Climate Change Science Institute: Overview, 2024

Peter Thornton, CCSI Director

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ORNL is managed by UT-Battelle, LLC for the US Department of Energy

A brief history of CCSI

- Started in 2009
- Organized as four themes, focused on work being done within our projects, and exploring new integrative directions.
  - Earth System Modeling
  - Data Integration, Dissemination, and Informatics
  - Terrestrial Ecosystem and Carbon Cycle Research
  - Climate Impacts, Adaptation, and Vulnerability
- Science-to-applications and outreach have been consistent goals
- 2014: moved to co-location in 4500N

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Setting new goals around stakeholder engagement

- Leadership Team established January 2023, currently 22 members
  - Represents five directorates: BESSD, CCSD, ESTD, NSSD, OLD-OPS
  - Represents seven divisions: BSD, BTSD, CSED, COMM, EEID, ESD, GSHS
  - Gender diversity: 10 women, 12 men
- Charge in 2023
  - Develop a new mission and vision for CCSI
  - Engage all CCSI staff to refine mission and vision, identify use cases and potential stakeholder engagements, define new science needed to meet these challenges
    - 120 staff participated in in-person all-hands meeting in April 2023
  - Develop regional stakeholder relationships and initiate collaborations

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CCSI Leadership Team

(top row) Daniel Adams, Moet Ashfaq, Kim Askey, Carter Christopher, Bob Cottingham, Maggie Davis, Melissa Dumas, Sudershan Gangrade
(middle row) Natalie Griffiths, Carly Hansen, Beth Herndon, Forrest Hoffman, Yetta Jager, Dan Lu, Salil Mahajan, Terry Mathews
(bottom row) Melanie Mayes, David McCollum, Joshua New, Harold Shanafield, David Sholl, Jim Szybist

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April 2023, CCSI all-hands visioning workshop

CCSI Vision:

We leverage ORNL's unique capabilities as a trusted partner to provide climate change knowledge, insight, and solutions for a sustainable future.

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CCSI Mission:

We develop and translate data, knowledge, and applied understanding of climate change science through collaboration with stakeholders, to provide an equitable and sustainable future for our communities, the nation, and the world.

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What can CCSI do that is not already being done by sponsored projects?

- CCSI is envisioned as **primarily an outward-facing organization**, with the goal of serving society by helping to solve problems at local and regional scales
- Integrate and leverage efforts across multiple climate change projects
- Combine data, methods, technologies, and knowledge to provide new climate change solutions, pathways, and understanding
- **Engage a new generation of scientists** who want to contribute their creativity and energy to translating R&D to tackle problems of climate change at local, regional, and larger scales
- Attract non-traditional sponsors for work that advances practical and science-based **solutions for climate change in the Southeast and beyond**

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Developing regional collaborations

- Southeast Decarbonization Workshop, Nov 2023
  - Co-organized by ORNL and Georgia Tech
  - 125 participants from industry, state and local government, non-profits, universities, ORNL
  - **Covered all sectors related to GHG mitigation, including transportation, buildings, industry, electric grid, data systems, community outreach, and education**
  - Partnerships discussions at an advanced stage
- Vanderbilt University: Climate Change and Environmental Justice Workshop, Oct 2023
  - Discussed numerous potential partnership topics in climate and environment
  - Partnership discussions at an advanced stage
- University of Virginia
  - Initiated discussions in October 2023, exploring partnership opportunities

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The 2023 Southeast Decarbonization Workshop: Creating science, business and community partnerships

- Marilyn A. Brown[1], Peter E. Thornton[2], Richard L. Gruber[1], Susan Hubbard[2], Melissa Lapsa[2], Edgar Lara-Curzio[2], Timothy C. Lieuwen[1], David McCollum[2], Michael Oxman[1], Don Stanton[2], Michael Twardy[2], Robert Wagner[2] ([1]GT, [2]ORNL)

