

Cornell University
David R. Atkinson Center
for a Sustainable Future

Sustainability - The Final Frontier: Cornell Leads the Way

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www.acsf.cornell.edu



CU Breadth and Depth



Connect
Seed
Grow
Impact





The 3 E's of Sustainability are Interconnected

**ECONOMIC
DEVELOPMENT**

ENERGY



ENVIRONMENT





A Seed Project Grows

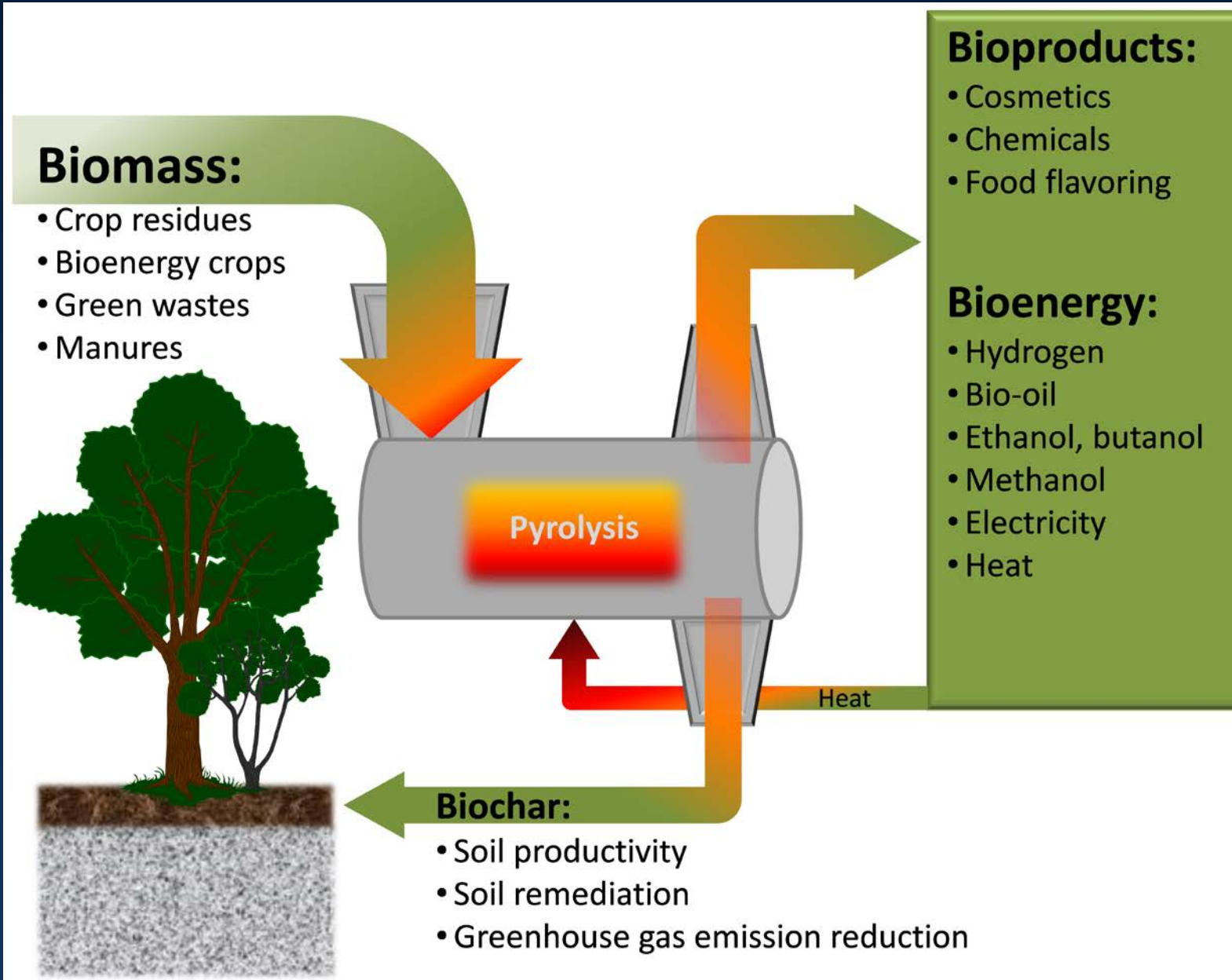


Biochar is the stable, carbon-rich product produced by thermal decomposition when biomass is heated in an anoxic environment (pyrolysis).

