GEEC The Global Equipment Energy-Use and Cost Database

A New Dataset for Efficiency Policy Research

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GEEC's Scope

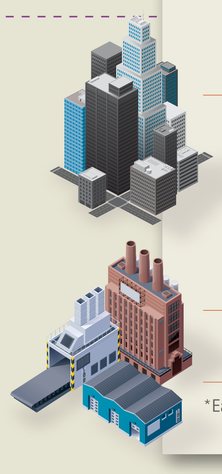
The Global Equipment Energy-Use and Cost (GEEC) database has two fundamental components, the first is a dataset of efficiency and price data for the countries and end-uses shown here.

Data in the set originate from engineering data published to support efficiency policies, retail price data correlated with efficiency rating schemes, and published literature.

Country Coverage by End-Use Category*

		China	E.U.	India	S. Korea	U.S.A.
Residential	Air Conditioning	●	●	●	●	●
	Cooking Products	●				●
	Dishwashers		●			
	Laundry	●	●			●
	Lighting	●	●	●		
	Refrigeration	●	●	●	●	●
	Space Heating	●	●		●	●
	Stand-By Power Mode	●	●	●	●	●
	Television	●	●	●	●	●
	Water Heating	●	●		●	●
Commercial	Air Conditioning	●		●		●
	Laundry					●
	Lighting	●	●	●		●
	Refrigeration				●	●
	Space Heating	●	●			●
	Water Heating		●			
Industrial	Motors	●		●		●
	Transformers	●	●	●		●

*Each category is broken down into specific product classes, such as space heating including furnaces, boilers, and others.



The Question and the Data

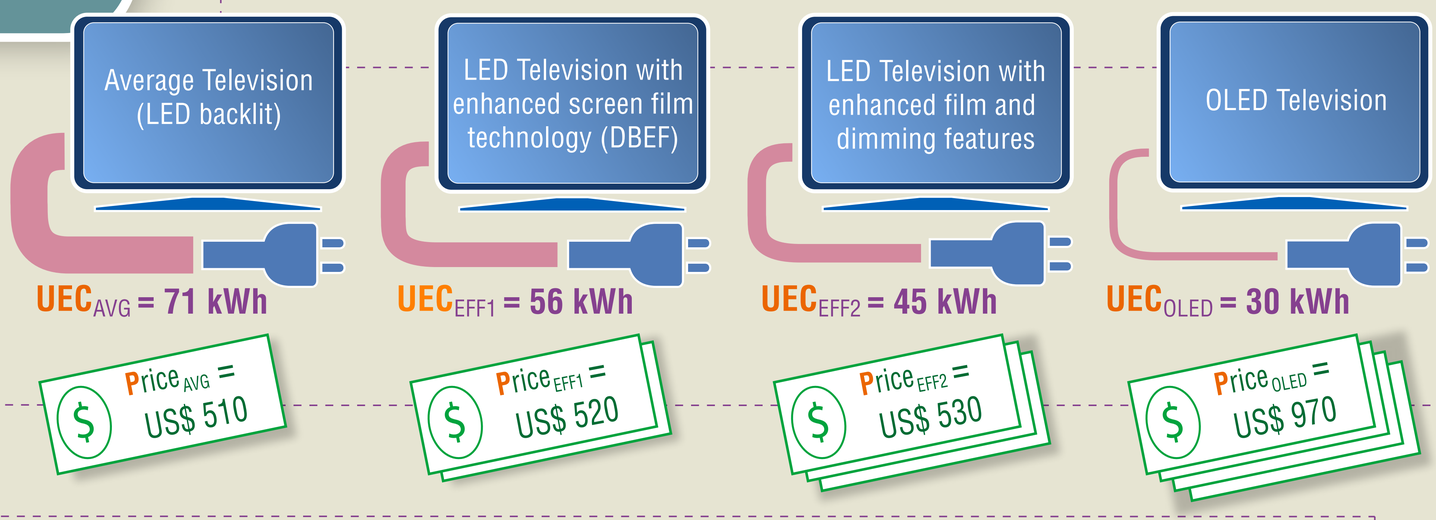
The second component of GEEC is its evaluation of cost-effective energy savings. Here we look at the question from the consumer perspective, using the U.S. resident as an example:

Q: If I pay more to get an OLED TV instead of the average TV, will the lower electricity bills cover the additional cost? If not, which television design saves me the most electricity while also saving money? I'm assuming it will last 8 years (**L**).

