

Combined Heat and Power (CHP) Improving Reliability and Resiliency in Universities and Campuses

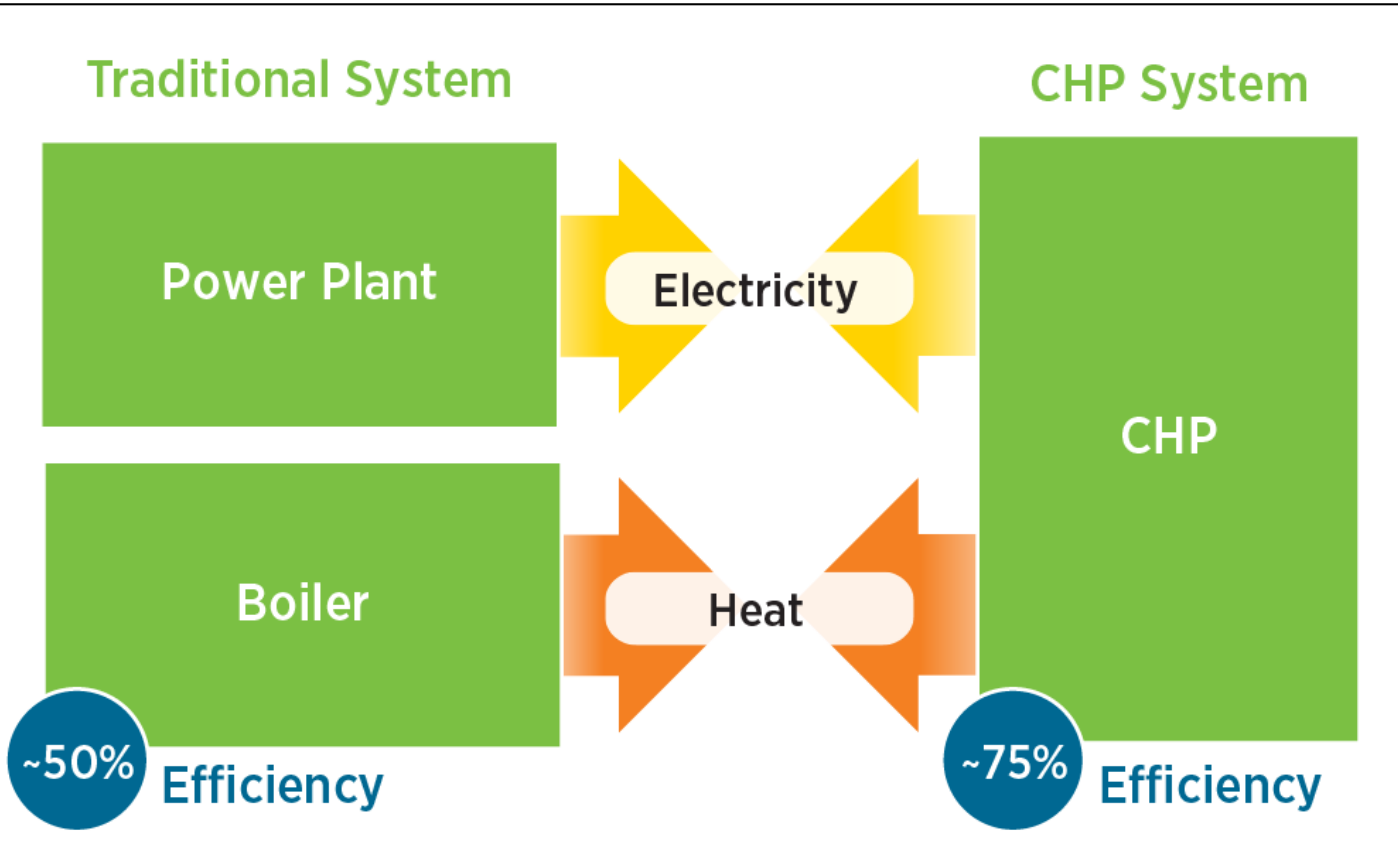
IDEA Campus Energy 2017

- Combined Heat and Power (CHP) overview
 - Background
 - Opportunities in commercial/institutional applications
- CHP Examples
 - Case studies – universities and campuses
- CHP projects – key selection criteria
- Q & A

