American Council for an Energy-Efficient Economy, Alliance to Save Energy, Appliance Standards Awareness Project, Natural Resources Defense Council, Northwest Power and Conservation Council and Pacific Gas and Electric Company

FEBRUARY 12, 2007

Re: [**Docket No**. EE–2006–STD–0129] **RIN** 1904–AA90

Ms. Brenda Edwards-Jones
U.S. Department of Energy
Mailstop EE-2J
1000 Independence Ave.
Washington, DC 20585

Dear Ms. Edwards-Jones,

This letter comprises the comments of the American Council for an Energy-Efficient Economy, the Alliance to Save Energy, the Appliance Standards Awareness Project, the Natural Resources Defense Council, the Northwest Power and Conservation Council and the Pacific Gas and Electric Company on the Framework Document for the water heater, pool heater and direct heating equipment rulemaking. We appreciate the opportunity to comment, and the Department's commitment to the standards process as one key way to improve the energy efficiency of the nation's economy.

The American Council for an Energy-Efficient Economy is a nonprofit organization dedicated to advancing energy efficiency as a means of promoting both economic prosperity and environmental protection. ACEEE fulfills its mission by conducting in-depth technical and policy assessments; advising policymakers and program managers; working collaboratively with businesses, public interest groups, and other organizations; publishing books, conference proceedings, and reports; organizing conferences and workshops; and educating consumers and businesses. ACEEE was involved in the legislation establishing federal efficiency standards, and has been active in all significant rulemakings since then.

The Alliance to Save Energy is a non-governmental organization that has been working for thirty years to improve energy efficiency in the US and internationally. Formed as a bipartisan initiative between Senators Charles H. Percy and Hubert H. Humphrey in the wake of the first OPEC oil embargo, the Alliance has developed an international reputation for effective policy and program work in the energy-efficiency field. Our staff economists, technical experts, researchers, and policy professionals work together to advocate for energy efficiency policies, help advance efficient building codes and appliance standards, partner with other organizations to develop and implement energy efficiency programs, and communicate complex data on the benefits of energy efficiency to policymakers, stakeholders, and the general public.

NRDC is a national environmental advocacy organization with over 1.2 million members and on-line activists nationwide. NRDC has spent decades working to build and improve the U.S. Department of Energy's ("DOE's") federal appliance standards programs because of the important energy, environmental, consumer, and reliability benefits of appliance efficiency standards. NRDC has also worked on state and international appliance efficiency standards.

The Appliance Standards Awareness Project (ASAP) is dedicated to increasing awareness of and support for appliance and equipment efficiency standards. Founded in 1999 by the American Council for an Energy-Efficient Economy (ACEEE), the Alliance to Save Energy, and the Natural Resources Defense Council, ASAP is led by a steering committee that includes representatives from the environmental community, consumer groups, utilities and state government. ASAP provides advice and technical support to parties interested in advancing state standards.

The Northwest Power and Conservation Council is an intra-state compact representing the states of Idaho, Montana, Oregon and Washington. The Council was authorized by Congress and approved by the states under the Pacific Northwest Electric Power Planning and Conservation Act (Public Law 96-501). The Power Act directed the Council to develop a 20-year electric power plan to guarantee adequate and reliable energy at the lowest economic and environmental cost to the Northwest, develop a fish and wildlife program to protect and rebuild populations affected by hydropower development in the Columbia River Basin and conduct an extensive program to educate and involve the public in the Council's decision-making processes. Council members are appointed by the governors of their state.

Pacific Gas & Electric Company (PG&E) is an investor owned utility serving Northern California. Incorporated in California in 1905, PG&E is one of the largest combination natural gas and electric utilities in the United States. There are approximately 20,000 employees who carry out Pacific Gas and Electric Company's primary business—the transmission and delivery of energy. The company provides natural gas and electric service to approximately 15 million people throughout a 70,000-square-mile service area in northern and central California. PG&E has 5.0 million electric customer accounts and 4.1 million natural gas customer accounts.

We begin with overall concerns about the Framework Document, and then turn to comments on standards for several of the equipment types covered.

