DEMAND SIDE MANAGEMENT BEST PRACTICES GUIDEBOOK

FOR PACIFIC ISLAND POWER UTILITIES

July 2006

Prepared for:
South Pacific Applied Geoscience Commission (SOPAC)
United Nations Department of Economic and Social Affairs (UNDESA)

SOPAC

Prepared by:
International Institute for Energy Conservation (IIEC)

IIEC

https://www.kontrolkalemi.com/forum/

Table of Contents

https://www.kontrolkalemi.com/forum/

Preface

"Reliable, safe and affordable access to efficient power for all Pacific Island communities" is the overarching goal of the Power Sector as stated in the Pacific Islands Energy Policy.

Electricity production in the Pacific region is considered as one of the highest energy consuming sectors. Tariff rates in the region are also considered high in comparison to other developing countries. This has been attributed to the limited access to advanced electricity production technologies, limited options and high cost of renewable energy technologies, high fuel costs and other factors such as access to funds for capital expansion. Power Utilities on the other hand have continued to generate electricity in order to cater for the increasing demand by the economies and societies.

The current increasing costs of fossil fuel have not in anyway made electricity production cheaper. This has set the platform for Power Utilities to seek alternate strategies such as investment into renewable energy technologies and work towards optimizing demand side consumption. Demand Side Management (DSM) as it is usually referred to, has been earlier introduced to the region however the concept has not been fully accepted or applied due to a number of constrains.

The recent UNDESA funded Pacific DSM Project has clearly indicated that many Power Utilities in the region do not regard DSM as an important activity within their core-business of generating electricity. The lessons learnt, including those from initial DSM initiatives, have prompted the development of this guidebook.

The guidebook is published with the view to promoting DSM in the region by providing a methodology in the form of a series of phases and offers options that will contribute to and assist in developing and implementing DSM programmes. Examples of good DSM practice are elaborated through a series of case studies from other parts of the world. It anticipated that the guidebook will inspire Pacific Power Utilities to seriously consider DSM as a complimentary activity to just continuing to increase electricity generating capacity.

Funds for the publication of the guidebook have been made possible through UNDESA.

https://www.kontrolkalemi.com/forum/

Acknowledgements

The International Institute for Energy Conservation (IIEC) has been privileged to have assisted in the implementation of the Pacific Island Demand Side Management Programme. IIEC acknowledges the support provided by several agencies and individual electric utilities in the implementation of the programme. These include:

- The United Nations Department of Economic and Social Affairs (UNDESA)
- Energy Section of the Community Lifelines Programme at the South Pacific Applied Geoscience Commission (SOPAC), Suva, Fiji.
- The Pacific Power Association (PPA)
- Fiji Electricity Authority (FEA)
- Electric Power Corporation (EPC), Samoa
- Fiji Department of Energy (FDOE)

https://www.kontrolkalemi.com/forum/

Executive Summary

The International Institute for Energy Conservation (IIEC) has developed this Guidebook as part of the Pacific Island Demand-Side Management (DSM) initiative, a programme funded by the United Nations Department of Economic and Social Affairs (UNDESA). The purpose of this Guidebook is to facilitate the development, financing and implementation of Demand-Side Management (DSM) projects in the Pacific Island Countries (PICs), by providing guidelines for DSM programme development and documented international DSM case studies. This Guidebook introduces the DSM concepts, gives the reader a perspective on the DSM opportunities in the PICs and provides a compendium of case studies from different sectors and countries and a proposed methodology for implementation of DSM in the Pacific Island utilities.

https://www.kontrolkalemi.com/forum/

Acronyms

CFL	Compact Fluorescent Lamp
CO2	Carbon Dioxide
DSM	Demand-Side Management
ECF	Energy Conservation Fund
EE	Energy Efficiency
EGAT	Electricity Generating Authority of Thailand
EMCAT	Energy Management Consultation and Training
EPC	Electric Power Corporation, Samoa
ESCO	Energy Services Company
GEF	Global Environmental Facility
FEA	Fiji Electricity Authority
GHG	Greenhouse Gas
GWh	Gigawatt Hour
HEM	High Efficiency Motors
HP	Horsepower
HPS	High Pressure Sodium Lamps
IFC	International Finance Corporation
IIEC	International Institute for Energy Conservation
IPP	Independent Power Producers
KWh	Kilowatt Hour
LCC	Life Cycle Cost
LPG	Liquefied Petroleum Gas
M & E	Monitoring & Evaluation
MU	Million Units (Electricity)
M & V	Monitoring & Verification
MW	Mega Watt
NGO	Non-Governmental Organization
NPV	Net Present Value
PIC	Pacific Island Countries
PPA	Pacific Power Association
SOPAC	South Pacific Applied Geoscience Commission
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
WB	The World Bank

https://www.kontrolkalemi.com/forum/

Chapter 1 Introduction

1. Introduction

As with other developing countries the Pacific Island Countries (PICs) have experienced significant increase in electricity demand and as a result greater emphasis is now being placed on DSM and energy conservation activities. Most PICs are reliant on imported fossil fuel for electricity generation and are more vulnerable to the impacts of high oil prices. DSM offers significant benefits to PIC utilities, their customers and the PIC economies. From a utility perspective, in addition to reducing supply costs, DSM benefits also includes deferral of capital expenditure on generation, transmission and distribution facilities, improved system load factor, better customer relations and better data for load forecasting and system planning.

Utilities have several options of improving system efficiency and these are summarized in Fig 1.1.

