DOCKETED

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Project Title:	Pool Pumps and Spa Labeling
TN #:	210375
Document Title:	Staff Workshop Draft Pool Pump and Motor Standards - Slides
Description:	N/A
Filer:	Sean Steffensen
Organization:	California Energy Commission
Submitter Role:	Commission Staff
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California Energy Commission

Staff Workshop
Draft Pool Pump and Motor Standards

February 18, 2016

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Efficiency Division

Presentation Agenda

- Background
- Scope and Product Description
- Regulatory Approach
- Technical Feasibility
- Cost Effectiveness
- Statewide Energy Savings
- Environmental Benefits
- Discussion Items

Workshop Purpose

- Staff Proposal:
  - Expand scope to commercial pool pump motors under 5 hp
  - Expand scope to include filter, booster, and waterfall pumps
  - Remove prescriptive prohibition of certain motor types
  - Add minimum motor efficiency performance requirement
  - Adopt CSA 747-09 Motor Efficiency Test Procedure
  - Adopt ANSI/HI14.6-2011 Pump Efficiency Test Procedure
- The draft staff report contains proposal details.
  - http://docketpublic.energy.ca.gov/PublicDocuments/15-AAER-02/TN210066_20160128T103017_Analysis_of_Efficiency_Standards_for_Pool_Pumps_and_Motors_and.pdf
- Staff seeks public comments on the proposal.

Scope

- Staff Proposal:
  - Expand scope to commercial pool pump motors 5 total hp or less
  - Expand scope to include filter, booster and waterfall pumps
  - Includes pumps and motors for residential, commercial, above ground, in-ground, permanent and storable pools
- Rationale:
  - Improve compliance and enforcement of regulation
  - Increase energy savings through application to additional pump types

Pool Pump and Motor Combination

Replacement Pool Pump Motor

Scope Description

In Scope (5 total horsepower or less):

Residential and Commercial Filter


Residential and Commercial Booster


Residential and Commercial Waterfall


In ground, above ground, and storable pools


Out of Scope:

Pool Pumps > 5 total horsepower


Portable Electric Spa Pumps


Commercial and Industrial Pumps




Motor Efficiency

- Staff Proposal:
  - Remove prescriptive prohibition of motor types
  - Add minimum motor efficiency performance requirement
- Rationale:
  - Technology neutral performance requirement allows for market innovation
  - Standard will lead to energy savings by improving efficiency of all pool pump motors sold in California
  - Tiered approach to allow market transition to efficient motors

Motor Efficiency

Motor Design	Full-Speed (3450 RPM)	Half-Speed (1725 RPM)
Single-Speed (up to 1 hp)	70%	N/A
Variable-Speed/Multiple-Speed/Dual-Speed (up to 5 hp)	70%	50%

Tier 1: Effective January 1, 2018

Motor Design	Full-Speed (3450 RPM)	Half-Speed (1725 RPM)
Single-Speed (up to 1 hp)	80%	N/A
Variable-Speed/Multiple-Speed/Dual-Speed (up to 5 hp)	80%	65%

Tier 2: Effective January 1, 2021

Motors between 1 hp and 5 hp total capacity require a minimum 2 speed

Test Method

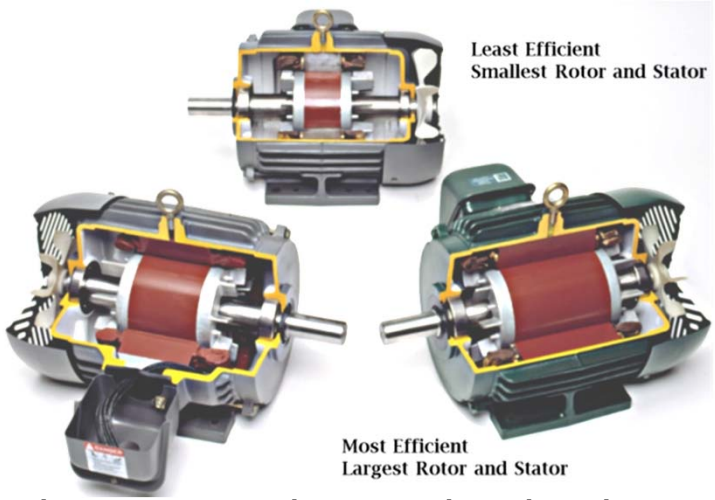
- Staff Proposal:
  - Adopt CSA 747-09 Motor Efficiency Test Procedure
  - Adopt ANSI/HI14.6-2011 Pump Efficiency Test Procedure
- Rationale:
  - CSA test standard provides for efficiency testing of all small motor types and at speeds less than full speed
  - ANSI/HI14.6-2011 test standard modernizes pump efficiency standard

