

# Free Cooling & Other HVAC Opportunities

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# Main Take-Away

- Easy HVAC savings opportunities may exist with existing equipment.
  - Make sure your mechanical and controls equipment is operating per design and best practice.
- Sometimes good opportunities can be more complex.
  - Eversource and engineering firms are great resources to identify creative savings opportunities.



# Simple Opportunity: Taj Boston Hotel Free Cooling



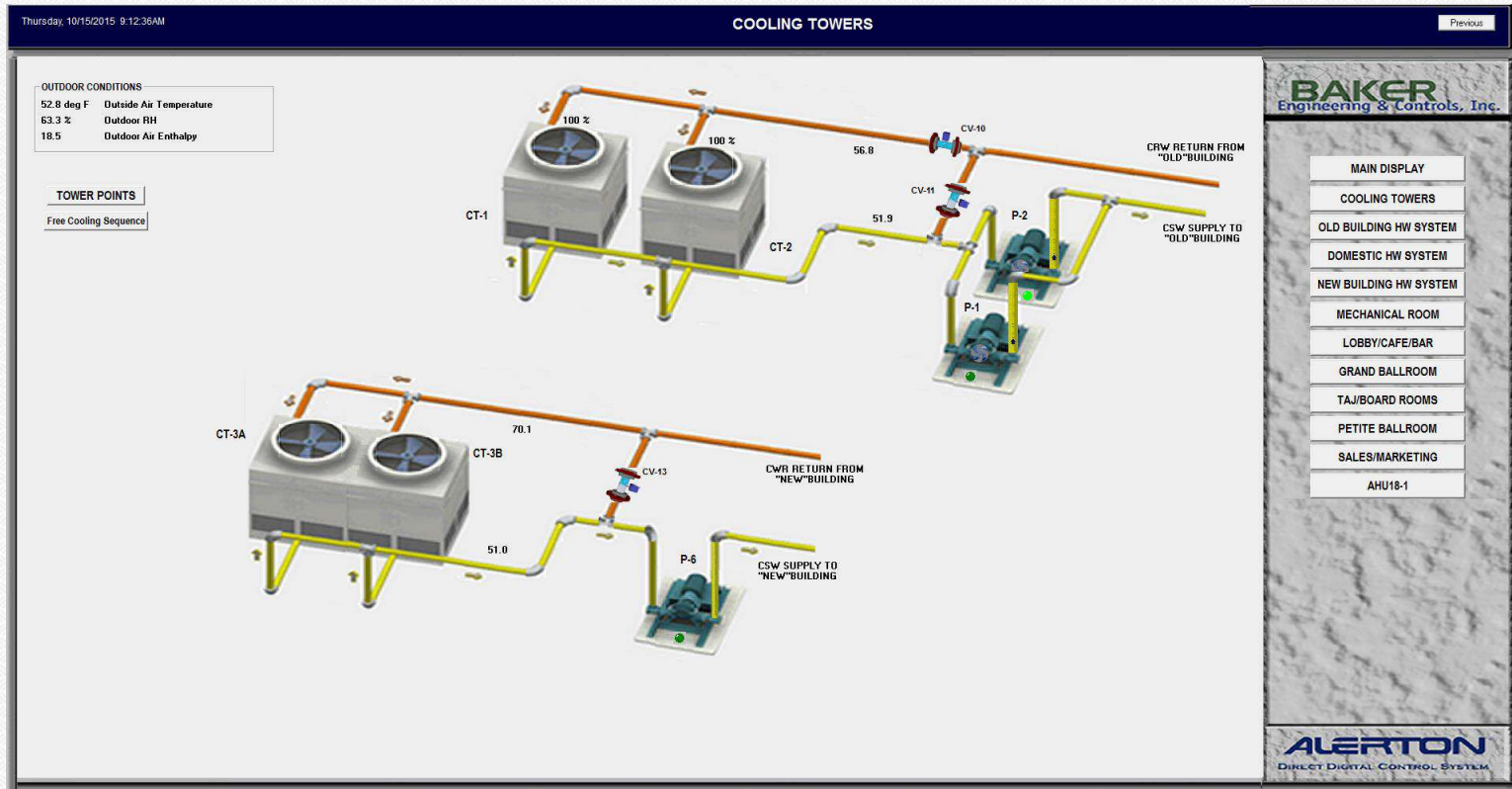
# Taj Boston Free Cooling

- **Free Cooling Basics**

- **All commercial buildings need cooling, even in the winter. Normally a chiller is used to produce cooling water. Free cooling allows for the use of a cooling tower to produce cooling water when outdoor air conditions permit. A cooling tower fan is significantly less costly to operate than a chiller compressor (and in many cases the cooling tower needs to run with the chiller anyways).**
- **Cooling tower effectiveness and free cooling is based on outdoor wet-bulb temperatures. Typically it's possible to start free cooling effectively with a wet-bulb of around 45 degrees, but this can vary significantly.**
- **Any facility with a chilled water loop in the Northeast should probably have free cooling. A facility that has a water cooled chiller will already have a cooling tower. With this equipment available, all that is necessary to achieve free cooling is a heat exchanger. Even if a chiller is air cooled, it's still possible to implement free cooling. The initial cost would be greater but so would the savings potential.**
- **Benefits of free cooling include saving energy, reduced wear on your chiller, and environmental benefits associated with reduced energy consumptions. Ultimately it translates to monetary savings.**
- **Free cooling is a well established best practice. If your building doesn't have it you should consider this opportunity.**
- **Utility incentives are available for this type of project. Typical paybacks can be about 2-3 years.**



