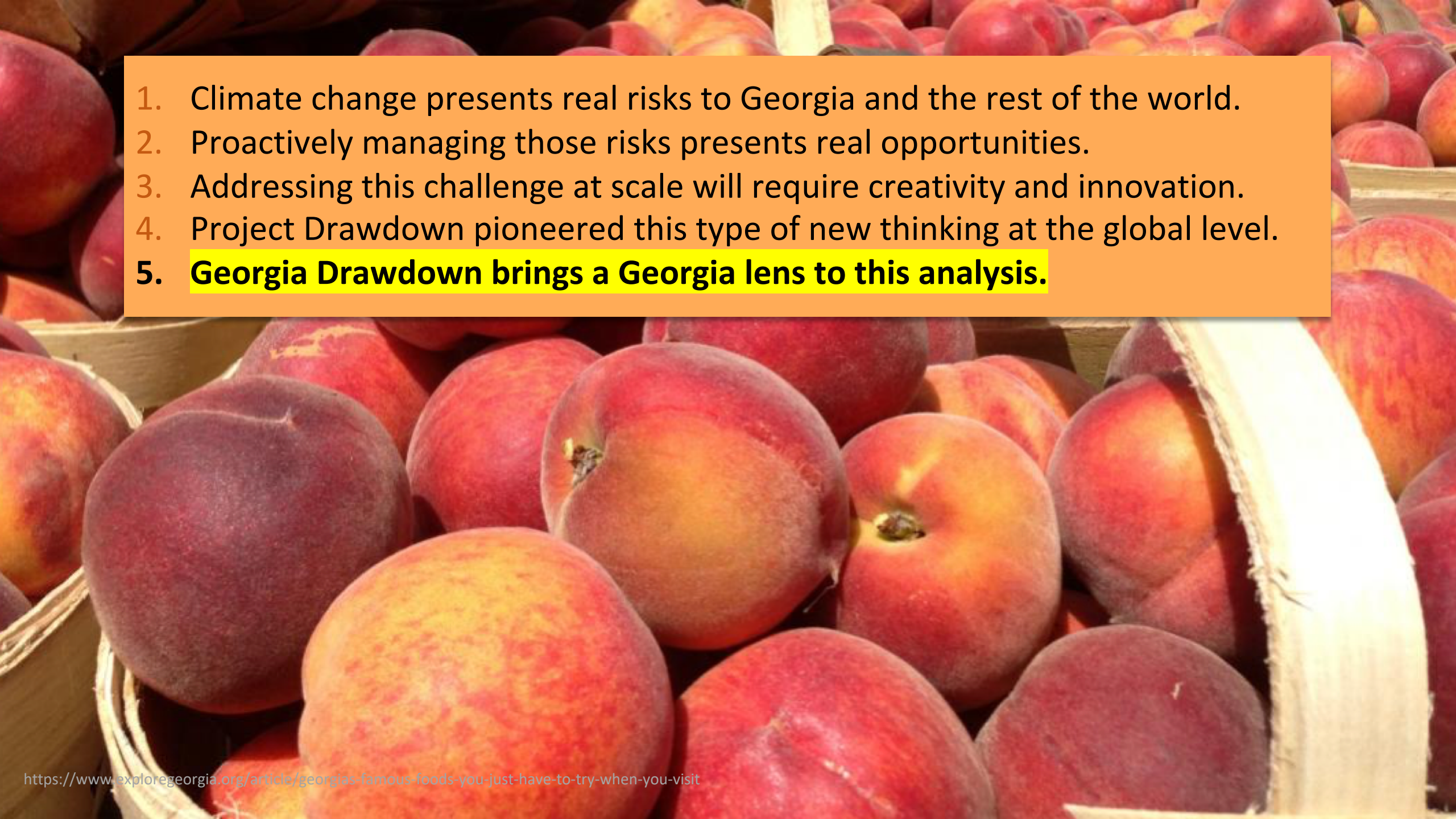


Georgia Drawdown™

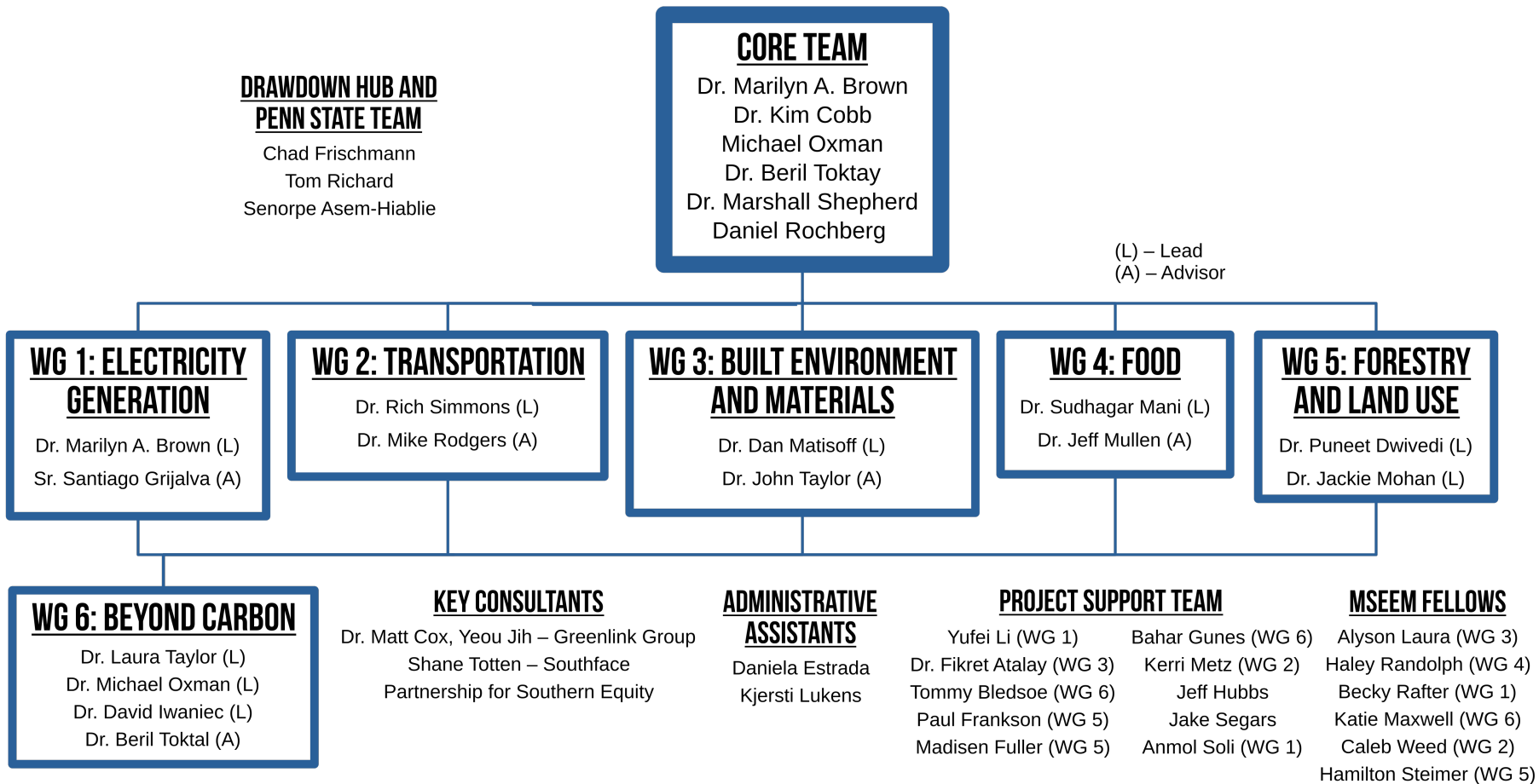


Identifying the most promising solutions
for achieving carbon neutrality in Georgia.

