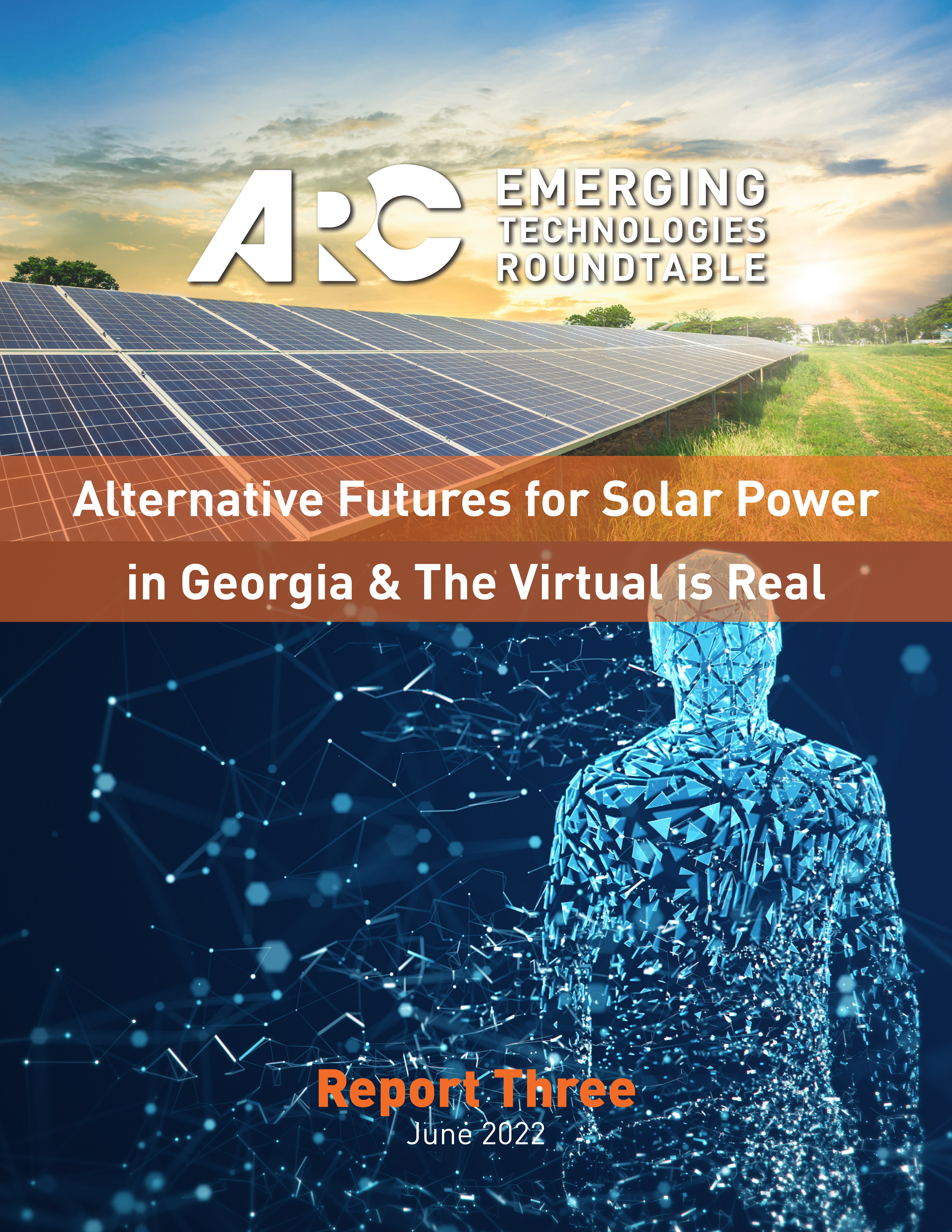

EMERGING TECHNOLOGIES ROUNDTABLE

# Alternative Futures for Solar Power in Georgia & The Virtual is Real

## Report Three

June 2022

# Members

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*Research Scientist and Director of DataWorks at Georgia Tech*

**Brandon Branham**
*CTO and Assistant City Manager at City of Peachtree Corners*

**Dr. Marilyn A. Brown**
*Regents' Professor School of Public Policy at Georgia Tech*

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**Frank Fernandez**
*President & CEO at Community Foundation for Greater Atlanta*