Summary and Overall Concerns

Broadly speaking, the framework document proposes that rulemaking be considered for several product classes, including residential service water heaters except solar; "Direct Heating Products" such as wall, floor, and room heaters; and gas-fired pool heaters <1,000,000 Btu/hr. Specifically, DOE proposes to include (and exclude):

Rule Making for Water Heaters &c			
Class	**"Fuel"**	**covered**	**excluded**
Potable Water Heaters	**Gas**	Storage, 20 - 100 gal	
		Tankless, 50k - 200k Btuh	
	Oil	Storage, ≤105k Btu/h,	
	Electric	Storage, ≤ 12kW, 20 - 120 gal and HPWH	Tankless
			Small tabletop
	HPWH	with electricity	
	Solar		All
Direct (space) Heating	**Gas**	Vented-wall, floor, room, hearth	Unvented (no test procedure)
	Oil		All
	Electric		All
Pool Heaters	**Gas**	<1,000,000 Btuh	
	Electric		All
	Oil		All
	Solar		All

We group our concerns in six categories, with some overlap. From least to greatest impact, these can be roughly ordered as: equipment classes, technology options not considered, parameters chosen (and ignored) for analysis, test method problems, decision criteria, and policy. We discuss each, and related recommendations in sequence.

Equipment Classes

We are pleased that heat pump water heaters (HPWH) are included in the class of electric storage water heaters, rather than treated separately (page 9). We support the understanding that portable, electrically heated spas are not included in the consideration of pool heaters. This type of spa is treated as a stand alone appliance by California regulations and should remain outside the scope of the DOE rulemaking for pool heaters. Portable electric spas consist of a packaged set of components which consume electricity to deliver what the consumer wants. DOE has properly decided to not attempt to cover the spa heater component as part of the federal rulemaking.

Technology Options

At least four technology option omissions seem potentially damaging to the Department's efforts to meet its statutory responsibility of setting standards that *maximize* cost-effective energy savings:

First, in contrast to its own work on the ENERGY STAR water heating program, the Department has chosen to exclude solar-assisted water heating options. This leads to arbitrary exclusion of EF values in the range of 0.95 – 2.0 (roughly) for electric water

heaters (other than heat pump water heaters). This is discussed below, under test methods and policy issues.

***Recommendation**: Solar-assisted water heating should be included as a technology option.*

Second, the Department does not consider the opportunities that would be opened for more efficient oil-fired equipment by the adoption of requirements for low-sulfur (15 – 100 ppm) fuel oil. For a standard proposed to take effect no earlier than 2013, the Department must be cognizant of the energy efficiency opportunities that will accrue from regulations to require low-sulfur fuel in some US regions – and especially the Northeast (*Ozone Transport Commission)* which is the region where a large fraction of oil-fired heating equipment is located. Mandatory national use of low-sulfur diesel fuel is required now. The *highest* projected cost increment for low-sulfur fuel was $0.10/gallon (American Petroleum Institute); other predictions are half as much. Low-sulfur fuel oil (similar to kerosene) allows Great Britain to require oil-fired condensing boilers, in regulations that take effect April 1, 2007. Work at the Department's Brookhaven National Laboratory (BNL) shows that low-sulfur fuel all but eliminates corrosion of the boiler combustion chamber, since only trivial amounts of sulfuric acid can be formed. Presumably, it also greatly reduces concerns for acidic damage to the flue and chimney. These effects would greatly reduce purchase and installation costs of a condensing water heater. In addition, without sulfur, soot formation is greatly reduced, which decreases the cost of maintenance.

***Recommendation:** The Department should take into account the availability of low-sulfur fuel oil in considering the technical feasibility and cost-effectiveness of high-efficiency condensing technologies.*

Another option not considered is a requirement for sealed combustion (using outside air for combustion and dilution). The present test procedure does not consider the energy costs of using heated (or cooled) indoor air for these functions. These costs can be significant, particularly for high-output tankless gas equipment.

