Orange Empire Chapter

Pump Energy Efficiency Regulations

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Xylem - Bell & Gossett
September 2018

Where pump regulation began . . .

- The **U.S. Energy Policy and Conservation Act of 1975** (**EPCA**) set forth a variety of provisions designed to improve energy efficiency. Part C of Title III establishes the "Energy Conservation Program for Certain Industrial Equipment." The covered equipment included electric motors, compressors, and pumps.

- This provision was not acted upon for pumps until 2011 when the U.S. Dept of Energy announced their intent to develop a Pump Energy Conservation Standard.

Dept of Energy Process

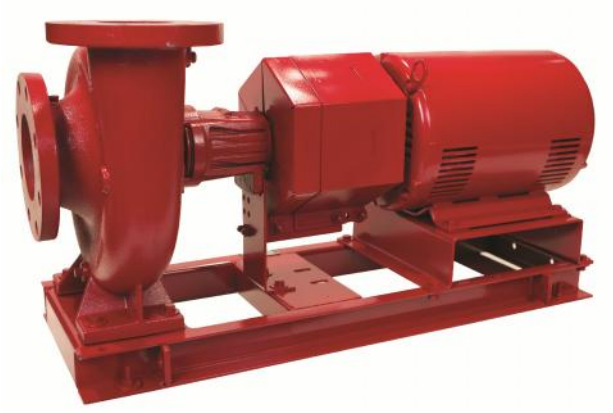
- DOE Working Group
  - product manufacturers,
  - energy advocates
  - Trade associations and
  - other interested parties.

- DOE vets Working Group recommendations to insure energy savings and fairness to all interested parties.

- DOE announces laws and allows time for manufacturers compliance.

- Key Working Group recommendations
  - Regulate pumps in alignment with EU
  - Promote the use of pumping systems (pumps, motors and VS drives)
  - Set efficiency standards to remove the 25% poorest performing pumps
  - Follow Hydraulic Institute Pump Test procedures
  - Allow four years for manufacturers to get in compliance.

Which Pumps are in DOE scope?



End Suction Frame Mtd

End Suction Close Coupled

Inline Close Coupled & Split Coupled

Submersible Vertical Turbine Pumps

Vertical Multi-Stage Pumps

More info on DOE Scope Limitations

- Clean Water Applications only
- BEP Power Input: 1-200 Hp
- BEP Flow Rate: 25 GPM or greater
- BEP Head: 459 feet or less
- Temperature: 14 – 248° F
- Nominal Speeds: 1800 and 3600 RPM

Which Pumps are NOT in DOE scope?

Double Suction Pumps

Circulator Pumps

Other Pumps NOT in DOE Scope

- Non-Clean Water Pump Designs (API, ASME, Slurry, Wastewater, etc.)
- Nuclear spec controlled Pumps
- Mil Spec Pumps
- Magnetic Drive Pumps
- Fire Pumps
- Sanitary Pumps (3-A Standard)
- Prime Assist Pumps
- Vertical Turbines with bowl size greater than 6”

Summary of National Benefits (U.S.)

- <u>Environmental Benefits over a 30 year period</u>

  Cumulative emissions reductions:

  - 16 million metric tons of carbon dioxide (CO_2)
  - 73 thousand tons of methane (CH_4)
  - 12 thousand tons of sulfur dioxide (SO_2)
  - 23 thousand tons of nitrogen oxide (NO_X)
  - 0.22 thousand tons of nitrous oxide (N_2O)
  - 0.04 tons of Mercury (Hg)