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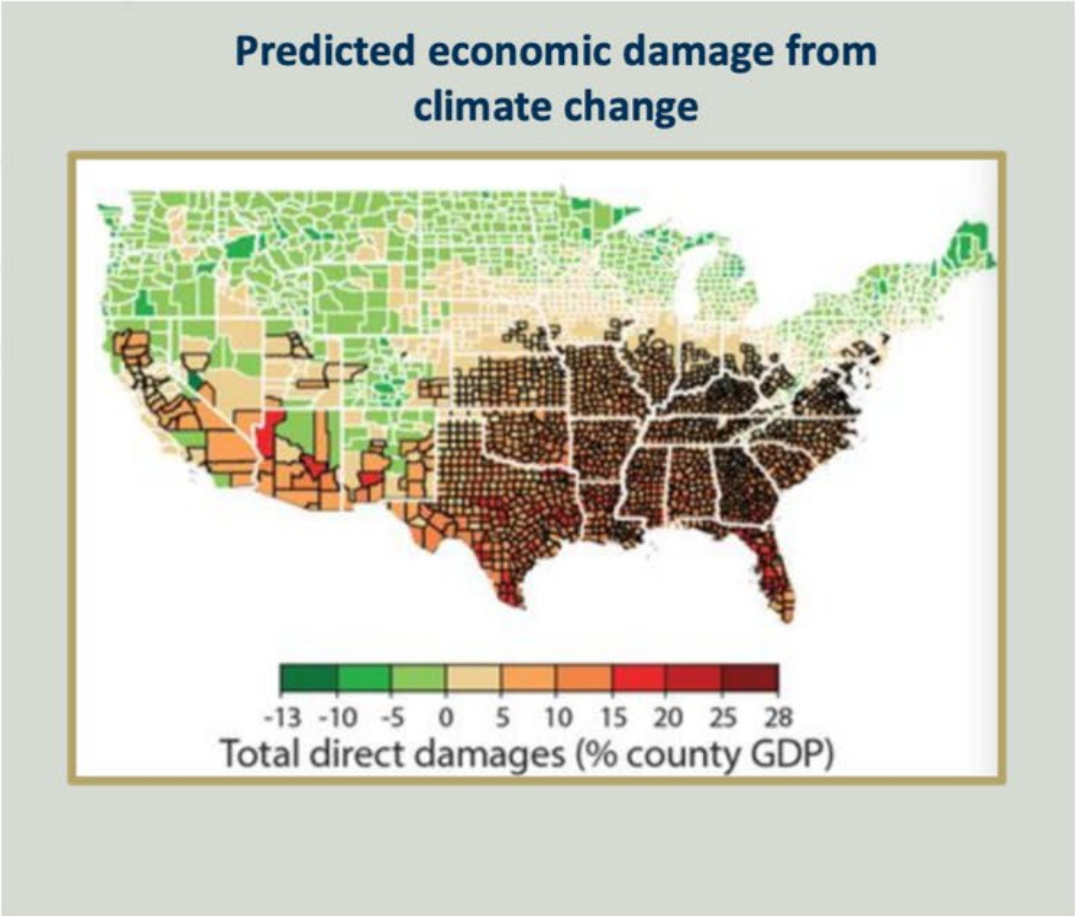