***Recommendation:** The Department should revise the test procedure for water heaters (see below) taking into account the effects of sealed combustion technologies in reducing the energy costs for heating and cooling make-up combustion air.*

Finally, the Department's treatment of so-called "tabletop" electric resistance water heaters raises other questions of interpretation of the law. On page 9, the Department states that "Considering these strict size limitations for these products, DOE is not aware of any feasible technological advancement which would change its conclusion from 2001. Therefore, DOE is proposing to exclude tabletop water heaters from consideration in this rulemaking." The Department did not consider vacuum panel insulation, developed at DOE labs and used in some refrigerators.[1] This product is commercially

[1] For example, the Domestic NDR series, at http://www.campingworld.com/browse/products/index.cfm?prodID=1946&affiliateID=358&src=frg

available, and the flat sheets commonly fabricated are well-suited to this category – and would provide increased amenity: the insulation is much thinner for a given U-value, so storage volume could be increased. In addition, the Department has not established that *decreased* storage volume from using thicker conventional insulation would significantly decrease utility. This would require field studies of draw patterns, or at least a careful survey of existing installations to determine whether running out of hot water is a significant problem for users of these units.

Recommendation: *The Department should re-assess its initial proposal to exclude "tabletop" electric water heaters, after taking into account the commercial availability of vacuum panel insulation and also considering the potential effect of a more representative pattern of water use for tabletop units.*

At the hearing, GAMA suggested that some technology options should not be considered because they do not show up on the test method. We disagree. *All* options which have the potential to cost-effectively save energy should be thoroughly evaluated. Such evaluation is useful both to help inform potential revisions to the test method and as the basis for potential prescriptive requirements that could be established in addition to performance requirements.

Recommendation: *DOE should evaluate all technology options, regardless of whether the existing test method captures energy saving benefits.*

Parameters Chosen for Analysis (gas prices, EF, sizing)

One of the most significant economic effects of a water heater standard is its effect on natural gas prices. Gas water heaters are large direct users of gas, and electric water heaters account for large amounts of gas fired power generation.

As NRDC and the Dow Chemical Company pointed out in comments submitted for both the ANOPR and NOPR phase of the DOE furnace proceeding, the economic benefits from lower gas prices due to high efficiency levels may be larger than the direct benefits to the users. At any rate, they are far too significant and well-established to ignore.

Recommendation: *DOE must calculate a range of values of the reduction in gas prices at each trial standards level, and consider this input in weighing the economic benefits and burdens of the level.*

For **electric water heaters**, we are perplexed by the Department's proposal to analyze EF 3.12 as the only appropriate efficiency level for heat pump water heaters (HPWH) (p. 27). EF 3.12 is far beyond the performance of the units whose development DOE has supported. DOE's consultants explained at the January 16 hearing that EF 3.12 had been selected as the maximum technologically feasible level based upon certain Japanese products. We believe that, in addition to the max tech level, it is crucial that DOE evaluate mid-level HPWH EF levels closely in line with those which DOE has sought to encourage through its own R&D funding. More modest EF levels achieved by heat pump

water heaters are likely to demonstrate very different cost-effectiveness and overall economic justification than the max tech levels. For example, GAMA lists HPWH units with EFs of 2.28. Specifically, if the max tech level of EF 3.12 turns out not to be economically justified, such a finding would not mean that all EFs of greater than 1 are not economically justified. If DOE does not analyze intermediate levels as well, any potential rejection of the 3.12 level would leave DOE indefensibly proposing an EF less than 1.

Recommendation: *The DOE must fill the gap between the EF .95 and EF 3.12 levels it has proposed to evaluate by also evaluating EFs of 1.7, 2.0 and 2.3.*[2] *Evaluating these three levels will enable DOE to effectively consider the range of potential impacts of heat pump water heater technology. If DOE's resource constraints preclude analysis of all three values, DOE should select EF 2.0 for analysis since significant resources have been dedicated toward development and marketing of equipment with EF near this value.*

For 40 gallon **gas-fired storage-type water heaters,** the Department's five efficiency levels to be analyzed are fairly well spaced (Table 7, page 27), but do not consider the range of possible levels for condensing type equipment. Work by the SEGWHAI (Super-Efficient Gas Water Heater Appliance Initiative)[3] suggests that "max tech" for condensing storage water heaters will probably be in the range of 0.86, which the Department proposes as an analysis level. But, SEGWHAI suggests that there may be a "sweet spot" for lower price, cost-effective, condensing water heaters at about EF 0.82 and one for non-condensing units at EF 0.70.

