HYDRAULIC INSTITUTE

Energy Rating as the Basis for Utility Conservation Programs

Introduction

Energy-efficient pumps, motors, and controls present significant potential for reducing energy consumption and utility bills across many sectors of the economy. Pumping systems alone can be responsible for 40% of energy use in industrial fluid systems, meaning efficient pump products can represent important cost savings at industrial facilities.[1] However, improving the efficiency of a pump has historically been challenging for industrial customers and commercial property managers primarily due to lack of information about the energy consumption of different pump models, limited knowledge of factors that cause waste in a pump system, and the disconnect in information about how efficiency affects long-term energy costs.

Because of this lack of information on pump energy performance, utility pump efficiency programs have relied on engineering calculations to quantify the energy savings available to each unique pumping system when customers apply for an incentive. The process is time consuming and costly for the program administrator and for the facility applying for the incentive. Custom programs are limited in impact, reaching a small portion of the total pump market. With nearly half a million pumps expected to be sold in 2020, which are collectively expected to consume 7 million kWh per year,[2] utilities have an important opportunity to capture energy savings from a pump-focused efficiency program.

The Hydraulic Institute recently developed the Energy Rating label that rates pumps based on their energy consumption relative to minimally-compliant pump models defined by DOE regulations. The label provides information consumers need to make informed decisions when purchasing a pump. It also creates the opportunity for utilities to run simple and effective deemed savings programs focused on efficient pumps. The Hydraulic Institute's Energy Rating label provides representative and accessible numerical estimates of energy savings, forming the foundation of energy efficiency programs that encourage selection of efficient products without requiring a calculation for each project. The Energy Rating program is designed to clearly and effectively identify and communicate the energy savings opportunity associated with high efficiency products to the market.

[1] http://pumps.org/EnergyEfficiency.aspx
[2] https://www.regulations.gov/document?D=EERE-2011-BT-STD-0031-0058

This memo outlines how the Energy Rating label can form the foundation for activities to promote energy efficient pumps. Utilities can use the Energy Rating to shift the pump market toward efficient products by:

- Supporting programs that differentiate efficient products and provide incentives using pre-determined (or "deemed") energy savings measures and rebates
- Educating pump specifiers about efficient pump selections
- Partnering with pump manufacturers to promote more efficient products with higher Energy Rating values
- Working with specifying engineers to leverage The Energy Rating value to "hold spec" and ensure competing bids are compared on both price and efficiency
- Educating end-users to easily understand the lifecycle cost associated with the operation of a pump and select efficient alternatives using Energy Rating

The next section explains the Energy Rating label and the information it provides to the pump market. Energy Ratings relate directly to the energy savings associated with an efficient pump over the standard model allowed by federal codes. Section III describes the calculation of energy savings using an Energy Rating. Section IV describes program design choices that impact the structure of midstream and downstream program strategies. Section V discusses the steps and messaging to connect with market actors and successfully launch an incentive program. Finally, Section VI summarizes the findings and draws final conclusions.

The Energy Rating Label

The Hydraulic Institute designed its Energy Rating label to clearly communicate the efficiency of a pump to consumers. It provides buyers with the opportunity to compare pumps and to make choices on the total cost of a product rather than the simple purchase price. The Energy Rating is a numeric rating that represents the percent power savings over the standard model allowed by code. For example, an Energy Rating of 5 represents a pump that consumes 5% less power than a code-minimum pump model, while an Energy Rating of 60 represents 60% less power than a code-minimum pump model. The Energy Rating also improves on previous pump efficiency metrics as it can consider the performance of a bare pump, a pump and motor, or a combination of pump, motor and control. The Energy Rating accounts for both the hydraulic efficiency of the pump and the ability to accommodate variable loads (through the application of variable speed controls) and provides an apples-to-apples comparison of energy performance of a pump among these different pump configuration options.

Pump energy conservation programs that rely on the product's Energy Rating are simple and easily comprehensible to participants, provide reliable estimates of savings, and allow for simplified verification during evaluation. Design engineers can use the Energy Rating to help clients understand and consider lifetime energy consumption in addition to purchase price. The label is a visible and intelligible representation of the energy performance to a potential pump purchaser and can, therefore, move the market toward more efficient decisions that reduce costs

and save energy. In many cases, the Energy Rating label will be displayed on the product at the point of purchase or physically attached to the pump itself, delineating a clear advantage over similar products.