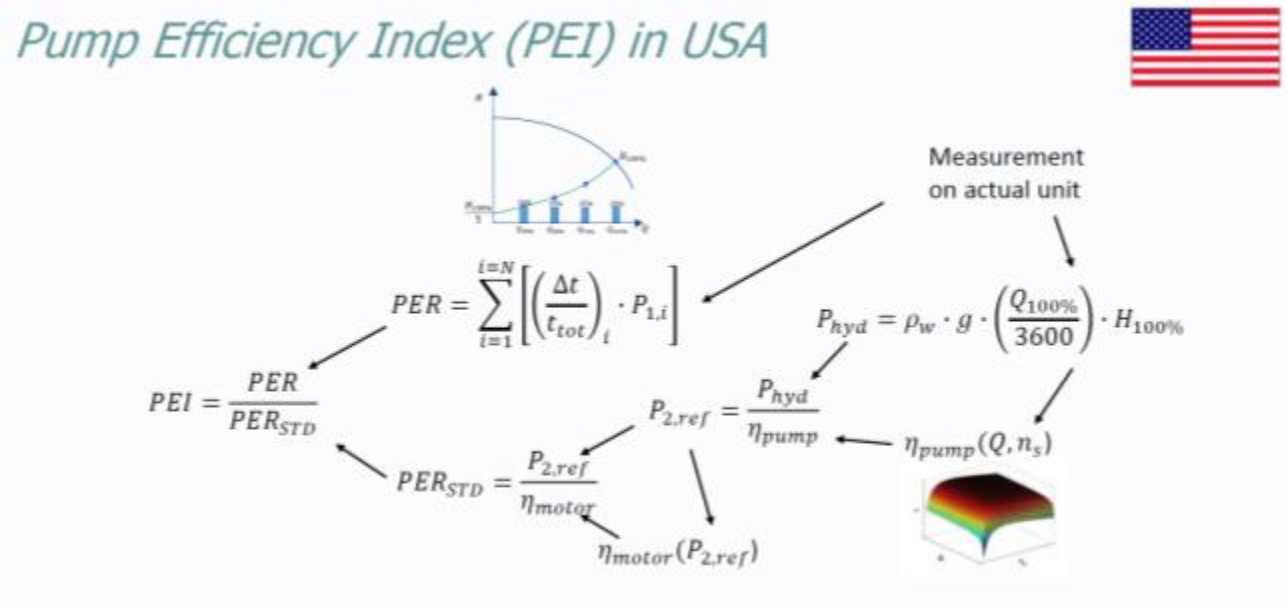
DOE Timeline

- Working Group: 2011 – 12
- DOE Final Rule released: January 2016
- Compliance Date: January 27, 2020

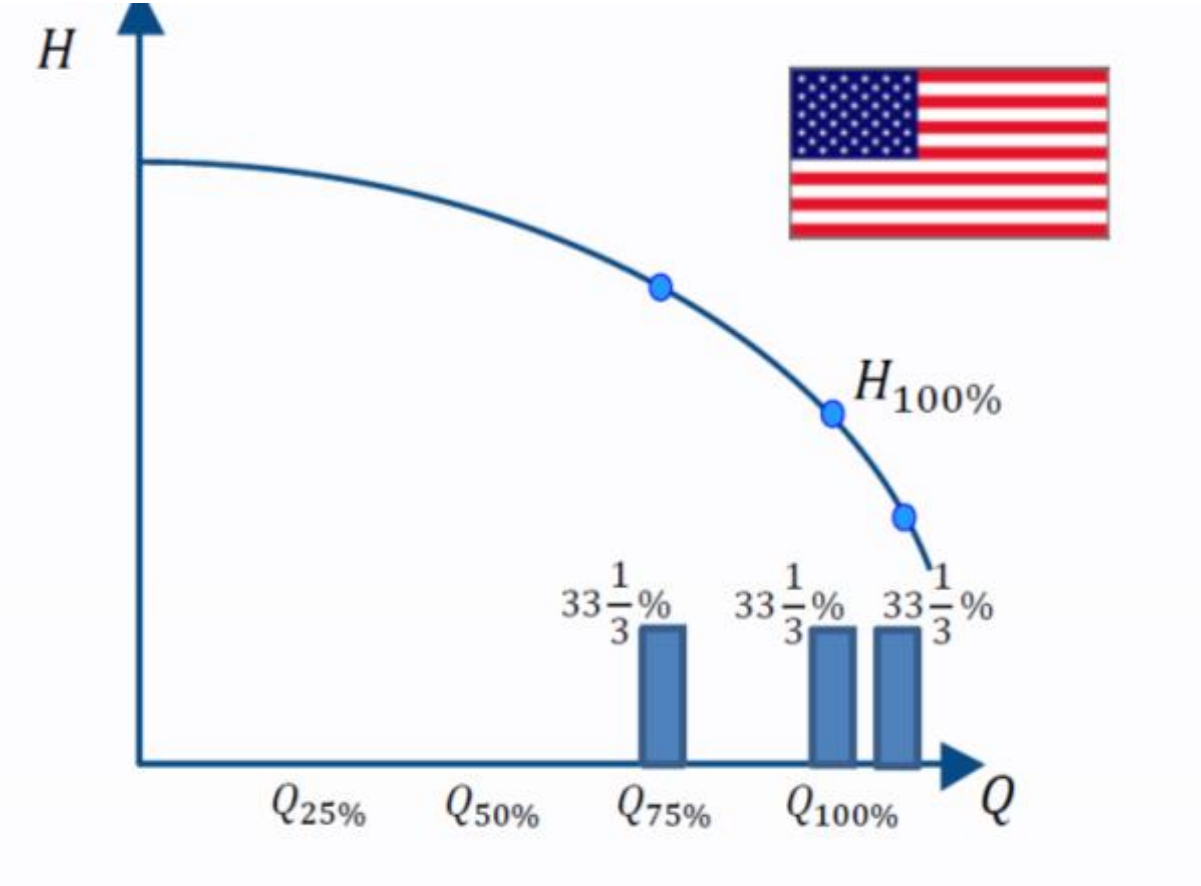
- DOE Pump Efficiency Index (PEI) established
- DOE Pump Test Procedure established
- PEI must be listed on pump nameplate

What goes into a PEI calculation?

