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Briefing Paper 94-54

Market Transformation: What is It, and How do we Get There?

SUMMARY

The potential to secure energy efficiency through market transformation in the Northwest is large and likely very cheap. If all currently identified market transformation efforts were pursued aggressively and were successful, the potential is approximately 1,300 average megawatts at a cost of about 0.3 cents per kilowatt-hour to the utility. The Bonneville Power Administration has identified market transformation as a key piece of its conservation reinvention strategy, and the investor-owned utilities of the region also appear interested in pursuing market transformation ventures. This paper describes market transformation activities that could be pursued further by Bonneville and other regional stakeholders. Because Bonneville's conservation reinvention efforts will rely significantly on market transformation, this paper also makes an initial estimate of the size of resources that Bonneville might need to pursue market transformation vigorously.

THE ISSUE

The words "market transformation" are hot on the lips of most conservation implementors today. Many utilities in the region and around the nation are quite interested in the concept of market transformation because they view it as an opportunity to reduce the utility costs of conservation, which has become crucial in the increasingly competitive utility environment.

Bonneville has named market transformation a central piece of its conservation reinvention strategy. In the past, Bonneville collected funds to cover conservation actions (including payments to customers, administration and support activities) in general revenues and then disbursed the funds to those utilities that were active in developing the conservation resource. In the future, Bonneville proposes that the utilities fund conservation actions directly, and Bonneville will significantly reduce its funding from general revenues[1]. Bonneville has called the class of conservation actions that it will continue to pursue directly as "market transformation" activities, and proposes to fund them from tier 1 revenues, as described in the draft Business Plan. In addition to Bonneville, many of the region's

[1]The extent of reinvention on Bonneville's budgets was guessed at by Randy Hardy at the Council's 1994 Conservation Conference where he indicated that conservation budgets might be cut from approximately $200 million per year to $20 million. See *Clearing Up*, May 30, 1994, page 12, No. 624.

investor-owned utilities have expressed an interest in market transformation, although specific collaboration details have not yet been laid out.

A key purpose of this paper is to identify a portfolio of promising projects that could be pursued through market transformation. The activities described in this paper were drawn from suggestions from a variety of national and regional discussions. This paper first defines market transformation, then describes how it might be pursued. Next, likely targets of market transformation are discussed and principles to help plan and sort through which actions will be pursued in the nearterm are described.

A second purpose of this paper is to help the Council track the portion of Bonneville's conservation reinvention that is composed of market transformation. This will be done by working closely with Bonneville to ensure that a comprehensive set of market transformation activities will be pursued. As a partial means of tracking this, and because Bonneville is in the process of setting market transformation budgets for fiscal year 1996 and 1997 within the next few months, an estimate of the size of the resource it would take to pursue the actions identified is given.

Last, the steps that should be pursued to continue along the path of market transformation are briefly listed.

DEFINITION AND REASONS TO PURSUE

Market transformation is a process where energy-efficient products are introduced into a marketplace and eventually represent a large portion of the eligible market. A market is transformed when efficient products are the norm in their particular market niche. This would mean that utility efforts to secure efficiency after the transformation could be largely concluded. Bonneville is currently working with the definition: "Market transformation is a strategic effort by utilities and other entities to induce lasting structural or behavioral changes in the market that result in increases in the adoption and penetration of energy efficient technologies and practices."

Market transformation is a different perspective on conservation acquisition than the traditional utility acquisition approach. The market transformation idea is to identify actions that will eventually multiply and affect large markets for a particular product or practice, rather than approaching acquisition on a one-by-one, building-by-building basis.

Market transformation efforts by their very nature tend to cross utility service territory boundaries simply because markets for products are not defined by these service territories. As a result, a number of utilities will need to pool their resources to create a large enough market pull. In these cases, it is important for all the utilities in the region to work together to develop common specifications for efficient products and to aim for administrative simplicity. For example, efforts to affect the efficiency of motors that are installed in packaged equipment, such as air compressors, are most efficiently targeted at the manufacturer level, rather than the retail level. In this case, it makes sense to pool the funding and market power of the public utilities through Bonneville, collaborate with other Northwest and national utilities, and target the manufacturer rather than the consumer.

Examples of market transformation are the success the region has had in passing new residential and commercial building codes in Oregon and Washington, influencing the market for refrigerators

through the Super Efficient Refrigerator Project (SERP), and the manufactured housing acquisition program (MHAP). Other success stories from across the nation in market transformation are described in Geller and Nadel, 1994

The goal of most conservation programs is to accelerate adoption of efficient technologies. Market transformation has the added goals of reducing levelized costs (especially utility levelized costs) and creating a lasting effect in the market by having efficient measures and practices as the preferred option even after the utility intervention has been removed. Because market transformation targets strategic leverage points, it can often also result in a higher penetration of the efficient technology than has been the case with more traditional utility programs.

As a result, market transformation benefits the utility in a number of ways. First, long-term program costs are reduced and the cost per kilowatt-hour of the savings acquired is lowered because the transformed market no longer requires utility intervention, yet savings continue to accrue after utility intervention has stopped. The challenge is to predict which markets have the greatest potential to yield lasting efficiency gains after strategic utility intervention has been substantially reduced. Second, the cost to produce some of the efficiency may be reduced simply by increasing the size of the market and reaching some economies of scale in production. Third, usually penetration is increased, thus resulting in higher savings.

Market transformation seems a likely path for utilities to acquire efficiency more efficiently, however, it is not a panacea for several reasons. First, while the long-term levelized cost of conservation to the utility will be significantly reduced through market transformation, the costs to intervene initially in the market may still require large expenditures, similar to current programs. Second, many transformation efforts may be less visible to customers during an era when increasingly utilities want to get close to their customers. Market transformation efforts should be designed to build improved utility/customer relations whenever possible. Third, it may be difficult to measure the savings from some market transformation efforts and therefore attribute suitable acknowledgment. Finally, since market transformation efforts cannot be done by a single utility in isolation, (simply because it's service territory does not match the market base that is trying to be transformed and it does not influence a large enough share of the market) it requires *cooperation* among utilities in an era when *competition* among utilities and other service providers is increasing.

METHODS TO PURSUE MARKET TRANSFORMATION

If the goal is to transform a market for a product so that energy-efficient products capture a vast majority of sales and remain the product of choice, how can that be done? One tool that has been used successfully in the Northwest and at the federal level is building codes and appliance efficiency standards. Once these are adopted, inefficient versions of the product disappear entirely from the market. But how does one influence a market sufficiently that codes and standards are possible? The answer depends entirely on the barriers that exist in the market that prevent the efficient product from being the norm. Geller and Nadel (1994) offered nine elements that would constitute different approaches to transforming markets. These actions could be taken by various parties, including private companies, state energy offices, national laboratories, and utilities. Utilities could be involved in all stages of market transformation, although some non-utility contributions will be crucial, especially in the research and development end. In a revised and modified version, the elements used in market transformation are:

1. Research and development
2. Demonstrations and field tests
3. Commercialization
4. Marketing and consumer education
5. Infrastructure support and training
6. Retail level financial incentives
7. Voluntary commitments (e.g., Green Lights)
8. Bulk and/or manufacturing level purchases
9. Building codes*
10. Equipment/Appliance efficiency standards*
11. Code enforcement

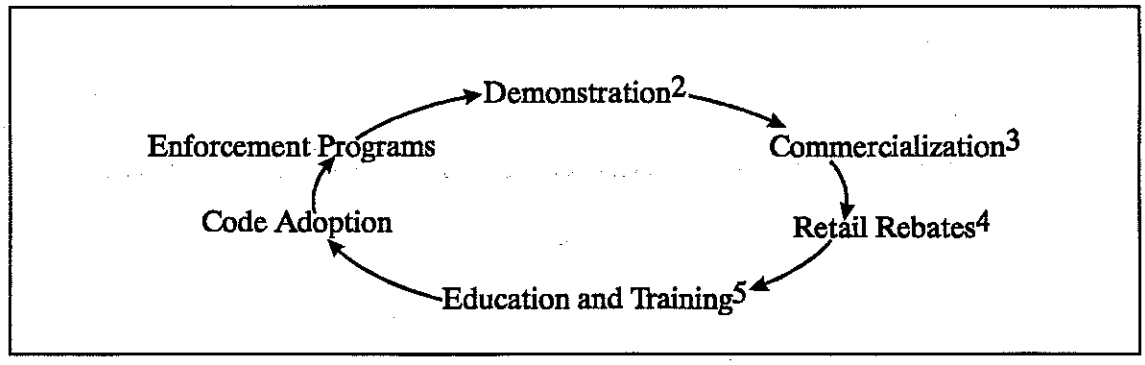
* Often an end product of the other elements listed.

For a particular technology, there are many different approaches that are complementary, and the set selected and actors required will depend entirely on the market and development stage of the technology. For example, transforming the residential construction market involved the active participation of Northwest utilities, state energy offices, local and state governments and the Council at various stages of the transformation.

Figure 2 illustrates the "life cycle" of the transformation of the residential space heating market. Utilities were involved in demonstrations and field tests, in commercialization of technologies, in marketing and consumer education, in infrastructure support and training, in financial incentives, and finally in building code enactment and enforcement. Most of these actions were done in concert with many other parties.

The pay-off was large. For the Washington residential code, Washington State Energy Office estimated the costs to utilities over the 1983-2003 period to be about $112 million. But because the savings are so large, and the utility is not paying for each house after the code is passed, the levelized cost to the utility is less than one-half cent per kilowatt-hour. In addition, penetration rates are much higher with the codes than would be the case with one-on-one retail-level incentives, such as those in Super Good Cents.

Figure 1
Life Cycle for Transforming the Residential Space Heating Market in the Northwest



WHAT ARE LIKELY MARKET TRANSFORMATION TARGETS?

While there are numerous ways that can be selected to target a transformation of any given market, there are probably three primary categories into which current and future market transformation efforts can be grouped: 1) targeted actions for specific end uses; 2) quality assurance/support items that ensure energy-efficient products are providing superior service to customers; and 3) demonstration and commercialization activities that will be required to gain more experience with emerging technologies before full-scale programs are launched. These are described next.

Targeted Actions

Utilities around the Northwest and the nation will have to evaluate a multitude of projects that could be eligible for market transformation efforts. These projects should target a specific market barrier that if overcome, will significantly aid in the transformation of the market to efficient products. One way to start this process is to identify which technologies are likely transformation targets. A second step is to develop a work plan that would identify the type of strategic intervention planned, measurable goals and an entrance and exit strategy.

