How Evaluation is to be Used by the Audiences in the Utility in case of EGAT, Thailand

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Abstract

In 1991, Thailand became the first Asian country to formally approve a countrywide demand-side management plan. In 1993, Thailand initiated a demand side management (DSM) program to help curb electricity demand growth and promote more energy-efficiency equipment and cost-effective energy services within the country. Since then, the Electricity Generating Authority of Thailand's (EGAT), also incorporating the DSM Office, has developed a portfolio of DSM measures targeting a wide range of sub-sectors and end-users, as a result EGAT was able to reduce the original energy peak use substantially, in such a manner that they repeatedly surpassed the energy saving targets. At present, more than 25 voluntary labeling DSM programs developed by EGAT are active and they still perform.

Impact evaluation of these programs was conducted through a series of studies using engineering analysis methods and calibration of significant parameters. These programs were adjusted from time to time, to maintain persistence of energy saving. In early 1997, the internal development of a monthly reporting procedure provided preliminary estimate of program impacts based on engineering assumptions and program data tracking. Followed by a more independent evaluation during 1998-2000 by a consulting firm, comprehensive evaluations by using survey research and end-use metering studies were conducted. From mid-2000 onwards, a standard evaluation procedure was installed, were the EGAT internal staff conducted the evaluations monthly.

DSM program evaluations can have multiple audiences. These audiences are the various stakeholders in a DSM program. The evaluation output is disseminated through the stakeholders in/ and outside EGAT. This paper focusses on the communication issue inside EGAT. After long experiences of conducting DSM evaluation, it was found that there's limited understanding at many levels of the meaning of the reports. As a result, for some years energy savings are not as high as could be achieved in some areas, with a waste of time and resources as a result.

This paper tries to provide an in-depth understanding of what likely happens to the DSM involved parties in the EGAT-utility. It seeks to discuss possible directions of communication about DSM evaluation towards stakeholders including the utility's decision makers, the executive and staff of DSM program planning/ implementation, the system planner and the related officers. Also the way of disseminating evaluation output information and the role of the evaluator are discussed. Finally the lessons learned from EGAT's DSM evaluation experiences are described and a set of recommendations is given.

Keywords

Evaluation output, Communication, Demand-side management, Stakeholders, DSM programs.

Introduction

The Electricity Generating Authority of Thailand (EGAT) is Thailand's leading state-owned power utility responsible for electric power generation and transmission for the whole country. In 1991, Thailand became the first country in Asia to adopt a national demand-side management (DSM) Master Plan. By a resolution of the Cabinet of the Royal Thai Government, the Demand Side Management Office (DSMO) was created within EGAT with the legal mandate and authority to implement DSM programs in the electric power sector.
EGAT's DSM programs Commenced in 1993 with financial support from 3 sources in the first 7 years of operation (1993 – 2000), which are the Global Environmental Facility (GEF), Japan Bank for International Cooperation (JBIC), and funding through a tariff mechanism (Ft). The initiated US$ 189 million EGAT's DSM program aimed to help curb electricity demand growth by promoting the use of more energy-efficient equipment and cost-effective energy services within the country.[1] Since then, the Electricity Generating Authority of Thailand's (EGAT) DSM Office has developed a portfolio of DSM measures, targeting a wide range of sub-sector and end-users, and substantially surpassed the reduction of the original peak energy use. A DSM program evaluation can have multiple audiences. These audiences are the various stakeholders[1] in a DSM program. We define stakeholders as not only the people who have a stake in the program, either through their involvement in the program activities, but also when they are affected by the program. In this paper, we focus on the audience inside the utility, including utility personnel and utility regulators.

