

## ***The Next Stage Of The Design Specification For Production: Energy Efficiency***

*by Kevin Parmenter, Chair, and James Spangler, Co-chair, PSMA Safety and Compliance Committee*

This article is written to supply information on energy efficiency standards, which may be needed to complete the design of your product. Marketers and anyone who creates new product specifications need to review the energy efficiency specifications before sending the document(s) to the engineering department.

Many of these rules, regulations, guidelines, etc. will require additional engineering design time and testing time prior to sending the product to the qualifying test lab for approval. It is also important to select a qualified and approved test house for energy efficiency standards. Many of the energy efficiency standards require a special report to be filed showing the test results.

In this article, we briefly describe how energy efficiency requirements fit within the mix of broad mix of regulations governing the design of power supplies and their end applications. We then introduce a specialized, free energy efficiency database that engineers can access to determine which energy efficiency requirements apply in their power supply or end equipment applications and also to keep up-to-date on changes in these requirements. Our step-by-step tour of this database will help designers to understand what types of information it contains and how to quickly access this information.

### ***Product Design***

Prior to the engineering design or redesign process, a number of items should be gathered and understood from the engineering and marketing perspectives. If your company is not already doing so, include consideration of the energy efficiency rules and regulations as part of this process. Not all products are power supplies but many power supplies are placed inside appliances. Many products must be tested as a complete assembled unit such as dishwashers, clothes washers, etc.

Of course, the energy efficiency requirements are in addition to other requirements concerning product safety, emissions, harmonics, ESD, etc., which also must be considered. The following is a brief re-cap of the common requirements.

### **Product Standards And Regulations**

Product standards and regulations concerning the safety of specific product categories must be gathered. These include UL and IEC specifications such as UL 60950 and the new IEC 62368, UL 8750 for LED Lighting, UL 1310 Class 2 Power Units, and any other standards that can be applied to the product.

### **Conducted And Radiated Standards**

Conducted and radiated emissions standards are applied in all parts of the world, though the specifications in each country are slightly different. Radiated and line conducted emissions for the U.S. are governed by FCC Part 15 and FCC Part 18 of Title 47 for commercial and consumer regulation. In Europe the relevant standards include the CISPR 11, EN55011, and EN55022 specifications. While there are differences among these standards' requirements, various organizations such as FCC and the IEC are working to harmonize these rules.

### **Harmonics, Flicker, ESD, Immunity And Susceptibility**

These specifications are combined together under a single heading for this article. The harmonic line current standards are applied to some products in North America notably lighting. Line current harmonic specs are mandated in Europe above 60 W; and are different in other parts of the world. Some of these specs include:

- EN 61000-3-2 (IEC 61000-3-2): ac line harmonics
- EN 61000-3-3 (IEC 61000-3-3): ac line flicker
- EN 55014-2: Electromagnetic compatibility for household appliances, electric tools, etc.
- EN 61000-4-2: ESD
- EN 61000-4-3: Radiated RF susceptibility
- EN 61000-4-4: Electronic fast transient/burst
- EN 61000-4-5: Surge (voltage on the ac line)
- EN 61000-4-6: RF conducted susceptibility
- EN 61000-4-11: Voltage dip and interruptions (on the ac line) sometimes referred to as ac drop out.

### Energy Efficiency

Energy efficiency requirements come in various forms including standards, rules, and voluntary guidelines that are issued by government agencies and non-profit groups such as 80 PLUS, California Energy Commission, Energy Star—U.S., Energy Star International, U.S. Environmental Protection Agency (EPA) and others. To help product designers navigate this often confusing field of requirements, the Power Sources Manufacturers Association (PSMA) supports and maintains a database where many of these standards, rules and guidelines are kept and regularly updated.

This database serves a similar purpose to the Safety and Compliance database, which we described in a previous edition of this column (see the reference). And as we did with the Safety and Compliance database, in this article we will give readers a step-by-step tour of the PSMA's Energy Efficiency database. As with the Safety and Compliance database, the Energy Efficiency database is free to use by anyone. You simply have to register as explained below.

### Logging Into The Database

The homepage of the [www.pσμα.com](http://www.pσμα.com) website is shown in Fig. 1. If you have already created a user name and password for the Safety and Compliance database, just login; the same user name and password can be used for both databases. If you have not registered, click on the Energy Efficiency database link circled in Fig. 1, and you will see the new page as in Fig. 2. An email will be sent to you granting permission to use the databases. When you have successfully logged in, your screen will change to Fig. 3. This can be considered the homepage for the Energy Efficiency database after logging in.

