



Hot Water Use In Canada And The Implications For Performance Test Standards

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Supported by PERD, OEE and Utilities



The Test Standards

CSA P.3 -04 CSA P.7-98 CSA C745-03 ASHRAE 118.2
US DOE CFR Title 10, Part 430, Subpart B, Appendix E

Energy Factor (EF) =

The ratio of the energy delivered to the end user as hot water divided by the total energy consumed by the water heater over a 24 hour period, in a simulated use test.

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Are The Test Standards Out Of Date ?

The basis for the current water heating appliance performance Standards was established many years ago (~25 years).

Assumes :

6 draws of 40.6 litres (10.72 US gallons) an hour apart

Flow Rate rate = 10.4 litres per minute (3.0 US gpm)

~ 3.6 minutes per draw

Established as being typical for a US family of four.

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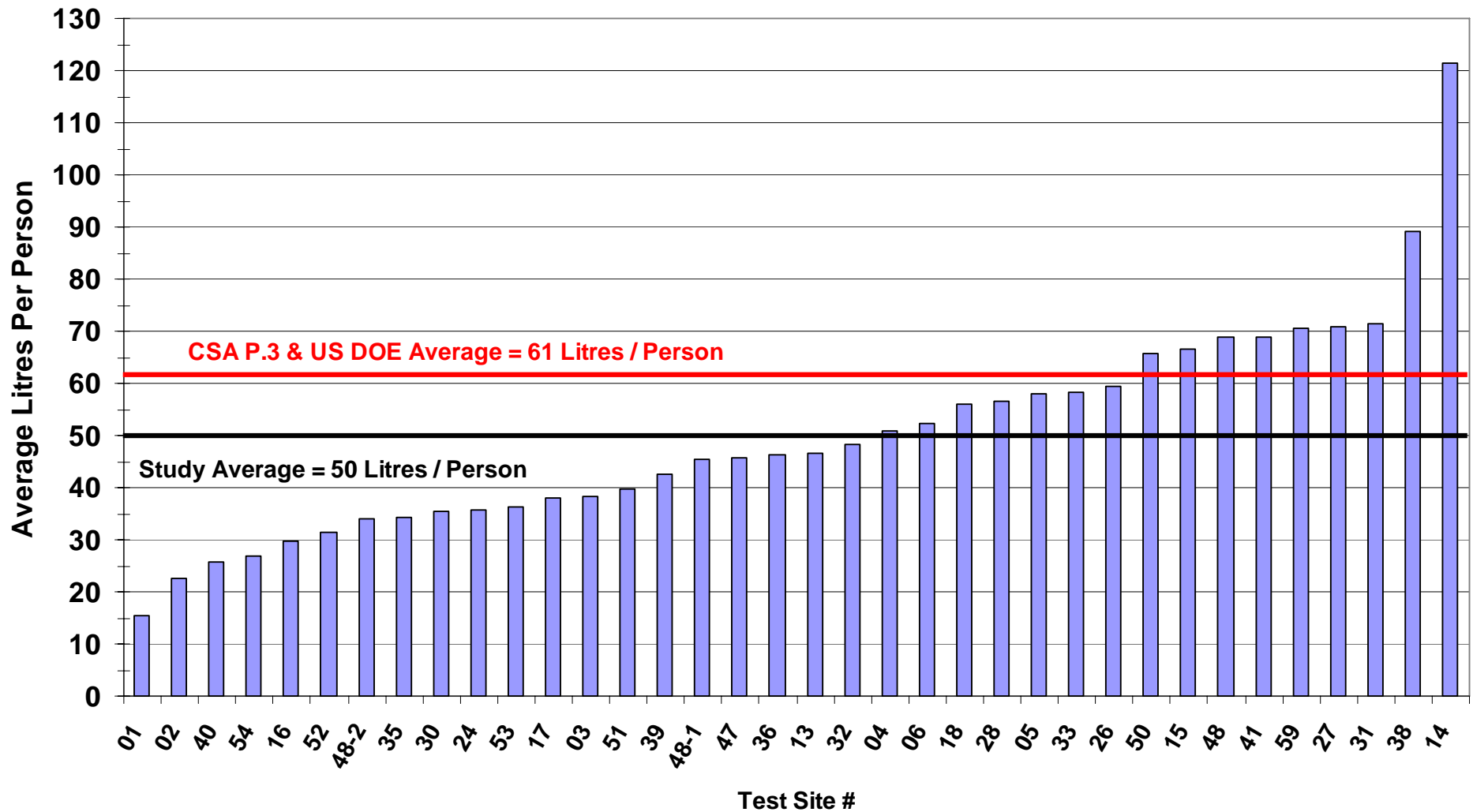