Recommendation: *We recommend that DOE add values of EF 0.70, 0.80, 0.82 and 0.84 for evaluation. Adding these values will enable DOE to thoroughly evaluateboth non-condensing and condensing water heater technology at a range of efficiency levels. If DOE's resource constraints limit the EFs which can be evaluated, we strongly recommend that DOE at a bare minimum include EF 0 .82 in the analysis.*

Finally, the gas-fired tankless water heater levels for which DOE proposes to gather data (Table 9), do not include 0.80 EF, the current federal tax credit threshold. One would expect this to be a level for which substantial data would be available in the market,[4] with possible value for calibrating the Department's assumptions.

For **tankless water heaters,** DOE proposes to use 190,000 Btu/hr as its baseline (p. 20), because this is the most common listing in the GAMA directory (3/2006). This choice may have implications as the market develops. In this nascent market, instantaneous water heaters seem to be most popular in new construction, where installation costs are

[2] The Department's Oak Ridge National Laboratory carried out extensive work, including field studies, on the "Watt $aver" heat pump water heater, and is well-positioned to advise on EF levels that are likely to be most cost-effective for heat pump water heaters.

[3] www.segwhai.org

[4] Of course, current price data need careful examination, as "street" prices may be increased by the availability of the tax credits. In addition, as the Department showed in the recent Furnaces and Boilers NOPR and its associated Technical Support Document, it is devilishly difficult to tease apart product price from installation price.

relatively low. In contrast, for replacements and retrofits, which are 80% of the total water heating market, 190,000 Btu/h models are problematic for technical reasons: (1) Because this size requires gas flow about 4 times greater than conventional storage units, instantaneous units may require new lines and meters, at substantial expense. (2) These units require completely different venting systems, which imposes another substantial cost. Thus, it is not clear whether the predominant market in a decade will be these "endless hot water" models.

Test Methods

The Department has excluded some categories of equipment just because there is no DOE test procedure now. These include combination units ("combos," water heaters that also provide space heating services), and all categories of unvented space heaters. In contrast, it proposes to use an ANSI test standard for pool heaters (p. 24). The Department offers no rationale for failing to use similar consensus test standards from ASHRAE, ANSI, CSA, or international standards organizations in the case of combo space and water heaters, or unvented space heaters.

Indeed, DOE supported the development of ratings and certification for solar water heaters,[5] a product category DOE proposes to exclude from its standards program.[6] "Combos" are another example of the dead-ends that result from DOE's rationalization. The Department claims that there is no test procedure now, but provides a footnote that NIST is developing a procedure but the DOE process has not yet been completed (p. 9, footnote 8). This can only be read to mean that DOE could avoid regulating any product by delaying test method development arbitrarily. In the meantime, the Department, following its own precedent as established for pool heaters, could choose to employ ASHRAE 124-2006, which has been approved for publication, which was specifically developed for this task of rating combination space and water heaters. Beyond the policy principle, we are concerned about this issue because we believe that there will be increasing opportunities for "single flame" solutions in the new construction market. Indeed, at least one major manufacturer has already introduced a condensing water heater that is clearly designed for this application.[7]

In at least one respect, the existing test method is so defective that it affects the market, however inadvertently. We are particularly concerned that the present water heater test method is seriously biased in favor of instantaneous gas water heaters over storage varieties (p. 20). It appears that this is an historical accident, but it leads to a roughly 8.8 point performance gap, one large enough to require regulatory intervention in California to assure energy savings. The underlying issue is that the current test procedure is based on recovery energy for six large (10.7 gal each) draws at one hour intervals, plus the

[5] Solar Rating and Certification Council, http://www.solar-rating.org/

[6] In this case, there is a major policy issue, as well, in that DOE claims that it has no authority to set standards for solar products.

[7] The 50 gallon, 76,000 Btu/h A.O. Smith "Vertex" water heater includes a pair of side taps for a heating coil for space conditioning. http://www.hotwater.com/products/residential/rg-vertex.html

standby losses during the rest of a 24 hour cycle.[8] This may have been appropriate in the past to compare like technologies (*e.g*, only storage water heaters) but it is not adequate for the range of technologies currently available. Tankless units excel at this test because it effectively considers only their steady-state efficiency (standby losses are very low).

