

APPENDIX I. CONSUMER RESEARCH REPORT

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DRAFT REPORT ON CONSUMER RESEARCH FOR CLOTHES WASHERS

CONSUMER RESEARCH SUMMARY

I.1 INTRODUCTION — PRESENTATION OF CONSUMER RESEARCH

This report is a summary of consumer research on clothes washers.

I.2 SOURCES OF INFORMATION

Listed below are sources of information regarding consumer issues. Some programs are applicable to more than one general heading.

Major Studies by Consortiums

The High Efficiency Laundry Metering & Marketing Analysis (THELMA)
Bern, Kansas / Maytag demonstration project
WashWise — Northwest Energy Efficiency Alliance (NWEAA)
Northeast Energy Efficiency Program (NEEP)

Individual Utility Demand Side Management (DSM)/Market Transformation Programs

Pacific Gas & Electric (PG& E, California)
Commonwealth Electric

Consumer Publications

Consumer Reports (USA)
Consumer (New Zealand)
CHOICE (Australia)

Trade & Professional Organizations

Soap & Detergent Association
American Home Appliance Association (AHAM)
Electric Power Research Institute (EPRI)
American Society of Mechanical Engineers (ASME)

Government Programs

Energy Star Appliance Programs (DOE, EPA) — D&R International and other
ORNL - Commercial Laundry Field Study
MacDill Air Force Base, DOD
Fort Hood Demonstration Study, DOD
Fort Hood Government Procurement, DOD

I.3 SOURCES AND PROJECTS

I.3.1 Major Studies by Consortiums

I.3.1.2 THELMA (The High-Efficiency Laundry Metering & Marketing Analysis Project)

Sponsors:

The High-Efficiency Laundry Metering & Marketing Analysis (THELMA) study is an Electric Power Research Institute Tailored Collaborative project sponsored by a consortium of 28 electric, gas, water and sewer utilities, as well as the Electric Power Research Institute (EPRI) and the U.S. Department of Energy. The project is being coordinated through EPRI.

Contractors:

Hagler Bailly Consulting Inc., Phone: (608) 232-2800
Dethman & Associates, Phone: (206) 545-0717
SBW Consulting, Inc., Phone: (206) 827-0330
National Center for Appropriate Technology, Phone: (206) 324-8064
Arther D. Little, Phone: (617) 498-5000

Objectives:

The broad goals of THELMA are to acquire the information necessary for leveraging a lasting market transformation to efficient clothes washers and to design effective incentive programs and other promotional tools for simulating the purchase of efficient washers.

Specific objectives include:

- ▶ Characterize status of H-axis technology.
- ▶ Confirm savings estimates.
- ▶ Assess customer laundering habits.
- ▶ Identify market barriers.
- ▶ Suggest strategies for utility actions.

Methodologies:

The THELMA report includes the following volumes (not all are currently published):
Volume 1: Final Research Plan

Volume 2: Laboratory Testing of Clothes Washers
Volume 3: General Market Assessment
Volume 4: Distribution Channels
Volume 5: Product Demonstrations
Volume 6: Product Users: In-Home Interviews
Volume 7: Product Users: Field Monitoring
Volume 8: Product Benefits and Target Markets
Volume 9: Product Users: Further Evaluations

Individual THELMA report volumes, organized by tasks, are discussed below.

Future Work:

Findings of the THELMA project will be published in a nine volume set. Four volumes were made available to LBNL; all but the Laboratory Testing Report were draft documents. It is not certain when the other eight report volumes will become available to the general public. Additional field testing with the Neptune, Maytag was done but this report is not available yet. There are currently no plans for EPRI to do additional work.

I.3.1.3 THELMA Task 2.1 Final Report

Title: **Results of Focus Groups with Consumers**

Date: June 1995

Report leader: Dethman & Associates

Objectives:

- ▶ Qualitatively assess the current market for H-axis washers.
- ▶ To explore consumer attitudes, rather than to measure them.
- ▶ Identify and explore the educational needs of consumers.
- ▶ Inform other THELMA research components.

Methodologies:

Washers: prior to introduction of Neptune (Maytag); both top-loading and front-loading H-axis washers were discussed.

Description: Focus Groups with Consumers.

Date: February 6-9, 1995.

Location: Bellevue, Washington & Concord, California

Sample size: Four focus groups of 10 people each (2 in each location).

Sample demographics: selected by wash loads and income

Rebates: None

Topics covered included:

- ▶ satisfaction with current washer
- ▶ reactions to H-axis washer
- ▶ interest in buying a H-axis washer

- ▶ consumer descriptions of H-axis washers

Findings: [from Executive Summary]

Barriers to Acceptance of H-axis Washers

- ▶ Awareness of H-axis washers was extremely low among focus group participants.
- ▶ Participants reactions were initially quite negative to front-loading H-axis washers, based on old associations. They also were resistant to certain features, citing concerns about the need to bend; leaking; child safety; and ease of use. (Participants were shown photographs of front-loading and top-loading models; information and diagrams that compared the mechanical action and cleaning technique of V-axis and H-axis washers; specific details of resource and cost savings).
- ▶ Participants viewed top-loading H-axis washers as a confusing hybrid. They also had concerns about specific features (e.g., double door entry; the hatch always rotating to the top).
- ▶ Even when given basic information about H-axis washers, participants had a multitude of questions and concerns.