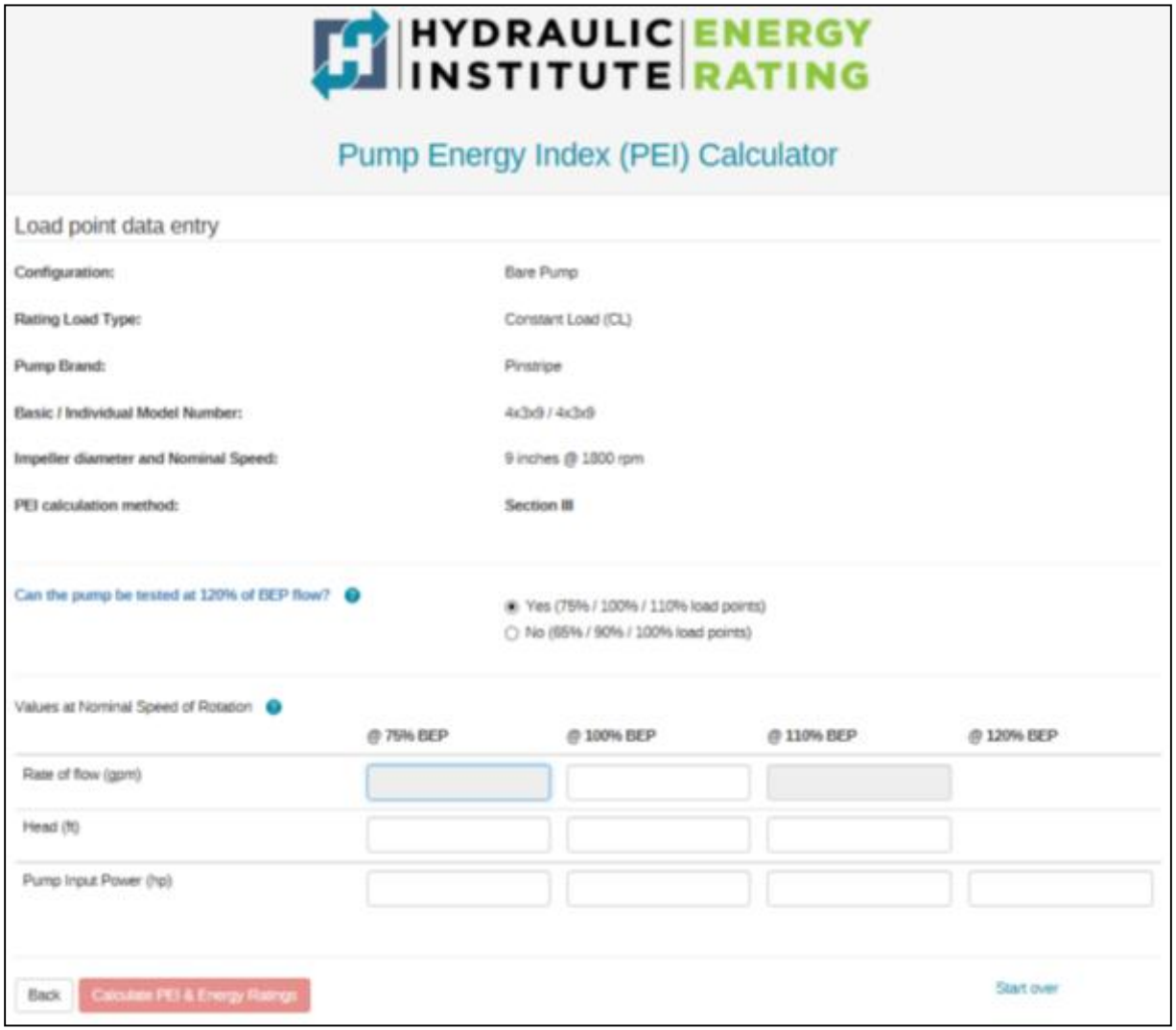
- The DOE PEI metric consists of a ratio of the representative performance of the pump being rated over the representative performance of a pump that would minimally comply with any prospective DOE energy conservation standard for that pump type.



