



# **DISTRICT ENERGY DECARBONIZATION**

## **CORNELL UNIVERSITY**

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Facilities & Campus Services, Cornell University

**JUNE 26<sup>TH</sup>, 2019**

CORNELL UNIVERSITY

PAST

COAL

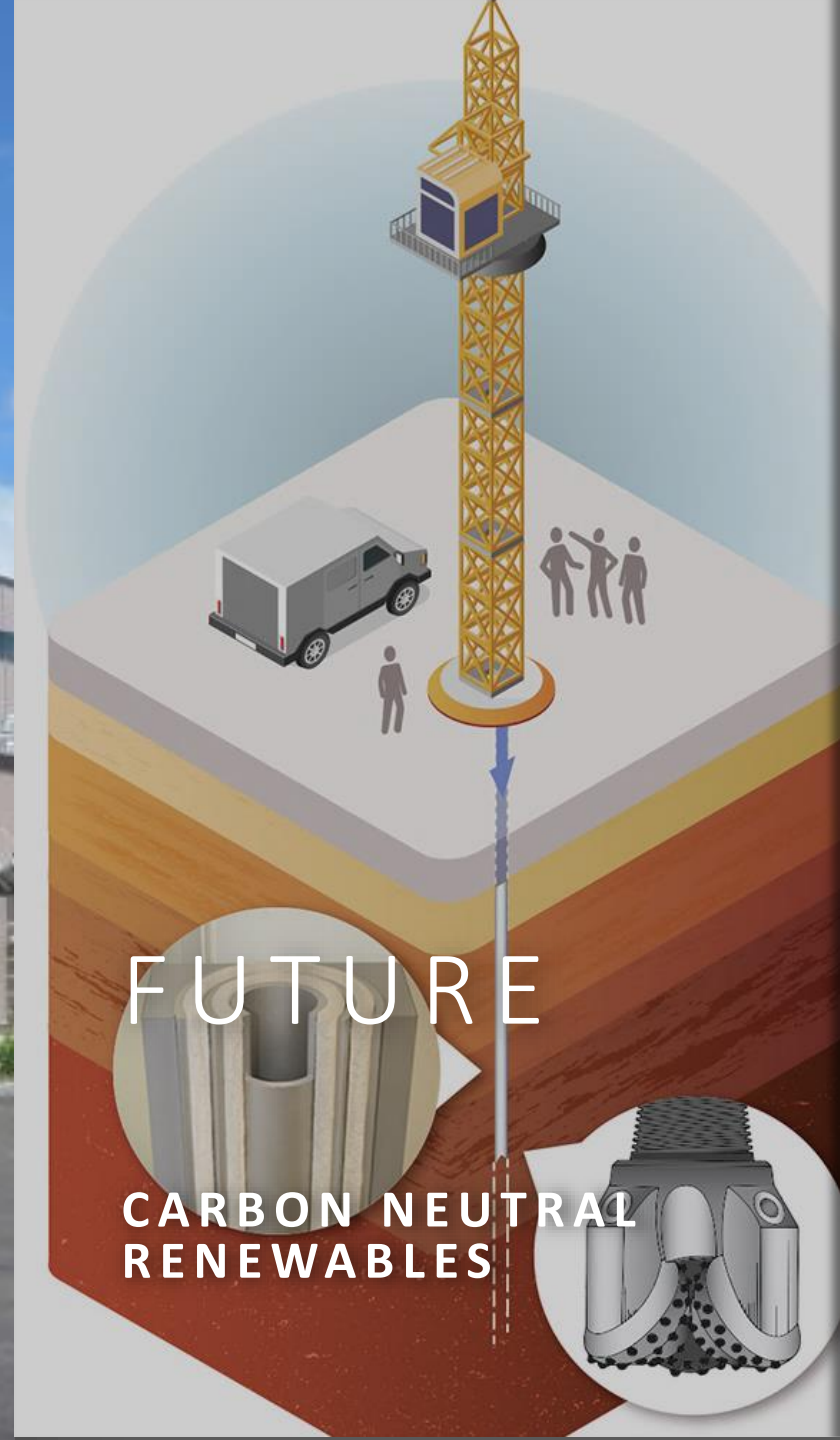
June 2019

PRESENT

NATURAL GAS

FUTURE

CARBON NEUTRAL  
RENEWABLES





An aerial photograph of the Cornell University campus in Ithaca, New York. The image shows a dense collection of university buildings, green lawns, and trees with autumn foliage. A red circle is drawn in the upper right quadrant, highlighting a specific area that appears to be a utility or industrial site, possibly a power plant or water treatment facility, with several tall smokestacks or chimneys. The text "CORNELL UNIVERSITY" is overlaid in the top right corner.