The Appeal of H-axis Washers

- ▶ Most participants in the focus groups said they might consider buying an H-axis washer if it was equal to their V-axis washer in terms of reliability, capacity, price, and convenience.
- ▶ Participants who spontaneously suggested H-axis benefits were few in number and quite tentative.
- ▶ Participants perceived that resource conservation is less important than other washer attributes such as ease of use and cleaning ability.
- ▶ Participants rarely mentioned energy and water efficiency as key buying criteria; rather, they mentioned cost, reliability, large capacity, versatility, and easy use.

Key Buying Criteria [from Results of Focus Groups with Consumers, Draft]

The most frequently mentioned buying criteria were:

- ▶ Cost
- ▶ Reliability and durability
- ▶ Large capacity
- ▶ Versatile features (e.g., water levels; wash speeds; temperature settings; rinse cycles; delicate settings; dispensers; etc.)
- ▶ Controls that were easy to use

Factors that were occasionally mentioned included: ease of home maintenance; safety features; gas vs. electricity; type of agitator; noise level; aesthetics; length of wash cycle. Energy and water efficiency were rarely mentioned, except in the context of selecting the water level to match the load size.

I.3.1.4 THELMA Task 2.3 Draft

Title: **Laundry Demonstration Center**

Date: April 1996

Report leader: Dethman & Associates

Objectives:

The Demonstration Center's purpose was to introduce potential H-axis consumers to two types of H-axis washers, and to collect their reactions to and insights about these washers. The primary objectives of the Demonstration Center were to assess respondents:

- ▶ Awareness and initial impressions of H-axis washers.
- ▶ Preferences for top-loading vs. front-loading H-axis washers.
- ▶ Reactions to trying out an H-axis washers when they conducted a "test wash".
- ▶ Likelihood of buying an H-axis washer.
- ▶ Questions about H-axis washers and reactions to H-axis utility program ideas.

Methodologies:

Washers:

- ▶ Participants were shown a top-loading and a front-loading machine, and they performed a test wash on the front loader.
- ▶ Neptune washer (Maytag) was not involved.

Description: Surveyed participants after demonstrating washers.

Time period of surveys: November 7, 1995 to February 21, 1996.

Location: Lynnwood, Washington (a suburban area just north of Seattle)

Sample size: one hundred in depth interviews were conducted.

Sample demographics:

- ▶ Random from phone books covering neighborhoods near the demonstration center.
- ▶ Participants who had some potential for buying an H-axis washer were selected.
- ▶ Homeowners with at least \$30,000 income
- ▶ Currently owned V-axis machines
- ▶ Household did four or more wash loads per week

Findings: [from Executive Summary]

What's Important in a New Washer?

- ▶ Capacity (51%)
- ▶ Specific features such as dispensers, cycles (48%)
- ▶ Efficiency (35%) (e.g., selecting cold wash rinse or adjusting water level)
- ▶ Reputation/reliability (31%)
- ▶ Purchase price (28%)

What Initial Impressions Did Participants Have of H-axis Washers?

- ▶ One-third had heard of residential H-axis washers; 15% had used one.
- ▶ Just over a quarter of respondents said they would be extremely or very likely to buy one.
- ▶ Those less predisposed to H-axis washers most often cited “lack of information” as the reason for their negative ratings; other concerns included front-loading issues (e.g., bending, leaking) and inferior performance.

What Difference Did Hands-on Experience Make?

Findings are based on two specific brands of washers, and therefore, may not apply equally well to other H-axis machines, especially findings on specific product features.

Response to Front-load Washer (Washer A)

- ▶ Perceptions on capacity changed. Over a third of participants remarked that they could have added more clothes.
- ▶ Many asked for reliable data on the true capacity of H-axis washers, and on the relationship between capacity and cleaning performance.
- ▶ About half thought the clothes would get as clean and rinse as well as with their V-axis washer.
- ▶ About half were unsure or expected inferior cleaning and rinsing. Respondents were confused about how clothes could get clean without immersion in water, or without the scrubbing action of an agitator.
- ▶ Respondents wanted more hands-on proof about the machines’ performance under a variety of real life settings.
- ▶ Appealing features included: overall appearance, quietness, gentleness on clothes, familiar controls, better balance, and the convenient dispensers for bleach/softener.
- ▶ Areas of concern included: bending to load and unload, fear of leaks, accessibility of controls to children, and dispenser spills.

Response to Top-Load Washer (Washer B)

This was a top-load, horizontal axis washer.

- ▶ Said they preferred the top-loading H-axis washer in theory but preferred the front-loading H-axis washer because they felt the overall design was more logical, more familiar from laundromat experiences, and more user-friendly.
- ▶ The majority of respondents who said they preferred a top loader said they would never buy Washer B. Reaction to Washer B was dominated by negative response to the latched opening used to enter the drum, as well as concerns about the machine’s basic quality and finish.