What is Combined Heat & Power (CHP)

Key benefits

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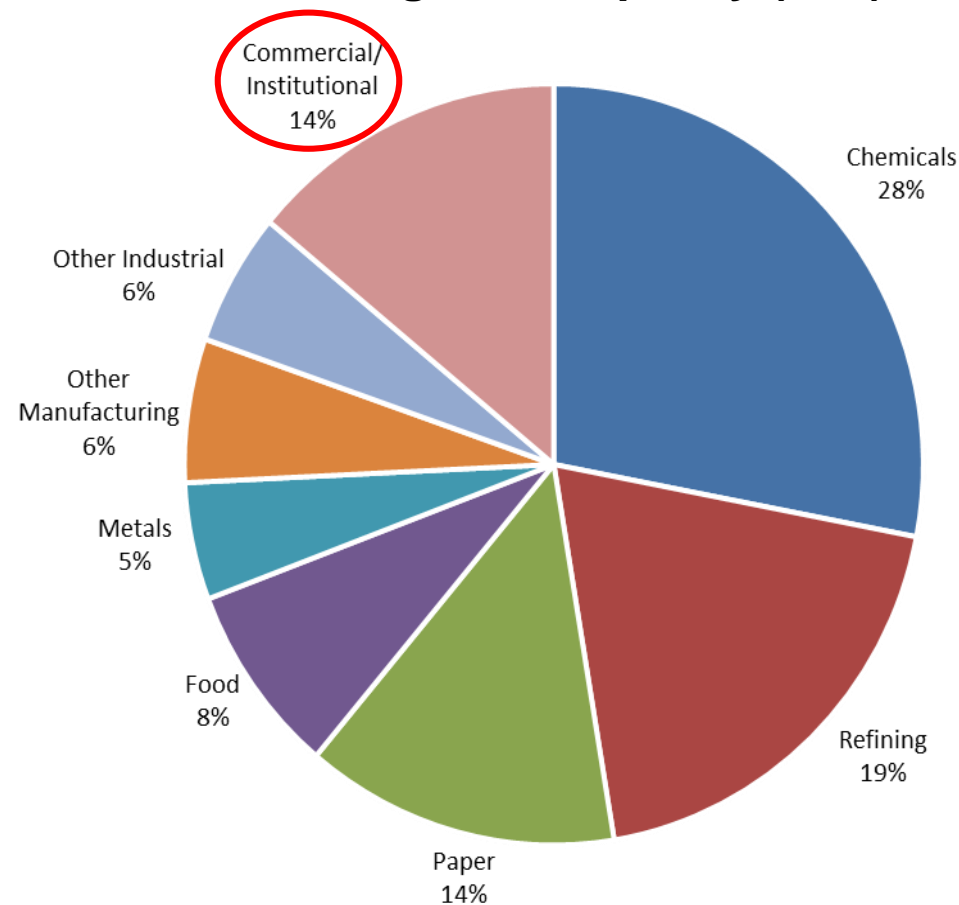


- Distributed generation
- Higher efficiency
- Lower cost
- Reliability & resiliency
- Flexibility
 - Mode of operation
 - Integration with renewables (microgrids)
 - Fuel
 - Scalability
 - Technology upgrades
- Sustainability (lower emissions)