The Energy Rating label is intended to amplify and support the Department of Energy (DOE) Pumps Energy Conservation Standard.[3] The DOE standard is based on the Pump Energy Index (PEI), which is calculated from the weighted average input power of pumps over typical annual operation. Starting on January 27, 2020, all pumps covered by the DOE's pump regulations must have a PEI less than or equal to 1.0 (equivalent to an Energy Rating greater than or equal to zero). The DOE Standard is limited to clean water pumps between 1-200 horsepower of the following pump types: [4]

- End Suction Close Coupled (ESCC)
- End Suction Frame Mounted (ESFM)
- In-line (IL)
- Radially Split Vertical Multistage In-line Diffuser Casing (RSV)
- Submersible Turbine (ST)

The Hydraulic Institute's Energy Rating program currently covers the same scope of pumps but is expanding to include circulators and potentially other clean water pumps in 2020. In addition to being more intuitive, visible, and comprehensive than PEI, the Energy Rating can also be applied and capture energy savings when a Variable Frequency Drive (VFD) is added later in the commerce stream, which is a common in the marketplace today.

Energy Rating Tools

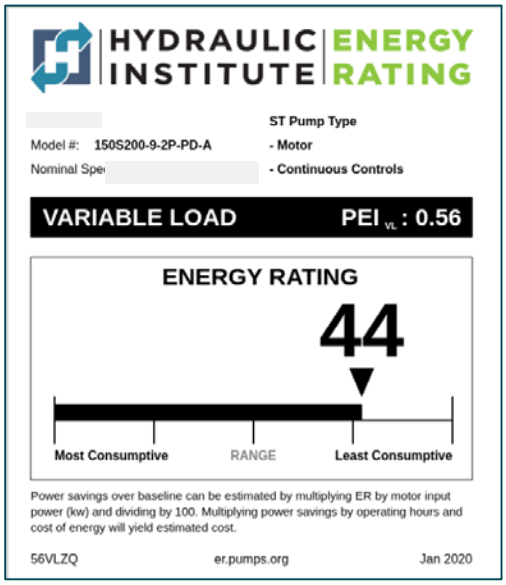
The Hydraulic Institute maintains a series of tools that help utilities and program administrators initiate and operate pump efficiency programs. These tools simplify the identification and classification of a product's efficiency, smoothing the administration of a pump program by providing publicly accessible and reliable product listings for all covered products and configurations.

The most recognizable piece of the Energy Rating program, the equipment label, is designed to clearly indicate the power savings obtained from pump system upgrades and product selections above the code requirement. This label communicates deemed energy savings, enabling any market actor to determine the efficiency of a given pump system. Figure 1 shows an example label.

[3] https://www.ecfr.gov/cgi-bin/retrieveECFR?n=pt10.3.431#sp10.3.431.y

[4] The definition of a clean water pump is included in the DOE Regulation. It includes more than potable water, such as systems with glycol additives, but is limited to a low level of solids in the liquid stream.

