

Memo

To: **EEAC**
From: **EEAC Consultant Team**
Date: **December 30, 2015**
Subject: **C&I Innovation – A Review of Upstream Offerings**

INTRODUCTION

Energy efficiency programs have typically employed a prescriptive incentive approach targeting end-users. End-users purchase and install an eligible piece of energy efficient equipment, submit a rebate form, and are paid a financial incentive to offset the additional cost of the efficient equipment relative to standard efficiency equipment. This approach, while popular, is rife with barriers and has resulted in low market penetrations. Chief among these barriers are the limited understanding among end-users of the costs and benefits of energy-efficient equipment and complex prescriptive incentive forms that may require the assistance of contractors or other professionals to complete.

Upstream incentive programs shift the focus of program efforts “upstream” in the supply chain to market actors with broader impact such as distributors and manufacturers. In this approach, incentives are paid to distributors or manufacturers enabling them to lower the prices to end users of efficient equipment with the goal of making them cost-competitive with standard efficiency equipment. This approach has the advantages of reducing or eliminating the application burden on end-users, reducing program administration complexity and costs, reducing incentives due to lower upstream incremental costs, and increasing the availability of efficient equipment in the marketplace.

The purpose of this memo is to educate the Council about current and planned commercial and industrial (C&I) upstream initiatives in Massachusetts. We provide a brief history of the Massachusetts Program Administrators’ (PA) efforts with upstream initiatives in the commercial and industrial (C&I) sectors, planned efforts for implementation in 2016, and other upstream opportunities being considered for implementation in the future. Finally, we briefly describe the upstream efforts of other selected programs and provide recommendations for improvement of the PA upstream offerings.

The PAs have made good progress in advancing the C&I upstream initiative. In 2016, the C&I Upstream Lighting Initiative alone is planned to account for 30 percent of the total C&I portfolio annual savings. Future plans indicate a commitment to the upstream approach and provide evidence that the PAs recognize the potential for increased initiative participation and savings across additional markets and end-uses through expanded upstream offerings. However, opportunities remain to broaden initiative offerings, investigate opportunities with niche market actors, and improve data acquisition and reporting to provide a more complete picture of participants and the PA impact on the market over time.

HISTORY OF PA UPSTREAM EFFORTS AND CURRENT OFFERINGS

Since debuting the C&I Upstream Lighting Initiative in 2011, the PAs have continuously improved and expanded upstream portfolios to include additional lighting products, HVAC equipment (2013), and water heating equipment (2015). The upstream initiatives leverage distributor and manufacturer networks and infrastructure to positively influence the purchase of higher efficiency equipment. These efforts have boosted the availability of efficient

equipment and dramatically increased participation rates, especially for LED lighting. Through the continued development of the upstream offerings, the PAs have established the following guidelines for determining whether equipment is suitable for the upstream model:¹

- The higher efficiency equipment must be suited for one-for-one replacement for a less efficient measure in either a failed equipment scenario or in new construction;
- The equipment purchase decision must be almost entirely driven by first cost, with minimal amenity or reliability distinctions between the products;
- The substitute higher efficiency equipment must be stocked and available at distributors at the time of the purchase decision;
- The vast majority of product sales must occur through the distributors;
- There must be no, or minimal, additional or unique installation requirements that distinguish it from the product for which it is substituted.

Originally designed as part of the C&I New Construction Program, Upstream Initiatives are now part of both the New Construction and Retrofit Programs. For 2016 to 2018, the results for the Upstream Lighting Initiative will be reported separately as the initiative has historically contributed a large portion of C&I portfolio savings.

Currently, participating distributors provide nearly full coverage of the state for lighting, HVAC, and water heating equipment. While some participation gaps exist for small distributors, these distributors may only conduct a handful of C&I sales per year. These distributors have proven difficult as they often request access to the incentives but also commonly state that they cannot support the data reporting requirements of the program.²

The upstream initiatives are generally marketed and promoted by the contracted third-party implementers. The implementers are responsible for engaging and enrolling the local distribution networks. Engagement efforts typically begin with high volume distributors and continue with the medium and small distributors. This process continues until participating distributors provide complete geographic coverage. Upstream initiatives are not typically directly marketed to the end-use market. It is primarily marketed by the enrolled distributors, in partnership with the manufacturers, to contractors and, on occasion, end users who buy equipment directly.³