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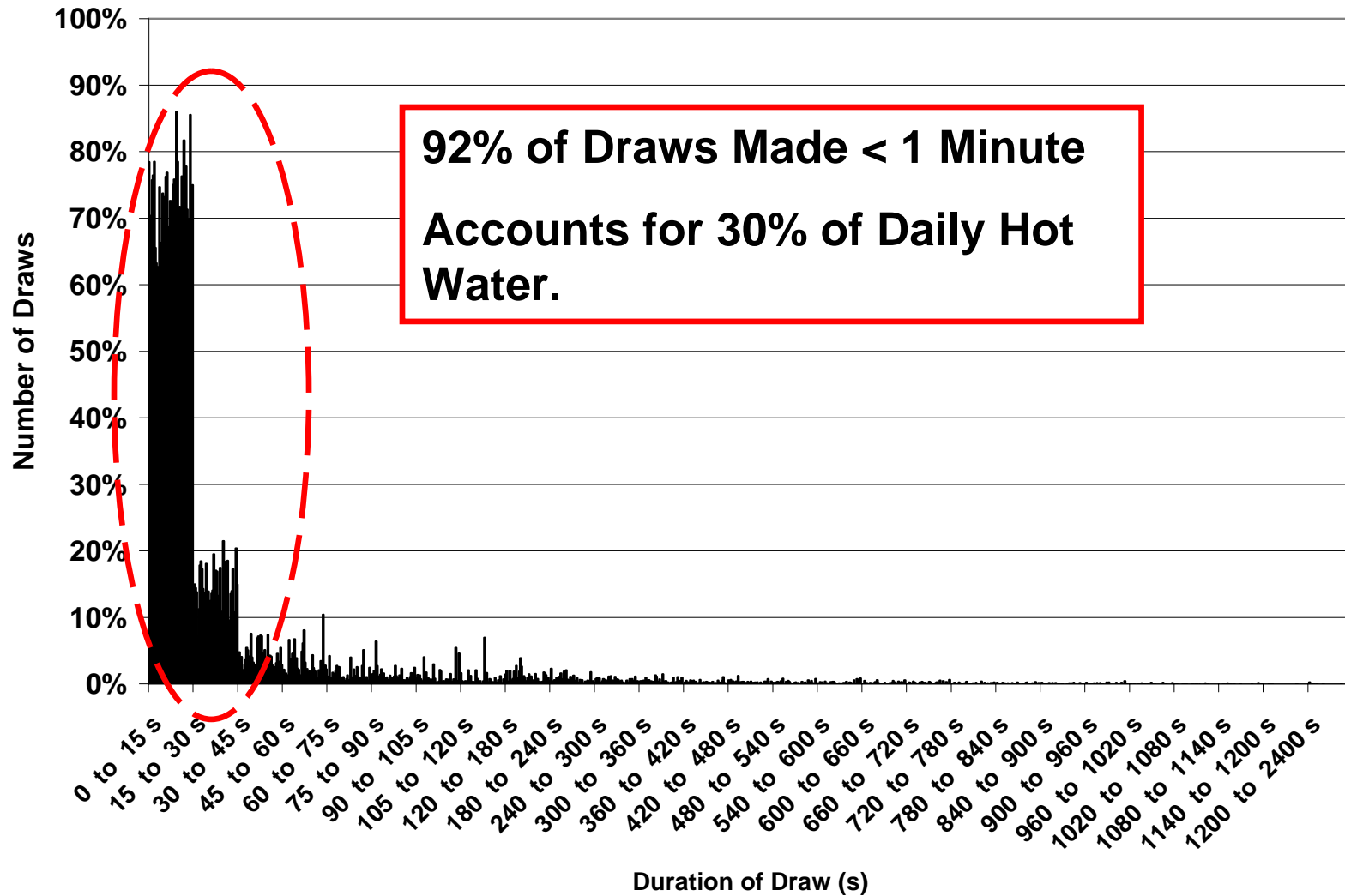