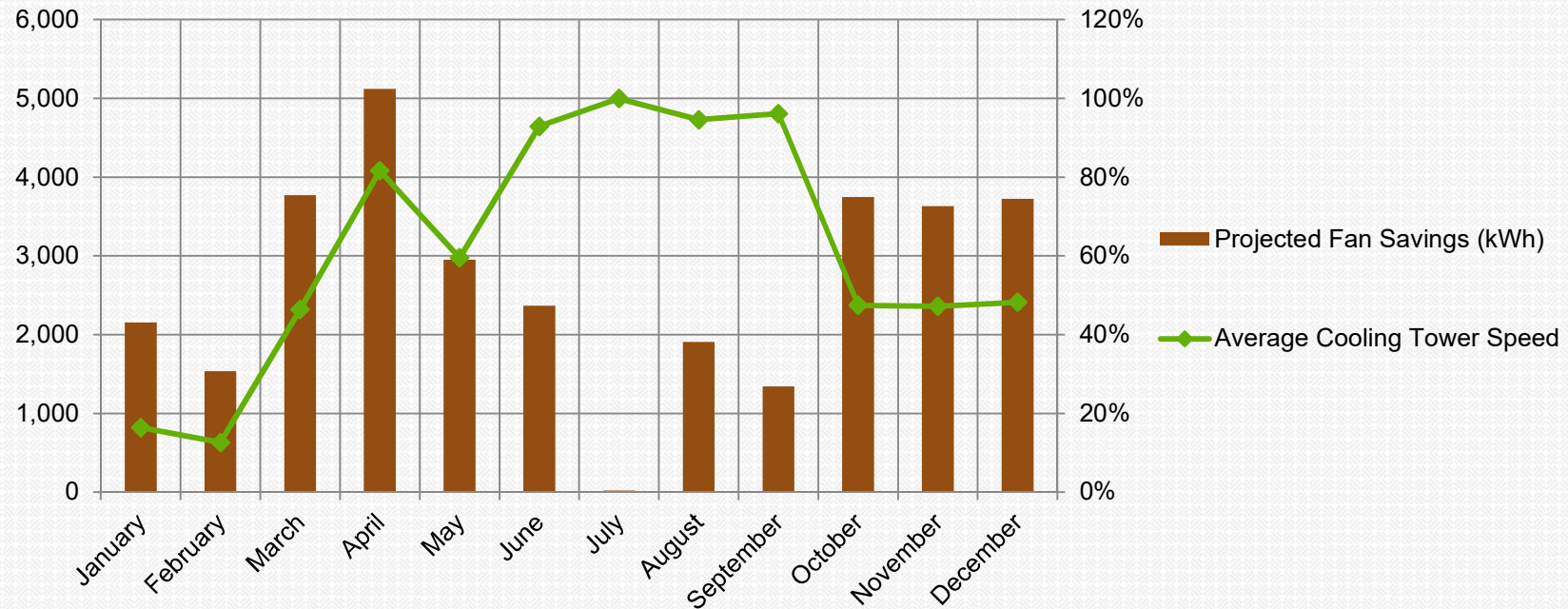
# Taj Boston Free Cooling



- Project completed early 2013. About 1 year payback with utility incentives.
- Utilize existing un-used Free-Cooling Heat Exchanger
- Operate free cooling ~19 BTU/Lb Enthalpy
- Add Variable Frequency Drive to 15HP Tower and properly control existing 25HP Drive (was 2 speed control)