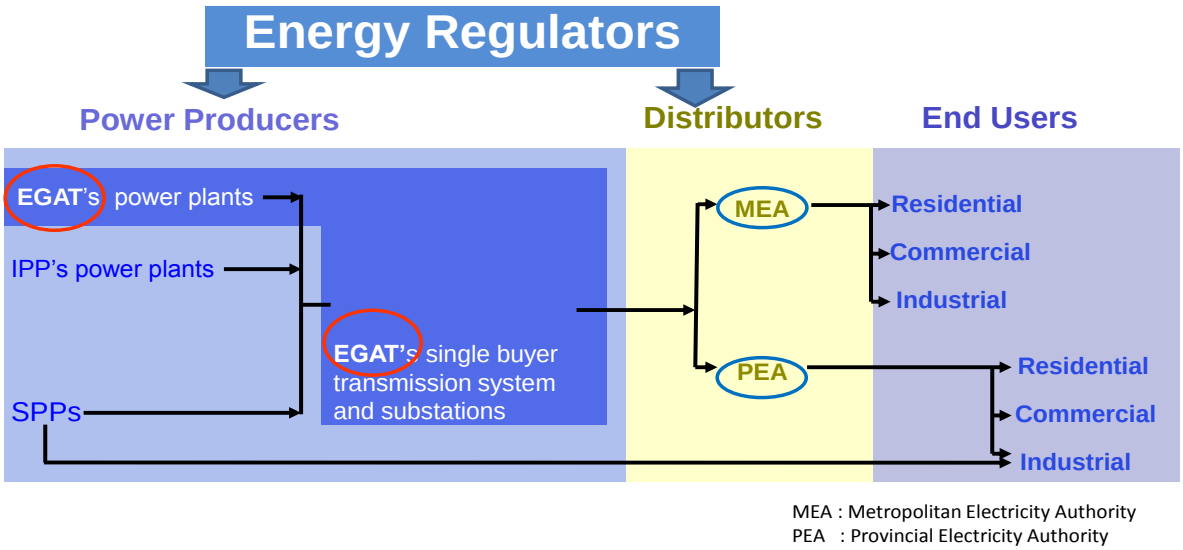


Figure 1. Power System Structure, Thailand

[1] Customers, utility personnel, trade allies, regulators, personnel at other utilities and research colleagues

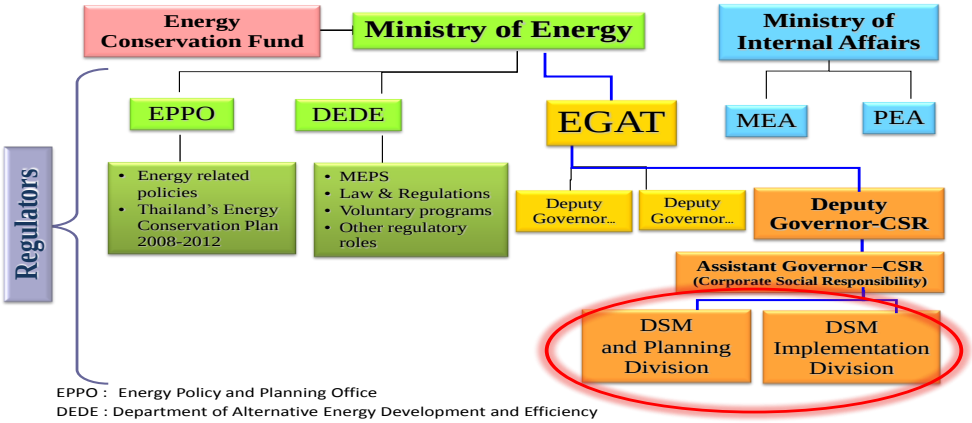


Figure 2. Thailand's DSM Structure within the Thai energy governance structure.

DSM program

The DSM program contains several subprograms in the commercial, industrial and residential sector. For instance, for the commercial sector, EGAT has focused on promoting design and construction of energy efficient building, facilitating installation of load control system, and replacing low efficiency appliances with high efficiency ones. For the industrial sector, EGAT has taken many energy conservation measures to reduce energy cost and provided energy consultant services. For the residential sector, the voluntary labeling DSM programs (in which Energy Label No.5 is given to home appliances that meet the efficiency rating) is a common information program for devices. EGAT has communicated the message of electricity cost with its customers not only through electricity bills, but also through energy efficiency labels. EGAT developed a product efficiency labeling approach, where participating brands carry a label which indicates the efficiency measure by a rating 1-5 (where 5 indicates very energy efficient), annual kWh consumption and energy saving estimates. This label is used for many applications already. At present, there are more than 25 labeled products.