Figure 1. Hydraulic Institute Energy Rating

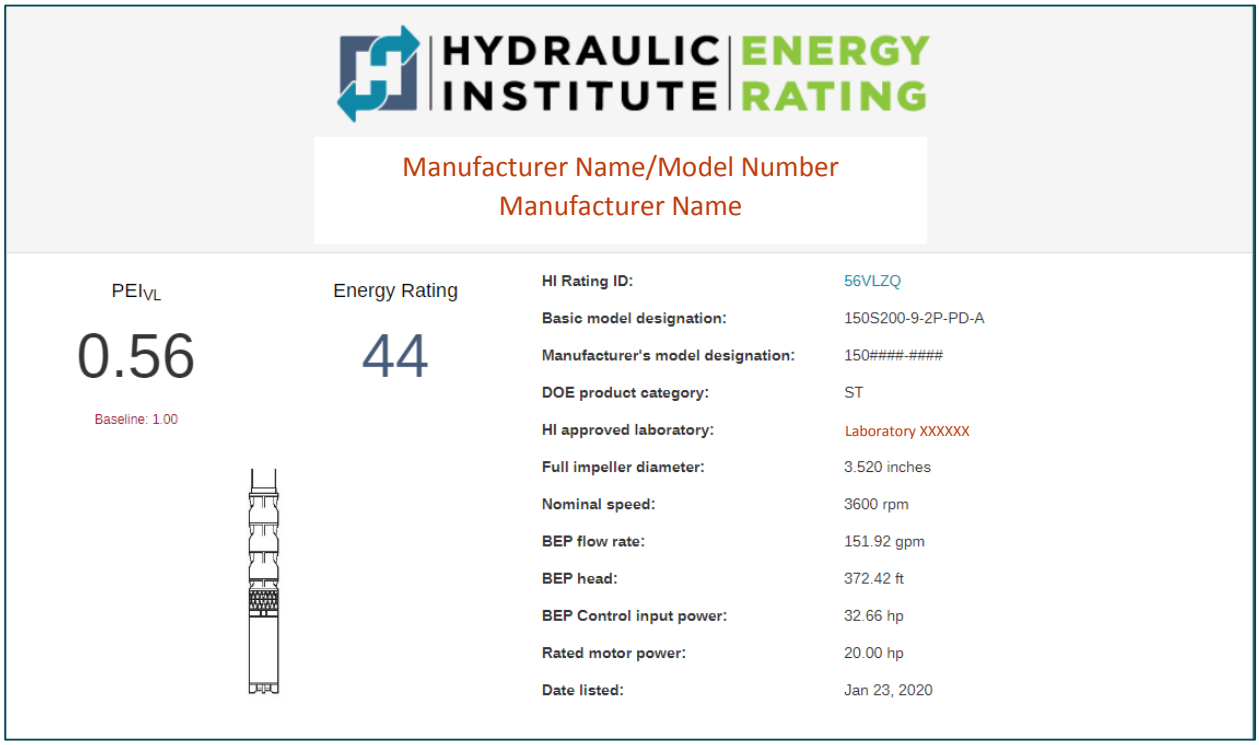


The Hydraulic Institute's online Energy Rating database allows the public to search for any listed energy efficient commercial and industrial pumps.[5] Figure 2 shows an example pump listing from the database. The list provides technical characteristics in addition to the Energy Rating, which can be used to connect a specific pump sold to its listing in the database. Listed pump characteristics include:

- HI Rating ID
- Manufacturer Model Number
- Basic Model Number
- Product Category
- Energy Rating
- Nominal Speed (RPM)
- Horsepower
- Full Impeller Diameter
- Load Type
- Third Party Audited Testing Laboratory

[5] http://er.pumps.org/ratings/search

Figure 2. Pump Database Listing Detail



The Hydraulic Institute also offers an Energy Rating Certificate program that provides a calculated Energy Rating and generates a listing for a pump, motor, and drive that are combined in the field.[6] The Energy Rating Certificate addresses the market need to calculate the energy performance of equipment installed when the drive has not been supplied by the pump manufacturer, for example when the pump distributor provides the drive. The vast majority of pumps are sold and installed in this manner today. The Energy Rating Certificate reliably represents the percent power savings for the pump, motor and drive combination when it is installed in the field, which otherwise would have been missed. Critically, the Energy Rating Certificate qualifies pumps installed in applications where a drive is required by state or local building code and utility incentives require proof of energy savings above the statutory requirement. It provides a representative and comprehensible expression of energy efficiency in situations where equipment combinations cloud information for accurate decision-making.

Energy Savings

The Energy Rating provides clear information on the relative energy consumption of a product to pump purchasers, equipment specifiers, and engineers designing pump systems. Utilities can

[6] http://er.pumps.org/ratings/certificates

promote the sale of more efficient products by establishing an Energy Rating threshold for pumps to qualify in a program and be confident that those energy savings are verified, significant, and above minimum code requirements or current market practice.

Energy savings calculations are simple using Energy Rating. The Energy Rating represents percentage improvement over a minimally-compliant pump for the required input power. Multiplying the Energy Rating (after dividing it by 100 to obtain a fractional percentage) by the motor horsepower and the operating hours provides an estimate of the annual energy savings, according to the calculation below:

$$Energy_{Savings} = \frac{ER}{100} * HP_{Motor} * OpHours * 0.746$$

where

$Energy_{Savings}$	=	Annual energy savings (kWh)
ER	=	Energy Rating
HP_{Motor}	=	Motor Horsepower
$OpHours$	=	Annual operating hours
0.746	=	Power conversion factor

While this equation is a simple and easily comprehended estimate of energy savings for a person purchasing a pump or comparing the performance of pumps, a utility measure list or state technical reference manual (TRM) will require additional analysis to characterize typical operating hours and the average performance of a pump sold in a specific market, as well as an estimate of the weighted average efficiency of pumps sold in the market to represent the current practice baseline.[7] The Northwest Regional Technical Forum has developed deemed Unit Energy Saving estimates for clean water pumps that adapt the simplified Energy Rating energy savings calculation to be more specific,[8] as shown in the following equation:

$$Energy_{Savings} = HP * 0.746 * OpHrs * \left(ER_{Base} * AdjFactor_{base} - ER_{Eff} * AdjFactor_{Eff}\right)$$

where

$Energy_{Savings}$	=	Annual energy savings (kWh)
HP	=	Motor Horsepower
0.746	=	Power conversion factor
$OpHrs$	=	Annual operating hours of the pump
ER_{base}	=	Energy Rating of the base case pump
$AdjFactor_{base}$	=	The Adjustment Factor (to correct for real-world operating characteristics) of the base case pump