CORNELL UNIVERSITY

CAMPUS SIZE: 14,000,000 GSF  
*District Energy Connected*

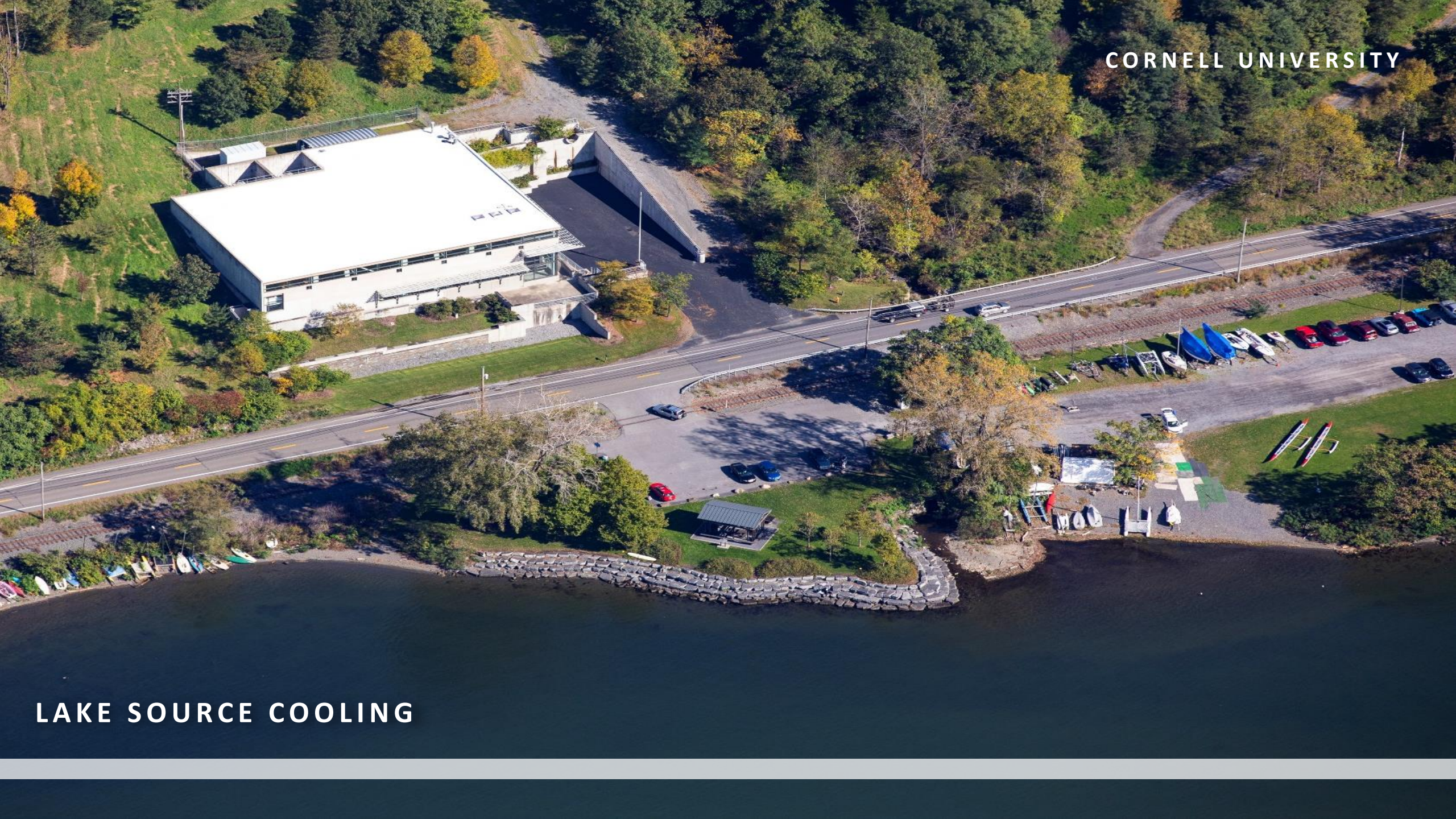


ELECTRIC:  $35 \text{ MW}_e$  (PEAK)  
STEAM:  $90 \text{ MW}_{th}$  (PEAK)  
COOLING:  $90 \text{ MW}_{th}$  (PEAK)