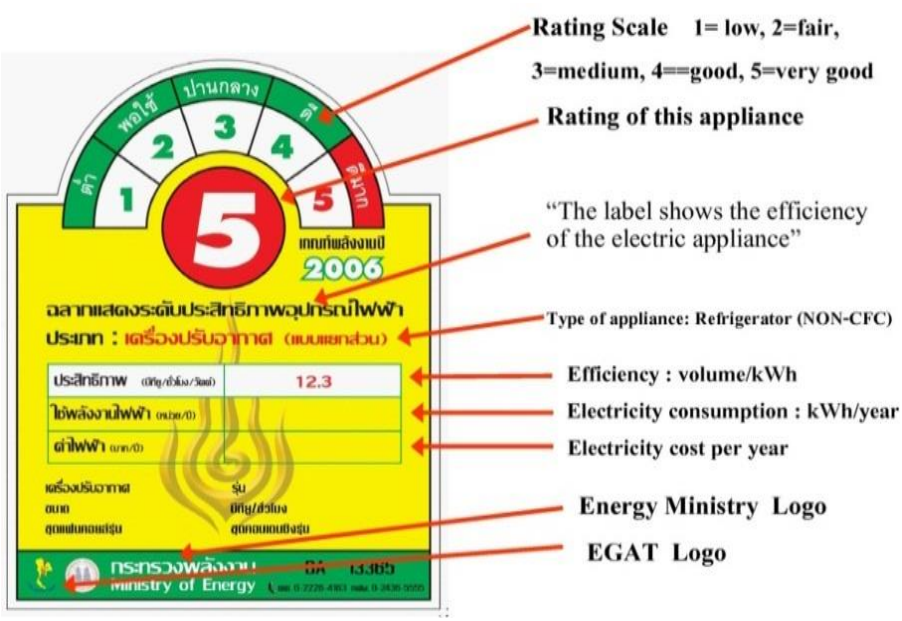


Figure 3. Example of EGAT's Energy Label No.5

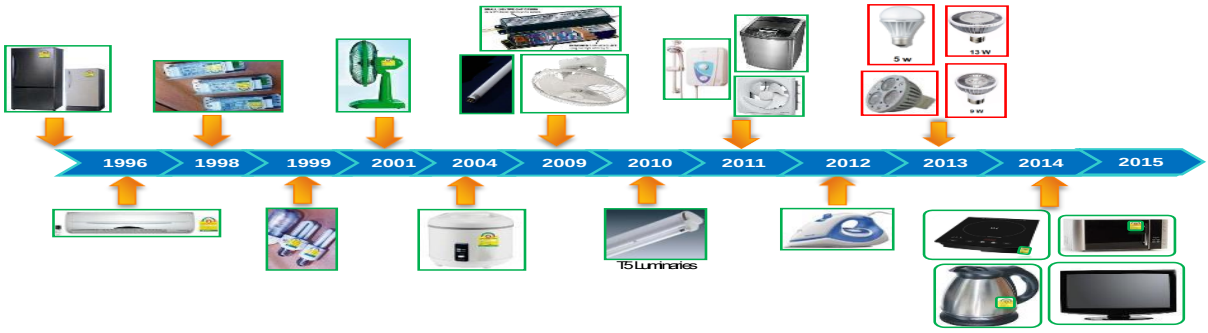


Figure 4. EGAT's Voluntary Labeling DSM Program

The energy efficiency evaluation Process

Systematic evaluations of EGAT's DSM programs started in 1997. EGAT relied on engineering estimates to determine demand/ energy savings attributed to each DSM program. The original evaluation plan called for increasing the precision of these estimates with supplemental data and information from survey research and end-use metering studies. As such, in 1999, EGAT hired consultants to conduct additional evaluations on the initial DSM programs through 1998. The GEF also requested the use of the Independent Monitoring and Evaluation Agency (IMEA) to assess the validity of the evaluation results. The IMEA provided recommendations for improvements. EGAT conducted the training upon the in-house staff of DSM office. The evaluation staff of EGAT has had a training in evaluating the results of the DSM. The consultants provided extensive training and technical transfer. They assisted in the data development and analysis step by using energy simulation model. Based on experience gained from the consultant works, the evaluation staff of DSM Office conducted 1999 through June 2000 evaluation work in-house. The result was subsequently audited and accepted by the IMEA.

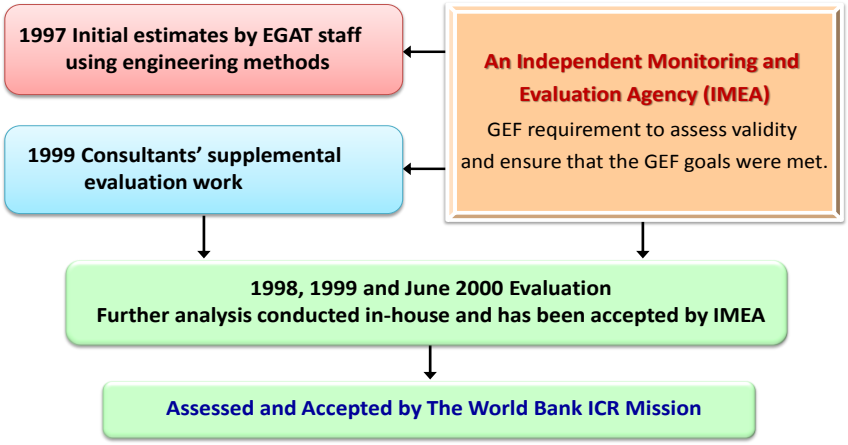


Figure 5. Evaluation**:** Process of Verification

The evaluations have been performed and adjusted from time to time to maintain focus on energy saving. During 2014-2015, EnConLa (King Mongkut's University of Technology Thonburi) was hired as a third party consultant to conduct a study in order to review the evaluation methodology and process of evaluation. The finding shows that the methodology is appropriate however revision of parameters especially for key parameters (especially for baseline) is needed for labeling programs in accordance with the situation change. It is planned to implement this year.

