Modernization of Brock's District Energy Plant – Preparing for the Future

Brock University

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Agenda

Background and Environment

- Brock University
- Challenges and project rationale
- Original DES

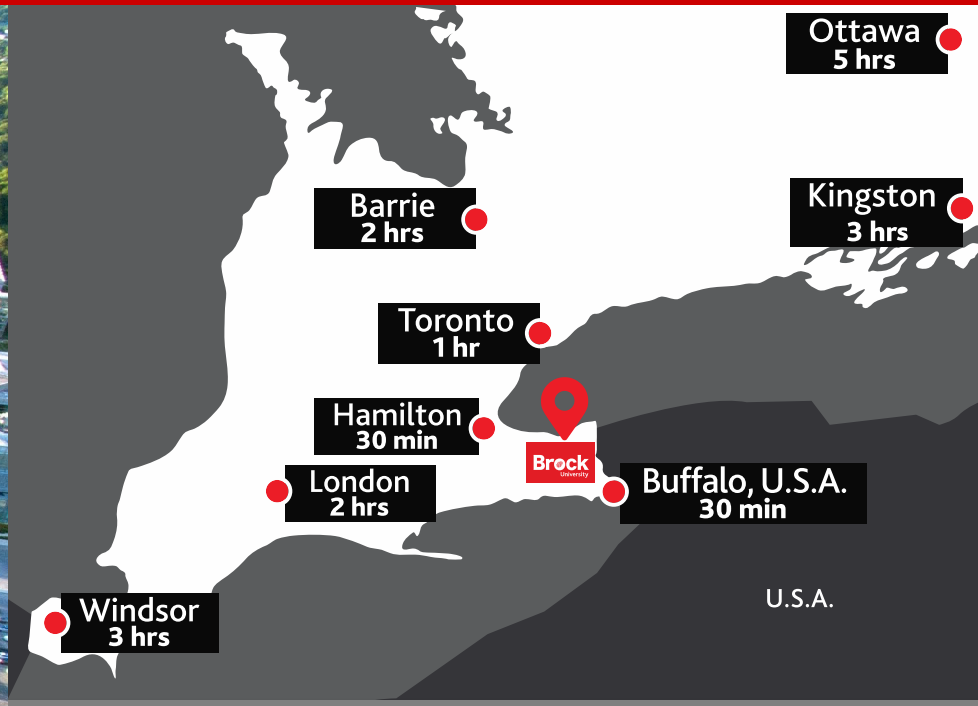
District Energy Efficiency Project (DEEP)