### Menu Options

The database has five pull-down menus shown in Fig. 3: Agencies, Agencies by Application, Regulations by Application, Agencies by Country/State and Agencies by region.



Fig. 1. Power Sources Manufactures Association home page.

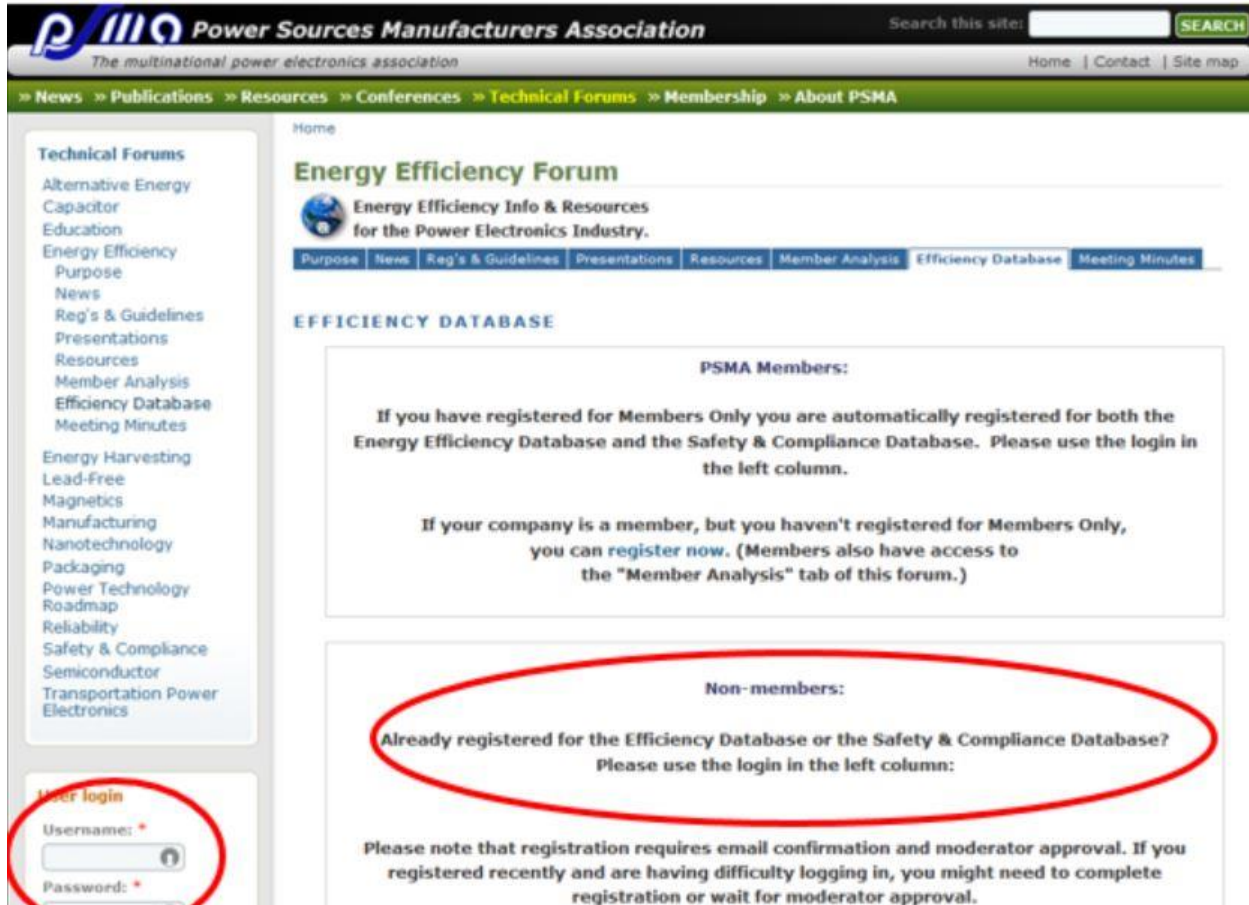


Fig. 2. Sign-in sheet.