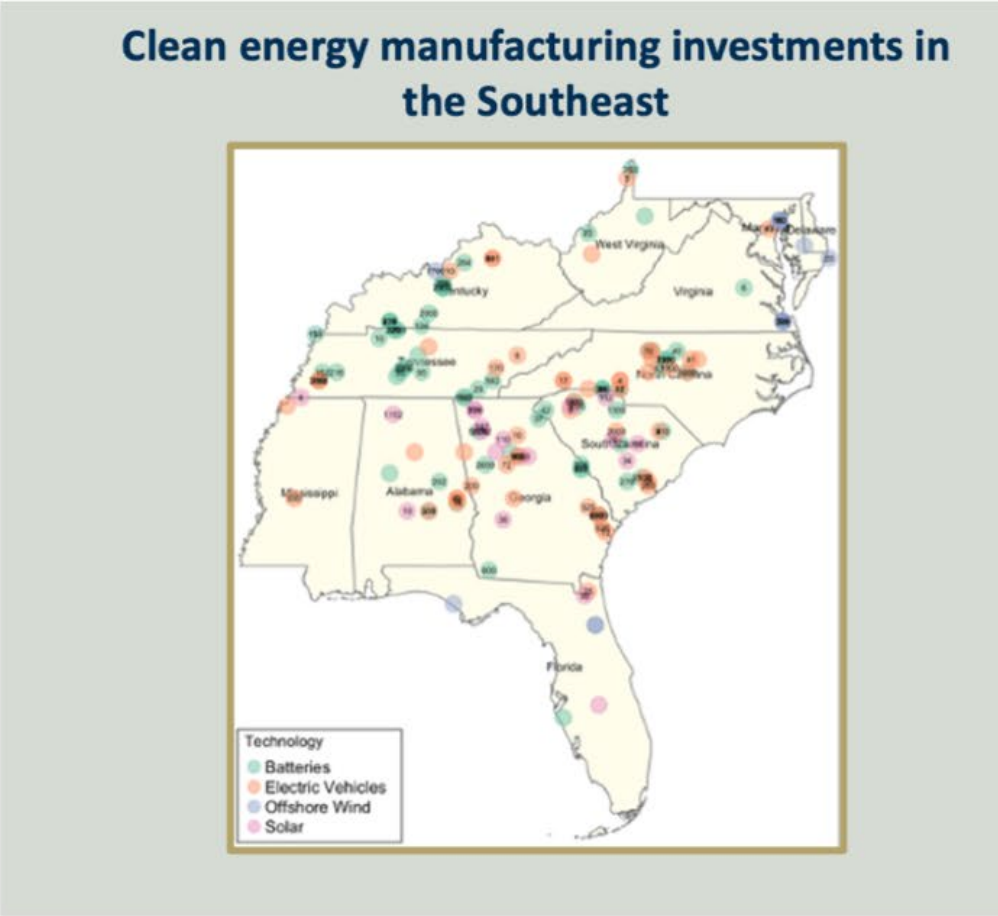
Southeast Decarbonization Workshop

