The SEAD Global Efficiency Medal Competition: Accelerating Market Transformation for Efficient Televisions

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Abstract

The Global Efficiency Medal competition, a cornerstone activity of the Super-efficient Equipment and Appliance Deployment (SEAD) Initiative, is an awards program that encourages the production and sale of super-efficient products. SEAD is a voluntary multinational government collaboration of the Clean Energy Ministerial (CEM). This winner-takes-all competition recognizes products with the best energy efficiency, guides early adopter purchasers towards the most efficient product choices and demonstrates the levels of energy efficiency achievable by commercially available and emerging technologies. The first Global Efficiency Medals were awarded to the most energy-efficient flat panel televisions; an iconic consumer purchase.

SEAD Global Efficiency Medals were awarded to televisions that have proven to be substantially more energy efficient than comparable models available at the time of the competition (applications closed in the end of May 2012). The award-winning TVs consume between 33 to 44 percent less energy per

unit of screen area than comparable LED-backlit LCD televisions sold in each regional market and 50 to 60 percent less energy than CCFL-backlit LCD TVs.

Prior to the launch of this competition, SEAD conducted an unprecedented international round-robin test (RRT) to qualify TV test laboratories to support verification testing for SEAD awards. The RRT resulted in increased test laboratory capacity and expertise around the world and ensured that the test results from participating regional test laboratories could be compared in a fair and transparent fashion.

This paper highlights a range of benefits resulting from this first SEAD awards competition and encourages further investigation of the awards concept as a means to promote energy efficiency in other equipment types.

Competition Objectives

The SEAD awards program is part of a suite of policy interventions by governments designed to drive markets towards greater efficiency in electrical end-use equipment. The Super-efficient Equipment and Appliance Deployment (SEAD) Global Efficiency Medal competition recognizes products with the best energy efficiency performance, subject to certain quality constraints, in different regions as well as globally. This program complements existing standards and labeling programs in promoting energy efficiency.

The primary goal of the competition is to maximize energy savings by increasing the market share of efficient products. It also aims to spur innovation among manufacturers and foster international government collaboration to strengthen the technical foundation of efficiency policies for globally traded products. The competition process supports the harmonization of test procedures, the building of testing capabilities and the provision of internationally-comparable and transparent test results. The SEAD awards program is provides insights into market dynamics, stakeholder positions, potential market interventions, and gaps in the supporting policy environment for the product in question.

Competition Design and Features

The SEAD Global Efficiency Medal competition for flat-panel display televisions was launched at the International Consumer Electronics Show in Las Vegas, Nevada, USA in January 2012. Between August and October 2012, SEAD awarded Medals to Samsung and LG for producing the most energy efficient flat panel display televisions (FPD TVs) in the world. A global awards ceremony was held at the Clean Energy Ministerial in New Delhi on 17 April 2013. The awards are a pure recognition prize and do not involve a financial component.

TVs consume more than 3%-4% of global residential electricity consumption. Relative to a baseline prevalent in the market today, there is an energy efficiency improvement potential of up to 35% with more efficient technologies [11]. Based on technology market shares and specific technology efficiency forecasts, an average improvement of 10% is in energy efficiency expected over the business-as-usual forecasts as of 2012. The choice of TVs as the product category for the first round of the competition was driven by the significant energy savings potential and efficiency improvement potential indicated by the above analysis. Within the broader television category, the choice of flat-panel televisions was based on the trend of increasing global market share. In addition, the existence of a well-established, accepted international test method (IEC 62087) and the ability to differentiate TV models by their energy efficiency reinforced this selection. Finally, the relative homogeneity of the global market and market dominance by a few manufacturers contributed to the feasibility of launching a global competition and successfully promoting it to manufacturers.

The first SEAD Global Efficiency Medal competition aimed to encourage the production and sale of super-efficient TVs in three different size categories (small, medium and large as described in Table 1) and four geographical regions (Australia, Europe, India, and North America). Size categories were determined through a market analysis and are consistent with natural segmentations found in these markets. TV screen technologies sold in different regions of the world are very similar, as TV manufacturing is highly aggregated. The four award regions of the SEAD TV Awards account for more than 40 percent of the global TV market. An award ceremony to announce the European regional winners was held at the Internationale Funkausstellung (IFA) Fair on August 31, 2013 in Berlin. The

global awards also recognized an overall winner for each size category, as well as the most efficient emerging technology product.