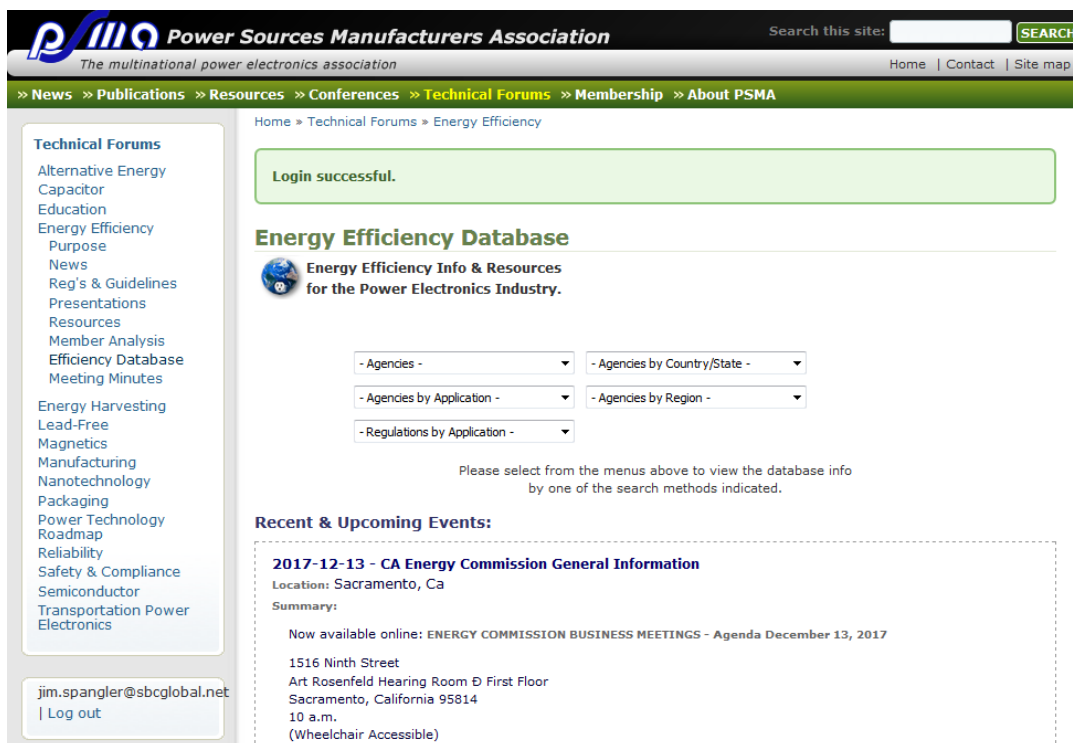


Fig. 3. Successful login to the Energy Efficiency database home page.

**Agencies**

When Agencies is selected in the drop-down menu, you will see a partial list in the database (Fig. 4). Additional information can be seen by using the scroll bar on the right.

**Energy Efficiency Database**

Energy Efficiency Info & Resources for the Power Electronics Industry.

WA House Bill - Agencies by Country/State -

- Agencies -

**80 PLUS**

American Council for an Energy-Efficient Economy

American National Standards Institute

Asia Pacific Partnership

Australian Department of Environment

AZ House Bill

Blauer Engel / Blue Angel - Germany

CA Energy Commission

China Energy Conservation Project (CSC)

China National Institute of Standardization

Clasp

Climate Saver's Computing Initiative

Consumer Electronics Association CEA

Efficient Lighting Initiative

ENERGY STAR - International

ENERGY STAR - US

EPSMA The European Power Supply Manufacturers Asso

EU Eco-Label

EUCI

when tested at 20%, 50%, and 100% of  
us; 80 Plus Bronze; 80 Plus Silver; 80 Plus

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Fig. 4. Energy Efficiency database listings by Agency.

**80 Plus**

Selecting the 80 PLUS option calls up the results shown in Fig. 5, which describe an incentive program that is applied to computer power supplies and other products. Many purchasers of power supplies demand that the power supply meets one of the 80 PLUS specifications.

Efficiency is specified at different load levels from 10% to 100% in addition to power factor (PF) at 20% of the maximum rated load. This is important in server power supply applications, where each watt of energy saving translates to energy savings in the cooling cost of the room or building where the servers are located.

**80 PLUS**



Locations: Americas - US  
Type: Incentive Program  
Notes:

**Computer power supplies must meet a minimum of 80% when tested at 20%, 50%, and 100% of rated power and be power factor corrected. Categories are: 80 Plus; 80 Plus Bronze; 80 Plus Silver; 80 Plus Gold; 80 Plus Platinum; 80 Plus Titanium**

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[80 PLUS Home Page](#)

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**Application: Desktop Computers**

**80 PLUS - Start year : 2004**

Description: 80 PLUS

Notes:

**Computer power supplies must meet a minimum of 80% when tested at 20%, 50%, and 100% of rated power and be power factor corrected. Categories are: 80 Plus; 80 Plus Bronze; 80 Plus Silver; 80 Plus Gold; 80 Plus Platinum; 80 Plus Titanium**

Start Year / Status	1 Test Type	2 Certification Level	3 10% Load Efficiency	4 20% Load Efficiency	5 50% Load Efficiency	6 100% Load Efficiency	Reg Sort 7 True PF
2004-03-01 active	115 V Internal Non-Redundant	80 Plus Standard	N/A	80%	80%	80%	>= 0.95 @ 20% Load
2008-03-19 active	115 V Internal non-redundant	80 Plus Bronze	N/A	82%	85%	82%	>= 0.95 @ 20% Load
2008-03-19	230 V internal	80 Plus	N/A	81%	85%	81%	>= 0.95 @

Fig. 5. 80 Plus, an incentive program.