How Did Participants View H-axis Washers in the End?

- ▶ Respondents were most likely to believe that H-axis washers did reduce wear and tear, but were less sure about their superior cleaning/rinsing ability and equivalent capacity.
- ▶ Respondents were evenly split between those who said that the higher purchase price (\$600-\$800 purchase price) would deter them from buying an H-axis washer, and those who said

it might be worth paying more, if the savings, superior performance and reliability of H-axis washers were proven.

- ▶ Two-thirds were impressed with improved efficiency and financial savings; others wanted proof or thought the savings were too small.
- ▶ The number of participants who rated themselves extremely/very likely to buy an H-axis washer had more than doubled (from 28% to 67%), after the interview and test wash.
- ▶ Most respondents said they would need more information before actually buying an H-axis washer. Respondents required proven data about the H-axis washers' track record; ease of repair; efficiency/savings; cleaning, rinsing, wear & tear; and capacity.

I.3.1.5 THELMA Task 4 Draft

Title: **Impact Analysis**

Date: October 1996

Report leader: SBW Consulting, Inc. (for EPRI Retail Market Tools and Services)

Objectives:

To assess energy and water savings in an "in-home" environment as compared to a laboratory setting. Laboratory testing can provide savings estimates but must make assumptions about peoples' laundry practices. In-home monitoring can provide estimates under more realistic and diverse conditions.

Methodologies:

Washers: Two types of H-axis washers were used.

- ▶ *Washer A* was installed in 46 of 50 sites. It is a front-loading model that was officially released to the U.S. market in September 1996 by a major U.S. appliance manufacturer. It has a maximum spin speed of 650 rpm.
- ▶ *Washer C* was installed in 4 of 50 sites. It is a front-loading model manufactured in Europe and available in the United States. *Washer C* requires 220 Volt service and only a cold-water connection because it has an internal electric water heater.

Description: Existing washer and dryer were monitored for a 6-week period.

An H-axis washer was then substituted for the V-axis washer, and the H-axis washer and dryer were then monitored for a 7-week period.

Dates:

Phase I (existing washer monitored) Sept. 1995 - Dec. 1995,

Phase II (H-axis washer monitored) May 1996 - Aug. 1996.

Locations:

Phase I: 22 sites within a 10-mile radius in the Greater-Seattle, Washington area

4 sites in Tacoma, Washington

Phase II: 19 sites in Salem, Oregon

5 sites in the Bay Area of California (Fremont, San Rafael, Richmond)

Sample size: 50 homes were monitored.

Findings:

- ▶ Water savings ranged from 11 to 74 percent with an average water savings of 36 percent.
- ▶ Energy is saved if warm or hot water is used for washing or if the washer features a high spin speed. Average savings were 1.02 kWh/wash load.
- ▶ Participants with the H-axis Washer A reduced their load size by 4 percent. Those with Washer C reduced on average reduced their load size by 10 percent.
- ▶ There was no significant change in the wash temperatures selected between the V-axis and H-axis washers.

G1.3.1.6 THELMA, Final Report

Title: **Laboratory Testing of Clothes Washers, Final Report**

Date: April 17, 1997

Contractor: Arthur D. Little, Inc. (ADL)

Principle investigators: J Dieckmann, Detlef Westphalen

Project Managers: R. Gillman, J. Kesselring ; Customer Systems Group, EPRI

This report was a continuation of an earlier report of the same title, published in December 1995. Principal investigators for the earlier report (also by ADL) are: J Dieckmann, W. Murphy. An additional washer not previously available was tested in the updated report.

Objectives:

To test energy and water consumption and other performance parameters discussed below.

Methodologies:

Washers: Number of clothes washers tested: seven H-axis and one V-axis washers. Washers were labeled A through H. It is believed that a prototype Neptune (Maytag) was included in the testing. Clothes washers could be identified by noting their unique specifications.

Laboratory testing of washer to determine (for 8 washers):

- ▶ DOE washer capacity
- ▶ Hot and cold water consumption
- ▶ Energy consumption by the washer mechanical drive
- ▶ DOE energy factor
- ▶ Water extraction effectiveness
- ▶ Effect of water extraction effectiveness on dryer energy
- ▶ Soil removal effectiveness
- ▶ Rinsing effectiveness
- ▶ Gentleness of action

Findings: [from report Conclusions]

- ▶ The normal wash cycle times of the eight H-axis machines ranged between 40 minutes and 110 minutes. The V-axis normal wash cycle required 37 minutes.
- ▶ The energy factor of the H-axis machines, as measured by the DOE test procedure, was approximately 95% higher than the V-axis machine that was tested (i.e., H-axis energy consumption normalized to the basket volume is approximately 45% less than V-axis).
- ▶ The average water consumption of the eight H-axis machines, normalized to the basket volume, is 25% less than the V-axis machine at maximum fill level and 10% less than the V-axis at minimum fill level.
- ▶ The H-axis washers tested all had higher spin G's than the V-axis machine, resulting in measurably lower remaining moisture content (RMC).
- ▶ Electric clothes dryer energy decreases linearly with decreasing RMC.
- ▶ As a group, the soil removal effectiveness of the H-axis washers, as measured by the AHAM soil removal test, was 50% greater than for the V-axis machine.
- ▶ The average rinsing effectiveness of the H-axis washers was 50% greater than the V-axis washer.
- ▶ The AHAM gentleness of action test results were comparable for H-axis and V-axis machines.