Electric Motor Test Bench

Technical Feasibility

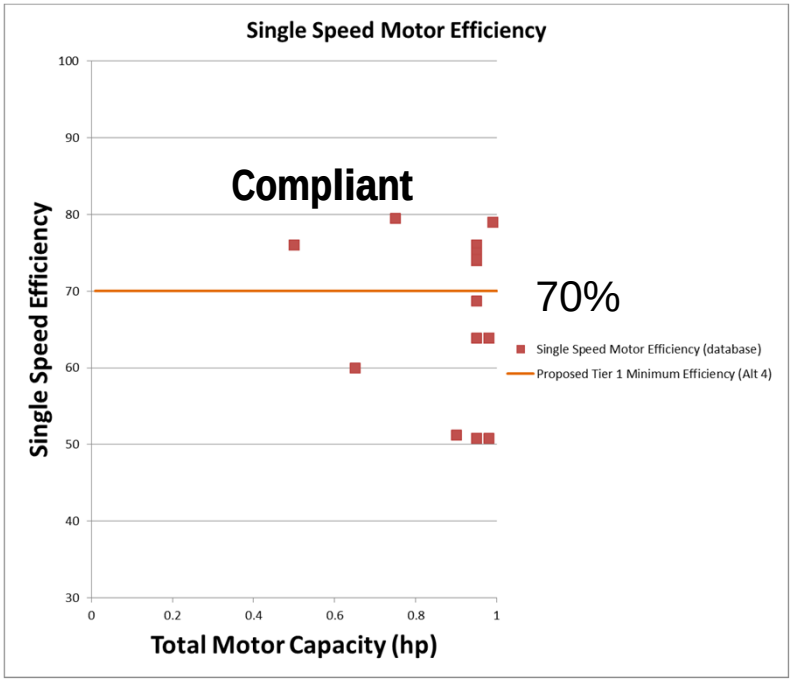
- Motor manufacturers have improved efficiency by modifying the motor design to reduce energy losses:

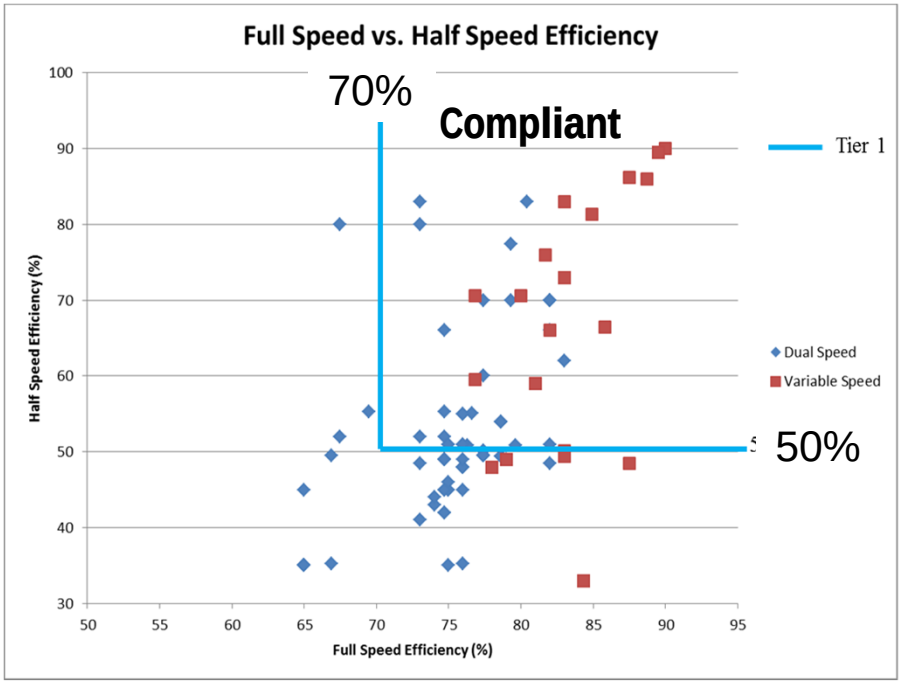
Source of Energy Loss	Design Solution
Conduction losses in motor stator	Reduce conduction losses within the motor's stator by increasing copper conductors
Conduction losses in motor rotor	Eliminate conduction losses in motor's rotor by replacing electro-magnet with permanent magnet



