e.g.*, water usage by the electric generator that powers the facility) and "Scope 3" impacts (*e.g.*, water use associated with critical minerals extraction that goes into conductivity and building and operations of a data center). He also described the current rapid growth of the data center industry in the US as "the wild west" and expressed cautious optimism that there will be more focus on efficient use of resources as the industry matures.

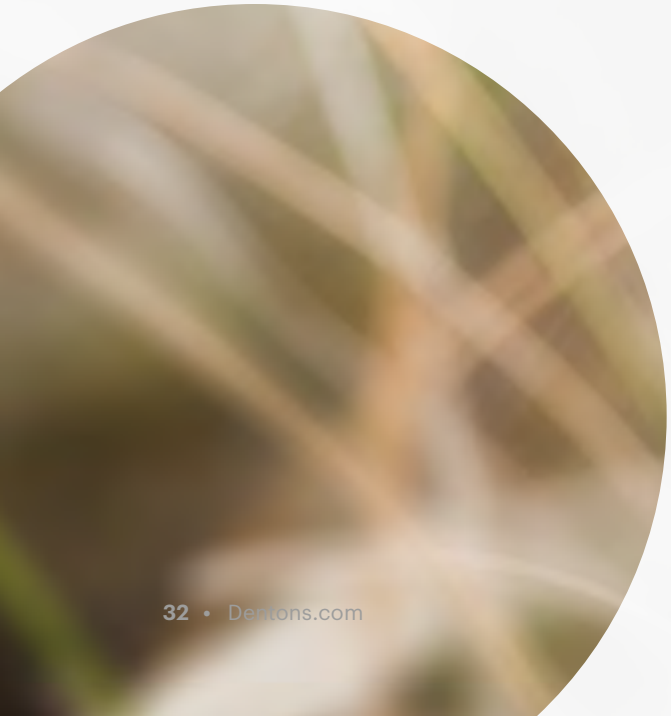
Dr. Wangusi also explained that data center designs are all very similar, with emphasis on energy efficiency rather than water efficiency. The panel discussed how the industry is evolving rapidly. Now there is some work being done to optimize energy and water and other issues depending on where the data center is located.

All of the major data processing enterprises have made commitments to mitigate water impact. However, a significant challenge is measurement and disclosure of how those commitments are fulfilled. A problem with disclosure is that water and energy use in comparison to capacity is considered proprietary information, so most disclosures report global numbers or averages rather than facility by facility impact. There is a lot of opportunity for innovation here.

US data centers mapped over water sources (blue), fibre optic network (white lines) and transmission networks (red and orange lines) as of April 2025. Map by NREL Chief Cartographer Billy J. Roberts.

The panelists were asked if there is a risk of overbuilding. McJunkin said she did not think so. The water sector needs new supplies regardless of the presence of data centers. Panelists also noted that climate change adds uncertainty. Droughts and floods will impact any infrastructure that is built. Finally, Oliver reminded everyone that only a few years ago, when we talked about increased demand for water, we were looking at accelerated growth of both data centers and green hydrogen plants. The outlook for water was dismal. But we are looking at tech companies, which typically find a way to solve their own problems. In all likelihood, chip manufacturers will find a way to build data centers with lower energy requirements, which would result in lower water demand overall for their operations. The story is still evolving, and it is especially hard to predict the future in the tech space.

A recording of this discussion is found here.



## May 2025

### Reimagining Cities and the Future of Urban Planning

*Sponsored by the Buildings, Cities & Green Space Planning Pillar and the Investment, Finance & Economic Development Pillar*

This discussion focused on how we might restructure the way we plan our cities in such a way so as to: avoid doom loops, promote equality, create greater community satisfaction, and improve the overall economy.

Opening remarks:
Clint Vince, Chair of the US Energy practice, Co-chair of the Global Transportation & Infrastructure sector for the US Region, and Co-chair of the Global Smart Cities & Connected Communities Think Tank, Dentons

Moderator:
Linda Willard, Counsel, Energy practice and Executive Director of the Global Smart Cities & Connected Communities Think Tank, Dentons

Panelists:

- Ryan Miller, Executive Regional Director, Cushman & Wakefield
- Rebecca Rockey, Deputy Chief Economist and Global Head of Forecasting, Cushman & Wakefield
- Egbert Perry, CEO, The Integral Group

In the advent of the COVID 19 crisis we've found ourselves poised to do things that have never been done before. Pandemics, business shut downs, and homelessness are not new. What is different is that these events are occurring at a time where we are well- equipped to build back in a revolutionarily bet ter and smarter way if we choose to do so.

Rebecca Rockey of global commercial real estate firm Cushman Wakefield and one of the authors of a recent report *Reimagining Cities: Disrupting the Urban Doom Loop* (available at www.cushwake.cld.bz/Reimagining-Cities-Disrupting-the-Urban-Doom-Loop) opened the discussion with an overview of the report. Beginning in the late 1990s, the US experienced a significant "back to the city" movement. The shutdown during the pandemic and continuing "work from home" trend have disrupted this movement, decreasing urban foot traffic in city centers, leading to decreased real estate occupancy, especially commercial real estate, and negatively impacting valuations and tax revenues. Ripple effects throughout communities have included a significant decline in public safety and a rise in homelessness.

Some have described our current post-pandemic societal situation as a "doom loop" – a kind of self-reinforcing negative economic and urban cycle that amplifies major problems rather than resolving or alleviating them. However, the term can be used in two contexts. It can describe a structural scenario, from which it is extremely difficult to emerge, or episodic circumstances, which come out of a tragedy or shock that is tremendously impactful but can be made temporary by a significant intervention that prevents it from becoming structural. She posits that we are in the latter situation. Examples of episodic doom loops include Hurricane Katrina in New Orleans and the terrorist attack of 9/11. They were horrible events that shocked the nation, but due to significant interventions, communities were able to recover and avoid more permanent negative impacts.

The report examined data from 15 cities, each with walkable urban areas that have a large impact on overall GDP (so called "WalkUps"). They typically make up only three percent of the total land mass in a city but represent 37 percent of tax revenue and 57 percent of GDP. They subsidize the entire city and generate most of the economic output.

Right now, most US cities are struggling with severe real estate imbalances. Overall, urban office space generally represents 70-80 percent of built urban space, while living and recreational space make up only 20-30 percent. The breakdown in areas described as "urban adjacent, urban university or urban commercial typically reflect a more balanced distribution. The report finds that the optimal breakdown is 42 percent office space, 32 percent living space, and 26 percent recreational space. So how do we readjust the real estate proportions to strike a better balance?

Egbert Perry of the Integral Group suggested that we need a change in perspective. We generally approach these problems through either a pure community development lens, or through a commercial lens. The community development view is a more long term outlook and the pure commercial lens is a more short term outlook. However, both can create inequities, so a middle ground must be found. We need to simultaneously create value for cities and build (or re-build) the fabric of communities. One way to do this is by redefining our concepts of "highest and best use". Presently, "highest and best use" is determined by assessing how to maximize rent on a single piece of property. But this will not get us to our goal. Instead, we must look at the broader context including durability and sustainability. By not focusing so much on pumping up front end rents at the expense of all else, we can ensure higher rents over the long term.

Perry offered two strategies for creating a more equitable, balanced, and economically strong city. First, we need "vertically integrated city populations rather than horizontally stratifying communities based on income. Second, we need to implement creative public-private partnerships. This change may involve some rethinking of tax increment financing and strategic tax abatements. Decision makers should also consider using form based codes to both provide a more flexible environment and reduce overall costs.

Additionally, we need to change how we think about the housing crisis in the US. Rather than viewing it as a broad question of affordability, we should reframe it as housing affordability in the right locations. This outlook goes to the notion that we should

focus on vertical rather than horizontal population distribution. Rather than just building more housing, we need to focus on "placemaking", where housing is a component of the overall place. This will also require changes in perceived connections between places and race or class, which negatively impacts the marketplace. Perry suggested that changing the lens to "profession" might be one approach. Those facing the housing crisis would not be viewed by their income or their race, but by the fact that they are all potential professionals.

Ryan Miller of Cushman Wakefield rounded out the discussion with an important note: success here will require a partnership effort by all the various stakeholders. We currently have a unique opportunity to completely reshape our urban landscape for the better. We have the tools and ideas necessary to break the episodic doom loop, but will need to work together in ways that we've never worked together before.

A recording of this discussion is found here.

## June 2025

## Streamlining Energy Permitting — Collaborative Solutions for Sustainable Progress

Hosted in Collaboration with the Keystone Policy Center

*Sponsored by the Energy, Electrification & Resilience Pillar and the Government Leadership & Public Policy Pillar*

Panelists:

- Eric Vandenberg, Senior Director, Transmission Policy, Invenergy LLC
- Chase Weir, CEO and Executive Vice Chairman, Distributed Sun and truCurrent
- Tom Hassenboehler, Co-Founder and Managing Partner, CO2EFFICIENT
- Jon Rund, Deputy General Counsel, Nuclear Energy Institute (NEI)
- Rudy Beese, Partner, Dentons Global Real Estate group

Welcome:
Christine Scanlan, President and CEO, Keystone Policy Center

Moderator:
Clint Vince, Chair of the US Energy practice, Co-chair of the Global Transportation & Infrastructure sector for the US Region, and Co-chair of the Global Smart Cities & Connected Communities Think Tank, Dentons

### Introduction

There is intense pressure to build new energy generation capacity and transmission lines in the US, and the exponential growth of artificial intelligence (AI) and data centers is adding to this pressure. Unfortunately, large energy infrastructure projects face permitting wait times that can stretch for multiple years. The average time it takes to build a high voltage transmission line in the US for instance starts at 10 years. Policy makers have started to consider ways to reform our energy permitting system, but, because of the patchwork of state and federal laws and regulations governing the development of energy projects, agreement on meaningful permitting reform has thus far been unattainable.

Our panel explored challenges and potential collaborative solutions to make the energy permitting process more efficient and effective. Panelists discussed the unique federalist system in the US and other structural roadblocks in the permitting process.

### Congressional action and federalism issues

With respect to federalism issues, Tom Hassenboehler commented that Congress now

recognizes permitting reform is a challenge that needs to be addressed. There is a need to tackle the National Environmental Policy Act (NEPA), siting, infrastructure build out, red-tape, and federal-state jurisdictional bottlenecks. He specifically mentioned House Energy and Commerce Chair Bart Guthrie (R-KY), Senate Environment and Public Works Chair Shelley Moore Capito (R-WV), and Senate Energy and Natural Resources Committee Chair Mike Lee (R-UT) as leaders in the permitting reform policy effort. When asked about legislative models for permitting reform, Hassenboehler pointed to the Clean Air Act amendments and Federal Power Act amendments as examples that combine a much-needed "carrot and sticks" approach to federal-state jurisdictional issues. Panelists agreed there is a need to better address jurisdictional issues. To that end, the Federal Energy Regulatory Commission's (FERC) upcoming decision with respect to co-location in the PJM region will be an opportunity to delineate FERC's role.

### Transmission

Transmission was a key topic of the permitting reform discussion. Eric Vandenberg described Invenergy's efforts to construct the 5,000 MW Grain Belt express, the largest transmission project ever, which will run through Kansas, Missouri, Illinois and Indiana.[1] With respect to legislative changes to advance permitting reform, Vandenberg expressed that no significant changes to key environmental statutes were needed; rather, the challenge was in the implementation of these statutes, such as: (1) adequate resources and trained staff; (2) regulatory certainty and dispute resolution procedures; and (3) interregional transmission planning. Eric Vandenburg also lamented the lack of a robust process for interregional transmission planning. Tom Hassenboehler expressed optimism over interconnection-related permitting bills that have recently passed through the House Energy and Commerce Committee.

There are structural barriers to investment for merchant transmissions. Eric Vandenburg commented that the best way to unlock private sector investment for transmission and more generally is by unleashing some of these structural barriers. Chase Weir described unlocking the grid is the only way to balance our economy going forward.

### NEPA and innovation

The panelists had varied opinions on the role of NEPA in delaying permitting for energy projects. Chase Weir of Distributed Sun and truCurrent offered some hope that the NEPA timeline for their projects had gone down to two years, a 28 percent improvement. He added that environmental reviews are getting somewhat easier, provided there is thoughtful and active community engagement. Weir also emphasized the role of behind the meter load and grid innovations to make the process more efficient.

### Nuclear

Jon Rund of NEI addressed the disconnect between growing bi-partisan consensus supporting nuclear energy and the challenges posed by the Nuclear Regulatory Commission's (NRC) permitting process that can have little or no bearing on safety. Recent federal legislation, however, in the form of the ADVANCE Act passed in the last Congress and other measures, has started to make the NRC permitting process more efficient as well as additional federal tax credits for nuclear production and investment. Rund said there were positive other developments in nuclear's favor, such as the restart of currently closed reactors such as that at Three Mile Island and the Dow-XEnergy facility in Texas, which has an 18-month target date for permitting, as set forth in the Trump executive order.

### Data centers

The explosion of data centers has yielded an extraordinary increase in energy demand. We're living in an "industrial built society that's not meant for the digital age. Panelists agreed that collaboration and coordination between state and local governments and hyperscalers to use the permitting process to leverage incentives to bring power to the grid, strengthen the grid to make

1 On July 23, the US Department of Energy announced its plans to rescind its US$4.9 billion loan for this project.

adequate power available to even larger projects with vast demand. Chase Weir invited the audience to think of kilowatt/hours (energy production) as the same thing as brain power or processing power and it is working capital; energy permitting needs to let us put more capital to work for us.

A recording of this discussion is available here.

## July 2025

### Critical Infrastructure Security and Resilience: Mitigating Evolving Threats

*Sponsored by the Security & Privacy Pillar and the Infrastructure Modernization Pillar*

**NOTE: This discussion was subject to Chatham House Rules. Accordingly, the following summary is high level. Please listen to the recording of the discussion for more detailed information.**

Welcome:
Linda Willard, Energy Counsel and Executive Director of the Global Smart Cities & Connected Communities Think Tank, Dentons

Moderator:
Clint Vince, Chair of the US Energy practice, Co-chair of Dentons' Global Transportation & Infrastructure sector for the US Region, and Co-chair of the Global Smart Cities & Connected Communities Think Tank, Dentons

Panelists:

- The Honorable Harry Coker, Jr., Secretary, Maryland Department of Commerce
- Kelli Andrews, Senior Director, Cybersecurity & Lawful Access Policy, Microsoft Corporation
- Brett Freedman, Senior Director of Emerging Technology, The Institute for Critical Infrastructure Technology
- Max Carr-Howard, Partner and Co-Chair of Dentons' Global Compliance and Investigations Team, Dentons

The conversation began with Maryland Secretary of Commerce Harry Coker, Jr. defining some terms for the panel to consider. The concept of cyber security includes not only cyber attacks but also physical attacks, natural disasters, and equipment failures. There is an increasing number of attack surfaces, i.e., avenues for bad actors to compromise our cyber or digital systems. The more connected our world becomes, the more attack surfaces there are. This brings about increased responsibility to mitigation vulnerabilities.

Today, we should be using the term "cyber resilience," not just cyber security. Everyone has a responsibility because everyone has a digital connection to a system that is bigger than they are. We exist in a strategic environment that is more complex, more interconnected, and more competitive than ever before. In this environment, the most capable (*i.e.*, the federal government and big tech) should bear a greater portion of responsibility, but everyone has a role. Cyber resilience is essential to economic prosperity but needs to recognize strategic environment.

There are five disturbing trends that impact smart cities and interconnectedness:

1. Risk to critical infrastructure
2. Increased cybercrime, notably: ransomware
3. Commercial spyware is becoming increasingly accessible to anyone who has the funds
4. Supply chain exploitation
5. Artificial intelligence

Brett Freedman of The Institute for Critical Infrastructure Technology described data as "today's

gold". From his vantage point, there is no such thing as cyber security. We need to be cyber resilient. There are no borders in cybersecurity – we need to accept that information will be accessed and stolen. Our proliferation of data only exacerbates the problem of remaining accountable for data and maintaining integrity of that data, especially as nefarious actors seek to undermine trust in our system.

With respect to tactics that have evolved for cyber actors in recent years. Now there is persistent access, with attackers sitting on systems awaiting opportunities for disruption. They are not necessarily seeking to take information, but rather to shut down systems and sow chaos. As a country, we are unprepared. And it is a reality we need to learn to address.

Kelli Andrews of Microsoft Corporation added a few data points to center the conversation. Microsoft sees over 600 million attacks a day on its customers. Amazon has said it sees about 700 million attacks a day. Microsoft has reported detecting 47 million phishing attacks in one year. Microsoft tracks over 1,500 unique threat actors, over 600 of which are nation-state actors. This number doubles year over year. There is an influx of sophisticated threat actors that are targeting the US Government, NGOs, and critical infrastructure as the top three targets. These actors are no longer just taking data or conducting espionage (although China needs data for AI and espionage certainly continues at a tremendous level); it also is about "prepositioning" for potential disruption.

Max Carr-Howard of Dentons emphasized the many levels of attack coming together. People are thinking about theft of social security numbers, but are not necessarily focused on manipulation of data or how it can be used against critical infrastructure. Importantly, we are all in this together, and every scheme discussed by the panelists has a human element. We need to implement cyber controls but also to teach people to be skeptical. We also need to be sure that all employees are trained and vetted. There is a robust set of actors after money. But there also are actors who are trying to manipulate data or steal intellectual property for competitive advantage.

Secretary Coker commented that malicious actors are also trying to instill a lack of trust in government. One significant challenge to protecting against attacks is that by the time that a city or community or government can tell that a system has been compromised, it is too late. We need to devote more effort to deterring attacks, not just identifying or responding to them.

In cyberspace, we are in conflict every moment of every day. Every tool of national power must be used – not just signaling, but acting, diplomacy, economic tools, etc. The State Department has led a "digital solidarity" initiative meant to bring together "like-minded" allies who can partner accordingly.