I.3.2 Bern / Kansas Study

Title: **Bern Clothes Washer Study – Final Report**

Date: March 1998

Report: ORNL/M 6382

Sponsors: Department of Energy, Maytag

Contractor: Oak Ridge National Laboratory

Contacts:

- ▶ John Tomlinson, Oak Ridge National Laboratory (ORNL), Phone: (423) 574-0291
- ▶ D.T. Rzyz, Oak Ridge National Laboratory
- ▶ Linda Eggerss, Maytag, Phone: (515) 791-8518

Web Site: www.energystar.gov

Objectives:

- ▶ To evaluate the energy and water savings of high-efficiency, H-axis washers in a community which has been converted to the new design.
- ▶ To determine the impact of the new washer on customers' laundry habits and perceptions
- ▶ To demonstrate the findings and to develop information helpful to utilities (energy and water) and others with an eye towards moving the current clothes washer market to higher efficiency options.

Methodologies:

Washers: Monitoring was done with the existing V-axis washing machines in Phase I and with the Maytag Neptune H-axis washer in Phase II.

Description: Demonstration/monitor & metering study.

- ▶ H-axis washers were installed in 105 homes in Bern, Kansas.
- ▶ Interviews and questionnaires were used to determine the machines users satisfaction with the washer.

Dates: monitoring took place between June, 1997 and September 1997.

Location: Bern, Kansas; a rural community with a population of about 200

Sample size: 105 homes

Conditions: participants were allowed to keep washers after the study free of charge

Data collected on:

- ▶ impacts of load size
- ▶ water consumption
- ▶ energy consumption
- ▶ detergent use and consumption
- ▶ impacts on other additives
- ▶ impacts on laundry habits
- ▶ impacts on machine settings
- ▶ cleaning performance
- ▶ impacts on load dampness
- ▶ impacts on drying habits
- ▶ municipal utility impacts

Findings: [from Executive Summary and Conclusions]

- ▶ Overall, it was found that the changeover to the H-axis washer reduced the average water consumption from 41.5 gallons/load to 25.8 gallons/load - a water savings of about 38%.
- ▶ The H-axis washer's energy consumption including washer energy and hot water energy fell by 58% due to hot water savings and the impact of a highly efficient motor in the H-axis.
- ▶ The remaining moisture content of damp loads removed from the H-axis washers was, on average, 7% lower than for loads removed from participants' V-axis washers.
- ▶ The data and subsequent analyses also showed that across all loads, temperature settings, use of detergent and other additives, participants found the cleaning performance of the H-axis technology to be generally superior to their Phase I washer irrespective of its age.
- ▶ Participants seemed to adapt easily to the H-axis design, and laundry habits (average load weights, detergent use, how loads were dried, when loads were washed during the week, wash/rinse temperatures and other factors) remained largely unchanged from Phase I to Phase II.
- ▶ Taken together, these findings suggest that a changeover to H-axis technology delivers large savings in energy and water to the customer with an improvement in cleaning performance and utility.

- ▶ The fraction of loads in which participants were “completely satisfied” with the cleaning performance increased threefold from 15 to 45% in the changeover from the average V-axis washer to the H-axis washer in the study.
- ▶ Overall, the study showed that the changeover to the H-axis washer has little impact on the way in which customers washed and dried clothes.

I.3.3 WashWise

Title: *Coming Clean About Resource-Efficient Clothes Washers: An Initial WashWise Program and Market Progress Report - Final Report*

Report Number: E98-003

Date: January 28, 1998

Commissioned by:

- Northwest Energy Efficiency Alliance (NWEEA); comprised primarily of electric utilities in the Pacific Northwest.

Contractors:

- Portland Energy Conservation Inc. (PECI)
- Gilmore Research
- Pacific Energy Associates (PEA)

Contacts:

- Northwest Energy Efficiency Alliance
 - Tom Eckman, Phone: (503) 827-8416
 - Gabriel Foulkes, Phone: (503) 827-8416 x225
 - Ben Bronfman, Phone: (503) 827-8416 x226
- Portland Energy Conservation Inc. (PECI)
 - Lois Gordan, Phone: (503) 248-4636 x207
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 - David Hewitt, Phone: (360) 571-0497
 - Gary Smith, Phone: (503) 590-4609
- Gilmore Research Group
 - Denise Bauman, Phone: (503) 236-4551
- Oregon Department of Energy
 - Charlie Stevens, Phone: (503) 229-5625

Web site: <http://www.nwalliance.org>

Objectives:

- To dramatically increase the market share of resource-efficient clothes washers (RECWs) in the program area over the next three years.