Table 1 lists a portfolio of market transformation possibilities.[6] It is anticipated that the first wave of targeted transformation efforts will come from this list, although new items not yet on this list may also emerge. Detailed calculations on these are given in the spreadsheet in Attachment A. The market

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[2]Residential Standards Demonstration Program and Residential Construction Demonstration Program tested technologies, demonstrated cost-effectiveness, and increased builder support and awareness of energy-efficient construction.

[3]Commercialization was accomplished through a variety of means, including RSDP, and Super Good Cents and extensive builder/contractor training.

[4]Super Good Cents included retail level rebates, but also served as a primary method of commercializing the energy-efficient residential structures.

[5]State Energy offices played a significant role in bringing builders and consumers up to speed to be able to provide and demand quality energy-efficient housing. They were also crucial in forging appropriate links among institutions at the state level to allow passage of efficient building codes.

[6]Some of the items from the commercial sector listed in Table 1 are already being pursued to some degree by utility efforts in their commercial programs, primarily Energy Smart Design. For example, occupancy sensors may be recommended as part of a comprehensive package of measures in a new commercial building during participation in the Energy Smart Design program. To the extent these measures are already being pursued, the market transformation efforts should complement the utility program already in place, unless there is a clear replacement that is significantly better.

for each identified project will need to be closely reviewed to determine exactly the actions that should be taken. Those projects that are supported by others (either regionally or nationally), that are likely to have lasting effects on the presence of efficiency in the market place, and are likely to represent the least-costly, long-term manner of achieving the savings, or result in a higher penetration rate, should be the highest priority items. These and other criteria to prioritize actions are discussed in a later section.

Some of these projects are already under way, and others are being developed or considered by the national Consortium for Energy Efficiency (CEE). Those projects being developed or launched by CEE are particularly attractive because a national market is being developed for these efficiency measures, not just a Northwest market and because we already have a head start in getting these programs on the street.

Table 1
Potential Targeted Market Transformation Projects

	Average Megawatts Acquired			Regional Levelized Cost			
Target	During Effort	After Transformation		By Measur	If Transforme	CEE Active	Code/ Standard
		BPA	IOU				
RESIDENTIAL							
HP Wtr Htr, New & Replac't	35	206	308	38	2.4	Yes	Federal
Clothes Wash-Horiz'l Axis	3	8	10	27	5	Yes	Federal
Showerheads, New Const	1	9	13	8	0.4	No	Fed/State
Dishwashers	1	7	9	37	2.2	No	Federal
Clothes Dryers (Microwve or heat	1	3	4	109	10.6	No	Federal
SERP technologies to new stds	1	21	30	39	1.3	Yes	Federal
Compact Flourescent Lighting	7	14	20	53	9.6	Yes	No
Heating Sys Eff (design) - New	<1	39	36	Unknown	0.3	No	Possible
Windows - .4 to .32 - New Const	2	19	17	49	2.7	No	State
Manuf. Housing Acquis. Program	26	18	24	18	6.8	No	Federal
COMMERCIAL							
Improved Lighting - New (1.2 - .8)	4	21	48	35	1.9	No	State
Daylite Dimming - New	2	7	16	106	9.9	No	State
E.L. Exit signs - New	1	4	10	43	2.3	No	State
Occupancy Sensors - New	2	6	14	68	6.3	No	State
Low E window (0.4)	2	13	30	48	2.6	No	State
Building Commissioning	3	10	22	43	4	No	Possible
Halogen IR lamps	2	6	13	67	6.2	No	State
Code Enforcement - WA & OR	2	2	5	21	4.7	No	No
Update Design Rules of Thumb	Unknown			N/A		No	No
Packaged AC and Chillers (CEE)	Chillers may have particular application since CFC changeouts will open "window of opportunity"					Yes	Fed/State
INDUSTRIAL							
Motors - Adjustable Speed Drives	42	42	42	11	0.3	Possible	No
OEM Motor systems	40	37	42	20	0.5	Likely	Possible

Table 1 also indicates what measures could be incorporated into codes and standards, which would make the effects of the transformation longterm. Almost every action listed in the table could have a related code or standard in the marketplace, at which time utility involvement could be significantly reduced. Those measures that are eligible for national appliance standards will have to pass the

"economically justified" criteria in the National Energy Policy Act , which also requires periodic reviews of the efficiency levels of these appliances. Those measures targeted to state and local code adoption processes will have to be approved by legislators and politicians whenever sufficient attention can be focused on energy issues. The timeline on state action is probably longer than for federal action.

The total resource represented by all these items is about 150 average megawatts for the region during the transformation effort period, and about 1,200 average megawatts after the transformation has been accomplished through the year 2010.[7] Most of the efforts are focused in the 1995 - 1999 time period, with standards and codes implemented after that. Bonneville represents about 550 average megawatts of this potential.[8] These numbers reflect successful efforts on all the projects listed above, and are based on numerous assumptions, which are documented in the appendix.

If each of these end uses is pursued on an item-by-item basis, the total levelized costs of the resource (including 20 percent administration) is about 3.6 cents per kilowatt-hour if the full cost is counted. If the market transformation is completely successful, and the utility does not pay for savings after about the year 2000 (but savings continue to accrue through about 2010), the cost of the savings to the utility is cut by more than 90 percent to less than 0.3 cents per kilowatt-hour. Heat pump water heaters weigh heavily in these average costs because they represent a large portion of the savings potential. However, excluding them from the analysis changes the results by less than one mill per kilowatt-hour.

Quality Assurance/Support

In addition to measure-specific actions, there is also a need to provide sufficient education, training and support in some markets. This is not a new concept. Education, training and support were crucial to getting residential codes during the 1980s. Although the commercial sector will likely be the focus in the future, these same functions will need to be served. This will be especially important in developing the institutional relationships, and appropriate data, to pass codes at the state and local level. In the past, state energy offices and local government associations have been crucial to this activity.

Table 2 lists ongoing activities funded at least partially by Bonneville (from Fiscal Year 1994 budgets) that deliver significant support to key market transformation targets, such as commercial lighting.[9] For example, the state energy offices provide training and support to architects and engineers to help them achieve better quality lighting with less energy use. These support items are crucial to some of the technologies included in the market transformation efforts to ensure customer satisfaction with the conservation technologies and to ensure the savings. An example is occupancy sensors, which dim or turn lights off when occupants are not present. This technology can save

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[7]These are based on the Council's medium high forecast from the 1991 Power Plan, except industrial sector estimates, which are based on the medium forecast. Residential and commercial sector electricity use has been very close to the medium-high forecast in the last few years, but industrial is lower. In addition, the conservation targets set out in the 1991 plan are based on the medium-high forecast.

[8]This number is not comparable to the 660 average megawatts often used to represent Bonneville's portion of all cost-effective conservation. For example, the time period of analysis here is through 2010, but the 660 average megawatts is through 2003. In addition, a number of the measures on the market transformation list were not included in the 1991 Power Plan, and so were not in the 660 average megawatts estimate. If the measures listed here remain cost-effective after further analysis, they will likely appear in the 1995 Power Plan and become part of the "all cost-effective" criteria.

[9]Investor-owned utilities help fund some of these items and have fully funded other similar projects, such as the Energy Resource Center in Portland.

significant amounts of energy, but high quality dimmable ballasts must be available at a reasonable cost to ensure occupants don't notice the transition between the lights being on and the lights being off. In addition, the sensors must be placed correctly in the room. State energy offices and educational facilities, such as the Lighting Design Lab, help ensure that the applications of efficient technologies are of high quality.

These types of quality assurance and support activities will likely need to be pursued in an aggressive market transformation effort. Most of these activities also add value to local utility programs, and support may not come exclusively from market transformation efforts. However, for market transformation to be successful, Bonneville and other regional utilities will likely need the services of quality assurance and support of institutions like those listed in the table.

Table 2
Historic Bonneville Projects for Quality Assurance/Support

Lighting Design Lab
Electric Ideas Clearinghouse
Energy outlet
Commercial Community College Classes
American Institute of Architects Awards
State Energy Offices/Local Governments and Tribes

Demonstration and Commercialization Actions

To bring technologies to market, some amount of demonstration and commercialization will be required. For example, the residential standards demonstration program helped demonstrate the cost-effectiveness and feasibility of building houses to the level of the model conservation standards and enhanced the viability of passing building codes. The exact level of effort will depend on the technologies that need to be demonstrated and whether it is likely that these will become eligible for market transformation efforts after the demonstration phase.

There is a lot of gray area between "demonstration and commercialization" and "research and development." In terms of utility efforts, much more demonstration and commercialization activity will need to be pursued to transform markets than research and development. However, some form of research and development is clearly a supporting piece of market transformation. Nadel and Geller included it in their elements of market transformation (described above), and Randy Hardy identified research and development of efficient technologies and products as integral parts of Bonneville's market transformation in "Straight talk about BPA and conservation."[10]

Bonneville is already working on a number of projects that represent a start on the market transformation path. For example, the agency is testing the next generation of super-efficient windows. However, other new technologies are on the horizon, and then will also need to be investigated. Such investigations should be pursued jointly with other parties. Cooperation is important here because the benefits of such actions accrue to multiple parties.

Table 3 indicates conservation technologies that are likely targets for further demonstration and/or commercialization. This list is taken primarily from work commissioned by the California

[10]See: BPA Circuit, Administrator's Perspective, "Straight talk about BPA and conservation" March, 1994, page 2.

Conservation Inventory Group. Not all of these items will result in projects that will be conducive to market transformation, but a significant portion of them are candidates. This group did not focus on the industrial sector, and additional items targeting industrial projects, such as a number of those developed through the Resource Supply Expansion Project (RSEP), would need to be added. It is clear from this table that there are a number of promising projects that should be investigated, usually through partnerships among utilities, manufacturers and other parties. Many of these technologies represent the market transformation projects of the future.