Additional rotor and stator conductors lead to better motor efficiency

Technical Feasibility (Tier 1)

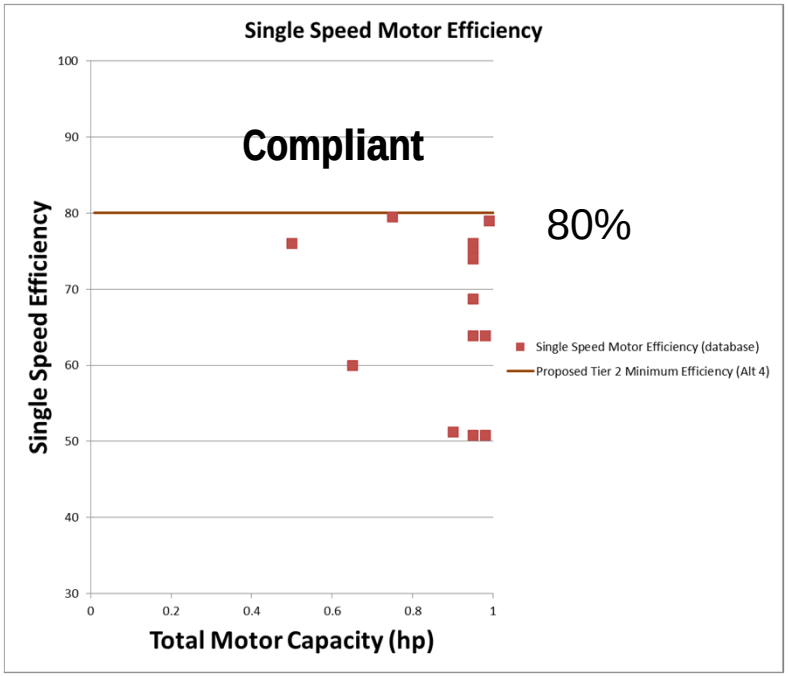


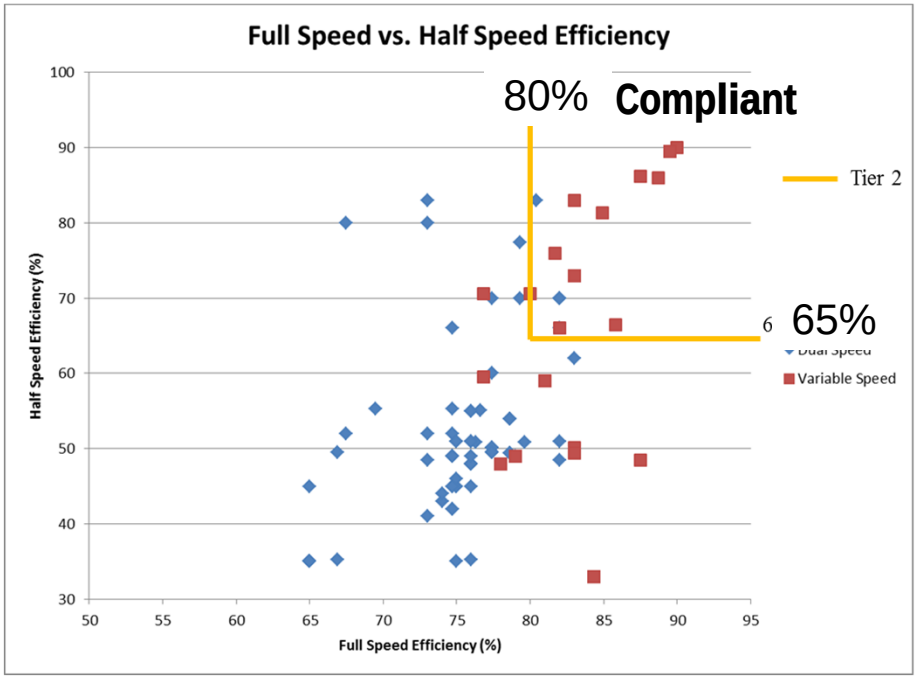


Source: Energy Commission Appliance Database (June, 2015)