- To influence the development and support of maximum energy and water efficiency levels for revised federal clothes washer standards.

Methodologies:

Washers: At the time the surveys below were done, the Maytag, Neptune H-axis washer was not on the market. Frigidaire, Staber and Europeans had horizontal axis washers on the market.

Description: This project has several aspects to it:

- ▶ a telephone survey of 419 participants/purchasers of RECWs as part of the WashWise rebate program (a rebate program funded by utilities)
- ▶ an intercept survey of 42 consumers shopping for laundry equipment
- ▶ a telephone survey of 205 appliance retailers
- ▶ a telephone survey of qualified representatives of nine major appliance manufacturer and importers of European products

Location: Pacific Northwest; Washington, Oregon, Idaho, and western Montana

Gilmore Research conducted the following surveys:

- ▶ Participant Survey — those who participated in the rebate program and bought an H-axis clothes washer. Consumers got a \$130 instant rebate and dealers got a \$20 rebate from the sponsoring utility.
- ▶ Intercept Surveys — what people thought of H-axis washers before they became participants and before they used the H-axis washers.
- ▶ Retailer Survey (dealers) — how many they think they could sell.
- ▶ Manufacturer Survey — predicted future H-axis sales.

Pacific Energy Associates evaluated the program and discussed key findings in the report: *Coming Clean About Resource-Efficient Clothes Washers: An Initial WashWise Program and Market Progress Report.— Final Report; January 28, 1998*

This report includes analysis of:

- ▶ reasons for purchasing a RECW;
- ▶ satisfaction with WashWise program;
- ▶ product pricing and RECW cost barrier;
- ▶ manufacturer’s perception of the RECW market;
- ▶ opportunities for increasing RECW sales.

Findings:

Purchaser Survey

This consisted of 419 interviews with people who had purchased a RECW in the beginning months of WashWise.

- ▶ Demographics: 36% had incomes of less than \$40,000 per year, 39% had household incomes between \$40, 000 and \$75,000 per year.
- ▶ Main reasons for purchasing a RECW were: energy or water savings, 74%; cleaner clothes, 18%; and gentler on clothes ,15%.

- ▶ 76% said that they would have purchased a front loading washing machine even if the rebate was not offered.
- ▶ 95% said they were at least somewhat satisfied with each RECW feature
- ▶ 81% said the washer was worth the price
- ▶ 91% said they would recommend the machine to others

Intercept Surveys (42 interviews)

Of the forty-two (42) intercept interviews conducted, thirty-two (32) were customers shopping primarily for top-loaders, and ten (10) interviews were with customers looking for tumble-action washers.

- ▶ Top-load shoppers mentioned “high cost” more than anything else as a reason for buying a top-loading washer rather than a tumble-action washing machine.
- ▶ Thirteen (13) top-load shoppers said they were shopping for a top-loader rather than a tumble-action washer because the tumble-action machines were too expensive.
- ▶ Customers also reported that they did not want to bend over to load and unload the clothes (mentioned by 8 top-load shoppers).
- ▶ Six (6) top-load shoppers reported that they were simply used to top-loaders.

Retailer Survey (205 dealers)

- ▶ Retailers believed that about half of the RECW purchasers would have purchased a standard, top loading machine if the rebate were not available.
- ▶ If the rebate were not offered, 57% thought the demand would slacken, then pick up again.
- ▶ When retailers were asked to estimate the average price of top loading machines that have similar capacity and features to the most popular tumble actions washers. The median response was \$500.
- ▶ Retailers thought 30% of customers would be willing to pay \$200 more for a RECW, and 50% would pay \$100 more.
- ▶ About half of the retailers believe that tumble action washers will dominate the market as consumers become more familiar with them.

Manufacturer Survey (6 U.S., 3 Importers)

- ▶ Six U.S. based manufacturers of clothes washers and three major importers were interviewed.
- ▶ Manufacturers’ estimates for RECW market share ranged from 2% to 25% in five years.

Future Work:

Follow-up participant, consumer awareness/acceptance, appliance dealer, and manufacturers surveys will be conducted in the Spring of 1998, and an evaluation/marketing report will be published in the second quarter of 1998 to document program success in terms of market indicators and program accomplishments.

I.3.4 Northeast Energy Efficiency Partnership (NEEP)

Reports: None at this time

Sponsors: A consortium of utilities.

Contractors: Sub-contractor: RLW Analytics

Contact: Bruce Wall, Phone: (860) 620-0076

Web Site: future web site to be called: www.tumblewasher.org

Objectives:

The market for high efficiency clothes washers will be evaluated. High efficiency clothes washers will be promoted.

Methodology:

Washers: Any washer meeting Energy Star performance levels is eligible; currently this means H-axis washers.