- Phases
- New DES
- Operations

Lessons Learned

- Q&A

Background and Environment



- UNESCO Biosphere Reserve
- Research-intensive
- 19,000+ students
- 2.7M GSF

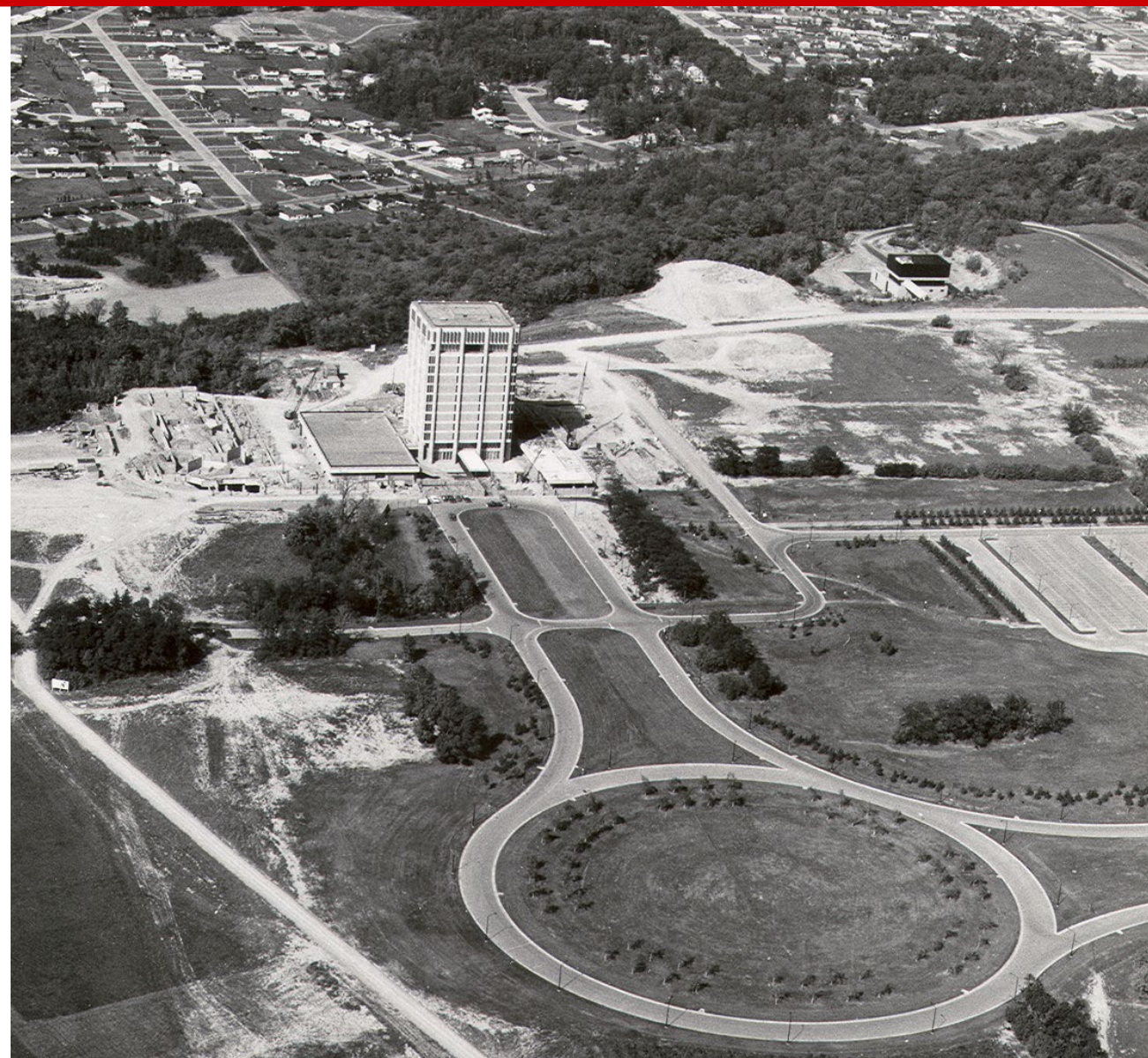
Background and Environment

Campus Energy History

- 1964: 100% electric campus
- 1992: District Energy System

Campus Evolution (2017)

- Campus growth
  - Students: 18,700
  - Space: 2,421,879 GSF
- Intensified research
- Aging infrastructure
- 31 Buildings



Background and Environment

DES Status in 2017

- 25 MMBTUh (8MWe) for thermal energy
  - 4 MMBTUh of unextractable thermal energy
- 240 degF water system
  - More stringent requirements and oversight
- 6.4 MW in electrical capacity
  - Block load limitation of 820kW
  - Only provides 85% of the campus' needs
- Equipment at end of life