Table 1. Size Categories for Commercially Available Products

	Small	Medium	Large
Viewable Screen Area	Less than 2400 cm^2 (372 in^2)	2401 cm^2 (372 in^2) to 4800 cm^2 (744 in^2)	4801 cm^2 (744 in^2) to 6890 cm^2 (1068 in^2)
Nominal Diagonal Screen Size	Less than 29 in	29 in to less than 42 in	42 in to 50 in*

Note: TVs with screen larger than 6890 cm^2 (equivalent to 50 inches in diagonal) were eligible for this competition, but a value of 6890cm^2 was used as the screen area in the efficiency calculation (on-mode power/min{viewable screen area, 6890}) for these products.

Winning TVs were selected based on energy efficiency performance, which was evaluated as on-mode power consumption (expressed in Watts) normalized by screen area (expressed in square centimeters), using the IEC 62087: 2011 test procedure. Efficiency was evaluated based on product performance with "out-of-box" settings, and products were required to have a default luminance setting that was 65% of the maximum luminance (aligned with US EPA ENERGY STAR requirements). These requirements were aimed at ensuring that winning products delivered good picture quality and that test results were representative of real-world consumption, since most consumers use their TV's default settings. Additionally, products were required to have a maximum standby power consumption of 0.5W.

A note on the automatic brightness control (ABC) feature: According to the IEC 62087 test procedure, on-mode power consumption is measured with ABC disabled if the feature exists. If the ABC feature cannot be disabled, then measurements are performed with the light shone directly into the television's ambient light sensor at a level of 300 lux or greater, effectively disabling the ABC feature. The competition adopted the same approach to ABC.

The SEAD competition further established minimum sales requirements as a condition of entry to ensure market access of winning products. For the Commercially Available Technology product sub-category, applicants were required to have plans to sell at least a minimum number of units of a product model in the region of nomination as specified below.

Region	**Minimum Sales Threshold Units**
Australia	5,000
Europe	10,000 in one country or 50,000 units across all EU27 and EFTA-countries
India	5000
North America	50,000

The sales threshold was intended to ensure that award-winning TVs have a significant footprint in terms of market share, in order to maximize potential energy savings. For the Emerging Technology product sub-category, applicants were required to have plans for mass production of nominated products within two years of the end of the competition.

The competition identifies the most efficient products based on manufacturers' nominations, requiring active participation by the manufacturers, rather than awarding products based on publicly available data. The active approach was adopted, to expose interest from the manufacturers in producing more efficient products and spur innovation to compete and win the competition. Manufacturers entered the competition by submitting nominations forms with details about their products, including their on-mode energy usage. The Awards Administrator then identified presumptive wining products based on manufacturers' energy efficiency performance claims. Manufacturers were required to provide serial

numbers for 50 products from different retail or warehouse locations from which the Awards Administrator randomly selected 2 products for verification testing. The tested products were required demonstrate an energy efficiency performance within a margin of 2 percent of the manufacturer's claims. Models that exceeded the 2 percent margin requirement during verification testing would be disqualified and the Awards Administrator would request test samples for the TV model with the next best energy efficiency performance claim for verification testing. Testing costs were borne by the SEAD governments of the respective Awards region while manufacturers were responsible for paying the shipping costs to send test samples to the laboratories.

A detailed description of the design of the competition can be found in a paper published in the conference proceedings of the 2013 European Council for an Energy Efficient Economy (ECEEE) Summer Study [10].

Competition Results

SEAD Global Efficiency Medals in the Commercially Available Technology category were awarded to the most energy efficient TVs in each of four award regions, as specified in Table 2. All award-winning models are light emitting diode (LED) backlit liquid crystal display (LCD) TVs.

Within each size category, winning products in each region were similar models from a single manufacturer, with minor technology differences to comply with regional regulations. This is reflective of the global homogeneity of the TV market and the market aggregation around a few manufacturers. The standby power of these models are well below the competition limit of 0.5W, following the global trends of sharply dropping standby power consumption driven by regulation.