The initiatives collect extensive information about rebated products. In addition to the name of participating distributor, tracked information includes (but is not limited to):

- Product information (e.g., product name, manufacturer, product Type, SKU)
- Sales information (e.g., sale date, quantity, retail price, promotion price, buydown amount, store address)
- Customer information (e.g., customer installation address, business segment, utility)
- Purchaser Information (e.g., organization, purchaser contact information)

C&I Upstream Lighting Initiative

Initially implemented in September 2011 to promote high efficiency replacements of standard efficiency fluorescent bulbs, the C&I Upstream Lighting Initiative has since expanded to include LED lamps (including linear replacement lamps – “TLEDs”) and select LED fixtures. Current offerings for 2015 are detailed in Table 1.

¹ <http://ma-eeac.org/wordpress/wp-content/uploads/Exhibit-1-Gas-and-Electric-PAs-Plan-2016-2018-with-App-except-App-U.pdf>, Page 136

² Personal communication with PAs, December 21, 2015.

³ Ibid.

Table 1 | C&I Upstream Lighting Offerings

Product Type	Subtype	Incentive Amount	Minimum Customer Contribution
Linear Fluorescent Lamps (LFL)	T5HO	\$2.00	\$1.00
	T8 - 28	\$2.00	\$1.00
	T8 - 25	\$2.00	\$1.00
	U-Bend T8 - 28	\$2.00	\$1.00
	U Bend T8 - 25	\$2.00	\$1.00
LED Lamps†	PAR20/BR20	\$10.00	\$1.00
	PAR30/BR30	\$20.00	\$1.00
	PAR38/BR40	\$25.00	\$1.00
	A-line, 40/60W equivalent	\$10.00	\$1.00
	A-line, 75/100W equivalent	\$15.00	\$1.00
	Decorative Lamps	\$5.00	\$1.00
	TLED, 4ft and 2ft Instant Fit lamps	\$5.00	\$1.00
	MR16/PAR16/GU10	\$10.00	\$1.00
	G24 LED – 2-pin & 4-pin	\$19.00	\$1.00
LED Fixtures†	LED Down Lights, <25W	\$25.00	\$1.00
	LED Down Lights, >25W	\$30.00	\$1.00
	4' LED Stairwell Kit w/sensor, <55W	\$100.00	\$1.00
	2' LED Stairwell Kit w/Sensor, <55W	\$75.00	\$1.00

Notes:

Eligibility to receive incentives is predicted on qualifying lamps being listed on the DLC qualified products list, ENERGY STAR, or a PA-defined eligible products list.

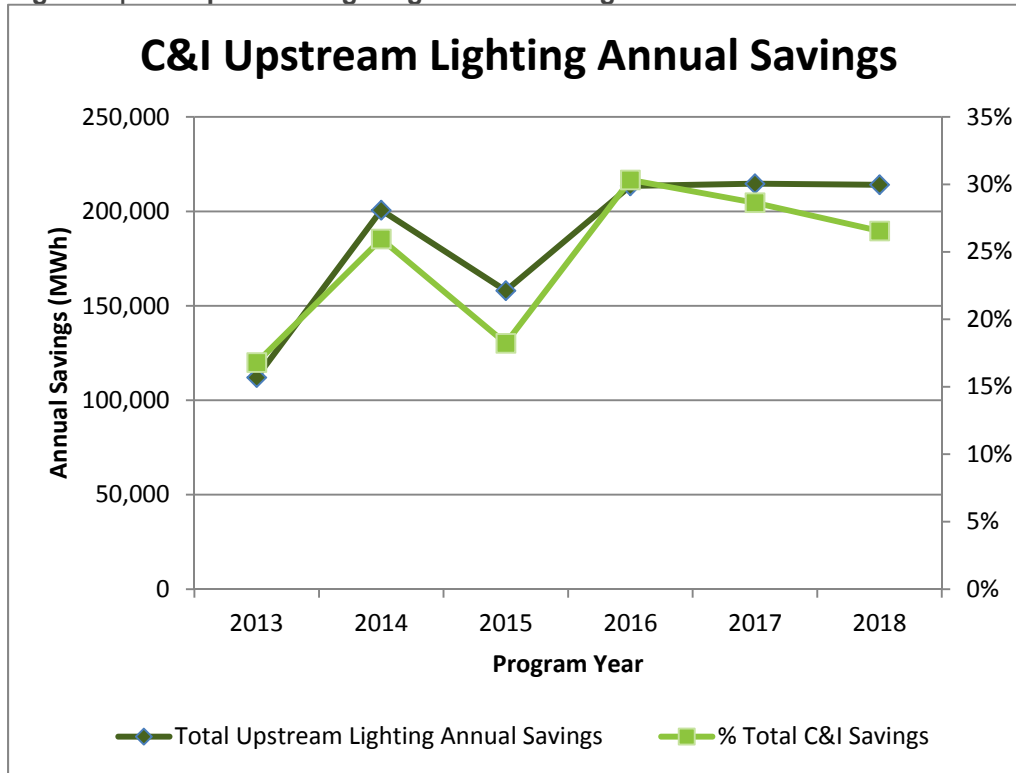
Minimum Customer Contribution must be collected at point of scale.