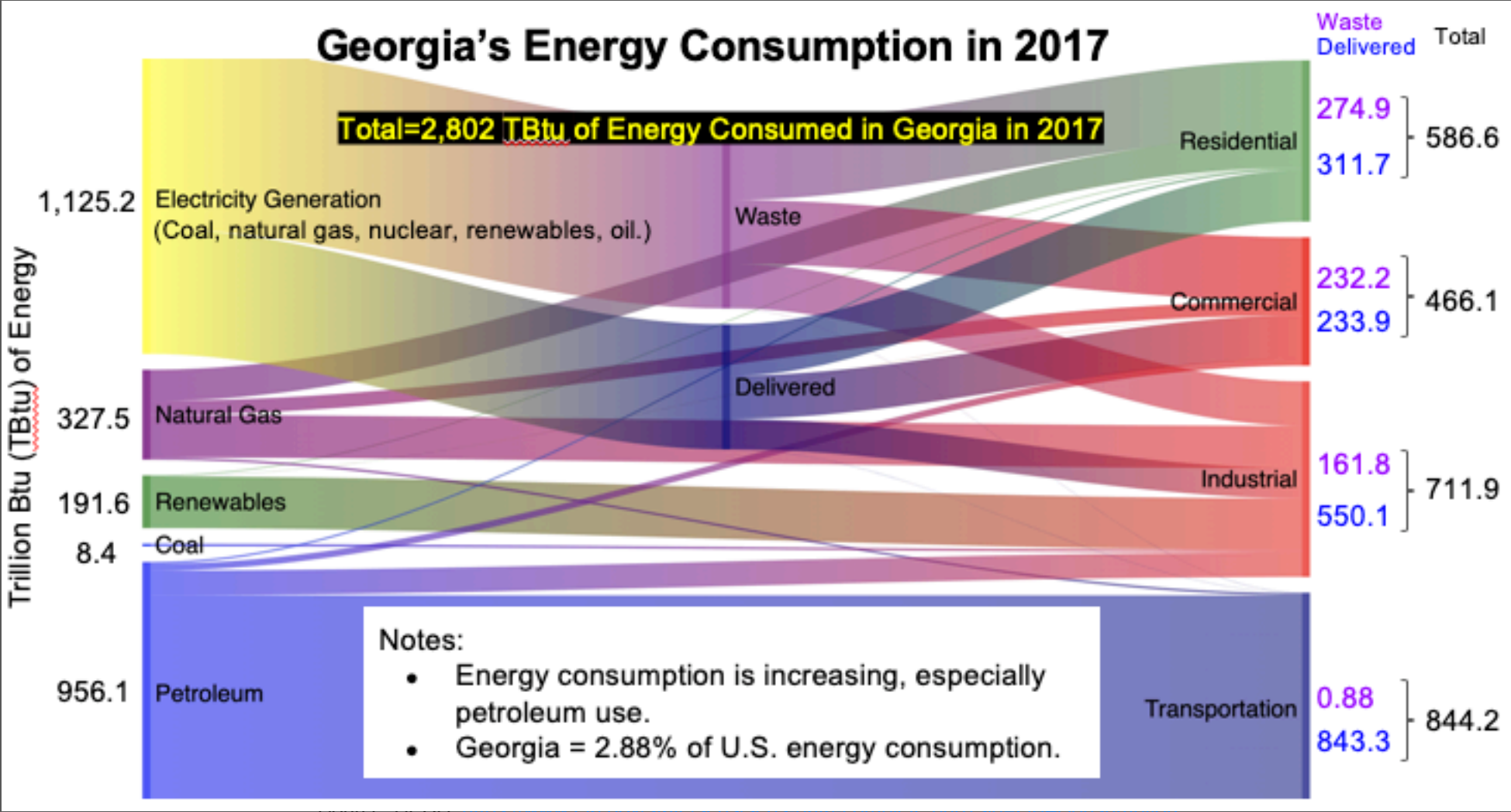
Dr. Marilyn A. Brown
Regents' & Brook Byers Professor of Sustainable Systems
Georgia Institute of Technology

- 
1. Climate change presents real risks to Georgia and the rest of the world.
 2. Proactively managing those risks presents real opportunities.
 3. Addressing this challenge at scale will require creativity and innovation.
 4. Project Drawdown pioneered this type of new thinking at the global level.
 5. **Georgia Drawdown brings a Georgia lens to this analysis.**