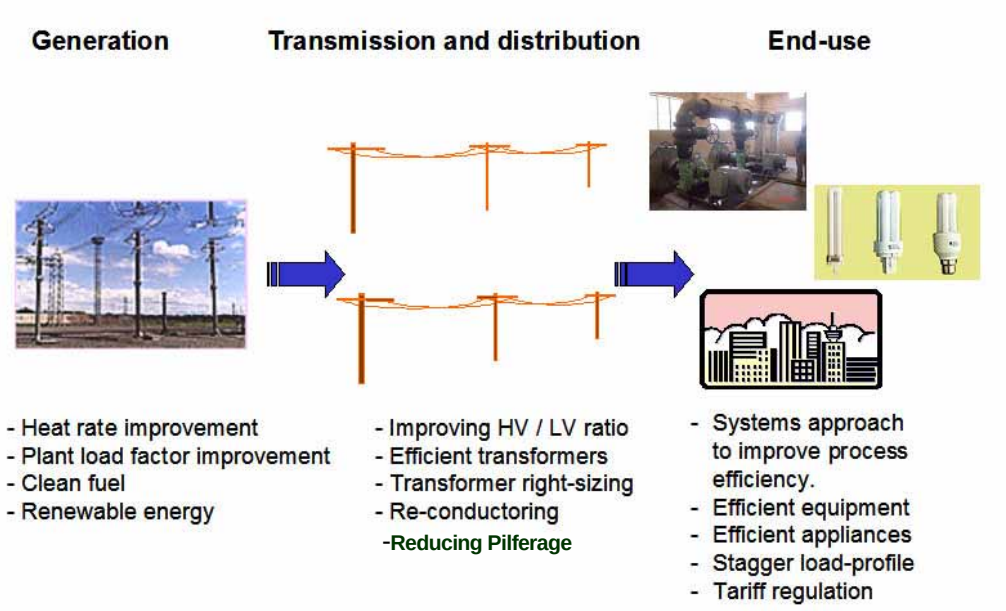


Fig. 1.1: Efficiency Opportunities in Power Distribution

The PICs were first introduced to DSM activities through the United Nations Development Programme (UNDP) funded "Support to the Pacific Islands Power Sector Project" undertaken during 1993-1996 implemented through the Energy Division of the Forum Secretariat in coordination with the Pacific Power Association (PPA). DSM assessments were conducted in ten PIC utilities – PNG Electricity Commission (Elcom), Fiji Electricity Authority (FEA), Marshall Islands Energy Company (MEC), Palau Public Utilities Corporation (PUC), Solomon Island Electricity Authority (SIEA), Tonga Electric Power Board (TEPB), Samoa Electric Power Corporation (EPC), Te Aponga Uira O Tumu-Te-Varovaro, Cook Islands (TAU), Kirabati Public Utilities Board (PUB) and Tuvalu Electricity Corporation (TEC). The cost effectiveness of DSM programs using a variety of end-use technologies was evaluated, as applicable to each of the utilities' individual characteristics. Nine cost effective DSM programmes were identified with a total peak demand saving potential of 21 MW across the ten utilities with an equivalent energy savings of 90 GWh/year by 2000. Under this project a DSM Analysis Manual for the PIC utilities was published and distributed to all utilities to assist them in programme development.

https://www.kontrolkalemi.com/forum/

In 2003, the second phase of the DSM Project was initiated with funding from UNDESA and implemented by SOPAC and the International Institute for Energy Conservation (IIEC). This programme focused on implementing pilot DSM programmes in selected PICs. The programme was aimed to be a practical exercise in the review, design and application of appropriate DSM technologies through the development of replicable demonstration projects. This Guidebook has been developed as a part of this project.

This Guidebook aims to facilitate the adoption of end-use efficiency measures through Demand Side Management (DSM) approaches by utilities in the PICs. The concepts and rationale for DSM is covered in Chapter 2 and DSM potential and applicable programs for the PICs are highlighted in Chapter 3. Chapter 4 provides a generic model for implementation and evaluation of DSM programs in the context of PIC utilities and Chapter 5 gives an overview of successful DSM projects from across the world, from residential, commercial, agricultural, industrial and municipal sectors. The Appendix A provides details of relevant case studies

https://www.kontrolkalemi.com/forum/

Chapter 2 DSM Concepts / Rationale

2. DSM Concepts / Rationale

2.1 Definition and Rationale

Changing electricity markets in the developing and the developed countries face several challenges, largely due to the uncertainties in the load growth, higher investments required in capacity addition, declining fuel sources and its associated environmental costs. Tariff changes due to the changing regulatory stands also affect the ability of utilities to service its customer base. The concept of Demand-Side Management (DSM) was developed in response to the potential problems of global warming and the need for sustainable development, and the recognition that improved energy efficiency represents the most cost-effective option to reduce the impacts of these problems.

DSM refers to cooperative activities between the utility and its customers (sometimes with the assistance of third parties such as energy services companies and various trade allies) to implement options for increasing the efficiency of energy utilization, with resulting benefits to the customer, utility, and society as a whole. Benefits of the DSM initiatives are diverse, as outlined in Table 2.1 below.

Customer benefits	Societal benefits	Utility benefits
Satisfy electricity demands	Reduce environmental degradation	Lower cost of service
Reduce / stabilize costs	Conserve resources	Improve operating efficiency, flexibility
Improve value of service	Protect global environment	Reduce capital needs
Maintain/improve lifestyle and productivity	Maximize customer welfare	Improve customer service

Table 2.1: DSM Benefits

The implementation of DSM programs is likely to:

- Improve the efficiency of energy systems – through improved generation efficiency and system load factor
- Reduce financial needs to build new energy facilities (generation) – through deferral of capital expenditure resulting from peak demand reduction through DSM
- Minimize adverse environmental impacts – reduction of GHG emissions through efficient generation and minimizing thermal generation.
- Lower the cost of delivered energy to consumers – lower generation costs and lower customer bills through the use of energy efficient equipment and appliances.
- Reduce power shortages and power cuts – improved system reliability though decrease in demand.
- Improve the reliability and quality of power supply – through demand reduction in distribution systems
- Contribute to local economic development – increased employment through reallocation of capital to other development projects.