In contrast, field measurements summarized by the report, "Hot Water Draw Patterns:Findings from Field Studies"[9] show that actual water use follows a very different pattern: roughly a log-normal or Poisson distribution of draw frequency vs. draw volume: There are tens of very small draws for every large draw. Due to cycling losses, tankless water heaters appear to be significantly less efficient than the current test method indicates. California has found that lab tests with realistic draw patterns reduce the apparent EF for tankless units by roughly 8.8%. This may lead to changes in the treatment of efficient water heaters in California's Building Energy Efficiency Standards, Title 24 for 2009. In their energy calculations, a 0.82 EF instantaneous water heater may be treated as the equivalent of a 0.748 EF storage water heater. *To summarize, although field data are limited, enough is known to assert with some confidence that the assumptions of the test procedure are not adequate to establish the typical annual energy consumption of tankless products.* Policy implications of this test method failure are discussed below.

We have previously pointed to the failure of the current test method to consider the energy losses for heated or cooled indoor air used for combustion, which could significantly affect the calculated cost-effectiveness of sealed combustion options.

In addition, at the hearing on January 16, GAMA noted that several technologies which save energy do not show up on the test method as doing so. One example is tank-bottom insulation for electric storage water heaters.

Recommendation: *Given these multiple problems with the test method, DOE should immediately commence work to revise the water heater test method. This work should be completed in parallel to the current phase of the standards rulemaking.*

Decision Criteria

The Department proposes several decision criteria for setting standards levels on the products under consideration. Given how the Department has chosen to implement these criteria for standards setting recently, questions arise which warrant careful consideration (Many spill over to policy issues, discussed below). These are all questions of analysis practice and interpretation, which could significantly affect the ability of DOE's rulemaking to meet the clear intent of the law, that standards should achieve the

[8] Test Procedure for Water Heaters: Final Rule. Federal Register 63, #90, 25995 – 26016, specifically p. 26012 (Section 5.1.4.3). May 11, 1998

[9] "Hot Water Draw Patterns:Findings from Field Studies" report in progress. This work was supported by the California Energy Commission, Public Interest Energy Research Program, under Contract No. 500-05-007 and by the Assistant Secretary for Energy Efficiency and Renewable Energy, Building Technologies Program of the U.S. Department of Energy under Contract No. DE-AC02-05CH11231.

maximum savings that are technically feasible and economically justified. For convenience, we raise these analysis issues in the sequence of the Framework document, not necessarily in order of importance.

We believe that there are new challenges for **market assessment** for water heaters, particularly storage water heaters. First, the industry is extremely consolidated, almost completely dominated by three manufacturers selling under many brands through diverse channels. This is likely to make it difficult to obtain good data, or to build simulation models that fully capture the economies of scale in an industry in which a handful of factories produce roughly 9 million units/yr.[10] Even surveying market prices over time will have challenges, because the near-universal adoption of Flammable Vapor Ignition Resistant (FVIR) technologies as a voluntary standard on January 1, 2003, just a year before the current water heater standards were implemented. It may be very difficult to accurately separate the possible cost changes to meet this voluntary standard with cost changes due to the January 2004 DOE standard (pages 15, 25).

The **cost-efficiency relationship** is also difficult to document for another fundamental reason: as demonstrated by *Consumer Reports*,[11] dissection of a representative sample of water heaters shows that features thought to be correlated with higher energy efficiency are also strongly correlated with longer warranties. These product characteristics include thicker insulation, larger heating elements (electric), bigger burners and better heat transfer (gas). Longer warranties are also associated with thicker or longer anodes, as would be expected. The point is that the incremental price for the longest warrantee models was $60 - $80 for electric and $50 - $100 for gas units, which is a strong upper bound for the cost of the largest efficiency differences commonly found on the market. That's because these values include both efficiency and non-efficiency features. We infer that this price limit is applicable to current models, since the text implies that *Consumer Reports* evaluated models with FVIR. There may be other ways to further bound the maximum cost for incremental efficiency gains.

Using manufacturing costs determined by the Department and the simulation models Tank (gas storage) and Watsim (electric storage) seems to require **validation** of the results by comparison with market prices within the mainline product efficiency levels (page 27).

Recommendation: *The Department's economic analysis should take into account real-world market conditions such as those identified above.*

In a related modeling issue, the Department proposes to use NEMS-BT to evaluate **utility impacts** (p. 45). We question whether this model is capable of realistically handling changes in hourly demand for natural gas as well as electricity – not just changes in seasonal or annual energy use. This is particularly relevant for instantaneous gas water heaters, which can flow 3- to 5-times as much gas as storage units while they are firing. There has been much speculation about the potential impact of the Local (gas)

[10] Inferred from data at statistical reports from www.gamanet.org
[11] Consumer Reports, February, 2005, pp. 46-48

Distribution Companies (LDCs) ability to maintain pressure during the morning peak if these units are widely used.