We consider the consumer's discount rate (**d**). This is the estimated interest charges on any debt for the purchase, which is 5% for the U.S. residential consumer*.

In our database we track the discount rate (**d**), lifetime (**L**), price (**P**) and annual unit energy consumption (**UEC**) of each design.

*Refrigerator and Freezers Final Rule: Technical Support Document, USDOE, 2011.



Cost of Conserved Energy Approach

Every energy improving design has a cost of conserved energy (**CCE**), relative to the average design on the market.

The CCE tells us how much the consumer must pay for a kilowatt-hour (kWh) or gigajoule saved.

$$CCE_{OLED} = \frac{P_{OLED} - P_{AVG}}{\sum_{n=1}^{L} \frac{1}{(1+d)^n}} \Big/ \left(UEC_{AVG} - UEC_{OLED}\right)$$

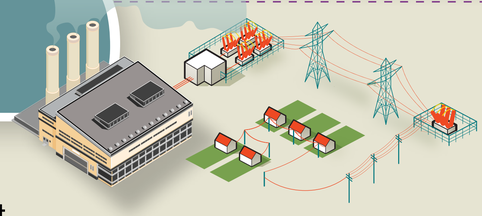
The extra expense of the OLED television is divided by a capital recovery factor, which puts the investment in present terms, accounting for the lifetime and discount rate.

We divide that by the annual energy saved.

Result

A: The new OLED technology is not cost effective yet, but the most efficient LED-backlit design already is!

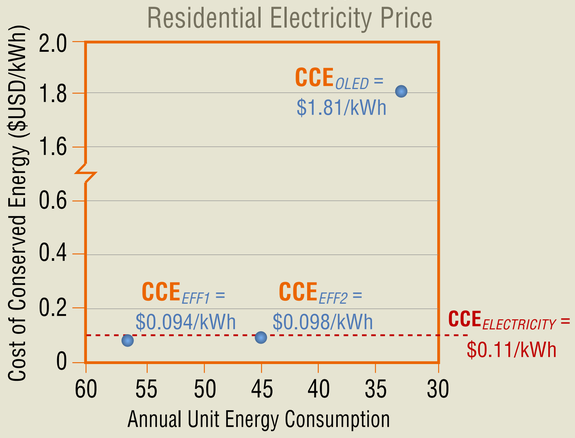
$CCE_{EFF2} < Price_{Electricity}$



Finally, in GEEC we see if the cost of saving a kilowatt-hour or gigajoule is lower than buying one from the grid. The latter is what the consumer will face if they buy the market average model.

This poster presents a single application of the GEEC Database. These results scale up to national targets, and allow us to compare countries and sectors. By combining GEEC's facilities with LBNL's Bottom-Up Energy Analysis System (BUENAS), we report on the energy, carbon and financial benefits of a scenario. GEEC is unique in both the detail of its data and the breadth of its scope.

Cost of Conserved Energy and the U.S. Residential Electricity Price



Here we provide a single-end use's data table, in this case we show a different example, Korean Room Air Conditioners

Market Average				Highest Cost Effective Target		
Country and Sector	Republic of Korea – Residential					
End Use	Split Room Air Conditioners					
Product Class	Split 4 kW - 10 kW					
Product Class Market Share	42%					
Lifetime	12					
Capital Recovery Factor	0.113					
Efficiency Design Level	UEC (kWh)	Price $2010 (USD)	Level Market Share (MS)	MS Weighted UEC	MS Weighted Price	Weighted CCE
Level 5	870	940	35%	**690**	**1170**	
Level 4	770	1050	1.2%	660	1210	0.113
Level 3	**670**	**1170**	**13.5%**	**620**	**1250**	**0.127**
Level 2	590	1300	0.2%	580	1320	0.147
Level 1	570	1340	50%	570	1330	0.152
Korean Residential Electricity Price	$0.145 USD					
In-Class Target UEC	620 kWh/yr					
End-Use Target UEC	495 kWh/yr (weighted-average of targets of all product classes)					