Freedman responded to questions about how AI and quantum computing are changing the landscape, noting that these developments render current encryption techniques obsolete. Notably, we do not look at it in the same context as other actors. Some countries are working very hard to win the quantum race.

As for how we protect systems, over 90 percent of critical infrastructure is privately owned, so the federal government and private sector must cooperate. In so doing, we need to find a way to effectively protect cyber sources and methods while sharing essential information. We also need to be sure that the average person understands the tools available and trusts their essential partners for information sharing.

Andrews remarked that the issue of figuring out the right model to share info between industry and government is challenging, but not new. We do not yet agree on who should be the hub. It usually is thought to be the intelligence community's purview, especially with respect to threats from nation state actors. But we need two-way sharing and we need clear mechanisms to get information out to the right systems and to the public as necessary.

Secretary Coker stated that this is a shared challenge that requires shared services. The federal government does recognize that it

cannot be successful in cyber by itself, which is important. It needs to partner with the private sector. We also have to figure out how, when we share information with the public, do we protect ourselves against other actors who are racing to exploit that vulnerability that was just disclosed. The social infrastructure, from a policy perspective, needs development.

Freedman discussed legal challenges to sharing information even among government entities, and other barriers to sharing of information by industry with government. Additionally, he explained, we need to focus on recovery after an attack. We need to be able to get back up and running and to rely on the information we use to restore systems.

Max Carr-Howard noted that Microsoft understands the challenge, but there still is work to be done to educate smaller businesses to understand the risks to their bottom line from these kinds of attacks. They think about it more in terms of reputational risk if personal data is shared, but it goes far beyond that. We need investment in resiliency but we also need to get senior business leaders to understand that the answer is not for them to solve the problem on their own. Collaboration is needed with multiple levels of response – *i.e.*, government and business at all levels, and a mechanism to communicate. He also emphasized the social engineering aspect of attacks and the need to educate people to be aware of this.

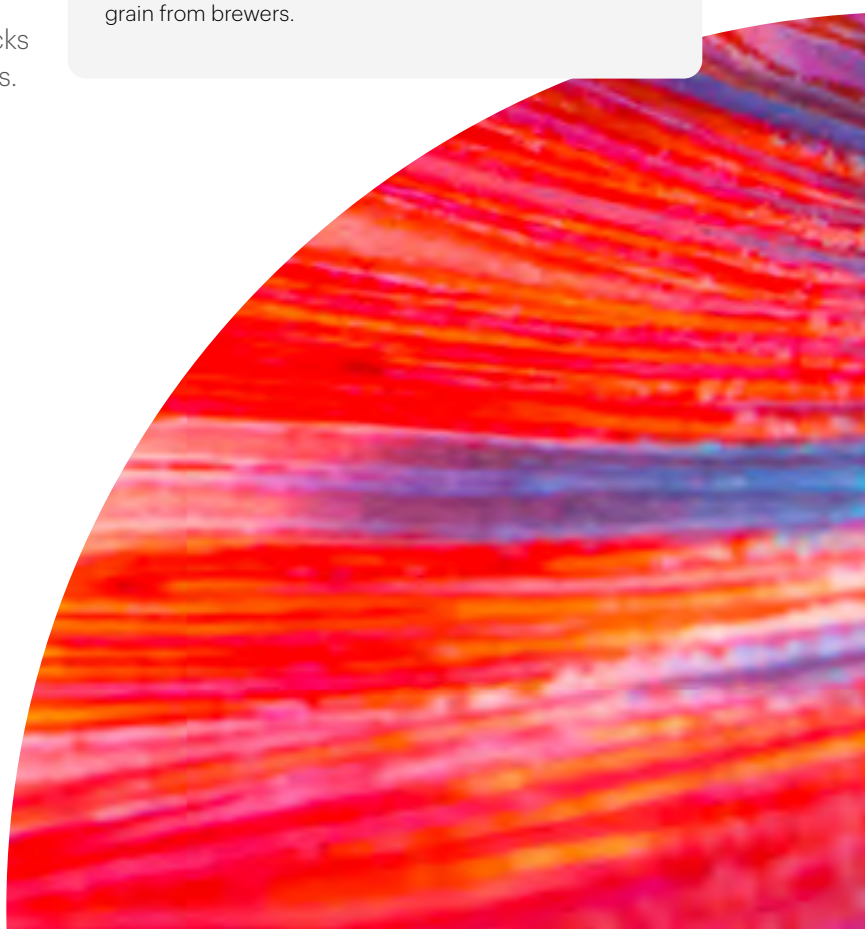
In the end, critical thinking, collaboration, and communication, and especially important, trust in the people and in the government, will be key to cyber resilience. We also need to improve deterrence by setting up a hierarchy of consequences for nation state adversaries.

A recording of this conversation is found here.

Recordings of all of the Smart Cities and Connected Communities roundtable discussions, including from prior years, can be found here.

**Smart Agriculture**

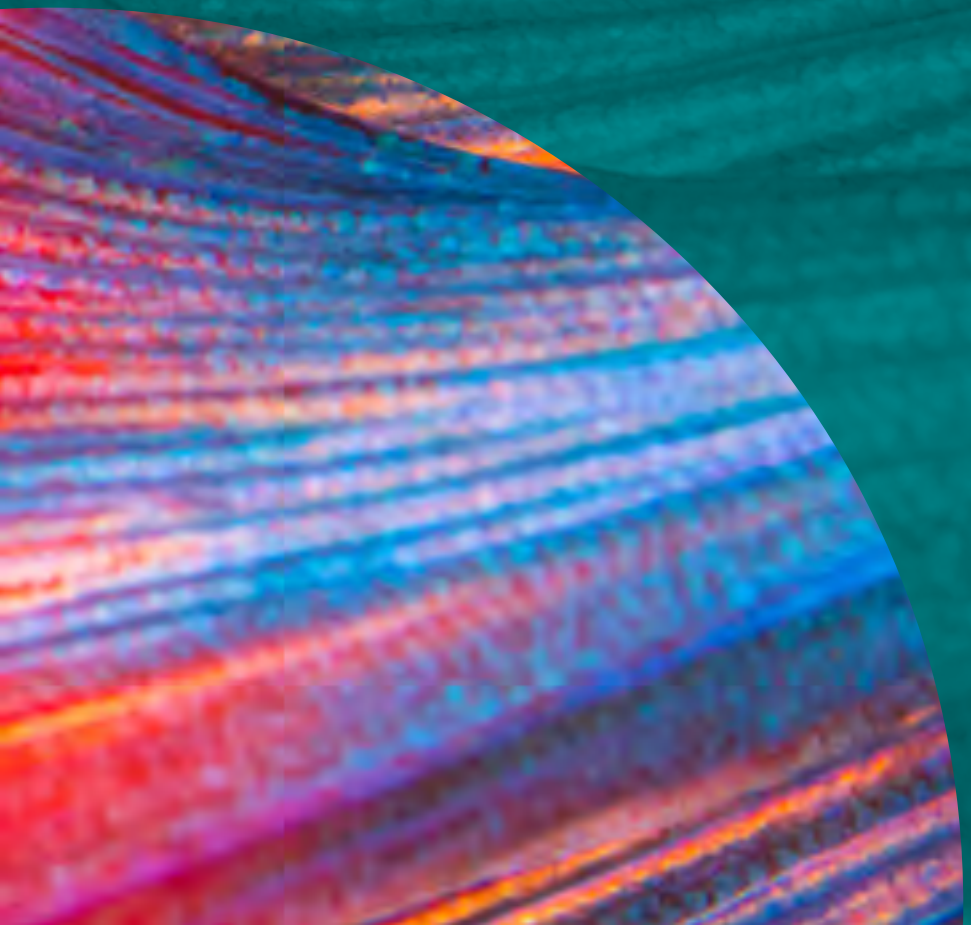
The Dutch Ministry of Agriculture is promoting a smart farming model that mitigates sea level rise, addresses increasing scarcity of agricultural land as population increases are met with development on former farm land, and promotes food security in flood-prone regions. Floating farms, both for crops and livestock, enable food production directly on canals or harbors. Rotterdam, with some areas 20 feet below sea level, has established the most well-known floating farm, with cows living and grazing on floating platforms. The farm is self-sustaining, with solar panels, rainwater collection and purification systems, and much of the feed coming from city waste including grass from golf courses and athletic fields and grain from brewers.



# Smart Cities & Connected Communities Thought Leadership

Following are short articles shared by our members on topics related to the work of the various Pillars of the Think Tank, ranging from mega-trends spanning multiple aspects of infrastructure modernization to Pillar-specific thought pieces on developments, challenges and opportunities for the betterment of the lives of city and community leaders, inhabitants, and other stakeholders. Some articles are reprints, with permission, from other publications, while others are original thought pieces produced expressly for the Think Tank.

Think Tank members are invited to submit short articles throughout the year for inclusion in our report. Contact Think Tank leadership if you have a thought piece you would like to share.



# Megatrends Impacting US Infrastructure and Businesses

By Clint Vince and Jennifer Morrissey

*A version of this article previously appeared in the March 2025 issue of Financier Worldwide*

The US business and regulatory ecosystem is undergoing a transformative sea change affecting all aspects of the economy. The current Administration, which represents the polar opposite of most of the policy ideals of the Biden Administration, is hastening certain shifts in governance and modifying the directional tide of others. With control of both houses of Congress (albeit by slim margins) and, for all practical purposes, of the increasingly politicised Supreme Court, the Trump Administration has a tremendous political advantage in enacting its desired policy changes.

As an initial matter, the size of US federal administrative agencies is being dramatically reduced, and agency decision making will be restricted, especially in agencies such as the Environmental Protection Agency (EPA), the Securities and Exchange Commission (SEC) and the federal Departments of Energy, Defense, Interior, Health, Labor and Education. In his inaugural day executive orders, President Trump rolled back a slew of his predecessor's policies and initiatives on energy, the environment and immigration, and put a pause on pending new federal rules for a period of reassessment.

Coupled with the Supreme Court's dismantling of deference to federal agencies in a series of rulings over the past 12 months, policy decisions are no longer being driven by federal agencies but instead are coming from the President and his cabinet. As a result, the courts are experiencing a tsunami of litigation,  and regulatory unravelling is reducing investor certainty as businesses look for strategies to navigate during the transition.

There has been a lot of activity at the sub-national level in reaction to the President's policies and actions dismantling federal agencies and programs. Attorneys general in both red and blue states have already been taking aggressive action in organised opposition to a variety of federal policies. There is a maxim in the US that when Congress is gridlocked or polarised, the states become more active. This also carries down to political subdivisions, including cities and counties, depending upon ideology.

These disruptions take place while both the federal government and companies alter their approach to governance policies and practices. The President has directed an end to federal DEI programs. Meanwhile, companies, under pressure from investors and customers, have been quietly rebranding environmental and social governance and diversity and inclusion commitments, focusing instead on sustainability and bottom-line targets. It is unlikely that these commitments, by whatever name, will cease to be considered entirely in company operations and transactions. They are important to deal valuation because of the measurable correlation to company performance. Additionally, environmental and social governance metrics will continue to be required, tracked and reported in many other countries, and so will continue to be important for companies operating internationally.

Of course, it will take time for many of the Administration's new measures to fully take effect, and there will invariably be roadblocks. There are as many predictions on what the next four years will look like as there are question marks. Nevertheless, there are several additional mega-trends, both domestic and global, that will influence how businesses respond and the directions they choose to take.

## Global trends impacting US companies

Sweeping changes in geopolitics are impacting the business and investment decisions of companies in the US, as elsewhere. The trend away from globalism to regionalism and nationalism is not unique to the US. War and shifting alliances have ripple effects throughout economies around the world.

President Trump appears to be dedicated to implementation of significant tariffs, which has exacerbated threats of trade disputes, supply chain disruptions and competition over access to critical minerals and other essential resources, adding complex layers of risk even to straightforward transactions.

Population growth and urbanisation continue to be significant trends, and sustainability remains a global priority. At the same time, jobs, energy security, trade and economic development will be key drivers, with costs prioritized over reductions in emissions.

## Climate

In addition to reversing numerous environmental regulations, President Trump has ordered withdrawal of the US from the Paris Climate Agreement. These actions will be cheered by some, however companies throughout the economy have already made substantial investments in recent years to retool operations to meet the requirements of the now eliminated rules and are unlikely to completely reverse course at this point.

Importantly, the effect of natural disasters because of a changing climate will continue to be relevant for business decisions. Massive wildfires and flooding in the past several months have reinforced how climate remains a concern among shareholders, states, and nearly half of Congress, and has a clear effect on company bottom lines. The impact of turbulent weather on gross domestic product (GDP) is dramatic. Reports indicate that the sum total of the nine most significant weather events in the US last year exceeded US$500bn, nearly two percent of GDP, and this year is on track to surpass that figure. The extraordinary destruction caused by the California wildfires in January is the costliest natural disaster in US history to date.

The massively disruptive effects of such events impact everything from energy use and demand, insurance, housing, communications infrastructure, transportation, and so forth, and strains federal disaster relief funding as well as state and local budgets. There will be investment opportunities for private companies to harden US infrastructure, which is unable to cope with disasters of the magnitude we are seeing, but it is unclear what role the federal government will play in supporting such efforts.

## Artificial intelligence

Artificial intelligence (AI) is a megatrend that, although in its infancy, is making its impact felt in a profound way. With the ability to disrupt and transform entire industries, the deployment of AI will involve some growing pains, as is the case with the adoption of any revolutionary new technology. Foremost among the challenges currently facing AI developers are the potential for abuse, job losses and supply constraints, including energy supplies needed to power AI, which may slow deployment.

The US will likely go light on regulation of AI. AI has the potential to optimize business operations and increase productivity across sectors. Transportation, manufacturing, energy, healthcare, finance and agriculture all represent opportunities for AI applications. The tech industry itself will also present many opportunities for investment and growth.

## Tremendous increase in electricity demand

After nearly two decades of flat demand, the US is experiencing an explosive surge in demand for power supply that is dramatically outpacing additions of generation and other power infrastructure. Data centers to power AI, electrification and a domestic manufacturing renaissance are all fueling this huge increase in demand, which can only be met with a multi-resource solution. Some generation resource retirements are being delayed, while mothballed units, including decommissioned nuclear units, are coming back online, but this is nowhere near enough.

Natural gas has steadfastly remained a key component of the US energy supply portfolio. The Trump Administration's declaration of an energy emergency will pave the way for natural gas to retain this prominence.

Massive investment is needed in transmission and distribution. Transmission construction is exceptionally slow, and expansion of distribution systems is constrained by a severe transformer shortage.

Finally, a shortage of skilled labor is also impacting the rate at which electricity infrastructure is built. AI will have a role in solving some of the demand growth challenges, but the electricity sector is facing significant losses of institutional knowledge as personnel retirements outpace the onboarding of new talent.

## Uncertain US energy landscape

President Trump's 'Unleashing American Energy' executive order signals renewed emphasis on fossil fuels, although it is not a given that US oil & natural gas production will increase dramatically beyond current levels. US natural gas production already represents approximately 25 percent of global output, even with the Biden Administration's pause on liquified natural gas exports. But the shale plays that have allowed for prolific production of oil & gas over the last decade are now mature, and the marginal cost of recovering additional resources is increasing. Even with loosening of regulation and opening of federal lands to production, market conditions and current economics may not support dramatic increases.

Additionally, tariffs and global supply chain issues may negatively impact the domestic oil & gas industry. If input costs rise, production and refinery costs will increase, which would increase costs of gasoline and diesel – an outcome that the President campaigned to avoid.

Tariffs would also raise costs for the solar and wind industries, although we may see expansion of nuclear and hydrogen. At least one automobile maker has announced its intent to focus on hydrogen vehicles rather than electric vehicles (EVs). With the new Administration's de-emphasis on EVs, others may follow suit.

While there are questions about the future of the infrastructure legislation passed by the previous Administration, there was a flurry of Inflation Reduction Act (IRA)-funded investment in the last quarter of 2024, and the IRA supported a wide range of technologies and manufacturing, which the current Administration should have an interest in maintaining.

## Intensified cyber security risks

Cyber attacks on businesses and infrastructure, cyber crime, sabotage and espionage, often sponsored by state actors, have become everyday events. More organizations relying on AI to detect suspicious activity means more devices are interconnected to the grid. We can expect to see an increase in sophisticated attack methods that exploit the vulnerabilities presented by these new technologies and devices. Many do not have security built in or for the purpose for which they are ultimately deployed. Instead, security features often are layered on after the fact, which creates additional risk for underlying data and assets. Additionally, as use of cloud-based technologies for cost savings becomes commonplace, defence perimeters are eroded and risks change.

The above represent but a few of the major trends that will impact business and investment in the US in the foreseeable future. In short, we can expect rapid, tumultuous change and intense backlash, with an extraordinary amount of litigation and disruption of relationships, international and domestic. All interested parties should batten the hatches and prepare for heavy and confused seas.


### ABOUT THE AUTHORS

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## Smart Cyber Security

Switzerland has built a quantum internet cable that is virtually unhackable. This fully operational quantum encrypted fibre optic cable runs from Geneva to Zurich. Traditional encryption uses complex mathematics for security. The Swiss technology uses "entangled photons" which collapse if data is intercepted, physically changing the message and alerting the system. The technology can be deployed on existing standard fibre-optic lines, reducing the need for new infrastructure. Developers are now exploring expansion of the network through

## Smart Affordable Housing Model

Uruguay's housing cooperative system is a model for a public-private-partnership approach to affordable housing. Families co-own property and housing units, although they do not have traditional private ownership rights in the cooperative. They participate in building and management of their homes, and create a community of collaboration while addressing a housing crisis that might otherwise exclude many, especially lower income households, from decent, affordable housing in locations near to jobs, health clinics, and open spaces. Studies of cooperative homeownership in several countries have shown that in order to be successful, there needs to be strong policy structures to support these projects and a strong culture of collaboration, which, if not already present, would need to be built in order for a cooperative model to work.