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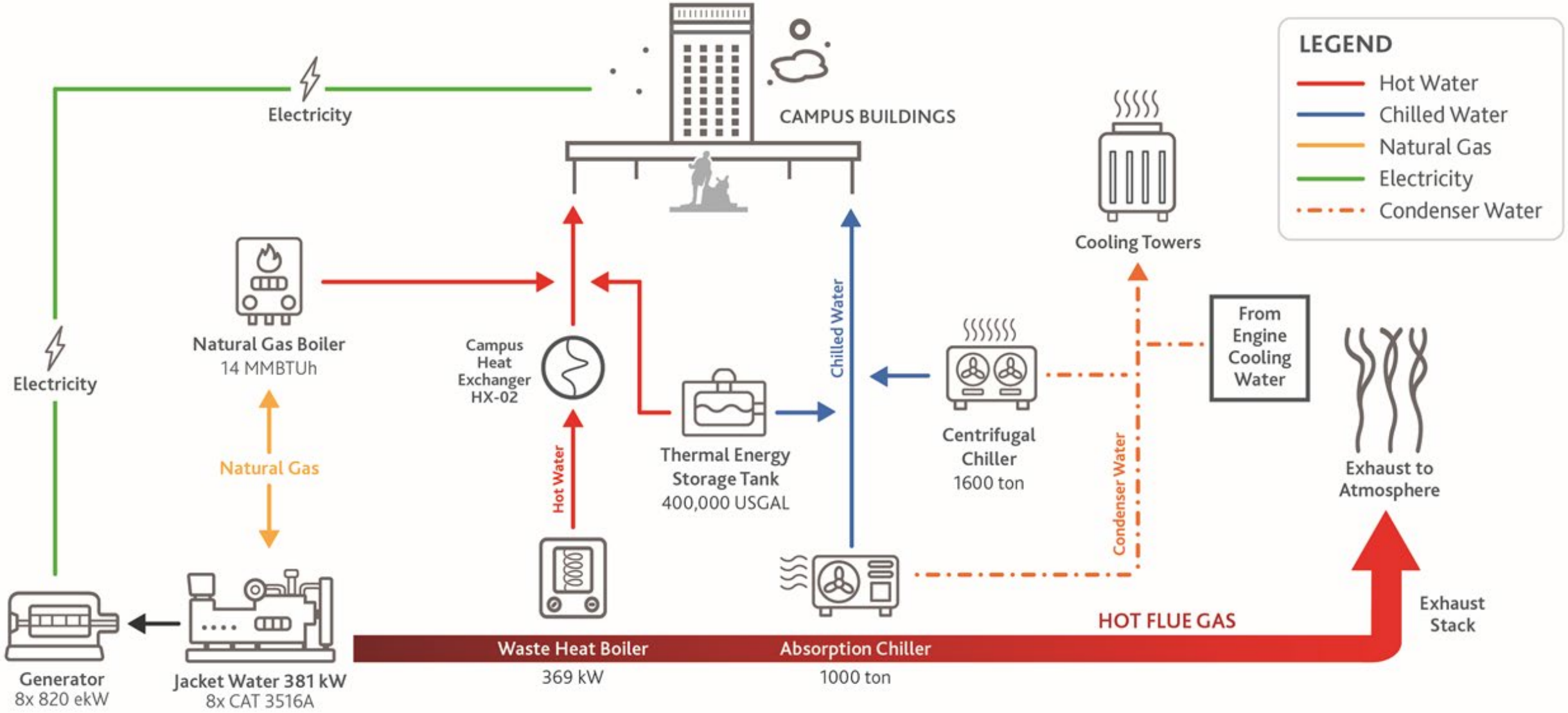
Background and Environment

Original DES

- 8 CAT3516A engines
- Thermal Energy Storage tank
- Absorption chiller
- Centrifugal chiller
- Distribution in 3 loops
- Hot water boiler
- Exporting electricity to LDC grid

Original DES



Background and Environment

Project Rationale

- Need for more resilience
- Avoid additional cost
- Growing deferred maintenance
- Reducing carbon emissions
- Increased sustainability awareness
- Tightening environmental regulations

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Solution - DEEP

District Energy Efficiency Project (DEEP)

- Different engines and chillers considered

Cost

- Phase I: $10.54M CAD
- Phase II: $7.59M CAD

Construction

- July 2017 – March 2019

DEEP – Phase I

Removed

- 4 CAT3516A
- Old absorption chiller
- HEX-02
- Piping reworks
- Common exhaust

Installed

- 2 new CAT3516H engines
- New absorption chiller
- Direct injection loop
- Integration of piping in distribution loops
- Thermal bypass
- New Master Control Panel (MCP)

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DEEP - Transition into Phase II

Rental boiler

- Finding a suitable unit
- Interconnection to existing system

Using other DES assets

- Electric boilers
- Satellite Utility Areas
  (e.g., Bioscience building)
- TES tank
- Back-up boiler

DEEP – Phase II

Removed

- Remaining 4 CAT3516A
- Old centrifugal chiller

Installed

- 2 new CAT3516H engines
- New magnetic bearing chiller
- Selective Catalytic Reduction system
- New logic and controls