Motor Design	Full-Speed (3450 RPM)	Half-Speed (1725 RPM)
Single-Speed (up to 1 hp)	70%	N/A
Variable-Speed/Multiple-Speed/Dual-Speed (up to 5 hp)	70%	50%

Technical Feasibility (Tier 2)





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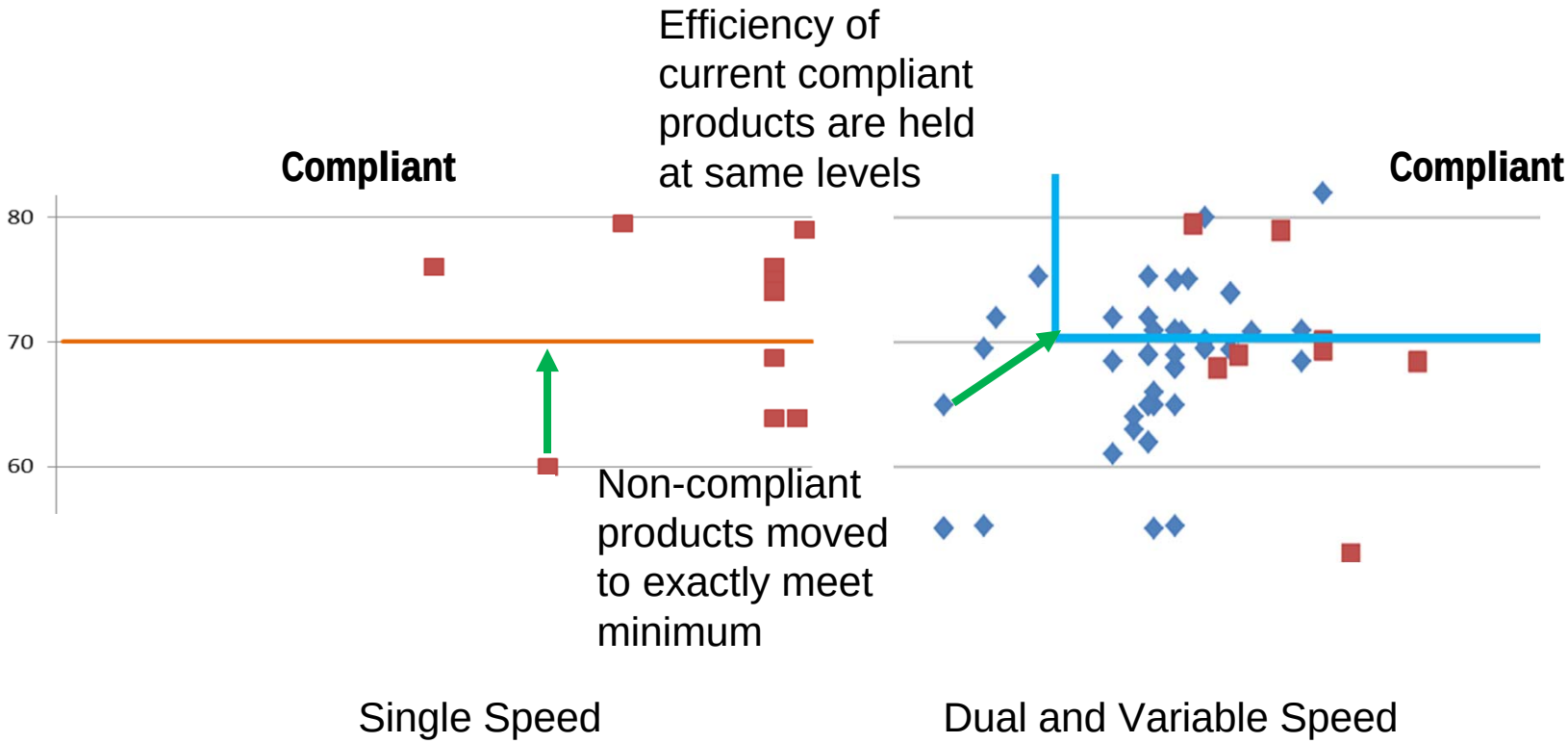
Savings Methodology