These incentives cannot be combined with other offers at the point of sale.

†Unitil's Minimum Customer Contribution for LED Lamps and LED Fixtures is \$0.

Since its inception in 2011, the Upstream Lighting Initiative has played an increasing role in the C&I savings portfolio. Figure 1 shows the upstream lighting contribution to C&I portfolio from 2013 through 2018. The values for 2013 and 2014 reflect evaluated actuals, whereas the values from 2015 reflect projected upstream lighting savings and planned total C&I savings. Values for 2016 through 2018 reflect the 2016-2018 Three-Year Plan.

Figure 1 | C&I Upstream Lighting Annual Savings



The upstream lighting initiative contributed 26 percent of total statewide C&I savings in 2014, the most recent year for which complete data is available, after only three years of operation. Beginning in 2016, Upstream Lighting Initiative results will be reported separately by the PAs to reflect the increasing importance in the C&I portfolio.

C&I Upstream HVAC/HP Initiative

In 2013, the PAs launched the C&I Upstream HVAC/HP Initiative as part of the New Construction Program. The initiative provides upstream incentives for air conditioners, heat pumps, and select HVAC controls and motors; a complete list of promoted products is shown in Table 2.

Table 2 | C&I Upstream HVAC/HP Initiative Offerings

Minimum Efficiency Levels/Incentive Levels						
HVAC Unit Size			Level 1		Level 2	
Tons	Btuh		Minimum SEER/EER for Incentive	Incentive \$/Ton	Minimum SEER/EER for Incentive	Incentive \$/Ton
Air Conditioning Systems						
Air Cooled Unitary and Split Air Conditioning Systems						
< 5.4	< 65,000	Split	14.0 SEER & 12.0 EER	\$70	15.0 SEER & 12.5 EER	\$125
< 5.4	< 65,000	Packaged	14.0 SEER & 11.6 EER	\$70	15.0 SEER & 12.0 EER	\$125
≥ 5.4 to < 11.25	≥ 65,000 to < 135,000		11.5 EER	\$50	12.0 EER	\$95
≥ 11.25 to < 20	≥ 135,000 to < 240,000		11.5 EER	\$50	12.0 EER	\$95
Large Commercial Air Cooled RTU and Split Systems						
≥ 20 to < 63	≥ 240,000 to < 760,000		10.5 EER	\$30	10.8 EER	\$60
≥ 63	≥ 760,000		N/A	N/A	10.2 EER	\$60
Water and Evaporatively Cooled Air Conditioning Systems						
≥ 20	≥ 240,000		14.0 EER	\$80	N/A	
Heat Pump Systems						
Air Cooled Heat Pump Systems						
< 5.4	< 65,000	Split	14.0 SEER & 12.0 EER & 8.5 HSPF	\$70	15.0 SEER & 12.5 EER & 9.0 HSPF	\$125
< 5.4	< 65,000	Packaged	14.0 SEER & 11.6 EER & 8.0 HSPF	\$70	15.0 SEER & 12.0 EER & 8.5 HSPF	\$125
≥ 5.4 to < 11.25	≥ 65,000 to < 135,000		11.5 EER & 3.4 COP	\$50	N/A	
≥ 11.25 to < 20	≥ 135,000 to < 240,000		11.5 EER & 3.2 COP	\$50		
≥ 20	≥ 240,000		10.5 EER & 3.2 COP	\$30		
Water Source Heat Pump Systems						
< 11.25	< 135,000		14.0 EER & 4.6 COP	\$80	N/A	
Ground Water - Water Source Heat Pump Systems (Open Loop)						
< 11.25	< 135,000		18.0 EER & 4.0 COP	\$150	N/A	
Ground Water - Water Source Heat Pump Systems (Closed Loop)						
< 11.25	< 135,000		15.0 EER & 3.2 COP	\$150	N/A	
Ductless Mini-Split Heat Pumps						
Qualifying Products			SEER	HSPF	Incentive/Unit	
Ductless Mini-Split Heat Pumps			18	≥ 9.0	\$250	
Ductless Mini-Split Heat Pumps			20	≥ 11.0	\$500	
Energy Savings Control and Fan Motor Options (when installed w/ new qualifying equipment)						
Dual Enthalpy Economizer Controls						
Outside Air Economizer utilizing 2 enthalpy sensors						\$250/Unit
Electronically Commutated Motors (ECM) for HVAC Fans						
ECM motors installed on HVAC supply fans on small unitary equipment						\$150/Motor