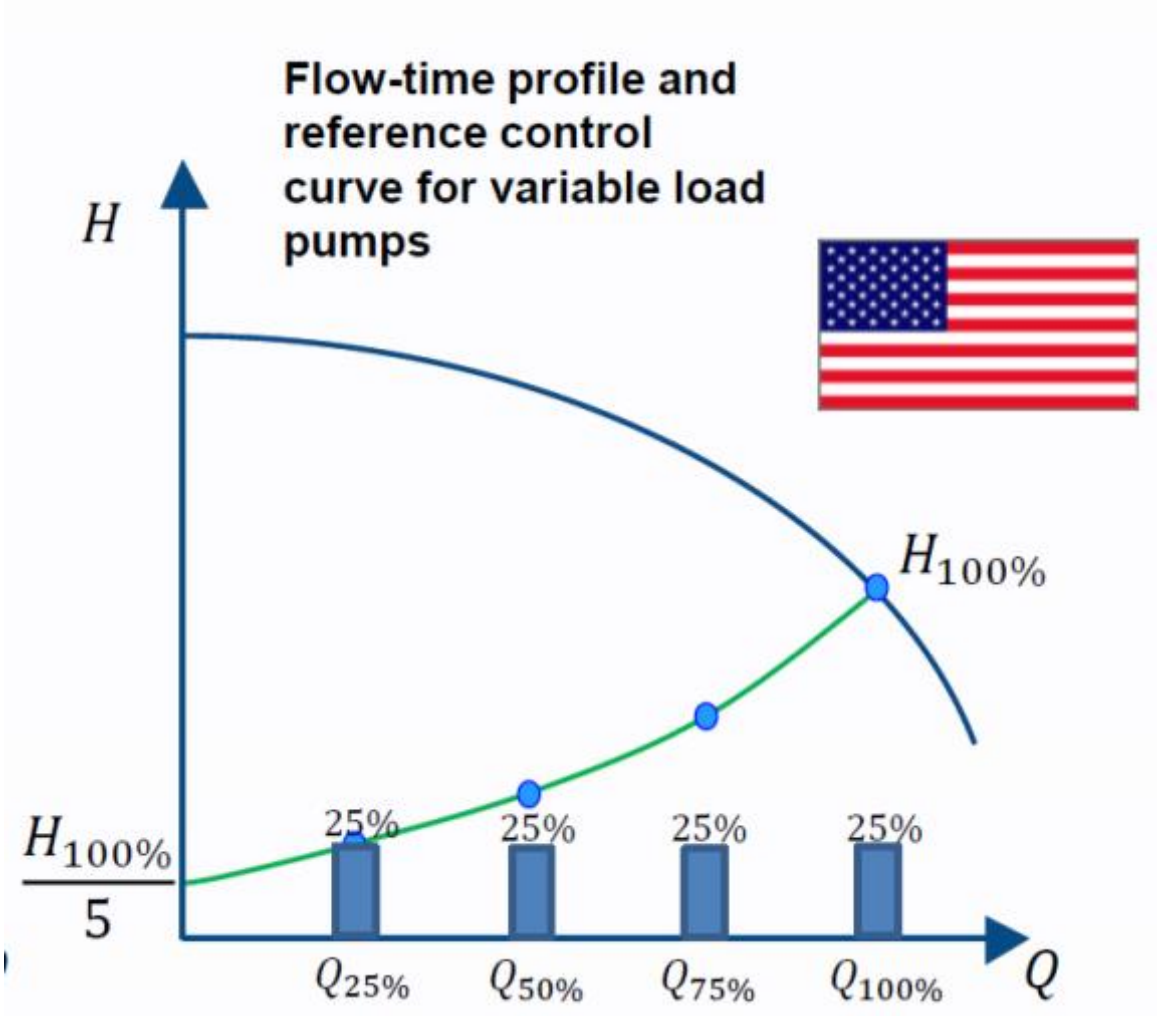
Control Curves for Constant Load



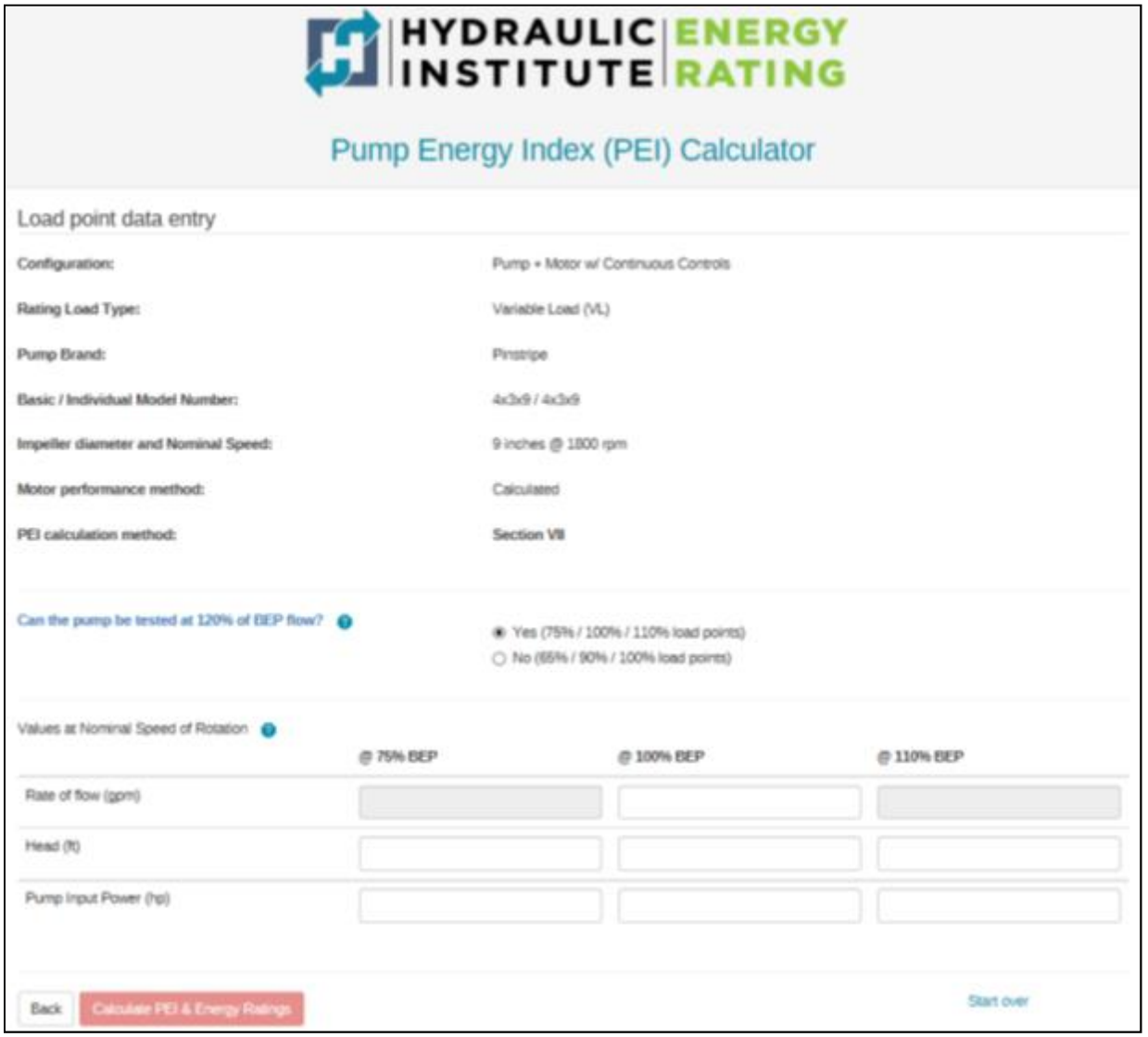
PEI_{cl} Calculator



Control Curves for Variable Load



PEI_{VL} Calculator



Nuances of the DOE PEI

- Pumps are rated using full impeller diameter only. For calculations with motors, Non-overloading Motor Hp is used.

- Multiple configurations can be rated:
  - Bare Pump only (always Constant Load)
  - Pump and Motor (always Constant Load)
  - Pump, Motor and Variable Speed Drive (always Variable Load)

- Two ways to determine PEI
  - Pump performance test must be used to determine PEI for Bare Pump
  - Extended Pump Product
    - Motor and VS Drive efficiency can be added to the pump PEI via calculation using nominal motor and VS Drive efficiency
    - Motor and VS Drive efficiency can be added to the pump PEI by testing complete pump, motor and VS drive (wire to water efficiency test). If this is done – must specifically link rating to motor and drive mfgr used for the test.

DOE PEI Information

- Pumps with a PEI less than or equal to 1.00 can be sold in the United States after January 27, 2020. Power savings over a minimally compliant pump or savings over any other PEI can be easily calculated.

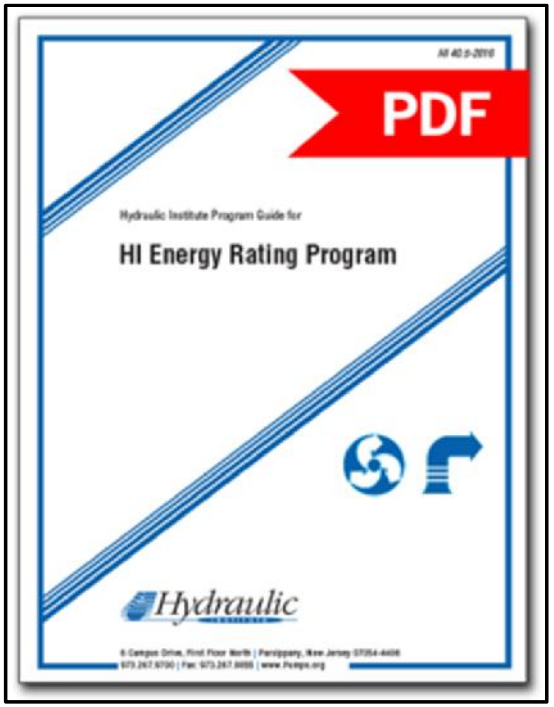