# Taj Boston Cooling Tower VFD

## Cooling Tower Fan Speed & kWh Savings

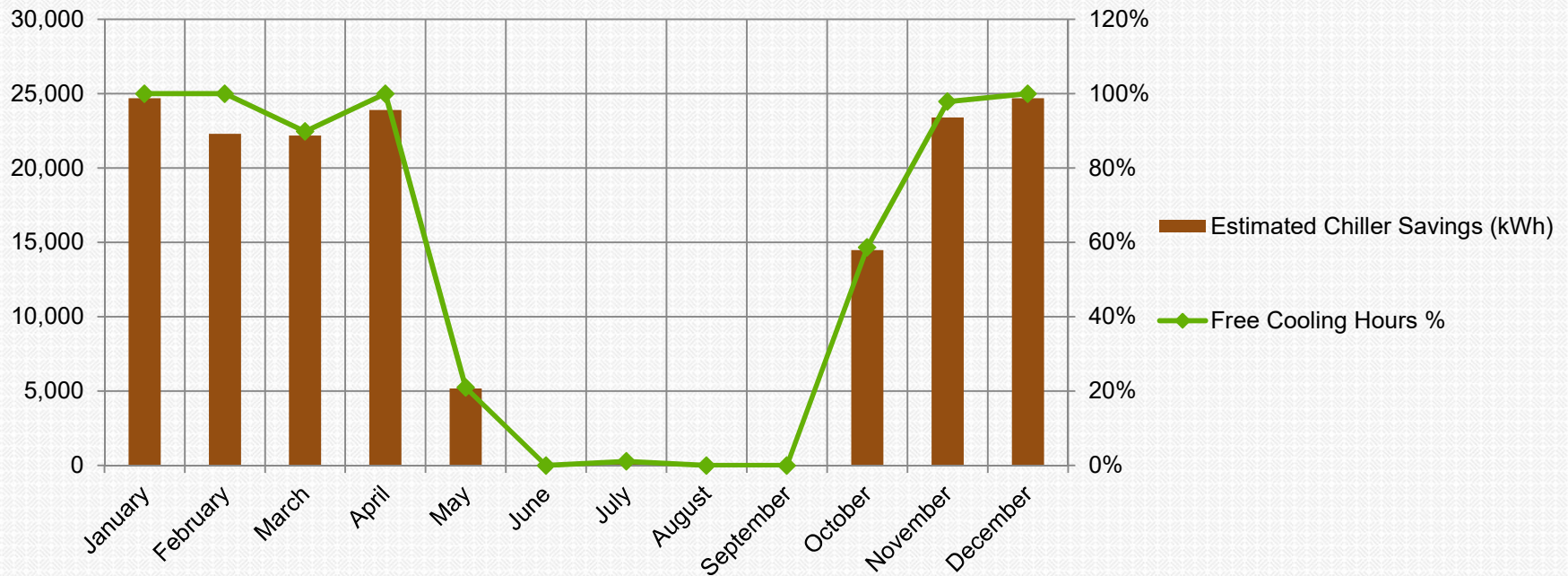


- Fan speed modulates to maintain Cooling Tower Supply setpoint (48 degrees in free cooling, 74 degrees in mechanical cooling)
- Total savings ~32,000 kWh and ~\$5,000 at \$0.15/kWh