# Unlocking Brain Capital: The Catalyst for Systems Change

By Dr. Lawrence Jones

In the age of complexity, our success in transforming man-made systems will depend on a new form of value: brain capital. Human creativity is the driving force that transforms existing systems into more resilient new ones. We must ask ourselves the key question: how far could we go if our brain skills were enabled, optimized, and supported across every sector of society?

### The Case for Brain Capital

Brain capital, as explained by Dr. Harris Eyre of Rice University, encompasses "brain health and brain skills across the lifespan." When I invited him to speak at the Global Electrification Forum (GEF) last year, he explained during our talk titled Boosting Brain Power for System Change how the health of our brains has a tremendous effect across society. A healthy brain is a creative brain. Dr. Eyre, who is a leading advocate of understanding and boosting brain capital, offers it as a framework to improve our systems.

The concept of brain capital presents a holistic opportunity for business and society at large and fostering it can unlock significant economic potential across societies. According to the McKinsey Health Institute, prioritizing brain health can unlock up to $26 trillion worldwide. This is because healthier brains lead to increased productivity, innovation, and a better quality of life–a flourishing that is achievable.

On a personal note, I recall how, after extensive conversations with neuroscientists and experts, including Dr. Eyre, Dr. Lara Jana, and Dr. Mithu Storoni, and adapting a few changes to my daily work routines, I saw real improvements in my brain health. Just as we invest time and money to go to the gym and improve our physical fitness, we need to incorporate mental exercises and make healthier choices for brain fitness. A culture that promotes positive brain capital will improve society for all.

As an electrical engineer, I've become increasingly passionate about the brain-energy nexus, which offers powerful analogies between the human brain and the electric grid. The brain is one of the most complex natural systems we know, and the grid is one of the largest and most complex man-made systems in existence. By studying how the brain manages its vast network and economy of energy with remarkable efficiency, we can uncover new insights for building smarter, more efficient, more resilient systems of our own.

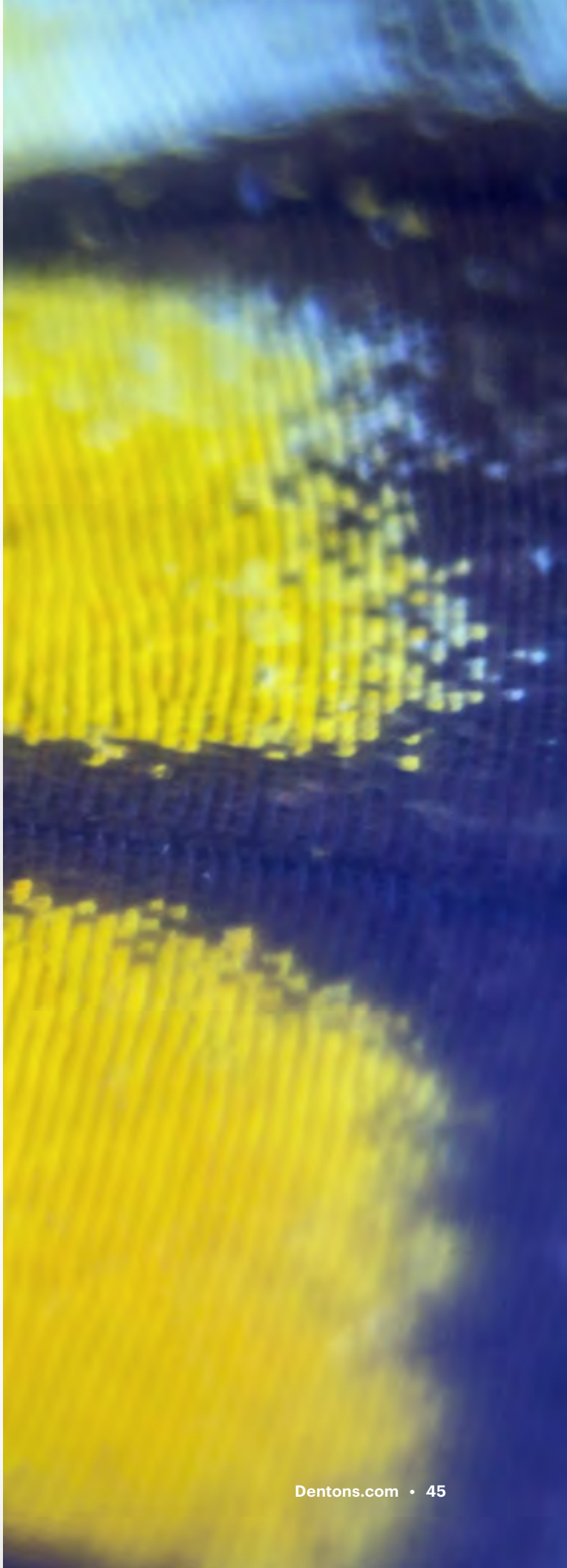
AI systems are now ubiquitous, increasingly automated, and fueled by unprecedented access to information. Yet with access to all this, are we really prepared for today's vexing problems and those that are emerging with potential disruptive impacts?  Societies across the globe are confronting increasingly complex challenges as the deep interdependencies of critical infrastructures become clear. In board rooms around the world, simple business and policy decisions demand a holistic view that integrates financial, legal, geopolitical, and ethical concerns. Leaders need advanced analytical and agile minds to keep up.

Transitioning our critical infrastructures to smarter, sustainable, and people-centric systems means that the mental models of practitioners and decision makers must transition alongside them. In fact, we as individuals are an essential part of our critical infrastructures, with various roles from consumers to practitioners to leaders. Take the electric grid, for example. It is traditionally understood as a complex network that brings electricity to our homes, but we, the consumers, are an important part of this network. There is no need for power generation without demand, and there is no grid to deliver electricity without the workforce – the human capital behind it.

For the workforce behind any system to be prepared to confront these shifts, we must go beyond technical skills and cultivate creativity, resilience, critical thinking, and adaptability. For example, workers in energy and other sectors need to fortify their brain skills to function under extreme weather conditions and cope with the rapid pace of changes in technology, geopolitics, geoeconomics, and environment. Unlocking boundless imagination and creativity will enable innovations, large and small, toward smarter systems. Organizations and governments can achieve this by investing in brain capital. Building brain capital is needed in every type of work, from behind-the-desk analysts and engineers to frontline workers, doctors, educators, lawyers, and leaders in both the private and public sectors.

### A New Era of Polymaths: The Value of Transdisciplinary Thinking

Today's reality is one replete with ubiquitous complexity and interdependencies. It is no longer sufficient to take a reductionist approach to addressing the challenges of our time. The brain, if cared for and kept fit, allows us to solve interrelated system problems. The brain capital framework exemplifies how ideas across disciplines can lead to real systems change. It also makes a compelling case for transdisciplinary thinking as the key to driving next-generation solutions. We must be open to learning and thinking from diverse perspectives, systems, and fields.




We all know that generative AI is transforming work processes now and will increasingly do so in the future. How we interact and learn from AI systems is equally as important. In today's complex world, AI offers a powerful partner in expanding human learning and human potential. Now that everyone is waking up to the realization that we can accelerate our learning through AI prompting and model specialization, it is important to take this momentum and recognize that the future workforce must be profoundly transdisciplinary.

We must encourage the development of polymaths and embrace the value of transdisciplinary approaches to work. As discussed by Aksinya Staar in her book Future of Work: From Industrial to Polymath Mindset, and Waqas Ahmed in The Polymath: Unlocking the Power of Human Versatility. To think critically about the challenges of tomorrow, we should advance new education paradigms that teach and prepare lifelong learners across disciplines. It is through exploration beyond academic and professional boundaries that we will make breakthroughs. Breakthroughs require us to look at one problem through different perspectives, enabling boundless creativity.

### Enhancing the Workforce Brain Health

Critical infrastructures rely on highly skilled workforces that often work under difficult conditions. Take, for example, the stress of a frontline worker who works long hours and must be precise at every decision point while serving the community. What steps can organizations take to improve brain health and enhance the brain skills of these workers to increase productivity and, most importantly, to live a healthier life? Due to advancements in neuroscience, we now have more robust frameworks to help answer such questions. Organizations can make informed decisions based on advancements in neuroscience, brain health, and neurotech to develop strategies to mitigate burnout, reduce stress, and improve the well-being and performance of these essential workers. By creating the optimal mental environment for creativity to flourish, organizations not only prevent burnout but also nurture the fertile ground from which new ideas grow. This not only benefits our imagination and

creativity for more innovation but also enhances the reliability and safety of the systems we operate. It is important to be able to assess the brain health of any organization. In this regard, The Business Collaborative for Brain Health is focused on Building Brain Capital and has developed a scorecard.

### Sightscoping: A Tool for the Age of Complexity

Our brains not only enable creativity and imagination but also generate the perspectives required for decision-making. Without knowing, our brain naturally helps us generate hindsight, insight, and foresight. Inspired by the Roger Spitz's book *Disrupt with Impact: Achieve Business Success in an Unpredictable World*, I had numerous conversations with Kruthika Bala, Managing Director at Resources Now, about how we couple and harness the three "sights" in designing sustainable solutions to the complex problems facing businesses, governments and the broader society The result is what we call SightscopeTM a device which posits the question: what if we could look to the past, look to the present, and look to the future, simultaneously to harness hindsight, generate insights, and develop foresight to solve a given problem? As you can see in our AI-generated image of the device, on the left and right are hindsight and foresight, respectively. They represent looking into the past and the future, and as you move their knobs for different inputs, then the insight in the middle takes different shape. The three pillars of *sightscoping* – hindsight, foresight, and insight – are all imaginative and creative processes enabled by a healthy and fit brain.

Hindsight is the creative act of re-imagining the past. When looking back, it is critical to be aware of how hindsight bias works to better analyze cause and effect. Hindsight bias teaches us that after an event has occurred, we look back and, like detectives, begin to put the pieces together about how the event took place. When doing so, it is important to take a systems view approach to tackling the event from various angles.

Foresight is the creative act of imagining possible futures. It uses complex cognitive functions to synthesize current trends and signals, allowing us to proactively shape tomorrow. To quote

Spitz, "Foresight does not seek to predict, but to drive imagination to inform decision-making and the actions required today considering the potential futures ahead. Foresight prepares you for the swerves."

Finally, insight is the creative leap: a breakthrough that is the synthesis of our past and future. It is the result of using the 360-degree decision-making lens. When our brain is most efficient, we constantly using the three "sights."

This initial idea of sightscoping came to me out of my fascination for dragonflies back when I was growing up in Monrovia, Liberia, where I had the aspiration to become a veterinarian, and my interest in biomimicry. Nature teaches us many lessons, not just about our limitations as humans but also about our potential. The dragonfly is one of the only creatures in the world that has a 360-degree view of their environment. The sightscope proposes that we can learn from the dragonfly by having a 360-degree temporal view of our environment, the decisions that we make, and the results. This is somewhat akin to The Medici Effect, a concept defined by Frans Johansson that describes how the convergence of ideas, concepts, and cultures from different fields creates an explosion of new, breakthrough innovations at their "intersection". This effect is named for the Italian Medici family, who sponsored Renaissance art and scholarship, fostering an environment where diverse fields and people could interact and generate novel ideas.

No matter what the industry, us organizations can apply sightscoping to foster systems thinking and optimize decision making in today's increasingly unpredictable, complex, hybrid physical-digital world. Harnessing hindsight, insight, and foresight requires intentional and sustain investment in the brain health of workers to reap positive brain capital.

## Positive Brain Capital for Economic Prosperity

A healthy and fit brain is the foundation of creativity, imagination, and sound decision-making. Brain capital is not a luxury for select industries; it is the hidden infrastructure that underpins every workforce and every system we rely on. If we treat brain capital with the same urgency and seriousness as financial or physical capital, we can unlock new levels of resilience, innovation, and prosperity.

This means going beyond the rhetoric and designing workplaces and policies that protect brain health, equipping education systems to cultivate multidisciplinary thinkers, and encouraging organizations to adopt frameworks that value hindsight, insight, and foresight equally. It also means investing in ourselves, building daily habits that strengthen brain fitness just as deliberately as we strengthen our bodies.

I am delighted to see serious actions on brain health and brain capital. The World Economic Forum and the McKinsey Health Institute have established the Brain Economy Action Forum, the Center for Houston's Future and Greater Houston Partnership have a local brain economy initiative modelled on the Houston Energy Transition Initiative, and Blue Ash Ventures has launched as the first brain capital-focused venture capital fund. In the Global South, the President of Cameroon has endorsed the Yaoundé Declaration for the Brain Economy which provides a roadmap for brain economy strategies across Africa.

We are entering an age where the challenges of complexity cannot be solved by machines and models alone. The true differentiator will be the capacity of human brains – healthy, creative, and interdisciplinary, to imagine and build systems worthy of the future we want. Brain capital is not merely a key to thriving in the age of complexity. It is the capital of the future.

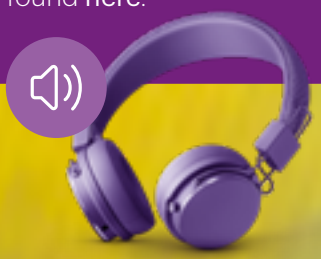
## ABOUT THE AUTHOR

**Dr. Lawrence Jones** is Senior Vice President, International Programs for the Edison Electric Institute, a Member of the Global Board of Directors for the World Resources Institute, a Senior Associate (non-resident), Energy and National Security, for the Center for Strategic and International Studies, a Member of the Royal Swedish Academy of Engineering Sciences, and a Member, Steering Committee of Brain Capital Alliance. He is the creator and host of Influential Minds and Global Circuit Exchange, two flagship conversation series that engage industry leaders worldwide. The views expressed in this article are those of the author and do not reflect those of any organization he is affiliated with.

### Smart Traffic Safety Solution

Canada has reduced traffic accidents involving vehicles and wildlife by as much as 80 percent in Banff National Park by creating green overpasses that allow animals safe points to cross highways without endangering themselves or drivers. Several US states have erected similar structures, including California, Arizona, Colorado and Utah, each resulting in a dramatic decrease in animal/vehicle accidents.

Leaders of the Dentons Smart Cities & Connected Communities Initiative in the Canada region have launched the Smart Cities Chat podcast series, with subjects ranging from public-private collaboration to challenges for broadband to issues of smart urban density and beyond. Recordings of all of the Dentons Smart Cities Chat podcasts are found here.



# The Administration's New Automated Vehicle Framework: What it Means for the Future of Transportation

By Eric Tanenblatt, Peter Stockburger, and Walker Boothe

In a significant announcement that could reshape the future of American transportation, the US Transportation Secretary Sean Duffy unveiled the Administration's new Automated Vehicle (AV) framework at the end of April. Touted as a milestone toward a safer and more innovative transportation system, the framework is designed to remove regulatory barriers, encourage private sector innovation, and ensure America's leadership in the global race for autonomous mobility.

### A new vision for automated vehicles

The Automated Vehicle Policy 5.0 is an update to previous federal guidance documents on AV technology. The framework emphasizes flexibility, innovation, and safety—three pillars that the Administration believes are essential to unlocking AV's promise.

Key highlights from the framework include:

- Voluntary Safety Self-Assessments (VSSA): Instead of mandatory federal regulations that could stifle innovation, companies are encouraged to submit voluntary safety reports outlining how their AV systems meet essential safety metrics.
- State and Local Coordination: The framework defines more precise boundaries between federal, state, and local authorities. The federal government will focus on vehicle performance and design, while states will manage licensing, insurance, and traffic laws.
- International Leadership: The Department of Transportation (DOT) emphasized that a flexible approach would help US companies compete globally, particularly against nations like China, where AV development is rapidly advancing.
- Public Education: Recognizing the public's skepticism about driverless technology, the framework includes new initiatives to build trust through education and transparent communication.

> "Government shouldn't be picking winners and losers," Secretary Duffy said during the unveiling. "Our job is to create an environment where innovation can flourish, and safety remains a top priority."

### Highlights from the public announcement

Throughout the presentation, Duffy emphasized that while AVs could dramatically reduce roadway fatalities—94 percent of which are currently caused by human error—there are still significant challenges ahead. He underscored that the framework is not a "one-size-fits-all" policy. Instead, it provides a roadmap that adapts as technology evolves, avoiding heavy-handed rules that could quickly become outdated.

The presentation also featured demonstrations of cutting-edge AV technologies from American companies, showcasing real-world examples of how automated systems can handle complex driving environments, from congested urban intersections to rural roadways.

## A balanced approach to innovation and safety

One of the most striking aspects of the new AV framework is its emphasis on balance. Rather than rushing to overregulate a rapidly changing industry, the Administration's approach leans toward the idea that private sector innovation should lead the way, with government playing a supportive but critical oversight role.

The policy also recognizes that automated vehicles could help address broader societal issues, such as reducing traffic fatalities caused by human error; expanding mobility for seniors, people with disabilities, and underserved communities; and increasing transportation efficiency to help reduce emissions and congestion. Nevertheless, ongoing collaboration with industry leaders, local governments, and the American public will be essential to ensure a smooth and responsible rollout.

## Implications for the future

The introduction of this AV framework signifies a commitment to maintaining the United States' leadership in automotive technology. By fostering a regulatory environment that balances safety with innovation, the framework aims to accelerate the development and deployment of AVs, ultimately enhancing mobility and safety for all Americans. While this development moves us closer toward a more structured framework, there is still much work left to go. It is unclear how quickly the Administration will move with this initiative.


### ABOUT THE AUTHORS

**Eric Tanenblatt** is the Global Chair of Public Policy and Regulation at Dentons US LLP.

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**Walker Boothe** is an associate managing director in Dentons' Regulatory, Public Policy and Government Affairs practice.


Each year, the Dentons Global Autonomous Vehicles Group puts out a guide covering expansions in the autonomous vehicles market driven by advances in artificial intelligence and robotics. As these innovations shape the future of transportation, widespread adoption of autonomous vehicles continues to face policy, regulatory, and legal challenges across the globe as countries are still formulating their approach to autonomous mobility.