Profs Lehmann, Angenent, Fisher, Gouldin and Lee

\$5 M from Yossie Hollander









Impact: 400 + Faculty Fellows, 75 Departments, 11 Colleges





Dynamic Engagement





ACSF Impacts: After 7 years

130 + topical lunches

Strategic Partnerships: e.g. CARE-Cornell

ROI: \approx \$15 M \rightarrow \$100 + M

60+ Rapid Response Grants

66 AVF Seed Grants

28 Countries:

1/3 of grant \$

66 centers and institutes



Many Pathways

**Widespread
Implementation
& Impact**

**Early
Adoption**

**External
Collabs**

**Government
Briefing**

**External
Validation**

New Internal

**Topical
Lunch**

**Ideas,
Problems**

Collabs

**External
Funding**

**RRF, AVF
etc**

**Promising
Solutions**

Prototype

**Pubs,
Patents**

**Publish
Book**





ACSF Strategic Plan Focus Areas



New Materials



**Sustainable
Communities**



Energy Transitions



**Sustainable
Agriculture
and Food Systems**



One Health



**Computational
Sustainability**





Energy Transitions: Potential Partners

SIEMENS

nyserderda
Energy. Innovation. Solutions.

UC

UNIVERSIDAD
DE CANTABRIA

Walmart
Save money. Live better.



**IBERDROLA
RENEWABLES**



U.S. DEPARTMENT OF
ENERGY



GE
Energy



NREL

NATIONAL RENEWABLE ENERGY LABORATORY

NYC

Citywide Administrative
Services





Strategic Collaborations

The path to impact ... 1 + 1 = 3

Done
In Progress
Not Started

Collaborator	First Contact Scouting	Engaged Right People	Co-creating a win-win	Executive Support	First Pilot	Mature Collaboration
GE	Done	In Progress	Not Started	Not Started	Not Started	Not Started
MARS	Done	Not Started	Not Started	Not Started	Not Started	Not Started
Unilever	Done	In Progress	Not Started	Not Started	Not Started	Not Started
Mondelez	In Progress	Not Started	Not Started	Not Started	Not Started	Not Started
Consolidated Edison	Done	Not Started	Not Started	In Progress	Not Started	Not Started
Land-O-Lakes	In Progress	Not Started	Not Started	Not Started	Not Started	Not Started
WalMart	Done	In Progress	Not Started	Not Started	Not Started	Not Started
TNC	Done	Done	In Progress	Not Started	In Progress	Not Started
CARE	Done	Done	Done	In Progress	In Progress	Not Started
Smithsonian	Done	Done	Done	Done	In Progress	Not Started
EDF	Done	Done	In Progress	In Progress	Not Started	Not Started
NYSERDA	Done	In Progress	Not Started	In Progress	Not Started	Not Started





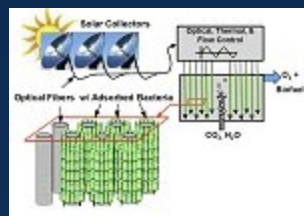
Some of the Energy Transitions Focus Area Funded Activity



Improving Energy Cost and Scalability of Algal Biofuels - Susan Daniel (CHEME), Roseanna Zia (CHEME), Beth Ahner (BEE), and Itai Cohen (PHYS)



A Hydrogen Test Bed at Cornell: Distributed-Scale Biorenewable Hydrogen Generation - Elizabeth Fisher-York (MAE), Paul Mutolo (EMC2), and Alfred Center (CHEME)



Thousandfold Improvement in Solar Photobioreactors Using Advanced Photonics - David Erickson (MAE), David Sinton (MAE), and Largus Angenent (BEE)



Methane Production in Natural Gas Extraction from Shale - Jed Sparks (EEB), Anthony Ingraffea (CEE), Natalie Mahowald (EAS), Robert Howarth (EEB), and Antonio Bento (AEM)



The Impact of Green Energy Development on Rural Community Sustainability - Richard Stedman (NTRES), Rod Howe (CALs), Susan Riha (EAS), and Susan Christopherson (CRP)