# Taj Boston Free Cooling

## Free Cooling % & Chiller kWh Savings



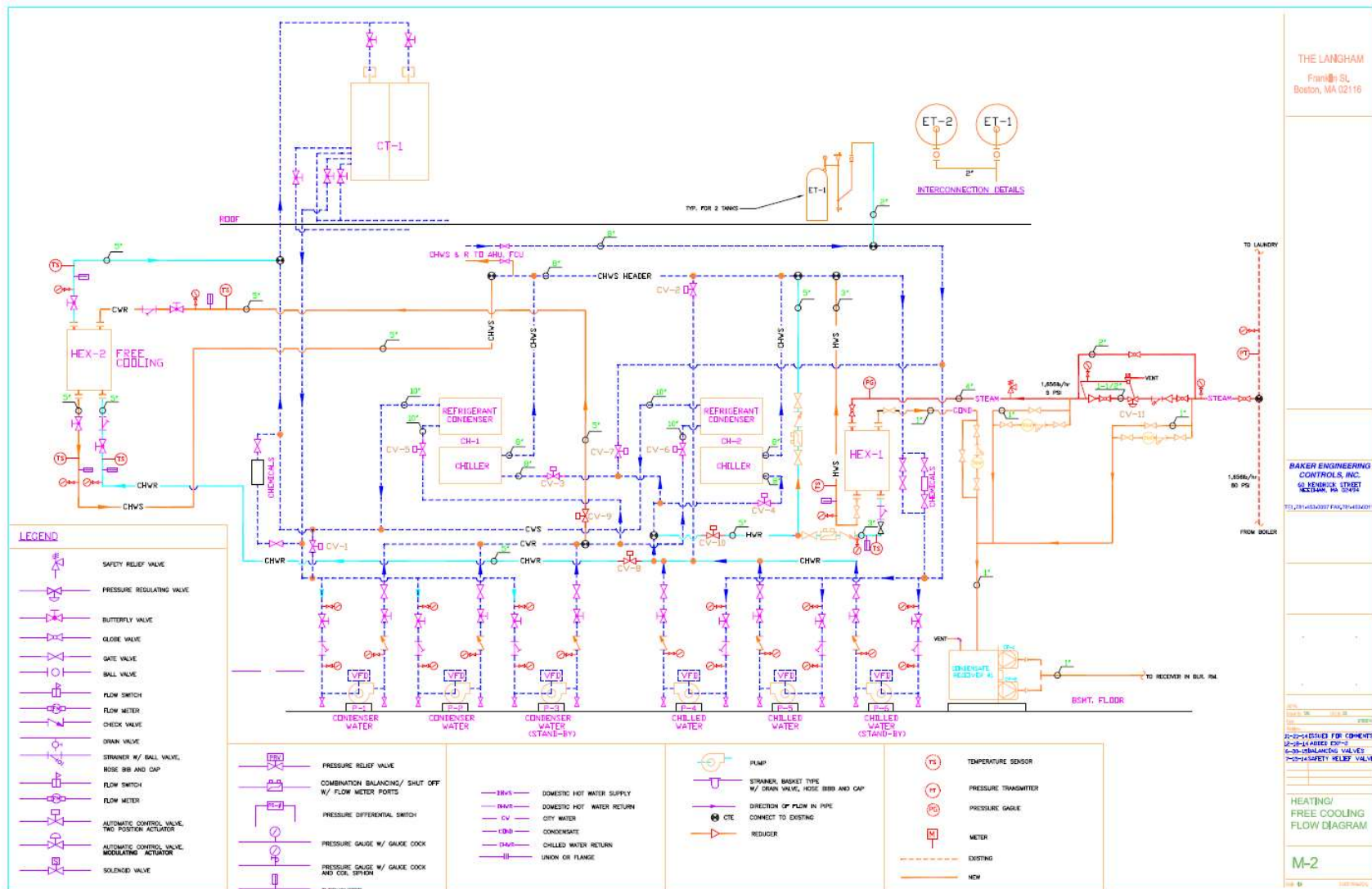
- **Operate Free Cooling Mode when OSA Enthalpy <19BTU/Lb**
- **2014 Free Cooling Hours 4,855 or 56% of the year.**
- **Total savings ~161,000 kWh and ~\$24,000 at \$0.15/kWh**