Another interesting observation is that the large size winners consume less power and have lower luminance than the medium size winners. Since larger TVs typically consume more power, this demonstrates the commercial viability of technology that can significantly reduce the power consumption of TVs.

Table 2. Award-winning Models in Commercially Available Technology Category

	Size category	Australia	Europe	India	North America
Small	Model	Samsung UA26EH4000M	Samsung UE26EH4000W	Samsung UA26EH4000R	Samsung UN26EH4000F*
	On Mode Power (W)	24.4	24.9	24.9	22
	Viewable Screen Area (cm2)	1863.83	1863.83	1863.83	1863.83
	Standby Power (W)	0.15	0.13	0.13	0.13
	Max. Luminance (cd/m2)	220	260	240	240
Medium	Model	Samsung UA40EH5306M	Samsung UE40EH5000W*	Samsung UA40EH5330R	Samsung UN40EH5000F*
	On Mode Power (W)	47.4	44	47.4	44
	Viewable Screen Area (cm2)	4411.62	4411.62	4411.62	4411.62
	Standby Power (W)	0.15	0.17	0.15	0.17
	Max. Luminance	240	280	290	240

	(cd/m2)				
Large	Model	LG 47LM6700	LG 47LM670S*	LG 47LM6700	LG 47LM6700
	On Mode Power (W)	43.4	43,1	43.4	44.5
	Viewable Screen Area (cm2)	6080.6	6080.6	6080.6	6080.6
	Standby Power (W)	0.2	0.2	0.2	0.12
	Max. Luminance (cd/m2)	160	160	147	159

* International Winners
Note: More details are available at http://www.superefficient.org/TVawards

The SEAD Global Efficiency Medal in the Emerging Technology category was awarded to an LG 47-inch LED backlit LCD prototype TV that used an advanced optical film and back-light dimming technology. Per the competition rules and eligibility criteria, the Emerging Technology winning TV will be commercially available within 2 years of winning the SEAD Global Efficiency Medal.

Competition Outcomes

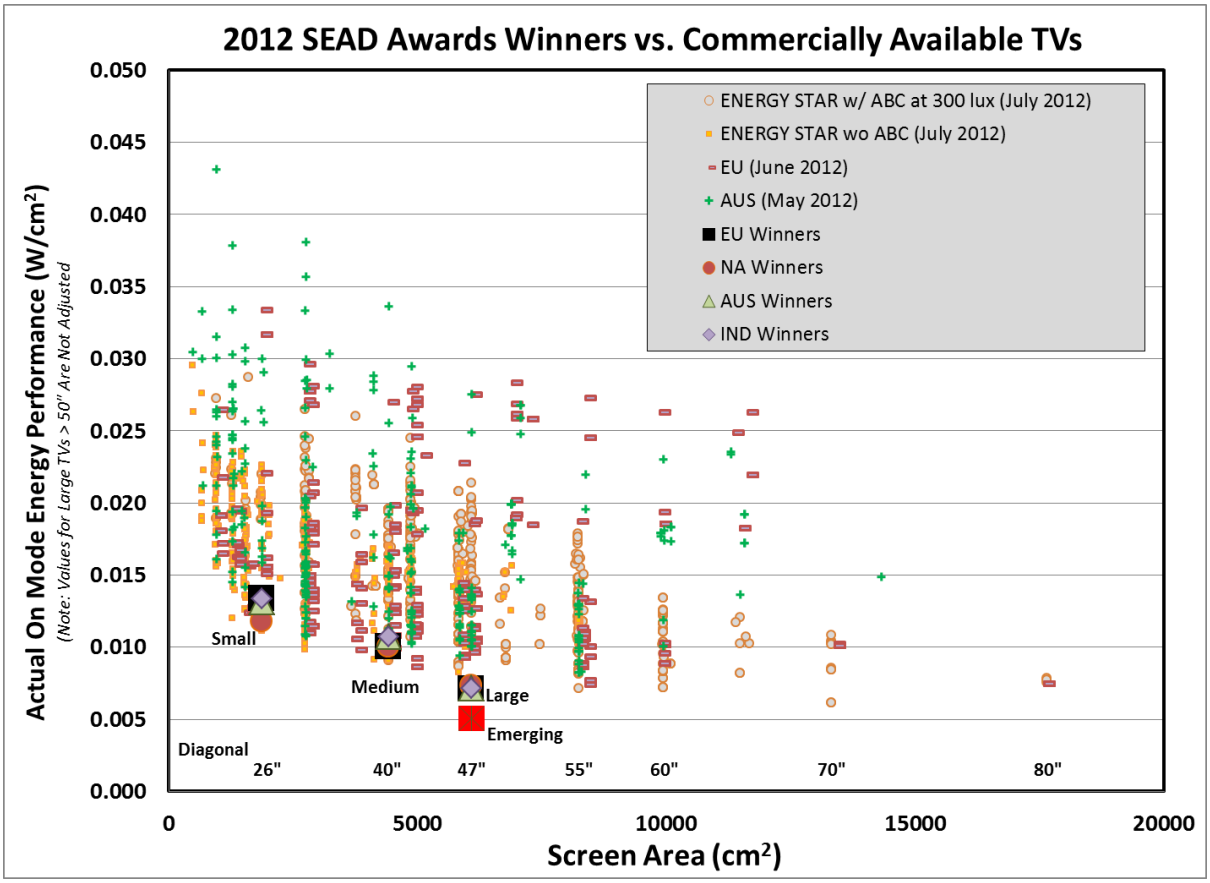
The first round of the SEAD Global Efficiency Medal competition provided many new insights into the global television market and demonstrated the potential for greater energy savings through increased product efficiency. This section provides an overview of the major findings that resulted from this competition.