Our 2025 Global Guide to Autonomous Vehicles explores these challenges, offering a detailed look at the evolving policy, legal, and regulatory landscape impacting AV development and testing across 11 countries, including around issues such as artificial intelligence, privacy, liability, and connectivity. The guide can be found **here**.

To stay abreast of all the latest technical, legal and regulatory developments shaping the path to full autonomy, visit our Driverless Commute blog at **https://www.thedriverlesscommute.com/**

# Creating Resilience for an Increasingly Complex Electric Power System

By Jeffrey P. Price, President, OnGrid Options, LLC

The following is an extract from a paper by the same title and has been significantly abridged for inclusion in this report. To read the author's excellent report in its entirety, along with other papers in the same series on innovative approaches to grid resilience, visit https://gridoptions.com/documents.

The electric power sector, its regulators, and the public face the challenge of strengthening the sector's resilience against rare and devastating threats. These threats often extend beyond the electric sector, impacting other critical national infrastructure and communities. Determining the appropriate resilience measures to take and justifying their costs presents a significant challenge. The electric sector's evolving and increasingly complex nature and its growing interconnectedness with other intricate systems seriously challenge vulnerability assessments and resilience strategies. Compounding this issue is the difficulty in motivating investments to address extreme risks, as their infrequent occurrence can lead to a perceived lack of urgency.

Traditional cost-benefit and reliability analyses, the power sector's standard tools, prove inadequate for evaluating extreme risks within this increasingly complex system. A more appropriate approach is required to assess vulnerabilities and implement effective solutions. Complex Systems Science [(CSS)], which accounts for evolving behaviors of the electric system, offers a promising alternative. This approach points toward an innovative grid architecture, the Resilient Community Grid [(RCG)], designed to address both reliability and resilience challenges created by both interdependence and the emerging complex behaviors of the modern electric grid.

Extreme outages and especially black sky outages pose both perception and institutional challenges. Their unprecedented and rare nature often leads to disbelief and underestimation of their likelihood.[1] The significant effort and cost of preparedness may further contribute to not prioritizing readiness. Nevertheless, these events do happen. Building resilience is crucial to mitigating the devastating consequences of rare but high-impact risks. Electric power faces many risks of this type, and these risks are amplified by numerous interdependencies.

The absence of a reliable evaluation method is increasingly apparent, especially as stakeholders promote their own resources for grid resilience while simultaneously criticizing competitors, especially after outages. Compounding this, there's a growing understanding of the grid's vulnerabilities and interconnectedness. The industry and regulators are now recognizing the potential for catastrophic, widespread outages. Those that are most recognized because they have repeatedly occurred have been caused by severe weather. There are other risks including flaws in the electric system, for example, an unexpected series of protective relay operational flaws [that] caused a cascading outage in the US Northeast in 2003 [or the] April 2025 widespread outage throughout the Iberian Peninsula and southern France due to power plants

1 Footnotes are omitted in this excerpt. See full version of the article for all internal references and citations.

A Resilient Community Grid consists of a local section of an electric transmission and distribution (T&D) network containing both power generation and interdependent critical infrastructure facilities that can temporarily be "islanded" to operate independently during regional outages. Unlike microgrids, RCGs are intrinsic parts of the T&D grid and serve multiple facilities under different ownership at different locations. RCGs have independent control and cybersecurity systems that do not operate and are not visible under normal conditions. RCGs cost-effectively protect grid sections serving critical infrastructure from multiple threats and reduce risks from infrastructure interdependence. RCGs add value to renewables and Distributed Energy Resources (DER) by enabling those resources to provide a new, vital community resilience service.

RCGs enable the most important and often interdependent critical infrastructure serving a community and the nation to be protected using existing grid infrastructure. RCGs can be created where a community's critical infrastructure and electric generation and storage resources cluster within the T&D grid.

*See* Jeffrey P. Price, Resilient Community Grids: Creating an Affordable and Resilient Energy Transition, available **here**.

not providing the voltage control for which they had contracted. The electric grid faces other threats with the potential for complex risks, for example, from combinations of cyberattacks and physical assaults.

Utilities often justify decisions using "prudent utility practice, "a regulatory standard typically defined as common industry methods. However, this can stifle innovation and encourage conformity. Furthermore, traditional cost-benefit analyses, ineffective for catastrophic risks, and standard reliability metrics, which overlook black sky scenarios, are often integrated into defining prudent utility practice.

The human tendency to underestimate risks based on limited experience is also an obstacle. The absence of widespread, long-tern outages caused by events like solar flares, major earthquakes, volcanic eruptions or large and complex infrastructure attacks can lead to a perception that such events are so unlikely they are not worth preparing for, particularly where they haven't already been experienced.

One further challenge is the vast number of points of vulnerability. The electric power sector in North America consists of a huge and complicated network spanning the entirety of the United States and Canada as well as parts of Mexico. It consists of four major synchronized interchanges including the continental United States alone, 66 balancing authorities, over 7,300 power plants, 160,000 miles of transmission lines, 55,000 transmission substations, and millions of more miles of distribution lines. Beyond this are the communications, fuel, water and other resource networks that supply it. Many of these present points of vulnerability to both manmade and natural threats, particularly on the transmission system. Protecting all of this all the time from all threats is virtually impossible. Protection must be prioritized, but how?

Calculus and statistics, the standard techniques of power system engineering and cost-benefit analysis, cannot be used to model the behavior of complex systems.  Complex Systems Science tools already used to some extent in the electric power sector, is the study of how the relationship among parts of a

system create collective behaviors of the system and how the system interacts and forms relationships with the environment.

[In particular, it can help analyze] four basic principles for creating resilience of interdependent complex systems:

1. Focus on what is most important,
2. Address risks at an appropriate scale,
3. Reduce interdependence vulnerabilities, and
4. Ensure the system continues to operate properly.

Each part of a complex system and its relationships with other parts has its own importance and vulnerabilities. Addressing all vulnerabilities may be infeasible, so decisions must be made about what is important. The structure of the systems and the impacts of disruptions need to be understood so that what to protect can be prioritized. Within the electric power system, power generation, storage resources, and load often cluster within communities of various sizes. An effective approach to resilience must focus on protecting those clusters.

Since different behaviors take place at different scales, choosing the right scale to intervene is vital. The intervention must be viable, effective and affordable. An intermediate community scale provides such an approach. Action can be practically and economically taken at that scale. [S]ections of the grid can operate independently by stopping cascading outages from affecting them. Developing an intermediate scale construct also has other advantages by reducing grid investment needs, enabling better DER hosting, and prioritizing transmission grid investments.

An [intermediate scale Resilient Community Grid] protects related groups of interdependent critical infrastructure system components that can still support each other when the grid goes down (*e.g.*, electricity, water, wastewater, telecommunications).

[CSS tools can identify measures to] ensure the system continues to operate properly. Redundancies are more feasible and cost-effective for a section of the electric grid than for the electric grid as a whole. A cybersecurity breach of the regional grid does not affect the RCG and the RCG provides a more difficult target. [F]ewer points of vulnerability [are created]. Critical components of an RCG are fewer and can be more cost-effectively protected.

[CSS analysis can also support] [e]nabling readiness. Resilience cannot be achieved through just engineering alone. Decision makers and operators are an inherent part of the system. Traditional grid operation is focused on top-down control of large power plants and T&D systems by anticipating the variation of electric loads, outages and resource availability. Sophisticated models have been developed to plan for diverse and challenging conditions. Those are not adequate, however, for black sky or other extreme events. Preparedness of critical infrastructure staff for the unexpected is also crucial for maintaining community resilience.

Considering the vast scale of the grid and critical infrastructure as well as the large numbers of people potentially involved, prioritizing key personnel and resources is crucial.


**ABOUT THE AUTHOR**

**Jeff Price** has provided advice to companies in the electric power industry on power markets and technologies for four decades. Much of his work has focused on technology and resource choices, as well as on development and commercialization of new technologies. He holds an MBA in Operations Research and a BS in Engineering Physics.

Dentons is a member of the Intelligent Community Forum (ICF), a global research and training organization advancing innovation, digital connectivity, and inclusive economic growth in cities worldwide. This partnership strengthens members' abilities to navigate the legal and regulatory complexities of smart city development faced by both the public and private sectors and reinforces collaboration with communities and stakeholders to create resilient, equitable, and future-ready urban environments that foster long-term growth and innovation.

Engagement with ICF's network of leaders in government, technology, and business provides critical insights into emerging challenges such as AI integration, data privacy, cybersecurity, and sustainable urban planning. These insights inform strategy, help anticipate risks, and identify opportunities that align with evolving smart city priorities.

# How America is Losing a Precious and Essential Resource: Water Knowledge

By Dr. Cat Shrier, Ph.D., P.G.

America is rapidly losing one of its most precious resources - a resource that is critical to the health of its citizens and economy, its capacity for innovation, national security, and quality of life. What is that resource? It is America's "water knowledge" – a body of information and experience essential to the operation, maintenance, adaptation, and innovation in the nation's water sector, as well as every other sector that relies on the availability of clean, safe, reliable water supplies, protection of water quality, management of water resources, and protection from floods and other water-related disasters.

America's water knowledge is embodied within experienced water professionals, who have already been leaving the industry at an alarming rate and without the opportunity for knowledge transfer and mentorship of younger generations. This is occurring across not just one, but two generations – including both the retiring Baby Boomers and large numbers of Gen X water professionals who have been laid off during acquisitions or other workforce reductions, passed over for promotion to leadership roles or pushed out in favor of younger employees, or who took breaks in their careers and found that there are no opportunities to reenter the workforce.

These losses in America's water knowledge are presently exacerbated by the recent federal workforce reductions in water-related programs (across multiple agencies) and reductions in water-related funding that has supported water professionals through federal contracts and grants. Water professionals and programs are found in the US Environmental Protection Agency, which protects drinking water and water resources (rivers, aquifers, coasts, etc.), in the US Army Corps of Engineers, which ensures our rivers, ports and harbors are navigable, prevents flooding through major dams throughout the United States and that are also used for water supply, recreation and habitat, and for wetlands, and in the US Bureau of Reclamation (Interior), which provides water supply reservoirs and other infrastructure to capture the more limited water supplies for the western half of the continental US as well as Alaska and Hawai`i.

They also are involved with several "land agencies" which manage water on federal lands including the US Forest Service (Agriculture), and Interior's US Parks Service, US Fish and Wildlife Service, and Bureau of Land Management, and the Bureau of Indian Affairs. And of course, they are present in agencies that support American prosperity and security through several essential industries such as the Departments of Energy, Agriculture, Commerce (NOAA), Homeland Security, Health and Human Services, Transportation and State, among others.

### Why have water programs been so highly impacted by current federal changes?

Importantly, despite the political divide on issues related to environmental regulation and climate change, water has historically been one of the most bipartisan issues at all levels of government, from Presidential Administrations and the US Congress to local water boards. Water is recognized as being

so essential that, eventually, parties typically come together to authorize and appropriate funds for water programs and projects.

At present, however, many water-related federal programs are among those targeted by current federal elimination of programs, grants and funding. Some are the result of across the board cuts in reaction to priorities of the prior Administration, while others are the result of a lack of understanding of the importance of water in nearly every commercial and industrial endeavor and a tendency to view water in terms of environmental protections. These cuts are being made with little or no input from water professionals.

### How the "silver tsunami" is washing away two generations of water professionals

The problem is deeper than the current Administration's policy priorities. Water issues are complex and highly multidisciplinary. Most new water professionals begin with academic training within their own professional discipline or trade. In dealing with water in natural settings, and the continuously changing uses of water, human interactions with water, changes in natural systems and climate, laws and policies, social and political priorities, water professionals learn to adapt their past training to new circumstances, and eventually develop a basic understanding of the various disciplines involved in water management and protection including the science, technology, law, and management practices. Unfortunately, due to a combination of the "silver tsunami" retirements of the Baby Boomer and changes in hiring and promotional practices within the water sector and other sectors employing water professionals, there has already been a significant loss of water experience across the industry.

In some respects, the changes in the water sector are similar to mass retirements in other sectors, such as the energy sector, where for nearly a decade the industry has warned of the need for more experienced workers and a transfer of knowledge. Even with technology filling some gaps, the loss of institutional knowledge and insufficient replacement employees will impact basic needs for adequate water supplies – ensuring water supplies are protected from diseases, toxins and other forms of contamination; for management of wastewater and protection of floods; for industry and for life itself.

Even as most Baby Boomers are leaving the workforce in what is sometimes described as a "silver tsunami," a number have chosen to delay retirement, whether due to continued good health and a desire to stay active, or because COVID-19 and economic uncertainty impacted their retirement savings, or, in certain cases, to ensure that they have installed their successor and ensured their legacy.

In anticipation of the coming wave of retirements, leaders in the water and wastewater sector (and other industries reliant on water knowledge) for several years have focused on "the next generation" – *i.e.* the "tech savvy" Millennials who were chosen as their successors to industry leaders and upper management as a demonstration of commitment to innovation and to appeal to younger new recruits.

Millennials entered their respective industries demanding changes in the workplace and in society and leapfrogging the generation in between. Generation X, less populous and quieter than either the generation before or following it, brought many changes to the workforce – and particularly in water and related fields. Not only was this the first generation to grow up with Title X and affirmative action, bringing more women and people of color into technical and analytical fields including science and engineering as well as social sciences (*e.g.*, economics, policy analysis), which are often found in water; they also grew up with Earth Day and the suite of environmental laws passed in the early 1970s (*e.g.*, the Clean Water Act, Safe Drinking Water Act, and the National Environmental Policy Act).

Many went into public service jobs, environmental consulting or water-related programs in academia. As they moved beyond lower level tasks and field activities often given to younger water professionals, entering into supervisory and management fields, many found that opportunities for advancement were sometimes limited for those who didn't look like or think like the leadership of their organizations. They also found themselves "sandwiched" once

they reached middle management – with continuing childcare demands compounded by the caretaking demands for their aging parents, responsibilities that interfered with focus on career advancement or even efforts just to keep their jobs and prompted many to temporarily leave or reduce participation in the workforce.

The fact that many were just entering management positions at the time of the sudden economic downturn that occurred in 2008 also meant that this generation was particularly susceptible to layoffs. When hiring of water and environmental professionals ramped up again as the American Recovery and Investment Act brought new funding to public infrastructure, many of the GenX water professionals who had lost their jobs were replaced by younger, less expensive and more "tech savvy" Millennials.

Many of the GenX water professionals who wanted to continue working in water turned to federal government or contractor positions or federally-funded nonprofit or academic positions. Unlike many of the competitive private industry positions in water, these positions were considered safer. GenX employees were less likely to be laid off as they entered their late 40s and 50s and early 60s. Unfortunately, many of these positions have been among the hardest hit by the current reductions and changes in funding priorities. This leaves GenX water professionals – who hold so much essential water knowledge with only slim chances of finding employment in the industry segments that had previously rejected them, *i.e.*, the private sector or local water utilities.

Not only is institutional knowledge lost, many younger employees have missed out on mentorship opportunities – a centerpiece of the continuing education of water professionals, leaving many Millennials and younger water sector workers to figure things out themselves by consulting their peers on social media or web searches rather than consulting with a more experienced water professional.

### Opportunities to conserve water knowledge while modernizing water infrastructure

Many GenXers (and now over-35 Millennials) are turning to water entrepreneurship as a means of staying active in water-related work, but it is not without challenges. Even with awareness of increasing water scarcity and quality issues, water-related disasters (*e.g.*, flooding) in climate conversations, and increased private sector commitment to climate tech investment, little funding or support is going towards water tech innovations. Nearly ten percent of greenhouse gas emissions come from the water sector (including water capture, conveyance, storage and treatment, distribution, pipes, pumps, wastewater capture or reclaiming and treatment), but less than three percent of climate tech funding goes toward water.

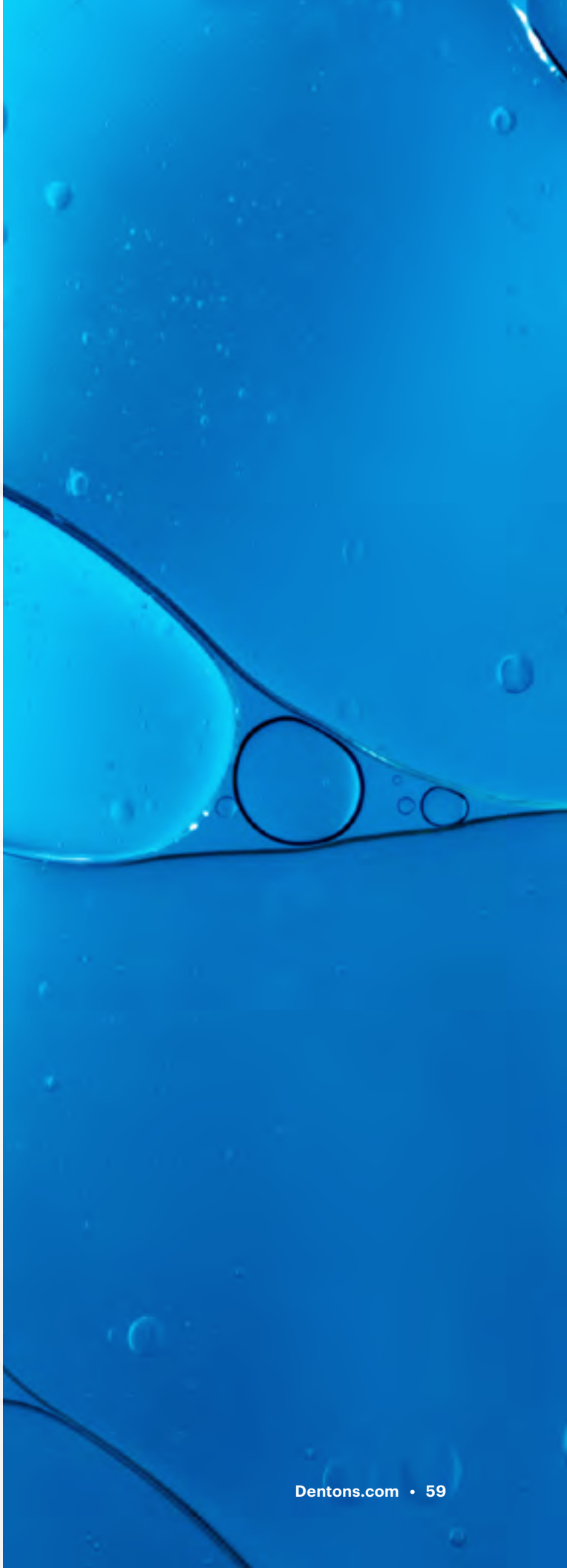
This situation creates important opportunities for investors and entrepreneurial water professionals alike, particularly since early stage research, development and deployment (pilot testing) will likely be reduced given cuts to federally-funded university programs or federal labs. WaterCitizen.org is attempting to fill these gaps with programs like *WaterPitch! the Water Startup Matching Extravaganza*. While most of the accelerators and funds are targeting growth-to-late stage startup, with "early" startup support referring to "early-to-market" is overlooked, as is the need for continued access to labs, maker-spaces, and other opportunities to develop and refine water innovations, even for those startups that are not "university spinoffs." By matching industry-knowledgeable entrepreneurs with investors, early-to-market technologies can be launched to resolve both the water challenges and the problem of conserving and utilizing our vast water knowledge resources.