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*Geospatial Administrator at Atlanta Regional Commission and Co-Chair of the Emerging Technologies Roundtable*

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*Senior VP and Chief Engineer at North American Electric Reliability Corporation*

**Mayor Tom Reed**
*Mayor of the City of Chattahoochee Hills and Co-Chair of the Emerging Technologies Roundtable*

**Anna Roach**
*Executive Director of the Atlanta Regional Commission*

**Laura Rogers**
*Deputy Director at The Ray*

**Dr. Nashlie Sephus**
*Applied Science at Amazon AI and Founder/CEO at The Bean Path*

**Elizabeth Strickler**
*Senior Lecturer and Director of Entrepreneurship Programs at Creative Media Industries Institute at Georgia State University*

EMERGING TECHNOLOGIES ROUNDTABLE

The third meeting of the Emerging Technologies Roundtable (ETR) was held on April 27th, 2022. During the meeting, Roundtable members explored two emerging technology topic areas: **Alternative Futures for Solar Power in Georgia**, presented by **Dr. Marilyn A. Brown**, Regents' Professor School of Public Policy at Georgia Institute of Technology, and **The Virtual is Real**, presented by **Elizabeth Strickler**, Senior Lecturer and Director of Entrepreneurship Programs at Creative Media Industries Institute at Georgia State University.

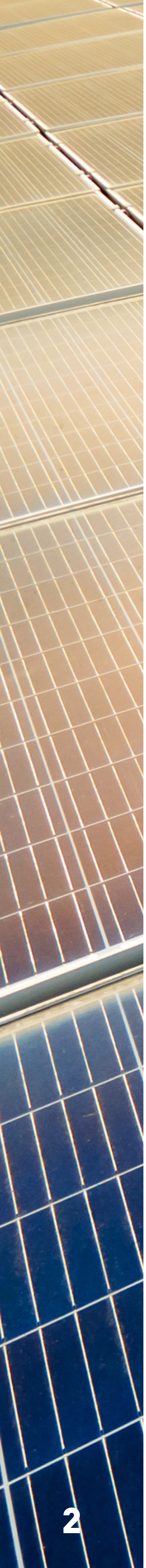
**Dr. Marilyn A. Brown**, Regents' Professor School of Public Policy at Georgia Institute of Technology, presented on **Alternative Futures for Solar Power in Georgia** and the critical need to decarbonize electricity generation to meet carbon emission reductions and climate goals. Starting with Paul Hawken's Drawdown Project and the 100 Global Climate Solutions, Dr. Brown shared how the Drawdown Georgia initiative focused on climate solutions relevant to Georgia by examining Paul Hawken's 100 global solutions through several filters that included:

- Is the solution relevant in Georgia?
- Is the technology and market ready to scale by 2030?
- Is there sufficient local experience and available data?
- Can the solution deliver 1 million metric tons of annual greenhouse gas reduction by 2030?
- Is the solution competitive with other solutions?
- Are there significant "beyond carbon" impacts?

The examination performed by the Drawdown Georgia Research Team identified twenty Drawdown Project climate solutions *specific* to Georgia, with Dr. Brown's presentation providing a deeper understanding of the five Electricity solutions.

**Elizabeth Strickler**, Senior Lecturer and Director of Entrepreneurship Programs at Creative Media Industries Institute at Georgia State University introduced **The Virtual is Real**, providing the Roundtable with an understanding of:

- The relationship between digital labor creating digital goods (e.g., non-fungible tokens/NFTs) that are purchased by digital money (e.g., cryptocurrency) with a record of transactions stored on public ledgers (e.g., blockchain)
- The layers of the Metaverse, digital twins and the limitations of reality
- Web 3.0/Web3, a decentralized internet and self-sovereignty
- The mixed reality continuum from reality through augmented reality to virtual reality



## Key Insight #1
## Utility-Scale Solar and Demand Response provide clean, renewable energy while reducing or eliminating the need for backup energy solutions.

