Evaluation Methods and Results of EGAT's Labeling Programs

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Presentation Outline

- Program Summary
- Evaluation Approach
- Program Evaluation Results
- What was learned ?
- Next Steps

Program Summary

Objectives : To transform the market so that high efficiency refrig. or A/C are the norm in five years.

(since 1995 and 1996)

Major Market Barriers :

- Availability on EE models (A/C, Refrig)
- Customer Information on relative EE (A/C, Refrig)
- Price (A/C)

Strategies : Promote the use of efficient refrig. and A/C (label#4 and #5) over the standard ones (label#3) by obtaining voluntary agreements with manufacturers to affix labels in exchange for EGAT's promotion supports.

Program Summary -- Refrigerator Labeling

- Commenced in 1995 with focus on residential refrigerators.
- Negotiation with 5 local manufacturers to initiate voluntary labeling scheme for single-door models. (dominant market share)
- Large public campaign to raise consumer awareness and aggressively promote level 5 label.
- In 1998, labels have been made mandatory for single-door models and EGAT has expanded to include two-door models for voluntary labeling.
- Starting in Jan 2001, the efficiency level for each of the 5 ranking categories was increased by 20% .

Refrigerator Efficiency Levels

Level 5 Annual electricity consumption is at least 25% below the mean consumption of tested refrigerators.

Level 4 Annual electricity consumption is 10% to 25% less than the mean consumption of tested refrigerators.

Level 3 Annual electricity consumption is within +/-10% of the mean consumption of tested refrigerators.

Level 2 Annual electricity consumption is 10% to 25% more than the mean consumption of tested refrigerators.

Level 1 Annual electricity consumption is at least 25% more than the mean consumption of tested refrigerators.

Rating Scale 1= low, 2=fair, 3=medium, 4==good, 5=very good

Rating of this appliance

"The label shows the efficiency of the electric appliance"

Type of appliance: Refrigerator (NON-CFC)

Efficiency : volume/kWh

Electricity cost per year

Electricity consumption : kWh/year

EGAT Logo

Program Summary -- Air Conditioner Labeling

- Commenced in 1996 with focus on room A/C (7,000-24,000 Btu/hr)
- Similar to refrigerator labeling but dealing with 55 manufacturers
- Product price differentials were significant, as a result;
  - interest free loan to customer
  - rebates to A/C retail shops
- Mandatory still not possible due to higher number of participating manufacturers.

A/C Efficiency Levels

Level 5	10.6	<	EER		
Level 4	9.6	<	EER	<	10.6
Level 3	8.6	<	EER	<	9.6
Level 2	7.6	<	EER	<	8.6
Level 1			EER	<	7.6

OLD

Rating for this appliance

"The label shows the efficiency of the electric appliance"

Type of appliance: Aircon

Size: X btu/hour

Produce name; model

EER btu/watt

Electricity price baht/year

Electricity use units/year

Logos from EGAT, MEA, PEA

"we can work together and save energy"

EGAT's Program Evaluation Framework

1997 Initial estimates by EGAT staff using engineering methods

1999 Consultants' supplemental evaluation work

An Independent Monitoring and Evaluation Agency (IMEA)

GEF requirement to assess validity and ensure that the GEF goals were met.

1998, 1999 and June 2000 Evaluation
Further analysis conducted in-house and has been accepted by IMEA

Assessed and Accepted by The World Bank ICR Mission

Evaluation Objective

- To quantitatively and qualitatively assess two EGAT's labeling programs in terms of energy and environmental impacts.
- Program Goals

	MW	*GWh*	*CO_2 reduction*
Refrigerator	27	185	not specified
Air Conditioner	22	117	not specified

Evaluation Methods - Engineering Estimates

- **Engineering Algorithms Share Similar Features**

  GWh savings = Number of units * saving per unit * hours of operation * (1-free rider rate)

  Peak MW Reduction = Number of units * saving per unit * coincident peak factor * (1-free rider rate)

- **EGAT's spread-sheet monthly report since 1997 provided quantitative estimates of program impacts based on assumptions and program data tracking.**

Engineering Estimates Monthly Report
Comparison of Savings Target and Achieved to Date as of June 2000

Based on Afternoon Peak (2:00 p.m.)