2.2 DSM Planning and Implementation

DSM programs are utility and customer specific. Figure 2.1 describes various steps involved in implementing a DSM programme.

https://www.kontrolkalemi.com/forum/

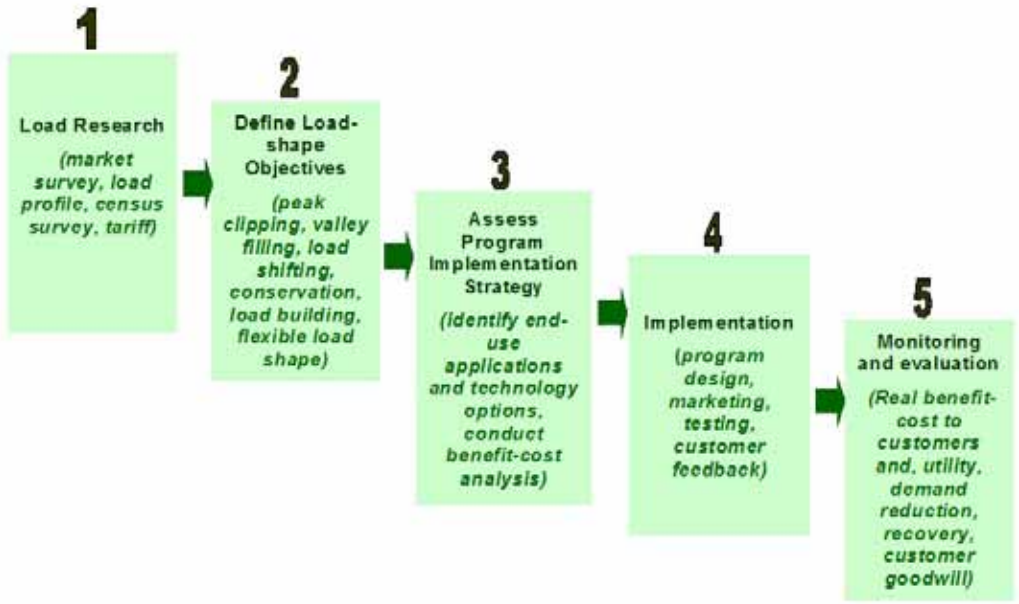


Fig.2.1: Steps in typical DSM Programme Planning

Step 1: Load Research

This stage in the DSM implementation will typically assess the customer base, tariff, load profile on an hourly basis and will identify the sectors contributing to the load shape. This step will also identify the tariff classes in the utility, current recovery from different sectors and current subsidy offered to different sectors. Data types and sources required for Load Research is given in Fig 2.2.

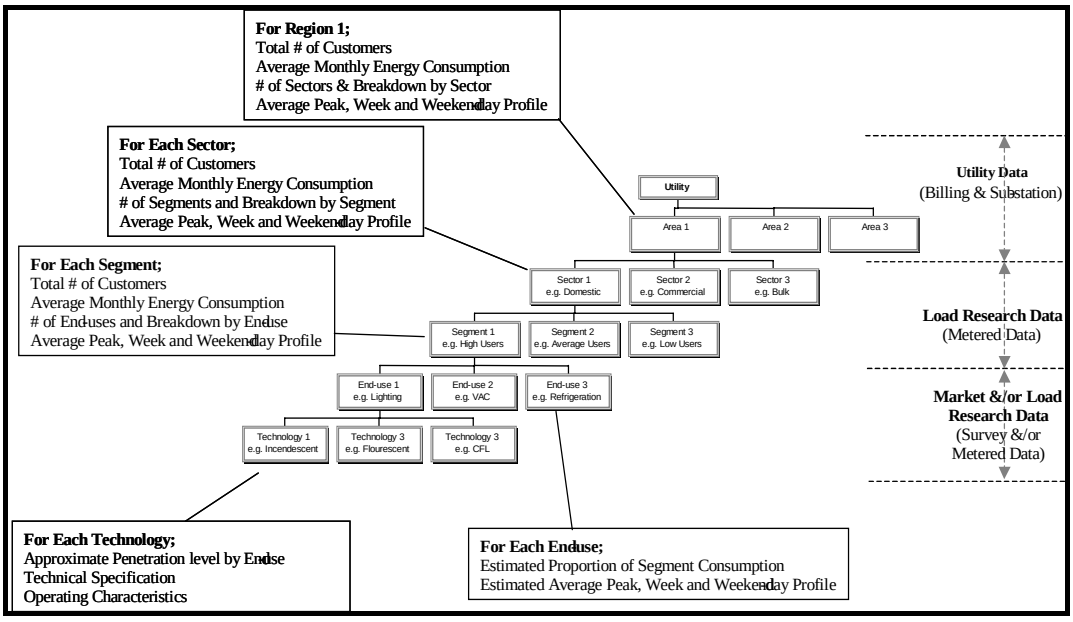


Fig 2.2: Data Types and Sources required for Load Research

https://www.kontrolkalemi.com/forum/

Step 2: Define Load-shape Objectives

Based on the results of the load research in the utility, DSM engineers will define the load shape objectives for the current situation. Various load-shape objectives - **Peak Clipping** (reduction in the peak demand), **Valley Filling** (increased demand at off-peak), **Load Shifting** (demand shifting to non-peak period), and **Load Building** (increased demand) are possible. These are represented in Figure 2.2.

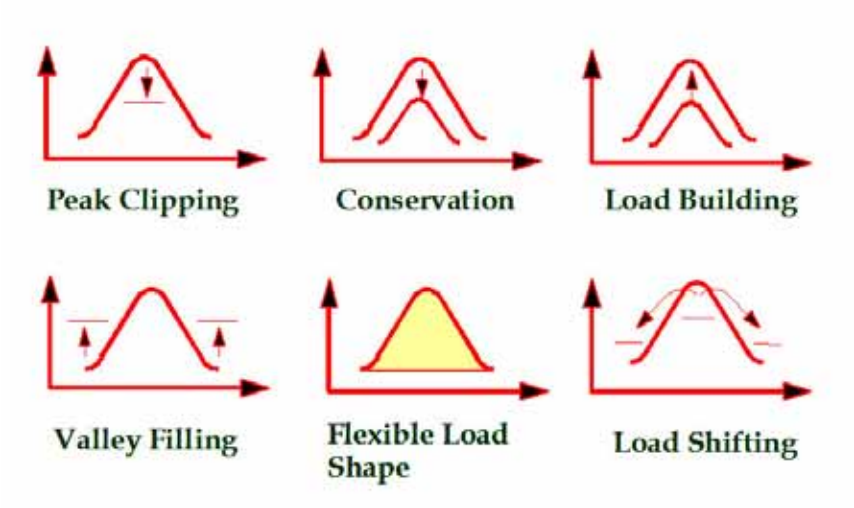


Fig.2.2: Load-shape Objectives

Specific descriptions of load-shape objectives are shown in Box 2.1.

