Short Form Work Paper WPSDGENRRN0017

**Revision 0**

**San Diego Gas & Electric**

**Energy Efficiency Engineering**

**Refrigeration Floating Suction and Head Pressure Controls**

**March 2, 2018**

**SDG&E** **Energy Upgrade California – Refrigeration Floating Suction and Head Pressure Controls**

## Introduction

This short form workpaper documents the cost and energy impacts adopted from SCE’s workpaper entitled “Refrigeration Floating Suction and Head Pressure Controls” (SCE17RN023.1 - Refrigeration Floating Head Pressure Controls\_Final.docx). SDG&E adopts all the cost and energy impacts in SCE17RN023.1 - Refrigeration Floating Head Pressure Controls\_Final.docx, with the following exceptions:

1. Only SDGE climates zones are included in this workpaper.
2. SDGE implantation IDs are used which are per DEER measures, therefore savings impacts are taken directly from DEER. The SCE workpaper averages some of the DEER measure savings because the SCE solution codes encompass multiple DEER measures.

The energy impacts are based on DEER measures and the costs are based on Work Order 17 (WO017) Ex Ante Measure Cost Study.

## Document Revision History

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| --- | --- | --- | --- |
| **Rev** | **Date** | **Author** | **Summary of Changes** |
| 0 | 03/02/18 | Keith Valenzuela/SDGE Contractor | - Adapted SCE’s workpaper SCE17RN023.1 |
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## Measure Summary

