Welcome to the IDEA Webinar Series

- The webinar will **start promptly at 3:00pm EST (Boston time) and is scheduled to last one (1) hour; including time for questions.**
- Please **mute your phone** during the webinar. All lines are muted.
- **Questions to Presenters**: Please enter your **Questions** in the **Q&A** box at the lower right of the screen. These questions will be moderated and addressed during **Q&A Segment** at conclusion of presentation.
- If you are having problems with video or audio, please send a note via the Chat Box function on the right side. Click the Chat box and choose – **"Chat privately to Cheryl Jacques (host)". Or call to IDEA at +1-508-366-9339.**
- **Survey on completion**: Please complete the brief on-line survey following the webinar.
- **Webinar Download or Streaming**: Webinar will be recorded and available via download or streaming. Slides will be made available in pdf format. Please visit **www.districtenergy.org.**

Thermal Energy Corporation

2019 IDEA SYSTEM OF THE YEAR AWARD WINNER

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BACKGROUND: IDEA System of the Year Award:

- Started in 1992
- Highest honor IDEA can convey on a member system
- Recognize exemplary performance and industry engagement

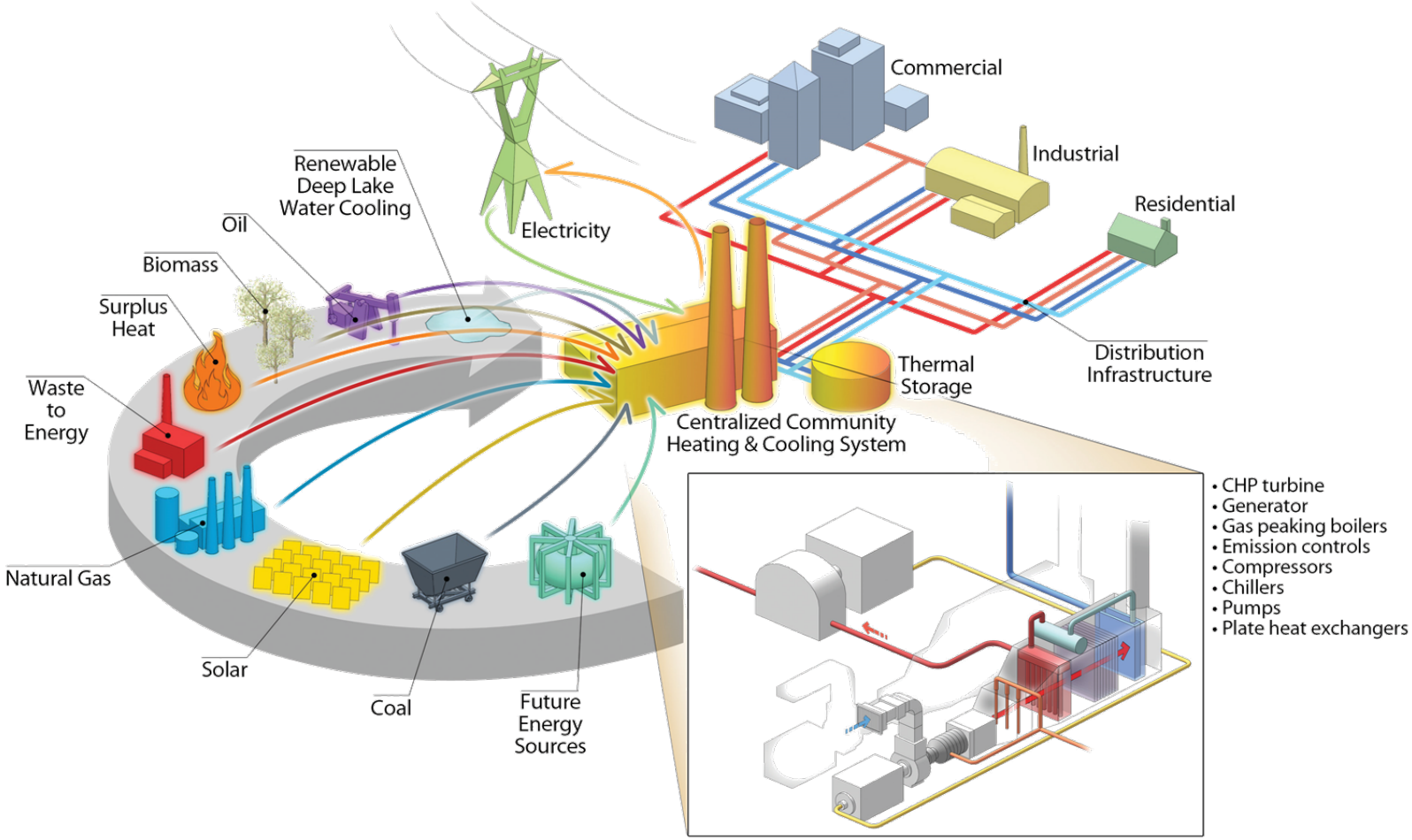
PURPOSE of AWARD:

- Industry benchmark for overall excellence
- Platform for sharing ideas and efforts that have made systems successful
- Recognize systems that illustrate value and importance of district energy systems relative to larger energy industry
- Publicize and educate on features and benefits of district energy systems

ELIGIBILITY:

- System must be a member in good standing of IDEA, or managed/operated by a member in good standing.
- System may be privately- or publicly owned.
- A university, military, corporate or healthcare campus, downtown utility, municipal, airport, community or government-owned entity serving three or more separate building facilities is eligible.
- The system must have been in continuous operation for at least two (2) or more years. Start of operation determined by date of continuous service to first customer or facility.

ELIGIBILITY For definition, a district energy system is comprised of a central plant or plants providing thermal energy and/or electricity to three or more buildings through a distribution network, and may incorporate technologies such as highly efficient heating and cooling, combined heat and power (CHP), waste energy recovery, deep lake water cooling, waste-to-energy, thermal energy storage, renewables, microgrids, and other related technologies.



CRITERIA

Systems are judged on the criteria below giving equal weight for each category:

1. **System Energy Efficiency**
2. **Reliability and Availability**
3. **Resiliency (the ability to restore operations promptly due to weather or other events)**
4. **Environmental Benefits & Carbon Footprint**
5. **Sustainability**
6. **Employee Safety & Training Programs**
7. **Customer Relations, Service Improvements, Communications & Marketing**
8. **Involvement in the Community and Professional Organizations**

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SPEAKERS

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Vice President, Operations for TECO

Ram Goonie, CEM
Energy Director for TECO

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2019 IDEA System of the Year

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- Began operations in 1969
- 100% reliability over the past 26 years
- Average 3,590 cooling degree-days
- $377 million energy-saving system expansion completed in 2011
- CHP startup in 2010 cut fossil fuel consumption by more than 60%, reduced CO_2 and total greenhouse gas emissions by 48%
- No service interruptions during any natural disaster

SYSTEM DESCRIPTION

- 120,170 Tons of chilled water capacity
- 980,000 PPH steam capacity
- 48 MW combined heat and power plant
- 16 MW of emergency power generation
- 8.8 million-gallons of chilled water TES tank
- 138-kV electric substation
- 35+ miles piping ranging from 6 to 60 inches in diameter

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TECO currently serves
50 buildings
16 different institutions
22.7 million sq. ft of space

TEXAS MEDICAL CENTER

10 million patients annually
110,000 employees
8th largest business district in U.S.
180,000+ surgeries annually
10,500 patient beds
$2.5 billion in annual life science research

TECO Customer Institutions:

- Baylor College of Medicine
- CHI St. Luke's Health
- Harris County
- Harris Health System Ben Taub Hospital (Level 1 trauma center)
- Houston Community College
- Houston Independent School District
- Houston Methodist Hospital
- Memorial Hermann Hospital System (Level 1 trauma center)
- Shriner's Children Hospital
- Texas A&M University
- Texas Children's Hospital
- Texas Medical Center
- Texas Woman's University
- The University of Houston
- The University of Texas MD Anderson Cancer Center
- The University of Texas Health Science Center at Houston