Table 3
Potential Emerging Technologies

Projects	Brief Description
Advanced freezers to level of "golden carrot"	Efficient freezer contains improved compressor and insulation
Automatic washer controls	Controls sense type of fabric, dirtiness etc. to adjust wash parameters accordingly
Heat pump clothes dryers	Dryer which uses heat pump instead of electric resistance heat
Improvements/replacements to standard incandescent bulbs:	
-General service halogen infrared reflecting lamps	General service halogen lamp with infrared reflector coating for higher efficiency
-Coated filament incandescent	Filament with low-e coating burns more efficiently
-Hafnium carbide single crystal filaments	Improved filament burns more efficiently
-100W equivalent CFLs	Smaller CFL lamp with light output = 100 watt incandescent
Improvements/replacements to commercial fluorescent bulbs:	
-Fluorescent surface wave lamp (electrodeless)	VHF ballast (60MHz) runs electrodeless lamp
-DC lighting systems	Building transformer for DC-powered fluorescents
-Advanced reflector design	Advanced reflectors improve fixture efficiency to near 90%
-Thermal bridging for fluorescent fixtures	Device dissipates heat and improves lamp efficiency
Architectural daylighting devices	Light Pipes, holographic glazings and fiber optics
Electrodeless HID lighting	High frequency ballast runs electrodeless lamp
Higher R-value glazing (u=0.2)	Triple glazed Low-E Crypton filled windows (BPA in pilot)
Internal access duct sealants	Aerosol spray seals ducts from the inside
Five-phase synchronous motors	Improved permanent magnet DC motor
Efficient office equipment	Desktop PC with power management/improved printers/faxes/copiers

MARKET TRANSFORMATION IN BONNEVILLE'S CONSERVATION REINVENTION

Bonneville has committed to pursuing market transformation activities in it's draft Business Plan. While much of the impact of Boneville's conservation reinvention effort is to shift budget and acquisition responsibility for conservation to the local utilities, Bonneville has proposed to keep market transformation items in its centralized budget. Part of the reason for this is because the benefits of market transformation flow to all customers in the market after the transformation has taken effect. It makes sense for Bonneville to use the influence of all its utilities together to affect the change.

The Council is trying to ensure that we end up with a better conservation delivery system in the post-reinvention era than we had in the past. We are significantly involved in developing the terms under which the local utilities are picking up the responsibility for conservation development. We will

also need to be involved in ensuring that Bonneville is poised to participate aggressively in all market transformation opportunities that present themselves.

Bonneville is currently involved in setting budgets for Fiscal Years 1996 and 1997, including budgets for market transformation items. To get a sense of whether these are sufficient, staff worked up an estimate of the types of expenditures it might take to pursue market transformation. These are broken into the categories of projects, quality assurance/support and demonstration/commercialization, and are briefly described next. It is important to acknowledge that funds for some of these categories may come from areas in Bonneville other than the market transformation team. For example, the manufactured housing acquisition program (MHAP) does not reside in the market transformation budget within Bonneville, but it is being pursued by another group. The goal is to ensure that the types of activities described in this paper get done, regardless of how the budgets are split within Bonneville.

Projects: Annual potential budgets for the items listed in Table 1 are difficult to quantify since a work program has not been developed for each item. However, an estimate is made here by looking at the levelized cost of each measure, assuming increasing penetration of the projects from about 1995 to about 1999 and assigning utility costs at 80 percent of the full levelized costs. Utility investments of closer to 100 percent of the levelized costs of the measures have been more the norm in other market transformation efforts, such as MHAP and Super Good Cents. Table 4 indicates annual budgets given these assumptions for both 80 percent and 100 percent costs.[11] These costs are placeholders to represent a potential aggressive effort.

Table 4
Potential Annual Budgets at Bonneville for Targeted Actions ($000)

	1995	1996	1997	1998	1999
Targeted Projects @100%	$21,000	$28,500	$34,500	$43,000	$35,500
Targeted Projects @ 80%	$17,000	$22,500	$27,500	$34,500	$28,000

Budgets peak in 1998 and then taper off as some projects come to a close. It is likely that in these later years, emerging technologies, currently in the demonstration and commercialization phase, will become future likely targets. The largest single budget items during the next two years (50-60 percent) are for manufactured houses (MHAP), a program already under way, and for heat pump water heaters, where some very preliminary efforts are in progress. MHAP, and some forms of the heat pump water heater program that could emerge,[12] have the benefit that individual units can be tracked to specific utility service territories. This, in turn, has the advantage that the costs of the added efficiency could be charged directly to the utility receiving the benefit (as is currently done with the private utilities in MHAP), thus alleviating equity concerns about conservation investments.

[11]Further detail can be found in the spreadsheet attached as Appendix A, especially from the worksheet labeled "ylybudgt." The costs include 20 percent administrative costs, which have already been added to the levelized measure costs in the prior table. This method of estimating the potential size of the budgets is simply a placeholder. Costs in addition to the measure costs (such as marketing baseline and information studies) will certainly need to be included. The utility portion of measure costs may not fall in the 80-100 percent range. End-uses not yet identified may emerge. Exact approaches will depend entirely on the market barriers that need to be addressed.

[12]For example, the heat pump water heater program could initially be to get heat pump water heaters installed in all MHAP homes. Since MHAP homes are tracked to individual service territories, the water heaters would be also.

However, even if such arrangements could be crafted, Bonneville would likely need to keep the total revenue requirement in its budget because it is unlikely that the utilities would agree to pay Bonneville ahead of time.

Quality Assurance/Infrastructure Support: This is another budget category that is very difficult to determine with any precision. In the past, Bonneville has spent about $4 million annually on the types of actions listed in Table 2.[13] A number of past projects will have to be refocussed in order to truly support market transformation efforts. While the past does not predict the needs of the future, the same sorts of infrastructure support will need to be accomplished, especially since a large focus of the market transformation efforts will be in the commercial sector, and will need this type of activity. As a ballpark estimate, market transformation might need to pick up 80-90 percent of historic costs. This will have to be further developed as specific market transformation infrastructure support items are identified.

Development and Demonstration: Again, until specific projects are identified, it is difficult to predict the size of the actions that should be taken. However, it is instructive to note what has occurred in the past. Bonneville's development and demonstration budgets have varied tremendously over time. According to the 1994 "Yellow Book," Fiscal Year 1993 and Fiscal Year 1994 conservation development and demonstration budgets were about $2.8 million and $1.6 million respectively.[14] Not all of the projects investigated by these development and demonstration agendas would have been eligible for market transformation. Fiscal Year 1993 budgets are significantly greater than 1994, primarily because all development and demonstration efforts, except those already committed, were brought to a halt starting in about 1992, due to drought and severe financial constraints. In the late 1980s, when large projects such as the End-Use Load and Conservation Assessment Program were in full swing, and other institutions participated less in joint development, budgets were about three times higher.

There are a large number of potential projects, as shown in Table 3, many of which could lead to market transformation initiatives. These technologies are at various stages of development, and some will prove worthy of further efforts. Some will not. If Bonneville were to pursue research and development to the level of 1993, budgets would be on the order of $3 million per year. Assuming that 75 percent of these projects would become eligible for market transformation would imply about $2-2.5 million per year. These budgets assume significant partnerships with other parties to fund the projects.

The budgets discussed here are preliminary. A more precise estimate will only be available after the markets for each opportunity are explored and key approaches to overcoming the particular barriers of each market are worked out. Even though some tasks are in process, further refinement of each item will have to be done in a consensus-building group, and it will take some time before a more precise estimate is available. The Council is committed to the process to better define the market transformation efforts. In the meantime, Bonneville will have to set initial budgets for the 1996/1997 rate case by about late September 1994. The budgets should be sufficient to ensure that the end-uses and energy savings identified in this paper can be aggressively pursued.

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[13]This does not include funds that went to state energy offices directly from specific programs.

[14]The figures represented here are just Bonneville expenditures per year for these projects. Other institutions, including EPRI, DOE and the investor-owned utilities also shared in these costs. EPRI dues are not included in this total.

KEY ATTRIBUTES FOR MARKET TRANSFORMATION PROJECTS

The following items should be considered when screening, planning or prioritizing market transformation projects.

Strategic Intervention: Attempts to transform a market should be based on knowledge of the market and should target strategic points to leverage the market toward efficiency. Plans for intervention should include measurable goals and an exit strategy that is appropriate to the market.[15]

Market Scope: Targeted market must cross utility service territory boundaries. However, on a limited scope and fixed duration, some demonstration projects could be tested in a single territory.

Collaborative: Bonneville and the investor-owned utilities should collaborate financially as long as their territories serve part of the targeted market. Collaboration is needed for market mass, influence, expertise and funding.

Efficient: Market transformation efforts should represent an efficient path to secure the savings. This would mean it is either the least-costly long-term method of achieving the savings, or is expected to result in higher penetration of energy efficiency that is still cost-effective over the long term.

Lasting: Market targets should have the characteristic that the market is likely to continue the efficiency improvements in the long run without utility incentives.

Following from these attributes, it would make sense to prioritize market transformation targets on the basis of: significant collaboration from key parties, likelihood of lasting effects, key activities already in progress, likelihood of success, strength of leverage points to affect the market, levelized costs; and kilowatt-hour savings.

NEXT STEPS

This paper proposed projects and end uses that should be investigated, and initiated the discussion on quality assurance and demonstration efforts. The next steps will include fleshing out the ideas on projects and investigating what is known about the markets for each item. From this, some form of collaboration among regional and national parties must be forged.

The Council can play a role in ensuring collaboration among the parties in the region. This has already been raised in the forum of the Conservation Acquisition Task Force and will continue to be pursued there. In addition, the Council needs to continue to monitor Bonneville's progress in conservation reinvention, with a close eye toward ensuring that sufficient resources exist to aggressively pursue all viable market transformation efforts.

[15]Some markets may not require any utility intervention after the goals are met, while others may require some level of extended "after-care."

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Bonneville Power Administration, Office of Energy Resources, "FY 1993/94 Research, Development and Demonstration Projects," June, 1994.