CORNELL UNIVERSITY

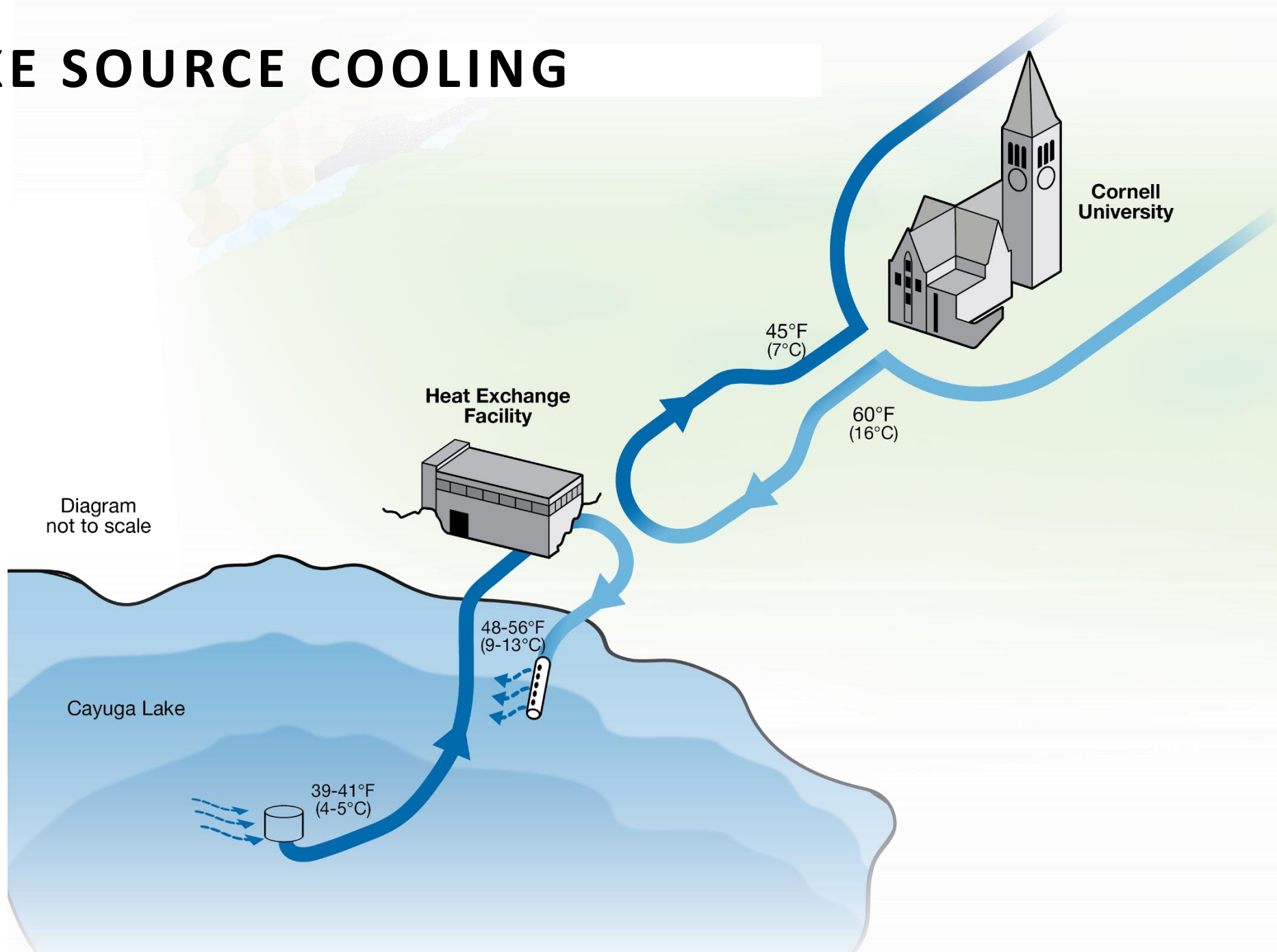
LAKE SOURCE COOLING





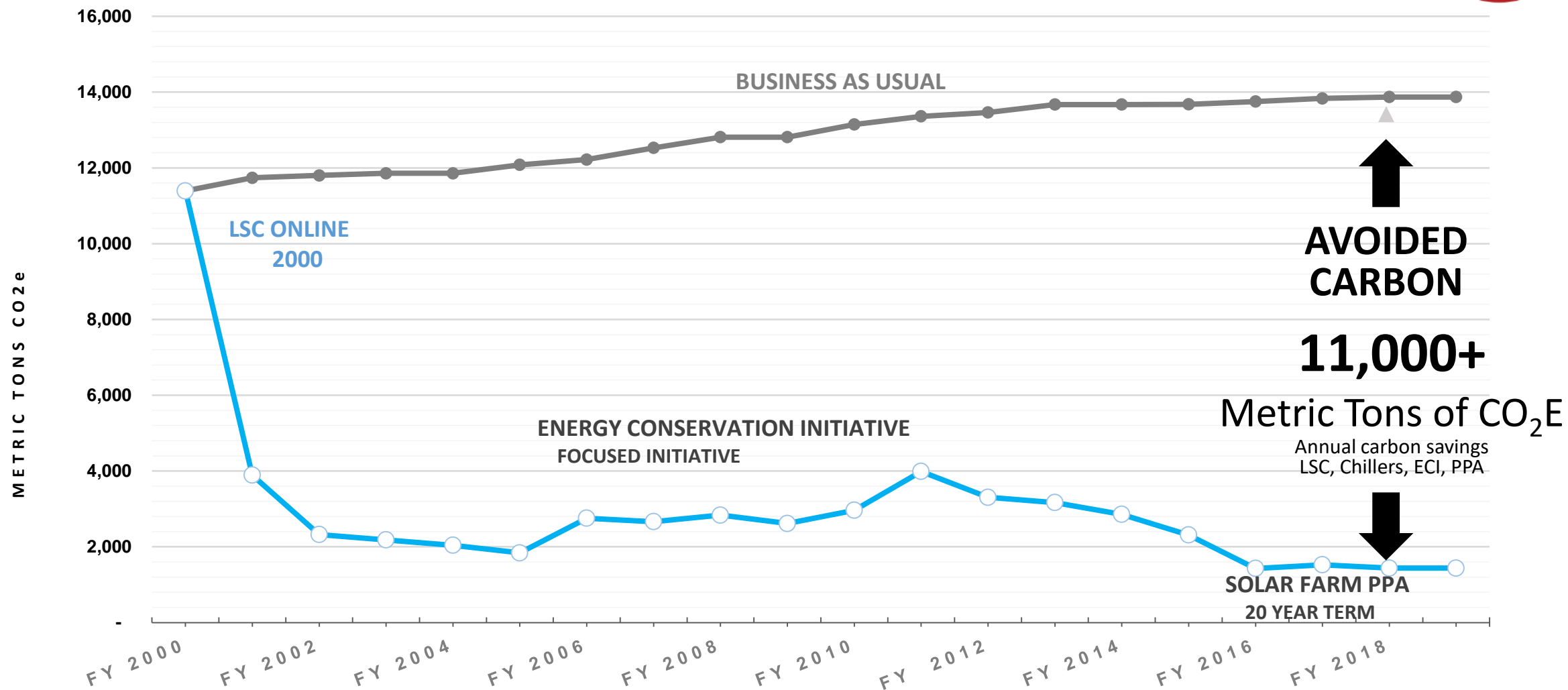
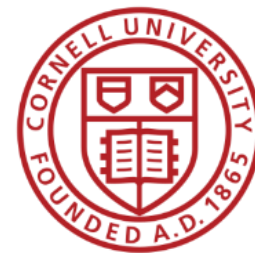


# LAKE SOURCE COOLING



# DISTRICT COOLING DECARBONIZATION

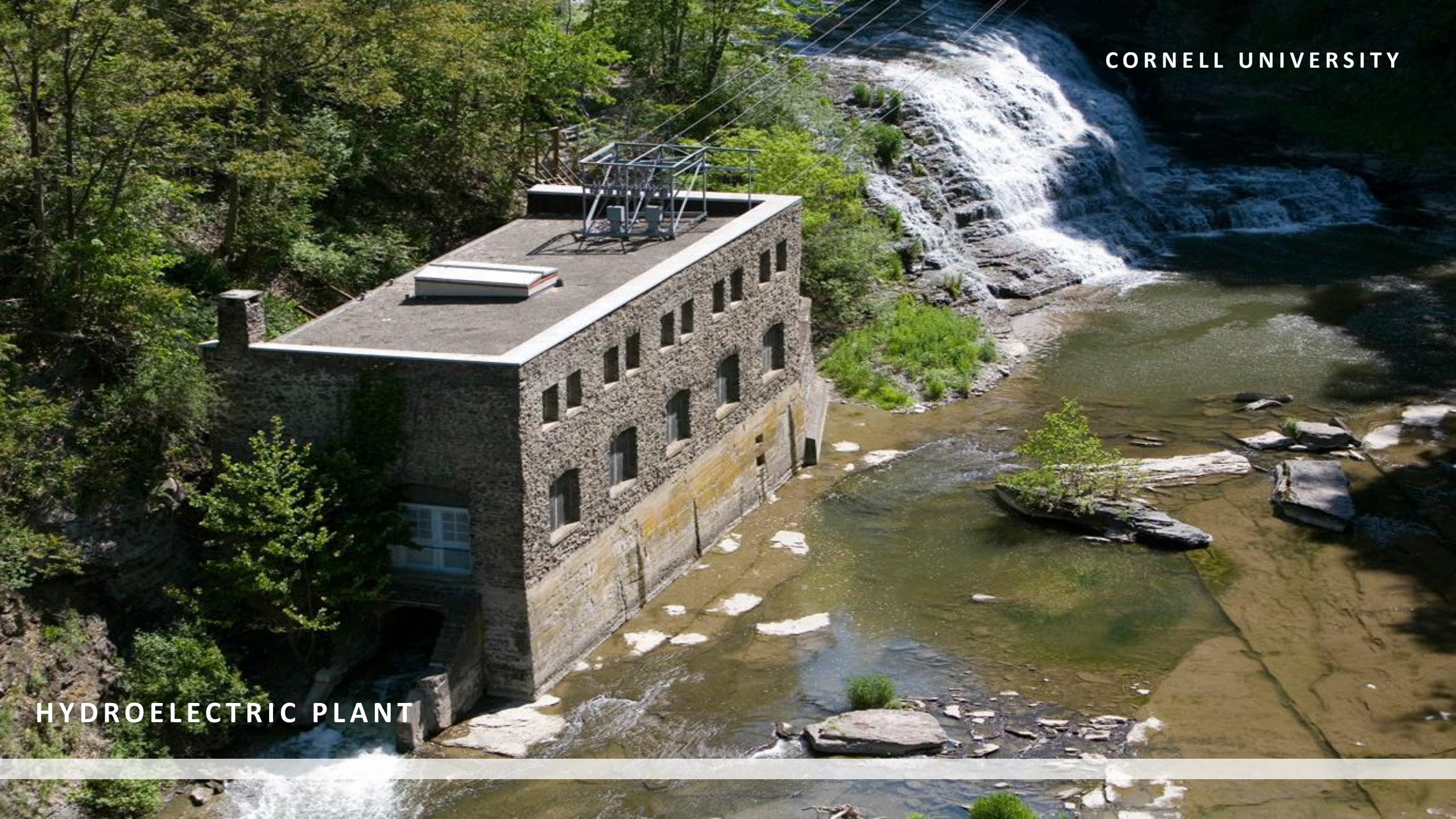
## LAKE SOURCE COOLING + PEAKING CHILLERS





