

Air Filter Labeling

Appliance Efficiency Rulemaking
California Energy Commission

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Josh Butzbaugh
Appliances & Existing Buildings Office
Efficiency Division

josh.butzbaugh@energy.ca.gov / 916-653-6231



Agenda

- ❑ Pre-rulemaking
- ❑ Background
- ❑ Objectives of Labeling
- ❑ Regulatory Approaches
- ❑ Proposed Requirements
- ❑ Analysis
- ❑ Next Steps



Pre-rulemaking

Order Instituting Rulemaking (3/14/12)

Commission identified a variety of appliances with the potential to save energy and/or water for appliance efficiency measures.

Invitation to Participate (3/25/13)

Opportunity for interested parties to inform the Commission about the product, market, and industry characteristics of the appliances identified in the OIR.

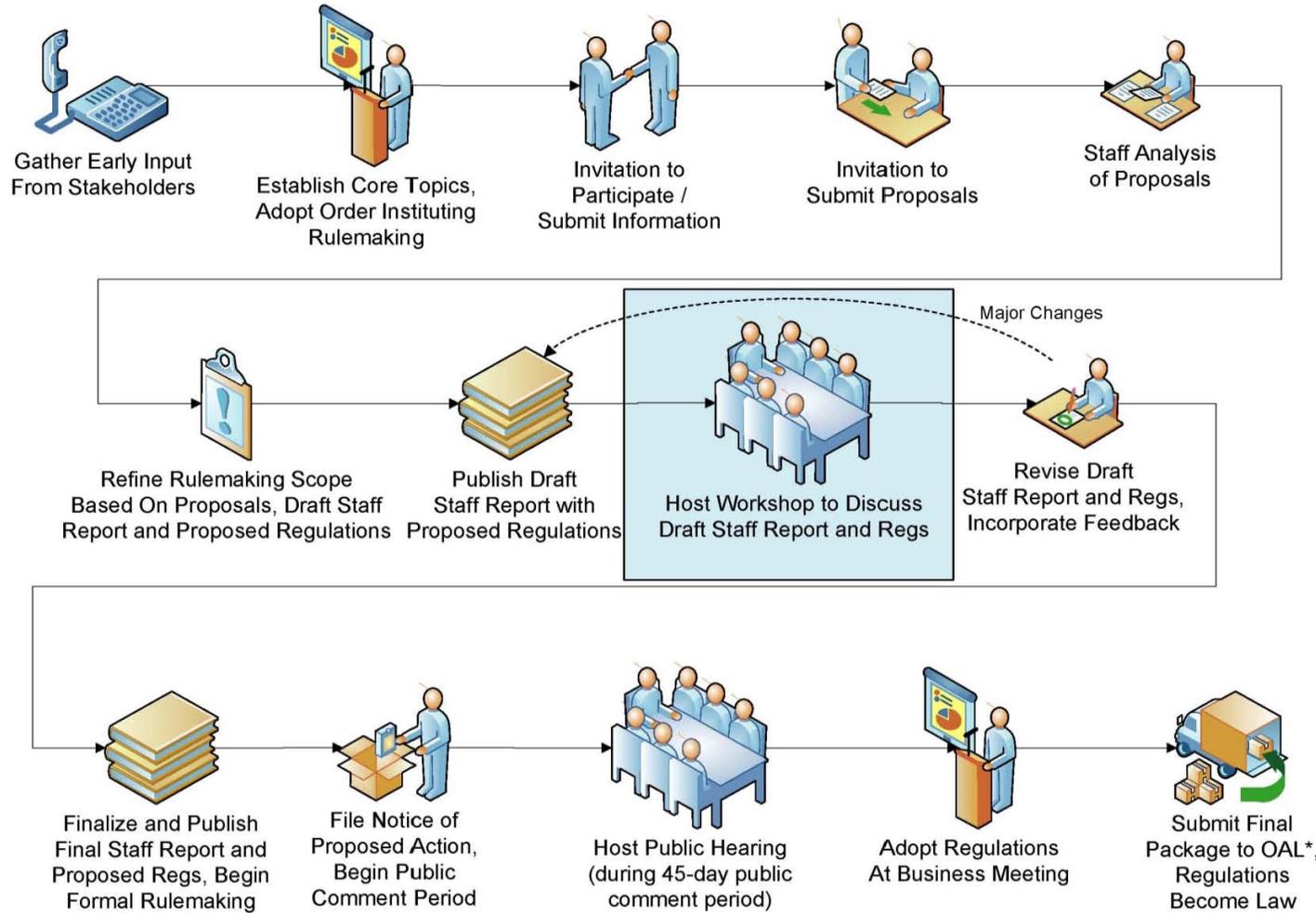
Invitation to Submit Proposals (6/13/13)

Opportunity for interested parties to submit proposals for standards, test procedures, labeling requirements, and other measures to improve efficiency.



Appliance Energy Efficiency Rulemaking Process

5/2/2013



*Office of Administrative Law



Background: Why Air Filter Labeling?