Participation in the Upstream HVAC/HP Initiative has been lower than anticipated.⁴ In spite of the low participation results, the 2015 Characterization of Supply-Side Market Actors study “identified 30 distributors selling package units in MA. Fifteen of the 30 were listed as participating in the upstream HVAC incentive program.” Further, the study points out that “the distributors participating in the MA programs may represent a large share of the overall market even if they do not include the majority of companies producing a particular type of equipment. For example, in the package equipment market, the program lists only 15 of the 30 distributors that are selling this equipment. However, the 15 program participants are known to have a large market share in MA.”⁵

EM&V is undertaking a process evaluation of upstream HVAC which is scheduled for completion in May 2016. The primary goals of this research are to investigate:

- Why the initiative is not achieving a higher level of activity from participating distributors
- Why some HVAC distributors are not participating in the initiative

⁴ Stage 2 Scope of Work Upstream HVAC Program Process Evaluation (Draft). Prepared by: DNV GL Team. October 16, 2015.

⁵ Characterization of Supply-Side Market Actors: Scoping Study Final Report. Prepared by KEMA, Inc. and APPRISE. April 16, 2015.

→ What changes in initiative design or delivery would lead to increased initiative activity

The findings will inform modifications to the initiative design to address barriers and increase participation in this important market.

C&I Upstream Water Heater Initiative

Launched in late 2015 as part of the New Construction Program, the C&I Upstream Water Heater Initiative promotes several types of water heating equipment. A complete list of promoted products, requirements, and upstream incentives is presented in Table 3.

Table 3 | C&I Water Heater Initiative Offerings

Water Heater Type	Input Rating	Required Efficiency	Incentive
Storage Water Heaters	< 75 Mbtuh	Energy Factor ≥ 0.67	\$100/unit
	≥ 75 Mbtuh	Thermal Efficiency ≥ 95%	\$4.00/Mbtuh
Tankless Water Heaters	< 200 Mbtuh	Energy Factor ≥ 0.82	\$0.50/Mbtuh
	< 200 Mbtuh	Energy Factor ≥ 0.94	\$2.50/Mbtuh
Indirect Water Heaters	N/A	N/A	\$400/unit

The PA research that informed the development of the upstream water heater program resulted in changes to the water heater incentive structure to better reflect the potential efficiency gains and cost differentials associated with the different equipment types.

PLANNED PA UPSTREAM EFFORTS FOR 2016 AND BEYOND

According to the 2016-2018 Plan, the PAs will consider adding several products to their upstream portfolio including boilers, furnaces, circulator pumps, motors in HVAC systems, and select commercial kitchen equipment.⁶ Based on personal communication with PA representatives, Table 4 summarizes the PAs' current and future upstream planning activities.