CORNELL UNIVERSITY

HYDROELECTRIC PLANT





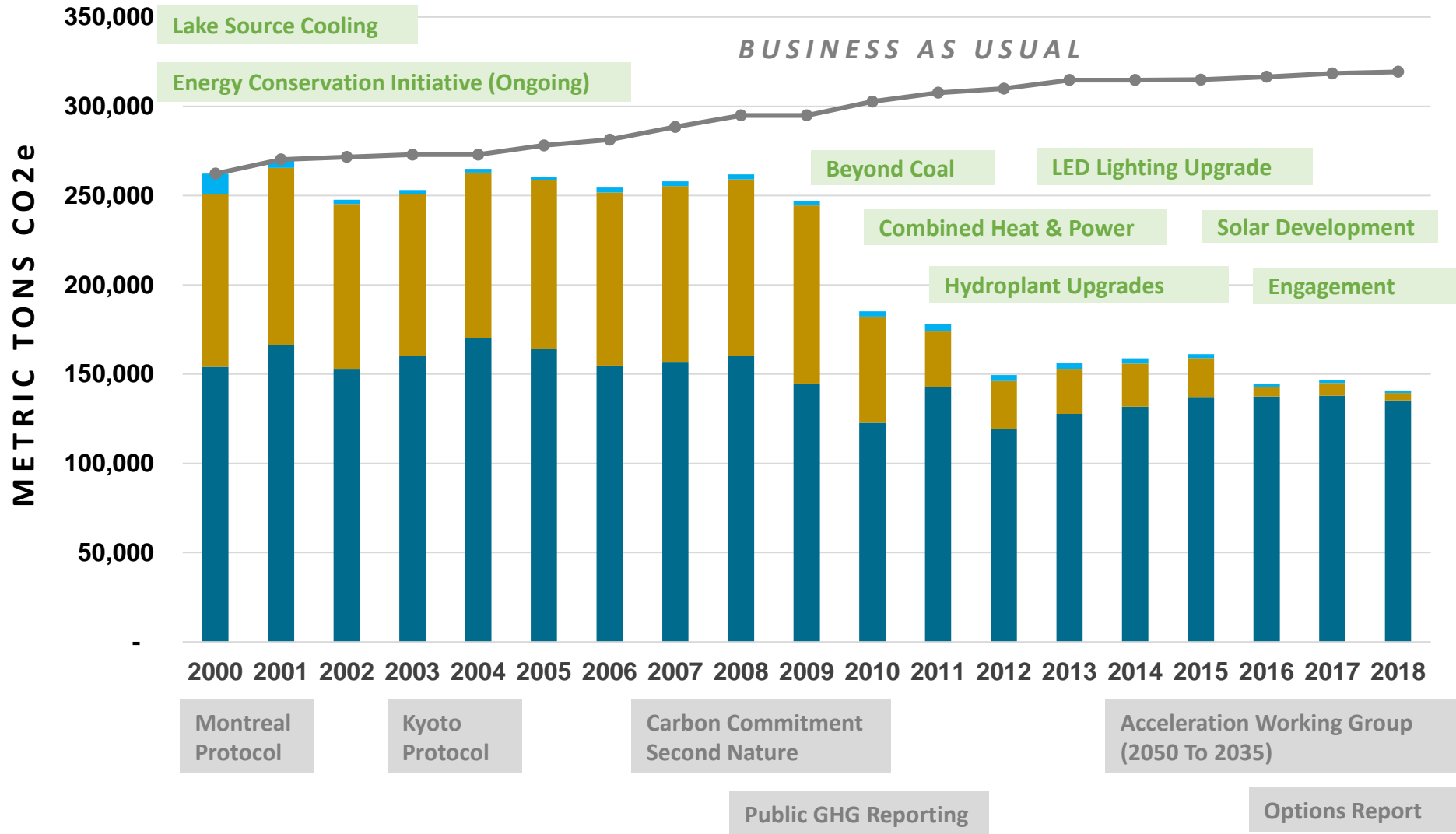


SOLAR FARMS (MUSGRAVE FARM)