1. Award-winning TVs are up to 71% more efficient than commercially available TVs, demonstrating significant efficiency improvement potential in flat-panel TVs

The energy efficiency performance of SEAD award-winning TVs was compared with TVs registered to regional databases in 2012. The dataset includes only TVs with standby power consumption less than 0.5 W and the luminance ratio between default home mode and brightest picture mode greater than 65 percent. [1], [4], [5] All TVs in the database were considered to be commercially available and weighted equally since sales weighted data was not available at the time. For North America, the dataset was taken from the U.S. EPA ENERGY STAR database and for Australia, the source of the dataset is the Australian Energy Rating. The majority of TV models compared with the European winning models are from the Intertek database, which can be regarded as representative of TVs sold in Europe. (Country-specific changes from basic models are made mostly in tuners.)

The performance of the award-winning TVs is shown in comparison to the other TVs in the different regional databases in Figure 1. The figure compares against two different U.S. EPA ENERGY STAR datasets. Since the U.S. EPA ENERGY STAR Version 5 on-mode power calculation is weighted by ABC for ABC-enabled TVs, award results are compared to on-mode power consumption of ABC-enabled U.S. EPA ENERGY STAR qualified TVs at high ambient lighting conditions (300 lux) and TVs without ABC. [1]

[1] It is also important to note that on-mode power with ABC at 300 lux is not necessarily the same as on-mode power with ABC deactivated.



Note: AUS (Australia), EU (European Union), IND (India), NA (North America), ABC (Automatic Brightness Control)

Figure 1. On-mode power performance (W/cm^2) –SEAD TV Awards Winners vs. Commercially Available TVs

Figure 1 shows that the award-winning models in the Commercially Available Technology category can be regarded as the most efficient products in the regional markets in most cases. However due to voluntary nature of participation, it is possible that the most efficient products were not nominated for this competition. It is also possible that the most efficient models do not meet the sales criteria stipulated by the competition. A more detailed comparison to the regional labels is available in [12].

The efficiency of award-winning models compared to the average efficiency among commercially available TVs in the different regions is summarized in Figure 2. “Conventional TVs” denote Cold Cathode Fluorescent Lamp (CCFL) backlit LCD TVs and “Comparable TVs” denote Light Emitting Diode (LED) backlit LCD TVs. The winners were at least 20% and as much as 71% more efficient than the average TV in the datasets. While the comparison was made to the average performance of the TVs in the database, the median performance was very close to the average.