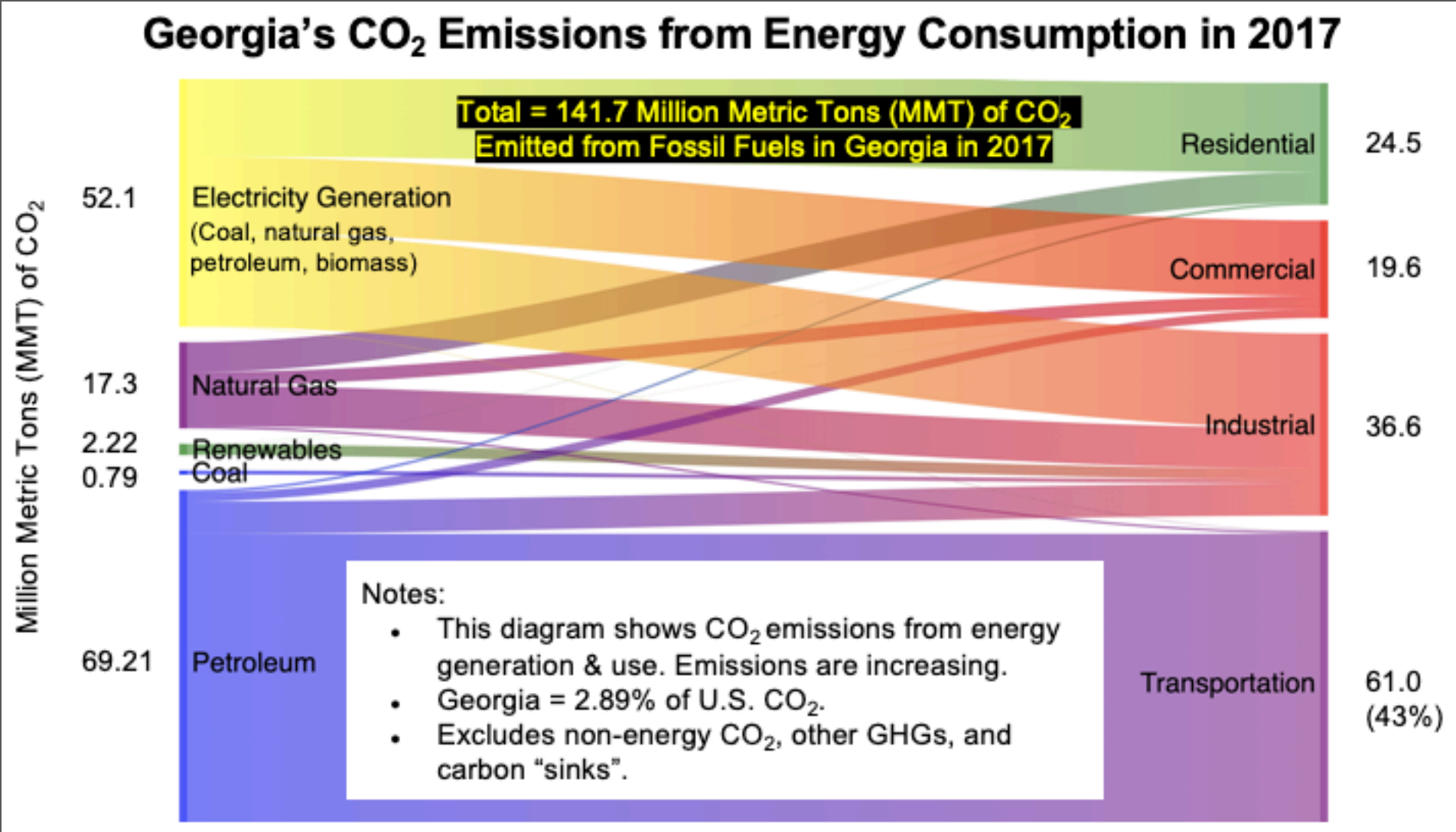
Project Overview | Georgia Drawdown Organizational Chart