Table 4 | Current and Future C&I Upstream Planning Activities

Fuel	End-Use	Technology	Status	Description
Electric/ Gas	Multiple	High Efficiency Circulator Pumps (Fractional hp)	Awaiting Implementation	These pumps typically incorporate electronic commutation technology. The PAs expect to launch this initiative in the near future. This equipment has been successfully promoted upstream by Efficiency Vermont.
Electric	HVAC	Air-Source Chillers	Active Consideration/ Investigation	Similar to the approach taken with unitary air-conditioners and heat pumps, the PAs tentatively plan to promote air-source chillers in late 2016. Water-source applications are considered too complex to support through the upstream approach, whereas air-source chillers tend to be more "plug-and-play."
Electric	HVAC	Variable Refrigerant Flow (VRF) Air Source Heat Pump Systems	Active Consideration/ Investigation	The PAs are exploring the possibilities around the upstream approach to VRF systems, but no specifics have been determined at this point. VRF systems have been successfully promoted upstream by PG&E and SCE in California.

⁶ <http://ma-eeac.org/wordpress/wp-content/uploads/Exhibit-1-Gas-and-Electric-PAs-Plan-2016-2018-with-App-except-App-U.pdf>, Page 127

Fuel	End-Use	Technology	Status	Description
Electric	Lighting	LED Fixtures	Active Consideration/ Investigation	In 2016, the PAs plan to incorporate additional LED fixtures in the upstream lighting portfolio. Currently, upstream LED fixtures are limited to downlights and stairwell kits. Eventually, both indoor and outdoor fixtures are expected to be included in the upstream initiative. A limited pilot was conducted offering upstream rebates for 1x4, 2x4, and 2x2 luminaires for a period of 90 days. Based on the positive results of the pilot, the initiative will be expanded to permanently include additional LED fixtures.
Gas	Space Heating	Steam Traps	Active Consideration/ Investigation	The promotion of advanced steam traps with wireless monitoring capabilities is under consideration by the PAs. This technology can reduce steam trap losses by immediately alerting facility personnel to trap failure, reducing or eliminating the need to perform comprehensive, periodic steam trap audits.
Gas	Water Heating	Hot Water Boiler (Domestic Hot Water Supply)	Active Consideration/ Investigation	Similar to the current C&I Water Heater Initiative, the PAs are actively considering the promotion of domestic hot water boilers upstream.
Electric/ Gas	Food Service	Commercial Kitchen Equipment (CKE)	Active Consideration/ Investigation	The PAs are working with Energy Solutions to develop an instant rebate program for commercial kitchen equipment distributors. Promoted products would include cooking, hot food holding, and warewashing equipment. Downstream approaches have typically found little success with CKE due to the large market for used equipment (a result of high business turnover rates) and the importance of first-cost to the market.
Electric/ Gas	Multiple	High Efficiency Circulator Pumps (1-7.5 hp)	Active Consideration/ Investigation	Similar to the fractional High Efficiency Circulator Pumps, this opportunity reflects larger motors more common in C&I applications.
Electric	Multiple	Electronically Commutated (EC) Motors	To Be Considered/ Investigated	The PAs are currently working directly with Regal Beloit, the manufacturer of this technology to advance this initiative. Possible applications include furnace fan motors and commercial refrigeration equipment.
Electric	Multiple	Variable Speed Drives (VSDs)	To Be Considered/ Investigated	The PAs plan to consider moving the promotion of VSDs upstream but want to limit the initiative to new applications by working with certified installers. These are mostly anticipated to be used in HVAC applications, but some refrigeration and industrial process applications also represent savings opportunities.
Gas	Space Heating	Furnaces and Boilers	To Be Considered/ Investigated	Similar to the domestic hot water boiler opportunity, the PAs are also planning to consider the promotion of boilers (and furnaces) upstream for space heating.

UPSTREAM EFFORTS FROM OTHER PROGRAMS

In researching this memo, the Consultant Team reviewed the upstream C&I offerings of several other programs including Efficiency Vermont, Pacific Gas and Electric (PG&E), and the Northwest Energy Efficiency Alliance

(NEEA). In general, the offerings of these initiatives are consistent with what the Massachusetts PAs are currently offering or planning to offer.