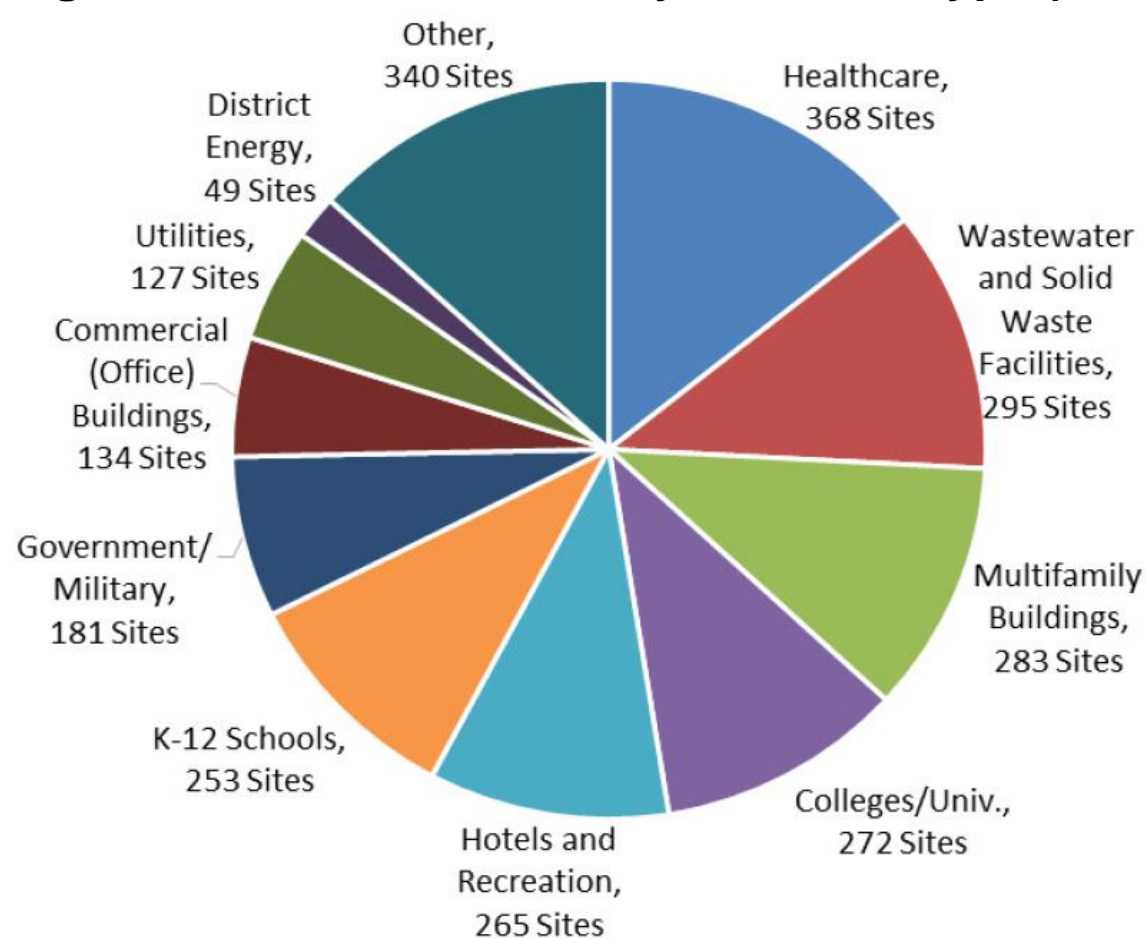
Source: DOE CHP Deployment Program, 2016



Existing CHP Capacity (MW)