Our Stories and Plans



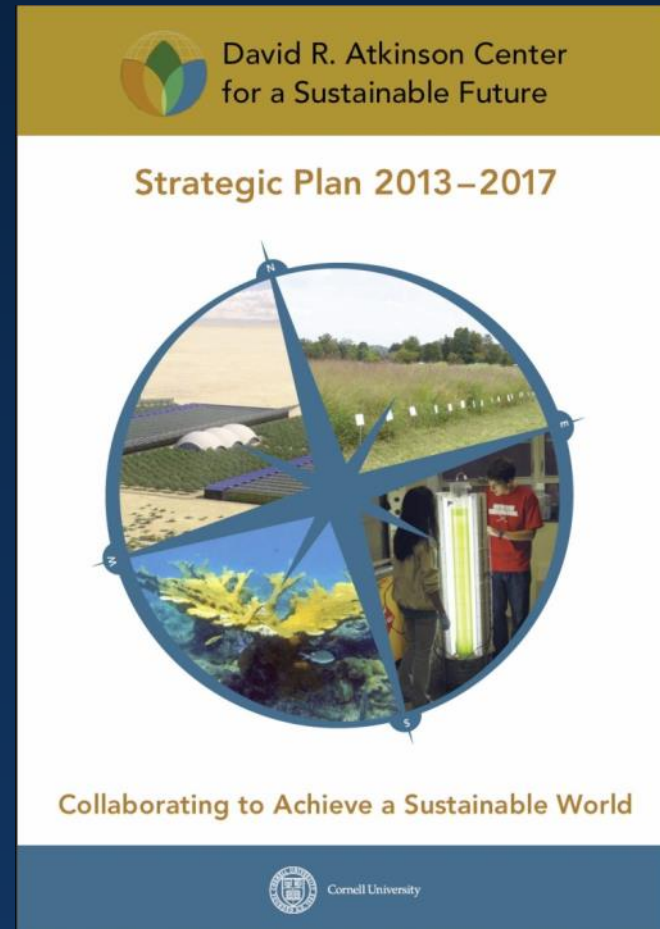
David R. Atkinson Center
for a Sustainable Future

2013
ANNUAL REPORT



Cornell University

ENERGY ENVIRONMENT ECONOMIC DEVELOPMENT



David R. Atkinson Center
for a Sustainable Future

Strategic Plan 2013-2017



Collaborating to Achieve a Sustainable World



Cornell University



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Climate Neutrality Acceleration Working Group





Climate Action Leadership

50% reduction in carbon emissions since 1990
32% since climate commitment signed in 2007

- Colleges and units incorporating sustainability into their culture and operations
- New academic programs focused on energy and climate
- Combined heat and power & beyond coal
- Lake source cooling
- Energy conservation and green building policy
- Solar and wind projects under development





Past climate and sustainability leadership has brought:

- National recognition
- Engaged students and alumni
- Faculty recruitment and retention
- Efficient operations





Cornell Leadership at a Crossroads



What will
Cornell's legacy
be 150 years
from today?





The Report

- **Six 1-year milestones: critical indicators for leadership, visibility, and engagement**
- **16 specific recommendations with cost estimates in the areas of campus and community engagement, energy demand, energy supply, and carbon offsets**