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	A	B	C	D	E	F	G	H	I	J	K	L
1		Incremental Installed Measure Cost + 20% Admin	Successful Venture Characteristics	Venture Duration	TOTAL Cumulative $94 To Fund Venture At Cost in Column B		Regional MWs	MW Potential AFTER SUCCESS		Code Activity or Assumed Penetration As a Result of Market Transformation Activity	Time Period	Levelized Cost For All MWs Acquired
2												
3					IOUs	BPA	Acquired	IOUs	BPA			Mills/Kwh 94$
4		Mills/kWh 1994$										
5	**RESIDENTIAL**											
6	HP Wtr Htr, New & Replac't (CEE)	38	20% of Market by 2000	95-99	$83,926,139	$64,527,610	35	308	206	25% in 2001-02, 90% Code 2003-2010	2000-2010	2.4
7	Clothes Wash-Horiz'l Axis (CEE)	27	15% of Market by 1999	95-98	$6,199,412	$4,766,492	3	10	8	15% Market Penetration	1999-2010	5.0
8	Showerheads, New Const	8	Std to 2.0 GPM	95-99	$520,417	$372,666	1	13	9	Code Effective in 2000	2000-2010	0.4
9	Dishwashers	37	Tighten Std by 10%	96-98	$1,675,756	$1,288,425	1	9	7	Fed Std Effective in 1999	1999-2010	2.2
10	Clothes Dryers (Microwave or heat	109	Market Introduction	96-98	$3,000,000	$3,000,000	1	4	3	10% Market Share	2000-2010	10.6
11	SERP technologies to new stds (C	39	Tighten Std by 25%	95-98	$5,210,101	$3,524,480	1	30	21	Fed Std Effective in 2001	2001-2010	1.3
12	Compact Fluorescent Lighting (CE	53	2 Bulbs in 20% exist res.	95-99	$9,903,857	$6,367,097	7	20	14	2 bulb in 60% all 2010 Houses	2000-2010	9.6
13	Heating Sys Eff (Design) -New	Unknown	Demonstration	95-98	$1,000,000	$2,000,000	<1	36	39	Code Effective in 2000	2000-2010	0.3
14	Windows - .4 to .32 - New Const	49	25% of Market by 2000	95-99	$14,297,639	$12,851,090	2	17	19	Code Effective in 2000	2000-2010	2.7
15	Manuf. Housing Acquis. Program	18	Upgrade HUD Std to MAP	95-98	$60,000,000	$44,000,000	26	24	18	Partial HUD Upgrade @50% of MAP	1999-2010	6.8
16												
17	**COMMERCIAL**											
18	Improved Lighting - New (1.2-.8)	35	25% of Mkt by 2000	95-99	$17,774,204	$7,488,360	4	48	21	Code Effective in 2000	2000-2010	1.9
19	Daylite Dimming - New	106	25% of Mkt by 2000	95-99	$20,008,121	$8,429,520	2	16	7	30% in 2000 to 80% in 2010	2000-2010	9.9
20	E.L. Exit signs - New	43	25% of Mkt by 2000	95-99	$2,865,241	$1,207,140	1	10	4	Code Effective in 2000	2000-2010	2.3
21	Occupancy Sensors - New	68	25% of Mkt by 2000	95-99	$7,721,581	$3,253,140	2	14	6	30% in 2000 to 80% in 2010	2000-2010	6.3
22	Low E window (0.4)	48	25% of Mkt by 2000	95-99	$15,491,725	$6,526,740	2	30	13	Code Effective in 2000	2000-2010	2.6
23	Building Commissioning	43	Increase Expectations	95-99	$11,072,455	$4,664,880	3	22	10	30% in 2000 to 80% in 2010	2000-2010	4.0
24	Halogen IR lamps	67	25% of Mkt by 2000	95-99	$1,651,156	$695,640	2	13	6	30% in 2000 to 80% in 2010	2000-2010	6.2
25	Code Enforcement - WA & OR	21	Insurance on 90aMWs	95-97	See Note	$4,761,000	2	5	2	N/A	2000-2010	4.7
26	Update Design Rules of Thumb	N/A	ChangeDesignNorms	95-99		Unknown	Unknown					
27	Packaged AC and Chillers (CEE)	Not yet assessed	Chillers may have particular application since CFC changeouts will open "window of opportunity"									
28												
29	**INDUSTRIAL**											
30	Motors -Adjustable Speed Drives	11	ChangeCurrentPractice	96-2000	$2,008,845	$2,008,845	42	42	42	Technology becomes Current Practice	2001-2010	0.3
31	OEM motors systems	20	ChangeCurrentPractice	96-2000	$3,725,978	$3,341,765	40	37	42	Technology becomes Current Practice	2001-2010	0.5
32					##########	##########	177	710	495	1383		
33	**EXCLUDED FROM FURTHER CONSIDERATION**											
34	Exist Res Retro thru hook-up stds or local ordinances	This would work, but no one believes it could happen										
35	Centralized Chains + Franch	This is an approach (means), not an end										
36	Large Commercial Cooling	Efficiencies were adopted in WA Code and soon will be in OR Code										
37	Comm-Heat Pump Water Heaters	Niche market(Restaurants)-Small Water Heat Load in Commercial Sector - Would be captured under HPWH activities described in Line 6										
38												
39	**FURTHER CONSIDERATION POSSIBLE**											
40	Coated filament lamp	This product is not commercially available, but could be on the market by 2000										
41	Irrigation Scheduling	Program manager believes that with rate increases and the end of the Irrigation Discount, the acceptance of this practice will increase.										
42	Luminaires (Fixtures) for CFLs	An approach to persistence for compact fluorescents: lifetime issues, lack of data										
43	3Glaze LowE CryptonWindows-.2(	BPA is doing pilot demo to evaluate cost-effectiveness - likely niche market for design flexibility (tradeoffs) - See Row 15 above for proposed window activity										
44	Efficient Office Equipment	Power Management Features are entering market without intervention. Costs are not available. DOE Energy Star Program targets these units.										
45		If voluntary program does not meet objectives of the Energy Policy Act of 92, DOE will develop efficiency standards.										
46	Small Commercial Air Cond.	CEE program for rooftop unitary air conditions has been approved and launched - utility incentives approach										
47	Vending/Beverage Machines (CEE	CEE gathering information about better insulation, glass, and control measures.										
48	Res & Comm Geoth'l Ht Pumps (C	NE Utilities working with CEE and EEI. Unlikely c-e in the NW even after transformation										
49	Residential A/C (CEE)	Low NW loads so unlikely target, even though CEE committee started										
50	Advanced Lighting Tech (CEE)	Covered in Development and Demonstration efforts										
51												
52												
53	**APPROACHES**											
54	Electric Ideas Clearinghouse											
55	Lighting Design Laboratory											
56	Energy Outlet											
57	Technical Assistance/SEOs											
58	Regional Advertising											

Attachment for "Market Transformation" Paper

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	M	N	O	P	Q	R	S	T	U
1		Codes and Standards		Will					
2		Date of	Possible	MTV					
3		Possible	Effective	Impact	Current				
4		Adoption	Date	Codes/Stds?	Activities	Barriers			
5	**RESIDENTIAL**								
6	HP Wtr Htr, New & Replacement	95/99	98/2003	Probably	CEE, EPRI	Untested, Infrastructure, Consumer Accept.			
7	Clothes Washers-Horizontal Axis	1995	1999	Probably	CEE, THELMA	Consumer Acceptance, Availability			
8	Showerheads, New Const	1998?	2000+?	Possibly		Consumer Acceptance			
9	Dishwashers	1996	1999	Possibly					
10	Clothes Dryers (Microwave)	1995	1999	Possibly	EPRI Testing	Expensive, Availability			
11	SERP technologies to new stds	1998	2001+	Probably	CEE Program	Boundary Issues,			
12	Compact Fluorescent Lighting	None			CEE Program	High Up Front Cost			
13	Heating Sys Eff (Design) -New	1999	2000	Probably		Infrastructure			
14	Windows - .4 to .32 - New Const	2000?	2000?	Probably		Site-by-Site Application? Product or Service			
15	Manuf. Housing Acquis. Program	1996/1998	1997/1999	Probably		HUD Stds are lowest common denominator			
16									
17	**COMMERCIAL**								
18	Improved Lighting - New (1.2-.8)	WA94/OR96	Update Unk	Possibly		Infrastructure			
19	Daylite Dimming - New	WA94/OR96	Update Unk	Possibly		Infrastructure, Availability			
20	E.L. Exit signs - New	WA94/OR96	Update Unk	Probably		Resistance to Govt Intervention			
21	Occupancy Sensors - New	WA94/OR96	Update Unk	Possibly					
22	Low E window (0.4)	WA94/OR96	Update Unk	Possibly					
23	Building Commissioning	WA94/OR96	Update Unk	Possibly		Infrastructure			
24	Halogen IR lamps	WA94/OR96	Update Unk	Possibly		GE Has Monopoly			
25	Code Enforcement - WA & OR	WA94/OR96	Update Unk	Yes					
26	Update Design Rules of Thumb	N/A		Possibly					
27									
28									
29	**INDUSTRIAL**								
30	Motors -Adjustable Speed Drives	N/A		Possible	CEE	Infrastructure			
31	OEM motors systems	N/A		Possible	CEE	Infrastructure			
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Cell: H1
Note: Assumes penetration rate achieved through MTV persists and stays consant through 2010.

Cell: B4
Note: Assumes a 7.5% credit to account for line loss savings. Discount rate is 3%

Cell: C6
Note: Goal of the preliminary CEE initiative for this technology

Cell: E6
Note: Assessment period: 1995-1999
Assumes the following penetration:
1995: 2%, 1996: 6%, 1997: 10%, 1998: 15%, 1999: 20%

Cell: F6
Note: Assessment period: 1995-1999
Assumes the following penetration:
1995: 2%, 1996:6%, 1997: 10%, 1998: 15%, 1999: 20%

Cell: H6
Note: Assumes penetration rate achieved through MTV persists in 2001-2002, and Federal standards become effective in 2003. Does not access the fuel choice impact of code adoption.

Cell: I6
Note: Assumes penetration rate achieved through MTV persists in 2001-2002, and Federal standards become effective in 2003. Does not access the fuel choice impact of code adoption.

Cell: P6
Note: The goal is to demonstrate the reliability and feasibility of the new technology to DOE and the industry

Cell: Q6
Note: CEE has formed a committee to develop a model program design that individual utilities could adopt to promote HPWHs.Draft available mid-1994.

EPRI-E-Tech model is being tested by EPRI in conjunction with member utilities in an extensive field test - 100 HPWHs.

Cell: B7
Note: Annual non-energy benefits to the consumer are as follows:

Water: $7.44
Detergent: $53.20
Waste Water: $10.49

These benefits shoud be considered when evaluating Total Resource Cost

Cell: C7
Note: Probable goal of preliminary CEE initiative for this technology. Long term goal is to make this technology current practice.

Cell: E7
Note: Assessment Period: 1995-1998
Penetration Rates Assumed:
1995: 5%, 1996: 8%, 1997, 10%, 1998: 15%

Cell: F7
Note: Assessment Period: 1995 - 1998
Penetration Rates Assumed:
1995 - 5%, 1996 - 8%, 1997 - 10%, 1998 - 15%

Cell: H7
Note: Assumes penetration rate achieved through MTV persists and stays consant through 2010.

Cell: I7
Note: Assumes penetration rate achieved through MTV persists and stays consant through 2010.

Cell: N7
Note: Goal is to have Horizontal Axis included under the Federal Standards for clotheswashers.

Cell: P7
Note: The goal is to incorporate Horizontal Axis Clotheswashers into the Federal Efficiency Codes established for Top Loading Models

Cell: E8
Note: Assessment period is 1995-1999
Penetration rates of all new housing stock are assumed to be:

1995: 5%, 1996: 8%, 1997: 11%, 1998: 15%, 1999: 20%

Cell: F8
Note: Assessment period is 1995-1999
Penetration rates of all new housing stock are assumed to be:
1995: 5%, 1996: 8%, 1997: 11%, 1998: 15%, 1999: 20%

Cell: H8
Note: Assumes a code or standard becomes effective in 2000 that gets 100% penetration for the 2000-2010 period. New Housing only. It is assumed that retrofit will also be captured, but savings are not included in this estimate.