[7] The Hydraulic Institute maintains a model TRM deemed measure workbook that is customizable to specific regions. http://pumps.org/EnergyEfficiency.aspx

[8] https://rtf.nwcouncil.org/measure/efficient-pumps

ER_{Eff} = Energy Rating of the efficient case pump

$AdjFactor_{Eff}$ = The Adjustment Factor (to correct for real-world operating characteristics) of the efficient case pump

As the equations reflect, the savings model relies on five key variables, two inputs (HP and ER_{Eff}) and three assumed values based on the pump sector and pump class (OpHrs, AdjFactor, and ER_{Base}). Motor HP determines pump size and Energy Rating represents relative efficiency. Both values come from equipment nameplates (motor nameplate and pump nameplate, respectively). The measure bases operating hours on the installed pump's application and pump class Adjustment Factor that accounts for variation in load profile and pump sizing and selection practices. The Energy Rating of the baseline pump also varies based on the pump class and application.

The RTF measures differentiate energy savings based on the following attributes:

- **Motor Speed Control** identifies the speed control of the pump being installed and assumes the baseline pump speed control based on the pump's application. The measure set uses three possible Pump Speed Control scenarios:
    - Constant to Constant Speed Pump: A constant speed pump is always assumed to replace a constant speed pump.
    - Variable to Variable Speed Pump: Some jurisdictions have adopted codes that require variable speed pumps in new commercial buildings. In these locations variable speed pumps are used as the baseline.
    - Constant to Variable Speed Pump: In locations where variable speed pumps are not required, a mixed baseline of constant and variable speed pumps is used. The mixed baseline is the weighted average pump efficiency based on market penetration figures.
- **Pump Efficiency Level** determines the efficiency increase of the efficient pump from the baseline pump. The Energy Rating defines the Pump Efficiency Level. The measure set uses the difference between the Energy Rating of the efficient pump and the average current practice baseline Energy Rating for that pump configuration. The pump type, speed control method, and motor horsepower define the baseline Energy Rating.
- **Motor HP** determines the size of the pump.
- **Pumping Application** determines the operating hours and load profile for the pump. The measure establishes three different applications:
    - Commercial HVAC
    - Agricultural Irrigation
    - Industrial Process Loads

- **Pump Class and Nominal Speed** aligns with the DOE's definitions of the mechanical configuration of the pump, coupled with the nominal speed of the pump. The Code of Federal Regulation (10 CFR 431.462) [9] defines the following pump classes:
    - End Suction Close Coupled (ESCC)
    - End Suction Frame Mounted (ESFM)
    - In-Line (IL)
    - Radial Split, multi-stage, vertical, in-line diffuser casing (RSV)
    - Submersible Turbine (ST)

The RTF measures have been used to underlie a number of existing pump utility programs, including those in the Pacific Northwest, PG&E, Xcel Energy, and others, many of which are structured to align with the Consortium for Energy Efficiency Pump Initiative[10]. The accompanying measure workbook provides additional detail, including data resources, energy savings measure analysis, and cost-effectiveness calculations.

Program Design

The Energy Rating label is useful to utility programs for three critical functions of a pump efficiency program:

1. First, the rating can **easily identify qualified products** that are eligible for utility rebates, which are necessary to define the minimum thresholds in a market with many thousands of products.
2. Second, the Energy Rating label can **serve as the basis for calculating energy savings** from the sale of efficient pumps. Because Energy Rating increases with efficiency, utility efficiency programs can easily scale rebates in proportion with savings.
3. Third, the Energy Rating label **simplifies program evaluation** by providing necessary inputs for delivery verification in a third-party database linking the Energy Rating value to pump models.