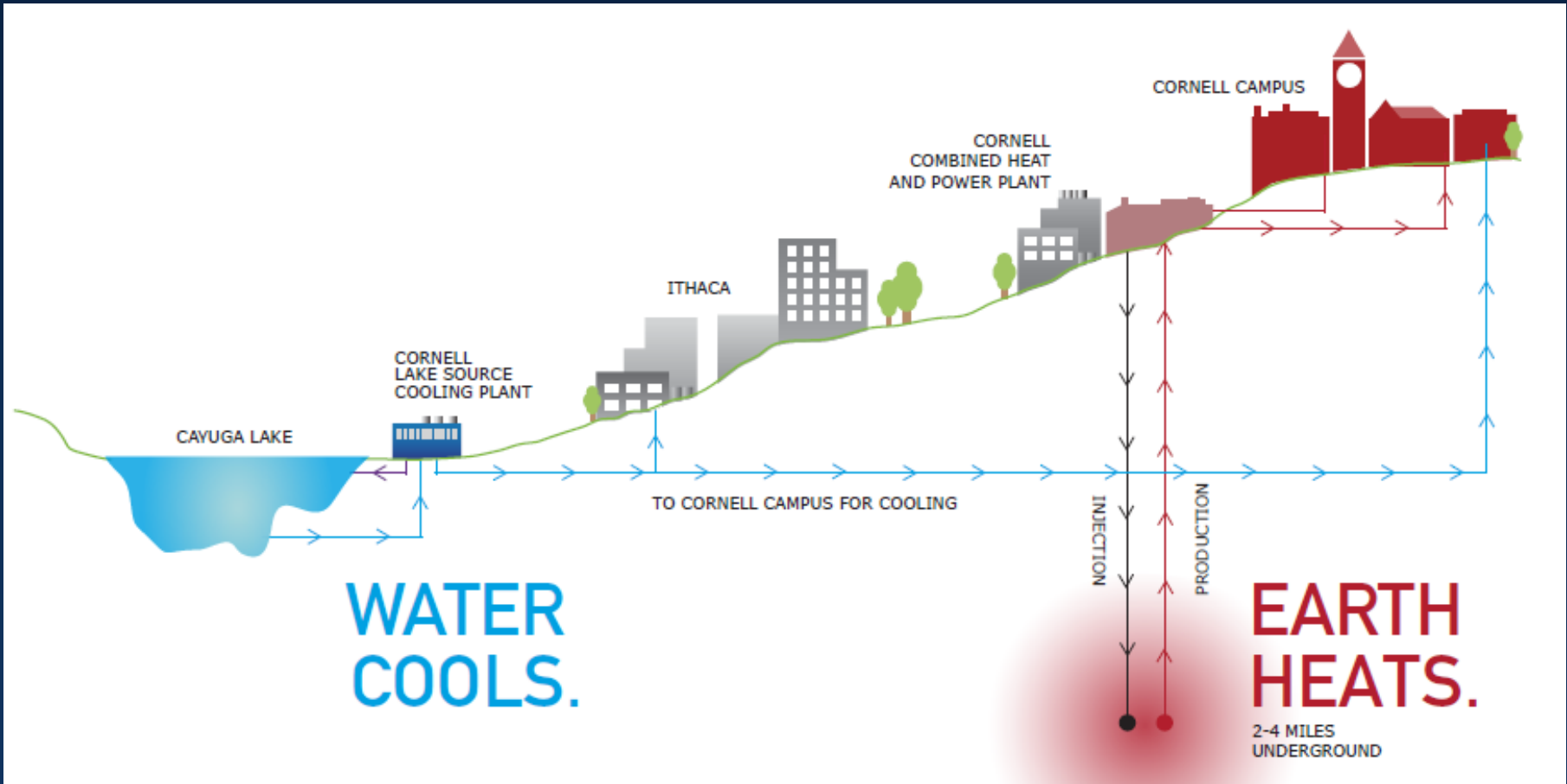
Secure Renewable Energy Supply

Obtain internal approval and complete Power Purchase Agreements for the wind, hydro, and solar projects currently being developed





Secure Renewable Heat Source



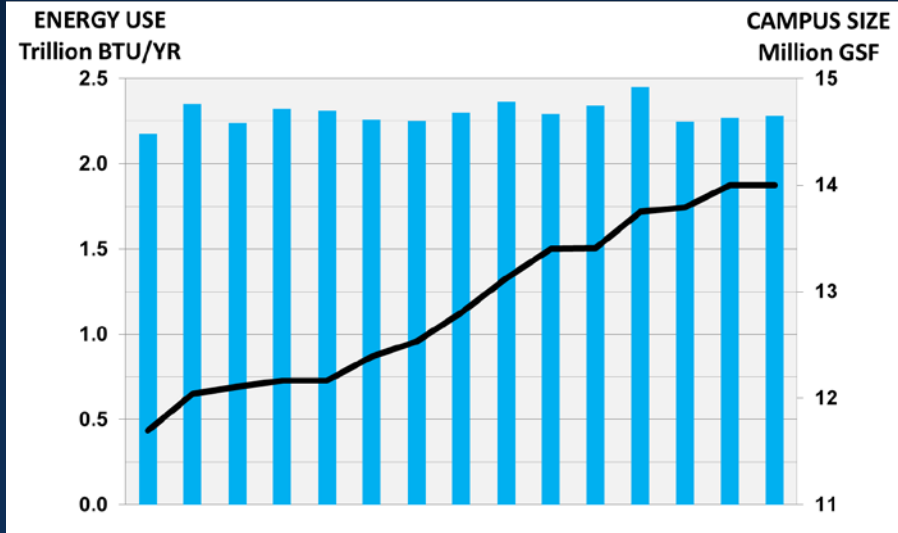
Lake Source Cooling



90% reduction in
electricity for cooling =
15 MW peak avoided



Cornell's energy demand is substantial but there are renewable options to supply it...