At the same time, it is important for public and private sector decision-makers (and those who influence them) to recognize the critical role that water programs, data, and research play in ensuring America has for industry, commerce, and society, ensuring America's security and prosperity – including the importance of maintaining America's water knowledge by ensuring that experienced

water professionals are able to continue working in water, whether through entrepreneurship, reinstatement to federal programs, or increased opportunities for professionals to work at state or local agencies, utilities or water districts, or private companies working in water.

### ABOUT THE AUTHOR

**Dr. Cat Shrier** is the founder and CEO of WaterCitizen.Org, a leadership development non-profit dedicated to transforming diverse water professionals and entrepreneurs into industry and societal changemakers. Among other activities, WaterCitizen's signature annual event is the WaterPitch! Water Startup Matching Extravaganza, bringing together entrepreneurs, industry participants, and investors to explore opportunities presented by groundbreaking innovations.



# Affordability of Electricity in the Face of Dramatic Challenges

By Clint Vince, Emma Hand and Jennifer Morrissey

*A longer version of this article appeared in the February 24, 2025 special issue of Public Utilities Fortnightly (PUF). PUF Executive Editor Steve Mitnick is a member of the Dentons Global Smart Cities & Connected Communities Think Tank and long-time collaborator with the Dentons Energy Practice.*

We are living in an era of unprecedented, accelerated technological change affecting all sectors of the economy. The electric utility sector is no exception. The entire industry is undergoing dramatic transformation. For first time in more than a decade, demand for power is increasing, driven by explosive growth in data centers to power AI, a domestic manufacturing renaissance, electrification trends and reshoring of manufacturing.

This is taking place against the backdrop of an urgent need for upgrades to aging infrastructure and a host of disruptive forces ranging from uncertain regulation and policy, cyber intrusion, a dramatic increase in litigation, consequences from the threat of tariffs, supply chain issues, extreme weather patterns and beyond. Our national electric grid needs massive investment, far in excess of current levels, to be able to cope.

Timely, cost-effective deployment of new technologies to secure the grid and enhance resilience are also essential because disruptions can be hugely costly. The most significant weather-related events last year amounted to nearly two percent of GDP. In just the first few weeks of 2025, the California wildfires alone have brought this year's figure to almost half of last year's total, which underscores the urgency of the investment need and the magnitude of what is at stake. As weather trends become more extreme, investments must be made to harden utility systems to better withstand severe weather events, or we will face increasing annual costs to repair the damage from such events.

Financing investments of this magnitude, always a challenge, grows more daunting in the context of tremendous structural changes being implemented at the federal level. Some regulatory hurdles may be cleared, but questions about how we will pay for it are far from eliminated, including important implications for affordability.

Despite the significant need for investments in the utility grid, there will be a limit to how much increase in energy bills customers can tolerate. Already nearly a third of US households struggle to pay their utility bills.[1] Many are faced with the choice between paying for utilities and paying for other essentials.[2] Nearly half of the energy used in homes is for heating and cooling,[3] which puts a particular urgency on resilience to extreme weather events.

But affordability is not a concern only for households. Energy is a huge cost component for many businesses. By some reports, small businesses spend US$60 billion each year on energy, and for industrial or manufacturing facilities, energy can be the single most costly input.

1 Https://www.eia.gov/todayinenergy/detail.php?id=51979.
2 See, *e.g.*, Ashley J. Lawson and Claire Mills, Cong. Research Serv., R47417, Electric Utility Disconnections, at 2 (2023) available at https://crsreports.congress.gov/product/pdf/R/R47417. ("CRS Report").
3 Https://www.eia.gov/energyexplained/use-of-energy/homes.php.

Accordingly, enhancing affordability is not simply a matter of managing disconnections and erecting bill assistance programs. Bill assistance, while helpful, addresses symptoms, but not causes, of the affordability conundrum. Moreover, with cuts to federal spending, some of these programs may soon be confronted with funding challenges. We need systemic solutions that can improve affordability at an earlier stage than once a bill is sent.

Technologies now allow customers to see and adjust their usage to prices in real time, which helps with managing costs and supports efficiency programs. Some companies have had success with pay-as-you-go programs. And smart home devices, though often costly, are becoming readily available. Widespread deployment of these kinds of solutions is useful, but will not, alone, solve affordability. Visibility into usage only gets a customer so far when faced with an extreme weather event where health and safety require that heating or cooling be run even if cost-prohibitive, or when rolling brown-outs interrupt business operations because of system supply or transmission constraints.

AI will eventually resolve some issues. AI promised more efficient, more cost effective energy production and distribution, with reduced line losses and smart management of fluctuations and demands on a multidirectional grid, and with better resilience to disruptions. But we are not there yet, and we won't get there until hundreds of millions, even billions of dollars are put into modernization.

Utilities are in a tough position. Caught between needing to rapidly improve their systems and ensuring this occurs at a cost that their customers can afford, they will need to be creative in their approaches. Utilities do not benefit from having a product that their customers cannot pay for, but neither do regulators, businesses and communities. In our interconnected world, the solution for this challenge does not rest solely with utility companies.

Collaboration and a systemic approach are key. Utilities, regulators and customers together can rethink rate and financing structures that, together with other mechanisms, exacerbate persistent affordability challenges and slow modernization efforts. Our current paradigm is litigious by design, which can draw focus away from innovative solutions in favor of defaulting to familiar but unworkable concepts. The level of investment that is needed will require a very different conversation about cost recovery mechanisms. By changing the approach to one of collaboration, better results for all interested parties can be achieved.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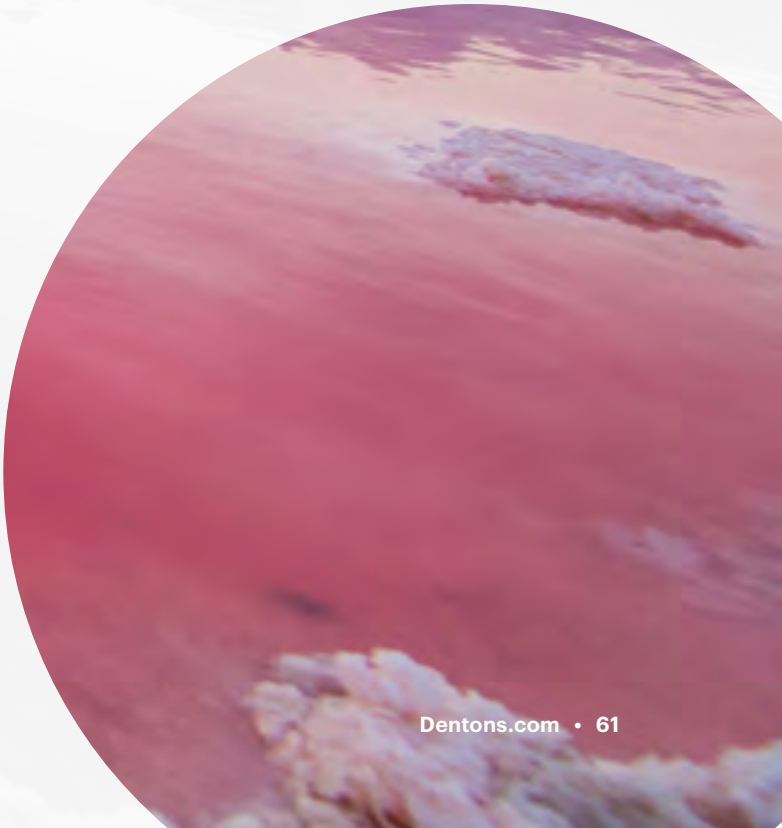

In February, Dentons' Smart Cities & Connected Communities Think Tank and Keystone Policy Center's - Key Conversations program co-sponsored a fireside chat with Clint Vince, Chair of Dentons' US Energy practice, and Jonathan Pershing, Program Director of Environment at the William and Flora Hewlett Foundation and former US State Department Special Envoy for Climate Change on the changing federal landscape for energy and climate. The discussion explored the evolving landscape of energy and climate policy, the outlook under the new Administration, and the crucial role that non-government organizations and civil society will play in shaping the future. Pershing also discusses the potential impacts of federal policy shifts on global climate commitments and what stakeholders can do to address the climate crisis.

For a recording of this discussion, click here.

## Private Smart Cities

The concept of "private smart cities" is being embraced in various locales as a path to efficient urban innovation. Dentons security and privacy expert Todd Daubert dives into this concept and discusses how private smart cities are transforming urban spaces through technology. Unlike traditional smart cities, which rely on multi-departmental coordination, private smart cities benefit from centralized decision-making, allowing a single network to support everything from security to public transit. This streamlined approach cuts costs, boosts efficiency, and enhances access to services like Wi-Fi, education, and healthcare. Todd discusses how these cities could set new standards for innovation and social equity, showcasing the potential for tech-driven solutions to address urban challenges in powerful ways.

Listen to this informative brief podcast here or here.

# Undersea Data Centers: A Solution to The Water Problem?

By Troy Carter

The increasing use of artificial intelligence (AI) is spurring the growth of data centers to facilitate the technology. Data centers typically are built with three key considerations in mind: availability of abundant and reliable power, low to moderate climate or disaster risk, and proximity to end-users. A fourth essential consideration is often given short shrift in initial planning: availability of suitable water sources to cool the facilities. This last requirement has created tensions in some areas where data centers are being built, and has prompted some innovative developers to choose an unusual site – under the sea.

This rapid rise in the development of data centers is straining potable water supplies in some areas. It does not seem that AI growth will be slowing down anytime soon, so we have no choice but to try and mitigate the shortages. This is not an easy task but there are groups that are seeking to address it. But before we can look at the solution, we must further assess the problem.

The development of large data centers is essential for meeting the growing demand for AI. Some of these large data centers can consume up to five million gallons of water per day. This consumption is roughly equivalent to the water use of a town with a population between 10,000 and 50,000 people. The water is used primarily for cooling because the work performed within the data centers generates lots of heat.

For this cooling process to be effectively executed for a typical data center, the water must be fresh and clean. Water that contains impurities and contaminants, or that has a high salt content, is corrosive and can clog or damage the cooling systems and other sensitive equipment within the data center. To prevent damage, a facility would need to install expansive filtration and treatment mechanisms which could be complex, expensive, and ultimately ineffective. Desalination is one option, but this, too, is costly (and energy intensive) and so is not really a viable option.

In most cases, potable water is used. Before being used for cooling purposes, the water is treated with chemicals to make it less corrosive and less susceptible to bacterial growth. These chemicals may not be safe for human consumption, and they may lead to undrinkable water once it is discharged. The water typically is recirculated through the data center before being discharged, and even if it is treated before discharge, it might not meet applicable water quality standards for drinking water or other uses requiring clean water.

This problem is made worse by the fact that data centers are being disproportionately placed in areas where water scarcity is a particularly prevalent issue. Areas with dry air are best for data centers because there is less risk of corrosion and electrical issues in the equipment that could arise from being exposed to humid air. But these same areas are already fraught with water scarcity issues, leading to serious practical and ethical issues of how to balance the business needs of big technology corporations with the needs of residents and farmers. For example,

Arizona has over 100 data centers in operation within its borders, most within the city of Phoenix, resulting in competition for available water resources.

Technology companies at times have been able to use their sophisticated and outsized bargaining power to strike deals on water allocations that are advantageous for them, but can be detrimental to residents. For example, Tulsa University reported an incident where one company purchased water at around US$6 per 1,000 gallons whereas residents paid nearly US$11 per 1,000 gallons, reflecting what appears to be a market flaw in the allocation of water resources.

Some argue that the increased job growth brought in by data centers justifies, if not offsets, the impact on the water supply. However, this justification may not withstand scrutiny. It has been found that around 90 percent of data center jobs relate to the physical construction of a facility, and disappear once the project is completed. Though data centers may take some years to build, providing advantages to the job market for a period of time, the impact on the water supply is long-lasting and will continue to grow over time.

There are more than 3,800 data centers in the US today. Additions are projected to meet an approximate 10 percent increase in demand per year. This growth will lead to a corresponding substantial increase in water usage. Companies recognize that this level of growth is unlikely to be sustainable in the long run and are seeking innovative solutions.

In 2015, Microsoft deployed their first prototype of an undersea data center project. The idea is that the cooler environment under water reduces the amount of heat put off by the data center, and seawater, run through pipes, can provide additional cooling as needed. The data center is sealed in a capsule, surrounded by nitrogen, instead of oxygen. Microsoft tested this project for three years, proving the validity of the concept. At the end of a two year period, only eight out of 855 underwater servers failed. This is one-eighth of the failure rate on land. Microsoft accredits this success to the lack of human interference and the use of less corrosive substances, such as nitrogen rather than oxygen, in its operation. This project has been shelved for now, although the extremely promising results are reportedly being considered for potential application for on-land data centers.

Just this summer, a Chinese company began to construct a data center under the sea about six miles off the coast of Shanghai. Due to a degree of natural cooling that takes place from being under water, this project uses at least 30 percent less electricity, and generates far less heat, than on-land data centers. Further cooling comes from sea-water that runs through pipes connected to a radiator on the back of the server racks that absorb heat and carry it away. Through this method, the sea-water does not corrode the servers because they are completely sealed away by the container and hence never directly exposed to the sea-water.

Among some of the other benefits of undersea data centers, these projects can be run on tidal, solar or wind power. Additionally, they do not require expensive commercial real estate and they can be built much more quickly than on-land data centers. These undersea data centers could also lead to faster data travel. Over half of the world's population lives within 120 miles of the coast. If underwater data centers are placed near coastal cities than the data has less distance to travel and therefore will be faster, which would lead to a more effective service. This need for increased speed is one of the impediments to the idea of merely building data centers in cold-climate locations.

There are some drawbacks, however. For example, permitting, especially in the US, can be complicated. Additionally, studies have found that undersea data centers are especially susceptible to data disruption from acoustic attacks. Basically, if a noise above a certain volume (one that is not particularly high) is directed at the data center from within a certain distance it can disrupt the data center's activity. This is a serious problem that technologists are working to resolve. If defense systems can be built up to protect against this vulnerability, then undersea data centers could be a viable way to create a more sustainable future for the growth of AI.


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As part of the Smart Cities Chat Series, Think Tank members examined how universities shape the future of urban planning by providing critical research capacity, acting as community anchors and supporting municipalities with innovative solutions like housing accelerators. This podcast covers the benefits of university-municipality partnerships, from data-driven insights to transformative urban planning, as well as the unique challenges these collaborations face. Featuring real-world examples, such as C4C's work with the Municipality of Lakeshore, this episode uncovers how these partnerships are shaping the cities of tomorrow.

This 30 minute podcast is found **here**.

# The Increasingly Essential Role of Energy Storage For Grid Security

By Clint Vince, Jennifer Morrissey, and Andrew Mina

*This article previously was published in the August 2025 issue of Financier Worldwide*

Until relatively recently, energy storage has been discussed primarily in terms of its potential contribution to a low-carbon grid, that is, as a resource to firm intermittent clean generation and support distributed resources. While still a key consideration, the essential role of storage and the variety of benefits it offers to the grid are quickly becoming more broadly appreciated. As the US electric grid becomes more stressed due to massive increase in demand, years of under-investment in transmission, changing and increasingly turbulent weather patterns, and policy uncertainty, storage (especially utility scale battery storage) just may be the magic bullet needed to help manage these impacts in the near and medium term.

Last year, the US electric grid saw additions of new generation capacity of more than 70 percent over the previous year, a trend that is expected to repeat this year. This is a significant increase, but it pales in comparison to the expected three-fold increase in demand over the next few years, driven by AI and data center growth, and the electrification of transportation and industrial operations. To accommodate the growth, trillions of dollars of investment will be required not only in a variety of supply sources, but also in technologies to modernize and support the grid and to optimize delivery. Storage is already playing a fundamental role in the expansion, and is expected to continue to gain prominence.

At present, batteries and pumped hydro are the main storage technologies in use in the US. Pumped storage projects represent over 20 GW of capacity on the US grid, some of which are able to provide multiple days of generation capacity. Another 50 GW is planned, although construction of these kinds of projects can be quite difficult to build due to a variety of factors ranging from state and local regulations to geographical challenges to high costs and financing challenges. In fact, over the past decade, of the additional capacity that has been added to the US grid in the form of storage, more than 90 percent has been batteries (including more than 20 GW of utility scale battery storage in the past five years, according to the US Energy Information Administration). Only a small percentage is attributable to pumped storage, and most of that, upgrades to existing projects.