The pump market includes multiple actors that influence the purchase decision, not all of whom are motivated to consider the energy efficiency or lifetime cost of the product. Additionally, the market has limited awareness of the recent DOE regulations or the Energy Rating label. Utility program administrators can provide rebates and education to overcome many of these barriers but must be careful to avoid overlap with code-required energy conservation laws. There are many design options for successful energy conservation programs, which should consider the regional market for pumps and the specific circumstances of a utility and its regulatory environment. The subsequent sections describe the key barriers impeding increased efficiency in

[9] https://www.govinfo.gov/app/details/CFR-2017-title10-vol3/CFR-2017-title10-vol3-sec431-462

[10] https://www.cee1.org/content/cee-working-group-moves-toward-shared-framework-ci-clean-water-pumps.

the pump market, different program design options utilities may consider, and incentive design considerations when implementing an Energy Rating-based pump program.

Addressing Barriers

Despite the considerable energy savings potential, there are barriers preventing adoption of efficient pumps that a utility incentive program must address. Table 1 summarizes key barriers and solutions.

Table 1. Barriers and Solutions to Pump Incentive Program Success

Barrier	Problem	Solution
Focus on First Cost	Buyers typically buy on low first cost, unconcerned with lifetime cost of ownership, and unaware of energy ratings of the pump options they are considering.	Educate buyers and specifying engineers on lifetime cost; provide rebate to reduce incremental cost.
Split Incentive	Pump buyers & specifiers often do not pay the ongoing energy cost to run the pump.	Provide rebate to reduce incremental cost; educate specifiers to include Energy Rating in proposals to better inform the end-use customer.
Lack of Awareness	Buyers are typically not aware of efficient equipment or its benefits, and typically do not use relative energy performance to select products. Further, end users may be considering the entire pump system, not simply the pump.	Educational outreach occurring across all market segments will change the culture of awareness; train market actors in pumping system optimization.
Product Complexity	Pumps are a complicated product category and do not necessarily have a simple "like-for-like" model substitution for efficient pumps.	Focused education and marketing to engineers and pump distributors; higher rebates for variable load pumps; midstream programs for distributors to sell efficient products.
Historic Involvement	Single pump incentives programs are rare and have typically been custom to each project.	Deemed pump incentives can be offered for any eligible pump and easily redeemed at the point of sale.
Volume and Pace	Pumps are often sold as part of larger HVAC package and may take many months between pump specification and sale depending on the client. Program rules and rebate amounts may change during the long sales timeline.	The Energy Rating label provides quantifiable information to purchasers on potential energy savings; deemed incentives provide a reliable estimate of energy savings; rebate can be applied at the point of sale.

Program Design Options

Utility programs can interact with the pump market at any point in the supply chain. Each option has benefits and drawbacks impacting the reach, effort, and cost of a successful program. Additionally, the relative strengths and weaknesses of a utility efficiency program and the regulatory environment in which the program operates will also influence program design choice.

Downstream

End-users look for products that are reliable, safe, and low-cost. While they are often focused on first cost, they are impacted directly by lifetime energy costs. Messages warning of wasted energy and money will resonate with this group. Consumer purchasing habits can be influenced by price-based promotions such as sales or rebates. The mere presence of a utility rebate may provide validation of the value presented by a premium product. The downstream market is often the segment utility programs are most comfortable targeting and present the greatest opportunity for improving the reputation of a utility with its customers because of the direct interaction.

Although a prime target for messaging and rebates from utilities, targeting end-users requires a considerable amount of effort by program administrators. They are the broadest and most diverse group involved in the pump market, and there are few avenues to reach all types of end-users with marketing materials. End-users also lack awareness of pump regulations, labeling, and energy consumption and often do not purchase pumps regularly. Efforts by program administrators to reach end-use customers may only impact a one-time purchasing decision.

Midstream

Many energy conservation programs choose to target the midstream level of a market because the program influence leverages the broad relationships of only a few actors. In the pump market, distributors are often the primary channel from a manufacturer to engineers or installers. They often perform some basic services, such as trimming the impeller to reduce flow or assembling multiple pumps onto a skid. They are more than "order takers;" distributors have long-term relationships with customers and assist with engineering and specifying pumps for a specific application.

These close relationships are an excellent conduit through which energy conservation programs can reach and educate a broad swath of the pump market with a limited amount of effort on outreach. Incentives provided to distributors carry more impact than those applied downstream because incentives can impact a larger percentage of the overall selling price of the equipment at the distribution level than the retail level. Furthermore, distributors repeatedly sell pumps to the same customers (such as hydronic HVAC contractors), which means promoting efficient products may alter an engineer's purchasing habits for the long term.

