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INDUSTRIES IN HOT WATER:

INNOVATIVE TECHNOLOGIES TO ADDRESS RISING ENERGY COSTS THROUGH RENEWABLE COMBINED HEAT AND POWER

BY EMILY NORCROSS, FOUNDER AND CEO, GREEN CHP

Hot water is a fundamental component of operations for a diverse set of industries, such as food and beverage processing, commercial laundry, hospitality, healthcare, and manufacturing. In these sectors, hot water is used for cleaning, sanitization, and can be a fundamental component of the production process, making it a non-negotiable part of daily business. Despite its critical role, most companies are unaware of the exact cost of generating and using hot water.

According to the U.S. Department of Energy, commercial and industrial facilities use more than 50 billion gallons of hot water annually. Some industries, such as food processing and healthcare, can attribute as much as 25% to 30% of their total energy consumption directly to hot water generation and heating. The U.S. Environmental Protection Agency (EPA) reports that up to 70% of the total water consumption in a food processing facility is heated, driving significant energy use.

Despite its importance, companies rarely have a clear understanding of their hot water costs because these expenses are spread across various utility bills and cost centers. Electricity and gas bills lump the energy used for water heating with other consumption, water bills show total usage without indicating how much was heated, and steam systems mix costs for heating and production. Additionally, hidden heat losses from inefficient equipment and distribution lines further blur the true cost, making it difficult for companies to pinpoint inefficiencies and optimize usage.

The Business Impact of Hidden Hot Water Costs

The U.S. Energy Information Administration (EIA) reported a 15% increase in average industrial electricity rates over the past three years, and projections suggest that this trend will continue, particularly in states like California, New York, and Texas.

For businesses in energy-intensive industries, these increases can translate into millions of dollars in additional operating costs. For example, in California, industrial electricity prices are among the highest in the country, averaging $0.15 per kWh compared to a national average of $0.075 per kWh. Natural gas prices have similarly surged, making it more expensive to run gas-fired water heaters and boilers.

Natural gas prices in the U.S. are projected to increase throughout 2024 and 2025 due to increased demand and supply issues, with the average price expected to approach $3.00 per million BTUs (MMBtu). This trend includes an 11% rise in natural gas consumption for electricity generation, while industrial usage is expected to see only slight decreases.

If these trends persist, commercial and industrial companies will face growing pressure to find cost-effective ways to manage and optimize their energy usage, particularly for hot water and heating needs.

RENEWABLE COMBINED HEAT AND POWER: A STRATEGY FOR OPTIMIZATION

When it comes to optimizing hot water and heating, new technologies are paving the way for significant advancements. Among the most promising is Photovoltaic-Thermal (PVT) technology, which combines traditional photovoltaic (PV) and thermal systems into a single, high-efficiency panel.

Traditional Combined Heat and Power (CHP) systems, also known as cogeneration systems, have long been used to generate both electricity and heat from a single energy source like natural gas, diesel, or coal. These systems work by producing electricity and capturing the waste heat from the generation process for heating purposes. While this approach is more efficient than generating power and heat separately, it has several downsides. Most traditional CHP systems rely on fossil fuels, leading to carbon emissions that conflict with sustainability goals. They also come with high upfront costs due to the need for specialized equipment like gas turbines and extensive piping. Additionally, the moving parts and complex components of these systems mean higher maintenance requirements and operational complexities.

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In contrast, Renewable CHP systems using integrated Photovoltaic-Thermal (PVT) technology represent a cleaner, more efficient alternative. Instead of using fossil fuels, PVT panels harness sunlight to simultaneously generate electricity and capture thermal energy, offering the same dual benefits as traditional CHP but with zero emissions. This results in lower maintenance costs and reduced complexity, as PVT systems have no moving parts. Moreover, they are modular and scalable, making it easy to adapt them to changing energy needs, whether installed on rooftops or integrated into larger industrial setups. Traditional CHP systems struggle to capture the full value of the heat they generate, especially when demand fluctuates. PVT panels ensure nearly all the captured thermal energy is either used or stored efficiently, maximizing the overall energy yield.

PVT as Part of a Comprehensive Decarbonization Strategy

Incorporating PVT panels into a broader energy strategy is not just about improving efficiency—it's about laying the foundation for a zero-emission future. By pairing PVT technology with other advanced systems such as energy storage, heat pumps, and smart controls, companies can build a holistic energy solution that maximizes renewable energy use and minimizes fossil fuel dependence.

The current Investment Tax Credit (ITC) and Production Tax Credit (PTC) under sections 48 and 45 of the tax code are set to expire for projects that do not commence construction before December 31, 2024. This deadline is crucial for companies planning to leverage these credits as part of their energy strategies. After this date, the existing credits will be replaced by the new Clean Electricity Production Credit (section 45Y) and the Clean Electricity Investment Credit (section 48E) established by the Inflation Reduction Act. These new credits will apply to projects placed in service from 2025 onwards and are more technology-neutral, providing incentives for facilities that achieve net-zero emissions. But the future is uncertain.

For companies looking to invest in PVT systems, acting now to secure the full 30% ITC could significantly enhance the financial viability of their projects. Waiting until 2025 may result in reduced incentives and a longer payback period, as the eligibility criteria and value of the new credits might differ. Thus, initiating construction before the end of 2024 is critical to capture the most favorable tax benefits.

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2025 NATIONAL HOT WATER STUDY

To address the lack of visibility and understanding of hot water costs by industry, Green CHP has partnered with Columbia University's Climate School on a groundbreaking National Hot Water Study, which aims to benchmark hot water costs by industry in the United States.

The study will include a comprehensive quantitative and qualitative analysis, including detailed evaluations of utility bills, operational data, and best practices. By focusing on sectors such as food and beverage, dairy processing, corrections, nursing homes, manufacturing, and healthcare, the study will deliver industry-specific benchmarks, actionable insights, and sustainable management practices aimed at reducing hot water costs and enhancing overall efficiency.

The study will commence in January 2025 with a detailed report expected to publish by Fall 2025.

A CALL TO ACTION FOR ESCOS AND INDUSTRIAL LEADERS

The integration of PVT technology into renewable CHP systems represents a revolutionary shift in how companies approach energy management. By capturing both power and heat in a single, high-efficiency solution, PVT panels provide an elegant and sustainable alternative to traditional CHP. For companies looking to optimize their energy use, reduce costs, and meet ambitious sustainability goals, PVT systems are poised to play a transformative role in the U.S. energy landscape.

Historically, ESCOs have focused on delivering energy savings through lighting retrofits, HVAC optimizations, and building automation. However, there is a significant opportunity for ESCOs to expand their services by addressing inefficiencies in hot water and heat usage—areas that are often overlooked but can represent up to 40% of a facility's total energy consumption.

By taking a more holistic approach, ESCOs can help clients design and implement integrated solutions that optimize the use of hot water, reduce waste heat, and leverage renewable energy technologies. This could involve conducting detailed energy audits to identify the specific hot water usage patterns and inefficiencies within a facility, deploying monitoring systems for real-time tracking, and recommending technologies that can maximize overall system efficiency.

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Emily Norcross is founder and CEO of Green CHP, a renewable energy and data company that integrates advanced combined heat and power systems with real-time data services, enabling businesses and communities that depend on hot water to reduce energy costs, meet sustainability goals, and drive AI and machine learning applications for optimized performance and efficiency.

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