- The average unit energy savings calculated by comparing performance data to minimum efficiency



Cost Effectiveness

Product	Design Life (years)	Electricity Savings (kWh/yr)	Incremental Cost ($)	Avg. Annual Savings ($)	Life-Cycle Savings ($)	Life-Cycle Benefit ($)	Payback Period (years)
Variable-Speed Tier 1	10	0	$0	$0	$0	$0	N/A
Variable-Speed Tier 2	10	51	$18	$8	$81	$63	2.3
Dual-Speed Tier 1	10	53	$5	$9	$85	$80	0.5
Dual-Speed Tier 2	10	352	$65	$56	$564	$499	1.2
Single-Speed Residential Filtration Tier 1	10	297	$12	$48	$476	$464	0.3
Single-Speed Residential Non-Filtration Tier 1	10	157	$12	$25	$252	$240	0.5
Single-Speed Commercial Tier 1	10	682	$12	$109	$1,091	$1,079	0.1
Single-Speed Residential Filtration Tier 2	10	186	$55	$30	$297	$242	1.8
Single-Speed Residential Non-Filtration Tier 2	10	98	$55	$16	$157	$102	3.4
Single-Speed Commercial Tier 2	10	2,335	$65	$374	$3,736	$3,671	0.2

Statewide Energy Savings

Product	First Year Savings		Annual Existing and Incremental Stock Savings	
	Electricity Savings (GWh/yr)	Savings ($ million)	Electricity Savings (GWh/yr)	Savings ($ million)
Tier 1 Total Savings	60.9	$9.7	608.7	$97.4
Tier 2 Total Savings	56.9	$9.1	569.1	$91.0
Tier 1 and Tier 2 Total Savings	**117.8**	**$18.8**	**1,177.8**	**$188.4**

Environmental Benefits

Annual Reductions (tons)	Avoided Emissions (tons)				
	Oxides of Nitrogen (NO_x)	Sulfur Dioxide (SO_x)	Carbon Monoxide (CO)	Particulate Matter ($PM_{2.5}$)	Greenhouse Gas (eCO_2)
Dual- and Variable-Speed Tier 1	0.37	0.05	0.53	0.16	3,670
Dual- and Variable-Speed Tier 2	2.87	0.41	4.11	1.23	28,333
Single-Speed Tier 1	20.93	4.33	29.90	8.97	206,329
Single-Speed Tier 2	17.04	2.43	24.35	7.30	167,993
Total Avoided Emissions	41.22	7.23	58.89	17.67	406,324

Discussion Items

- Identify how other codes/standards interact with the proposed efficiency standard
  - California Health and Safety Code
  - California Title 24 Building Energy Efficiency Standards
  - Proposed Federal Department of Energy Regulation on Dedicated Purpose Pool Pumps
- Identify alternate pool pump and motor duty cycles and uses
  - Freeze protection
  - Above ground and storable pool use
- Describe industry's manufacturing timeline versus effective date
- Identify unintended environmental impacts from the proposed standard
- Identify any small businesses/manufacturers impacted by the proposed standard

Comments

- Comments due by 5:00 p.m. on February 29, 2016
- Submit comments electronically:
  - Go to: http://www.energy.ca.gov/appliances/2015-AAER-02/rulemaking/
  - Click on the “Submit eComment” link
- Or send a hard copy to:

California Energy Commission

Dockets Office, MS-4

Re: Docket No. 15-AAER-02

1516 Ninth Street

Sacramento, CA 95814-5512

- Or send a digital copy to docket@energy.ca.gov, please include docket number 15-AAER-02 and indicate Pool Pump Motors and Portable Electric Spas in the subject line.

Thank You!

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