The international award-winning model for the Emerging Technology category is approximately 30% more efficient than the winners of the large-size Commercially Available Technology category and approximately 59% more efficient than the most efficient models available in the market. This demonstrates that there is significant potential to improve the energy performance of TVs.

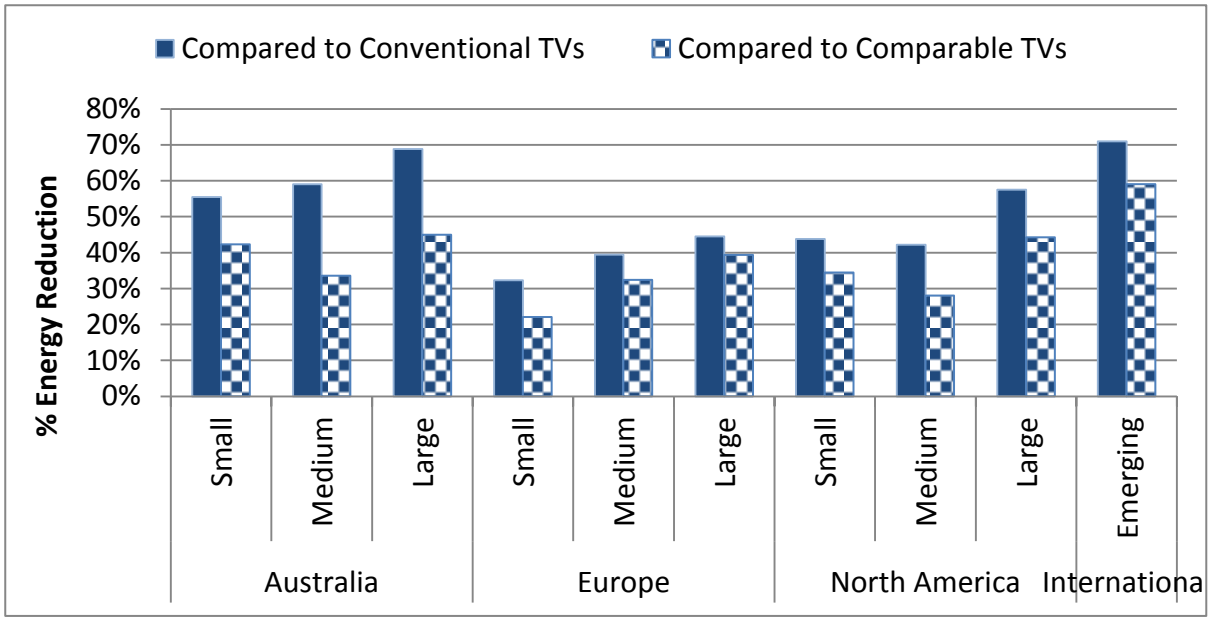


Figure 2. Comparison of Award-Winning Models vs. Commercially Available TVs

2. The SEAD Global Efficiency Medal spurs manufacturers to make ongoing changes in efficiency improvement

The regional award-winning models for the Commercially Available Technology category were already registered to the corresponding regional energy efficiency database, such as the U.S. EPA ENERGY STAR database. That is, these models were not new at the time of nomination; rather the models were a part of the manufacturers' existing product line. However, the on-mode power consumption values registered in early 2012 in the U.S. EPA ENERGY STAR database are higher than those claimed for the SEAD TV Awards.

Typically, manufacturers take into account a margin-of-error when reporting on-mode power consumption of their products to the regional databases. The volatile nature of television markets suggests that on-mode power consumption can be expected to decrease throughout the production year as manufacturers make running changes[2]. However, the 30 percent reduction in the energy use of the large size winner is well beyond the running changes typically achieved through the year. It is likely that the manufacturer made significant improvements to compete in and win this competition.

This improvement is an indication that the SEAD Global Efficiency Medal competition can spur innovation among manufacturers to improve the efficiency of their products. In fact, one of the winning manufacturers reported that they examined the product efficiency of their entire product line as a result of this competition.

3. Award-winning TVs demonstrate significant global energy savings potential

In our analysis, we estimate that if all the TVs sold were as efficient as the SEAD award-winning models, more than 84 billion kilowatt-hours (or 84 terawatt-hours [TWh]) of electricity would be saved worldwide in the year 2020 [12]. Table 3 provides the estimated savings by region.