Initial Work | Baseline Energy Consumption

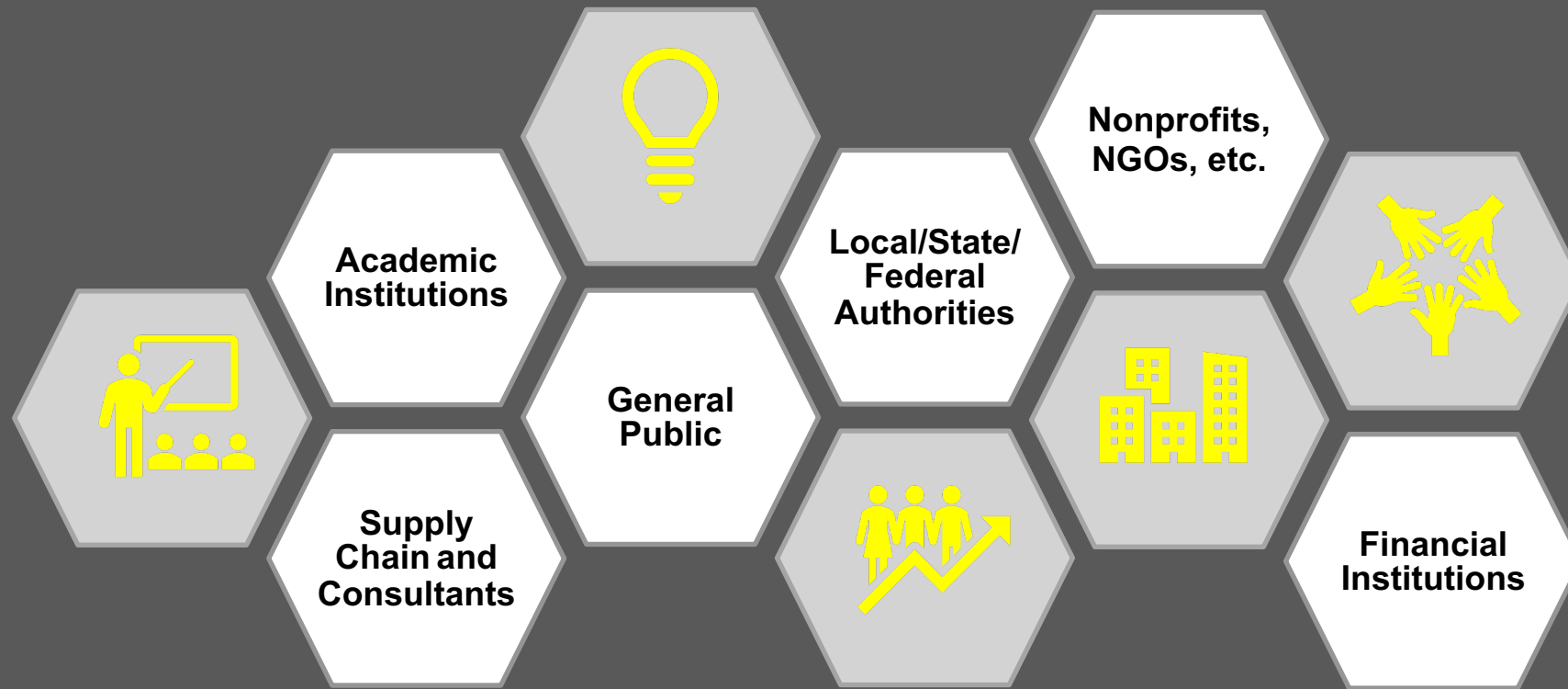


Initial Work | Georgia's Current Carbon Footprint ~ 100 Million Metric Tons



Conversion factors: Page 3 https://www.epa.gov/sites/production/files/2019-04/documents/2019_fact_book.pdf

Expert and Crowdsource Surveys: Rate solutions and identify missing solutions



Four Questions:

1. Rate/rank the carbon reduction potential of solutions
2. Rank top 5 solutions by cost effectiveness
3. Nominate solutions for Georgia that were missed by Project Drawdown
4. Write in "beyond carbon" considerations