Table : Measure Summary Table

| **Section** | **Value** |
| --- | --- |
| **Summary & Purpose** | The short form workpaper documents the adoption of the cost and energy impacts from SCE workpaper SCE17RN023.1 for commercial multiplex refrigeration systems retrofitted with floating head and/or suction pressure controls. |
| **1.1 Measure & Baseline Data** | |
| **1.2 Technical Description** | The installation of floating head pressure controls reduces the compressor power draw by reducing the compressor discharge pressure when the ambient temperatures are lower than what the air-cooled (evap-cooled) refrigeration system was designed for. The refrigeration system is set to have a minimum saturated condensing temperature to maintain refrigerant pressure at the inlet of the expansion valve. The installation of floating suction pressure control similarly reduces the compressor power draw by increasing the compressor suction pressure based on the worst-case zone demand. |
| Measures | Measure:  462353 - Grocery, Floating Suction Pressure (D03-220)  462354 - Grocery, Floating Head Pressure, Fixed Setpoint (air-cooled) (D03-221)  462355 - Grocery, Floating Head Pressure, Fixed Setpoint (evap-cooled) (D03-222)  462665 - Grocery, Floating Head Pressure, Variable Setpoint (air-cooled) (D03-223)  462666 - Grocery, Floating Head Pressure, Variable Setpoint (evap-cooled) (D03-224)  462846 - Grocery, Floating Head Pressure, Variable Setpt & Speed (air-cooled) Ambient following SCT setpoint, 70°F minimum, variable-spd condenser fan (D03-225)  462993 – Grocery, Floating Head Pressure, Variable Setpt & Speed (evap-cooled) (D03-226)  462817 - Ref Warehouse, Floating Suction Pressure (D03-306)  462818 - Ref Warehouse, Floating Head Pressure, Fixed Setpoint (evap-cooled) (D03-307)  463325 – Ref Warehouse, Floating Head Pressure, Variable Setpoint (evap-cooled) (D03-308)  463329 – Ref Warehouse, Floating Head Pressure, Variable Setpt & Speed (evap-cooled) (D03-309) |
| Code for All Measures | Per the SCE workpaper “This work paper deals with REA-type measures whose savings are not impacted by code standards.” |
| Requirements | Per the SCE workpaper:  Proposed head pressure controls must operate the refrigeration systems according to:   * 12°F temperature difference (TD) between Tdb and SCT for air-cooled commercial systems on all building types except refrigerated warehouse * 17°F TD between Twb and SCT for evap-cooled commercial systems on all building types except refrigerated warehouse * 9°F TD between Twb and SCT for evap-cooled process systems on refrigerated warehouses * Minimum SCT of 70oF   The proposed suction pressure controls must operate the refrigeration systems according to:   * Worst zone demand. The maximum suction setpoint is 5oF above the design temperature. The minimum is the same as the base case.   The following are ineligible:   * New construction installations. * Floating head pressure controls on air-cooled process refrigeration systems. * Floating suction pressure controls on refrigeration systems with variable speed evaporator fans. * Any improvements which results in increased system energy use   Additionally, calculation of the design cooling load (tons) is to be based on connected display cases, walk-in coolers and freezers, cooled storage and prep areas only. Subcooler loads and air conditioning loads are ineligible for consideration. |
| **1.3 Installation Type and Delivery Mechanisms** | |
| Installation Type | Retrofit Add-on (REA) |
| Delivery Mechanisms | PreRebDown |
| **1.4.1 DEER Data** | |
| Net-to-Gross Ratio | The Net-to-Gross Ratio is from the SCE workpaper. The table is included for reference:  Screen Clipping |
| Effective and Remaining Useful Life | The EUL and RUL values are summarized in the SCE workpaper. The table is included for reference:  Screen Clipping |
| GSIA | The GSIA values are summarized in the SCE workpaper. The table is included for reference:  Screen Clipping |
| **Section 2. Calculation Methodology** | |
| Energy Savings/Peak Demand Reduction – All Measures | Electrical energy and demand as well as natural gas savings for the SDGE measures were based on the following DEER17 measures for the SDGE California climate zones (CZs):   1. D03-220: Commercial Refrigeration Floating Suction Pressure 2. D03-221: Commercial Refrigeration Floating Head Pressure, Fixed Setpoint (air-cooled) 3. D03-222: Commercial Refrigeration Floating Head Pressure, Fixed Setpoint (evap-cooled) 4. D03-223: Commercial Refrigeration Floating Head Pressure, Variable Setpoint (air-cooled) 5. D03-224: Commercial Refrigeration Floating Head Pressure, Variable Setpoint (evap-cooled) 6. D03-225: Commercial Refrigeration Floating Head Pressure, Variable Setpt & Speed (air-cooled) 7. D03-226: Commercial Refrigeration Floating Head Pressure, Variable Setpt & Speed (evap-cooled) 8. D03-306: Process Refrigeration Floating Suction Pressure 9. D03-307: Process Refrigeration Floating Head Pressure, Fixed Setpoint (evap-cooled) 10. D03-308: Process Refrigeration Floating Head Pressure, Variable Setpoint (evap-cooled) 11. D03-309: Process Refrigeration Floating Head Pressure, Variable Setpt & Speed (evap-cooled)   The energy impacts were taken directly from the DEER READI v2.4.7 tool. |
| **Section 3. Load Shapes** | |
| Load Shape | SDGE:09-GRO-Grocery-REFG (D03-220 to D03-226)  SDGE:29-WRF-Storage-Refrigerated-Cooling (D03-306 to D03-309) |
| **Section 4. Cost** | |
| **Section 4.1 Base and Measure Costs** | |
| Base Cost | Per the SCE workpaper the base case cost is assumed to be zero because the measure is a discretionary modification to the customers’ existing equipment (REA). Their alternative is to make no changes to their existing system. |
| Measure Cost | The measure costs are based on cost data extracted from WO017. The table below summarizes the measure cost. Per the SCE workpaper: “The cost for the air-cooled floating head pressure controls measure is the average of three values from the WO017 cost data. The cost for the two evaporative-cooled floating heat pressure controls measures is the average of three values from the WO017 cost data. “  Screen Clipping   |  |  | | --- | --- | | **Measure CostID** | **DEER MsrID** | | SDG-GrocSys\_FltHdPres\_AirCooled | D03-221, D03-223, and D03-225 | | SDG-GrocSys\_FltHdPres\_EvapCooled | D03-222, D03-224, and D03-226 | | SDG-RefgWrhs\_FltHdPres\_EvapCooled | D03-307, D03-308, and D03-309 | | SDG-GrocSys\_FltSucPres | D03-220 | | SDG-RefgWrhs\_FltSucPres | D03-306 | |