As shown in the Drawdown Georgia graphic below, of the twenty solutions, five are related to electricity: Utility-Scale Solar, Rooftop Solar, Demand Response, Cogeneration and Landfill Methane. Of these five, the leading electricity solution identified in the Drawdown Georgia analysis is Utility-Scale Solar. Utility-Scale Solar (also known as Large-Scale Solar) systems are typically ground mounted, photovoltaic (PV) systems that convert solar energy into electricity and have an energy producing capacity of greater than 1 megawatt (MW). One can compare utility-scale with residential solar, which has a much smaller energy generation capacity of between 5 to 20 kilowatts (KW) or 0.005-0.02MW and much higher (nearly double) the installation cost per watt when compared to utility-scale. Since energy generated, or supply produced, must balance with energy demanded, we also must explore energy alternatives during peak demand periods. Peak demand often necessitates the use of greenhouse gas-producing, backup energy generation solutions (e.g., natural gas, coal). The use of electricity storage systems (e.g., batteries) or "solar-plus-storage" can improve the reliability and resiliency of renewable energy as utility-scale solar can be connected to on-site batteries to store surplus electricity captured during the daylight hours. This stored surplus of electricity can be provided: on-demand, at night when photovoltaic systems are not producing electricity, during periods of inclement weather, or shared with communities experiencing electricity shortages. Additionally, using the Demand Response solution can reduce or eliminate the need for peak demand greenhouse gas-producing backup energy generation solutions by shifting the timing of electricity usage by consumers to off-peak periods.

**Action**: Local and Regional Governments can support the installation of utility-scale solar energy systems in their communities. The benefits of utility-scale solar extend beyond carbon reductions to include a more resilient and reliable grid by decentralizing electricity production, increasing tax base and improving habitat and environmental protections.

**20 Drawdown Georgia Solutions for 2030**

DRAWDOWN GA

bringing climate solutions home

www.DrawdownGA.org

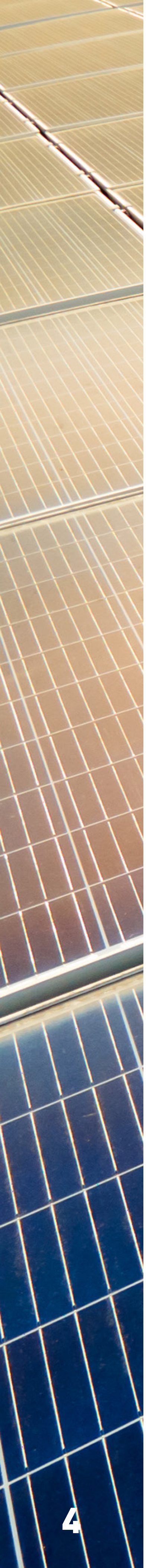
| | | |
|---|---|---|
| **Electricity** | Cogeneration<br>Demand Response<br>Rooftop Solar | Large-Scale Solar<br>Landfill Methane |
| **Buildings & Materials** | Recycling<br>Refrigerant Management | Retrofitting |
| **Food & Agriculture** | Composting<br>Conservation Agriculture | Plant-Forward Diet<br>Reduced Food Waste |
| **Land Sinks** | Afforestation & Silvopasture<br>Coastal Wetlands | Temperate Forest Stewardship |
| **Transportation** | Electric Vehicles<br>Energy-Efficient Cars<br>Energy-Efficient Trucks | Mass Transit<br>Alternative Mobility |

## Key Insight #2
## Everything in the real world will be recreated in the virtual world

The metaverse will contain a digital reflection of our real world as well as digital representations of entirely new worlds that need not be bound by the laws of physics found in our natural world. The social and economic systems we interact with today in the real world will be recreated in the virtual world. Many of the systems, models, and interactions we are accustomed to in the real world will be repurposed and improved upon in the virtual including the creation and sale of digital assets using digital currency. Additionally, as users leave the current digital model, known as Web 2.0, for the new, metaverse-enabling Web 3.0 (or simply, Web3) paradigm, one promising difference found within these new social and economic systems is the idea that users will own their identities and be able to choose who may interact with them or access their personal information. This user ownership model contrasts with the current Web 2.0 model where private companies own a user's personal information and keep it locked within their platforms.

As we build and experience the metaverse, we will find which metaphors work well and what fails to translate the actions and experiences from the real world to the virtual world. Some experiences will be better (or maybe only possible!) in the metaverse, some experiences will remain locked in the real world, and some will be amplified through combining both the real and virtual worlds. We will interact with the metaverse through our avatar, or virtual persona, and experience the persistent information found in virtual worlds through a spectrum of immersive technologies. We begin with the low immersion of an internet browser, move through the layered immersion found in augmented reality and finally reach higher levels of immersion using virtual reality and haptic technologies. As technology improves and stylish, augmented reality glasses and lightweight virtual reality goggles become ubiquitous and affordable entry points to virtual worlds for many users, designers will need to work to ensure the metaverse remains accessible to all people.