Air filters prevent the build-up of particulates in HVAC equipment by capturing these particulates from the air stream.

However, in doing so, air filters decrease airflow in the HVAC system. If this resistance is excessive, it can damage HVAC equipment and increase energy use.

People need information on particulate capture and airflow resistance to make rational decisions on air filter selection.



Background: Current Labels

Focus is entirely on particle efficiency, not pressure drop.

Minimum Efficiency Reporting Value (MERV) rating

- ❑ Filter's ability to remove particles (0.3 to 10 μm in size) from the air to keep HVAC equipment clean.

Microparticle Performance Rating (MPR)

- ❑ Exclusive to 3M™ air filters, focuses on 0.3 to 1 μm

Filter Performance Rating (FPR)

- ❑ Exclusive to air filters sold at The Home Depot™
- ❑ Weighted performance rating



Background: Current Labels

Market survey results

- ❑ 28% no label
- ❑ 25% only MPR
- ❑ 22% only MERV
- ❑ 12.5% both FPR and MERV
- ❑ 9.5% both FPR and MPR
- ❑ 3% only FPR

2012 survey conducted by California IOUs in Northern California.



Background:

Title 24 Air Filter Requirements

- ❑ Efficiency shall be equal to or greater than MERV 6 (ASHRAE Standard 52.2), or a PSE rating equal to or greater than 50% in 3.0–10 μm range (AHRI Standard 680).
- ❑ Pressure drop shall conform to the max allowable clean-filter pressure drop determined according to Section 150.0(m)12Aii, as rated using AHRI Standard 680, for the applicable design airflow rate(s) for the system air filter device(s).
- ❑ **Problem**
HVAC system designers do not have a repository of air filter model pressure drop information.



Background: Title 24 Air Filter Requirements

- ❑ System air filter locations shall be labeled to disclose design airflow rate and max clean-filter pressure drop.

Airflow Rate (cfm)	Initial Resistance (in. w.c.)	Use only replacement filters with an initial resistance less than 0.032 in. w.c. at 400 cfm airflow rate
400	0.03	



Background:

Title 24 Air Filter Requirements

- ❑ System shall be provided with an air filter labeled to disclose the efficiency and pressure drop ratings that demonstrate conformance with Sections 150.0(m)12B and 150.0(m)12C.
- ❑ **Problem**
This only applies to new HVAC installations and does not address air filter replacements. Majority of air filter purchases are replacements.



Objectives of Labeling

Improve the longevity & energy efficiency performance of HVAC equipment by providing the information to consumers, building inspectors, and HVAC system designers to make optimal purchase, compliance, and design decisions for HVAC systems.



Objectives of Labeling

Consumers

- ❑ Identify appropriate air filter for their HVAC system
 - ❑ Label at point of purchase on air filter
 - ❑ Repository of air filter performance information
- ❑ Level playing field for comparing air filter products
- ❑ Label is easy to use and not overwhelming



Objectives of Labeling

HVAC Designers

- ❑ Identify appropriate filter for HVAC equipment & system design
 - ❑ Repository of air filter performance information
- ❑ Balance of filter air flow resistance with HVAC equipment size, ductwork and other device losses
- ❑ Easy to comply with Title 24 regulations
- ❑ Level playing field for comparing air filter models



Objectives of Labeling

Building Inspectors

- ❑ Easy to facilitate enforcement with Title 24 regulations
- ❑ Align label with measurements included in the Title 24 requirements



Regulatory Approaches

3M

- ❑ PM2.5
- ❑ Average lifetime resistance

California IOUs and NRDC

- ❑ MERV
- ❑ Initial pressure drop (inches water column) measured at face velocities of 300 and 500 feet-per-minute



Regulatory Approaches

AHRI 680 Standard Rating

- ❑ Initial resistance across airflow rates
- ❑ Final resistance
- ❑ Dust holding capacity
- ❑ Particle Size Efficiency across 3 particle size ranges

Table 1. Example of Format for Published Rating

AHRI 680 Standard Rating						
Airflow Rate (CFM)	Initial Resistance ("wc)	Final Resistance** ("wc)	Dust Holding Capacity** (g)	Particle Size Efficiency** (0.30 - 1.0 µm)%	Particle Size Efficiency** (1.0 - 3.0 µm)%	Particle Size Efficiency** (3.0 - 10 µm)%
400	0.05					
800	0.10					
1200	0.17					
1600	0.25					
2000*	0.32					
		0.50	45	17	53	87

* Maximum Rated Airflow Rate as published by the manufacturer.
 ** Standard Rating requires that these shall be tested at Maximum Rated Airflow Rate as published by manufacturer.