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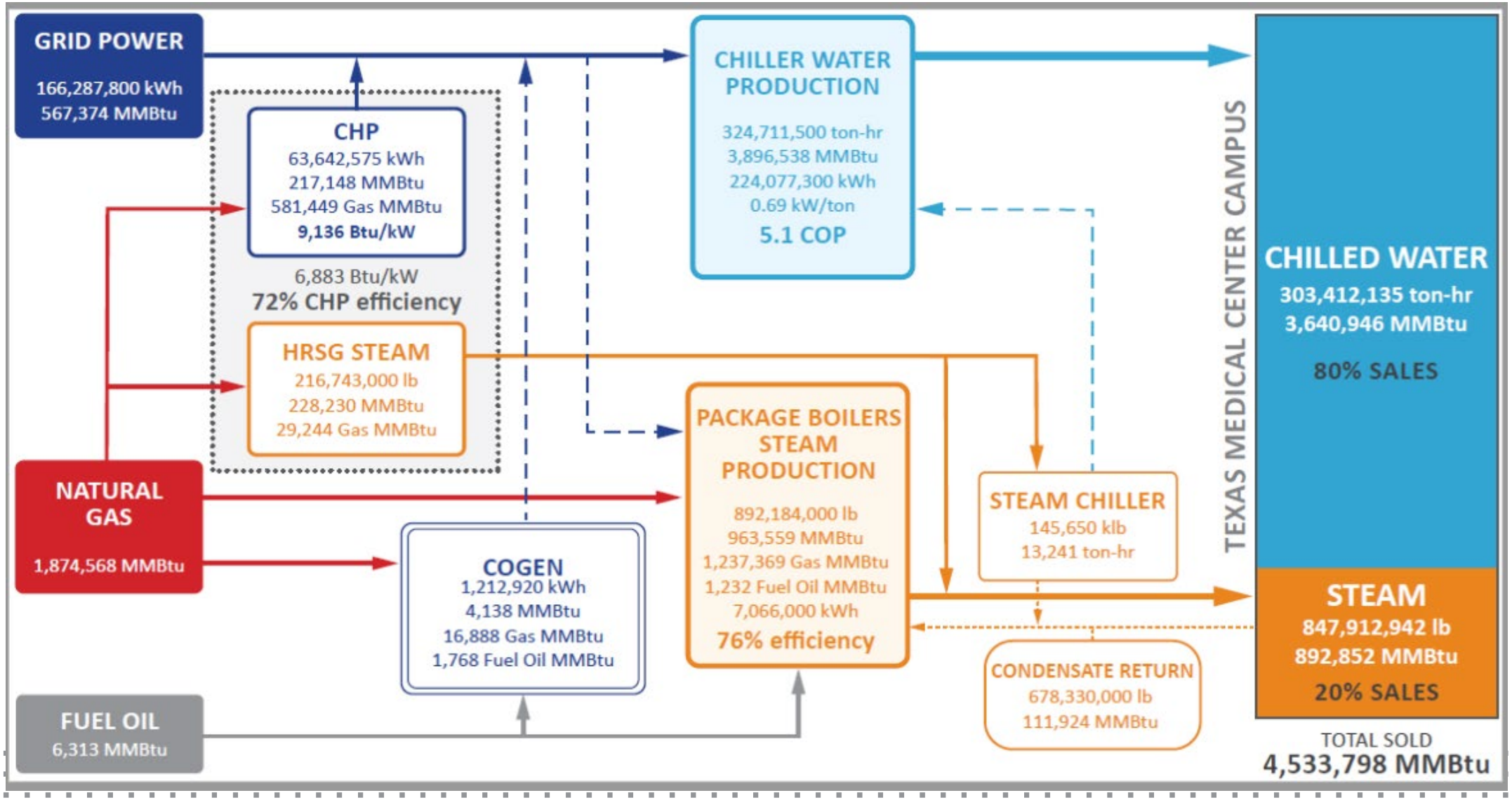