Box 2.1: Definitions of Load-shape Objectives

- Peak Clipping — the reduction of utility load primarily during periods of peak demand
- Valley-Filling — the improvement of system load factor by building load in off-peak periods
- Load Shifting — the reduction of utility loads during periods of peak demand, while at the same time building load in off-peak periods. Load shifting typically does not substantially alter total electricity sales.
- Conservation — the reduction of utility loads, more or less equally, during all or most hours of the day
- Load Building — the increase of utility loads, more or less equally, during all or most hours of the day
- Provision of a more Flexible Utility Load Shape — refers to programs that set up utility options to alter customer energy consumption on an as-needed basis, as in interruptible/ curtailable agreements.

Step 3: Assess Programme Implementation Strategies

This step will identify the end-use applications that can be potentially targeted to reduce peak demand, specifically in sectors with higher subsidies. This step will also carry out a detailed benefit-cost analysis for the end-users and the utilities, including analysis on societal as well as environmental benefits.

Step 4: Implementation

Implementation stage will design the programme for specific end-use applications, will promote the programme to the target audience through marketing approaches such as advertising, bills and inserts, and focused group meetings as in case of the industrial sector.

https://www.kontrolkalemi.com/forum/

Step 5: Monitoring and Evaluation

This step will track the programme design and implementation and will compare the same with proposed DSM goal set by the utility. A detailed benefit-cost analysis in this case will include identifying the avoided supply cost for the utility vis-à-vis the total programme cost for the utilities and benefits to the participants including the reduced bills or incentives to the end-users.

2.3 DSM Technology Options

Identification of suitable and practical DSM options requires study of users and end-uses of electricity. An understanding of end-uses of electricity helps identify end-use options that offer maximum DSM potential. While study of users and end uses of electricity offers to identify generalized DSM option i.e. which end-use and/or which customer sector and/or segment to be targeted. The need for more specific option, for the purpose of DSM implementation, would require identification of alternatives. In other words listing of all available options that can replace existing conditions in order to achieve DSM objectives is required.

The base technology generally refers to the standard or most commonly used technology within the geographical boundaries of a utility. In other words base technology is the present technological status of the end use being targeted for DSM. In contrast the alternative technology is the candidate efficient technology intended to replace base technology in order to achieve DSM objectives. There can be a number of alternative technologies which can replace base technology. In order to select an option for implementation purpose, all the alternative technologies must be compared against the screening criteria that form the basis of estimating DSM potential. The alternative technology option that most closely fulfils the screening criteria is selected and based on its relevant attributes anticipated DSM potential is estimated.

Some alternate technology that could be considered in the PICs is given in Table 2.2. It should be noted that it is not an exhaustive listing.

Table 2.2: Alternate DSM Technologies

Domestic	Commercial	Industrial
CFLs	*CFLs*	*CFLs*
High Efficiency Fluorescents	*High Efficiency Fluorescents*	*High Efficiency Fluorescents*
Day Lighting	*Day Lighting*	*Day Lighting*
Low Loss Ballasts	*Low Loss Ballasts*	*Low Loss Ballasts*
Efficient Fans	*Delamping*	*Delamping*
High Efficiency ACs	*High Efficiency ACs*	*High Efficiency ACs*
High Efficiency Refrigerators	*High Efficiency Refrigerators*	*High Efficiency Refrigerators*
Gas Cooking	*Air Conditioner Maintenance*	*Air Conditioner Maintenance*
Efficient Rice Cookers	*Air Conditioner Timers*	*Air Conditioner Timers*
Orientation – New homes	*Efficient Security Lighting*	*Efficient Security Lighting*
Solar Hot Water Systems	*High Efficiency Motors*	*High Efficiency Motors*
	TOD Tariffs	*TOD Tariffs*
	Interruptible Tariffs	*Interruptible Tariffs*
	EE Building Code	*EE Building Code*
	Solar Hot Water Systems	*Cogeneration*
		Power Factor Correction
		Variable Speed Drives

https://www.kontrolkalemi.com/forum/

2.4 DSM Programme Design Guidelines

Typically a DSM programme design includes the following:

- Determination of the "base" and "DSM" technology
- Determination of the targeted market sector or segment
- Identifying all potential barriers and possible solutions (this may include incentives)
- Conduct a Technology Cost Effectiveness analysis
- Estimation of market penetration over the programme duration
- Evaluating programme marketing strategies
- Estimation of staffing resources and programme costs
- Developing an Implementation Plan (this include a Marketing Plan)
- Developing procedures for programme monitoring and evaluation

The overall programme design process is shown in Figure 2.3.