PROGRAM	Launch Date	Savings Target (1998)		Achieved To Date		Percent Achieved		CO_2 Reduction (Tons)
		MW	GWh	MW	GWh	MW	GWh	
Lighting	Sept. 1993	139	759	628.84	2,373.85	452%	313%	1,771,157
Refrigerator	Sept. 1994	27	186	72.96	532.63	270%	286%	397,401
Air Conditioner	Sept. 1995	22	117	44.66	679.28	203%	581%	506,818
Motor	Dec. 1996	30	225	0.21	1.23	1%	1%	918
Commercial Building	Oct. 1995	20	140	8.20	23.50	41%	17%	17,530
TOTAL		**238**	**1,427**	**755**	**3,610**	**317%**	**253%**	**2,693,824**

Note : 1. Cost Effectiveness of DSM Program

- Estimated Total DSM Expenditures to Date = 1,814.50 million Baht
- Cost of Peak Demand Saving = 2,403.69 Baht/kW
- Cost of Energy Saving = 0.5026 Baht/kWh

2. Lighting Program

	MW	GWh
• Fluorescent Tube	627.55	2,279.96
• CFL	-	2,279.69
• Low-Loss Ballast	1.29	5.78
• HPSV Street Light	-	16.48

3. Commercial Bldg. Program

	MW	GWh
• Fluorescent Tubes & Reflectors	1.14	3.47
• CFL	6.58	20.03
• Thermal Energy Storage at EGAT	0.48	-

Calibration of Engineering Estimates 1

- **Surveys, Interviews, and Metering Study by Consulting firms**

	Refrigerator	A/C
Survey Samples		
participant	247	216
non-participant	229	209
Metered Samples (Hours of Operation)		
participant	75	64
non-participant	52	65
No. of manufacturers interviewed	10	32
Mail questionnaires sent to distributors	-	170
In-person interviews with EGAT DSMO Staff		

Calibration of Engineering Estimates 2

- **Adjustments due to IMEA comments and spot-metered data**

Refrigerator Baseline

Before IMEA's comment — average value of efficiency tested before program (Nov. 1994) 485 kWh/year/unit

After IMEA's comment — market average efficiency in Jan. 1995 i.e. 435 kWh/year/unit

A/C Baseline

	IMEA Baseline EER	EGAT Baseline EER
Non-residential	8.0	7.6
Residential	8.3	7.6
Total	**8.2**	**7.6**

Calibration of Engineering Estimates 3

- **Adjustments due to EGAT's internal analysis and data**

Refrigerator

- Coincident peak factor based on maximum kW metered values (not average values).
- Adjusted new with-load consumption factor.

A/C

- Coincident peak factor based on maximum kW metered values (not average values).
- Separate A/C sales to residential sector (80%) and non-residential sector (20%) based on in-house telephone survey.

Final Analysis and Formally Reported Results (Calibration of Engineering Estimates 3)