**Energy Star-US**

Selecting the Energy Star-US option calls up a number of different products as shown in Fig. 6. Standards shown are only a partial listing. Sign-in to view all the various categories the PSMA has for the US Environmental Protection Agency (EPA). The agency lists 35 product categories. The EPA is working with other U.S. and international agencies towards harmonizing energy efficiency standards.

## ENERGY STAR - US

ENERGY STAR - US



Locations: Americas - US (U)

Type: Voluntary Label

Notes:

Established by the U.S. Environmental Protection Agency (EPA) in 1992 for energy-efficient computers, the ENERGY STAR program, in conjunction with the Department of Energy, has grown to encompass more than 35 product categories for the home and workplace, including consumer electronics, office equipment, appliances, and external power supplies. ENERGY STAR is working with other organizations to harmonize efficiency specifications.

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- [Appliance Spec Development](#)
- [Audio DVD Eligibility](#)
- [Audio/Video Specification Version 4.0 Webpage](#)
- [Battery Chargers pdf](#)
- [Battery Charging Systems Key Product Criteria](#)
- [Battery Charging Systems Key Product Criteria](#)
- [Battery charging systems recharge and array of cordless products, including power tools, personal care products, yard care products, and small household appliances.](#)
- [CEA Procedure for DAM Testing: For TVs](#)
- [Commercial Dishwasher Specifications](#)

*Fig. 6. Energy Star-US, voluntary label, homepage.*

## Agencies By Applications: Home Appliances

Database users can also search for energy efficiency standards by application. In this case, Home Appliances was chosen as an example (see Fig. 7). The California Energy Commission, The Blue Angel program of Germany, and the Energy Star-US are shown. Home appliances include dishwashers, clothes washers, clothes dryers, microwaves, rice cookers, smoke alarms and water heaters. The PSMA will publish meeting notes and update the standards as they become available.

## Energy Efficiency Database



**Energy Efficiency Info & Resources**  
for the Power Electronics Industry.

- Agencies -	- Agencies by Country/State -
- Agencies by Application -	- Agencies by Region -
- Regulations by Application -	<a href="#">Back to Events List</a>

### Agencies by Application: Home Appliances

Includes: Clothes Dryers, Clothes Washers, Dishwashers, Microwaves, Rice Cookers, Smoke Alarms, Water Heaters

### Blauer Engel / Blue Angel - Germany

The Blue Angel is the first and oldest environment-related label in the world for products and services. It is the property of the Federal Ministry of the Environment, Nature Protection and Nuclear Safety and is sponsored and administered by the Federal Environmental Agency and RAL Deutsches Institut für Gütesicherung und Kennzeichnung e.V. Similar to the maximum power consumption specs of ENERGY STAR and EC Code of Conduct, hundreds of products are covered, including EuPs such as consumer and office electronic products.



### CA Energy Commission

The California Energy Commission is the state's primary energy policy and planning agency. Two major responsibilities of the Commission are to promote energy efficiency through appliance and building standards and develop energy technologies and support renewable energy.



### ENERGY STAR - US

ENERGY STAR is a U.S. Environmental Protection Agency (EPA) voluntary program that helps businesses and individuals save money and protect our climate through superior energy efficiency.

The ENERGY STAR program was established by EPA in 1992, under the authority of the Clean Air Act Section 103(g). Section 103(g) of the Clean Air Act directs the Administrator to "conduct a basic engineering research and technology program to develop, evaluate, and demonstrate non-regulatory strategies and technologies for reducing air pollution."



Fig. 7. Regulations by Applications: Home Appliances.

## Regulations By Applications: Home Appliances

Drilling down further, in Fig. 8 Regulations by Appliances, sub-menu Home Appliances, sub-menu Clothes Dryers was selected by scrolling down to Clothes Dryers. This calls up listings for Blue Angel of Germany, U.S. (DOE) Residential Clothes Dryer, CA Energy Commission, and Energy Star US as shown with links to additional information.