Battery storage has become increasingly affordable in recent years, making short duration battery technologies (typically one to four hours) a viable and economically effective option. Improvements have been made in battery life and safety, and costs have declined rapidly, even in the face of uncertain trade policies, supply chain issues, and critical minerals shortages. Researchers at both the National Renewable Energy Lab (NREL) and the Lawrence Berkeley Lab have highlighted how organized electricity markets in the US have tended to incentivize deployment of four-hour duration storage (which roughly aligns with summer demand peaks) with capacity rules that essentially provide the same compensation to four-hour batters and longer-

duration batteries, reducing economic incentives to deploy longer-duration storage.[1]

The rise of winter peaks in recent years, however, along with growing appreciation for the additional functions that battery storage can provide to the grid, is prompting the industry to rethink the battery value proposition.

Valuing a battery resource is a more complex exercise than for other resources. The cost of a battery resource is deeply intertwined with the engineering operations of the grid, and the arbitrage function of battery storage complicates the determination of the market value of the resource. Moreover, battery storage provides a variety of values to the electric system. The cost will vary depending on which service is needed at any given time to optimize which market, and will affect how battery storage is bid into the market and at what level of charge. This sets battery storage apart from other distributed resources.

In the US in the near term, solar plus storage, especially battery storage, is expected to represent the majority of new capacity additions. However, critical questions include not only whether these additions can keep pace with demand, but also are they viable without the extensive policy support they received under previous Administrations?

For the past several years, battery storage has had significant support from tax credits under the Inflation Reduction Act and state mandates to reduce carbon emissions. Now, the future of these incentives, especially at the federal level, is uncertain. Tariffs also pose a growing challenge. Even if a stable tariff regime were to prompt repatriation of manufacturing to the US (a trend that was already underway during the prior Administration), this does not happen overnight. Rising domestic costs, disruptions to global supply chains for essential components, and the current volatile tariff regime are all taking their toll on the battery storage industry.

Importantly, even under ideal development conditions, batteries alone won't satisfy the magnitude of demand that faces the grid. Already, generation retirements are being delayed and some decommissioned units are being brought back online. Interconnection queues are lengthy – often taking from two to seven years, or longer. Some large loads, faced with immediate need for massive, reliable power supply, are turning to oil and gas majors to build their own (mostly gas-fired) generation. In the case of hyperscalers committed to clean energy solutions, this represents an opportunity for other low or zero-emission resources needed to offset those fossil resources. Some are also exploring a variety of co-location and novel power purchase arrangements, although these, too, have their challenges.

Apart from batteries, there are other technologies demonstrating promising characteristics, with additional investment, may enter more prominently into the resource mix. Among these are solid state batteries, supercapacitors, compressed air, flywheels, liquid CO2 storage, and clean hydrogen.

NREL has been working for a number of years on a low-cost, long-duration thermal energy storage technology that would use sand, which is cheap, abundant, and has a high thermal stability across a very broad range of temperatures. This project is especially interesting because it can be integrated into existing infrastructure, such as by converting coal plants, that are already interconnected to the electrical system.[2]

A few of these technologies are deployed in the US (*e.g.*, compressed air and flywheels), although none has a significant presence on the US grid yet. Factors such as reduced dependence on critical raw materials, resistance to supply chain disruptions, and longer duration operability will all contribute to which ones are the more attractive investments and can most rapidly and cost-effectively be developed and deployed.

1 See, *e.g.*, https://www.nrel.gov/news/detail/program/2023/from-minor-player-to-major-league-moving-beyond-4-hour-energy-storage#:~:text=Why%204%2DHour%20Storage%20Has,hours%2C%20especially%20in%20the%20summer and https://emp.lbl.gov/publications/renewable-battery-hybrid-power.

2 See https://www.nrel.gov/news/detail/features/2024/solution-to-energy-storage-may-be-beneath-your-feet

Several storage technologies that are being brought to scale outside the US also show promise. Denmark has deployed a molten hydroxide salt energy storage project, and announced plans to build a 1GW project that its developer hopes to commercialize in the near future. Molten salt storage offers a number of benefits including safety (a reduced chance of explosion and non-flammable, non-toxic components), extended life cycle without degradation, thermal stability, high energy density, and the ability to operate efficiently even in extreme heat or cold. Australia has recently completed a first of its kind industrial steam heat energy storage demonstration project. This technology, too, has the advantage of low cost and integration with existing infrastructure. And a Swiss company is deploying gravity-based systems using cranes, high rise buildings and mineshafts.

The tremendous increase in demand is creating challenges and opportunities not only in availability of supply, but also on the delivery side of the equation. As the grid becomes simultaneously more modernized and constrained, longer-duration technologies will be essential to optimizing operations. Here, too, storage will play a major role in managing reliability and resilience at the grid and distribution levels. Storage can help to relieve transmission congestion, which means some transmission investment can be deferred. It also can help to improve utilization of transmission lines constructed for remote resources, which provides added flexibility to the system.

Some thought will need to be given to valuing these attributes of storage. At present, the North American Electric Reliability Corporation (NERC), the entity responsible for grid reliability in the US, is reluctant to include storage as a contributor to reliability because storage is not yet predictable enough. For battery storage, this means that as technologies are developed, improvements to provide visibility into state of charge and the operating performance will be needed so that grid and market operators can make better decisions. Artificial intelligence is expected to help, but significant investment in both hardware and software will be needed to get there.

For other technologies, cost, reliability, and speed of deployment will be key considerations.

Finally, there is an acute need for harmonization of the perspectives of storage developers, operators, the project finance community and regulators. This must happen quickly, so that the right incentives and signals are created to attract capital. Without a common understanding of the value of storage across the electric grid, deployment may be disjointed, a situation that the urgency of the moment cannot afford.


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# Collaboration for Smart Rail Investment

By Clarence Hawkes

From the nation's first transcontinental railroad to today's vast network of trains and commuter lines, rail has long underpinned American economic development. That remains true in 2025. Freight railroads move roughly 40 percent of long-distance freight by ton-miles, and the private freight sector continues to reinvest heavily in the network each year.[1] Passenger and commuter rail continue to provide vital, lower-carbon mobility in dense corridors where airports and highways are capacity-constrained. Yet, unlike highways and aviation, rail has lacked a sustained, dedicated federal funding stream and has therefore trailed other modes in long-term capital commitments. This financing gap has become a focal point in recent years, as policymakers and railroad industry leaders recognize the need for more resilient, sustainable infrastructure and the positive economic impact that durable, long-horizon investment would mean for freight efficiency and passenger reliability.

## Landscape of rail investment in the United States

Rail investment in the United States involves a complex interplay of public funding for passenger services and private capital for freight operations. The United States maintains a bifurcated rail model: freight rail is predominantly private and self-funded, while intercity passenger rail, chiefly Amtrak, and most commuter rail are publicly funded.[2] Freight carriers invest billions of private dollars annually in right-of-way, signaling, bridges, rolling stock, and yards, averaging more than US$23 billion per year, to sustain and expand capacity.[3] By contrast, Amtrak's capital program relies on annual appropriations supplemented by multi-year authorizations, and now, crucially, appropriations from the 2021 Infrastructure Investment and Jobs Act ("IIJA").[4]

The IILJ represented a once in a generation capital infusion for rail in the US; however, despite this unprecedented rail investment, the scale of funding for other surface and air transportation modes highlights rail's relatively modest share of the federal portfolio. The IIJA directs roughly US$350 billion over five years to Federal Highway Administration programs, an allocation that dwarfs federal rail spending. Aviation likewise received approximately US$25 billion over the same period for airport infrastructure and Federal Aviation Administration facilities, including air traffic control modernization.[5] Thus, even with IIJA's transformative rail dollars, rail continues to constitute a smaller slice of federal surface transportation funding than highways, and in many states, airport projects may command greater visibility and local-match leverage. The result is a persistent challenge for rail advocates and project sponsors seeking to compete for attention and resources within broader infrastructure priorities.

## Key challenges and opportunities

Aging infrastructure remains the most immediate challenge for US rail. Federal law imposes safety standards and reporting requirements, but enforcement and funding gaps persist, particularly for state and local agencies. Freight bottlenecks in major hubs like Chicago and Houston continue to limit network efficiency, with average speeds often falling below 15 mph in congested corridors. The Surface Transportation Board ("STB") has authority to address service failures and bottlenecks, but its remedial powers are often limited by the need to balance carrier interests and public necessity.[6]

Capacity-sharing tensions between freight and passenger operators have also become more acute in recent years, as Amtrak holds statutory preference on many lines that also serve freight

railroads.[7] However, the legal enforceability of Amtrak's preference has been the subject of significant litigation, including challenges to the Federal Rail Administration's (FRA) authority to set on-time performance metrics and the constitutionality of joint metric-setting with Amtrak.[8] The lack of clear, enforceable standards has led to inconsistent outcomes in disputes over dispatching priority and access fees, and highlights the need for collaborative solutions. Without targeted investments in double-tracking and signal modernization, among other things, both freight reliability and passenger on-time performance will remain at risk, especially as e-commerce and population growth drive up demand.

Regulatory complexity further complicates investment. Rail operators must navigate federal, state, and local permitting regimes, environmental review processes and compliance with safety standards. Legal and policy frameworks directly affect project timelines and financing structures, requiring careful legal counsel for both public-private partnerships and traditional procurement approaches.

New technological advances are beginning to address some of these challenges. Advanced signaling and train control systems can increase corridor capacity without constructing new tracks. Positive Train Control technology enhances safety while improving scheduling precision.[9] Implementation of Positive Train Control across the US network has created a digital foundation for precision-scheduled railroading, predictive maintenance, and even semi-autonomous operations. Energy-management software and zero-emission locomotive pilots, supported by IIJA and the Inflation Reduction Act, are reducing fuel consumption and emissions, while green hydrogen and battery technologies are being tested in select corridors.

Regional and intercity passenger rail expansions represent another avenue for modernization. California's high-speed rail project, supported by federal and state funds, aims to connect Los Angeles and San Francisco in under three hours, although federal funding is in dispute at the moment. Other projects, such as Brightline West and the FRA's Corridor Identification Program, are leveraging public-private partnerships and innovative financing to expand intercity rail options in the Midwest and West. Legal frameworks supporting these public-private partnerships are facilitating these projects by allowing shared investment risks and coordinated development of complementary transit services.

Smart corridor planning, leveraging data analytics, congestion pricing, and logistics coordination, further enables optimization of both freight and passenger flows. By aligning rail investments with port expansions, highway improvements, and energy infrastructure development, the US can achieve a more resilient and efficient transportation network.

## Outlook

Looking ahead, the outlook for US rail is cautiously optimistic. Sustained and targeted rail investment could yield substantial economic and societal benefits. For freight operations, infrastructure modernization can improve transit times, reduce bottlenecks, and lower operational costs, enhancing the competitiveness of US supply chains in a global market. For passenger services, investment in high-speed and commuter rail can increase reliability, expand access to urban centers, and reduce congestion on highways, contributing to environmental sustainability.[10]

From a legal and policy perspective, ensuring long-term investment stability requires thoughtful alignment of public funding, private capital, and regulatory oversight. This includes developing innovative financing mechanisms, streamlining permitting processes, and fostering interagency collaboration at the federal, state, and local levels. Closing the rail investment gap could generate significant GDP gains, preserve hundreds of thousands of jobs, reduce emissions, and improve freight network speeds.

Rail remains a critical backbone of America's economy, moving goods and people efficiently across regions while connecting communities.

Modern US rail infrastructure is essential for national resilience, supply chain stability, regional economic growth, and the energy transition. As the US looks to the future, rail investment is not a discretionary option but a strategic necessity, offering a unique opportunity to reinforce the backbone of American commerce for decades to come.

*NOTES*

1. Ass'n of Am. R.Rs., Freight Rail: Amtrak & Other Railroads, https://www.aar.org/issue/freight-railroads-amtrak/ (last visited Aug. 24, 2025).
2. *See* generally 49 USC subtitle V (Rail Programs).
3. Ass'n of Am. R.Rs., Freight Rail: Amtrak & Other Railroads, https://www.aar.org/issue/freight-railroads-amtrak/ (last visited Aug. 24, 2025).
4. *See, e.g.*, 49 USC §§ 24305, 24319.
5. Cong. Budget Office, Federal Funding for Transportation, FY 2022 (2023), https://www.cbo.gov.
6. *See* generally 49 USC § 11101.
7. 49 USC § 24308(c).
8. *Ass'n of Am. R.Rs. v. US Dep't of Transp.*, 896 F.3d 539 (DC Cir. 2018).
9. Positive Train Control Implementation, 49 CFR pt. 236 (2022).
10. Eno Ctr. for Transp., Economic Benefits of Rail Investment (2021), https://www.enotrans.org.


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# How Space Exploration Is Defining the 21st Century

By Max Oglesbee

This article follows up the January 2025 Smart Cities & Connected Communities fireside chat addressing a simple but impactful premise that space is shifting from a government-led frontier to a commercially-driven strategic domain—and that transition is beginning to reshape infrastructure, national security, and daily urban life. *See* https://www.dentons.com/en/about-dentons/news-events-and-awards/events/2025/january/30/beyond-the-horizon. More and more, space is infrastructure, and is an emerging backbone for connected communities.

## A brief history of space developments that support infrastructure on Earth: 1950s–2000

Advancements in rocketry during World War II, and the subsequent Cold War kickstarted government-led space programs driven by defense, science, and national prestige. The result was a durable foundation: safe and reliable launch to space, weather satellites, geostationary communications, human spaceflight, GPS, the Space Shuttle, and Hubble. These capabilities quietly underwrite modern life, from aviation and logistics to finance and mobile computing.

Those decades also delivered consumer-visible outcomes: reliable weather forecasts, satellite TV, GPS navigation—and the cultural imagination that made space mainstream including imaginative franchises like Star Trek and Star Wars. Critically, governments built the core technical primitives—rocketry; guidance, navigation, and control; launch ops; mission design; and communications.

But the model wasn't cost-efficient. By the early 2000s, reaching low Earth orbit (LEO) typically cost tens of thousands of dollars per kilogram for major systems. Despite aiming to be an affordable, reusable "workhorse," the Space Shuttle's fully burdened cost averaged roughly US$1.4–US$1.6 billion per flight (on the order of US$50,000–US$60,000/kg) with NASA's late-program marginal cost estimate around US$409 million per flight. The foundations existed; the economics held the market back.

## Expanding access: lower costs, higher cadence (2000–2025)

At the turn of the century, with reliable operations in place and the Cold War-era imperatives for government control of space diminishing following the fall of the Soviet Union, new commercial entrants attacked the cost and cadence constraints. SpaceX, founded in 2002, pursued an explicit dollars-per-kilogram reduction strategy, then scaled launch frequency and payload capacity through Falcon 1 – Falcon 9 – reusability – heavy-lift and high-volume architectures.

### Indicative launch cost milestones

| Year | Launch Vehicle | Funding Type, Source | Cost per Kg to Low Earth Orbit* |
|---|---|---|---|
| 1958 | Vanguard | Public, US Navy/NRL | ~$1,000,000/kg |
| 1981 | Space Shuttle | Public, NASA | ~$54,500/kg (fully loaded) |
| 2010 | Falcon 9 | Private, SpaceX | ~$2,720/kg (post-2018 estimates) |
| 2018 | Electron | Private, Rocket Lab | ~$19,039/kg |
| 2018 | Falcon Heavy | Private, SpaceX | ~$1,500/kg |
| *TBD* | *Starship*** | *Private, SpaceX* | *~$100–$500/kg (speculative)* |

* Values are indicative list/estimated prices in nominal US dollars by era unless noted; realized $/kg varies by orbit and configuration, based on public estimates from NASA, SpaceX, and industry reports as of 2025.

** Starship costs are speculative and depend on reusability, flight rate, and operations maturity.

The impact: what once cost as much as an aircraft carrier now trends toward the price of a small jet. This launch cost curve didn't move alone, other combinatorial advancements occurred simultaneously. The smallsat revolution replaced bespoke, single-shot school-bus-sized satellites with standardized, unit-based designs on rapid iteration cycles. Meanwhile, advances in terrestrial computing and telecommunications radically improved performance per watt while shrinking the size and cost of satellite components.

The result is a market-enabling platform. Affordable, frequent launch and standardized payloads unlock compounding applications, from Starlink's high-throughput, low-latency broadband with near-global reach, to Planet Labs' near-daily Earth-observation data as a subscription service and Varda's work pioneering microgravity-enabled in-space manufacturing with return capsules.

An analogy can be made to the internet's development, a service and marketplace that didn't exist 50 years ago, whose impact is obvious today. The internet's foundation was built through Cold War government funding during the space race era, specifically through ARPANET, designed for research network resilience. The internet economy emerged when technology matured and deregulation opened the floodgates for creative use cases, from e-commerce to social media to the gig economy we know today.

### Over the horizon: layers, opportunities, risks (2025–)

With key primitives and improving economics in place, it's useful to map the "layers" from Earth outward, noting characteristics, opportunities, and constraints:

- Threshold to space, the Kármán line: **~100km/62mi above sea level** (some US bodies recognize ~80km/50mi for astronaut wings).
    - Operational shift: above this boundary, orbital dynamics, latency, and drag begin to dominate design and business choices... this is where space begins.
    - Tourism touchpoint: suborbital flights (e.g., Blue Origin, Virgin Galactic) operate at or near these altitudes.