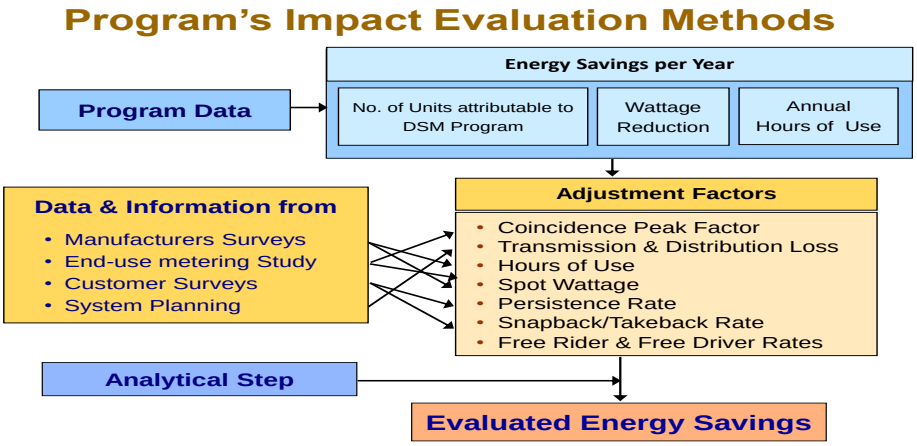


Figure 6. Evaluation Method of EGAT's Voluntary Labeling DSM Program

Impact Evaluation Methods

Engineering analysis is the method used to estimate demand reductions and energy savings for DSM programs.

Calibrated Engineering Estimates(Generation Level)

kWh Savings	=	No. of Units X Watt Saving per Unit x Hours of use per year x (1+ %Transmission & Distribution line loss) x (1 - other adjustment factor)
kW Reduction	=	No. of Units X Watt Saving per Unit x Co-incident Peak Factor x (1+ %Transmission & Distribution line loss) x (1+% Reserve Margin) x (1 - other adjustment factor)
Avoided CO_2 Reduction	=	kWh savings x emission factor*

* *CO_2 emission factor for Thailand's power sector in 2010 is **0.51** kg CO_2/kWh, from **Study of greenhouse gas emission factors for Thailand's electricity generation** by Thailand Greenhouse Gas Management Organization (TGO)*

Figure 7. Impacts Evaluation Methods

EGAT's DSM program has been internationally recognized as a successful program. Over 20 years, the DSM program's operation plans and implementation strategies have been continuously adjusted as a result of evaluations. EGAT's DSM program has proven real achievement. As of December 2015, according to program monitoring and evaluation, the DSM program was estimated cumulative to reduce peak demand with 4,002.8 MW, reach energy savings of 23,702 Gwh and emissions reductions of 13.69 million tonnes of CO_2.[2]

Evaluation output: Program Products

It is necessary to develop a range of products that could suit several categories of users and that could be developed and delivered in sequence during the work of a task. The program's products will include:

- Reports from the ongoing work(Minutes from Experts meetings, compilations of presentations, questionnaires)
- Publications of results (analysis, overviews and conclusions that might be accompanied by background material)
- Workshops and presentations at workshops and conferences
- Databases
- Software for calculations, simulations
- Training seminars and courses

EGAT's DSM program product include :

- Monthly report
    - kWh Saving
    - kW Reduction
    - Avoided CO_2 Reduction
    - Cost effectiveness of the DSM program
    - Dashboard with graphs
- Monthly Tracking report (Actual versus Expected trend)
    - Comparison of kW Reduction and expected target
    - Comparison of avoided CO_2 reduction and expected target
- Yearly process evaluation report
    - Labeling Display report : The market survey report on the use of label.
    - Random sampling & Testing report (MVE)
- Process/ Market evaluation report (from time to time)
    - Information on the price, market share, sales, customer satisfaction and other data for key appliances : T5, CFL, LED.
- Database
    - Database for (partial) MVE
    - Database for Impact evaluation (on-going development)

As part of each of the subprograms undertaken, (parts of) the reporting and documentation structure, as described above, needs to be implemented. Careful consideration is needed to decide what information is suitable for the different stakeholders. And also continuously reviewing of the dissemination process for improvement purposes is necessary. The evaluator should explicitly state what products they intend to deliver and preferably do so in a special Dissemination subtask that will be an integral part of their work. Each product is suitable for different stakeholders with different objectives at a proper time. A utility establishes its DSM objectives. These objectives guide the DSM assessment process and determine which programs are implemented/ improved. EGAT conducts program evaluation activities. These typically include two types of evaluation: process and impact. Process

evaluations review the effectiveness of the program's management and execution procedures, trade-ally involvement, the program's influence on the market place, and customer satisfaction with the program. Impact evaluations examine the customer participation rates and the program's energy and demand impacts for each target market.