Description:

- ▶ Could characterize as a market pull program; some participants will have incentives, also consumer education will be done, point of sales marketing promotions/education.
- ▶ Baseline market research will include: surveys, focus groups, interviews with retailers, intercept interviews with consumers leaving the store. (will follow up with repeat interviews of the same people 12 months later, who bought or didn't buy a horizontal-axis washer)

Location:

- ▶ Currently there are 18-20 participating utilities and retailers covering 5.4 million customers in all of New England, excluding Maine.
- ▶ New Jersey is expected to join in 1999. New Jersey's 1998 program will include only new construction.

Dates: Program will officially start on April 21, 1998, although some members of the partnership have already begun the program (e.g., Con-Electric).

Rebates: Some participants will have incentives to purchase efficient washers.

Findings:

The baseline market research is completed. It is anticipated that results of research will be made available to the public in the future.

I.4 INDIVIDUAL UTILITY DEMAND SIDE MANAGEMENT/MARKET TRANSFORMATION PROGRAMS

I.4.1 Pacific Gas & Electric (PG&E) — Utility Survey

Contact: Ted Pope, Phone: (415) 973-4856

Methodologies:

Washers:

- ▶ Currently all eligible machines are H-axis.
- ▶ The Neptune was available in the June/July time frame.

Description:

- ▶ Survey questions focused on participants satisfaction with their purchased H-axis machines.
- ▶ Rebate program participants responded to an 11 question survey.

Dates: Results from April through August 1997

Location: PG&E service territory (northern California)

Sample size: 643

Rebates:

- ▶ PG&E had a customer program where they gave rebates to consumers who bought energy efficient washers. (\$75-\$175 rebates).
- ▶ In addition, water utilities also provided rebates up to \$75.

Findings:

Over 90% of participants in a rebate program responded excellent or very good when asked if they were satisfied with their washer.

Future work:

Additional survey data is being collected.

I.4.2 Commonwealth Electric — Utility Survey

Contact: Dick Moran, Phone: (508) 291-0950 x 3548

Methodologies:

Washers: energy efficient washers

Description: survey of participants in a rebate program

Date: a rebate program has been running since September 1997.

Sample size: 175

Rebates: yes

Questions relevant to this study include:

- ▶ Would you have purchased this washer without a rebate?

- ▶ Rate your washer (in comparison to old washer) in terms of ease of use, appearance, time to wash, and quality of wash).
- ▶ Have you had any problems?

Findings:

Responses have not been officially tabulated, however, responses are leaning toward easier to use and overwhelmingly towards cleaner clothes.

I.4.3 Consumer Publications

I.4.3.1 Consumer Reports/Consumers Union

Contact: Mark Connelly, Division Head — Home Environmental Products, Phone: (914) 378-2325

Publication: July 1997 issue of *Consumer Reports* magazine

Methodology:

- ▶ Clothes washers were evaluated and rated
- ▶ Evaluates: noise, washability and features
- ▶ Compared 16 top-loading (V-axis) and 2 H-axis clothes washers
- ▶ H-axis washers evaluated were: Frigidaire FWT445GE and ASKO 8005 (compact)

Findings:

- ▶ “To get the best results with front-loaders, you need to use special detergent that can be expensive”.
- ▶ “Little is yet known about their [H-axis models] reliability”.
- ▶ Spot checks on wear and tear didn’t verify that front-loaders were more gentle on clothes.
- ▶ The Frigidaire did not produce dryer clothes at the end of the spin cycle.
- ▶ Front-loaders are generally quieter during filling and washing and a bit noisier during the spin cycle.
- The two front-loaders used less energy.
- H-axis washers handled unbalanced loads better than others.

I.4.3.2 Consumer — New Zealand publication

Contact: Hamish Wilson, email: hamish@consumer.org

Publication: September 1997 issue of *Consumer* magazine.

Methodology:

- Rated soil removal, spin efficiency, energy use, water use, gentleness, ease of use, cycle time, noise, detergent used.
- Rated more H-axis washers than U.S. consumer publications.

- Tested four (4) H-axis washers and six (6) V-axis washers

Findings: (results presented in bar chart form)

- Overall, H-axis machines scored better on energy and water usage.
- Overall, H-axis machines scored better on gentleness.
- Soil removal for H-axis and V-axis were similar.

I.4.3.3 Choice – (Australian Consumer Magazine)

Publication: September 1997 issue of CHOICE magazine

Methodology:

- 21 washing machines were rated; 7 H-axis, front-loaders and 14 V-axis, top-loaders
- Washers were rated/tested for: wash capacity, cycle time, noise, water used, energy efficiency, spin efficiency, gentleness, and dirt removal.

Findings:

- Based on a combination of reasonable performance, purchase price and 10-year running costs, the Best Buys were the GE and a Hoover front-loaders.
- “Notably higher scores than the top-loaders (V-axis) for gentleness and water and energy efficiency.”
- Top-loaders (V-axis) wash and spin just as well as front-loaders, and they tend to have faster cycle times.”
- Top-loaders (V-axis) are usually less gentle on your clothes.