If all new TVs (with the exception of OLED TVs) expected to be sold globally from 2013 to 2020 meet the efficiency levels that award-winning models for the Commercially Available Technology category have achieved, compared to the scenario of all new TVs with *no further efficiency improvement* within each screen technology from 2013 onward, it would provide annual savings in 2020 as follows:

- 2.9 TWh in Australia (equivalent to the national annual electricity use of Botswana [6])
- 17.2 TWh in Europe (equivalent to the national annual electricity use of Croatia [6])
- 5.4 TWh in India (equivalent to the national annual electricity use of Bolivia)

[2] A generally accepted industry term denoting "ongoing design changes made throughout the year"

- 18.6 TWh in North America (equivalent to the national annual electricity use of Nigeria [6])
- 84.6 TWh, equivalent to 28 medium size coal-fired power plants with 500 megawatts capacity, or taking nearly 12.3 million cars off the road for a full year [9], in all regions (more than the combined annual national electricity use of Denmark and New Zealand [6]).

Table 3. Regional and Global Savings Potential for Efficiency Improvement in SEAD TV Awards

	Annual Savings (TWh)		Cumulative Savings (TWh)	
	in 2015	in 2020	2013-2015	2013-2020
Australia	1.2	2.9	2.5	13.7
India	2.3	5.4	4.6	25.9
Europe	7.0	17.2	14.0	81.1
North America	8.0	18.8	15.6	88.7
Global	34.8	84.6	69.8	399.6

If all new large TVs (screen size equal to or larger than 42 inches) expected to be sold globally from 2013 to 2020 meet the efficiency level that the award-winning model for the Emerging Technology category has achieved, it would provide additional annual savings in 2020 of approximately 12 TWh for all regions. This is the equivalent to 28 medium size coal-fired power plants with 500 megawatts capacity[3], or taking nearly 12.3 million U.S. cars off the road for a full year [9].

4. SEAD Award-winning TVs demonstrate that energy efficient products can be cost effective

For the U.S. market, Commercially Available Technology winners in the small and medium size categories are entry-level models and that are less expensive than comparable TVs (see Table 4), which suggests that consumers can reap electricity cost savings without incurring an additional first cost for efficient technology. This demonstrates that energy efficiency can come at cost effective prices. A type of LED-direct[4] backlit LCD TVs, often referred to in industry parlance as "low-cost LED-direct backlighting" or "emerging market TVs", employ about half of the LEDs used in typical LED backlights, and use lower-cost optical components in the backlight system [13], [14], resulting in overall lower cost TVs for the same picture quality.

It is also possible to intelligently decrease the maximum luminance level and color-reproduction capability with material-based and algorithmic improvement and without sacrificing picture quality. Lower luminance allows manufacturers to use fewer LED lamps as well as low-voltage driven electronic parts in the circuitry [11].

Table 4. Market Prices and On-mode Power of the Regional Winners in North America and Typical TVs with Similar Technology

Regional Winners in North America			Typical TVs in the U.S. Market		
Model	Price[a]	On-mode Power Consumption	Model	Price[b]	Average On-mode Power Consumption[c]
Samsung UN26EH4000F	$260	22.0 W	26" LED-LCD 1366×768	$278	29.2 W
Samsung UN40EH5000F	$548	44.1 W	40" LED-LCD 1920×1080	$566	64.9 W
LG 47LM6700 (3D enabled)	$919	44.5 W	47" LED-LCD 1920×1080	$845 (3D)	92.2 W

[a] www.amazon.com, www.alltimetvs.com (lowest price, as of Sep 2012)
[b] Average market price as of Q3 2012 projected by DisplaySearch in Q4 2011 [2]
[c] Average on-mode power consumption of U.S. EPA ENERGY STAR qualified TVs in the given category. This data is measured in the same manner as specified by the competition.