- Why now, and why the Southeast?





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Summary of partnering opportunities

Community-Engagement

Emerging Technologies

- Hydrogen
- Alternative fuels - biofuels and electrofuels
- Energy storage - thermal, compressed air, and batteries
- Small modular nuclear reactors

Electricity Optimization

- Smart grids
- Electricity transmission and distribution
- Energy efficiency

Emissions-Reduction

- Hard-to-decarbonize sectors
- Transportation and urban infrastructure

Carbon Capture and Storage

- Engineered carbon capture and storage
- Nature-based carbon sequestration and storage

Partnerships

- Early engagement
- Open dialogue
- Diverse stakeholders
- Benefits to quality of life
- Transparent communication
- Investment in training
- Building accountability
- Fostering relationships
- Positive example setting
- Long term presence & commitment

Transportation | Electricity | Industry | Residential and Commercial | Nature-based

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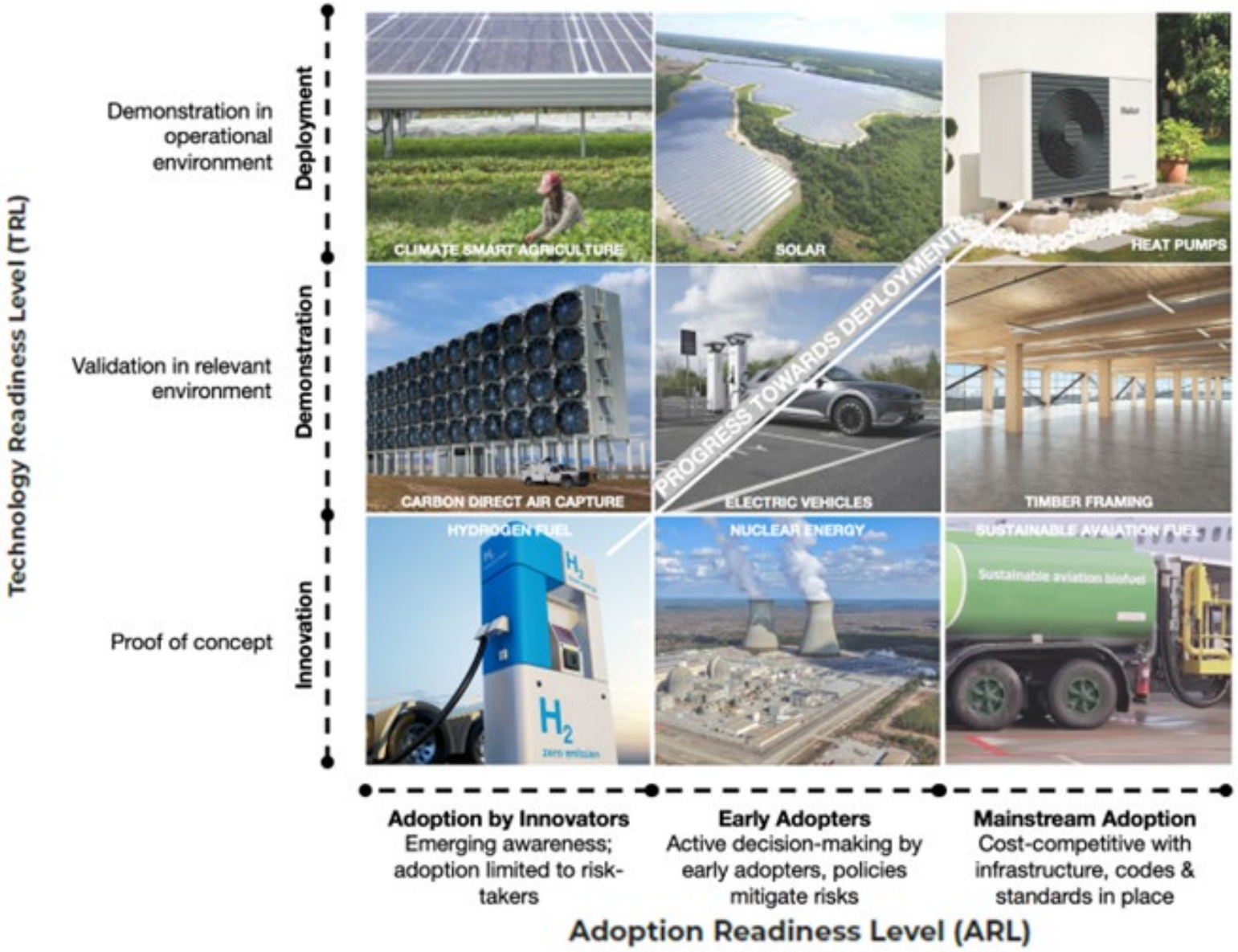
Technology and adoption readiness levels



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Potential stakeholder partnerships, as developed at the GT-ORNL workshop in November 2023:

- State / regional Climate Pollution Reduction Grants process (EPA)
- Large power companies: evaluation of grid reliability under decarbonization scenarios
- Rural electric co-ops: engage through national consortia (NRECA) to help respond to BIL / IRA and other emerging opportunities. INL already engaging in this way (Caldera)
- Collaborate with service provider for building electrification, such as BlocPower, to provide regionalization of needs and solutions

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Stakeholder partnerships (cont'd)

- Full cost accounting of decarbonization strategies for manufacturing and financial institutions (EV infrastructure, weatherization and electrification, autonomous transport, hydrogen production and transport, DAC)
- Engage with traders to provide technical analysis of private (voluntary) carbon markets – quality of credits, additionality
- Workforce development: climate science and technology education and curriculum development at all levels
- Spatial services for resource mapping, deployment strategies, identification of needs at community level
- Building trusting relationships with communities. ORNL has a role as a permanent and science-based regional partner

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