2MW Snyder Road Solar Farm

- 10 acre site
- 1% campus electric use
- 650 tons carbon reduction
- >30 local construction jobs
- \$0 Cornell capital
- External funding for 8MW more





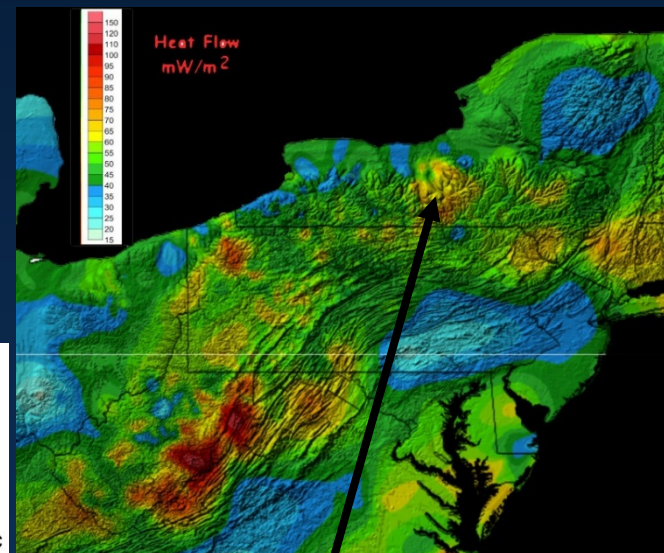
12MW Local Wind Farm



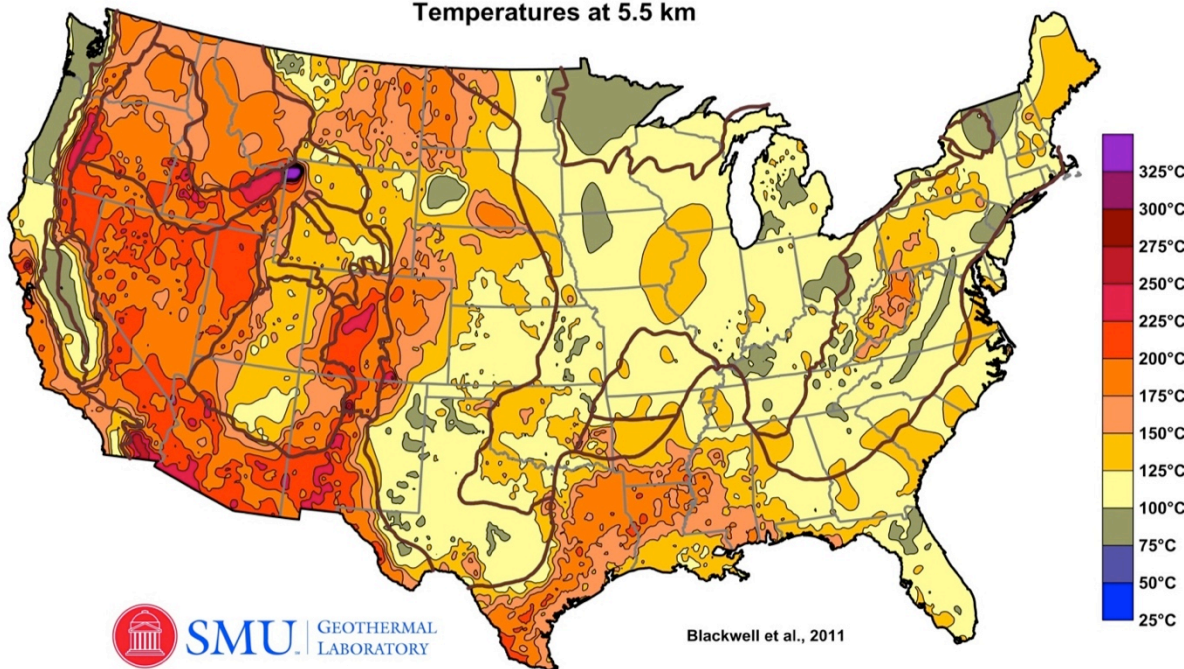
Geothermal Resource



New York contains a large region of higher geothermal heat flow



Temperatures at 5.5 km

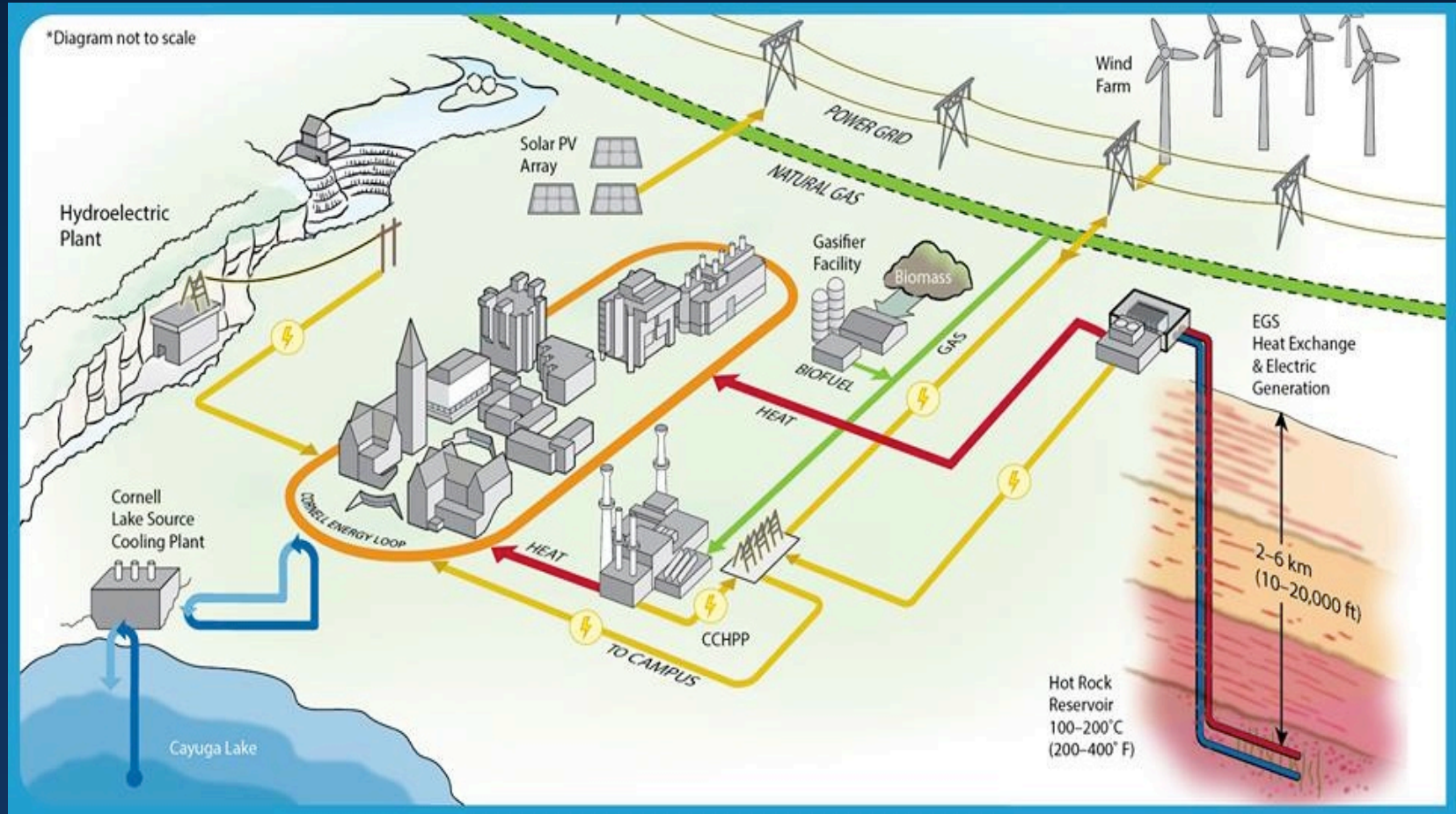


Cornell

To reach rock at 120-140°C well depths of 10,000 to 15,000 ft. are needed



Deep Geothermal and Biomass are Feasible - Next step: Demonstration





A Climate Neutral Campus Enhances our Mission

Intellectual depth - Requires us to wrestle with tough questions across disciplines

Engagement - Humanities, social science, and community engaged learning and research are all necessary

Impact - Translation of fundamental knowledge to real world problem solving

Scalable model - For New York state and the country

Stewardship - Land grant mission and cooperative extension





Atkinson Center for a Sustainable Future (ACSF)

- University lead for multi-disciplinary sustainability–based research on campus
- Convening and connecting internal and external stakeholders from all Cornell’s colleges and schools
- Seeding new collaborations across the broad and interconnected themes of sustainability involving the 3 Es
- Partnering externally to co-create and take applied solutions to scale to have impact





Cornell Energy Institute (CEI) :

- Engineering College lead for technology-based energy research and education
- Research – developing technology- based energy research leading to scalable, sustainable energy solutions,
- Education -- creating and managing energy related curricula in Engineering
- On campus deployment - Connecting energy education and research using a “living laboratory” approach
- Outreach - to promote energy literacy and responsible deployment of sustainable energy options.