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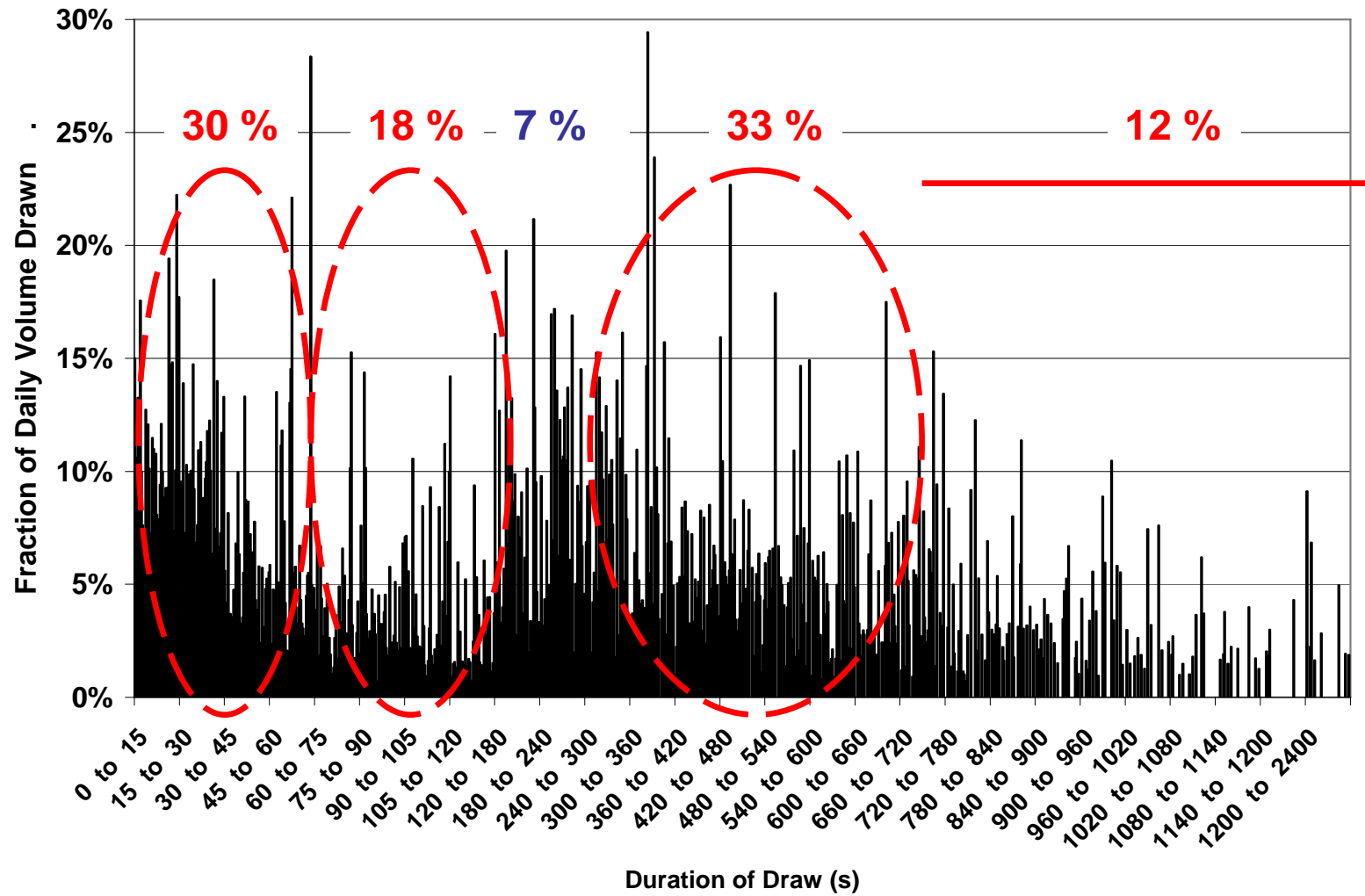
Average Daily Hot Water Use Per Person