Efforts to get in compliance

- What are manufacturers doing to get in compliance?
  - Re-testing to confirm performance
  - Re-designing specific models
  - Testing with V.S. drives

Hydraulic Institute's involvement?

- Hydraulic Institute resource page:
  www.pumps.org/doerulemaking

- Hydraulic Institute (HI) Energy Rating Program:
  1. Scope of program – Aligned with DOE
  2. Eligibility & how to participate
  3. The HI Energy Rating & Labels
  4. Testing & Listing of Pumps
  5. Proper Use
  6. Certificate Program
  7. HI Energy Rating Portal & Database



HI Energy Rating Program

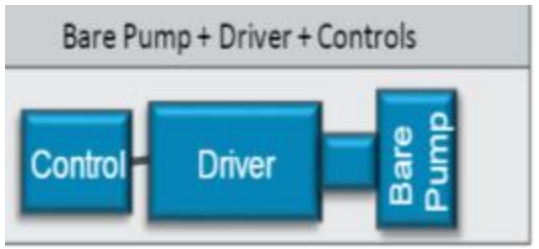
Goals of the Program – Build on DOE Regulations

1. Develop a separate energy rating system for bare pump and extended products

2. Suitable for utility programs to enable deemed incentives.

Provide additional value by:

- Requiring third party lab certification
- Provide data required for deemed incentives
  - In reliable, consistent, simple, searchable and easy to use format
- Managed by HI with input and feedback from utilities to meet your needs



B&G/HI Energy Rating Nomenclature

HI ER Nomenclature

e-1510 3BD-4P-PM

Series	Model	Poles	Configuration
		2P	BP – Bare Pump
		4P	PM – Pump & Motor
			PD – Pump, Motor & Drive