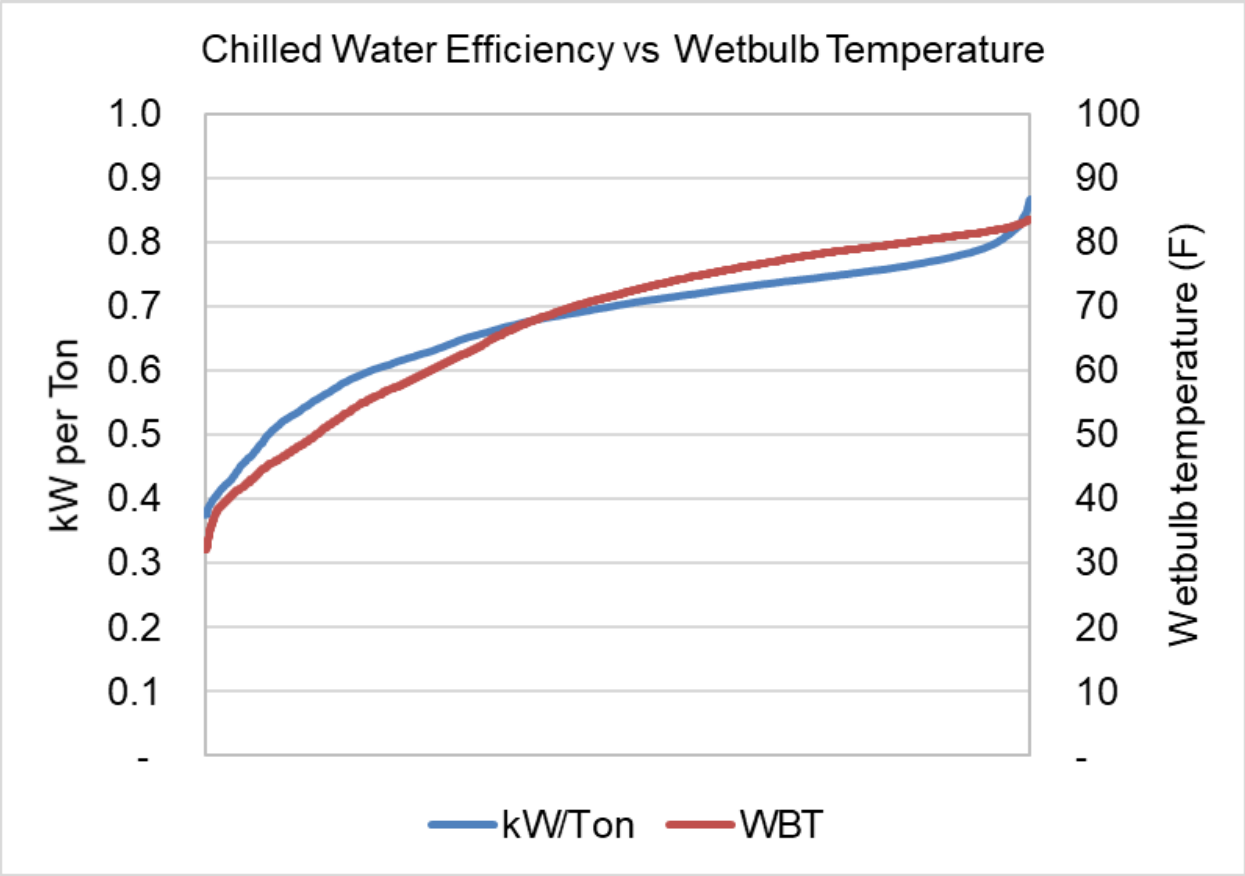
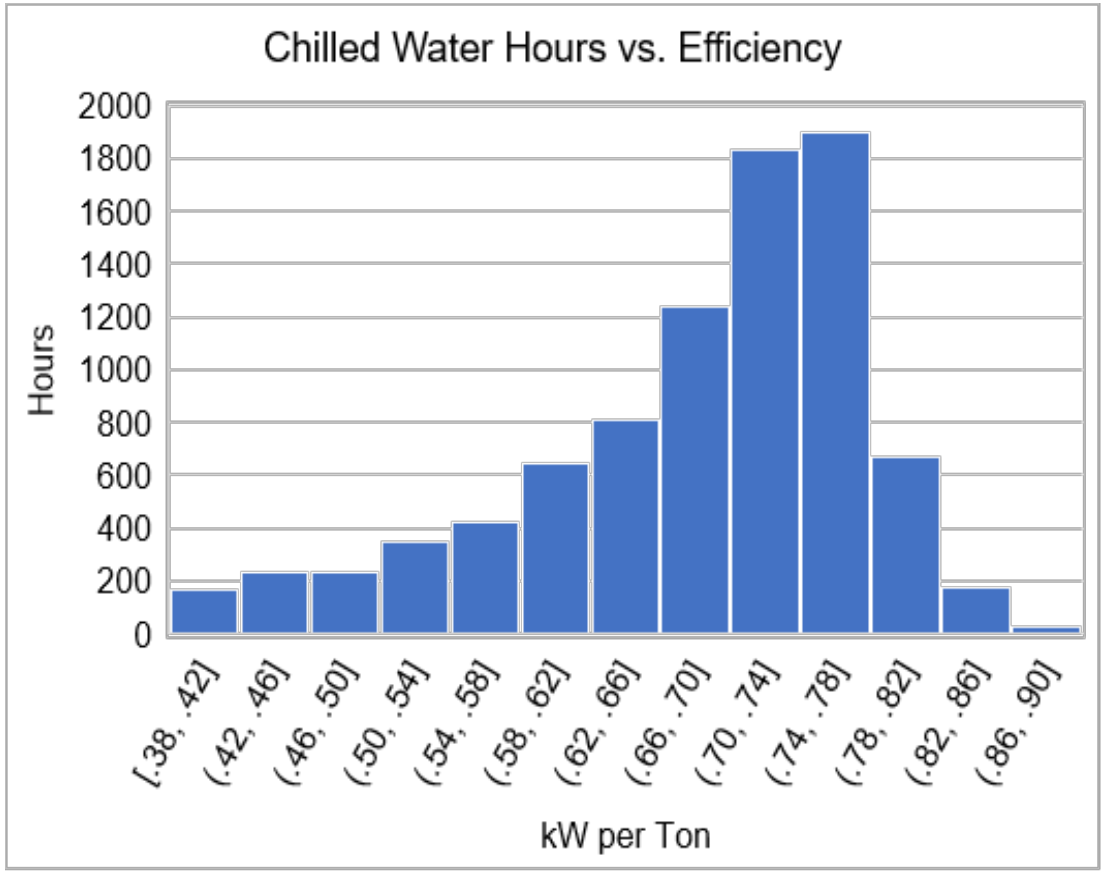
DEMONSTRATED EFFICIENCY