# Complex Opportunity: HVAC Retrofit at Langham Boston Hotel



# Langham Boston





# Langham Boston Project

ECM	Description	Current kWh	Potential kWh	Savings	Current Therms	Potential Therms	Savings	\$ Savings	Estimated Labor	Estimated Material	Measure Cost	Simple Payback (Years)	%
1	Heating System Retrofit	825,689	0	825,689	0	35,897	-35,897	\$112,690	\$93,600	\$62,400	\$156,000	1.38	72%
2	Free Cooling	82,642	26,106	56,535	0	0	0	\$9,046	\$60,000	\$39,000	\$99,000	10.94	9%
3	VFDs	211,614	123,304	88,310	0	0	0	\$14,130	\$10,000	\$15,000	\$25,000	1.77	57%
Totals		1,119,944	149,410	970,534	0	35,897	-35,897	135,865	\$163,600	\$116,400	\$280,000	2.06	49%

- **Retrofit Heating System**
  - **Steam heat to supplement electric heat.**
- **Add free cooling capability to Chilled Water system.**
  - **Addition of Heat exchanger to allow for free cooling.**
- **Variable Frequency Drives to modulate Chilled Water and Condenser Water pumps.**
- **EMS upgrade to make it all work.**
- **Why does Free Cooling have such a long payback at Langham? Why implement it?**
  - **Langham Hotel has a 2-pipe system which means they supply heating or cooling water, but not both at the same time. Most of the available Free Cooling hours will be used for heating because it's more cost effective in this case.**
  - **Having Free Cooling capability allows Langham Hotel to cool down their Hot Water loop quickly when they do need cooling.**
- **Eversource approved about ~50% incentive for this project. Currently it's pending approval by hotel ownership.**

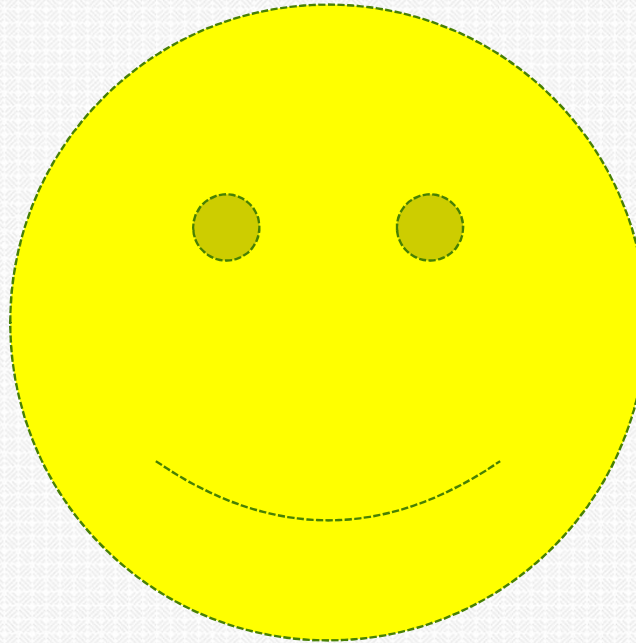


# Langham Boston Project

- **Langham hotel has a 2-pipe system that's currently used only for chilled water.**
- **All HVAC units utilize only electric coils as a heat source.**
- **An existing steam boiler has capacity for about 30% of Langham's heating needs and is used for the laundry facility.**
- **This project would add a heat exchanger to utilize the boiler's steam to heat the Chilled Water loop, thereby making it a hot water loop. The Hot Water loop would then be used to pre-heat the air at the HVAC units (Air Handlers and Fan Coils) as much as possible.**
- **All additional required heat would be made up by the existing electric heating coils.**
- **The purpose of Free Cooling for this project is to allow the building operators to cool down the Hot Water loop and revert to cooling when necessary.**
- **Additionally, the Free Cooling would be available to save chiller energy during colder months. However, due to the fact that Free Cooling won't be usable most of the time because the system will be in heating mode, the potential savings from free cooling are limited.**



# Thanks!



- **To find out more about us and set up a free walkthrough to find possible opportunities at your facility, please contact us at:**



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