Sample HI Energy Rating information

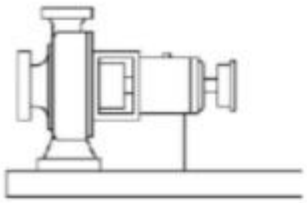
HYDRAULIC INSTITUTE | ENERGY RATING

Bell & Gossett / e-1510 3BD-4P-BP e-1510 3BD-4P-BP

Xylem, Inc

Pump Energy Index	Energy Rating
0.90	18

Baseline: 1.08



HI Rating ID:	QLVME5
Basic model designation:	e-1510 3BD-4P-BP
Manufacturer's model designation:	e-1510 3BD-4P-BP
DOE product category:	ESFM
HI approved laboratory:	Xylem Inc. - Applied Water Systems - 000102
Full impeller diameter:	9.500 inches
Nominal speed:	1800 rpm
BEP flow rate:	533.69 gpm
BEP head:	82.12 ft
BEP Driver input power:	14.02 hp
Rated motor power:	15.00 hp
Date listed:	Oct 23, 2017

Hydraulic Institute(HI) Pump Energy Rating Labels

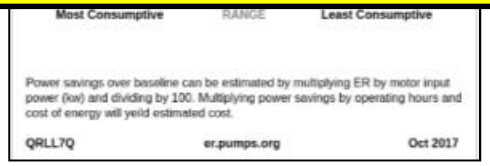
- **Hydraulic Institute Energy Rating labels now available**

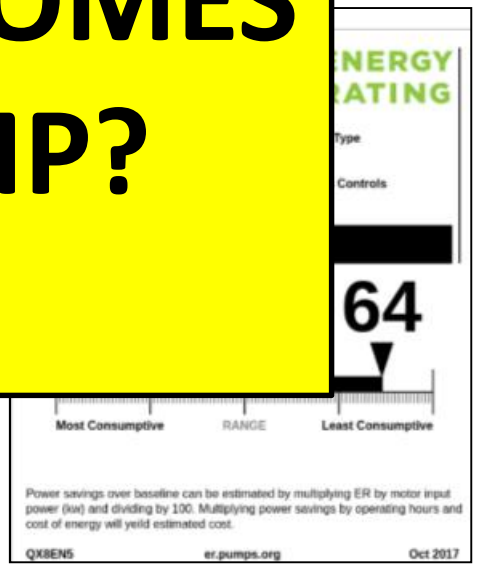
- **http://er.pumps.org/ratings/home**

HI ER Label examples

- Bare Pump
- Pump & Motor (Same as bare pump since motors is highly efficient)
- Pump, Motor and continuous controls (i.e. VS Drive)

WHAT LABEL COMES ON MY PUMP?





What HI ER Label is applied?

Order a Pump End Only –

you get the <u>Constant Load Bare Pump PEI Label</u>

Order a Pump & Motor –

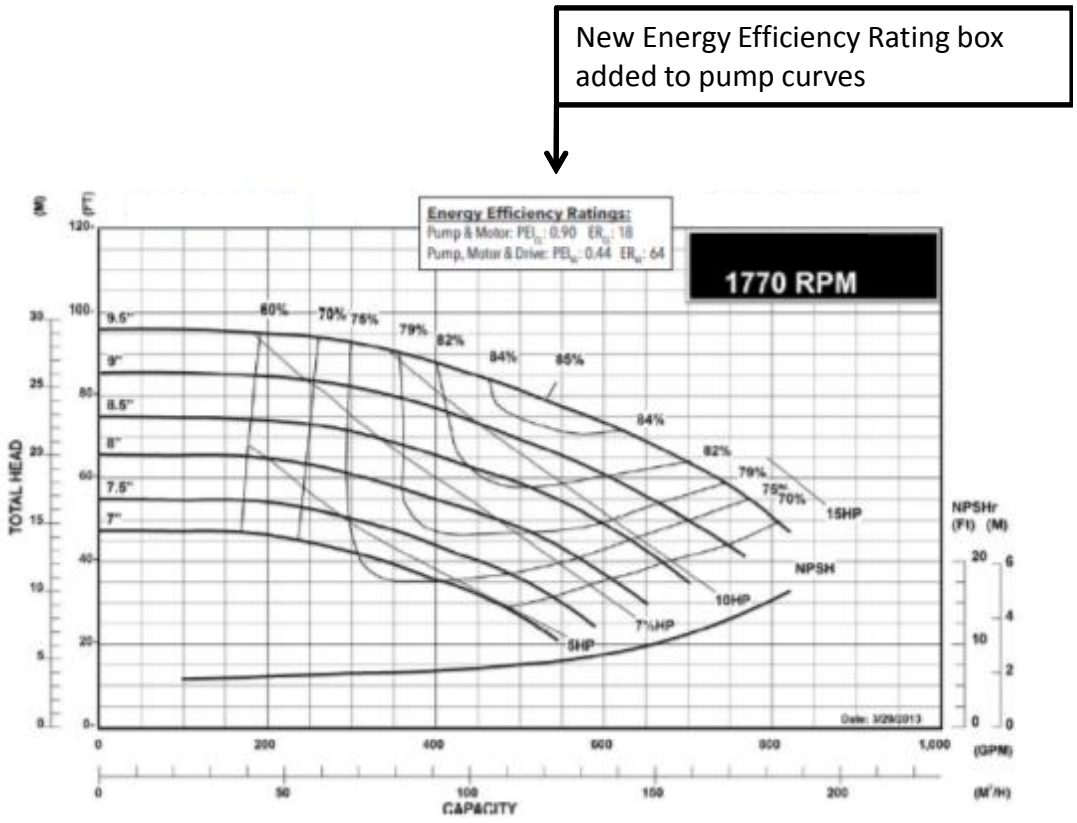
You get the <u>Constant Load Pump & Motor Label</u>