In addition to traditional "per pump" incentive models, distributors are candidates for creative and customized strategies for promoting efficient products. For example, bonuses might reward distributors for reaching a high average Energy Rating of pumps sold within a month, for reaching a target percentage of pumps with high Energy Ratings, or for selling a certain quantity of efficient pumps within a month, quarter, or year. Those bonuses could offer a "good, better, best" motivation with tiers of increasing challenge.

On the downside, distributors have limited influence with the actual purchase decision. Their customers are often providing a service further downstream in the market to a building owner or industrial facility. In many cases, those projects are very much driven by cost and the contractor simply wants to win the bid by having the lowest price. The contractor is not impacted by the energy costs of the pump and will not have the opportunity to communicate the improved performance to the customer. These challenges can be overcome through long-term educational efforts by the distributor with support by a utility to ensure downstream customers understand the value of higher efficiency models.

Incentive Design

The Hydraulic Institute's Energy Rating is uniquely suited to serve as the basis for incentive design. Because it indicates a percentage improvement over a standard pump, the Energy Rating of a pump scales proportionately with energy savings. Incentive designs using a scaled relationship to Energy Rating allows a utility to increase rebate payments as energy savings increase. Purchasers that select more efficient equipment with higher Energy Rating values will receive correspondingly higher utility rebates.

Pump size is a second consideration for incentive design. Larger pumps consume more energy and have higher upfront costs. Greater incentives are warranted for larger pumps to overcome that initial first cost and to scale in proportion with the savings being acquired. However, pumps range greatly in size. The DOE pump conservation standards cover pumps from 1 to 200 horsepower. To impact consumer decisions, rebates must notably impact a percentage of upfront cost. By scaling with pump size, incentives can capture a buyer's attention and influence the decision-making process while achieving utility and regulatory cost-effectiveness goals.

A third consideration for incentives is the addition of a VFD, which controls the speed of a pump in response to conditions in the pumping system. A VFD reduces energy consumption by lowering the pump input power when full speed is not necessary to serve the needs of the system. Compared to a constant load pump, variable load pumps represent a step-change in the energy savings potentially available. However, some jurisdictions require that code-compliant pumps must be installed with a drive; utility programs must avoid paying for savings that are required by statute. This requires three categories of incentive: constant speed pumps with a constant speed baseline, variable speed pumps compared to a variable speed baseline (VFD is required by code), and variable speed pumps with a current practice baseline that assumes a mix of constant speed and variable speed pumps (VFD not required by code).

Both Xcel Energy and the Northwest Energy Efficiency Alliance (NEEA) have successfully managed pump programs that consider pump size, efficiency, and drives. Xcel Energy's rebates are structured as tiers corresponding to increasing efficiency with a set incentive rate multiplied by the horsepower of the eligible pump.[11] During its pilot phase, NEEA's pump program provided a rebate at a set dollar amount per Energy Rating and horsepower, listed in Table 2. The minimum qualification for a pump is an Energy Rating of 5 for constant load pumps and an Energy Rating of 52 for variable load pump.[12]

Table 2. NEEA Clean Water Pump Incentives

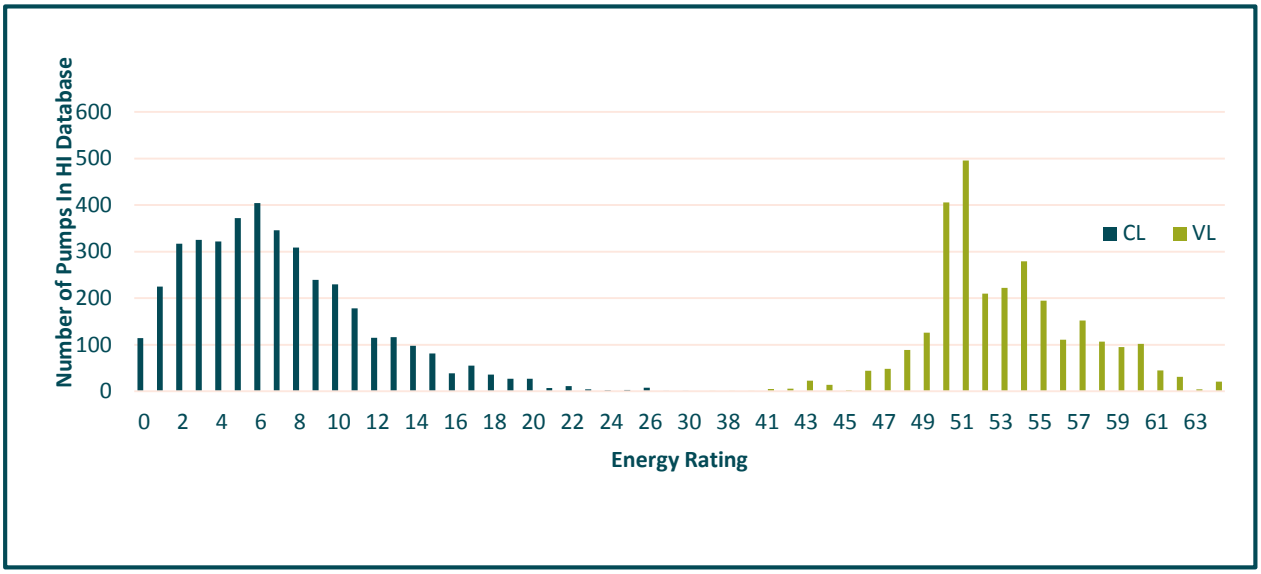
Measure Type	Baseline	Incentive for Small Pumps (≥1-<3 HP)	Incentive for Large Pumps (≥3 - ≤50*)
Constant Load	**Constant Load**	$3/ER/HP	$2/ER/HP
Constant Load	**Constant Load**	$3/ER/HP	$2/ER/HP
Variable Load	**Variable Load**	$0.75/ER/HP	$0.50/ER/HP