There are a few limited examples of programs having promoted technologies upstream that are not under consideration by the PAs. For example, in the Northwest, NEEA successfully transformed the energy-efficient power supply market for commercial desktop computers through an upstream initiative.⁷ Launched in 2004, the initiative encouraged computer manufacturers to install “80 PLUS” power supplies in their products. The 80 PLUS certification indicates that power suppliers are 80 percent efficient in the AC/DC conversion process. Since program inception, market share of 80 PLUS power supplies has leapt from 0 percent to approximately 85 percent by 2013.⁸

PG&E and Southern California Edison (SCE) have implemented upstream HVAC programs since as early as the late 1990s. In addition to offering upstream rebates for packaged and split air conditioner and heat pumps systems (similar to the Massachusetts PAs), PG&E and SCE have forged ahead with additional equipment categories including air- and water-cooled chillers, variable refrigeration flow air conditioner and heat pump systems, ductless/mini/multi-split systems, and others. In years 2013–2014, air- and water-cooled chillers combined accounted for nearly 42 percent of SCE’s total ex-ante upstream commercial HVAC first year kWh savings. VRF systems contributed a not insignificant 8 percent of savings.⁹ During the same period, chillers and VRF systems accounted for 32 percent and 13 percent of PG&E’s commercial upstream HVAC efforts, respectively.

One initiative deserving special attention is PG&E’s Bottling Company Rebate Program. This program provides incentives directly to participating bottling companies that install energy-efficient food service equipment such as Consortium for Energy Efficiency (CEE) Tier II glass door refrigerators or ENERGY STAR and CEE Tier III air-cooled ice machines at PG&E non-residential electric customer locations. This represents an interesting twist on the upstream approach by directly targeting a market niche that impacts a large volume of sales of a specific type of equipment. A similar approach is used in several jurisdictions to provide an upstream incentive to cable and satellite service providers to install ENERGY STAR set-top boxes.

DATA LIMITATIONS ASSOCIATED WITH UPSTREAM INITIATIVES

While the upstream approach is successful and should continue to be refined and expanded, there are some opportunities and challenges concerning data acquisition for upstream participants that have been identified through EM&V.

In both the most recent Customer Profile Report (currently in final draft form) and the 2013 Commercial & Industrial Customer Profile Report, the evaluators found it challenging to match upstream participants with customer account information.¹⁰ This results in less clarity regarding the types and locations of customers participating in upstream and challenges in understanding trends over time.

Upstream activities have a very direct impact on the market and can drive rapid change in measure adoption and equipment stocking. Currently, upstream providers track and report data associated with the measures receiving incentives. In order to better understand the market evolution toward efficiency and how the PAs are impacting that market, it is necessary to capture information on all equipment sales, regardless of initiative participation, as recommended in the 2015 Characterization of Supply-Side Market Actors study.¹¹ However, there are significant barriers and costs that impede this data collection.

⁷ <http://neea.org/neea-newsroom/press-releases/2013/10/02/neea-and-partners-successfully-transform-energy-efficient-power-supply-market>

⁸ <https://neea.org/docs/default-source/reports/80-plus-market-progress-evaluation-report-5.pdf?sfvrsn=10>

⁹ <http://www.energydataweb.com/cpucFiles/pdaDocs/1368/HVAC%201%20Residential%20and%20Commercial%20Upstream%20Research%20Plan%20Final.pdf>

¹⁰ 2013 Commercial & Industrial Customer Profile Report. Prepared by: DNV GL. March 27, 2015

¹¹ Characterization of Supply-Side Market Actors: Scoping Study Final Report. Prepared by KEMA, Inc. and APPRISE. April 16, 2015.

CONCLUSION AND RECOMMENDATIONS

In summary, the PAs have made good progress in advancing the C&I upstream initiative. Future plans indicate a commitment to the approach and provide evidence that the PAs recognize the potential for increased initiative participation and savings across additional markets and end-uses through expanded upstream offerings.

Recommendations:

- Continue to follow-through on the identified upstream planning activities and periodically revisit minimum efficiency requirements and rebate amounts for currently promoted equipment.
- Ensure the planned investigation of upstream LED fixtures is comprehensive and includes all DesignLights Consortium categories.¹²
- Investigate the opportunities for upstream promotion of efficient equipment through niche or specialized market actors (e.g., bottling companies and cable and satellite service providers)
- Improve data acquisition and reporting to provide a more complete picture of participants and the PA impact on the market over time.

¹² <https://www.designlights.org/content/qpl/productssubmit/categoryspecifications>