CHILLED WATER PRODUCTION EFFICIENCIES





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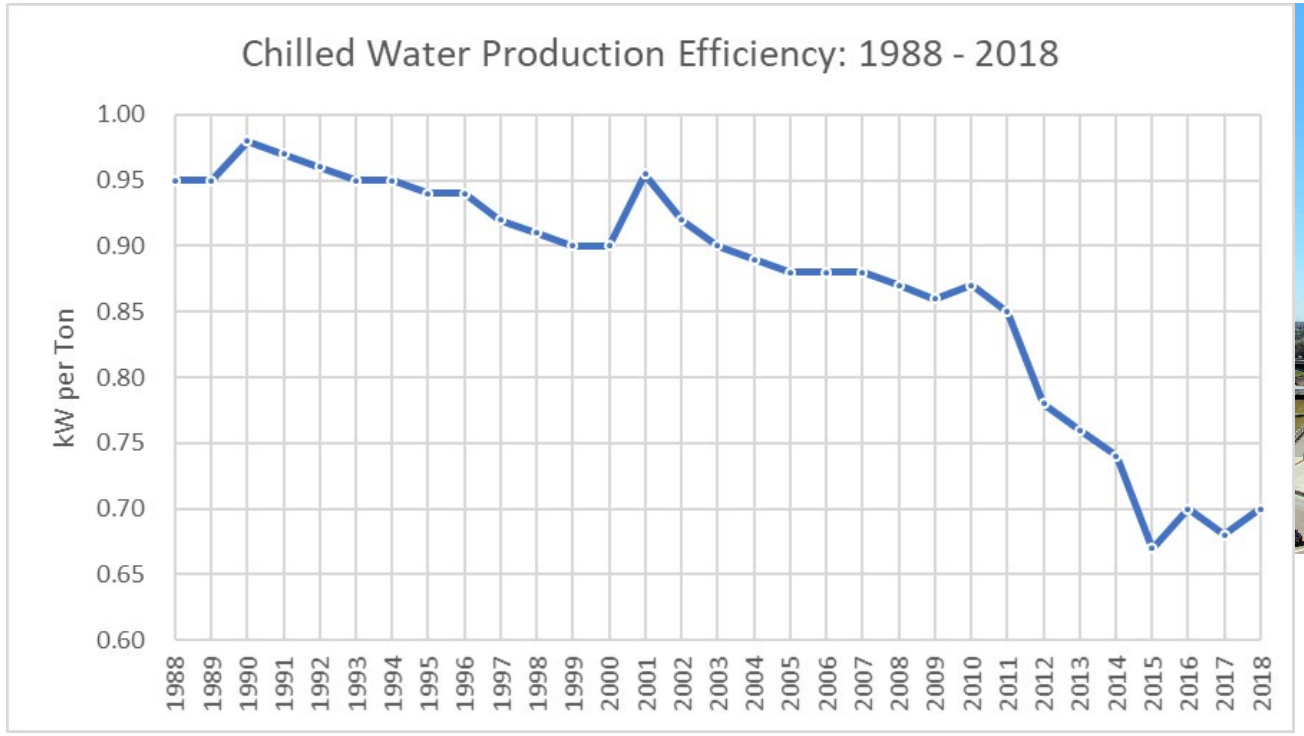
- TECO has steadily improved the chilled water production efficiency by reducing the kW per Ton over the last 30 years.
- The most notable improvement was after the installation of the variable speed chillers, pumps and cooling tower fan motors and an energy optimization system after 2011.