**Application: Clothes Dryers**

**Agency: Blauer Engel / Blue Angel - Germany**

**Blue Angel General Information - Start year: 1978**

Description:

Blauer Engel / Blue Angel - Germany

Notes:

The Blue Angel is the first and most well-known eco-label worldwide. Since 1978 it has set the standard for eco-friendly products and services selected by an independent jury in line with defined criteria. The Blue Angel is awarded to companies as kind of a reward for their commitment to environmental protection. They use it to professionally promote their eco-friendly products in the market. The Blue Angel is an ecological beacon showing the consumer the way to the ecologically superior product and promotes environmentally conscious consumption.

Start Year / Status	Reg Sort Max Off	Max Stby
(n/a) active	1 W	5 W

**Agency: United States (DOE)**

**U.S. (DOE) Residential Clothes Dryers - Start year: 2014**

Notes:

Start Year / Status	Reg Sort Max Off	Max Stby
(n/a)		

**Agency: CA Energy Commission**

**CA Energy Commission 17-AAER-01 - Start year: 2017**

Notes:

Commercial Tumble Dryers

Start Year / Status	Reg Sort Max Off	Max Stby
(n/a) proposed		

**Agency: ENERGY STAR - US**

**ENERGY STAR - US Clothes Dryer - Start year: 2014**

Notes:

Start Year / Status	Req Sort Max Off	Max Stby

Fig. 8, Regulations by Applications: Clothes Dryers

**Agencies by Country/State: California Energy Commission**

Selecting the Agencies by Country/State, the California Energy Commission is chosen as the last topic. Selecting the icon for the California Energy Commission brings up the screen shown in Fig. 9. California has mandatory Standards. Other states including Arizona, Connecticut, Maryland, New York State, Rhode Island, Washington State, and Colorado also have rules pertaining to them.



## CA Energy Commission

Appliance Efficiency Regulations (Tier 2)



Locations: Americas - US (U)

Type: Mandatory Standard

Notes:

**IMPORTANT NOTE:** THE US ENERGY INDEPENDENCE AND SECURITY ACT 2007 REPLACED STATES' EPS STANDARDS ON JULY 1, 2008. Efficiency standard to be developed for battery charging systems to include active mode as well as maintenance and standby mode.

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- [2012 Rulemaking on Appliance Efficiency Regulations](#)
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- [2013 Building Energy Efficiency Standards For Residential and Nonresidential Buildings](#)
- [2016 Standards Rulemaking](#)
- [2017-AAER-05/documents](#)
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- [Electric Program Investment Charge](#)
- [Emerging Technologies Summit event](#)
- [Energy Commission Approves Water Appliance Standards to Save More Than 100 Billion Gallons Per Year](#)

*Fig. 9. California Energy Commission page for programs.*

### Reference

"[Power Supply Standards: Which Ones Apply In Your Application?](#)" by Kevin Parmenter and James Spangler, How2Power Today, Spotlight on Safety & Compliance, September 2017 issue.

### About The Authors



*Kevin Parmenter is an IEEE Senior Member and has over 20 years of experience in the electronics and semiconductor industry. Kevin is currently vice president of applications engineering in the U.S.A. for Excelsys, an Advanced Energy company. Previously, Kevin has served as director of Advanced Technical Marketing for Digital Power Products at Exar, and led global product applications engineering and new product definition for Freescale Semiconductors AMPD - Analog, Mixed Signal and Power Division based in Tempe, Arizona.*

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Sector. Kevin also led an applications engineering team for the start-up Primarion where he worked on high-speed electro-optical communications and digital power supply semiconductors.

Kevin serves on the board of directors of the [PSMA](#) (Power Sources Manufacturers Association) and was the general chair of APEC 2009 ([the IEEE Applied Power Electronics Conference.](#)) Kevin has also had design engineering experience in the medical electronics and military electronics fields. He holds a BSEE and BS in Business Administration, is a member of the IEEE, and holds an Amateur Extra class FCC license (call sign KG5Q) as well as an FCC Commercial Radiotelephone License.



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*For many years, he worked as a field applications engineer (FAE) for Motorola Semiconductor, On Semiconductor, Cirrus Logic, and Active Semiconductor, assisting customers in using semiconductors. He published numerous application notes and conference papers at a variety of conferences: APEC, ECCE, IAS, and PCIM. Topics included power factor correction, lighting, and automotive applications. As an FAE, he traveled internationally giving switch-mode power supply seminars in Australia, Hong Kong, Taiwan, Korea, Japan, Mexico, and Canada.*

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