[3] In rough back-of-the-envelope calculations, if an efficiency technology or policy would save 3 TWh per year, it saves one 500 MW coal plant operating at 70 percent capacity factor in that year, this unit of energy savings is called one Rosenfeld [7].
[4] "LED-direct" or "LED full-array" configuration means that the LEDs are uniformly arranged behind the entire LCD panel. Unlike LED-direct models, "LED-edge" or "Edge-lit" configuration means that all of the LEDs are mounted on sides (or edges) of the display.

On the other hand, the large size winner (LG 47LM6700) does not appear to be cheaper than a typical model of its size. Another way to look at cost effectiveness is the cost of conserved electricity (CCE)[5]. CCE is estimated by dividing the annualized incremental cost (IC) (i.e., incremental price) of the energy efficient model by annual energy savings due to that option. For this calculation, the comparable product category is defined by screen size, backlight type and 3D capability (i.e., 47-inch 3D-capable LED-LCD TV). The CCE for the product category is calculated using annualized IC for the product category and energy savings for the product category, as follows:

$$CCE = \frac{annualized\ IC}{energy\ savings} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where

$$annualized\ IC = IC\left[\frac{discount\ rate}{1-(1+discount\ rate)^{-lifetime}}\right] \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$$Energy\ Savings_i\left(\frac{kWh}{year}\right) = Power\ reduced\left(\frac{watts}{unit}\right) \times daily\ usage\left(\frac{hours}{day}\right) \times \frac{365\ days}{year} \times \frac{1\ kilowatts}{1000\ watts} \ldots\ldots (3)$$

, *lifetime*$_i$ is the TV economic lifetime[6], i.e. and *discount rate*[7] is the discount rate of the end user.

Given that on-mode power saved is 47.7 W and the incremental price is $74, compared to a typical model, the winner in the large size category (LG 47LM6700) has CCE with a range of $0.105/kWh and $0.178/kWh as described in Table 5.

Table 5. Cost of Conserved Electricity (CCE) for the Large Winner (LG 47LM6700)

USD/kWh		Economic Lifetime				
		6 years	7 years	8 years	9 years	10 years
Discount Rate	4%	0.162	0.142	0.126	0.114	0.105
	5%	0.167	0.147	0.132	0.120	0.110
	6%	0.173	0.152	0.139	0.125	0.115
	7%	0.178	0.158	0.142	0.130	0.121

The average electricity price of the U.S is $0.115/kWh. Thus, the CCE of the LG 47LM6700 model, with 3D capability and wireless network functions, is currently similar to or higher than the average residential electricity prices of many states in the U.S. (in some regions, average residential prices (tariffs) are lower than the marginal residential tariffs---the tariff for the last unit consumed which is equivalent to the reduction in consumer bill if one unit of electricity is saved.) The market price of 3D capable 47-inch LED-LCD TVs was projected to come down to about $560 by the end of 2015 [2]. Therefore, while the winning model in the large size category may not be cost effective today, it is likely to become cost effective in the future.

5. Several energy efficiency organizations support the competition and the SEAD award-winning TVs through promotional campaigns and financial incentives

[5] CCE is a metric used to compare the cost of saving electricity to the cost of providing electricity to assess the desirability of energy efficiency measures. CCE is estimated by dividing the annualized incremental cost of the energy efficient model by annual energy savings.

[6] In the U.S., the average age of recently replaced TVs was about 8 years [3]. This analysis provides the CCE results in range of 6 to 10 years.

[7] Residential and commercial sectors may use various methods to finance the purchase of TVs. The U.S. Department of Energy (DOE), in a technical support document for the energy efficiency program for consumer products analyzed that the average discount rates are 4.8 percent for residential consumers and 6.2 percent for commercial sectors [8]. This analysis provides the CCE results in range of 4 to 7 percent.

SEAD promoted the winning televisions through media campaigns and partnerships with key organizations with synergistic goals for promoting energy efficiency. Partner organizations include the Alliance to Save Energy, Consortium for Energy Efficiency, Consumer Electronics Association, Efficiency Vermont, Enervee, EPEAT, New York State Energy Research and Development Authority (NYSERDA), and TopTen USA. These organizations supported SEAD by promoting the Global Efficiency Medal competition and the award-winning televisions to their consumer base.