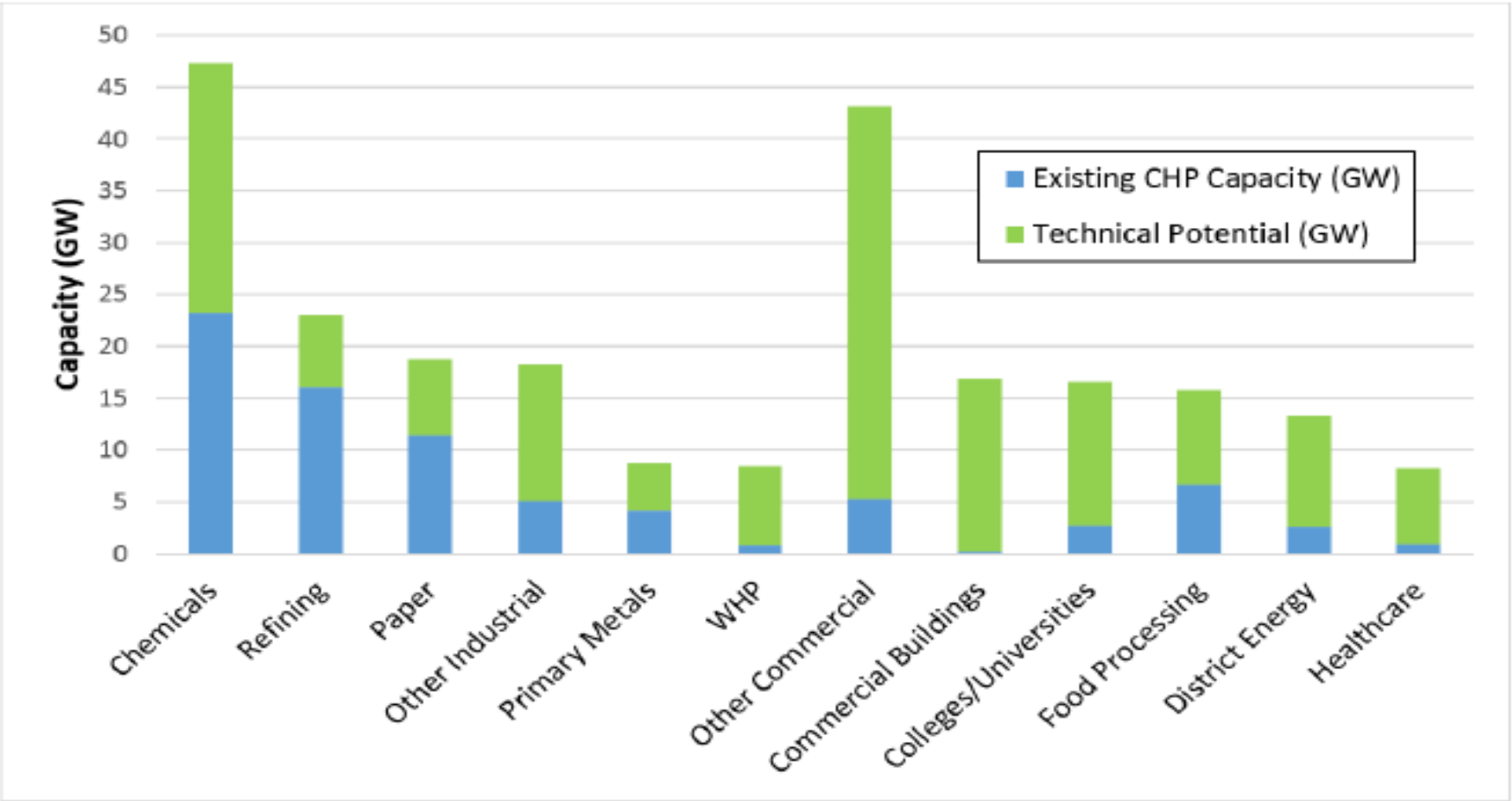
Existing Commercial CHP Sites by Business Type (2,567 sites)



Source: DOE CHP Installation Database (U.S. installations as of December 31, 2014)