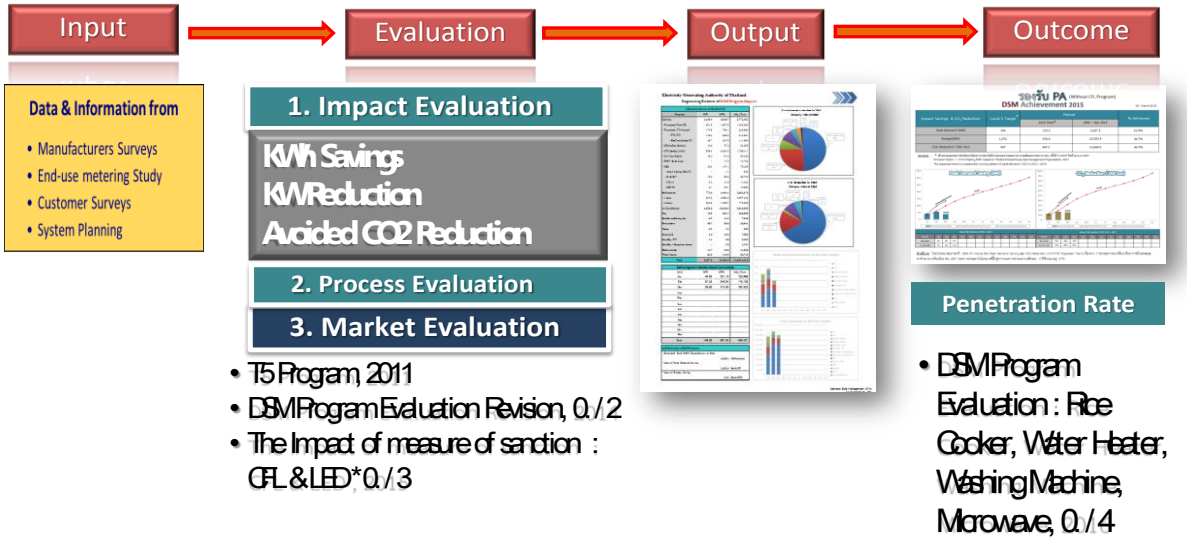
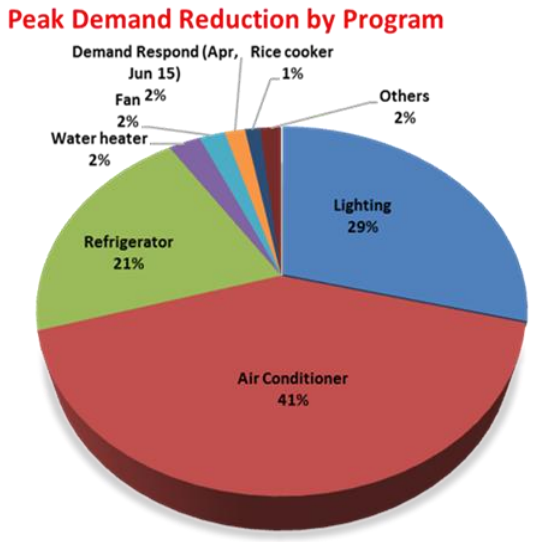


Figure 8. Dimension of EGAT' DSM Evaluation

Results of Program Implementation

Achieved to date (as of Dec 2015)			
Program	MW	GWh	CO_2 (Ton)
Lighting	1,163.3	6,514.4	3,847,975
- Fluorescent Tube (T8)	401.5	1,957.5	1,446,682
- Fluorescent T5 Program[1]	175.0	794.5	426,305
- FTL (T5)	129.2	586.5	314,391
- ElecTronic Ballast T5	45.8	208.0	111,914
- CFL(before labeling)	10.0	57.2	42,295
- CFL(labeling 2008)	521.5	3,380.7	1,749,308
- Low-Loss Ballast	18.3	91.8	60,479
- HPSV Street Light	-	17.2	12,723
- LED	36.9	215.5	110,183
Refrigerator	825.4	4,720.2	2,949,534
Air Conditioner	1,649.6	11,380.8	6,341,943
Fan	82.4	713.7	363,739
Double oscillating fan	7.5	17.4	9,078
Rice cooker	48.4	62.8	32,106
Motor	0.2	1.2	909
Comercial	2.6	10.3	7,583
Standby - TV	1.1	3.8	2,025
Standby - Computer screen	-	2.3	1,241
Eleltric kettle	15.9	25.3	12,922
Water heater	101.4	135.6	69,322
Iron*	5.0	8.7	4,470
Washing Machine*	15.1	40.9	20,913
TV*	18.4	64.1	32,781
Microwave*	0.9	0.3	139
Demand Respond (Apr, Jun 15)	65.5	0.2	1
Total	4,002.8	23,702.0	13,696,679