Cell: I8
Note: Assumes a code or standard becomes effective in 2000 that gets 100% penetration for the 2000-2010 period. New Housing only. It is assumed that retrofit will also be captured, but savings are not included in this estimate.

Cell: N8
Note: Oregon adopted a 2.5 GPM showerhead code in Nov 92
Washington adopted a 2.5 GPM showerhead code in Jul 93
A Federal standard for 2.5 GPM showerheads was effective Jan 94

Cell: P8
Note: By demonstrating to Federal and State code officials that 2.0 GPMs will meet with consumer acceptance.

Cell: E9
Note: Assessment period is 1996 - 1998

Currently units are available that exceed the Federal Standard by 10% at no cost to the consumer. Other estimates of incremental cost are in the $20 bracket.

Goal is to increase the representation of these units to 25% of those available for sale.

Assumption is that we spend $20 per unit for 25% of new units coming on-line during the 1996-1998 period

Cell: F9
Note: Assessment period is 1996-1998
Currently units are available that exceed the Federal Standard by 10% at no cost to the consumer. Other estimates of incremental cost are in the $20 bracket.
Goal is to increase the representation of these units to 25% of those available for sale.
Assumption is that we spend $20 per unit for 25% of the new units coming on-line during the 1996-1998 period

Cell: H9
Note: Assumes a Federal Code is put into effect in 2000 to increase the current standard by 10%

Cell: I9
Note: Assumes a Federal standard is put into effect in 2000 to increase the current standard by 10%

Cell: N9
Note: Federal standards for energy efficency for dishwashers were effective May 94.

Cell: P9
Note: Will demonstrate that these units are commercially available in significant numbers, at no additional cost to the consumer.

Cell: E10
Note: Assumes we purchase approximately 17,000 units under a direct to the manufacturer approach.

Cell: F10
Note: Assumes we purchase approximately 17,000 units under a direct to the manufacturer approach.

Cell: H10
Note: Microwave clothesdryers achieve a 10% Market Share that remains constant in the 2000-2010 period.
Assumptions: 10% of clothesdryers are replaced each year. In a ten year period, all will be replaced. 88% of existing residences have clothesdryers.
Publics: 1,500,000 Households * 88% = 1,320,000 clothesdryers purchased * 10% = 132,000 Clotheswashers.
Privates: 2,000,000 Households * 88% = 1,760,000 clothesdryers purchesed * 10% = 176,000 Clotheswashers

Cell: I10
Note: Microwave clothesdryers achieve a 10% Market Share that remains constant in the 2000-2010 period.
Assumptions: 10% of clothesdryers are replaced each year. In a ten year period, all will be replaced. 88% of existing residences have clothesdryers.
Publics: 1,500,000 Households * 88% = 1,320,000 clothesdryers purchased * 10% = 132,000 Clotheswashers.
Privates: 2,000,000 Households * 88% = 1,760,000 clothesdryers purchesed * 10% = 176,000 Clotheswashers

Cell: Q10
Note: EPRI is planning a field test.

Cell: B11
Note: Costs appear higher than SERP program because parallel efforts would extend to top mount models, at a lower savings level than side-by-sides. Side-by-sides are have the highest consumption and are the most inefficient model on the market.

Cell: C11

Note: Current goal of the SERP

Cell: E11
Note: IOU share is BPA investment ratiod up by number of new refrigerators.

Cell: F11
Note: Bonneville currently has about $710,000 per year for FY 95 and 96 plus 363,000 for FY97. Took these an added 10% of stock in FY98.

Cell: H11
Note: Assumes a more stringent Federal Standard 25% beyond the 93 standard becomes effective in the year 2001

Cell: I11
Note: Assumes a more stringent Federal Standard 25% beyond the 93 standard becomes effective in the year 2001

Cell: P11
Note: Impact through demonstration to DOE that technology is feasible, reliable and cost-effective

Cell: A12
Note: Assumes a mix of 70% indoor applications and 30% outdoor applications

This technology is very popular with our customers, and there is a good possibility of collaborate funding.

Cell: B12
Note: Does not include take-back. When calculating utility costs, the savings should be decreased by 10%

Assumes consumer installation

Cell: C12
Note: Based on all existing housing stock

Cell: E12
Note: Assessment Period: 5 Yrs - 1995-1999. Equals 20% of 1995 houses with 2 bulbs by 1999.
This cost assumes payment of full incremental cost. A manufacturer buy-down program with a cost of $5 per bulb would be less

Cell: F12
Note: Assessment Period: 5 Yrs - 1995-1999. Based on 20% of 1995 houses with 2 bulbs by 1999.
This cost assumes payment of full incremental cost. A manufacturer buy-down program with a cost of $5 per bulb would be less

Cell: H12
Note: Assumes captures new and existing to a final penetration of 2 bulbs in 60% of 2010 houses.

Cell: I12
Note: Assumes captures 2 bulbs in 60% of the 2010 housing stock by 2010.

Cell: L12
Note: If the bulbs purchased under the program period were done under a manufacturer buy-down approach at $5 per bulb, the average levelized cost would be less

Cell: M12
Note: Assumes a mix of 70% indoor applications and 30% outdoor applications

This technology is very popular with out customers, and there is a good possibility of collaborate funding.

Cell: N12
Note: It is improbable that a standard could be passed that would limit residential consumers in their lighting choice. New Housing lighting standards adopted in California might not work here because of the difference in consumer payback.

Cell: Q12
Note: The CEE has drafted a proposal for a Residential & Small Commercial High Efficiency Lighting program. It involves a manufacturer buy-down approach, and would be run by each participating utility

Cell: A13
Note: This includes duct sealing and heating system design

Cell: C13
Note: To generate cost/performance data & demonstrate techniques/materials used to improve system efficiency. Results would provide supporting evidence for more stringent building codes. Possibly could then provide service of certified system designers and installers for utilities requiring low cost but highly effective conservation.

Cell: E13
Note: Level of IOU support is speculative.

Cell: F13

Note: Includes .5 to 1 BPA FTE for a total of $500,000 per year for four years.

Cell: I13
Note: Washington & Oregon adopt a code change to incorporate improved thermal distribution systems. These codes acquire 100% penetration in the years 2000-2010

Cell: M13
Note: This includes duct sealing and heating system design

Cell: A14
Note: New clear sputter coats and stainless steel spacers (Cardinal IG is starting up a sputter coating operation in Washington this summer)

Cell: C14
Note: New Single Family Housing

Cell: E14
Note: Assumes the following penetration of new single family housing stock for the 95-99 period:
1995: 5%, 1995: 10%, 1997: 15%, 1998: 20%, 1999: 25%

Cell: F14
Note: Assumes the following penetration of new single family housing stock for the 95-99 period:
1995: 5%, 1995: 10%, 1997: 15%, 1998: 20%, 1999: 25%

Cell: H14
Note: Widows at .32 become current practice during the 95-99 period and are put into the WA & OR building codes effective in 2000. Estimates include 100% penetration of new single family housing stock in the years 2000-2010.

Cell: I14
Note: Widows at .32 become current practice during the 95-99 period and are put into the WA & OR building codes effective in 2000. Estimates include 100% penetration of new single family housing stock in the years 2000-2010.

Cell: P14
Note: Will impact codes through increase of the use of this level of window efficiency until it becomes significant (25%), and demonstrates feasibility, cost-effectiveness, etc.

Cell: E15
Note: Assessment Period: 1995 - 1998
Penetration Assumption: 100%

Cell: F15
Note: Assessment Period: 1995 - 1998
Penetration Assumption: 100%

Cell: H15
Note: Assumes that HUD code does increase in 1999, although probably not to MAP level, and that manufacturers continue to build MAP units without additional incentives.

Cell: I15
Note: Assumes that HUD code does increase in 1999, although probably not to MAP level, and that manufacturers continue to build MAP units without additional incentives.

Cell: P15
Note: It is not expected that the 1996 code review will result in a substantial change in current HUD standards. However, it is possible to influence a partial upgrade in specific areas of the code, and more on the next round of code review.

Cell: A18
Note: Ambient and Task Lighting - Design assistance

Cell: G18
Note: Assumptions for penetration of new floor space are as follows:
1995: 5%, 1996: 10%, 1997: 15%, 1998: 20%, 1999: 25%

Cell: H18
Note: Assumes the Design Assistance efforts during the 95-99 period are incorporated into Washington and Oregon code with penetration at 100% from 2000-2010.

Cell: I18
Note: Assumes the Design Assistance efforts during the 95-99 period are incorporated into Washington and Oregon code with penetration at 100% from 2000-2010.

Cell: M18
Note: Ambient and Task Lighting - Design assistance

Cell: N18
Note: In 1994 the Washington Nonresidential Energy Code (NREC) was adopted.

The updated Oregon Nonresidential Code is planned to go into effect January 1996.

Cell: P18
Note: With alot of work in the design assistance area

Cell: A19
Note: Sensors installed in areas near natural light that dim office lighting commensurate with the level of natural light available.

Cell: B19
Note: The cost has come down since this estimate was made. Special order item - volume would move cost down.

Cell: G19
Note: Assumptions for penetration of new floor space are as follows:
1995: 5%, 1996: 10%, 1997: 15%, 1998: 20%, 1999: 25%

Cell: H19
Note: Assumes the efforts during the 95-99 period are incorporated into utility programs with penetration increasing with time.
Penetration assumption: 30% in 2000, increasing by 5% per year to 80% in 2010.

Cell: I19
Note: Assumes the efforts during the 95-99 period are incorporated into utility programs with penetration increasing with time.
Penetration assumption: 30% in 2000, increasing by 5% per year to 80% in 2010.

Cell: M19
Note: Sensors installed in areas near natural light that dim office lighting commensurate with the level of natural light available.

Cell: P19
Note: Working toward a state code adoption is more promising than Federal code approach

Cell: A20
Note: Electra Lumenescent Exit Signs

Cell: G20
Note: Assumptions for penetration of new floor space are as follows:
1995: 5%, 1996: 10%, 1997: 15%, 1998: 20%, 1999: 25%

Cell: H20
Note: Assumes this technology is adopted and effective in Oregon & Washington State codes effective 2000 at 100% penetration.

Cell: I20
Note: Assumes this technology is adopted and effective in Oregon & Washington State codes effective 2000 at 100% penetration.

Cell: M20
Note: Electra Lumenescent Exit Signs

Cell: P20
Note: According to Jeff Harris, NWPPC, these should have been adopted in state codes already, but were omitted for reasons other than their technical merits and feasibility

Cell: A21
Note: Applicable to Filing Areas, Conference Rooms, Janitors Room, Bathrooms

Cell: G21
Note: Assumptions for penetration of new floor space are as follows:
1995: 5%, 1996: 10%, 1997: 15%, 1998: 20%, 1999: 25%

Cell: H21
Note: Assumes the efforts during the 95-99 period are incorporated into utility programs with penetration increasing with time.
Penetration assumption: 30% in 2000, increasing by 5% per year to 80% in 2010.