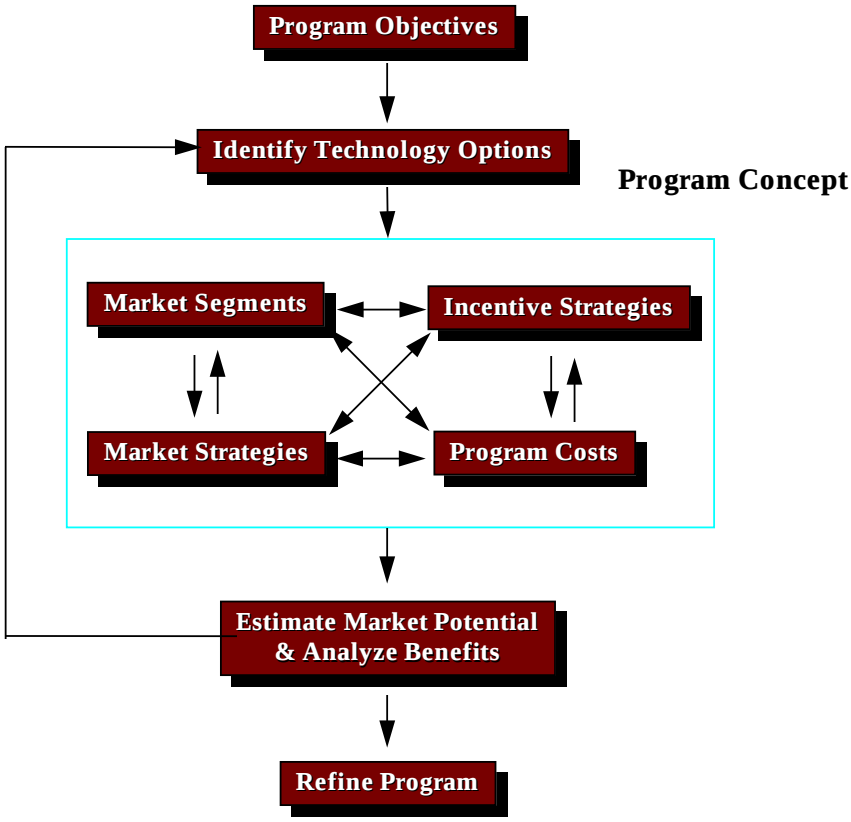


Figure 2.3: DSM Programme Design Process

https://www.kontrolkalemi.com/forum/

Chapter 3 DSM in Pacific Island Utilities

3. DSM in Pacific Island Utilities

3.1 DSM Potential

Under the UNDP funded project - "Support to the Pacific Islands Power Sector" (RAS/92/363) implemented from 1993 to 1996, DSM potential studies were conducted in 10 Pacific Island electric utilities. The study concluded that DSM offered significant benefits to PIC utilities, their customers and PIC economies. The UNDESA supported a follow-up programme aimed at assisting participating utilities in the implementation of pilot DSM projects and subsequent refinement into to full-scale programs.

The Pacific Island utilities with hydro capacity (PNG, Fiji, Solomon Islands and Samoa) are increasingly using thermal generation (diesel) to meet the ever increasing demand. The situation is compounded by the trend of higher oil prices and subsidised tariff structures. The utilities where generation is predominantly thermal the situation is far worse. All Pacific Island utilities could benefit from an aggressive DSM programme aimed at improving the system load factor (currently ranging from 45-60%) and sustaining the growth in demand.

3.2 Significance of DSM in Utility Operations

There is similarity in the system load shapes of the PICs and the utilities could be broadly categorised as "larger" and "small" based on the installed capacity. Recent studies conducted for some of the larger utilities (FEA, EPC) and small utilities (TEC) show distinctive load shapes as a result of increased commercial activity in the larger utilities. Typical load profiles for the two categories are given in Fig 3.1 and 3.2 below.