Cost Effectiveness of DSM Program	
- Estimated Total DSM Expenditures to Date	5,221.8 Million baht
- Cost of Peak Demand Saving	1,304.5 Baht/kW
- Cost of Energy Saving	0.22 Baht/kWh

Figure 9. Monthly Impact Evaluation Report

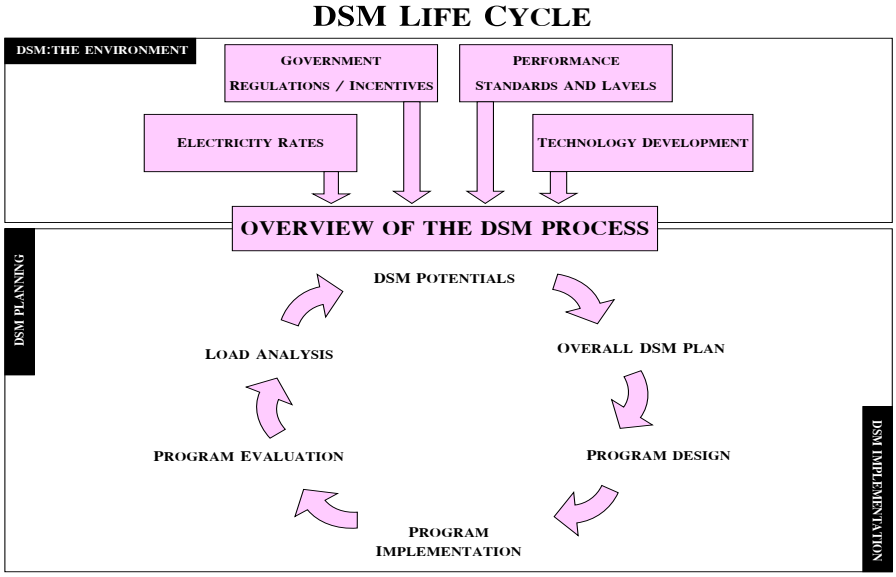


Figure 10. Evaluation: DSM work cycle

Using the results

The intention of the reports is to make use of the evaluation results to improve processes to reach the energy savings target. The evaluator together with decision makers use the evaluation results to assess program performance. In this step, the evaluator prepares and presents the evaluation findings, and should undertake activities to facilitate the use of the findings.

Conducting the evaluation yields estimates of program effects or process evaluation findings. The evaluator judges whether the findings indicate that the program objectives are at the end of the year being met. In general, utility decision makers use the evaluation results to decide the ways in which a program has been successful and the ways in which it needs to be improved. The evaluator conducts activities to serve these ways. Ideally, the evaluator already will have explored methods by which the program or processes can be improved. (for instance by implementation of a more effective marketing approach). The evaluator then develops recommendations.

The evaluator typically documents its analysis in a report that should include 4 basic elements:

- Statement of the program objectives that the evaluation is assessing.
- Methodology
- Findings and conclusions
- Suggestions for future research

Perhaps the **greater challenge** the evaluator faces is the need to facilitate the use of the evaluation findings. Many evaluators are disappointed to see that their evaluation reports aren't used as much as they like and are so to say "sitting on the shelf". With the recommendations unimplemented and the basic findings unknown. Peter Rossi, a noted evaluator, states, "Successful evaluators are those who have made clear to themselves, and to their sponsors and program staffs, how the evaluation is to be used and its level of application."[3]

It is an evaluator's job to encourage program stakeholders to use the evaluation results. The list below presents various methods the evaluator can use to improve chances to reach this goal.

Possible ways to improve the Use of Evaluation Results

- Identify users early in the evaluations and formulate the information easy accessible to these audiences;
- Ask staff about how they use information;
- Contact users frequently, especially during question formation and maintain contact with users during the evaluation;
- Study program components that users can control;
- Include plans for utilization and dissemination of results as part of the evaluation design;
- Ensure that results are timely and available when needed;
- Provide interim results;
- Translate findings into meaning and consequent action;

The evaluator should also keep in mind that policy and program change is often slow, itterative and incremental in nature. Consequently, the use of evaluation results is also often slow and incremental. Finally, some decision makers and program staff may not value evaluation results as highly as considerations of feasibility and expedience.

