GPG FINDINGS **035**

SEPTEMBER 2018

SMALL CIRCULATOR PUMPS WITH AUTOMATED CONTROL

OPPORTUNITY

How much energy can high-performance circulator pumps save?

4.75 TWh

REPLACING 30 MILLION U.S. CIRCULATOR PUMPS
WITH 50% HIGHER EFFICIENCY[1]

TECHNOLOGY

How do high-performance circulator pumps with automated control work?

< 2.5 HORSEPOWER PUMPS

VARIABLE SPEED

ELECTRONICALLY COMMUTED MOTORS

ONBOARD CONTROL ALGORITHMS

M&V

Where did Measurement and Verification occur?

NATIONAL RENEWABLE ENERGY LABORATORY (NREL) measured performance of two common pump applications at two buildings within the Denver Federal Center—a domestic hot water (DHW) system and an air handler unit (AHU).

RESULTS

How did the small circulator pumps with automated control perform in M&V?

96%
ENERGY SAVINGS
for DHW pump, 60% savings for AHU pump[2]

MORE
OPERATIONAL VISIBILITY
and reduced maintenance, no greasing of bearings or replacing pump seals [3]

<6
YEAR PAYBACK
@ 0.11/kWh GSA average utility rate and including annual maintenance savings[4]

Payback and Savings Compared to Baseline Standard Pumps

Higher flow rates combined with smaller pump sizes offered the best return on investment

	% Savings	Annual Energy Savings (kWh/yr)	Annual Energy Cost Savings @ 0.11 kWh ($)	Annual O&M Savings ($)	Incremental Cost ($) over market standard pump	Simple Payback	Savings-to-Investment Ratio (SIR)
DHWP #1: ¼ HP, 77 watts (duty point) **Baseline:** ¼ HP, 280 watts (duty point)	96%	587 kW	$65	$75	$575	4.1	3.6
DHWP #2: ¼ HP, 97 watts (duty point) **Baseline:** ½ HP, 370 watts (duty point)	96%	1,039 kW	$114	$75	$575	3.0	4.9
AHU 19 : 0.36 HP, 186 watts (duty point) **Baseline:** ½ HP, 223 watts (duty point) 4 hrs/day run-time	26%	45 kW	$5	$75	$500	6.3	2.4
AHU 19: 0.36 HP, 186 watts (duty point) **Baseline:** ½ HP, 330 watts (duty point) 20 hrs/day run-time	60%	688 kW	$76	$75	$500	3.3	4.5

DEPLOYMENT

Where does M&V recommend deploying small circulator pumps with automated control?

END-OF-LIFE REPLACEMENT

FOR CONSTANT-SPEED PUMPS

Pumps used for DHW recirculation, small heating systems, small chilled water systems, solar hot water systems and small geothermal heat pump applications are all candidates for replacement.

[1]High-Performance Circulator Pump Demonstration, Jesse Dean, Anoop Honnekeri, Greg Barker, National Renewable Energy Laboratory (NREL), September 2018, p.4 [2]Ibid, p.30, 42 [3]Ibid, p.v [4]Ibid, p.v

GSA

The GPG program enables GSA to make sound investment decisions in next generation building technologies based on their real world performance. **www.gsa.gov/gpg**