Order a Pump, Motor and VS Drive

You get the <u>Variable Load Pump, Motor & Drive Label</u>

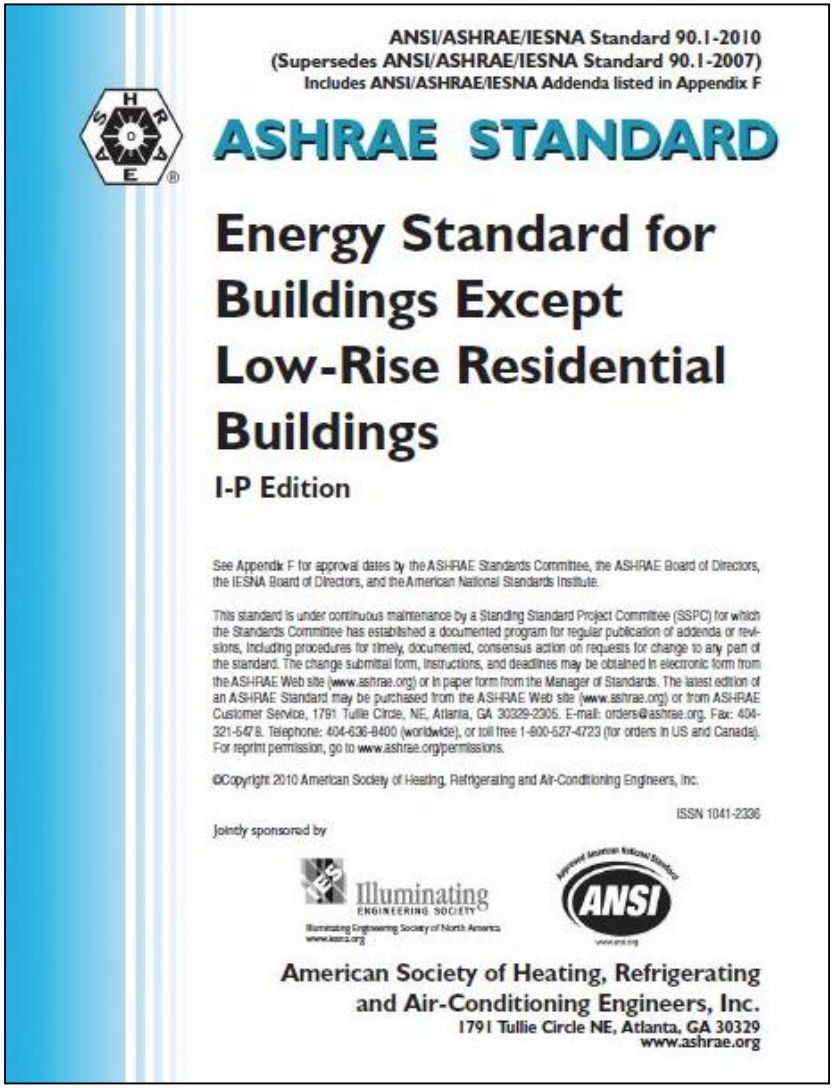
Where can I see DOE PEI and HI ER data?

- Each Mfgr will vary
- New “Energy Efficiency Rating” box added to each curve.
- Online databases also available. . .



ASHRAE STANDARD 90.1

- 90.1 Committee is currently working on the 2019 version of the standard which will be released in late 2019.
- Verbiage being added to require the used of DOE compliant pumps



Other DOE Pump Efficiency Regulations?

- Dedicated Purpose Pool Pumps
  - DOE Working Group 2015-16
  - Reached consensus agreement with DOE requiring V.S. Motors
  - Goes into effect July 2021

- Circulator Pumps
  - DOE Working Group 2015-2016
  - Recommended requiring ECM motors only
  - Proposal was never implemented by DOE

Utility Rebates for Pumps

New construction and retrofit:

- $25/HP for 3-40 HP
- $4/HP for 50-200 HP

Based on DOE PEI:

- Constant speed PEI less than 0.96
- Variable speed PEI less than 0.49

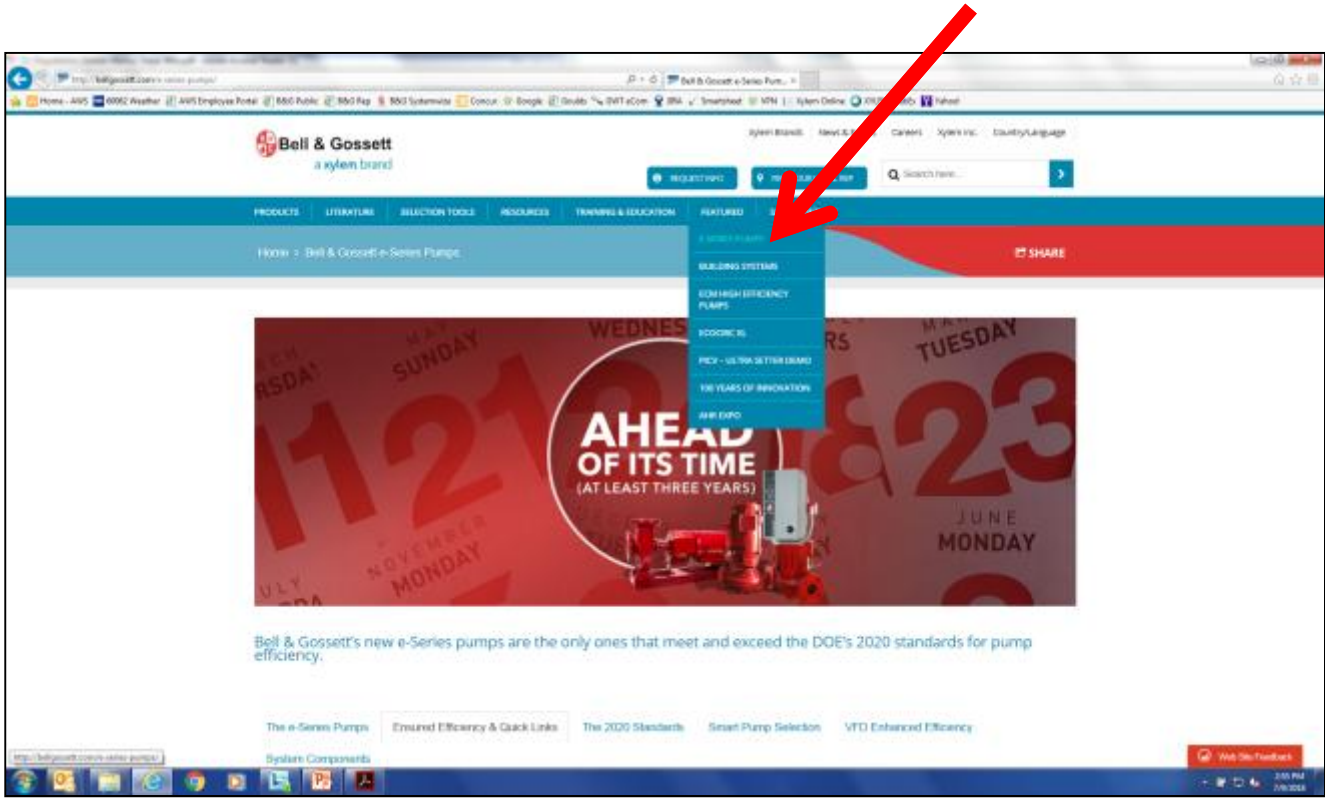
Other utilities expected to follow:

PG&E MIDSTREAM WATER PUMP INCENTIVE PROGRAM
2018 Measure Tables

Rebate Code	Description	Rebate/Unit Measure
PM003	Constant Speed to Constant Speed Replacement, ≥3HP≤50HP, PEI<0.96	$25/HP
PM004	Constant Speed to Constant Speed Replacement, >50HP≤200HP, PEI<0.96	$4/HP
PM006	Variable Speed to Variable Speed Replacement, ≥3HP≤50HP, PEI<0.49	$25/HP
PM0037	Variable Speed to Variable Speed Replacement, >50HP≤200HP, PEI<0.49	$4/HP

Resources available

- B&G Public Website “Featured” Tab
- “Resources” Tab
- “E-Series Pumps”
- “Ensured Efficiency & Quick Links” Tab



Available resources

Clean Water Pump Energy Efficiency Information	URL
U.S. DOE Energy Conservation Standard for Clean Water Pumps	https://www.ecfr.gov/cgi-bin/retrieveECFR?n=pt10.3.431#sp10.3.431.y
U.S. DOE Uniform Test Procedure for Certain Clean Water Pumps	https://www.ecfr.gov/cgi-bin/retrieveECFR?n=pt10.3.431#ap10.3.431_1466.a
U.S. DOE Energy Conservation Standard for Water Pumps - Scope, Diagram, and Definitions	http://www.pumps.org/DOE_Pumps.aspx
Hydraulic Institute Frequently asked questions related to the U.S. DOE Energy Conservation Standard and Test Procedure for Water Pumps	http://pumps.org/EnergyEfficiency/DOE_Rulemaking/FAQs.aspx
Hydraulic Institute List of Certified Pump Test Labs	http://pumps.org/EnergyEfficiency/Pump_Test_Lab_Approval_Program/PTLAP_Approved_Labs.aspx
Database of State & Local Incentives for Renewables & Efficiency	http://www.dsireusa.org/

Questions?

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