CHP

Opportunity in the US



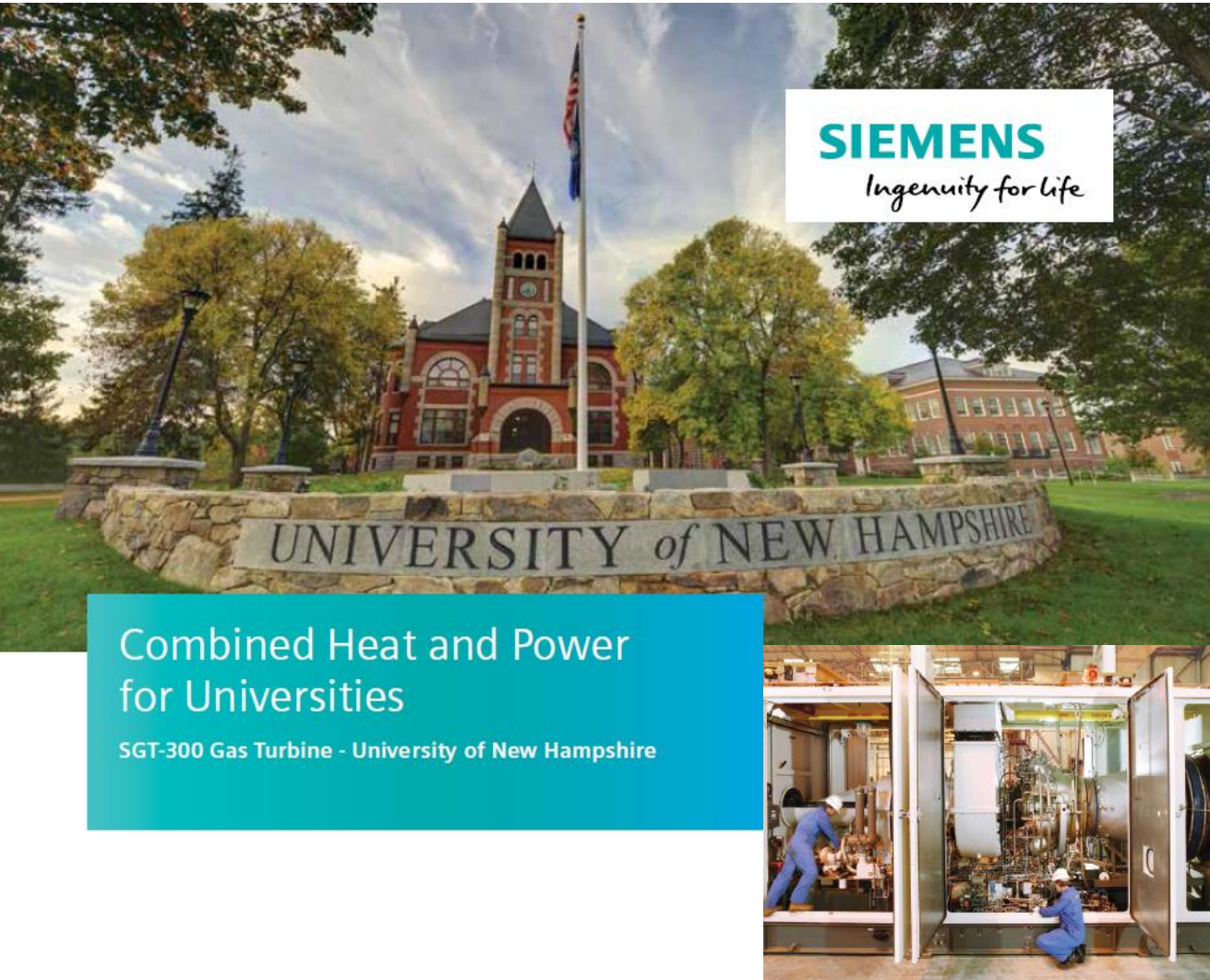
75+ GW
Technical Potential
of On-site
Commercial CHP

Source: DOE CHP Deployment Program, 2016

CHP examples and case-studies universities and campuses

University of New Hampshire CHP

Low emissions from landfill gas-to-energy project



Challenge	Solution
Process landfill gas as optional cost-effective renewable fuel	SGT-300 turbine can use natural gas, liquids and landfill gas fuels
Reduced emissions at university power gen site and at landfill.	Fuel flexibility allows use of low emissions fuel options with landfill gas.
CHP project delivers more than electric power	Up to 12MW of heating and cooling

7.8MW
electrical power output

99.02%
average availability
achieved

Wesleyan University CHP

Proven savings of \$1000/day



Challenge	Solution
Need for reliable source of power and heat	676 kW Guascor reciprocating engine
Lower power rates yet assure reliable source	CHP gas-fired solution integrated into a microgrid project saves \$1,000/day
CHP project maintenance a must	Siemens partner maintenance team access assured

