

System Type: Transcritical CO₂
Refrigerant: R-744
GWP: 1



**Hannaford Store #8437
 North Berwick, Maine**

<i>Charge Size</i>	600-lb R-744
<i>Store Size</i>	19,536 gsf (gross square footage)
<i>System Capacity</i>	MT = 521,600 BTU/hr LT = 115,500 BTU/hr Total heat of rejection = 886,600 BTU/hr
<i>System Location</i>	Rack is in a mechanical "pod" located behind the store (pre-fab structure from OEM with the rack inside). Gas cooler is on the roof.
<i>ASHRAE CLimate Zone</i>	6
<i>Average Electricity Cost</i>	\$0.14/kWh <i>Utility: Central Maine Power</i>
<i>Baseline for Comparison?</i>	No.
<i>Key Characteristics</i>	New, smaller format store within one hour drive of corporate headquarters. System has electric defrost and uses heat reclaim with a glycol distribution system.

SYSTEM BASICS

From Hannaford’s perspective, key factors affecting the system choice include: 1) Transcritical CO₂ (TC) supports the Hannaford greenhouse gas (GHG) and global warming potential (GWP) reduction goals; 2) TC is Hannaford’s standard approach now for new stores; 3) Hannaford anticipates good performance in terms of energy and maintenance; 4) The scale of this system was more manageable since it is a smaller format store.

Safety measures incorporated into the system include pressure relief valves where needed (dual valves in parallel with isolation valves, in case one valve doesn’t reseal properly) and provision to connect a mobile backup generator to power the entire store in case of long-term power outage, which added approximately \$50,000 to the overall cost. This store is Hannaford’s first 20,000 gsf prototype.

QUANTIFYING & COMPARING ENERGY USE

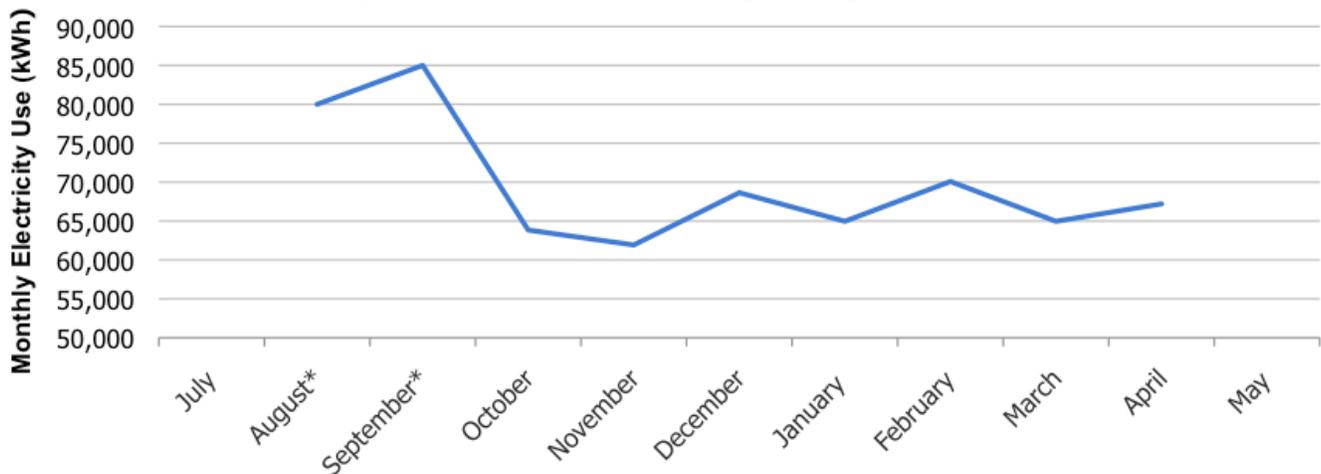
This store came on line in August 2015. While it would be possible to compare the North Berwick store with some older stores of similar size, there could be significant differences in site loads, lighting, equipment, doors on display cases, etc.

Hannaford expects energy performance to be similar to its previous prototype system (DX refrigeration with R407A and full-condensing heat reclaim using glycol distribution). Hannaford expects the current energy savings to persist, because it monitors monthly electricity use and will take corrective action if energy use increases substantially.

The system has electronic controls, and initial settings were confirmed. Sub-metering data is not yet available. The glycol heat reclaim system provides heating to the main HVAC unit for first stage of heating in cold weather and for reheat in humid weather.

What Hannaford Says:
 "The overall commissioning and installation process was complicated by poor design and selection of an under-sized gas cooler. The problem was compounded by an even poorer design of the larger gas cooler that was furnished to replace the original unit; it did not work and caused a two-day refrigeration outage at the store, which was a major problem. This highlights the newness and relative lack of availability of this equipment; there was no suitable equipment available within 500 miles that we could obtain to get the store back on line. Now that we have a properly sized, properly designed gas cooler, the system performance is in line with expectations."

Electricity Use Since Store Opening in August 2015



* August & September electricity use are approximate; poor performance due to failed gas cooler



The North American Sustainable Refrigeration Council is a 501(c)(3) nonprofit dedicated to advancing natural refrigerants and creating a more sustainable future for retail food refrigeration.

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