

West Campus Cogeneration Facility

Technology

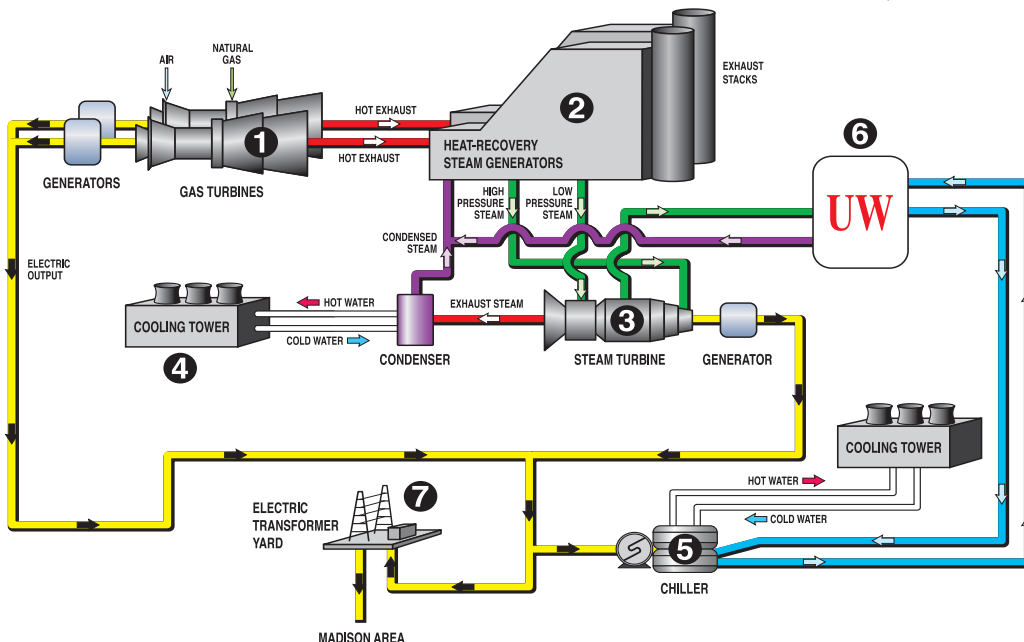
The West Campus Cogeneration Facility provides reliable heating and cooling for the UW-Madison campus and electricity for MGE customers. The facility, which began commercial operation in spring 2005, can produce 150 megawatts of electricity, 20,000 tons of chilled water and 500,000 lb/hr of steam.

The natural gas-fired plant is one of the cleanest in the Midwest. MGE worked with community members to take steps beyond current environmental regulations. Through innovative mitigation measures, MGE is off-setting air emissions and water use from the power facility.

How the facility will operate

1. Two natural gas-fired combustion turbines drive generators to produce electricity.
2. The hot combustion gases from each turbine pass through a corresponding heat-recovery steam generator (HRSG) to produce steam. The HRSGs also have duct burners to produce additional steam as needed.
3. The high- and low-pressure steam from the HRSGs pass through a single extracting/condensing steam turbine that can send steam heat to the UW and produce electricity for the Madison area.
4. The exhaust steam is sent to a condenser and then cooled by cooling towers. This process forms water that is then reused.
5. Centrifugal chillers provide 20,000 tons of chilled water capacity. Electric-driven chillers use roof-mounted cooling towers for heat rejection. The plant can accommodate 30,000 additional tons of chilling capacity in the future.
6. The steam heat and chilled water is used on the UW-Madison campus.
7. The electricity is sent to a substation and then to the Madison area.

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Environmental aspects

By partnering on a single power plant to meet multiple needs, MGE and UW-Madison achieved efficiencies in fuel, land and water use.

- **Efficiency:** The facility's overall net efficiency in cogeneration mode will be 70% compared to a 30% to 35% rate for a conventional power plant.
- **Nitrogen oxide (NO_x):** Emissions will be reduced by up to 150 tons per year or up to 80% compared to separate electric generation and heating/cooling facilities. Selective catalytic reduction units will keep NO_x emissions at 2.5 parts per million.
- **Carbon dioxide:** Emissions are reduced on average by 50,000 tons per year or approximately 15% less than separate electric generation and heating/cooling facilities.
- **Noise level:** The plant was built to meet a stringent local noise ordinance.
- **Cogeneration mode:** An average of 10% to 15% less natural gas will be used as compared to separate electric generation and heating/cooling facilities.

Capacity

Two combustion turbines: 50 MW gross each

Steam turbine: 68 MW gross

Net electrical capacity: 150 MW

Steam capacity: 400,000 lb/hr firm, 500,000 lb/hr gross

Chilled water capacity: 20,000 tons with provisions for an additional 30,000 tons

Expected life: 40 years

Components of the facility

- **Combustion turbine system:**
 - Two dual-fuel combustion turbines with electric generators
 - Two dual-pressure, duct-fired, HRSGS at maximum capacity of 250,000 lb/hr of steam per unit. Includes selective catalytic reduction units to keep NO_x emissions at 2.5 parts per million (when burning natural gas)
 - Two exhaust stacks
- **Steam turbine system:**
 - One dual-pressure, extracting/condensing steam turbine with electric generator
 - Seven draft-induced cooling tower cells with plume abatement technology
- **Chilled water system:**
 - Four electric-driven chillers at 5,000 tons of chilling capacity each
 - Four draft-induced cooling tower cells
- Two natural gas compressors
- Backup storage tank at 495,000 gallons for ultra-low sulfur distillate fuel
- Process water system with two 250,000-gallon tanks—one for raw service water and one for demineralized water

Dimensional data

Site: 4.5 acres

Facility footprint: 80,500 square feet

Maximum height: 116 feet

Two exhaust stacks: 175 feet

For more information:

- Visit www.mge.com.
- Direct any questions to Bob Stoffs, an MGE community services manager, at rstoifs@mge.com or (608) 252-7906.