



## Steam to Natural Gas Conversion Renaissance Baltimore Harborplace

### Project Overview

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From November 2017 through June 2018, the Renaissance Baltimore Harborplace in Baltimore (“Property”), Maryland converted the heating and domestic water systems from city-steam to in-house natural gas boilers. The Property includes 622 guestrooms, 21 meeting rooms, restaurant, fitness center and ground floor lobby with a bar. This conversion impacted several back-of-house systems such as the space heating, domestic water heating, kitchen dish machines, and kitchen steam kettles. Prior to the conversion, natural gas was only used in the Property’s kitchen. The conversion was done to increase energy efficiency and reduce carbon emissions and energy costs; an additional benefit of the conversion was a reduction in water consumption and costs.

Buildings using steam-heating systems require significant amounts of utilities to run their systems which likely result in increased energy consumption, energy costs, and carbon emissions. In addition to increased energy consumption, steam-heating systems consume an

amplified amount of water to cool the residual hot water in flash tanks after the steam process. These flash tank processes are required before the residual water can be returned into the water drains. Other negative impacts of a steam-heating system include increased heat loss, building damage from cracked concrete near system pipes, increased floor space requirements in maintenance areas for the large equipment, and additional labor costs due to necessary in-person monitoring.

During the steam to natural gas conversion, the Property installed natural gas equipment by using the existing basement gas infrastructure and installing new natural gas lines up from the basement level to the sixth floor. The Property installed six new natural gas boiler tanks encompassing three for domestic hot water and three for heating hot water and eliminated one 1500-gallon domestic hot water tank. The contractors and Property employees took specific safety measures, including ensuring shields were used during welding to prevent injury during installation. Additionally, a new meter was installed to measure natural gas usage.

## Environmental and Financial Benefits

The initial project analysis and underwriting began in 2015. The due diligence phase determined that the total investment needed to complete the conversion was \$2.1 million. Following project due diligence, the on-site conversion began in November 2017 and was fully completed by June 2018. Upon completion of the conversion, the Property began measuring their first year's energy, carbon emissions, and cost reductions.

On an annual basis prior to the conversion, the Property's operating systems used approximately 8.7 million kWh of steam and annual steam expense of approximately \$600,000. In the first year following the conversion, the Property reduced energy consumption by approximately 7%, carbon emissions by 13% kg CO<sub>2</sub>e, and energy costs by approximately 29%.

| Annual Environmental and Financial Savings <sup>1</sup> |        |
|---|--------|
| Energy Cost   | -29.3% |
| Energy Usage Savings                                    | -6.6%  |
| Carbon Emissions Reduction                              | -12.7% |
| Water Usage Savings                                     | -19.6% |

## Project Challenges and Opportunities

**Large Capital Investment:** A city-steam source change to an in-house boiler plant requires an up-front large capital investment. This investment may vary based on the size of the hotel and the current building systems quality and infrastructure. The payback period for steam conversion projects are also not immediate, with a typical payback period of approximately five to six years.

**Long-term Energy Savings and Cost Reduction:** A city-steam to an in-house boiler plant conversion will result in long-term benefits for a hotel property including decreased energy consumption, utility costs, and carbon emissions. From an expense perspective, the Property simultaneously reduced utility costs and increased their ability to forecast future utility expenses as they are now able to purchase natural gas ahead of time. Prior to the conversion, the Property was subject to fuel adjustment rates, which resulted in a different steam rate every month. The conversion can also result in a secondary benefit, particularly additional water savings for the property. For the Property, the water savings was most significant in the winter months.

During the month when steam data was officially phased out, energy consumption was slightly higher. Energy savings are expected to be more significant during subsequent years following the complete installation of the natural gas system.

**Equipment:** The conversion resulted in floor area savings for the Property as the new natural gas boiler system consists of compact units that do not require steam traps or Heat Exchangers. Prior to a conversion, it is recommended that a property and contractor research equipment types and brands to ensure proper brand selection and equipment connections, future low maintenance requirements, and a partnership for a successful conversion. Space previously used for steam equipment can be converted into additional storage space for the maintenance department.

<sup>1</sup> Environmental and financial savings represent 1-year of data following the complete installation of the new natural gas system (July 2018 – June 2019). Metrics were not normalized for weather or occupancy.

In the months following the conversion, the Property's Director of Engineering continued to monitor the system through unit modules. The Property did encounter boiler failures following the installation of the system due to negative pressure in the boiler room. As a solution, the property installed an additional combustion fans within the maintenance room.



1 Domestic Hot Water Tanks



2 Old Steam System Hot Water Tanks

**Maintenance and Labor:** A new natural gas boiler system may result in decreased maintenance and labor expenses compared to a steam heating system. The steam heating systems required constant manual temperature monitoring, resulting in increased labor costs from the system monitoring needs. Newer natural gas systems require less manual monitoring, as most new units contain automated modules to monitor the equipment more efficiently. The Property found this to be a benefit, as building engineers have been able to reallocate their time to more pressing needs and better preventative maintenance measures.



3 New Natural Gas Boils



4 Previous Steam Heat Exchangers

**Safety:** Steam heating systems can create safety hazards, as hot pipes can burn maintenance and service personnel who access the areas the hot pipes were located. Natural gas heating systems avoid the use of hot pipes throughout a building.