Final Electricity Survey

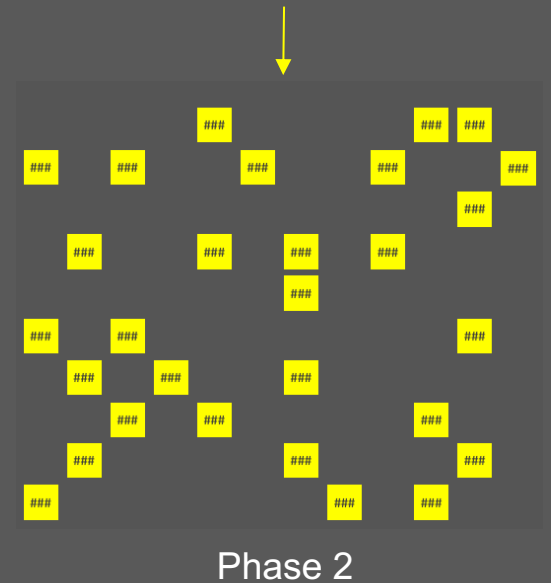
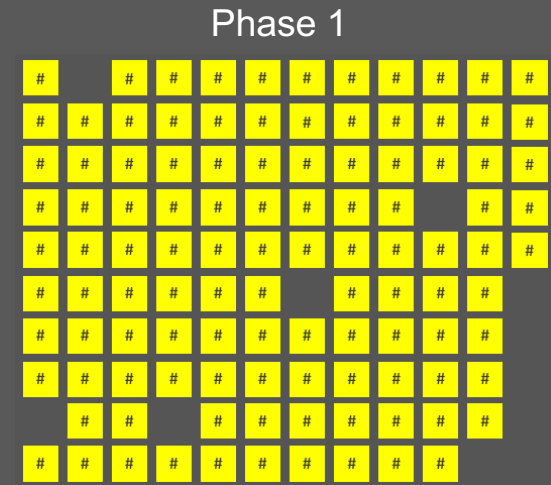
https://gatech.co1.qualtrics.com/jfe/form/SV_0f6YHJybj8qjKsd

Crowdsource Survey

https://gatech.co1.qualtrics.com/jfe/form/SV_57oUUxIFLvvMWO1

Down-Select Criteria Used by Working Groups

1. Technology and Market Readiness
2. Local Experience & Data Availability
3. Technically Achievable CO₂ Reduction Potential
4. Cost-Competitiveness
5. Other Considerations (“Beyond Carbon”)



Some Rigorous and Some Back-of-the-Envelope Calculations



1. Technology & Market Readiness

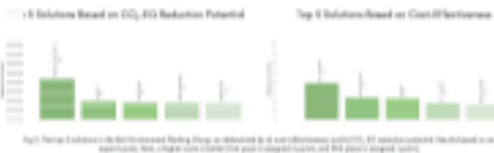
Are the solution's components ready to be launched at significant scale over the next decade? Can innovation, technology, and policy developments make the solution workable by 2030, if it is not workable already?

Alternative Multi-Attribute Choice Decision-Making
(1=least favorable, 5=most favorable)

Electricity Generation Generation Solutions	Attributes Total Score with Expert Review (average of 5)	Readiness Technology & Market Readiness (1-5)	Impacts Technological Readiness (1-5)	Costs Technological Readiness (1-5)	Costs Technological Readiness (1-5)	Readiness Technological Readiness (1-5)
Solar Photovoltaic	3.0	5	3.0	5	3.0	3.0
Onshore Wind	3.1	5	3.0	5	3.0	3.0
Geothermal	4.0	4.0	4.0	4.0	4.0	4.0

Fig 1. Three potential brownout solutions in the Georgia Working Group ranked on technology and market readiness.

CO₂-EQ Reduction Potential: Expert Survey



2. Local Experience & Data Availability

Is there sufficient data or qualitative analysis to adequately consider the solution in a Georgia context? Is there local familiarity with the technology? Are there any local pilot or demonstrations to study? Is the solution's level of complexity manageable so that it can be credibly assessed?