- Thermal Energy Storage (TES) tank has a capacity of 8.8 million-gallons/75,000 ton-hours of chilled water.
- The key benefits of the TES helps provide system reliability and energy cost on chilled water production.



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COMBINED HEAT AND POWER PLANT (CHP)

- 48 megawatts of power capacity
- 330,000 PPH steam capacity
- Simple cycle heat rate - 9,136 Btu/kWh
- Combined cycle heat rate - 6,883 Btu/kWh
- Unit efficiency – 72%

- The CHP unit provides the reliability of our power source to assure un-interrupted thermal services to our customers in the Medical Center.
- It also provides benefits during times of distress on the local power grid that offsets the overall fuel cost.

DEMONSTRATED RELIABILITY

- TECO has demonstrated reliability over the past decades with 100% system reliability. No unplanned outages since 1992.
- Maintains 13% - 15% redundant equipment above peak demand.
- Looped interconnected distribution system.
- 64 MW of internal power generation with black start capability.
- 10 k-tons of steam driven chillers.
- Robust electrical system standards.
  - Ring bus system with fast-acting protection relays.
  - 138 kV transmission power with multiple feeds.
  - 4 kV stepdown transformers and breakers with protection system.
- 8.8 million gallon chilled water storage tank.
- Floodwall and flood gates design to withstand a 500- year flood plus 3 ft. around the Plant with 43 k-gallons of portable pumps for de-watering inside the floodwall.
- Distribution construction quality control.
- Load shed plan with annual testing to meet the critical needs if production were to be compromised.
- Major Equipment Replacement Program (MERP) guarantees funding for large equipment replacement.
- Predictive and preventive maintenance program.
- Multiple water wells that will handle 100% of the water needs if the municipal water supply was interrupted.
- Redundant air supply.
- Cyber security.

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RESILIENCY

TECO is no stranger to natural disasters. It endured Hurricane Alicia in 1983; Tropical storm Allison in 2001; Hurricane Rita in 2005; Hurricane Ike in 2011; and Hurricane Harvey, a category 4 storm in 2017. In every instance with careful planning, engineering and investments, TECO maintained 100% of chilled water and steam requirements to its customers.

PLANNING FOR THE WORST

- TECO has an emergency preparedness plan that addresses natural and manmade disasters that conducts monthly, quarterly and annual training and drills.
- TECO's plan details individual responsibilities plus the size, composition and care of a "ride out team" and is committed to sheltering 35 employees in place for 7 days.
- Plan includes recipes and shopping list for healthy meals and procedures to ensure that the proper plant and personal protection equipment, nonperishable food and bedding with hygiene items are on site.
- After each event, TECO conducts debriefing sessions to fortify company's plans and procedures.
  - In 1983 TECO added an onsite water well as a secondary source for water after the primary municipal district water supply pressure dropped during hurricane Alicia.
  - In 2001 Tropical storm Allison dropped 36 inches of rain in the area with a trickle of water into the plant. TECO followed up with a project to add the flood wall around the plant.