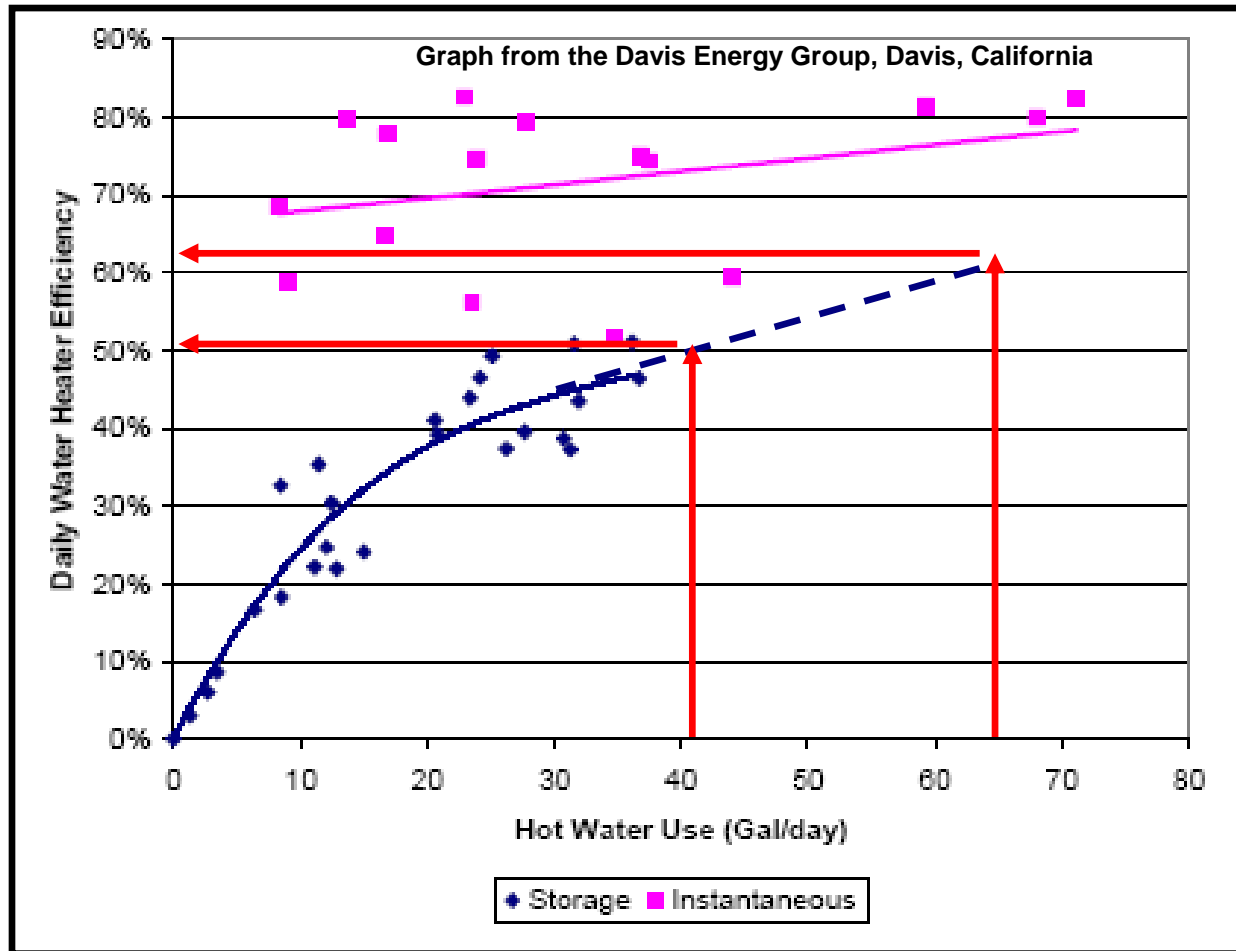
Number of Daily Hot Water Draws



Fraction of Daily Hot Water Volume Drawn