Case Study : EGAT's DSM Program Evaluation

For EGAT's DSM and Planning Division & DSM Implementation Division the impact evaluation is one of the key indicators to measure its performance. Impact evaluation is reported and disseminated by the program evaluators monthly to the utility manager and utility regulator, EGAT's decision makers. Many years ago it was decided that the impact evaluation indicator of the DSM program is *the* indicator by which DSM is evaluated and receives its budget on.

Normal Situation

If the evaluation results exceed the target, this means that the DSM office (DSM and Planning Division and of DSM Implementation Division) showed good performance. Consequently, DSM office is rewarded by a higher budget allocation than in case the result was below target.

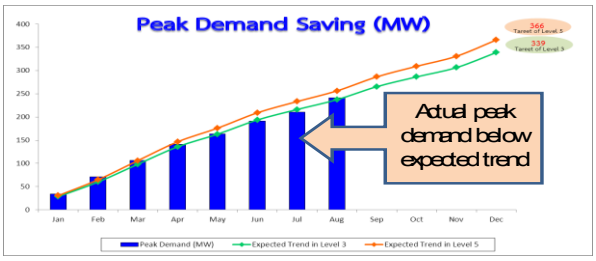
Mostly, the evaluation results exceed target. The impact evaluation report is monthly disseminated to related EGAT regulators, managers and staffs for over 20 years now and contains relatively little new information, because every time again the results exceed target. The risk of repeatedly bringing good news, is that the audience perceives the reports as 'no new information' so no feedback returns to the evaluators. As a result evaluators get the impression that the reports are hardly read let alone used. End up so to speak 'at the shelves'.

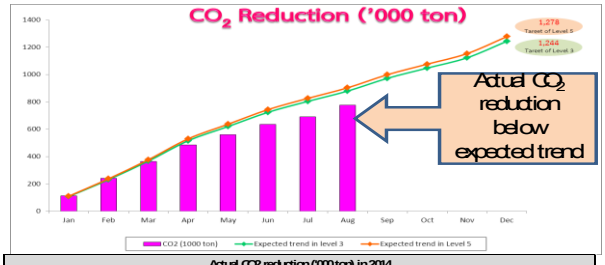
Critical Situation

A few years ago, in 2013-2014, there was a situation that the evaluation results were below target. This had tremendous effect on the performance and the budget of the DSM office. In early 2013, the reports already contained signs that the results tended to be lower than the target by the end of the year. At that time, the evaluator informally informed the utility regulator, the EGAT manager (the director of 2 divisions) and the DSM program implementation staff. He did so to speak his work. In mid-2013, that sign was explicitly clear and the evaluator formally informed the decision makers. It was however too late for action. Most of the involved parties had the question "Why did the evaluator evaluate the results below target?" They misunderstood that evaluator and evaluation were the point. However, for the evaluator, it seems like that "There is a gap for improvement rather than there is an issue to blame anyone". As a result of the 2013 lessons the evaluator in 2014 continuously tracked the evaluation results by creating a monthly tracking evaluation report by making comparisons between expected and actual results (see shown in figure 11).

In early 2014, signs showed that the evaluation results again tended to be lower than the target. At that time, the evaluator early informed the key audiences. In this case, the level of interest from utility regulator, EGAT managers was high. They had feed-back, comments and worries on the evaluation results. The monthly tracking report helped all the audiences to know that the actual results were still below the target. By using the comparison of actual results and monthly expected targets (trend), it is explicitly clear and easy to understand the situation. For the second half of the year, though the DSM managers and DSM program implementation staff started to recognize the problem and tried to set a new strategy. However, the process to take action and to implement a new strategy in order to pull the results to the right direction, took time. Action therefore was not in time and the results in 2014 did again not meet target.