- Low Earth orbit (LEO) ~160–2,000km (100–1,200mi)
  - Characteristics: low latency communications, efficient transmission of power, rapid revisit rates, relatively low radiation.
  - Opportunities include:
    - Global broadband constellations, progressing from SOS/text to direct-to-device data, voice, and images; expanding aviation, maritime, rural, and disaster-resilience markets.
    - Earth observation (optical, radar, multispectral) at daily cadence for change detection, climate intelligence, agriculture, supply chains, finance, and security.
    - In-space logistics: orbital transfer vehicles ("last-mile tugs") decouple launch rideshare constraints from final orbit needs.
    - In-space manufacturing (*e.g.*, pharmaceuticals, fiber) with return vehicles.
    - Space traffic coordination, debris avoidance, deorbit planning, insurance frameworks, and eventual remediation of large derelict satellites—essential to preserve orbital capacity and insurability.
- Medium Earth orbit (MEO) ~2,000–35,786km (1,200–22,236mi)
  - Characteristics: fewer satellites can cover larger areas; radiation exposure increases due to partial immersion in the Van Allen belts; latency increases.
  - Use cases:
    - Navigation (*e.g.*, GPS)
    - Communications or sensing applications where wider field-of-view outweighs latency requirements and radiation management complexity.
- Geostationary orbit (GEO) ~35,786km (22,236mi) at the equator
  - Characteristics: satellites match Earth's rotation—appear fixed over a region; ideal for persistent coverage.
  - Use cases:
    - Broadcast services, national or regional communications
    - Targeted "micro-GEO" applications without a full LEO constellation (e.g., nation-state, or location specific missions)
- Lagrange points (Sun-Earth and Earth-Moon systems)
  - Characteristics: gravitational balance points between two large celestial bodies in stable orbit where a smaller object can maintain a relatively fixed position relative to both. The most relevant points in our neighborhood are the five Lagrange points (L1-L5) in the Earth-Moon and Earth-Sun systems. Points L4 and L5 are stable, while L1, L2, and L3 are unstable equilibrium points requiring periodic station-keeping.
  - Opportunities include:
    - "Parking" and staging for cislunar logistics and mission assembly
    - Deep-space observation platforms (e.g., NASA's magnificent James Webb Space Telescope at Sun-Earth L2),
    - Rapid redeployment nodes increasing strategic responsiveness and operational flexibility for a variety of space missions
- Cislunar space (Earth–Moon volume)
  - Characteristics: the volume between Earth and the Moon, including lunar orbit. Historically explored during the Apollo

era, current activities include science and defense missions by multiple nation-states as well as emerging commercial missions.

- Missions and opportunities:
    - NASA-funded commercial lunar landers through the Commercial Lunar Payload Service (CLPS) program
    - Innovative power distribution concepts, including beamed power systems
    - South-pole water ice prospecting for propellant feedstock production
    - Establishment of permanent lunar bases (Artemis Base Camp, International Lunar Research Station)
- Cislunar space represents the next logistics theater beyond Earth. Surface resources and power infrastructure enable sustained presence and mobility. The Moon serves as a strategic stepping stone for deeper space exploration due to abundant natural resources and significantly reduced launch energy requirements, only ~20 percent of Earth's gravity well.

• Mars

- Characteristics: the most Earth-like world in the Solar System, reachable every ~26 months during favorable transfer windows. Orbiters, landers, and rovers (*e.g.*, Viking, Pathfinder, Spirit/Opportunity, Curiosity, Perseverance) have mapped the planet, detected subsurface water ice, and demonstrated key technologies such as in-situ oxygen production (MOXIE).
- Opportunity set:
    - A second cradle via habitats or long-term terraforming concepts (diversifying existential risk).
    - Breakthrough science in climate, geology, and possible past life, improving Earth climate models and resource understanding.
    - Technology spillovers: closed-loop life support, water recovery, resilient energy, autonomy, advanced materials, hardening Earth systems.
    - Local resources (water, oxygen, methane) and in-situ construction that reduce costs for space and remote Earth operations.
    - Economic expansion: drives advances in energy, robotics, biotech, and AI while inspiring STEM (science, technology, engineering, and math) talent and fostering public-private and international cooperation.

• Asteroids and the main belt

- Characteristics: small rocky and metallic bodies orbiting between Mars and Jupiter, with over 37,000 catalogued near-Earth asteroids (NEAs) accessible for missions. Many contain platinum-group metals at concentrations 5,000 times higher than Earth's crust, along with water-bearing minerals and structural metals.
- Asteroids represent the most accessible source of space resources beyond the Earth-Moon system. Companies like AstroForge are developing laser-based extraction and magnetic separation technologies for orbital processing. Successful asteroid mining could fundamentally reshape terrestrial supply chains, enable deep space missions through orbital refueling, and support sustainable space settlement infrastructure.
- Example potential missions:
    - Platinum-group metals extraction: targeting rare elements (platinum, palladium, iridium, rhodium) for terrestrial markets, potentially worth US$30+ billion annually without market disruption

        - In-situ resource utilization: water extraction for hydrogen/oxygen propellant production, enabling space-based refueling and reducing Earth launch dependency
        - Construction materials: iron, nickel, and other structural metals for space habitat and infrastructure construction
        - Supply chain transformation: reducing Earth mining environmental impact while securing strategic material independence
- Solar system and beyond
    - Characteristics: today's activity deeper in the solar system is still science-led: flagship probes (Voyager, Cassini, New Horizons), robotic landers (Rosetta, OSIRIS-REx), and planetary orbiters dominate deep-space traffic. Commercial presence is minimal but emergent as heavy-lift launchers, orbital refueling, and space-tug services approach operational readiness.
    - Commercial horizon: Depots, waystations, and in-space manufacturing create a broader "web" of activity. Expect emergent, unexpected new categories as primitives converge: cheap launch, proliferated communications, precision navigation, in-space refueling, standardized interfaces, and manufacturing. The best applications in deep space are likely yet to be imagined.

### Where we are on the curve

Commercial progress is occurring roughly in order of distance: Earth-orbit markets are already maturing at scale; cislunar operations are transitioning from concept to early execution; Mars-class primitives (heavy lift, refueling, closed-loop systems) are under rapid development. Given current trajectories, partial commercial success beyond Earth orbit looks increasingly plausible within planning horizons relevant to infrastructure and policy.

### Implications for smart & connected communities

- Connectivity / telecommunications baseline shifts: direct-to-device satellite services and resilient global backhaul will harden urban networks and extend equity of access.
- Climate and operational intelligence: high-cadence Earth observation will become routine inputs to city planning, permitting, utilities, insurance, and emergency response.
- Logistics and resilience: space-enabled navigation, timing, and communications are default dependencies, requiring redundancy and cybersecurity by design.
- New policy domains: spectrum management, traffic coordination, debris mitigation, and dark-sky protections will be integral to urban and regional governance.
- Economic development: space-adjacent industries such as advanced manufacturing, autonomy, materials, robotics, energy will concentrate in cities with the right talent, research anchors, and testbeds.

### Risks and pre-requisites

- Spectrum and regulatory complexity will shape winners and time-to-market.
- Space-traffic management and debris mitigation are gating functions for sustainable growth.
- Astronomy impacts require thoughtful design standards and coordination.
- Unit economics must survive interest-rate cycles and potential societal disruption (*e.g.*, wars, recessions, etc.)
- International cooperation and norms are essential to reduce strategic friction and ensure shared infrastructure remains reliable.

## Conclusion

If parts of this sound like science fiction, that's largely because they're arriving faster than expected, yet much is already live or imminent. We're still early in becoming a truly spacefaring, commercially scaled civilization, but the foundation is being established. For cities and communities, the shift from "space as possibility" to "space as default infrastructure" means orbital services will increasingly resemble utilities: persistent, price-predictable, and indispensable to daily life. As with electricity and the internet, the cities that plan for this backbone (governance, procurement, resilience, talent, etc.) will capture the outsized benefits.


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# Supreme Court Narrows Scope of Environmental Reviews for Infrastructure Projects

By Stephanie Regenold, Theodore Hunt and Vanessa Peery

*A more detailed version of this article previously appeared in Law360, "Seven County Ruling Should Trim Agency Enviro Analysis" (June 5, 2025)*

More than 20 years after issuing its last major decision on the National Environmental Policy Act (NEPA), the US Supreme Court, in an 8-0 decision [1], ruled in favor of narrowing the scope of environmental review for a proposed agency action in *Seven County Infrastructure Coalition v. Eagle County*.[2]

In *Seven County*, the Supreme Court reversed the US Court of Appeals for the DC Circuit's remand of the US Surface Transportation Board's (STB) approval of a new 88-mile rail line in Utah's Uinta Basin that will transport oil to Gulf Coast refineries. The DC Circuit had ruled that the STB failed to adequately evaluate other potential activities and projects that could be caused by approval of the project – including, primarily, increased upstream oil extraction in Utah and downstream oil refining on the Gulf Coast.

In its decision, the Supreme Court expressly directed agencies to narrow and scale back environmental reviews. Agencies now only need to focus on impacts from the proposed project, and not from projects down the road temporally or geographically – even if arguably ultimately caused by the current project approval. This directive affirms substantial deference to agencies and arms them with the decision-making power to make judgment calls and limit the NEPA process to the proposed project.

As the court explained, since its enactment in the 1970s, NEPA has grown from a procedural statute aimed at ensuring a baseline of environmental review before major federal agency action is taken, and has become a primary litigation tool to challenge, delay and prevent many major projects.[3] The *Seven County* ruling appears to have directed an end to the practice of trapping projects in NEPA purgatory under the guise of "just a little more" evaluation.

## The Supreme Court's view on the appropriate scope of review: agency discretion to define a project's proximately caused impacts

The *Seven County* case broached the question of what the appropriate scope of environmental review required under NEPA is – specifically, whether agencies must consider all reasonably foreseeable environmental effects, or only those proximately caused by the agency, and that fall within the agency's direct regulatory authority.

Borrowing from tort law, the Supreme Court had previously instructed agencies and courts to utilize a proximate cause test as the limit on the appropriate scope under NEPA.[4] But without any further guidance on how to apply the malleable concept of proximate cause, lower courts have struggled to establish definitive guideposts.

This has been particularly true for linear projects or fossil fuel transportation projects, where the agency action approving the project – *e.g.*, a pipeline or a railroad – is projected to increase extraction of fossil fuels (upstream effects) or consumption of fossil fuels (downstream effects), or lead to other forms of induced growth along the actual linear corridor.[5]

The *Seven County* ruling appears to have directed an end to the practice of trapping projects in NEPA

purgatory under the guise of "just a little more" evaluation, and instead established well-defined guideposts that significantly narrow the scope of NEPA review to get the proverbial train back on track.

The majority opinion held that the DC Circuit overstepped in two ways. First, the DC Circuit had failed to "afford the Board the substantial judicial deference required in NEPA cases."[6] Determining the meaning of a statute is a question of law for a court to decide, per the court's decision last year in *Loper Bright v. Raimondo* [7] – but where a statute, such as NEPA, grants an agency discretion and the agency must decide primarily questions of fact under the statute, such as what information to include in an Environmental Impact Statement (EIS), the agency receives deference in determining those factual questions.[8]

This is an important determination. Although the *Loper Bright* decision seemingly tossed out agency deference when it comes to interpreting ambiguous statutes or congressional silence, *Seven County* confirms that deference to agency decision-making still exists in certain contexts – *i.e.*, in factual determinations within the agency's expertise that implement or apply a statute to a matter before it. Moreover, because NEPA is an entirely procedural statute with no substantive constraints, "when determining whether an agency's EIS complies with NEPA, a court should afford substantial deference to the agency."[9]

Second, the DC Circuit erroneously held that NEPA required the STB to examine upstream and downstream effects resulting from projects that are separate in time and place from the rail line proposal before the agency.[10] Projects separated in time and place – in this case, upstream oil extraction and downstream oil refining – are not proximately caused by the project at issue.

Importantly, the court made clear that "agencies are not required to analyze the effects of projects over which they do not exercise regulatory authority."[11] There may be "a gray area in defining the project at hand" in certain cases, but court review still must remain deferential. Here, the court found that the NEPA question was not close.[12]

### Takeaways: what the decision means for NEPA and agency discretion going forward

In the wake of this decision, agencies should have confidence to narrow and limit the focus of an EIS only to evaluation of the proposed action presented before them. For some projects, finding a manageable line may not be so easy – but the court takes a pragmatic approach, recognizing that some impacts are too speculative and remote to require evaluation, including for temporal or geographic reasons. Agency focus should be on the direct impacts of the proposed action over which they have regulatory authority.

The court's desire to prune back the NEPA "judicial oak that has hindered infrastructure development" [13] appears to be consistent with recent lower court decisions invalidating the Council on Environmental Quality's (CEQ) rulemaking authority,[14] and with recent Congressional action limiting the length and timing of EIS preparation. The opinion made it clear that lower courts should not micromanage or fly-speck the scope of an EIS, and agencies now have broad discretion to draw what the court calls a "manageable line". Courts should not second-guess that drawing.

The court's decision is welcome news for project developers, as it provides more certainty for agencies to substantially narrow the scope of NEPA review for large linear transportation projects – not just railroads, but also highways, electric transmission lines and pipelines.

Further, the court's decision could limit the attempted use of NEPA as a legislative or regulatory gap filler for areas of the law in which Congress has not acted – such as for climate change or environmental justice. The breadth of the court's decision may also affect forthcoming CEQ NEPA guidance and agency NEPA regulations that are in the process of being updated.[15]

Although it remains to be seen how the court's direction will play out at the agency level and in the lower courts, the court seems to command a common sense and pragmatic approach to NEPA review and major infrastructure development, which

should unburden agencies from the cycle of NEPA analysis paralysis that forecloses projects with merit before they even begin.

*NOTES:*

1. Justice Neil Gorsuch recused himself from the case prior to oral argument.
2. *Seven County Infrastructure Coal. v. Eagle Cnty.*, No. 23-975, 605 U.S. __ (2025) (hereinafter, "Slip Op.").
3. Slip Op. at 12-13.
4. *Department of Transp. v. Public Citizen*, 541 U.S. 752, 767 (2004); *Metropolitan Edison Co. v. People Against Nuclear Energy*, 460 U.S. 766, 774 (1983).
5. *See, e.g., Sierra Club v. FERC (Sabal Trail)* , 867 F.3d 1357, 1371-75 (D.C. Cir. 2017) (finding an EIS inadequate where FERC, in approving a natural gas pipeline project, did not analyze impacts from burning of the gas at power plants in Florida)
6. Slip op. at 8, see also 9-15.
7. *Loper Bright Enters. v. Raimondo*, 603 U.S. 369 (2024) ("Loper Bright").
8. Slip op at 8-10.
9. *Id.* at 9.
10. *Id.* at 8, see also 15-21.
11. *Id.* at 17.
12. *Id.* at 20-21.
13. *Id.* at 13.
14. *See Manin Audubon Soc'y v. Fed. Aviation Admin.*, 121 F.4th 902 (D.C. Cir. 2024) (finding CEQ lacked authority to issue rules under NEPA); *Iowa v. Council on Envtl. Quality*, 765 F. Supp. 3d 859 (D.N.D. 2025) (vacating Biden administration's Phase 2 NEPA rule on the ground that CEQ does not have authority to issue rules under NEPA).
15. Earlier this year, CEQ rescinded its long-standing NEPA regulations that governed NEPA reviews by all agencies. Removal of National Environmental Policy Act Implementing Regulations, 90 Fed. Reg. 10,610 (Feb. 25, 2025).


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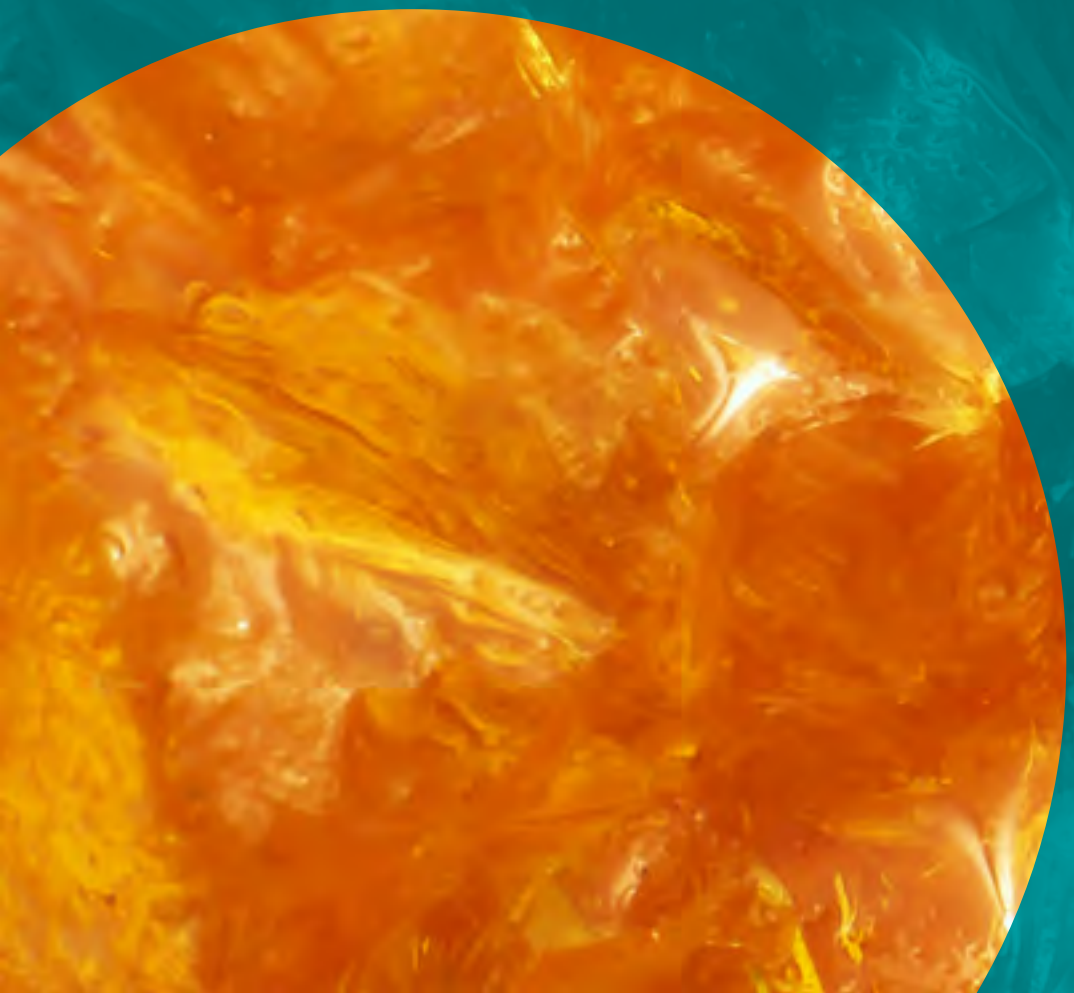
# Student Notes

Each year, we invite graduate students to submit notes for inclusion in our Think Tank Annual Report in recognition of the essential role that the next generation will play in the development of our smart cities and communities. These notes typically discuss exciting new technologies or reflect issues that are front of mind for future city and community leaders. This year's submissions reflect a growing concern regarding a general decline in critical thinking skills, an apathy about history, and a literacy crisis that, if left unaddressed, may have dire consequences on our ability to tackle societal problems in a responsible manner on any meaningful level.