How Water Use Affects Storage WH Efficiency



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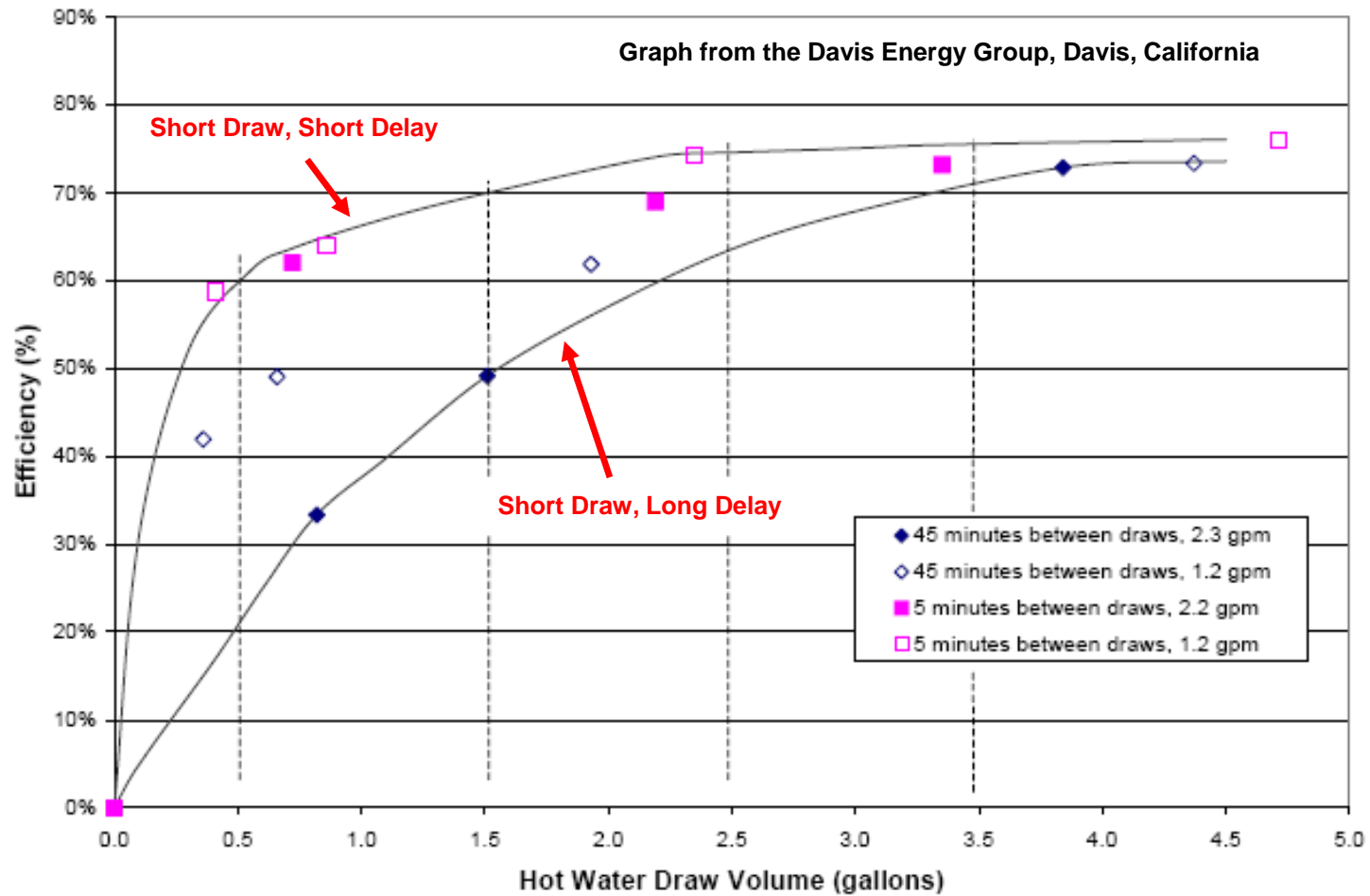