Proposed Requirements

Data certification to the Energy Commission for air filter models

- ❑ MERV (1-20)
- ❑ Particle Size Efficiency for 0.3 to 1.0 μm particle size (%)
- ❑ Particle Size Efficiency for 1.0 to 3.0 μm particle size (%)
- ❑ Particle Size Efficiency for 3.0 to 10.0 μm particle size (%)
- ❑ Dust holding capacity (grams)

Test procedure for particle efficiency & dust holding capacity

- ❑ AHRI 680-2009, or ASHRAE 52.2-2012
- ❑ Declare which test procedure used



Proposed Requirements

Data certification to the Energy Commission for air filter models
(continued)

- ❑ Maximum rated airflow rate (cfm)
- ❑ Initial resistance at 400 cfm (iwc)
- ❑ Initial resistance at 800 cfm (iwc)
- ❑ Initial resistance at 1,200 cfm (iwc)
- ❑ Initial resistance at 1,600 cfm (iwc)
- ❑ Initial resistance at 2,000 cfm or max rated airflow rate (iwc)
- ❑ Final resistance at 2,000 cfm or max rated airflow rate (iwc)

Test procedure: AHRI 680-2009



Proposed Requirements

Label Format

MERV	Airflow Rate (CFM)	400	800	1200	1600	2000*	*Max Rated Airflow
[value]	Initial Resistance (IWC)	[value]	[value]	[value]	[value]	[value]	

Printed or labeled on air filter

If packaging obscures label, then also printed on packaging

Consumers and retailers can match a spent air filter with a new replacement filter



Hypothetical Example

Size: 16 x 24 x 1

MERV	Airflow Rate (CFM)	400	800	1200	1400*	*Max Rated Airflow
10	Initial Resistance (IWC)	0.05	0.10	0.17	0.21	

Consumer decision-making process

1. Exact match for size
2. Exact match or less for pressure drop across airflow rate(s)
3. Exact match or greater for MERV

Building Inspector decision-making process

1. MERV is greater than 6
2. Initial pressure drop for the design airflow rate is an exact match or less (comparing labels on air filter & return duct)



Savings Analysis

Annual State Energy Consumption - Residential HVAC Systems with Filters											
Household Type	# of HHs	Central ACs		Heat Pumps		Furnance Fans		Furnaces		Energy Consumption	
		kWh	Sat	kWh	Sat	kWh	Sat	Therms	Sat	kWh/yr	Therms/yr
Single Family	7,269,794	894	56%	994	1%	216	73%	183	73%	4,858,112,434	971,171,760
Townhouse	905,580	483	41%	320	1%	91	61%	58	61%	232,498,572	32,039,415
2-4 hh Apartment	1,031,355	494	33%	324	1%	80	42%	66	42%	206,126,578	28,589,156
5+ hh Apartment	2,829,937	324	36%	522	3%	64	40%	32	40%	446,847,060	36,223,194
Mobile Home	477,945	876	48%	504	2%	157	66%	143	66%	255,308,620	45,108,442
Total										5,998,893,264	1,113,131,967

$$Total\ Annual\ Energy_{Household\ Type} = N_{households} \times S_{HVAC\ per\ HH} \times E_{avg\ HVAC\ per\ HH}$$



Savings Analysis

Annual State Energy Savings - HVAC Systems with Filters				
	Electric	Gas	Total Monetary	
	kWh/yr	Therms/yr	Savings	
Total Energy Consumption	5,998,893,264	1,113,131,967		
Non-Compliance %	50%	50%		
Energy Savings %	1%	1%		
Total Energy Savings	29,994,466	5,565,660		
\$/kWh	\$0.164			
\$/Therm		\$0.995		
Total	\$4,919,092	\$5,537,832		\$10,456,924



Costs Analysis

Annual State Costs					
	Number of HHs	Central AC Saturation	Heat Pumps Saturation	Furnace Fan Heating Only	Total
Household Type					
Single Family Avg	7,269,794	56%	1%	17%	5,379,647
Townhouse Avg	905,580	41%	1%	20%	561,460
2-4 hh apartment avg	1,031,355	33%	1%	9%	443,483
5+ hh apartment avg	2,829,937	36%	3%	4%	1,216,873
Mobile home avg	477,945	48%	2%	18%	325,003
Total Number of HVAC Systems with Filters					7,926,465
Filters per HVAC System					1.25
Filter replacements per year					2
Cost per Filter Label					\$0.03
Total Annual Cost per Filter Label					\$0.08
Annual Monetary Cost					\$594,485



Cost Effectiveness Analysis

Net Benefit per Household and Statewide		
	Per Household	State
HVAC Systems with Filters	-	7,926,465
Annual kWh Savings	3.78	29,994,466
Annual Therm Savings	0.70	5,565,660
Annual State Monetary Savings	\$1.32	\$10,456,924
Annual State Monetary Costs	\$0.08	\$594,485
Net Benefit	\$1.24	\$9,862,439



Next Steps

- ❑ Consider input from today's workshop and written comments. Written comments are due by June 6, 2014
- ❑ Revise staff report analysis and proposed requirements, as necessary
- ❑ Commission staff are available to discuss questions and concerns at any time during the proceeding.



Discussion & Comments

Josh Butzbaugh

josh.butzbaugh@energy.ca.gov
916-653-6231

Docket # 14-AAER-1
at docket@energy.ca.gov