676kW
reciprocating
engine is CHP
solution for
athletic facility

95%
availability
achieved

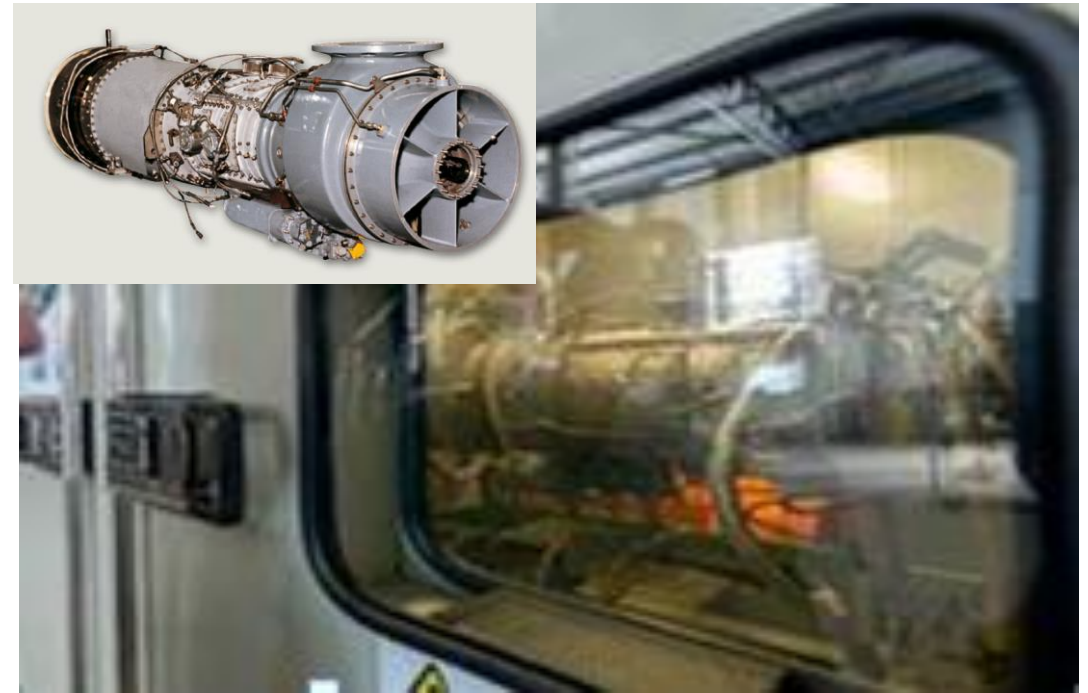
CHP projects in different commercial applications

Resiliency in critical facilities

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CHP plant at National Institutes of Health (Maryland, US)
SGT-600 Gas Turbine
23 MW(e) and heat requirements on campus



CHP plant Foster Hill Health Campus (Scotland)
501-KB7 Gas Turbine
5.2 MW(e) and heat requirements on campus

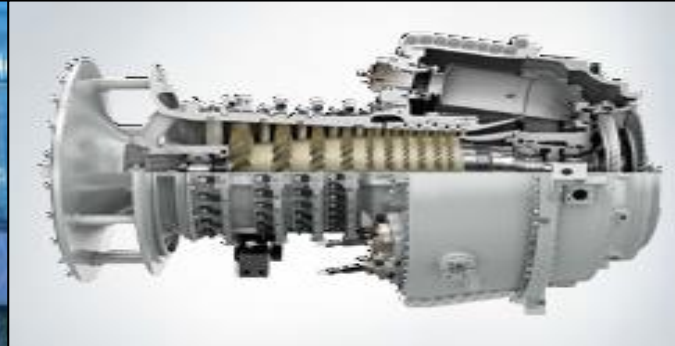
CHP projects in different commercial applications