Recommendation: *DOE should use models that capture the full range of impacts on utility system operating costs, capacity, and reliability for both electric and gas utilities.*

We are also very concerned with the way the Department uses **life cycle cost (LCC)** analysis.[12] Selection of inputs (such as discount rates and product service lives) can bias the results. We appreciate the Department's attempts to be transparent, but we believe that many of the **product lifetimes** chosen by DOE are rather low (page 38). We also find that *Appliance* magazine, the source used by DOE, tends to estimate different lives than other sources. The only source for the very long (20 year) estimate of the service life of gas-fired tankless water heaters comes for the Department itself without further reference.[13] Yet, the Department's estimate of nine year service life for conventional storage-type water heaters is much shorter than the 13 year estimate used by the California Energy Commission Database for Energy Efficiency Resources (DEER 2005). It is also much shorter than the Northwest Power and Conservation Council's Regional Technical Forum which adopted a 14 year lifetime for electric water heaters based on an evaluation of the average age of "failed tanks" returned to plumbers. Arbitrarily reducing service life estimates will significantly affect the estimated life cycle cost, and in particular will reduce the estimated new benefits for higher efficiency products.

Recommendation: *The Department needs to evaluate all available sources of lifetime estimates, and consider the impact of variance and uncertainty in the cost-effectiveness of high-efficiency options.*

Changing the **energy price** forecasts can also have large effects. Particularly for natural gas price forecasts, the DOE *Annual Energy Outlook* (AEO) has been very volatile in recent years, with a 14% increase in projected gas prices in AEO2007 relative to AEO2006. The Department should look at other price forecasts, and consider the range and uncertainty of future prices where these estimates differ significantly from AEO. In a related issue, natural gas prices and price projections are growing increasingly volatile. We believe the Department needs some method to deal with this volatility, and for recognizing the inherent uncertainty in forecasts that *begin* six or more years from now (Section 8.1, page 36).

As we have pointed out in commenting on previous DOE rulemakings, the appliance standards themselves – along with other policies and programs to improve energy efficiency – can have a significant effect on reducing natural gas prices and price volatility.[14] Yet the DOE analysis method currently has no way to incorporate this important positive feedback loop in analyzing a given efficiency standard for a gas

[12] See, for example, ACEEE comments on furnaces and boilers NOPR.
[13] http://www.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=12820
[14] Elliott R.N. and A. Shipley. 2005. "Impacts of Energy Efficiency and Renewable Energy on Natural Gas Markets: Updated and Expanded Analysis." ACEEE Report E052.

appliance, nor to consider the cumulative effects on gas prices and volatility of several such standards as well as other energy-saving programs.

The key issue derived from our comments about inputs to the LCC analysis is that it is critical to understand the limitations of Life Cycle Cost as a decision tool. We discuss this further in the next section, in the context of how to deal with decisions in the face of small changes in LCC with relatively large changes in efficiency.

Policy

We again note that the intent of EPCA is that standards should achieve the *maximum savings that are technically feasible and economically justified*. We fear that the Department has tilted the field in ways that negatively impact the potential energy savings and thus may fail to meet this statutory requirement. Let's consider some issues in the Framework Document that illustrate the reasons for our concern.

1. **Delay in effective date** - Unless DOE promulgates standards that require large changes in current technologies, such as condensing water heaters or heat pump water heaters, the implementation date should be set for **three years after publication** of the new Rule. This allows adequate time for manufacturers to prepare.

2. DOE, using another narrow interpretation of the law, says that EPCA defines energy as electricity or fossil fuels, and thus that it has **no authority over solar products**. This is the narrowest possible reading of the language, and very peculiar in view of the intent of existing law to maximize energy savings. Using the sun's heat directly, assisted by a solar collector, is essentially not different from using the heat in ambient air, with the help of a heat pump water heater. In addition, DOE supported the development of ratings and certification for solar water heaters.[15] Finally, pool heaters are predominantly a luxury product. Just as new technologies enter the luxury end of the automotive market first, a strong argument can be made for setting very stringent efficiency standards for pool heaters, which could be based upon condensing technology, heat pumps and/or solar water heaters. All of these products are on the market, and there are rating methods for all.