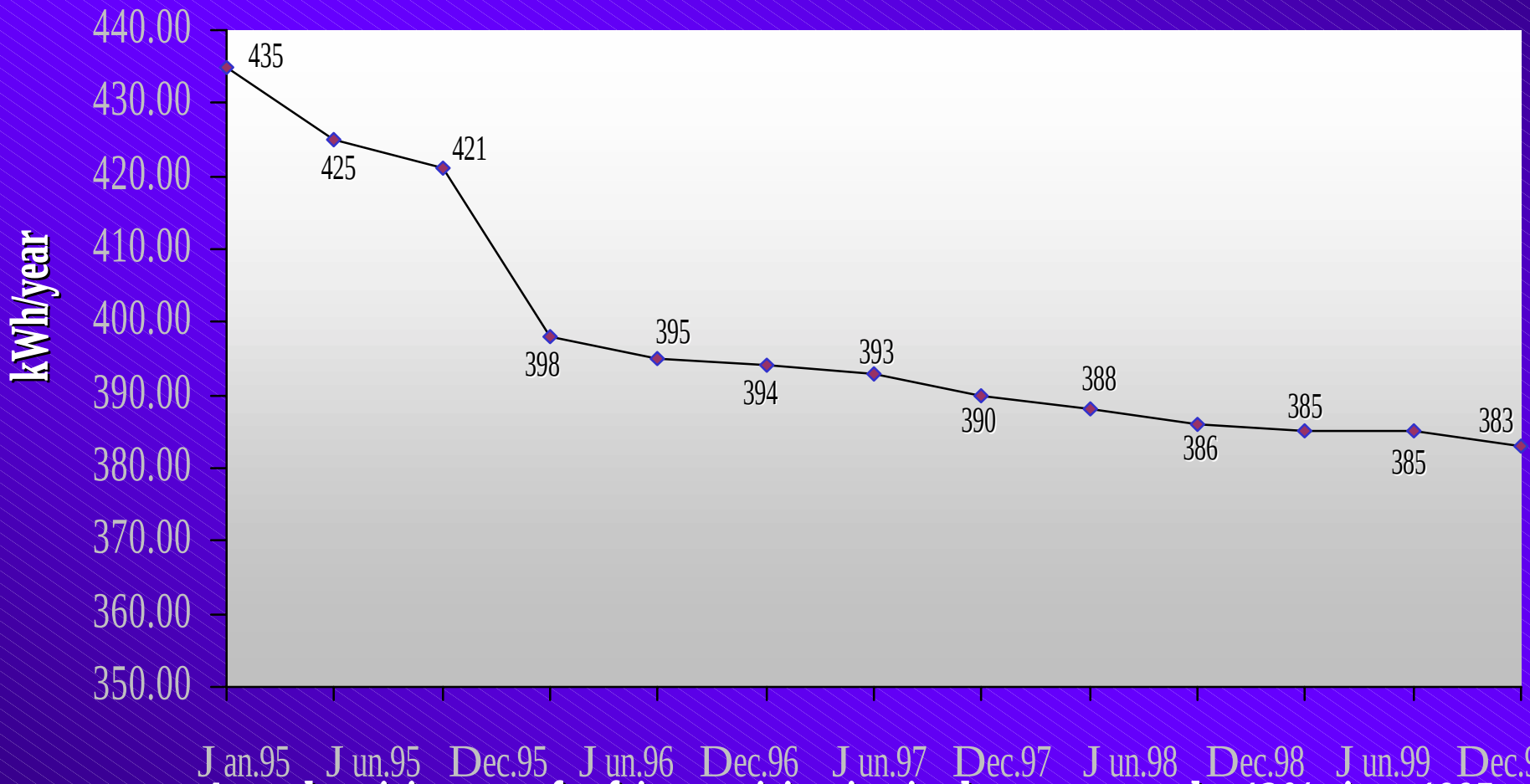
As of June 2000	Refrigerator	A/C
◆ Peak Demand Reduction (MW)	84	84
◆ Energy Savings (GWh)	849	318
◆ CO_2 Reduction (Tons)	627,365	235,314
◆ Benefit-Cost Ratio		
Participant Test	6.5	1.6
Utility Test	17.5	14.5
Total Resource Cost Test	1.6	1.1

Market & Process Evaluation

Refrigerator (single-door models)

- High consumer awareness
- 100% Market impacts for single-door models (~80% of total mkt)
- Consumers & manufacturers satisfied
- Improvements recommended
  - Testing speed and accuracy
  - Update labeling scheme
  - Target promotions to sales people

Average Electricity Consumption of Refrigerator in Program



Avg. electricity use of refrig. participating in the program by 12% since 1995.

Market & Process Evaluation

Air Conditioner

- High consumer awareness
- Manufacturers and consumers satisfied
- Retailers (Green Shops) were less satisfied due to inadequate market support by EGAT
- Market impacts from 19% (1996) to 38% (1998)
- Improvements recommended
  - Testing speed and capacity
  - Simplify loan program
  - Make labeling mandatory

Average EER. of Air Conditioner in Program

Avg. EER of A/C participating in the program ↑ by 2% since 1996.

Overall Program Impacts

- Capability building for program implementation & evaluation
- Domestic manufacturer awareness and capability to produce higher efficiency appliances
- Local testing capability improvement at TISI and MEA
- Introduction of Mandatory Energy Efficiency Standards by NEPO for six key end-uses by 2004 (Refrig., A/C, Electric Motors, Ballast, Fluorescent Lamps, Compact Fluorescents)

What was learned?

Implementation

- Program delivery is more effective for markets with few manufacturers and less price differentials.
- Efficiency and availability of testing facilities are important factors for effective delivery and continuity in operation.
- Voluntary labeling should be firstly introduced before extending to mandatory status of MEPS.

What was learned?

Evaluation

- Reliable pre- and post- program data such as baseline efficiency, market data, and end-use profiles are crucial to enable evaluators to correctly measure program impacts.
- Process evaluation is needed during early implementation to provide sufficient feedback to improve program delivery and program design.

DSM Five-year Plan & Labeling Programs

- Peak Demand and Energy Reductions Expected By Program (2001-2005)

Program	Peak Demand Reductions (MW)	Energy Saving (GWh)	B/C Ratios (TRC)
Refrigerator	108	1,095	1.78
Air Conditioner	102	388	1.26
CFL	30	173	1.11
Ballast	3	18	0.95
HEM	56	380	1.38
Total	**299**	**2,054**	**1.43**

- Labeling Programs primarily focus on residential sector and account for about 57% and 93% of total DSM peak demand & energy reductions target.