DOCKETED	
Docket Number:	17-AAER-06
Project Title:	Commercial and Industrial Fans & Blowers
TN #:	224134
Document Title:	Ingersoll Rand presentation
Description:	N/A
Filer:	System
Organization:	Ingersoll Rand
Submitter Role:	Public
Submission Date:	7/12/2018 8:50:26 AM
Docketed Date:	7/12/2018

Comment Received From: Alejandro Galdamez
Submitted On: 7/12/2018
Docket Number: 17-AAER-06

Ingersoll Rand presentation

Presentation in response to the draft staff report and analysis for commercial fans and blowers

Additional submitted attachment is included below.

Considerations for Certain Embedded Fans

Response to Draft Staff Report, Analysis of Efficiency Standards and Test Procedures for Commercial and Industrial Fans & Blowers
Docket Number 17-AAER-06

California Energy Commission Staff Workshop
July 11, 2018

Mark Lessans
Ingersoll Rand Center for Energy Efficiency and Sustainability

Ingersoll Rand Proposed Changes to CEC Staff Report Language

- **Explicitly exclude** from the scope of regulation fans embedded in products which must already meet an efficiency rating under **DOE Appliance Standards, CA Title 20, CA Title 24, and CARB Emissions Standards**
  - Including all fans embedded in commercial package and split air conditioning equipment, applied chillers, commercial and industrial air compressors
  - Regulating these fans will not yield proportional system energy savings
- As an alternative, we recommend that **CEC address the efficiency requirements for non-federally pre-empted products and systems** through existing state policy mechanisms
- Expand the definition of “heat rejection equipment” to include fans used for the purpose of removing heat from a system
- Clarify that all fans embedded in transport refrigeration equipment are exempt
  - Electricity savings potential in transport refrigeration units is *de minimis* (roughly equivalent to 1.5 homes for entire CA TRU market)

Practical Impacts on Embedded Fan Footprint

- In most embedded applications, **moving to a more efficient fan requires increasing fan footprint**
- CEC Staff Report cites 27” **square inline fan** to 27” **mixed-flow fan** will improve efficiency
  - These fans are designed and rated for ductwork applications, but are not used in packaged HVAC equipment
    - Use in packaged unitary equipment would reduce fan efficiency and increase re-optimization requirements
- Packaged unitary equipment uses **centrifugal housed** or **unhoused plenum** fans
  - Optimized for equipment applications whether discharging into a duct or downstream components
  - **There are no commercially available centrifugal housed or unhoused plenum fans where FEI can be improved without increasing fan footprint or limiting operating map**

INLINE

Centrifugal (Square)

INLINE

Mixed Flow

OEM

Centrifugal Housed

OEM

Centrifugal Unhoused (Plenum)

Fan footprint or performance change can require system redesign w/o reduced energy use.

Negative, Unintended Consequences of Staff Report Language

- **Disrupted Product Design Optimization**
  Redesigning a system to accommodate a larger/more efficient fan will lead to tradeoffs elsewhere to achieve the same product efficiency.

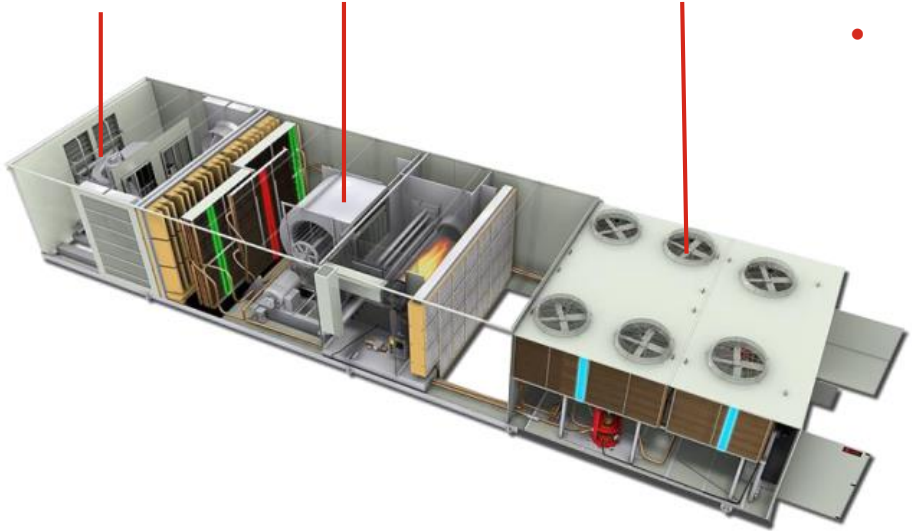
- **Loss of Utility for Energy Efficiency Features**
  For example, unitary HVAC system economizing will be significantly reduced if relief fans can only operate at narrow design point.

- **Diverted OEM Investments & Increased Consumer Costs**
  Resources which would otherwise be used for improving system efficiency, using alternative refrigerants, would be used for redesign to accommodate new fans. Resulting products will be sub-optimal and more expensive.

Increased component efficiency can increase consumer cost w/o system energy reduction.

Product-level Impacts: Unitary Air Conditioner >760,000 Btu

RELIEF FAN	SUPPLY FAN	CONDENSER FANS
3.6% of total energy consumption, not captured by IEER	**5.1%** of total energy consumption, captured by IEER	**7.2%** of total energy consumption, captured by IEER



Trane Intellipak 70 tons

- Theoretical maximum energy savings: 11,939 kWh/year*
- Retail product cost increase: $17,200**

*Actual energy savings may be zero after product re-optimization.
**Based on Trane unitary portfolio assessment, $246/cooling ton cost increase required to accommodate larger cabinet size and product redesign/re-optimization.

Considerations for Certain Embedded Fans

Product-level Impacts: Industrial Air Compressor

HEAT REJECTION FAN

2.5% of total energy consumption, captured by isentropic efficiency

Ingersoll Rand R-series 75 kW Rotary Screw Compressor

- Theoretical maximum energy savings: 800 kWh/year*
- Redesign factors impacting cost:
  - Larger finished product enclosure
  - Larger heat exchanger + more oil
  - Larger fan & blower box
  - Complete product re-optimization

*No known analysis of FEI impact on air compressor fans, assumes a 10% improvement in fan efficiency. Actual energy savings may be zero after system re-optimization.

Systems Efficiency Approach

- Setting regulations at the product- and systems-level will lead to actual, significant energy savings

- Unitary Air Conditioners >760,000 Btu and Air-cooled Chillers:
  - Product efficiency ratings are regulated by Title 24
  - Products are not pre-empted by Federal appliance standards

- Commercial & Industrial Air Compressors
  - CEC has initiated a rulemaking to regulate product efficiency under Title 20 (Docket # 18-AAER-05)


Ingersoll Rand
Inspiring Progress™