I.5 TRADE ORGANIZATIONS

I.5.1 The Soap and Detergent Association (SDA)

Publication: Detergents & Laundry Additives in High-Efficiency Washers

Contacts:

Janet Donohue, Director of Communication, Phone: (212) 725-1262

Jane Meyer, Director Consumer Education, Phone: (212) 725-1262

Background:

The Soap and Detergent Association is a national trade association (139 member), founded in 1926. The Association represents the manufacturers of household, industrial and institutional cleaning products and those companies that supply ingredients and finished packaging to the industry. Over 90% of the cleaning products sold in the United States are made by SDA members.

Methodology:

Not described, however, this document relies largely on data from tumbler washer use in Western Europe. Powder detergent is used as the basis of comparison.

Summary:

The Soap and Detergent Association made available a publication detailing information on detergents and their use in H-axis machines. (October 1996)

Discussed are:

- excessive sudsing
- formulating detergents for high-efficiency H-axis machines
- water temperature
- lower water volume
- clothes-to-water ratio
- powder detergents and laundry additives
- load sizes
- amount of detergent required
- availability of high-efficiency detergent

Findings:

- High-efficiency tumbler washers raise special challenges when formulating effective detergents and laundry additives
 - a. Suds are more readily created. Excessive suds can overflow the machine or interfere with the washers's proper operation.
 - b. Water temperature can be lower because there is less water to heat the wash tub and the clothes.
 - c. Lower water volume makes it more difficult to keep soils from redepositing on fabrics.
 - d. Lower water volume results in a higher clothes-to water ratio. This creates a greater tendency for fabric dyes to bleed and transfer.
 - e. Powder detergents and laundry additives are harder to dissolve in cooler and less water.
- High-efficiency washer load sizes are expected to be comparable to current agitator capacities and load sizes, i.e., 7 pounds.
- The amount of detergent required for effective cleaning is most closely related to the amount of laundry and soil being washed , not to water volume.
- As high-efficiency tumbler washers become more widely available, laundry detergents specifically made for these machines will also become available. [two brands are now available]
- To achieve optimal cleaning performance in high-efficiency tumbler washers, detergents formulated for these machines should be used.

I.5.2 Arthur D. Little (ADL) Report on the behalf of AHAM, 1991

Report: *Financial Impact of DOE Top Loading Horizontal Axis Standards on U.S. Washing Machine Manufacturers; Appendix A: Description of Consumer Survey*

Date: July 1991

Sponsor: AHAM

Objective: To determine the valuation by consumers of potential top loading H-axis washing machines relative to current products.

Methodology:

Washers: side-by-side, hands-on comparison of equivalent size, top loading V-axis and H-axis washers.

Description:

- Loading/Unloading Demonstration
- Card Sort/ Conjoint Exercise
- Self-Administered Questionnaire
- Environmental Sensitivity Index (measured environmental sensitivity)

Date: 1991

Location: Mall locations in Denver and Indianapolis

Sample size: 301 participants

Topics covered:

- Features relating to: adding clothing, loading method, water use and detergent use were examined.

Findings:

- Many consumers significantly desire the features of V-axis ,top-loading washing machines.
- Many consumer do prefer low energy cost units.
- Washing machine price is the major determinant of consumer utility or satisfaction.
- No substantial differences in utility patterns exist between environmentally sensitive and average consumers. However, low and medium income sub-groups of consumers have greater expected sensitivity to price.
- Conjoint Results (Appendix A) : Consumer preference for purchasing a washing machine are:
 - price, 49.1%;
 - energy costs, 20.3%;
 - ability to add more clothes, 11%;
 - loading method, 10.7%;
 - water use, 5.6%; and
 - detergent use, 3.3%.
- See (Appendix B) for detailed results of the self administered survey results.

I.5.3 EPRI (Electric Power Research Institute) Journal

Publication: EPRI Journal, November/December 1997 Issue
“The New Line on Laundry” by Leslie Lamarre

Findings:

- “Consumers also like the absence of the agitator (on H-axis machines), which frees up room for comforters, rugs, and other bulky items they might otherwise have to take to the laundromat.” This is an insight gleaned from the Four-year EPRI, THELMA project.
- At this time, 84% of consumers are very satisfied or somewhat satisfied with their own washing machines. Their biggest complaints are unbalanced loads and clothes tangling around the agitator.
- After in-home use, tests indicated that the capacity concern was more visual than actual.
- The biggest barrier cited to buying an H-axis machine was the higher cost of the machines.

I.5.4 Mechanical Engineering -- Journal of the American Society of Mechanical Engineers

Article title: Energy-efficient appliances
Author: Steven Ashley, Associate Editor
Date: March 1998

Summary:

- The author discusses the design of the Neptune washer (Maytag).

Findings:

- The Maytag, Neptune has a maintenance-free, low-noise, high-efficiency motor with infinitely variable-speed control.
- The Maytag team solved the bend-and stoop problem by tilting the spinner axis of the stainless-steel tub up 15 degrees and making the opening as large as possible.