Cell: I21
Note: Assumes the efforts during the 95-99 period are incorporated into utility programs with penetration increasing with time.
Penetration assumption: 30% in 2000, increasing by 5% per year to 80% in 2010.

Cell: M21
Note: Applicable to Filing Areas, Conference Rooms, Janitors Room, Bathrooms

Cell: P21
Note: With alot of work in the design assistance area

Cell: A22
Note: There are only a few manufacturers of this glazing - Good prospect for manufacturer buy-down approach

Cell: G22
Note: Assumptions for penetration of new floor space are as follows:
1995: 5%, 1996: 10%, 1997: 15%, 1998: 20%, 1999: 25%

Cell: H22
Note: Assumes the efforts during the 95-99 period are incorporated into utility programs with penetration increasing with time.
Penetration assumption: 30% in 2000, increasing by 5% per year to 80% in 2010.

Cell: I22
Note: Assumes the efforts during the 95-99 period are incorporated into utility programs with penetration increasing with time.
Penetration assumption: 30% in 2000, increasing by 5% per year to 80% in 2010.

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Note: There are only a few manufacturers of this glazing - Good prospect for manufacturer buy-down approach

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Cell: G23
Note: Assumptions for penetration of new floor space are as follows:
1995: 5%, 1996: 10%, 1997: 15%, 1998: 20%, 1999: 25%

Cell: H23
Note: Assumes the efforts during the 95-99 period are incorporated into utility programs with penetration increasing with time.
Penetration assumption: 30% in 2000, increasing by 5% per year to 80% in 2010.

Cell: I23
Note: Assumes the efforts during the 95-99 period are incorporated into utility programs with penetration increasing with time.
Penetration assumption: 30% in 2000, increasing by 5% per year to 80% in 2010.

Cell: P23
Note: With alot of work in the design assistance area

Cell: A24
Note: These are an improvement over the 90 Watt Halogen PAR Lamps currently in use.

The new lamps incorporate the infrared technology and use 60 watts

Cell: G24
Note: Assumptions for penetration of new floor space are as follows:
1995: 5%, 1996: 10%, 1997: 15%, 1998: 20%, 1999: 25%

Cell: H24
Note: Assumes the efforts during the 95-99 period are incorporated into utility programs with penetration increasing with time.
Penetration assumption: 30% in 2000, increasing by 5% per year to 80% in 2010.

Cell: I24
Note: Assumes the efforts during the 95-99 period are incorporated into utility programs with penetration increasing with time.
Penetration assumption: 30% in 2000, increasing by 5% per year to 80% in 2010.

Cell: M24
Note: These are an improvement over the 90 Watt Halogen PAR Lamps currently in use.

The new lamps incorporate the infrared technology and use 60 watts

Cell: P24
Note: With alot of work in the design assistance area

Cell: C25
Note: Insurance that we acquire approximately 90 aMWs (Med-High growth) estimated to be available through the adoption of the Washington Nonresidential Energy Code. This code is a stretch beyond current practice, and challenges the industry. Training, awareness, and enforcement activities must be done to insure compliance.
Work of this nature will also be needed to insure Oregon's commercial code.

Cell: E25
Note: Pacificorp Puget Power, Washington Water Power, Washington Natural Gas, Cascade Natural Gas are participants

Cell: F25
Note: Budgets are as follows:
Washington Nonresidential Energy Code
1994:$1,800,000, 1995:$2,200,000,
1996:$1,600,000, 1997:$800,000

Oregon Nonresidential Code:

1995: $75,000, 1996: $65,000
1997:$21,000

Cell: G25
Note: Assumes 10% of savings attributable to code adoption during the 95-97 period will not happen without enforecment, education, and assistance

Cell: H25
Note: Assumes 10% of savings attributable to code adoption during the 98-2010 period would not have been acquired without the enforecment, education, and assistance efforts in the 95-97 period.

Cell: I25
Note: Assumes 10% of savings attributable to code adoption during the 98-2010 period would not have been acquired without the enforecment, education, and assistance efforts in the 95-97 period.

Cell: A26
Note: Work with commercial building infrastructure to change outdated assumptions about the size of heating/air conditioning system needed for a particular project.

Cell: M26
Note: Work with commercial building infrastructure to change outdated assumptions about the size of heating/air conditioning system needed for a particular project.

Cell: G30
Note: This potential was derived as follows:
ASD Potential: 245 aMWs(BPA)
Subsequent Market Penetration: 20%
Achievable through codes: 50%
Achievable through MTV efforts: 65%
Achievable potential = 63.7 aMWs (BPA)
BPA is 50% of regional
Potential was prorated over a 15 year period.

Cell: H30
Note: This potential was derived as follows:
ASD Potential: 245 aMWs(BPA)
Subsequent Market Penetration: 20%
Achievable through codes: 50%
Achievable through MTV efforts: 65%
Achievable potential = 63.7 aMWs (BPA)
BPA is 50% of regional
Potential was prorated over a 15 year period.
After a five year market transformation venture, the potential remaining in the years 2001-2010 is achieved as this technology becomes increasingly current practice.

Cell: I30
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Potential was prorated over a 15 year period.
After a five year market transformation venture, the potential remaining in the years 2001-2010 is achieved as this technology becomes increasingly current practice.

Cell: Q30
Note: CEE is analyzing current research projects involving industrial motors as a preliminary step towards the potential development of programs that would encourage high-efficiency industrial motors as well as high efficiency motors in various OEMs (Appliances)

Cell: A31
Note: Orginal Equipment Manufacturer - i.e., beverage machines, conveyor belt assemblies, etc.

Cell: G31
Note: Assumes that 25% of tecnnical potential assessed for OEMs could be achieved through a market transformation venture

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After a 5 year market transformation venture, the remaining potential (25% of Tecnical) in the years 2001-2010 is achieved as high efficiency OEMs become increasingly current practice.

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After a 5 year market transformation venture, the remaining potential (25% of Tecnical) in the years 2001-2010 is achieved as high efficiency OEMs become increasingly current practice.

Cell: M31
Note: Orginal Equipment Manufacturer - i.e., beverage machines, conveyor belt assemblies, etc.

Cell: Q31
Note: Preliminary information is being gathered concerning the potential for encouraging higher efficiencies in vending machines and beverage machines.

Cell: A41
Note: Operates on the premise that there is an ideal time to apply an ideal quantity of water for optimal crop production. Incorporates soil moisture, evaporation monitoring, and weather data collection to conserve both water & electricity used to pump it to the crops.

Cell: A46
Note: 5-20 Ton units

	A	B	C	D	E	F	G	H	I	J
3			New		Space	Approximate Savings/unit range		Assumed		
4			Efficiency		Heat			Savings		
5		Base Case	Level	Units	Interaction	Low	High	Per Unit	Units	
6	RESIDENTIAL									
7	HP Wtr Htr, New & Replacement	0.86	2.4	Energy Factor	125	1750	2300	2000	kWh/yr	
8	Clothes washers - Horizontal Axis	None		kWh/Washer	0			360	kWh/yr	
9	Showerheads, New Const	2.5	2		0	125	175	150	kWh/yr/hs	
10	Dishwashers	700	630	kWh/yr/dw	0			70	kWh/yr/dw	
11	Clothes Dryers (Microwave)	0			0	100	220	180	kWh/yr/dryer	
12	Super-eff Refrigerator (SERP)	1000	700	kWh/ref	15%			255	kWh/yr/ref	
13	SERP technologies to new stds	705	530	kWh/ref.	15%			150	kWh/yr/ref	
14	Compact Fluorescent Lighting	68	23	watts	18%			45	kWh/yr/bulb	
15	Heating Sys Eff (Design) -New	65%Efficient	80%Efficient	kWh/House	0	1500	2000	1500	kWh/yr/hs	
16	Windows - .4 to .32 - New Const	0.4	0.32	kWh/House		400	500	450	KWH/yr/hs	
17	Manuf. Housing Acquis. Program	9100	5200	kWh/House	0			3900	kWh/yr	
18	Windows-MH-3glaz,LowE crypton	0.4	0.2	U-value	0	500	1200	850	kWh/yr/hs	
19	Coated filament lamp	75	25	watts	17%			50	kWh/yr/bulb	
20										
21	COMMERCIAL									
22	Improved Lighting - New (1.2-.8)	1.2	0.8	Watts/SqFt?				0.601	kWh/sf/yr	
23	Daylite Dimming - New							0.362	kWh/sf/yr	
24	E.L. Exit signs - New							0.128	kWh//sf/yr	
25	Occupancy Sensors - New							0.306	kWh//sf/yr	
26	Low E window (0.4)		0.4					0.376	kWh//sf/yr	
27	Building Commissioning							0.5	kWh//sf/yr	
28	Halogen IR lamps	90	60	watts				0.296	kWh/sf	
29	Code enforce, adopt, develop									
30	Efficient Office Equipment									
31	Change Design Rules of Thumb									
32										
33	INDUSTRIAL									
34	Motors -Adjustable Speed Drives							127	aMW(Rgn)	
35	OEM motors systems							140	aMW(Rgn)	

Cell: E7
Note: HP causes increased infiltration due to exhausting air. However, the effective is not completely additive to the natural infiltration load. Assumed 50% of the effect calculated by Tom Eckman in 4/15/91 memo which is about .5*250kWh/yr.

Cell: F7
Note: Use from plan before other measures=3770 kWh/yr; after other measures=about 2930. Adjusting for base efficiency of .86 to HP eff of 2.4 gives savings from HP of between 1880 and 2420 kWh/yr. Mark Jackson is monitoring HP with slightly higher COPs in houses that probably have more occupants and getting between 1800 and 2500 kWh/yr savings. These are adjusted for increased infiltration load in prior column.

Cell: H8
Note: Taken from Holly Frazier estimate in 3/16/94 memo.

Cell: H9
Note: From REMP/BPA study showing 500 kWh/yr for 1.4 GPM change for gross savings and 350 kWh/yr for 1.4 GPM change for net savings.

Cell: F11
Note: from 1991 Power Plan, which references some PP&L work.

Cell: G11
Note: From ACEEE, which references DOE work on standards

Cell: H13
Note: From Holly Frazier, BPA

Cell: H14
Note: kWh/yr reflect savings without takeback, but with space heating interaction and removal. Take back should be included when looking at utility cost: savings would be reduced by an average of 10%.