**Action**: Local and Regional Governments can prepare for the metaverse by eliminating the digital divide and ensuring all residents have access to platforms via broadband internet. Additionally, developing a foundational knowledge of digital twin technology may help governments understand how they can leverage virtual representations of community infrastructure and assets to better plan and prepare for the future.



## On the Horizon:

During the third Emerging Technologies Roundtable meeting, members were invited to synthesize and blend the presented information with their industry knowledge to shape a vision of possible futures for Metro Atlanta over the next decade. The following future scenario weaves together plausible themes revealed in Emerging Technologies Roundtable reports.

## Scenario: Virtual Worlds, Real Energy Challenges

*Note: The themes of digital twin technology, real-time energy optimization and electricity storage are explored in the Future Scenario sections of the Emerging Technologies Roundtable Report One and Report Two. Content below expands on these themes.*

The Metaverse of the early 2030s is comprised of countless connected and immersive virtual worlds and is the dominant online platform for social and economic activity. In response to this expanding decentralized environment, and to meet constituents "where they are", governments partner with gaming companies to speed technological advancements in digital twin technology. Investments in digital twin platforms brought staggering improvements to visual rendering speeds, positional fidelity, and image resolution. With a near 1:1 virtual representation of each human, car, delivery drone, Urban Air Mobility aircraft, IoT device and residential or commercial building, cities across the world could identify the real-time location, operational status or energy consumption of every connected person or object, fixed or moving, within the jurisdictional boundary. Visualizing and analyzing the behavior of physical, real-world items yielded improvements in optimization and efficiency across most sectors, including electric vehicle charging, increased accuracy of future-looking simulations and bolstered trust in planning models.

Celebrated as a shining example of U.S. innovation, the decarbonization of the North American electrical power grid was achieved through massive federal government investments in utility-scale solar, wind and battery storage projects along with cooperative efforts with Canada and Mexico. Shifts in clean energy generation and improvements in storage techniques kept pace with the rapid adoption and charging of electric vehicles. While EV adoption around the world yielded dramatic carbon reductions and made positive progress toward slowing the global impacts of climate change, extreme weather still occurs frequently. Extreme weather is regularly blamed for reducing solar and wind energy generation and for causing electricity shortages. There is reason for hope, though, as improved weather forecasting technologies provide accurate weather predictions for several months into the future allowing for connected grids everywhere to prepare for renewable energy shortfalls by scheduling the generation, storage, and optimized transmission to neighboring communities experiencing less favorable forecasted conditions.

As leisure and business travel were deprioritized during increasingly common occurrences of climate change-related extreme weather, technologically mature municipalities connected secure and visually enhanced versions of their digital selves to the Metaverse to entice virtual travelers. By sharing a highly detailed, immersive representation of their built environment online, communities began to replace the physical tourism lost to climate adaptation with compelling and realistic virtual alternatives. With virtual goods purchased and virtual entertainment enjoyed, commerce and travel in the Metaverse appeared to solve or mitigate several growing social and economic problems at once. The substitution of virtual consumption for physical consumption was thought to be a more sustainable environmental model, with a related reduction in travel further reducing carbon emissions. However, as many digital purchases in the Metaverse were enabled through blockchain platforms, the "frictionless" transactions meant to restore lost tourism revenue were requiring non-trivial levels of computing power and electricity. The rise of the Metaverse, and the enabling digital currencies, were creating additional stress on a national grid only marginally able to accommodate the charging demands of an increasingly decarbonized vehicle market.

## About the Emerging Technologies Roundtable

Initiated in 2021 by the former Atlanta Regional Commission Executive Director, Doug Hooker, the Atlanta Regional Commission's Emerging Technologies Roundtable is comprised of subject matter and issue experts from the Atlanta community. Emerging Technologies Roundtable members meet quarterly to explore, advise, and report on the ways in which emerging technologies may impact how we will live, work and travel in our region over the coming decade and beyond. Each Emerging Technologies Roundtable report is designed to better prepare ARC staff and the governments we serve to plan for preferred outcomes by providing actionable insights on plausible futures.

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