SEAD promotional efforts resulted in:

- Features in prominent media outlets across the globe, including Reuters and the Wall Street Journal. The competition was also promoted through popular consumer blogs such as CNET, ClimateWire, Gizmag, and Sustainable Brands. Winner announcements also appeared on digital displays in Times Square in New York City.
- SEAD award-winning TVs being placed in the top tier incentive of Efficiency Vermont's three-tier incentive program directed at retailers. Efficiency Vermont is a non-profit organization that provides technical assistance and financial incentives to reduce energy costs.
- A social media campaign to give away 10 SEAD award-wining TVs. Mass Save, an energy efficiency program in the U.S. state of Massachusetts, partnered with Samsung to organize the give-away.The sweepstakes was promoted through radio and social media campaigns and increased awareness of Mass Save's energy efficiency programs.

6. The SEAD Global Efficiency Medal competition supports testing capacity building and test method harmonization

Reliable and comparable test results are essential to a global awards program's credibility. To this end, it is critical to ensure that laboratories responsible for performing verification tests have the necessary qualifications and capabilities, and that common test protocols are available for use.

This competition employed the IEC 62087:2011 test procedure, an internationally accepted test procedure for TVs and other video equipment, to verify manufacturers' energy efficiency claims. An international round-robin test (RRT) was conducted across the designated verification test laboratories in the different participating regions by shipping the same set of 6 TVs to each laboratory and testing them in an out-of-box condition as per IEC 62087. An expert witness was dispatched to each laboratory and charged with ensuring the consistency of testing across all test laboratories. The expert witness assessed test laboratory equipment and provided training to lab technicians to ensure that all test labs were qualified to conduct TV efficiency testing according to the IEC 62087:2011 procedure. As a result, two test laboratories in India have improved testing capabilities, which are now the only test labs in India capable of testing television efficiency using IEC test methods.

At the request of the Philippines Department of Energy, SEAD extended the RRT to include a recently built government TV test laboratory. SEAD identified necessary improvements to laboratory equipment and trained several staff technicians. As a result, the Philippines Department of Energy TV test laboratory is now comparable to other leading international TV test laboratories.

Lastly, SEAD collaborated with the China National Institute of Standardization (CNIS) to incorporate the international SEAD television RRT in CNIS's ongoing national television round robin testing. This allowed SEAD to further validate the international test procedure used for verification testing.

It also allowed Awards Administrator to identify international winners without having to test all of the regional winners in the same test laboratory.

7. Data from the SEAD TV awards competition informs standards and labeling processes

The competition influenced energy efficiency standards and labeling in three different countries/regions as described below.

- *Korea:* Based on the test results from the SEAD competition, the Republic of Korea revised its television efficiency standards. These new standards are expected to save 2.2 billion kWh annually in 2020. That's enough to offset the CO_2 emissions of over 320,000 U.S. cars for a year [9].

- *India:* As a result of participating in the SEAD competition, India's Bureau of Energy Efficiency:
    - Added LED-backlit LCD televisions to the top category of their 5-star energy label
    - Is adopting the latest version of the IEC 62087 international test procedure as a basis for their efficiency labeling program. This was supported by the improved test laboratories described above.
    - Is improving the 5-star energy label rating criteria for color televisions.

- *Europe:* The SEAD competition informed the European Commission's revision of the EcoDesign regulation for televisions.

8. The competition's success necessitates further analysis of awards program as a concept

Outcomes of this first competition will help policy makers:

- Determine if an awards program can be an effective market transformation mechanism to promote energy efficient products in other markets,
- Inform subsequent rounds of the competition for other award category productsm, and
- See how efficiency improvement of globally manufactured products can be effectively accelerated.

This first round of the SEAD Global Efficiency Medal competitions merits further analysis to carefully establish its impacts in the aspects described below.

- An increase in the sales of internationally or regionally recognized award-winning products is expected to reduce electricity consumption in newly sold TVs that would otherwise have been less efficient. To determine the impact of the sales of the award winning TVs, SEAD proposes to purchase sales data for these TVs and perform further analysis to determine the net impacts of this competition.
- All award-winning Commercially Available Technology models within each size category are very similar in product design across all 4 regions. Consequently, it would be interesting to determine whether the cost effectiveness results for the U.S. market are applicable to other countries.[8]

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