Cell: H15
Note: Estimated savings per site, new resistance forced air heating system. Slightly less for heat pump houses. Sealing, combined with passive pressure relief, if needed, (small vents through the walls to reduce pressure) make up 2/3 of the savings. The remaining savings are conductive and other loss that might be reduced by moving ducts inside and optimal design.

Cell: H16
Note: Savings decreased from original 550 kWh/house to reflect some proportion of MF houseing

Cell: H27
Note: educated guess -- need to confirm further

	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS
3															
4		**Annual Additions to Commercial Floorspace (Million Sqaure Feet) Medium High Forecast - 1991 Council Plan**													
5		**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
6	**Publics**	21.03	21.86	22.36	23.03	23.41	24.22	25.15	25.95	26.57	27.38	28.3	26.85	28.06	28.31
7	**Ramp**	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%
8		1.05	2.19	3.35	4.61	5.85	7.27	8.80	10.38	11.96	13.69	15.57	16.11	18.24	19.82
9															
10															
11	**Privates**	50.74	51.73	52.76	54.49	55.79	57.48	57.91	59.93	61.37	63.85	64.92	63.34	64.64	67.25
12	**Ramp**	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%
13		2.54	5.17	7.91	10.90	13.95	17.24	20.27	23.97	27.62	31.93	35.71	38.00	42.02	47.08
14															
15															
16	**Total**	71.77	73.59	75.12	77.52	79.2	81.7	83.06	85.88	87.94	91.23	93.22	90.19	92.7	95.56
17	**Ramp**	5%	10%	15%	20%	25%									
18		3.59	7.36	11.27	15.50	19.80									
19															
20															
21		**Industrial Ramps of Achievable Potential - aMWs**													
22			**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
23	**ASDs**	**Publics**	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25
24		**Privates**	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25
25															
26	**OEMs**	**Publics**	3.74	3.74	3.74	3.74	3.74	3.74	3.74	3.74	3.74	3.74	3.74	3.74	3.74
27		**Privates**	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17

	AT	AU	AV
3			
4			
5	**2009**	**2010**	
6	29.44	30.08	
7	75%	80%	
8	22.08	24.06	
9			
10			
11	68.38	71.24	
12	75%	80%	
13	51.29	56.99	
14			
15			
16	97.82	101.32	
17			
18			
19			
20			
21			
22	**2009**	**2010**	**Total**
23	4.25	4.25	63.70
24	4.25	4.25	63.70
25			
26	3.74	3.74	56.10
27	4.17	4.17	62.60

	A	B	C	D	E	F	G	H	I	J	K
3		Part	Needs	Date of	Date						
4		of 660	Infrastructure	Possible	Std Takes	Key					
5		aMWs?	Support?	Std Adopt	Effect	Notes					
6	RESIDENTIAL										
7	HP Water Heater, New Const	yes	yes	95/99	98/2003	1,2,6	1. Proposed Federal standards only take the efficienc				
8	HP Water Heater, Replcmt Mkt	no	yes	1995	1998+	1,2,6	2. Proposed standards would exempt <40gallon tanks				
9	Clothes washers	no	no	1995	1999	3	Effect of exemption is ignored here.				
10	Showerheads, New Const	no	no	1998?			3. Significant non-energy benefits need to be included				
11	Dishwashers	no	no	1998		8	4. CEE is considering program for this measure				
12	Clothes Dryers (Microwave)	no	no	1999		5	5. Heat pump clothesdryers also a possibility, but 199				
13	Super-eff Refrigerator (SERP)	no	no	1998	2001+		(and higher aMW savings)				
14	SERP technologies to new stds	no	no	1998	2001+		6. Ignores fuel choice effects - simply counts projecte				
15	Compact Fluorescent Lighting	yes	yes	None			7. This product is not commercially available, but coul				
16	Duct Sealing -Existing Residence	no	yes				8. DOE adopted the savings represent by dishwasher				
17	Heating Sys Eff (Design) -New	no	yes			4	These savings represent going 10% beyond that.				
18	Windows - .4 to .32 - New Const	no	Yes								
19	Manuf. Housing Acquis. Program	yes	no	1996/1998	1997/1999	9					
20	Windows-MH-3glaz,LowE crypton	no	no	possible							
21	Coated filament lamp	no	no	check		7					
22											
23	COMMERCIAL										
24	Improved Lighting - New (1.2-.8)	yes	yes	possible							
25	Daylite Dimming - New	yes	yes	possible		10					
26	E.L. Exit signs - New	yes	no	possible							
27	Occupancy Sensors - New	yes	yes	possible							
28	Low E window (0.4)	yes	no	possible							
29	Building Commissioning	yes	yes								
30	Halogen IR lamps	no	no	97/98							
31	Code enforce, adopt, develop	yes	yes								
32	Efficient Office Equipment	no	no								
33	Change Design Rules of Thumb	no	yes								
34											
35	INDUSTRIAL										
36	Motor system Eff beyond stds	yes	no	possible							
37	OEM motors systems	yes	yes	possible							
38											

	L	M	N	O
3				
4				
5				
6				
7	/ to 1.89, so will still need effort to get to 2.4			
8	("low-boys"): low water users.			
9				
10	in TRC			
11				
12	l Plan indicates that higher level cost			
13				
14	l elect WH the same in base and eff. case.			
15	d be on the market by 2000.			
16	s in the 91 Plan into standards.			
17				
18				
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Cell: D10
Note: Oregon adopted a 2.5 GPM showerhead code in Nov 92
Washington adopted a 2.5 GPM showerhead code in Jul 93
A Federal Standard for 2.5 GPM Showerheads became effective Jan 94
I assume it will be reviewed in four years like most other applicance standards.

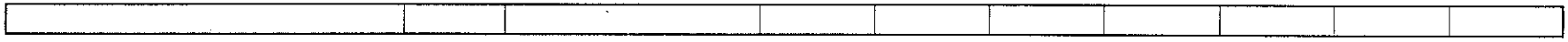
Cell: D15
Note: Current Federal standards relate to test procedures for Fluorescent Lamp Ballasts

Cell: A19
Note: This represents continuing the program beyond the HUD standards

6/30/94	Incremental Installed Measure Cost + 20% Admin Mills/kWh 1994$	Successful Venture Characteristics	Venture Duration	FUNDING REQUIRED TO ACCOMPLISH MTV GOAL IN COLUMN C							
				(000's) 1995		(000's) 1996		(000's) 1997		(000's) 1998	
				BPA	IOUs	BPA	IOUs	BPA	IOUs	BPA	IOUs
RESIDENTIAL											
HP Wtr Htr, New & Replacement	38	15% of Market by 2000	95-99	$ 1,854	$ 2,689	$ 5,304	$ 5,961	$ 8,318	######	######	######
Clothes Washers-Horizontal Axis	27	15% of Market by 1999	95-98	$ 513	$ 632	$ 867	$ 974	$ 1,062	$ 1,291	$ 1,561	$ 1,964
Showerheads, New Const	8	Std to 2.0 GPM	95-99	$ 32	$ 44	$ 51	$ 71	$ 69	$ 97	$ 95	$ 132
Dishwashers	37	Tighten Std by 10%	96-98	$ -	$ -	$ 429	$ 559	$ 429	$ 559	$ 429	$ 559
Clothes Dryers (Microwave)	109	Market Introduction	96-98	$ -	$ -	$ 540	$ 540	$ 900	$ 900	$ 1,620	$ 1,620
SERP technologies to new stds	39	Tighten Std by 25%	95-97	$ 500	$ 500	$ 750	$ 1,000	$ 750	$ 1,000	$ -	$ -
Compact Fluorescent Lighting	53	1 Bulb Per Residence	95-99	$ 3,754	$ 4,923	$ 3,679	$ 4,847	$ 3,692	$ 5,245	$ 3,704	$ 4,878
Heating Sys Eff (Design) -New	Unknown	Demonstration	95-98	$ 500	$ 250	$ 500	$ 250	$ 500	$ 250	$ 500	$ 250
Windows - .4 to .32 - New Const	49	25% of Market by 2000	95-99	$ 755	$ 679	$ 1,193	$ -	$ 1,863	$ 1,667	$ 2,582	$ 2,323
Manuf. Housing Acquis. Program	18	Upgrade HUD Std to MAP	95-98	$ 11,837	######	######	######	######	######	######	######
COMMERCIAL											
Improved Lighting - New (1.2-.8)	35	25% of Market by 2000	95-99	$ 462	$ 1,114	$ 960	$ 2,272	$ 1,473	$ 3,476	$ 2,023	$ 4,786
Daylite Dimming - New	106	25% of Market by 2000	95-99	$ 520	$ 1,254	$ 1,081	$ 2,558	$ 1,658	$ 3,913	$ 2,277	$ 5,388
E.L. Exit signs - New	43	25% of Market by 2000	95-99	$ 74	$ 180	$ 155	$ 366	$ 237	$ 560	$ 326	$ 772
Occupancy Sensors - New	68	25% of Market by 2000	95-99	$ 201	$ 484	$ 417	$ 987	$ 640	$ 1,510	$ 879	$ 2,079
Low E window (0.4)	48	25% of Market by 2000	95-99	$ 403	$ 971	$ 837	$ 1,980	$ 1,284	$ 3,029	$ 1,763	$ 4,172
Building Commissioning	43	Increase Expectations	95-99	$ 288	$ 694	$ 598	$ 1,415	$ 918	$ 2,165	$ 1,260	$ 2,982
Halogen IR lamps	67	25% of Market by 2000	95-99	$ 43	$ 104	$ 89	$ 211	$ 137	$ 323	$ 188	$ 445
Code Enforcement - WA & OR	21	Insurance on 90aMWs	95-97	$ 2,275	Unk	$ 1,665	Unk	$ 821	Unk		
Update Design Rules of Thumb	N/A	Change Design Norms	95-99	Funding Requirements Unknown							
INDUSTRIAL											
Motors -Adjustable Speed Drives	11	Change Current Practice	96-2000	$ -	$ -	$ 402	$ 402	$ 402	$ 402	$ 402	$ 402
OEM motors systems	20	Change Current Practice	96-2000	$ -	$ -	$ 668	$ 745	$ 668	$ 745	$ 668	$ 745
TOTALS				$ 24,009	######	######	######	######	######	######	######
APPROACHES											
Electric Ideas Clearinghouse				$ 750		$ 750		$ 750		$ 750	
Lighting Design Laboratory				$ 455	$ 300	$ 455	$ 300	$ 455	$ 300	$ 455	$ 300
Energy Outlet				$ 140	$ 60	$ 140	$ 60	$ 140	$ 60	$ 140	$ 60
Technical Assistance/SEOs				$ 2,500		$ 2,500		$ 2,500		$ 2,500	
Regional Advertising				$ 2,000		$ 2,000		$ 2,000		$ 2,000	
SERP Current Activity				$ 703		$ 721		$ 363			
FURTHER CONSIDERATION POSSIBLE											
Irrigation Scheduling	Program manager believes that with rate increases and the end of the Irrigation Discount, the acceptance of this practice will increase.										
Luminaires (Fixtures) for CFLs	An approach to persistence for compact fluorescents: lifetime issues, lack of data										
3Glaze LowE CryptonWindows-.20	BPA is doing pilot demo to evaluate cost-effectiveness - likely niche market for design flexibility (tradeoffs) - See Row 15 above for proposed window acti										
Efficient Office Equipment	Power Management Features are entering market without intervention. Costs are not available. DOE Energy Star Program targets these units.										
	If voluntary program does not meet objectives of the Energy Policy Act of 92, DOE will develop efficiency standards.										
Small Commercial Air Cond.	CEE program for rooftop unitary air conditions has been approved and launched - utility incentives approach										
Vending/Beverage Machines	CEE gathering information about better insulation, glass, and control measures.										
Coated filament lamp	This product is not commercially available, but could be on the market by 2000										