ENVIRONMENTAL BENEFITS

- TECO is committed to sustainable growth which has improved from severe nonattainment status for ozone in 2008 to marginal nonattainment for 8-hours ozone in 2018 with an attainment deadline of 2021.
- TECO benefits the area by keeping approximately 42,000 tons of greenhouse gasses out of the air annually.
  - TECO's CHP unit has helped to doubled its annual operating efficiency and cut fossil fuel consumption by more than 60% compared to conventional electric generation and heat only system.
  - Reduced annual tons of NOx by more than 90% and reduces CO2 and total greenhouse gas emissions by 48%.

- Emission Controls
  - TECO primarily uses natural gas with low-NOx burners and selective catalytic reduction technology to minimize emissions.
  - Only ultra-low sulfur diesel fuel is used to test diesel-fired back up boilers and emergency generators.
  - Refrigerant leak detection system in chiller plant. Recycles and reuses its own refrigerant.
  - Asbestos management – all asbestos was eliminated in the 80's.
  - Chemical Management and recycling that helps to minimize the use and disposal of hazardous chemicals within the community.

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SUSTAINABILITY

- TECO is a true partner with its customers and the local community.
  - Waterwise program in Harris/Galveston County Subsidence District is an award-winning educational program dedicated to teaching children in third through sixth grades how to protect and conserve precious freshwater resources.
  - TECO fund approximately 2,600 students kit a year in exchange for receiving water credits worth 84,000 gallon of groundwater.
- Braes Bayou Discharge Optimization – TECO is permitted to discharge treated wastewater such as cooling tower blowdown and boiler blowdown into the Braes bayou outfall with strict guidelines and is also monitored by agencies from the City, State and Federal water quality standards.
- Inhouse Sustainability-Trained Team Members such as LEED Certified Engineers, Professional Engineers, Certified Energy Managers, Business Energy Professionals, Environmental Health and Safety Professionals.

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EMPLOYEE SAFETY AND TRAINING

- Safety is a top priority at TECO. Employees embraces a safety culture and is rewarded for safe behavior that reflects its successful record.
- TECO conducts monthly safety training, meetings, safe action suggestions, Industrial safety programs, worksite safety zones and emergency coordination.
- In-house Environmental Health and Safety personnel.
- TECO has an extensive Training and Certification Program in-house that aims for continuous improvements and by investing in employee's higher education with reimbursing education cost.
- TECO have also invested into training classrooms with the latest equipment and tools for training. A fulltime Training Manager oversee and provide the in-house training.

QUESTIONS?

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PREVIOUS SOYA WINNERS

2019 Thermal Energy Corporation, Houston, TX
2018 University of Texas at Austin, Austin, TX
2017 University of Missouri Columbia, Missouri
2016 City of Richmond, British Columbia
2015 Veolia Energy Boston, Massachusetts
2014 Qatar Cool, Doha, Qatar
2013 Markham District Energy, Markham, ON
2012 Qatar Cool, Doha, Qatar
2011 Enwave Energy Corporation, Toronto, ON
2010 District Energy St. Paul, St. Paul, MN
2009 SOYA Not Awarded, All Recognized – IDEA Centennial Conference
2008 NRG Energy Center Phoenix, Arizona
2007 Consolidated Edison, New York, NY
2006 Metro Nashville District Energy/Constellation Energy Projects & Services Group
2005 University of Cincinnati, Ohio
2004 University of Missouri Columbia, Missouri
2003 Seattle Steam Company, Washington
2001 Cornell University, Ithaca, NY
2000 Consolidated Edison, New York, NY
1999 Enwave Energy Corporation, Toronto, ON
1998 Trigen Baltimore Energy Corporation, Maryland
1997 University of California - Los Angeles, CA
1996 NRG Energy Center Minneapolis, MN
1994 Energy Systems Company, Omaha, NB
1993 District Energy St. Paul, St. Paul, MN

https://www.districtenergy.org/system-year-award

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Thank You

- **Please complete a brief survey to follow.**
- **All participants will receive e-mail with information on access to presentation.**
- **Webinar slides will be available in pdf format and entire webinar is recorded as streaming content.**
- **Member systems are encouraged to submit for the 2020 IDEA System of the Year. Please visit here –** https://www.districtenergy.org/membership-services/awards-scholarships/system-year-award

INTERNATIONAL DISTRICT ENERGY ASSOCIATION