3. The accuracy of DOE's **manufacturer impact analysis** for prior rulemakings has never been evaluated, based on a *post hoc* comparison of actual cost increases experienced by manufacturers.

Recommendation: *DOE should evaluate the validity of estimates developed for the 2000 water heater rule to help determine if methods now employed for developing these estimates are valid. This evaluation should be used to improve DOE's manufacturer impact analysis for this and other rulemakings.*

4. DOE has not proposed to evaluate the international competitiveness impacts of standards at each of its trial levels. The cost of high efficiency equipment declines

[15] Solar Rating and Certification Council, http://www.solar-rating.org/

with cumulative production experience. This is known as the "learning curve" effect. Today, almost all water heaters sold in the United States are made domestically. But if the efficiencies of American-made products are stagnant or only slowly improving, foreign competitors will develop market advantage for the high-efficiency products, given the strong push for appliance efficiency in Europe, Japan, and China. DOE recognized this problem in the context of the furnace efficiency standards, where it noted "The European market is…[characterized by] high-volume pricing and large company suppliers," with the result that costs are lower." 71 Fed. Reg. at 59244. DOE is acknowledging in its discussion that higher volumes lead to lower prices. It must analyze this effect in determining economic justification of the more advanced potential standards levels.

5. **Life cycle cost** (LCC) analysis is a tool, and often a useful guide. However, as we have shown above, the results of LCC are highly dependent on the input data and assumptions. In addition, the recent *Furnaces and Boilers NOPR* showed that, for important product classes, there were trivial (1% - 2%) LCC differences over significant efficiency ranges. Given independent analyses of variability of inputs published in the NOPR (*e.g.*, installation cost variability of 15% among studies), it is clear that much smaller differences in the estimated LCC are insignificant artifacts and *cannot be used as the fundamental decision criteria*.

   Along these lines, the furnaces and boilers NOPR showed increases in LCC (but not in ranking) in the range of 20%, just from using fuel price forecasts from AEO2006 instead AEO 2005. This compares with first-cost differences of a few hundred dollars or less.

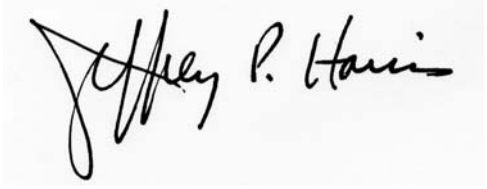
6. Water heater performance is significantly impacted by regional factors such as: availability of solar radiation, water delivery temperature, water quality, ambient temperature, Air Quality Management District emission standards, etc. The framework document does not address any of these important factors. This omission will have a negative impact on the ability of stakeholders to understand the importance of these issues with the potential of a standard that fails to meet the intent of ECPA.

Recommendation: *DOE should establish, as a matter of policy, that differences in estimated LCC that are within the range of uncertainty of one of more input value be* ***considered as substantially equal*** *when determining – as required by law – which proposed efficiency level represents the maximum (technically feasible) level that is life cycle cost-effective.*

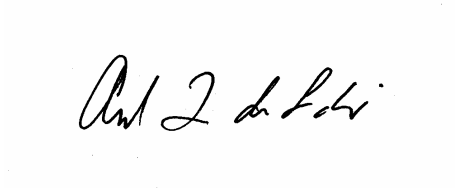
We appreciate the opportunity to participate in this Framework process.

Sincerely,

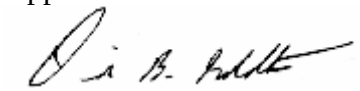
Harvey M. Sachs
Director, Buildings Program
American Council for an Energy-Efficient Economy (ACEEE)



Jeff Harris
Vice President for Programs
Alliance to Save Energy



Andrew deLaski
Executive Director
Appliance Standards Assistance Project (ASAP)



David B. Goldstein
Energy Program Co-Director
Natural Resources Defense Council (NRDC)

Tom Eckman
Manager, Conservation Resources
Northwest Power and Conservation Council

Duane Larson
Senior Manager Customer Energy Efficiency Department
Pacific Gas & Electric Company