(000's)		(000's)	
1999		2000	
BPA	IOUs	BPA	IOUs
######	######		
$ -	$ -		
$ 126	$ 176		
$ -	$ -		
$ -	$ -		
$ -	$ -		
$ 3,716	$ 4,891		
$ -	$ -		
$ 3,333	$ 3,007		
$ -	$ -		
$ 2,570	$ 6,126		
$ 2,893	$ 6,896		
$ 414	$ 987		
$ 1,117	$ 2,661		
$ 2,240	$ 5,339		
$ 1,601	$ 3,816		
$ 239	$ 569		
$ 402	$ 402	$ 402	$ 402
$ 668	$ 745	$ 668	$ 745
######	######	$ 1,070	$ 1,147
$ 750			
$ 455	$ 300		
$ 140	$ 60		
$ 2,500			
$ 2,000			
vity			

6/30/94	ıcremental Installed Mea Cost + 20% A Mills/kWh 19	Successful Venture Characteristics	Venture Duration	FUNDING REQUIRED TO ACCOMPLISH MTV GOAL (000's) PUBLICS 1995	1996	(000's) PUBLICS 1997	1998	(000's) PUBLICS 1999	2000
RESIDENTIAL									
HP Wtr Htr, New & Replacement	38	15% of Market by 2000	95-99	$ 2,225	$ 4,450	$ 7,788	$ 11,125	$ 16,688	$ 22,251
Clothes Washers-Horizontal Axis	27	15% of Market by 1999	95-98	$ 627	$ 1,003	$ 1,254	$ 1,882		
Showerheads, New Const	8	Std to 2.0 GPM	95-99	$ 32	$ 51	$ 69	$ 95	$ 126	
Dishwashers	37	Tighten Std by 10%	96-98		$ 429	$ 429	$ 429		
Clothes Dryers (Microwave)	109	Market Introduction	96-98	$ -	$ 540	$ 900	$ 1,620		
SERP technologies to new stds	39	Tighten Std by 25%	95-98	$ 843	$ 865	$ 436	$ 1,380		
Compact Fluorescent Lighting	53	ulb in 20% 1995 Reside	95-99	$ 637	$ 955	$ 1,273	$ 1,592	$ 1,910	
Heating Sys Eff (Design) -New	Unknown	Demonstration	95-98	$ 500	$ 500	$ 500	$ 500		
Windows - .4 to .32 - New Const	49	25% of Market by 2000	95-99	$ 986	$ 1,583	$ 2,466	$ 3,412	$ 4,404	
Manuf. Housing Acquis. Program	18	Jpgrade HUD Std to MA	95-98	$ 11,000	$ 11,000	$ 11,000	$ 11,000		
COMMERCIAL									
Improved Lighting - New (1.2-.8)	35	25% of Market by 2000	95-99	$ 462	$ 960	$ 1,473	$ 2,023	$ 2,570	
Daylite Dimming - New	106	25% of Market by 2000	95-99	$ 520	$ 1,081	$ 1,658	$ 2,277	$ 2,893	
E.L. Exit signs - New	43	25% of Market by 2000	95-99	$ 74	$ 155	$ 237	$ 326	$ 414	
Occupancy Sensors - New	68	25% of Market by 2000	95-99	$ 201	$ 417	$ 640	$ 879	$ 1,117	
Low E window (0.4)	48	25% of Market by 2000	95-99	$ 403	$ 837	$ 1,284	$ 1,763	$ 2,240	
Building Commissioning	43	Increase Expectations	95-99	$ 288	$ 598	$ 918	$ 1,260	$ 1,601	
Halogen IR lamps	67	25% of Market by 2000	95-99	$ 43	$ 89	$ 137	$ 188	$ 239	
Code Enforcement - WA & OR	21	Insurance on 90aMWs	95-97	$ 2,275	$ 1,665	$ 821			
Update Design Rules of Thumb	N/A	Change Design Norms	95-99						
Packg AC and Chillers					Not Yet Estimated				
INDUSTRIAL									
Motors -Adjustable Speed Drives	11	Change Current Practice	96-2000		$ 402	$ 402	$ 402	$ 402	$ 402
OEM motors systems	20	Change Current Practice	96-2000		$ 668	$ 668	$ 668	$ 668	$ 668
TOTALS		TOTAL yearly Budgets		$ 21,115	$ 28,249	$ 34,355	$ 42,821	$ 35,274	$ 23,321
		if at 80%	0.8	$ 16,892	$ 22,599	$ 27,484	$ 34,257	$ 28,219	$ 18,657



IN COLUMN C							6/30/94	Calcs for average levelized cost		
(000's)		(000's)		(000's)						
PRIVATES		PRIVATES		PRIVATES				from summary		
1995	1996	1997	1998	1999	2000	sum			l*(h+i)	
							RESIDENTIAL			
$ 2,894	$ 5,788	$ 10,129	$ 14,470	$ 21,705	$ 28,940	#######	HP Wtr Htr, New & Replacement		1237	
$ 816	$ 1,305	$ 1,631	$ 2,447			$ 10,966	Clothes Washers-Horizontal Axis		88	
$ 44	$ 71	$ 97	$ 132			$ 717	Showerheads, New Const		9	
	$ 559	$ 559	$ 559			$ 2,964	Dishwashers		35	
$ 540	$ 900	$ 1,620	$ -			$ 6,120	Clothes Dryers (Microwave)		67	
$ 1,246	$ 1,279	$ 645	$ 2,040			$ 8,735	SERP technologies to new stds		63	
$ 990	$ 1,486	$ 1,981	$ 2,476	$ 2,971		$ 16,271	Compact Fluorescent Lighting		328	
$ 250	$ 250	$ 250	$ 250			$ 3,000	Heating Sys Eff (Design) -New			
$ 1,079	$ 1,757	$ 2,744	$ 3,803	$ 4,914		$ 27,149	Windows - .4 to .32 - New Const		98	
$ 15,000	$ 15,000	$ 15,000	$ 15,000			#######	Manuf. Housing Acquis. Program		278	
									0	
							COMMERCIAL		0	
$ 1,114	$ 2,272	$ 3,476	$ 4,786	$ 6,126		$ 25,263	Improved Lighting - New (1.2-.8)		129	
$ 1,254	$ 2,558	$ 3,913	$ 5,388	$ 6,896		$ 28,438	Daylite Dimming - New		229	
$ 180	$ 366	$ 560	$ 772	$ 987		$ 4,072	E.L. Exit signs - New		34	
$ 484	$ 987	$ 1,510	$ 2,079	$ 2,661		$ 10,975	Occupancy Sensors - New		124	
$ 971	$ 1,980	$ 3,029	$ 4,172	$ 5,339		$ 22,018	Low E window (0.4)		113	
$ 694	$ 1,415	$ 2,165	$ 2,982	$ 3,816		$ 15,737	Building Commissioning		127	
$ 104	$ 211	$ 323	$ 445	$ 569		$ 2,347	Halogen IR lamps		118	
Unknown						$ 4,761	Code Enforcement - WA & OR		33	
							Update Design Rules of Thumb			
									0	
							INDUSTRIAL		0	
	$ 402	$ 402	$ 402	$ 402	$ 402	$ 4,018	Motors -Adjustable Speed Drives		24	
	$ 745	$ 745	$ 745	$ 745	$ 745	$ 7,068	OEM motors systems		42	
$ 27,661	$ 39,331	$ 50,779	$ 62,948	$ 57,131	$ 30,087	#######	**TOTALS**		3178	
$ 22,129	$ 31,465	$ 40,623	$ 50,358	$ 45,705	$ 24,070	#######			1130	AMW sum
									2.81	avg lev co
									1940	
									616	AMW-HP

									3	

		b*(H+I)			
		19635.33			
		488.3074			
		180.0688			
		590.4089			
		690.1624			
		1956.301			
		1816.726			
		1803.006			
		719.8746			
		0			
		0			
		2380.965			
		2463.1			
		630.1743			
		1330.307			
		2075.213			
		1363.075			
		1268.152			
		148.226			
		0			
		917.2807			
		1613.64			
		42070.32			
adj for row 13, 26					
st (mills/kWh)		37	avg levl cost with HPWH		
		22434.99			
wtr htr					

		36	avg levl cost w/out HPWH

	1996	1997
RESIDENTIAL		
HP Wtr Htr, New & Replacement	$ 4,450	$ 7,788
Clothes Washers-Horizontal Axis	$ 1,003	$ 1,254
Showerheads, New Const	$ 51	$ 69
Dishwashers	$ 429	$ 429
Clothes Dryers (Microwave)	$ 540	$ 900
SERP technologies to new stds	$ 865	$ 436
Compact Fluorescent Lighting	$ 955	$ 1,273
Heating Sys Eff (Design) -New	$ 500	$ 500
Windows - .4 to .32 - New Const	$ 1,583	$ 2,466
Manuf. Housing Acquis. Program	$ 11,000	$ 11,000
COMMERCIAL		
Improved Lighting - New (1.2-.8)	$ 960	$ 1,473
Daylite Dimming - New	$ 1,081	$ 1,658
E.L. Exit signs - New	$ 155	$ 237
Occupancy Sensors - New	$ 417	$ 640
Low E window (0.4)	$ 837	$ 1,284
Building Commissioning	$ 598	$ 918
Halogen IR lamps	$ 89	$ 137
Code Enforcement - WA & OR	$ 1,665	$ 821
Update Design Rules of Thumb		
Packg AC and Chillers	Not Yet Estimated	
INDUSTRIAL		
Motors -Adjustable Speed Drives	$ 402	$ 402
OEM motors systems	$ 668	$ 668
TOTALS	$ 28,249	$ 34,355
	$ 22,599	$ 27,484