I.6 GOVERNMENT PROJECTS

I.6.1 Energy Star Program

Contacts:

Bill Noel — Partnerships manager, DOE, Phone (202) 586-6149
Lee Bodner — Program manager; D&R International, Phone: (301) 588-9387
Mary Myers — D&R International, Phone: (301) 588-9387
Jamie Treworgy — D&R International, Phone: (301) 588-9387
Marc LaFrance — DOE, Phone: (202) 586-8423

Background:

Energy Star is a joint project of the U.S. Department of Energy (DOE) and the Environmental Protection Agency (EPA). This collaboration concentrates on educating

consumers about the benefits of highly energy efficient home appliances, consumer electronics, office equipment and building materials.

Programs:

- Demonstrating new Technologies in “real world” settings
Example: Bern, Kansas / Maytag Washer study

- Volume Purchases
Large institutional buyers, such as housing authorities, are organized to pool their resources.

- Energy Star Appliance Program (formerly the Retailer Initiative)
A retailer initiative pilot program to promote high efficiency washers. The DOE will place “Energy Star” labels on efficient washers to help consumers differentiate them from other machines; making it easier for consumers to recognize efficient appliances. A list of energy efficient clothes washers is listed at the energy star web site: <http://www.energystar.gov>.

- Financing Programs
The DOE is also working on financing programs with Fannie Mae, and working with utilities and retailers to determine the best ways to communicate efficiency benefits to consumers.

- Energy Star Manufactured Homes Program
DOE, Washington State University, and the Idaho Department of Water Resources are working with regional manufacturers to include high efficiency residential appliance, including clothes washers, in manufactured homes.

Energy Star Participants reported August 97:

- SMUD (Sacramento Municipal Utility District)
- Southern California Edison
- SDA&E (San Diego Gas & Electric)
- Potomac Electric Power Co.
- Wisconsin Electric Power Company
- Wisconsin Public Service
- Portland Energy Conservation Inc.

I.6.2 Commercial Laundry Field Study

Commissioned by: Cooperative Research and Development Agreement (CRADA) with Maytag

Contractor: John Tomlinson, ORNL, Phone: (423) 574-0291

Sub-contractor: Ayers Associates, CH2M Hill

Objective:

To measure and compare energy and water use before and after changing to an energy efficient clothes washer.

Methodology:

Washers: 10 residential V-axis washers were replaced by Maytag H-axis washers

Description:

- Energy monitoring and metering study
- Main laundry room selected with 10 washers
- Washers average 115 cycles per month

Location: Tampa, Florida apartment complex with 100 units

Findings: (Contact Tomlinson for more detail)

After replacing V-axis washers with H-axis washers:

- water use was reduced by 38%,
- hot water use was reduced by 40%,
- machine energy reduced by 47%,
- 69% were satisfied or very satisfied with the cleaning performance of the V-axis washer,
- 97% of customers interviewed were either satisfied or very satisfied with the cleaning performance of the H-axis machine.

I.6.3 MacDill Air Force Base

Commissioned by: Department of Defense

Contact: John Tomlinson, ORNL, Phone: (423) 574-0291

Subcontractor: Ayers Associates

Objectives: [from presentation by Tomlinson on July 18, 1997]

- Improved awareness of benefits.
- Information dissemination to facility managers.
- Information on load size.
- Technical evaluation

Methodology:

Washers: V-axis large Speed Queen replaced by 5 Frigidaire, 1 Creda

Description:

- Energy and water use study in two apartment laundry rooms used by Army barracks.
- Measure energy/water consumption; measure load size
- ▶ Customer impressions/habits

Incentives: H-axis machines contributed to project by manufacturers

Findings: (Contact Tomlinson for more detail)(from presentation by Tomlinson on July 18, 1997)

- H-axis washer (B) showed an increase in cu.ft / kWh of 190% over V-axis washer (A).
- H-axis washer (B) showed an increase in lb / kWh of 230% over V-axis washer (A).

I.6.4 Fort Hood Demonstration Study (metering study)

Commissioned by: Department of Defense, Forces Command — Department of Army

Contacts:

- Greg Sullivan, Pacific Northwest National Laboratory (PNNL), Phone: (509) 372-6212
- Graham Parker, PNNL, Phone: (509) 375-3805

Methodology:

Washers:

- Baseline washers are Roper residential washers.
- On premise laundry machines (like commercial washers without a coin box).
- Plan to monitor Staber, Maytag, & Amana washers (a total of 18 washers).

Description:

- Will monitor: hot & cold water and mechanical energy.
- Will examine operation and maintenance expense (washers expected to be treated roughly).

Dates:

- A 6 month project starting in December 1997.
- Will monitor H-axis washers January-June.

Location: Fort Hood — Texas (near Austin), Army Base.

Sample size:

- On-premise laundry for the barracks.
- Each barrack has 6 machines.
- Each machine is estimated to do 5-7 turns a day.

Findings: Current Status (3-23-98):

- Have monitored/metered Roper baseline washers for two months.
- Are currently monitoring Staber washers and have two months worth of data.
- Report expected in early summer of 1998.

I.6.5 Fort Hood Government Procurement — Department of Defense

Commissioned by: Department of Defense, Department of Army

Contact:

Summary:

- Government procurement program.
- Army bought approximately 1,200 Staber H-axis washing machines during the summer/fall of 1997.