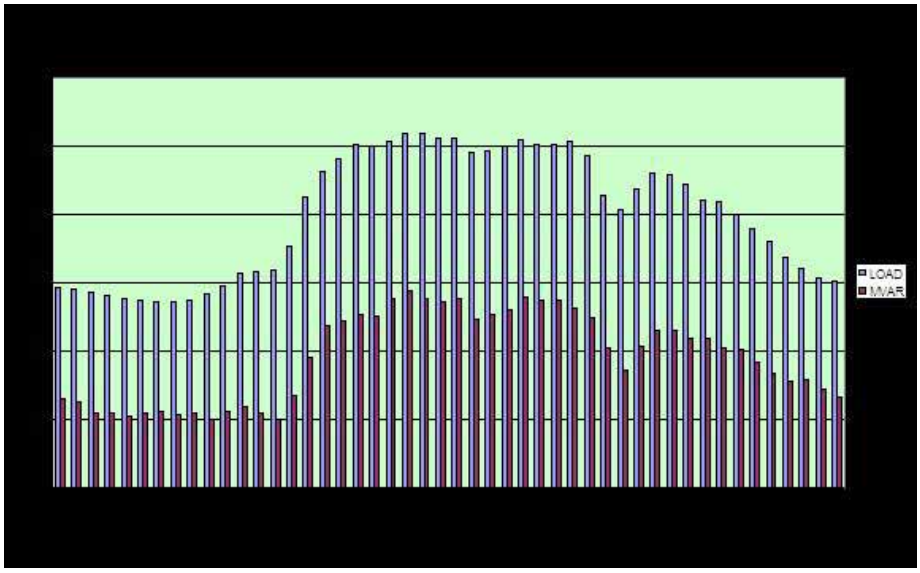


Fig 3.1: Larger Pacific Utility – Typical Load Profile

https://www.kontrolkalemi.com/forum/

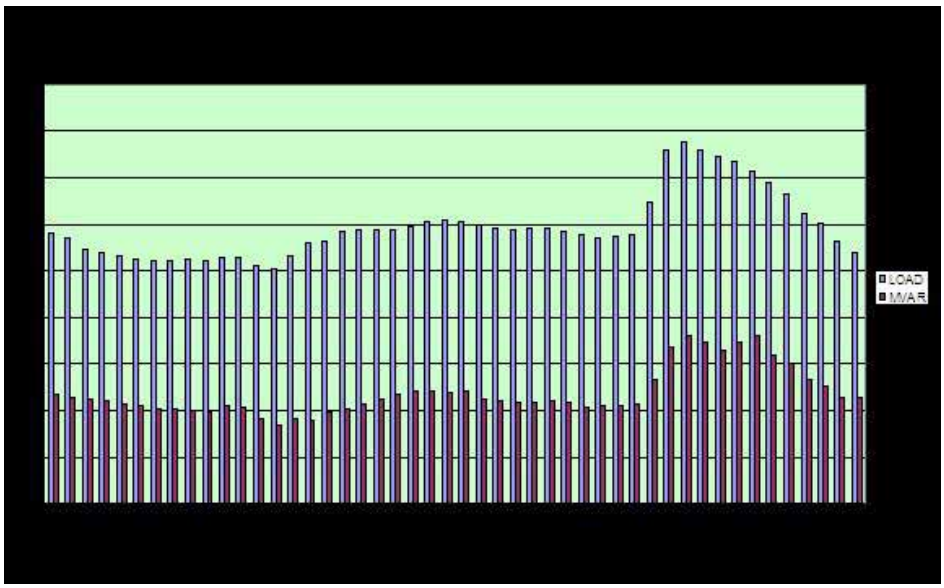


Fig 3.2: Smaller Pacific Utility – Typical Load Profile

In the case of the large utilities, the scope for DSM extends to all sectors (Industrial, commercial and residential) since they typically have two peak periods – a daytime peak attributed to commercial activity and an evening peak period attributed to the residential sector. In the case of the small utilities, residential activity is predominant and hence the system peak period is in the evenings and as a results DSM activities are normally focused on the residential sector.

3.3 Applicable DSM Programs

The UNDP Power Sector Project (1993-1996) identified nine DSM programs that would be applicable for the Pacific Islands. The proposed programs were:

- Compact Fluorescent Lamp (CFL) Programme
- High Efficiency Fluorescent Lighting Programme
- Refrigerator Labelling and Standards Programme
- Air Conditioner Labelling and Standards Programme
- Commercial Refrigeration Equipment Maintenance Programme
- Air Conditioner Equipment Maintenance Programme
- Interruptible Rates for Large Customers
- Energy Audit Programme for Large Customers
- Air Conditioner Timer Control Programme

Based on international experience other applicable programs include:

- Municipal Water Pumping Programme
- Street-lighting Programme
- Solar Hot Water Programme
- Time-of-Use Tariffs for Industrial and Commercial customers

https://www.kontrolkalemi.com/forum/

The Table 3.1 summarizes some of the key features of each programme.

Table 3.1 – Key Features of Selected DSM Programs

Programme	Key Features
Compact Fluorescent Lamp	Purchase CFLs in bulk from lamp manufacturer and sell to customers, allowing them to pay in installments through their electricity bills.
High Efficiency Fluorescent Lighting	Use lighting suppliers and trade allies to promote high efficiency fluorescent lamps and ballasts.
Refrigerator Labelling and Standards	Introduce energy labelling of fridges and freezers to enable customers to identify more energy efficient units. Establish minimum efficiency standard, and prohibit sale of fridges below this standard.
Air Conditioner Labelling and Standards	Introduce energy labelling of air conditioners to enable customers to identify more energy efficient units. Establish Standards minimum efficiency standard, and prohibit sale of air conditioners below this standard.
Commercial Refrigeration Equipment Maintenance	Provide information and advice to customers through brochures and on-site visits on methods to ensure refrigeration equipment is running as efficiently as possible.
Air Conditioner Equipment Maintenance	Provide information and advice to customers through brochures and on-site visits on methods to ensure air conditioning and ventilation equipment is running as efficiently as possible.
Interruptible Rates	Provide financial incentive for customers with Interruptible loads to switch these loads off, during times of system peak.
Energy Audits	Conduct energy audits to identify cost-effective energy efficiency opportunities for large customers. Assist in financing and implementing the opportunities identified.
Air Conditioner Timer Controls Programme	Purchase Programmable Timer Controls in bulk and sell to customers with air conditioners, (perhaps through trade allies) allowing customers to pay for the timer in installments.
Municipal Water Pumping	Use of High efficiency motors and pumps and Variable Speed Drives (VSDs) for water pumping
Street Lighting	Use of High Pressure Sodium Vapor Lamps in place of Mercury Vapor Lamps
Solar Hot Water Systems	Use of Solar hot water systems in place of electrical systems
TOU tariffs	Having differential tariffs for system peak and off-peak periods to encourage load shifting from peak to off-peak

https://www.kontrolkalemi.com/forum/

The target market sectors for the above programs are given in Table 3.2.

Table 3.2 – Target Markets for DSM Programs

Programme	Residential	Commercial & Industrial	
		Small	Large
Compact Fluorescent Lamp	×	×	
High Efficiency Fluorescent Lighting	×	×	×
Refrigerator Labelling and Standards	×	×	
Air Conditioner Labelling and Standards	×	×	
Commercial Refrigeration Equipment Maintenance		×	×
Air Conditioner Equipment Maintenance		×	×
Interruptible Rates			×
Energy Audits			×
Air Conditioner Timer Control Programme		×	×
Solar Hot Water Systems	×	×	
TOU Tariffs			×

3.4 Conceptual DSM Programme Designs

The key features of the DSM programs are summarised below.

Compact Fluorescent Lighting Programme

Programme Objective	This programme aims to encourage customers to install compact fluorescent lamps (CFLs) to replace existing incandescent lamps in areas of high usage.
Programme Description	A compact fluorescent lamp (CFL) uses approximately one-quarter the energy of a standard incandescent lamp, while providing equivalent lighting output and they last much longer than incandescent lamps. The first cost of these lamps is much higher and this barrier needs to be addressed in the programme design. There are several options available which include: • Payment in installments through the electricity bill; • Discounts offered by lamp suppliers or electric utility • Rebate from electric utility The programme needs to incorporate an advertising campaign to improve customer awareness. In addition, utility endorsement of the product is also important for the customers to have the confidence in participating in the programme. The CFLs promoted through a utility sponsored programme should ensure high lamp quality backed up by warranty of a minimum of one year. There are several examples of similar DSM programs that have been implemented (or being implemented) in the region, namely, Sri Lanka, Thailand, India and Vietnam. Hence, the strategy is to learn from international experience and design a programme customized to the situation in the specific country.