3. Technically Achievable CO₂ Reduction Potential

Could the Solution achieve significant carbon reductions in the 2030 timeframe as compared to other Solutions available to this sector? (A minimum threshold might be 1 MMTCO₂ annually--about 1% of 2017 CO₂ emissions from fossil fuels.)



Competitiveness Scale of Implementation Cost (Measured as levelized cost of electricity (LCOE))

Max 50 CO ₂ ~48\$/MWh ~ 1.8	
Min Offshore Wind and nuclear ~50	
\$/MWh ~ 0.5-0.8	\$/MWh ~ 0.5-0.8
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4. Cost Competitiveness

Is the solution's levelized cost of electricity (LCOE) in Georgia competitive with other Solutions available to the sector? Are the up-front capital costs affordable? Is the payback period competitive with other Solutions?

5. Other ("Beyond Carbon") Attributes

Major co-benefits or co-costs beyond carbon on four dimensions: environment, economic development, public health, & equity.]

Preliminary Beyond Carbon Impact Assessment: Food Waste Reduction

Environment	Economic Development	Public Health	Equity
Reduced greenhouse gas emissions from landfills	Increased local food production and distribution	Reduced food waste and improved food security	Increased food access for low-income populations
Reduced water consumption and wastewater treatment costs	Increased local food production and distribution	Reduced food waste and improved food security	Increased food access for low-income populations
Reduced energy consumption and greenhouse gas emissions from food processing	Increased local food production and distribution	Reduced food waste and improved food security	Increased food access for low-income populations
Reduced food waste and improved food security	Increased local food production and distribution	Reduced food waste and improved food security	Increased food access for low-income populations

Fig 4. Beyond Carbon impact assessment for reducing food waste. Green, positive impacts; orange, moderate impacts; red, negative impacts; blue, negative impacts.

Georgia Drawdown's Short List of 24 Solutions



Electricity Generation

Solar Farms & Community Solar*
Rooftop Solar*
Cogeneration
Biomass Power
Demand Response**

- *Some coupling with storage
- **Multiple technologies



Transportation

Energy-Efficient Cars
Energy-Efficient Trucks
Mass Transit
Aviation*
Electric Vehicles

- *Focused on ground transport at airports



Built Environment & Materials

Refrigerant Management
Waste Management*
Retrofitting*
Landfill Methane
Alternative Mobility*

- *Multiple technologies & markets



Food Systems

Reduced Food Waste
Regenerative Agriculture
Conservation Agriculture
Composting
Nutrient Management



Forestry & Land Use

Temperate Forests
Forest Protection
Afforestation
Coastal Wetlands



Beyond Carbon

Deeper Assessment of ~24 High Impact 2030 Solutions:
Data Collected, Tools and Models Deployed

Further Analysis of Beyond
Carbon Considerations

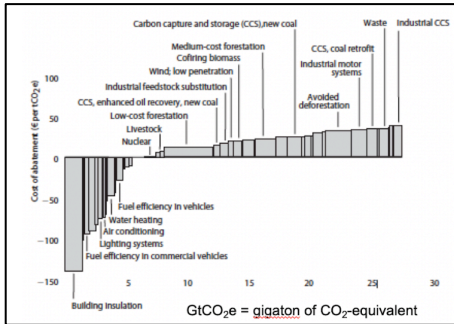
Roundtable with Georgia
CEOs + Board Chairs

Consider “honorable mentions”
and short list for 2030-50

Development of User-Friendly Data Portal and Dashboard
of Information on Final Down-Selected Solutions

Envisioning our Final Products

Deeper Analysis of 24
Georgia Drawdown Solutions
Including Their “Beyond
Carbon” Attributes



Dashboard Calculator and
Marginal Abatement Cost Curves

A Broad and Accessible
Published Article

Roadmap for Other States to
Pursue Carbon Neutrality



Georgia Drawdown Interactive Webpage

Roundtable with CEOs
and Board Chairs

Conference in May 2020

A plan for Next Steps: policy
assessments, stakeholder analysis
& engagement

www.GeorgiaDrawdown.org



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- Email us at drawdown@gatech.edu
- Sign up for email updates at www.GeorgiaDrawdown.org