# Monks in the City: A Modern Solution to an Old Problem

By Troy Carter, Dentons Smart Cities & Connected Communities Think Tank 2025 Research Fellow and 2L student at Tulane Law School

Thomas Carlyle in "On Heroes, Hero-Worship, & the Heroic in History" presented the "man of letters" as "the world's manner of dealing with... the most significant of the world's general position." By "man of letters", what Carlyle meant was serious writers, great individuals who played a key role in shaping culture and society. He provided Samuel Johnson, Robert Burns, and Jean-Jacques Rousseau as examples of members of this heroic class.

If we are to assess today's culture from the lens of Carlyle, we must first ask: who are our men of letters?

With the rise of the internet, writers can spread their work more easily now than ever before. As a result, it may be harder to identify a small class of "serious writers" who are doing most of the important and influential writing.

Carlyle asserted that in democracy, there is power in whoever people will listen to. These serious writers of the past likely became heroes because of the breadth and quality of their influence. In our current society, there is a group of people called "influencers" who are compensated for presenting and proliferating ideas on social media that impact all aspects of our lives, from what music become popular or what we wear, to how we define and view the most pressing crises in the world today. In the eyes of today's community, the influencer is likely the closest equivalent to the serious writer of the past. We have serious writers today, but they do not have the same platform that they once had.

It may be that the serious writer of today, not being the equivalent of a serious writer of the past, is a problem. It is important to note that the lack of equivalency is not the fault of contemporary writers, nor is it the result of the merit of older writers necessarily. The lack of equivalency is not borne from the producers of written work, but from the producers of new technology. Also, it is not inherently bad that the microphone has passed from one group to another. An argument can be made that it is actually a very good thing because the new technology has allowed everyone to gain a voice regardless of their literary talent. The problem lies not in the holders of the metaphorical microphone but in the nature of the microphone itself.

Marshall McLuhan, a Canadian communication theorist, aptly described our modern democratization of information when he said, "the medium is the message", meaning that the medium by which an idea is communicated affects the way that the idea is understood. Social media largely encourages short-form over long-form messaging. This allows for convenience of consumption which can be good in some ways, but for complex ideas it can lead to problems. It becomes increasingly concerning when considering that social media is not becoming a supplement to long-form reading, but instead is becoming a replacement.

Modern influencers are not simply communicating ideas, they are communicating bite-sized versions of ideas. This leads to a lack of potential for critical engagement as very often in these bite-sized ideas there is not enough information provided to grasp and work with the whole picture. Furthermore, the ideas presented by these influencers are often frivolous in nature. This is not an attack on the

influencer who presents these ideas nor an attack on the consumer who absorbs them or the platform that supports them. This is not a matter of fault, but instead a matter of fact.

How we got here is beyond the scope of this article. The more important issue here is identifying the problem as a problem. The National Endowment for the Arts produced a study called "To Read or Not To Read: A Question of National Consequence" which does a great job dealing with this issue. [1] First, it shows that time spent reading and on reading comprehension have both faced a dramatic decline not only in our schools but in the population at large. The study then asserts that advanced readers stand to gain personal, professional, and social advantages, advantages that fewer and fewer Americans are able to access. With the problem identified, we then must look at a potential solution.

Morris Berman, in "The Twilight of American Culture", proposes what he calls the "monastic solution" to this problem. This is a solution inspired by the monks of the dark ages who preserved humanity's intellectual and artistic traditions through a period in which they were not otherwise valued. Berman argues that we are currently living in just such a period, and that we need some sort of intellectual preservation mechanism, although his proposed solution is not to open a monastery and begin copying old texts like actual historic monks. Interestingly, many of the medieval monks did not have a great understanding of the works that they copied. This is evidenced by the fact that there was very little in the way of criticism or development by the monks in response to the works that they recorded and passed to others of their orders.

The key to solving our modern problem, he argues, is that we should seek to not merely preserve old knowledge, but to build on it in a way that allows the development of critical thinking. One problem he identifies with the monastic model is the group tendency to move progressively from utopian towards the tyrannical, a movement we see reflected in society today.

To avoid this dangerous progression, he argues for a commitment to individualism. A movement committed to individualism seems paradoxical, but he asserts that it is possible by making a conscious effort to create only informal links between individuals. The benefit of this, he says, would be less group-think.

Practically, this could be executed by utilizing a technology known as "massive open online course" (MOOC) technology in innovative ways to allow for people to share and contribute to knowledge and its critical application. If one were to think that such a platform already exists in the form of Wikipedia, it must be asserted that Wikipedia is a great resource for the pooling of knowledge, but it is in no way a platform for the critical application of knowledge. Users of Wikipedia may contribute if they have some accepted knowledge to share but critical application is fundamentally different. If one were to search on Wikipedia for "What Wikipedia is not", it says plainly "Wikipedia is not a publisher of original thought."[2] In the age of information, accepted knowledge is no novelty, critical application of knowledge is, and that's what we're focused on here.

As they currently stand, MOOCs are supported by two categories of institutions: universities and corporations. Corporations create the platform, universities build on it, and then, consumers learn from it. But what if rather than consumers, participants in MOOCs were "prosumers." A prosumer is someone who not only consumes a product, but also contributes to the production of it. In this case, a prosumer would be contributing to the knowledge base as they learn from it. This would require a greater time investment from educated individuals who would be required to assess the quality of produced works and curate the topics of criticism at times perhaps but it would be worth the investment to create a better society. Also, this method would address skepticism that's currently growing within the university system. By allowing prosumers to make their own critical contributions and for scholars of all backgrounds to be able to assess these contributions, there's little room for argument that certain voices are being hushed.

It would, ideally, be a true battleground of ideas where the best rise to the top.

Human nature is often an unpredictable variable. That truth may cause problems in the application of this method. One thing that must be considered is, what mechanism would compel the university producers to assist the layman prosumer? Another thing that must be considered is, what mechanism would prevent this battlefield of ideas from turning into a cesspool of hate and frivolity? These are questions that must be answered. They may be best answered through an iterative process, rather than through the sort of endless theorizing that kills projects before they're ever born. So rather than seeking to answer these questions, we will continue onwards with further delineation of what, exactly, this method is.

The methodology for this solution is simple. Rather than assessing participants solely on multiple choice quizzes and tests, like the current model of MOOCs does, include essay submissions as an alternative evaluation method. The essay is arguably the most efficient and effective tool for demonstrating understanding of complex issues, and it is in direct opposition to our bite sized idea problem. The medium is still the message, but the medium is improved through more critical input.

Our nation is faced with a cultural problem which is evidenced by, and exacerbated by, lower reading time and lower reading comprehension. This cultural problem is in fact a problem because it leads to reduced critical thinking. Critical thinking is immensely necessary for the proper functioning of a democratic republic. As critical thinking falls, it is fair to assume that many bad things will rise, as this has always been the way of history's motion. But, we needn't resign ourselves to this unfortunate fate. Instead, by utilizing new technology in innovative ways we can seek to combat this troubling trend.

*NOTES*

1. To Read or Not to Read: A question of national consequence, National Endowment for the Arts report #47 (2007), available at https://www.arts.gov/sites/default/files/ToRead.pdf (visited 8/6/2025).
2. Wikipedia:What Wikipedia is not - Wikipedia, https://en.wikipedia.org/wiki/Wikipedia:What_Wikipedia_is_not

# Rebuilding Intellectual Infrastructure

By Ibrahim Nazir, 2025 Dentons Summer Associate and 3L student at George Washington University Law School

Contemporary society is currently undergoing an intellectual crisis in which the foundations of intellectual society and individual flourishing are being undermined. The systematic decline of literacy models evidenced by the lack of rigorous critical thinking, deep learning, and intellectual integrity has created a vacuum in our cultural landscape. This absence leaves citizens vulnerable to manipulation and threatens personal satisfaction, civil engagement, and the critical thinking capacity essential for democratic resilience.

The evidence highlighted in this paper reveals a profound cultural shift away from intellectual authority and toward shallow engagement with complex ideas. For example, in previous generations, public intellectuals, educators, and thought leaders were valued deeply. However, in this current day and age, entertainment and vanity is prioritized over enlightenment. This change constitutes an erosion of the intellectual infrastructure necessary for informed citizenship and personal growth.

## Lessons from history

History teaches us that societies lacking in strong literacy and critical thinking traditions are vulnerable to extremist manipulation. This phenomenon was demonstrated in Nazi Germany where educational systems were deliberately transformed to serve propaganda rather than intellectual development leading to a degradation of independent thought.

The Nazi regime pursued education decrees mandating certain ideological curriculum to be enforced. This took place simultaneously while the regime burned over 25,000 books deemed "un-German" and purged universities from independent thinkers. Research from the Proceedings of the National Academy of Sciences shows that this indoctrination led to devastating outcomes. During this time period, a sharp rise in anti-Semitic beliefs coupled with authoritarian viewpoints demonstrates the detrimental effects of educational manipulation.

This pattern extends beyond just Nazi Germany. During the time of the Soviet Union, Mao's Cultural Revolution in China, and Khmer Rouge Cambodia, intellectuals and literacy infrastructure posed threats to ideological control. Prominent researched Regine Kolinsky found that individuals with low literacy levels remain significantly more likely to endorse unfounded theories and fall victims to misinformation. As history shows, this is a vulnerability that authoritarian movements have exploited systematically.

## Personal and societal decline

The lack of literacy role models is not limited to individual manipulation, but also creates ingrained personal and societal costs. National Literacy Trust research reveals that while 94.3 percent of children have role models, only about 36.5 percent look up to educators and teachers, while 52.6 percent idolize Youtubers and other entertainers. (National Literacy Trust 2022 *Role models and their influence on children and young people's reading*). On the face of it this might not seem too problematic, but this demonstrates a concerning shift toward entertainment over education that correlates with declining reading habits and critical thinking

capacity. This intellectual void can manifest in worse overall work performance, deteriorated relationship outcomes, and poor mental health. For instance, a meta-analysis study highlights that media literacy interventions significantly improve decision making capacity and resilience to manipulation. (*Media Literacy Interventions: A Meta-Analytic Review*, Jeong, Cho, & Hwang, 2012).

Another notable example to consider is how the pursuit of narrow self-interest can lead to other critical consequences. Alexander Karp, a prominent tech CEO in Silicon Valley argues in "*The Technological Republic*", contemporary culture has abandoned collective purpose for "shallow engagement" characterized by "timid leadership, intellectual fragility and an unambitious view" of human potential. Karp showcases how a retreat from deeper civilization values leaves individuals without intellectual anchors necessary for meaningful civil participation. Furthermore, this issue is significantly pertinent when it comes to vulnerable populations that bear disproportionate outcomes. Low-income minorities and youth aged 15-30, may have a lack of external locus of control which leads to greater susceptibility to misinformation and manipulation. The lack of accessible intellectual role models can lead to communities that are unequipped to navigate an increasingly complex information environment, and perpetuate a lack of purpose, as Karp mentioned, or cycles of disadvantage and exploitation.

## Solutions: rebuilding intellectual infrastructure

**a.** Resilience from integrating critical thinking in education

One of the major steps to combat the problems discussed above is to implement a system which fosters intellectual development and social resilience. This can be done through various educational models that have shown success in this realm. In Finland, for example, standardized testing is eliminated until age 16, master's degrees are required for all teachers, and there are integrated critical thinking curricula across age and grade levels. This approach has produced not only one of the highest literacy rates in the world but also a strong resistance to misinformation.

The Nordic model teaches us that elevating teaching to among society's most prestigious professionals, provides teachers with pedagogical autonomy, while also creating stable learning communities where deep mentorship relationships foster. Therefore, having educators as authentic intellectual role models who demonstrate critical thinking in practice while maintaining academic standards, allows students to develop both technical skills and intellectual courage.

Changing the current educational policy to match this model would require substantial investment in various important areas including a mandate on critical thinking integration across all subjects and age groups, teacher professional development programs, and a shift from assessment-focused to growth-focused evaluation systems. The best way to implement such a system is to begin adopting during primary education where early integration can be most efficient and effective.

**b.** Corporate civil responsibility

In addition to educational reform, Karp proposes a transformative solution that reframes how corporations interact with their employees and communities. Specifically, he advocates for corporations to provide something beyond mere monetary compensation and social status, and instead cultivate a sense of collective purpose and intellectual development. Karp's various examples throughout *The Technological Republic* highlight how current Silicon Valley leaders have abandoned heroic ambitions for shallow engagement with the potential of technology. He argues that today's tech entrepreneurs have become "vessels for the ambitions of others" rather than pursuing transformative national goals. When corporations adopt a shared purpose within the organization, employees can be empowered to utilize their talents towards meaningful collective missions. For instance, Microsoft has made digital literacy a global priority, offering

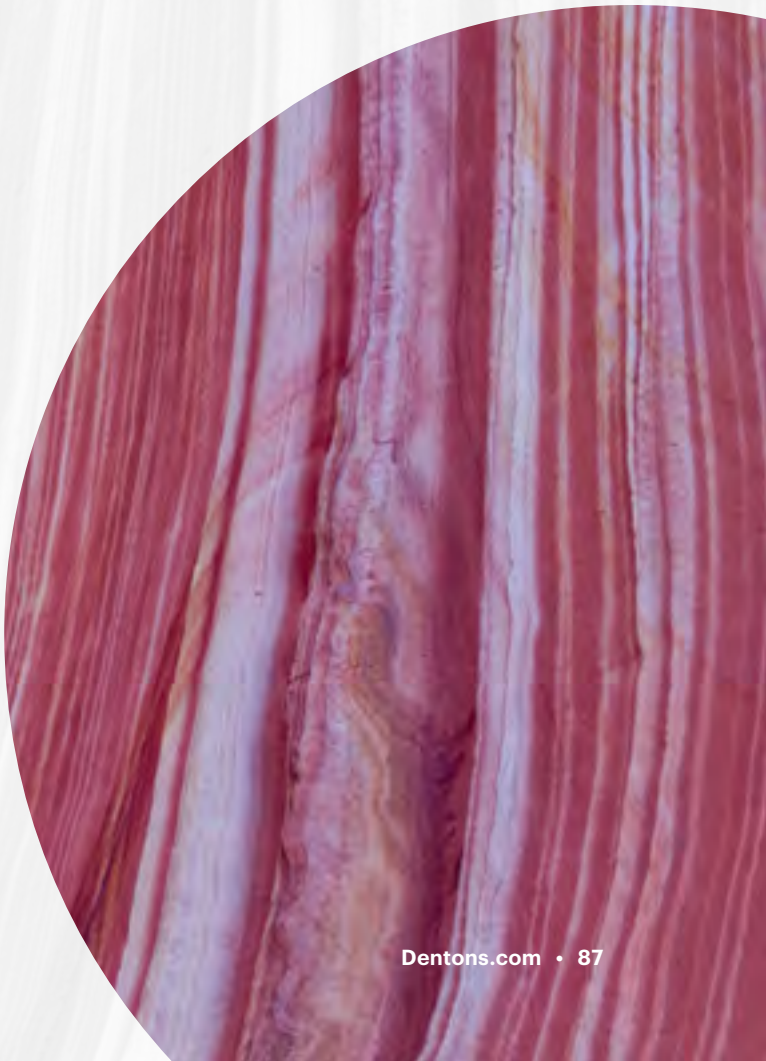
comprehensive training pathways to help individuals and from students ranging from nonprofits and governments to help navigate and thrive in the digital world. Verizon, through its corporate philanthropy, has provided free technical literacy tools and programs such as widely accessible online assessment platforms and extensive education resources to support literacy initiatives nationwide.

This ultimately exemplifies how corporations can extend beyond just ordinary profit seeking goals and adopt effective corporate programs to advance intellectual development and genuine community engagement.

## The path forward: renewing intellectual leadership

The crisis of declining literacy requires coordinated action across educational, corporate and governmental sectors. Historical evidence demonstrates that societies investing in critical thinking infrastructure develop resilience to manipulation which leads to higher levels of individual flourishing. In addition, various research confirms that media literacy interventions in conjunction with equitable educational policies can produce measurable improvements in both personal outcomes and democratic participation.

The stakes could not be higher. Contemporary society faces a variety of issues including authority challenges, economic disruption, and social polarization thus requiring citizens to be capable of rigorous intellectual engagement, collaborative problem solving and sound decision making. This can be achieved through a sustained exposure to strong intellectual role models who demonstrates these qualities in practice.



# How to Engage with the Think Tank

## Upcoming discussions

Over the next year, the Think Tank will take up topics including:

- What the proliferation of data centers means for the power sector
- Hot topics in transportation infrastructure
- Reliability and critical infrastructure
- Urban planning and equitable access to housing
- Climate adaptation: programs and technologies for a sustainable future in cities and communities
- Tribal microgrid projects
- Private sector and university smart city pilots

Think Tank members are invited to propose topics for discussion and to submit short articles and thought pieces on any topic related to infrastructure modernization and smart and connected cities and communities for inclusion in Think Tank reports. We also invite members to share work published elsewhere or events that might be of interest to other members. Please reach out to any of our Think Tank leaders to share your topic ideas.

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