https://www.kontrolkalemi.com/forum/

Sample Programme Marketing Materials	

High Efficiency Fluorescent Lighting Programme

Programme Objective	The aim of this programme is to promote the following fluorescent lighting technologies: ▪ 18 and 36 Watt fluorescent lamps to replace 20 and 40 Watt lamps, in existing buildings ▪ Low-loss ballasts (3-4 Watts) to replace standard ballasts (10- 12 Watts), in existing buildings
Programme Description	Fluorescent lighting has a very high penetration in the industrial and commercial sector. The most common types of fluorescent lighting are the 4 foot, 40 Watt tubes and the 2 foot, 20 Watt tubes. The 40 Watt lamp can readily be replaced with a 36 Watt lamp with the same lighting output, without any modifications. Similarly the 20 Watt lamp can be replaced with an 18 Watt lamp. The current retail prices of the high efficiency lamps are similar or slightly lower than the standard lamps and hence, financial incentives would not be required. The main barriers to the installation of technologies are seen to be lack of knowledge and lack of availability of these products. This programme will look at using trade-allies such as lighting suppliers and installers to provide/promote these technologies to their customers.

Refrigerator Labelling and Standards Programme

Programme Objective	The aim of this programme is two-fold: ▪ To introduce Energy Labelling of refrigerators (and freezers) enabling customers to differentiate refrigerators on the basis of their energy consumption, and ▪ To remove the most inefficient refrigerators (and freezers) from the market, by establishing a minimum energy performance standard, which manufacturers will be required to meet, in order for their appliance to be allowed into the country.

https://www.kontrolkalemi.com/forum/

Programme Description	Developments to increase the efficiency of refrigerators include improved compressor efficiency, higher insulation levels, redesign of the refrigeration cycle, reduced capacity of resistance defrosting heaters and improved controls. Many manufacturers are already taking steps to include these measures in their refrigerator design, resulting in refrigerators that use less electricity. Unfortunately without energy labelling, consumers are not always able to identify higher efficiency fridges from the others. Two possible methods for implementing this programme are described below: ▪ Establishment of a Testing Laboratory -In order to be able to compare the energy performance of different refrigerators, the fridges need to be compared under identical conditions. A single testing laboratory could be established for all the Pacific Island nations, in one location, and refrigerator models that are imported to these nations from all over the world, would be required to be submitted to the lab for testing. Based on their performance, the units would be labelled, to provide consumers with information about the energy consumption of the fridge, under the test conditions. A labelling system such as the star- rating scheme used in Australia and New Zealand could be adopted. A minimum energy performance level could be established based on the performance of all the fridges being tested. ▪ Using Test Information from Other Countries. This method would require the programme to rely on the test results from the refrigerator's country of origin. Staff would need to monitor the efficiency levels of refrigerators of different sizes currently being imported and establish a minimum performance level on each country's testing scale, for each size range. For example, for fridges coming from Australia and New Zealand, any fridge sized 400-500 litres, that is rated three stars and below could be banned from being imported. Similarly all fridges below certain efficiency standard on the US testing scale could be banned. Refrigerator labelling is carried out in a number of countries, including the USA, Korea, Thailand, and minimum performance standards have been established in Japan. The programme could ensure each fridge had a label from their country, and publicize the labels on the fridges to make consumers aware that they can at least compare the efficiency of fridges coming from the same country.

Air Conditioner Labelling and Standards Programme

Programme Objective	This programme is very similar to the Refrigerator Labelling and Standards Programme. The aim of this programme is two-fold: • To introduce energy labelling of air-conditioners enabling Standards customers to differentiate between them on the basis of their energy consumption, and • To remove the most inefficient air-conditioners from the market, by establishing a minimum energy performance standard, which manufacturers will be required to meet, in order for their appliance to be allowed into the country. This programme will concentrate on room sized air-conditioners, as these have been most widely tested and labelled in other countries, and probably have a high penetration in both the residential and the commercial sector.
Programme Description	Room air conditioners are typically less than 2 tons of cooling capacity (7 kW), and come as either a single unit (in which the evaporator, condenser, compressor and fans

https://www.kontrolkalemi.com/forum/

	are combined in a single cabinet) or as a split system, which has the evaporator indoors, the compressor and condenser outside, and insulated pipes carrying refrigerant between the two. The efficiency of an air conditioner depends on the compressor, the coils used for heat transfer in the evaporator and condenser, and the control system or thermostat. Room air conditioner labelling is carried out in a number of countries, including Australia, New Zealand, the USA, Korea, the Philippines, Thailand, and minimum performance standards have been established in Japan. In the absence of energy labelling, consumers are often unable to identify higher efficiency air conditioners, even where they are available in the market. As a result, significant opportunities for cost-effective energy efficiency are missed. Two possible methods for implementing this programme are: ▪ Establishment of a testing laboratory ▪ Using test information from other countries. Both of these options were described in some detail under the Refrigerator Labelling and Standards Programme.

Commercial Refrigeration Equipment Maintenance Programme

Programme Objective	This programme aims to encourage improved maintenance of commercial sector refrigeration equipment, such as cool rooms, freezers, refrigerated display cases etc. through the provision of free advice from utility personnel. As refrigeration equipment typically operates 24 hours a day, good energy management practices will save significant amounts of energy.
Programme Description	Refrigeration equipment such as cool rooms, freezers and refrigerated display cases are widely used in hotels, restaurants, and food retail outlets. Although this equipment is usually on 24 hours a day, common practice is to only pay attention to the equipment if it breaks down. However a number of simple measures and tips could be provided to owners/managers of this equipment to ensure that the equipment is running as efficiently as possible. The programme pursuing utility could develop an attractive "user-friendly" booklet with information and tips to provide to their customers. In addition, trained staff members (or trade allies) could visit hotels, restaurants, supermarkets etc. to inspect refrigeration equipment and provide a list of recommended actions for the owner/manager to take. A brief flyer could be sent out with commercial customers' electricity bills informing them of the free service to check refrigeration equipment and identify opportunities to save energy and money off t their electricity bills. The service could be limited to customers over a certain minimum annual electricity consumption level. A contact telephone number could be made available so that customers could call the utility and book a time for a site visit. This flyer could be sent to groups of customers in stages so as to ensure that utility is not inundated with requests for assistance. Contact could also be made with restaurant and hotel associations. Presentations by the utility staff could be made to members of such associations on the simple improvements that can be made to refrigeration equipment typically found in their businesses. Case studies could be used to show how electricity bills dropped after improvements were made, using customers who had actually participated in the programme.