Proven availability & reliability

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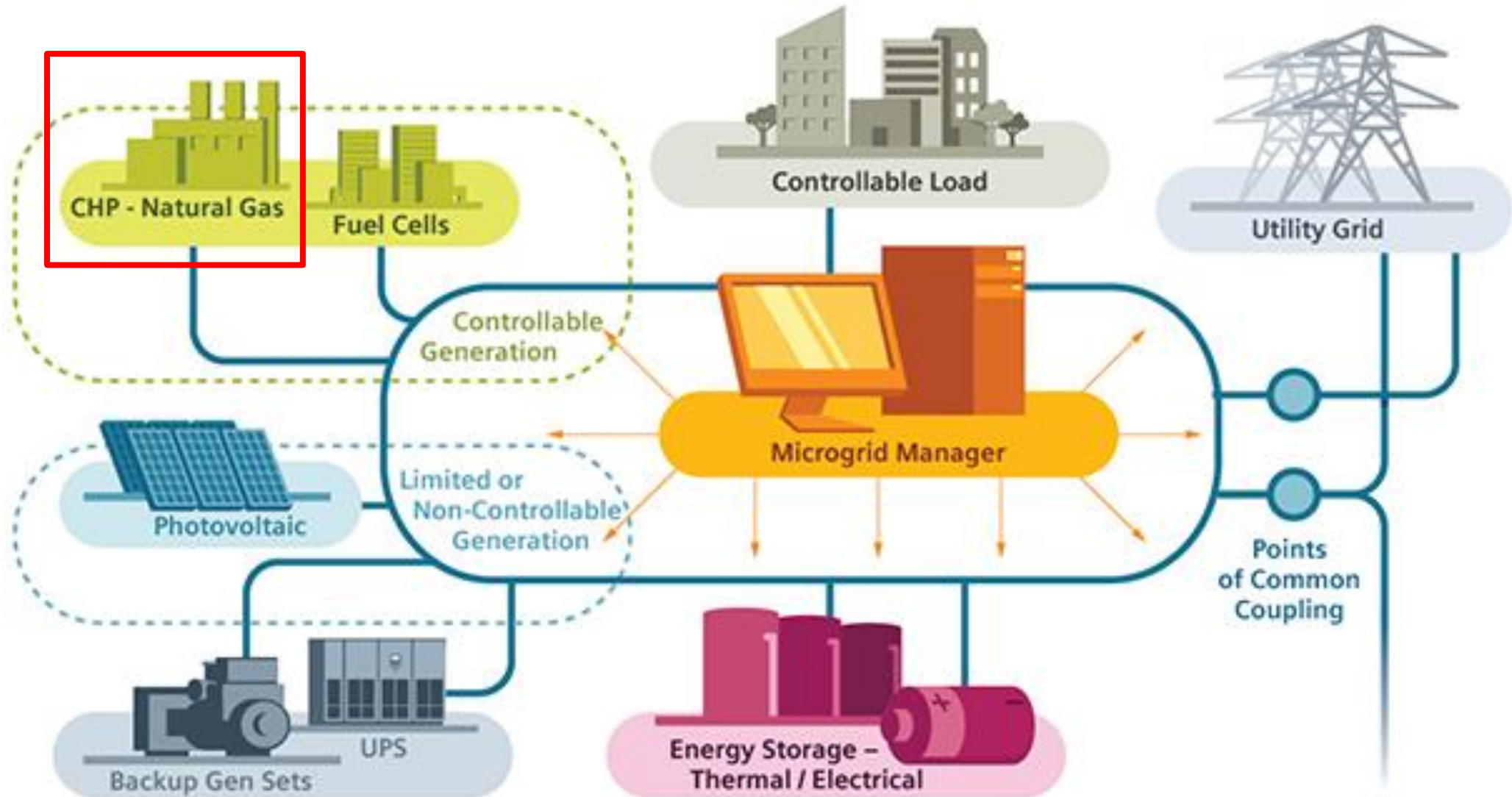


CHP plant at BBC Television Centre (London, UK)
SGT-100 Gas Turbine
5 MW(e) and steam for heating, hot water, & chilling



CHP plant at BolognaFiere Exhibition Center (Italy)
SGT-100 Gas Turbine
4.7 MW(e) and steam for heating and air conditioning

CHP – the anchor of the microgrid



CHP key selection criteria

CHP Projects: Key Selection Criteria

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- Meeting thermal and power load requirements
- Reducing energy costs
- Availability and reliability
- Lower emissions
- Fuel flexibility
- Enhanced control
- Financing solutions
- Life-cycle support



- Combined Heat & Power offers a significant opportunity for different commercial/institutional applications based on proven technologies
- CHP is the anchor of microgrids and serves a critical role in integrating with renewables and providing a clean energy solution
- Understanding the key selection criteria in advance is crucial to designing and building an efficient flexible CHP project

Questions?

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[Distributed Energy Systems](#)