Commissioning

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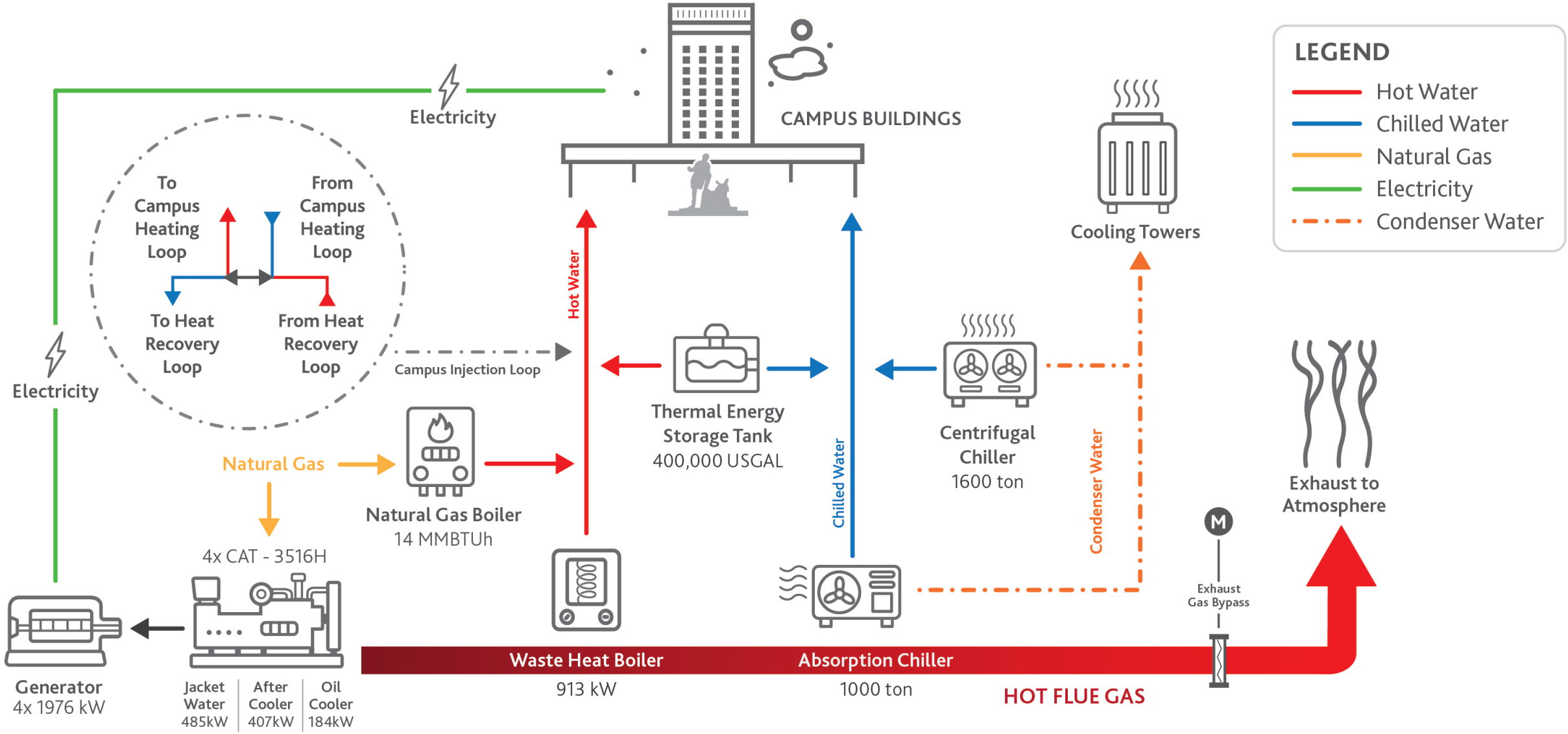
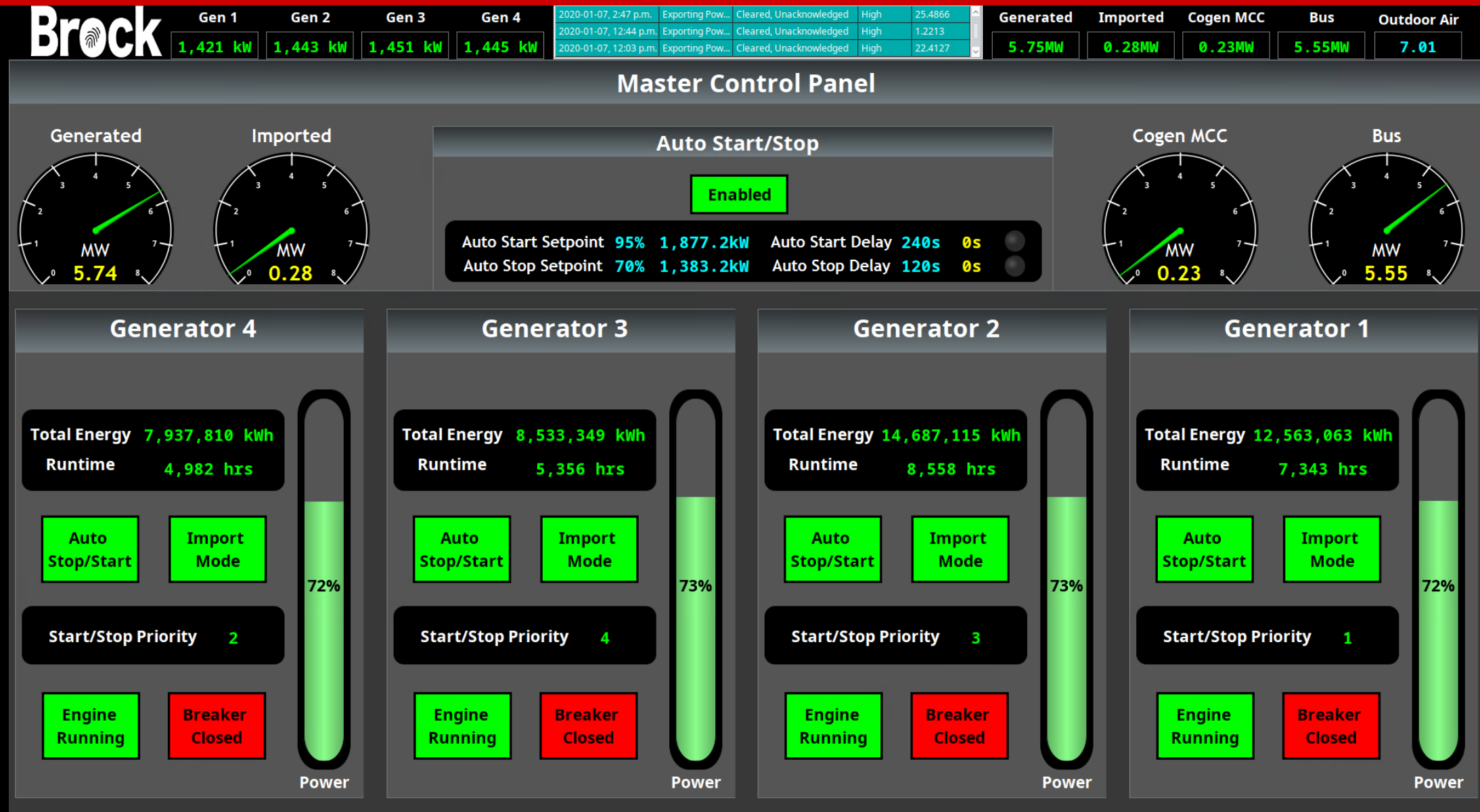
Brock's New DES



New DES - Operations

New DES - Operations



DEEP - Benefits

- Energy savings
- Carbon reduction
- Campus as a living lab
- Increased resilience
- Address deferred maintenance
- Improvements to SCADA system
- Enhanced control on operations

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Lessons Learned

- New technologies and learning curves
- Increased operational complexity (transition, Cx)
- Operating with an old distribution system
- Academic and research opportunities

Next Steps

- Additional distributed generation
- Modernize distribution system
- Integrate renewables
- Address inefficient and aging buildings
- Design new buildings to be highly efficient and low-carbon
- Optimization initiatives on DES

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Questions?

Thank You!

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