Impact Savings & CO_2 Reduction	Target		Period		% Achieved	
	Level 3	Level 5	2014 (Jan – Aug)	Start up – Present (Aug 2014)	Level 3	Level 5
Peak Demand (MW)	117	144	241.2	3,448.6	71.2%	65.9%
Energy (GWh)	2,433	0,500	1,516.1	20,607.2	62.3%	60.6%
CO2 Reduction ('000 ton)(	/,244	/,278	775.2	12,114.4	62.3%	60.7%





Actual Peak Demand (MW) in 2014												
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
By month	35.0	36.7	37.1	34.4	28.0	24.8	22.0	23.3				
As of month	35.0	71.7	108.8	143.2	171.2	196.0	218.0	241.2				

Actual CO2 reduction ('000 ton) in 2014												
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
By month	115.4	126.4	129.6	120.8	81.8	75.0	61.6	64.5				
As of month	115.4	241.8	371.4	492.2	574.0	649.0	710.6	775.2				

Figure 11. Monthly Tracking Report

Present Situation

In 2015, the situation returned to evaluation results exceeding target. This situation again evoked the old response of the audience that everything was okay. Stakeholders tend to think again that there was no problem. The evaluator however perceived the situation far

differently. Though the overall evaluation results (integrated programs) exceeded target, some subprograms showed results still below target. One of the subprograms that failed to reach target, is the LED-program. A program that is considered to be very important because of its potential of energy-savings.

In 2016, this situation continued. It became clear that while the market of LED is growing, the number of LED users is decreasing. So this subprogram needed serious attention.

To come to improvement the evaluator tries now to work more closely with the key stakeholders. This leaves the opportunity for the key stakeholders to take action and come to a new strategy in time. A strategy that hopefully will turn around trend towards reaching target again before the end of the year.

On-going Situation

The development of evaluation has occurred from time to time to maintain persistence of energy saving. During 2014-2015, a third party consultant was hired to conduct a study in order to review the evaluation methodology and process of evaluation. As mentioned early, the finding shows that the methodology is appropriate however revision of parameters especially for key parameters is needed for labeling programs in accordance with the situation change. In 2016, the updated parameters will be fully applied to impact evaluation. Consequently, the overall impact saving will decrease about 40%.[4]

Discussion of results and Recommendations

The critical situation in 2013-2014 turned out to stimulate the audiences to pay more attention to the evaluation results but it was only for a short time. Awareness enhancement should be created through the communication by the evaluator continuously. For the on-going situation, when all findings are applied to come to a meaningful evaluation. It is a challenge for the evaluator to inform the audience about the effect and what happens. After using updated parameters especially for new baseline, impact saving is expected to decrease. This is due to the fact that the baseline is higher than that in the past. Then, the gap of saving of that appliance is smaller which will have an effect on the overall saving. It can imply that the implementation of the DSM program for more than 20 years can help improve the energy efficiency of appliances in the market. In this case, this information is needed to be explained to the stakeholders carefully.

From the case study, it was found that there was limited understanding. As a result, it causes inadequate improvement in some related areas of the DSM program. The evaluator should anticipate that some program stakeholders will not be happy with the findings. “Evaluation results often threaten entrenched interests”. Evaluation always has an adversarial relationship with some parties.

The common facilitating the use of evaluation results are mentioned early in “Using the Results”. In addition, we learned that the recommended ways to communicate the audiences are as follows:

- Disseminate results through informal meeting, oral briefing, and media presentations.
- Write final reports with brief and nontechnical executive summaries that contain recommendations for taking action.
- Circulate results to other researchers and people interested in the issue.
- The creation of a monthly tracking report is an example of translating findings into action. Each utility can create a tool like a report to monitor its problem.

- The verification of evaluation from a third party is needed to maintain persistence of the results. Third party meeting is the channel to send messages to the utility regulator and DSM manager. It is a very important way of dissemination. To create trust among key audiences, professional organization is the representative of the evaluator to speak.
- Concrete source of fund is needed for effective evaluation.

Conclusion

DSM program evaluations reports have multiple audiences. These audiences are the various stakeholders in the DSM program. The evaluation output is disseminated to stakeholders in and outside EGAT. In this paper we only considered the dissemination of the report information inside EGAT.

Careful consideration is needed to decide what information is suitable for the different stakeholders and to ensure that results are timely and available when needed. The greater challenge the evaluator faces is the need to facilitate the use of the evaluation results. Many evaluators are disappointed to see their evaluation reports "sitting on a shelf" It may fall to the evaluator to promote the use of the evaluation findings throughout the utility. In this case, the evaluator is the responsible party to take steps to disseminate the evaluation findings among the potential users and to work with those users to come to a strategy to use the results in their activities to improve energy savings.

The way to facilitate the use of evaluation results should be with more focus and repeated action as often as possible. In addition, a professional organization as a third party can speak the thing as the representative of the evaluator to create trust among key audiences. Awareness enhancement for potential audiences should be created through the communication by the evaluator in order to drive the program forward to meet target. When the evaluation results do not meet the target, the evaluator has to present himself in a way that "There is a gap for improvement rather than there is an issue to blame anyone". The positive and negative feed-back from the audiences is needed. Whenever the potential audience realizes that the evaluator is one of the team, there is a chance to take action to improve the program together.

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