# DISTRICT ENERGY DECARBONIZATION

## ELECTRIC, COOLING & HEATING



**AVOIDED  
CARBON  
TO DATE**

**1.6 million  
METRIC TONS CO<sub>2</sub>e**



# RECENT TOOLS FOR CLIMATE ACTION PLANNING



## Options for Achieving a Carbon Neutral Campus by 2035

Analysis of Solutions

Cornell University Senior Leaders Climate Action Working Group  
September 2016



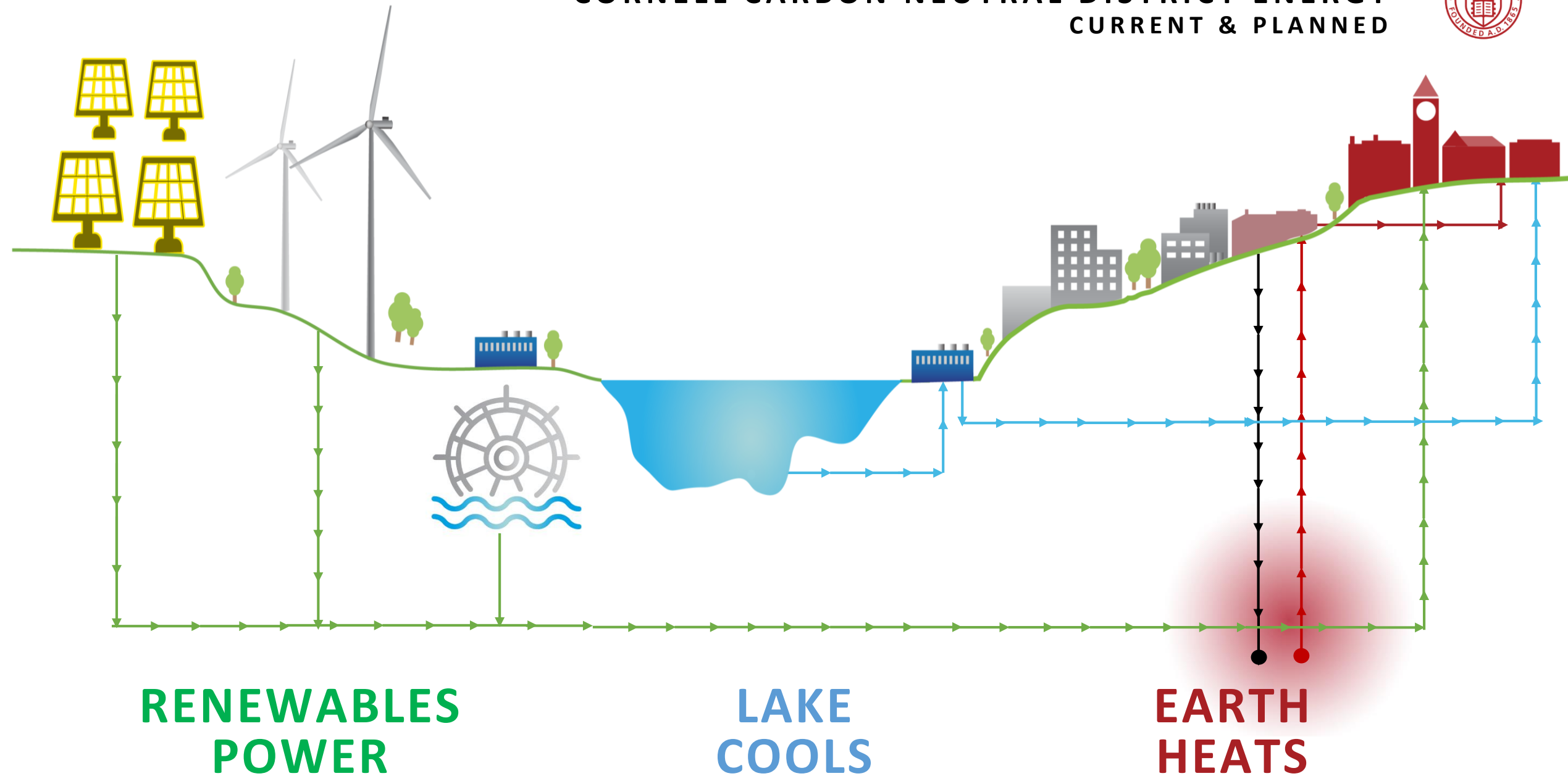
Cornell University

## CORNELL SUSTAINABILITY FRAMEWORK "QUADRUPLE BOTTOM LINE"



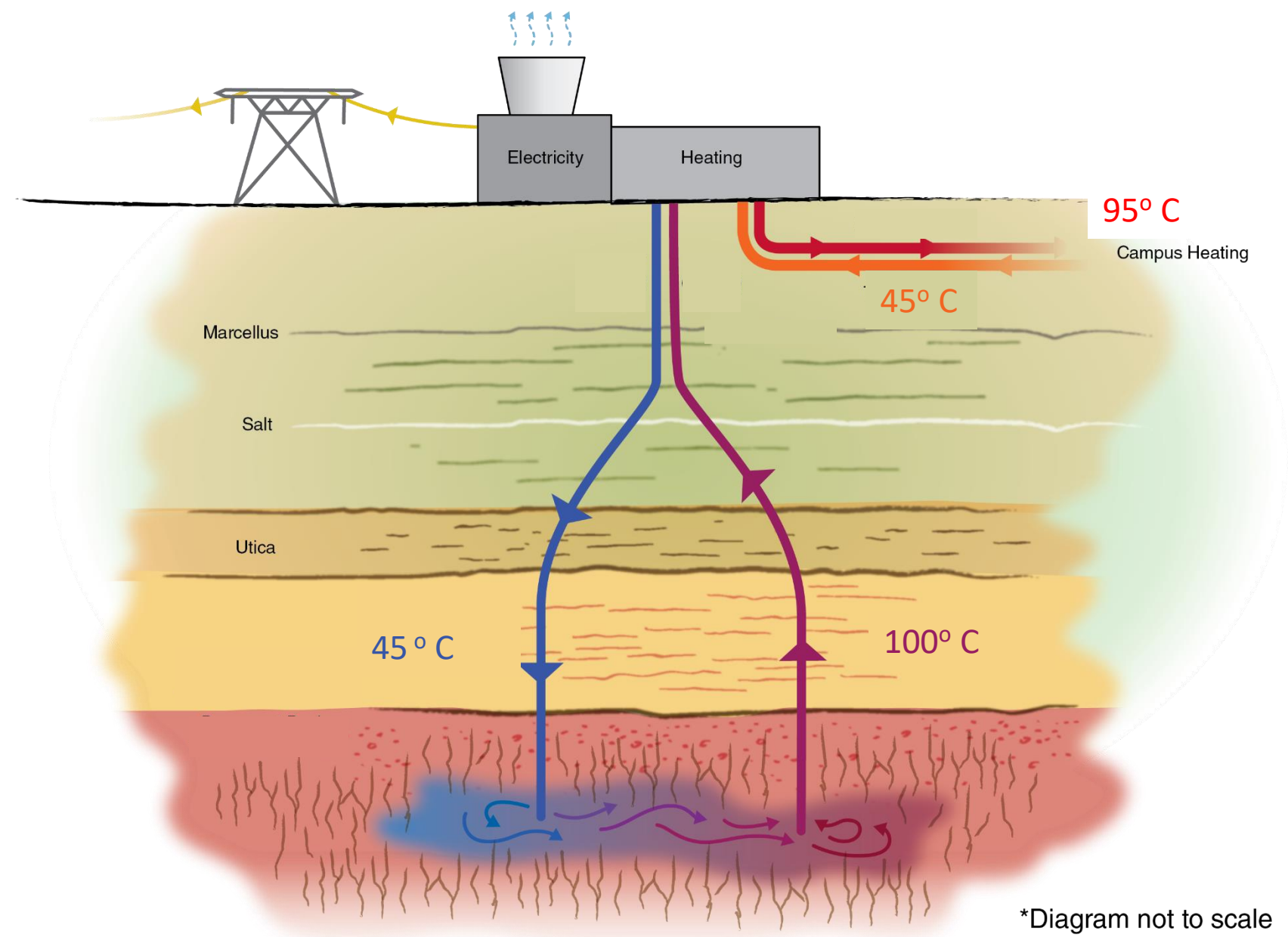


# CORNELL CARBON NEUTRAL DISTRICT ENERGY CURRENT & PLANNED



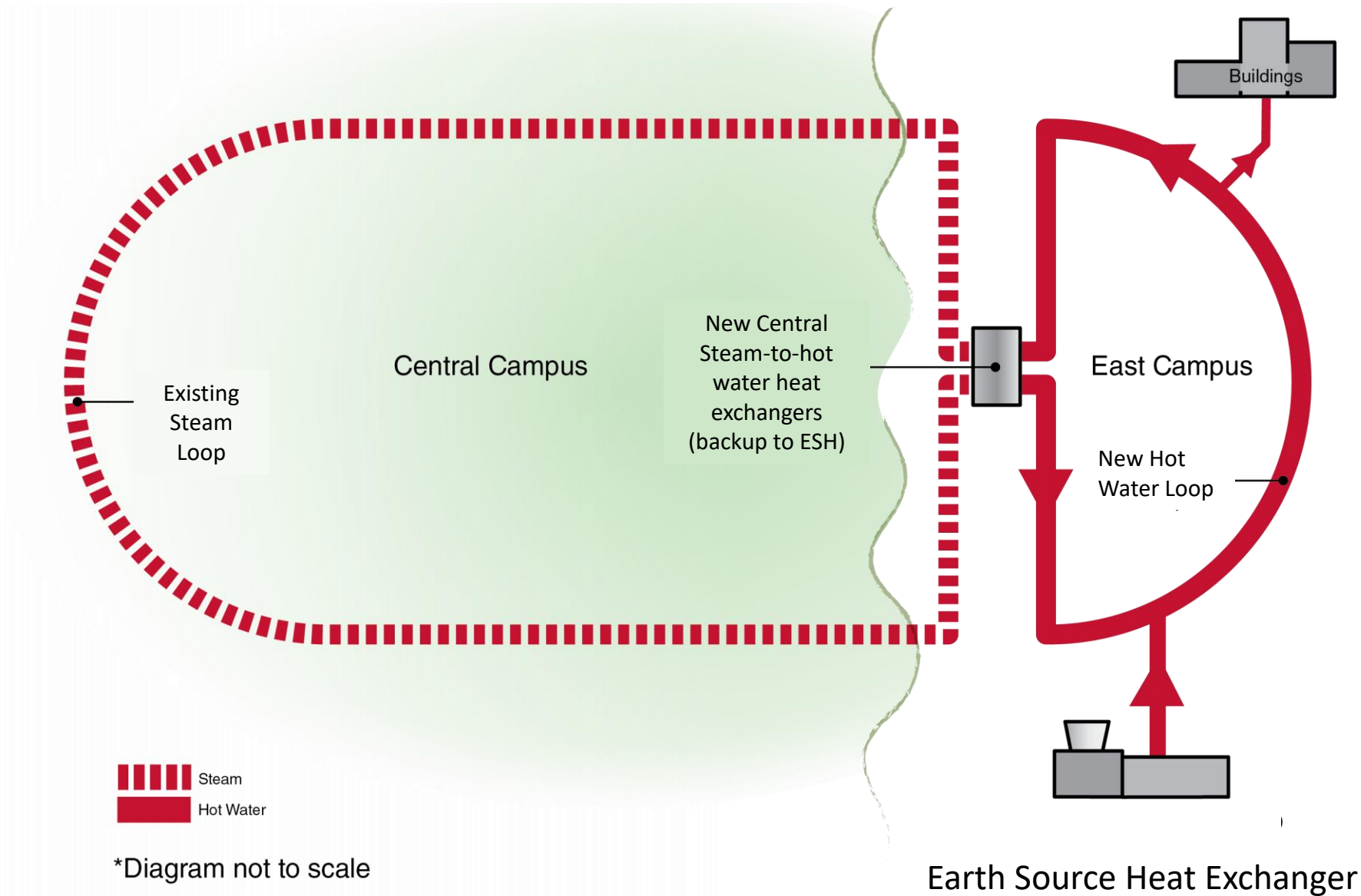