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How Water Use Affects Tankless WH Efficiency



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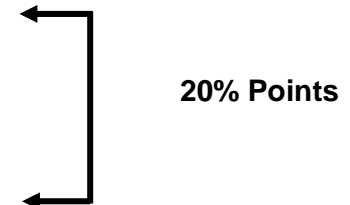
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How Water Use Affects Tankless WH Efficiency

NRCan Data

Summary Table

Steady State High Input (Flue Loss)	84%
Steady State Low Input (Flue Loss)	75%
P.7 (135 °F water, High & Low Input)	79%
1 on / 1 off, 135 °F water, 1.0 US gpm	71%
1 on / 3 off, 135 °F water, 1.0 US gpm	68%
1 on / 10 off, 135 °F water, 1.0 US gpm	67%
Test 1, 115 °F water, 1.3 US gpm, 1.2 min on / 15 off	64%
Test 2, 115 °F water, 1.3 US gpm, 0.75 min on / 15 off	59%
Test 3, 115 °F water, 1.3 US gpm, 200 Litres Drawn	68% (75% by Flue Loss)
Test 4, 130 °F water, 1.9 US gpm, 1.33 min on / 10 off	69%
Test 5, 130 °F water, 2.6 US gpm, 1.25 min on / 10 min off	70%
Test 6, 180 °F water, 1.3 US gpm, 1.4 min on / 15 min off	75%



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Changing The Test Method

P.3 6 Draws of 40.57 Litres at 11.4 Litres per Minute, 1 Hour Interval, 18 Hours on Standby

Modified 1 1 draw of 90 Litres to be taken followed by 40 minutes of standby then 18 draws of 2.1 Litres with 10 minutes standby in between and then a further 18 draws of 2.1 Litres with 3 minutes of standby. All draws are made at 11.4 Litres per minute.

Modified 2 1 draw of 90 Litres to be taken followed by 40 minutes of standby then 18 draws of 2.1 Litres with 10 minutes standby in between and then a further 18 draws of 2.1 Litres with 3 minutes of standby. First draw at 13.8 Litres per Minute, all Other Draws at 3 Litres per minute.

Effect of Test Method Draw Schedule on Energy Factor		
Test	Energy Factor	
	Storage	Tankless
P.3	0.57	0.76
Modified 1	0.40	0.67
Modified 2	Test In Progress	0.68

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Conclusions

- Changing the test method to more closely reflect a “real life” draw pattern will Result in a very different EF, in all cases.
- A water heater performance test method that reflects real use performance will help the true Energy Savings or Emissions Benefits to be established
- A new test standard would reward manufacturers that make the correct technology choices, that would result in more efficient water heating products.

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