*NEEA's program is limited to pumps below 50 HP so as not to duplicate custom programs

It is important to emphasize that the addition of VFDs represents the greatest opportunity for reducing energy consumption of a pump. While improved pump hydraulic efficiency or motor efficiency can lead to an Energy Rating as high as 25, a drive can push the rating up to 63. Figure 3 shows the total number of pump listings in the Energy Rating database as of February 2020 by Energy Rating value and control strategy.

[11] https://www.xcelenergy.com/programs_and_rebates/business_programs_and_rebates/equipment_rebates/clean_water_pump_rebates.
[12] https://neea.org/our-work/programs/xmp.

Figure 3. Number of Pumps Listed in the Hydraulic Institute Energy Rating Database by Energy Rating



In many states and localities, drives are required by code in new construction projects for pumps greater than a minimum threshold horsepower. A package of an efficient pump, motor, and drive can save energy even above this high code baseline, but **the most significant savings occur when an existing pump is replaced by a pump equipped with variable frequency drive.** Table 3 shows example rebates and energy savings associated with the installation of efficient pumps in each incentive category, which illustrates the great potential for energy savings when a variable load pump is installed where not required by code.

Table 3. Example Incentive and Savings for Efficient Pumps by Category

Case	ER	HP	Incentive	Energy Savings (kWh)[13]
Constant Load to Constant Load	11	10	$220	227.2
Constant Load to Variable Load	55	10	$1,100	785.3
Variable Load to Variable Load	55	10	$275	181.4

[13] From Regional Technical Forum deemed energy savings for commercial and industrial clean water pumps for an RSV Pump with a nominal speed of 1800 RPM. https://nwcouncil.app.box.com/v/ComIndAgPumpsv1-1.

Launching a program

Successfully launching a pump energy conservation program requires a large effort considering the lack of existing resources or history of industry interaction with rebate programs. Utilities must earn the support and cooperation of key players in the distribution chain who will benefit from increased sales of high-end models and the support of utility programs in promoting efficient products.

At the same time, end users must understand and be motivated by reduced energy waste and lower costs. Marketing materials are important but challenging due to the many disparate and non-homogeneous participants in the pump market. Ultimately, relationships are critical for building support with pump distributors, wholesalers, and/or large engineering firms.

Outreach is a critical element in an energy conservation program, especially in a technology such as pumps with limited history of regulation or rebates for efficient products. The level of effort, messaging strategy, and breadth of impact will be different depending on the market actor targeted.

Key Messaging

In general, messaging will focus on financial benefits specific to each market segment with benefits differing between segments. In addition, there are other compelling reasons to implement the Energy Rating label program that do not correlate with a direct financial benefit.

1.Distribution – Distributors make more money when selling premium products. Distributors involved in a rebate program will promote efficient but potentially higher priced products. Selection of these products is made simple with the Energy Rating label, which indicates the percentage of savings available to customers in the cost of operating a pump. Distributors understand that education to their customers is critical to making the sale and often have very collaborative and long-term relationships with engineering firms who rely on their expertise.

Specifying engineers and contractors - Distributors generally sell pumps to engineers or HVAC contractors who design pump systems and install them for clients. This may be a months-long process with multiple design iterations, or in response to an immediate need. Engineers, responding to the preferences of customers, are often highly motivated by upfront cost and have no concern over the cost of operation. They either act on the stated preferences from their customers for efficient pumps or to the opportunity to show expertise and add value by specifying higher quality products.