# CORNELL EARTH SOURCE HEAT





# CAMPUS CONVERSION TO ESH FROM STEAM





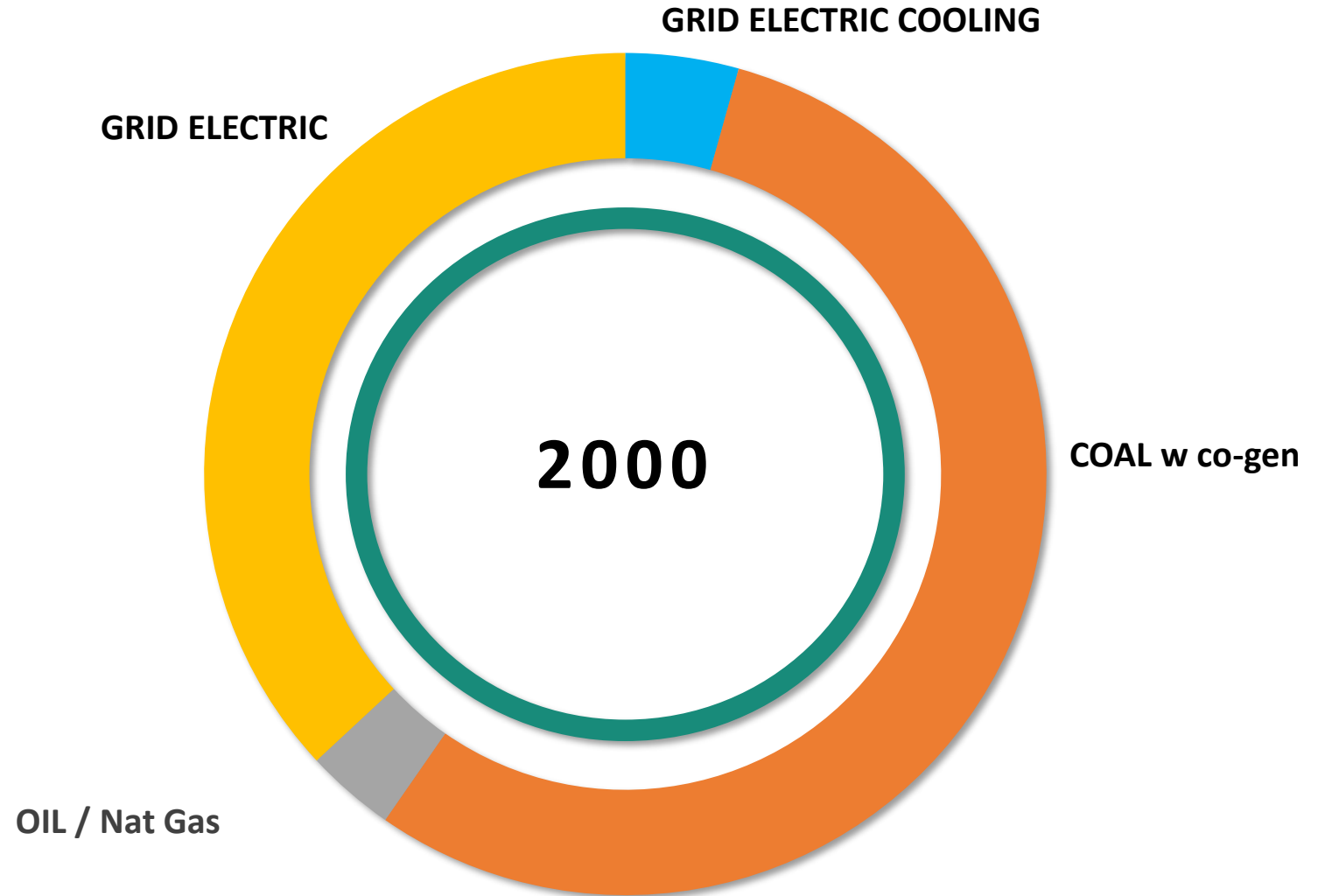
# DECARBONIZATION – PAST TO FUTURE

## CORNELL DISTRICT PROFILE



### CARBON INTENSITY

2000 260,000 MTCO<sub>2</sub>e





# DECARBONIZATION – PAST TO FUTURE

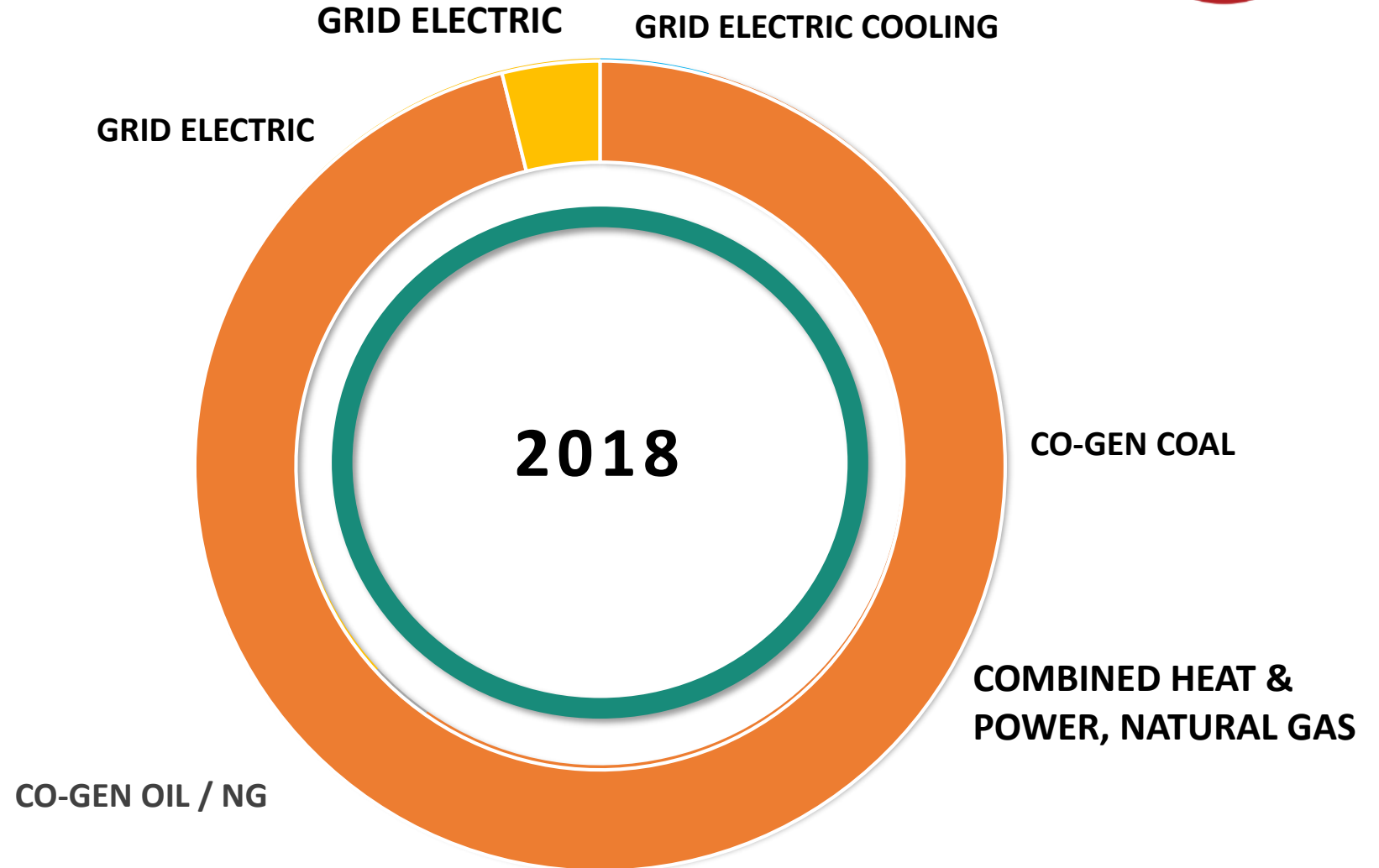
## CORNELL DISTRICT PROFILE



### CARBON INTENSITY

2000     260,000 MTCO<sub>2</sub>e

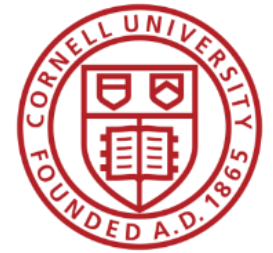
2018     165,000 MTCO<sub>2</sub>e





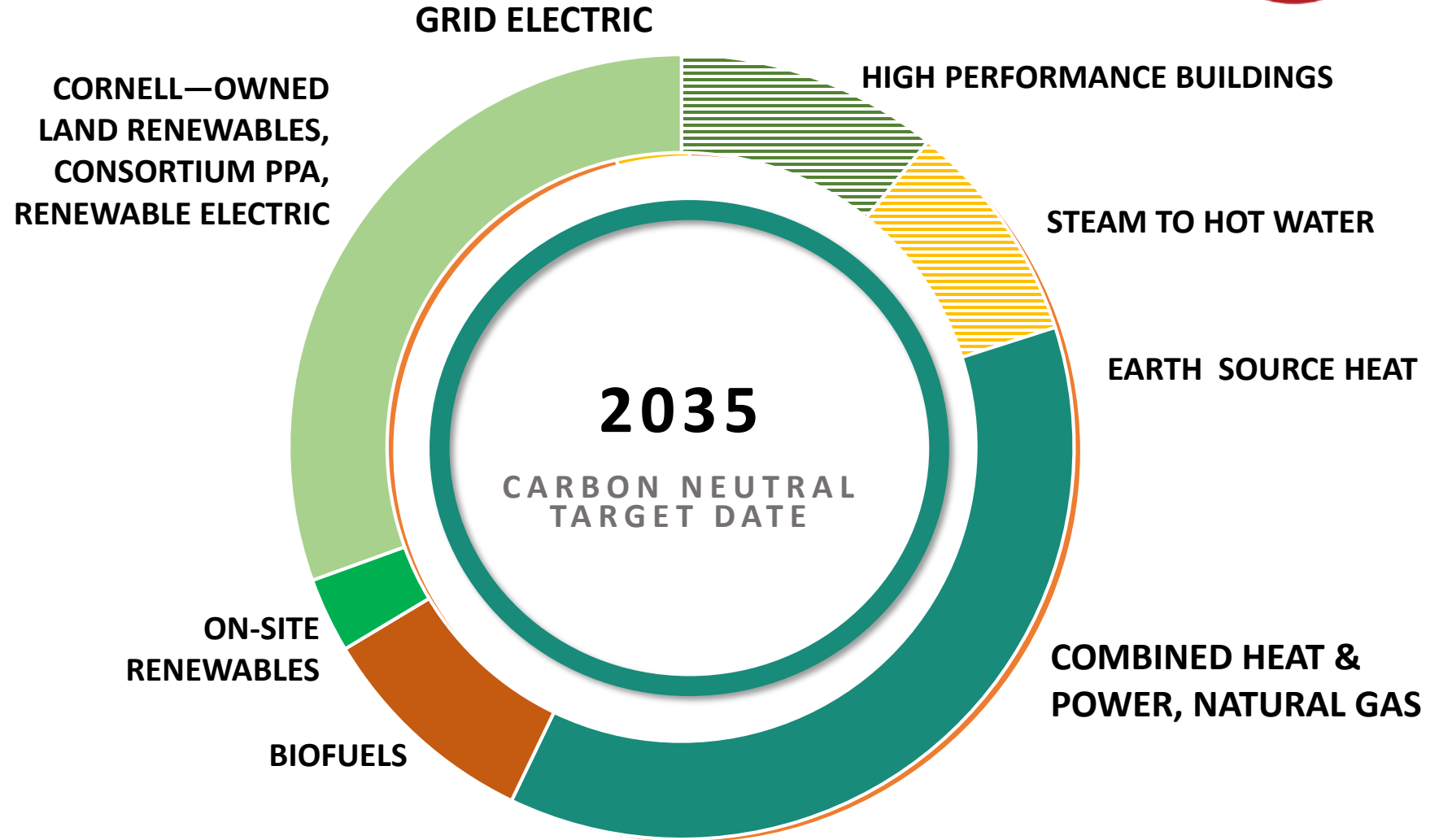
# DECARBONIZATION – PAST TO FUTURE

## CORNELL DISTRICT PROFILE



### CARBON INTENSITY

2000	260,000 MTCO <sub>2</sub> e
2018	165,000 MTCO <sub>2</sub> e
2035	~0 MTCO <sub>2</sub> e





# OUR PLAN

## DECARBONIZING DISTRICT ENERGY



### DEMAND SIDE

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- North Campus Residential Expansion 750k GSF low temp hot water; robust EUI goals
- Energy Conservation Initiative
- Study to determine building impacts associated with hot water conversion

### SUPPLY SIDE

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- Partnering with NYSERDA to develop Hot Water system design
- Department of Energy funded study of Earth Source Heat
- Partnering with renewable energy developers and other buyers (new projects)

### HUMAN SIDE

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- Sustainable Cornell Council – Cornell's 3rd generation of sustainability governance



# CHALLENGES



## ECONOMICS VS. ENVIRONMENT?

Make vs. buy power decisions when we do not need the heat

## CARBON ACCOUNTING?

Accounting for upstream methane emissions from natural gas

## EARTH SOURCE HEAT ALTERNATIVE?

Back-up plan for carbon neutral heat and power



# THANK YOU



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