Building owners and facility managers – The end-user is motivated to make a purchase that will save them money in the long term. Some building owners are aware of the long-term savings of a more efficient pump, but many require help understanding the options available to them and reasons for purchasing pumps with high Energy Rating values. Additionally, smart pumps – those with pump performance characterized in the drive and may have sensors integrated into the pump unit – are likely to have reduced installation and commissioning costs than a pump with an external VFD, and may operate at higher efficiencies because the control strategies are tuned to the specific pump. Environmental messages promoting the benefits of energy efficiency often have highest impact on end users.

It is worth noting the **principal-agent** problem in the pump industry. Often, the buyer does not bear the cost of an inefficient pump. The rebate program will be important for motivating the buyer. Additionally, specifying engineers wield considerable impact in the decisionmaking of these customers and represent an important target for outreach.

Marketing

Ratings reflecting pump efficiency are new, and few end users, installation contractors, or specifying engineers are even aware of DOE requirements or the information available on energy performance.[14] Effective program marketing is essential for raising awareness about the benefits of higher efficiency pumps and how utilities are helping users reduce energy waste, improve the environment, and save money. Marketing and promotional materials will include press releases, featurettes, infographics, tools and calculators, web content, social and earned media, and event outreach. The Hydraulic Institute provides a suite of marketing products, messaging content, and a lifecycle cost calculator that illustrates the potential energy and cost savings from efficient pumps to better inform the customer about the performance of a pump option and the impact on operating costs.[15]

Industry Training

Two leading industry training programs elevate the performance and understanding of an individual interacting with pump products. Training courses provide a range of information to create an understanding of pump efficiency with in-depth, actionable expertise. Offering these trainings as part of a comprehensive pump efficiency program creates a synergistic opportunity to (a) educate pump end-users about new deemed pump incentives and/or (b) provide valuable technical expertise to pump-focused end users that have received an efficient pump incentive through the deemed program.

Pump System Assessment Professional (PSAP) Training

The Pump System Assessment Professional Certification (PSAP) is a certification that ensures pump professionals have the experience and expertise to perform a high-quality assessment that will lead to more energy efficient and reliable commercial and industrial pumping systems during design or retrofit. For organizations with assets including pumping systems, PSAP Certification ensures the highest quality of system assessments are being performed and allows certified employees to increase their technical acumen and provide quantifiable value to the company. PSAP certification differentiates attendees as experts in their field. Utilities should consider the PSAP certification as an important credential for their custom pump energy conservation programs, and can sponsor a PSAP course and certification exam in their region to drive energy savings at the system level and support robust energy savings estimates for custom projects.

[14] NEEA (Northwest Energy Efficiency Alliance). 2019. XMP Market Characterization. https://neea.org/resources/extended-motor-products-market-characterization.

[15] http://www.pumps.org/EnergyEfficiency.aspx

Pump Systems Optimization Training

The Pump Systems Optimization (PSO) course comprehensively educates participants on the variables that impact the performance of a pump system. The focus on optimization is appropriate for individuals who interact with pump systems but may not be responsible for designing or maintaining them on a regular basis. Attendees gain an understanding of variables that impact pump system performance, enabling them to be conversant on important pump system topics and drive system planning towards more efficient alternatives.

Conclusion

Pump products and systems are an emerging and significant opportunity for energy conservation programs. Although they are not new products, pumps have rarely been targeted with utility energy efficiency rebates even though the engineering is well-understood and there is significant energy savings potential. By creating the Energy Rating program, tools, and training, the Hydraulic Institute has provided customers with easy-to-understand information they need to select the highest performing products and make decisions based on full lifecycle costs. This serves as a great basis for deemed incentive programs for efficient pump equipment.

With limited experience in pump energy conservation programs, utility program staff face some barriers in design and implementation. Program designs must target the optimal market actor in a region based on the utility's level of comfort and traditional program models. Incentives based on the Energy Rating are simpler and easier to understand and should scale with Energy Rating – which corresponds to energy savings – and size of pump.

Most importantly, outreach to market actors with meaningful messaging, compelling marketing campaigns, and industry training are critical to promoting efficient products and gaining the trust of critical market actors in implementing a successful pump efficiency program. The Hydraulic Institute's tools and resources serve as a foundation to help utilities develop and implement a comprehensive and successful pump efficiency program that includes education and outreach to maximize energy savings.