Air Conditioner Equipment Maintenance Programme

Programme Objective	This programme is almost identical in nature to the previous refrigeration maintenance programme, and aims to encourage improved maintenance of commercial sector air conditioning and air handling equipment through the provision of free advice from utility

https://www.kontrolkalemi.com/forum/

	personnel.
Programme Description	As with the refrigeration equipment, a number of simple measures and tips could be provided to owners/managers of air conditioning equipment to ensure that the equipment is running as efficiently as possible. Because of the diverse range of air conditioning systems, sizes and configurations, advice provided here would probably be more general, and targeted to smaller, simpler systems ie. room air conditioners, split systems, smaller packaged units and some ducting and air handling equipment. The utility could develop an attractive "user-friendly" booklet with information and tips to provide to customers. In addition trained staff members (or trade ally personnel) could visit offices, hotels, restaurants, shops etc. to inspect air-conditioning equipment and provide a list of recommended actions for the owner/manager to take. If this programme were marketed together with the refrigeration maintenance programme (if the relevant utility has identified both programs of significant importance) the same flyer could be sent out with commercial customers' electricity bills informing them of a free service to check both/either refrigeration and air conditioning equipment and identify opportunities to save energy and money off their electricity bills. As in the refrigeration maintenance programme; (1) the service could be limited to customers over a certain minimum annual electricity consumption level; (2) a contact telephone number could be made available so that customers could call the utility and book a time for a site visit; and (3) the programme flyer could be sent to groups of customers in stages so as to ensure that the utility would not be inundated with requests for assistance. Case studies could also be used showing how electricity bills dropped after improvements were made, using customers who had actually participated in the programme.

Interruptible Rates for Large Customers

Programme Objective	Many large customers of electricity are able to turn off specific loads during parts or all of the utility's peak period, without incurring large losses to their productivity. This interruption has no specific benefit to the customer unless an incentive such as a payment designed to offset the customer's inconvenience associated with having load switched off at the utility's request is provided. This programme looks at introducing an incentive for large customers to reduce some of their load during the peak period.
Programme Description	This programme would require the utility staff to contact larger customers and discuss the possibilities of their switching off certain loads during some or all of the hours from 8am to 4pm, on days when very high demands are anticipated. These loads could range from reducing (or switching off) corridor and passage lights in office buildings to switching off pumps or industrial process equipment. The programme set-up costs need to consider staff time, and some costs for establishing any new metering/wiring to record the demand reduction made by each participating customer. Several options are possible in how the utility would want to record customer's demand over the interruption period. These options range in cost and sophistication, from just using meter readers to read the kW meter at the end of the interruption period, to having the equipment that would be interrupted on a separate electrical circuit which could either be controlled by the utility manually, electrically or using radio wave control.

Energy Audit Programme for Large Customers

Programme Objective	This programme aims to identify cost-effective energy efficiency opportunities for large commercial and industrial facilities, and encourage these customers to take up these opportunities. The method of encouragement could be a full or partial loan to the customer from the utility to be paid back to the utility through the savings that are

https://www.kontrolkalemi.com/forum/

	achieved. Typically, larger customers have more complex, larger lighting and air conditioning systems or different types of energy-using equipment that needs a more customised approach in order to identify energy efficiency improvement opportunities.
Programme Description	This programme would require the utility staff to either conduct, or arrange for private firms to conduct, energy audits of the larger customers in utility region. Energy audits of this kind can take anything from one day to a week, sometimes with additional monitoring required over a longer period to get better data. These energy audits would be paid for by the utility. The audits would identify all the energy efficiency opportunities and list them in order of their costs and anticipated energy savings. Opportunities that are identified that could reduce energy usage at no or minimal cost to the customer should be implemented immediately, as part of the contract to conduct the audit. Measures that need larger capital expenditure will require more detailed discussions with the owner/manager of the facility. Experience has shown that although customers are usually willing to invest in improvements that will pay for themselves in 2 to 3 years (through electricity bill savings), they often do not have either (1) the initial capital to spend to implement the measures, and/or (2) the technical expertise or available time to arrange for and oversee the project. The utility staff will need to investigate each customer's situation and identify how much they are willing to spend, and how much the utility is willing to lend. The utility may also need to provide project management services as well as project financing. Establishing an ESCO within the utility for project implementation is one of the options to be considered.

Air Conditioner Time Controls Programme

Programme Objective	This programme would look at encouraging commercial customers with air-conditioning equipment, who do not need them to be on during the evening hours, to install timers so as to ensure that the equipment is not left running during this time. The utility could promote the use of timers by bulk purchasing timer controls and selling them to customers, allowing them to pay for them in installments. They could even make arrangements with local electricians to assist them in marketing the programme and installing the timers. The programme could be designed so that the installation cost is included in the installments payments for the timer.
Programme Description	Programmable time controls can easily be retro-fitted onto most types of air conditioning equipment and they ensure that the equipment only operates during the hours that it is required. Timers can reduce energy consumption and energy costs to the customer by ensuring that air conditioners are not running unnecessarily during non-business hours, such as overnight or on weekends and public holidays. Different timers allow pre-programming for different periods. Timers most commonly can be programmed for a week or for every day of the year. Multiple channel timers are also available so that other equipment, such as lights, photocopiers etc. can also be controlled. Most timers come with battery back-up and an override facility in case air conditioning is needed outside of the programmed hours. Case studies could be used showing how electricity bills dropped after the timers were installed, using information from customers who had actually participated in the programme. The pamphlets could contain a list of trade allies whom customers could contact if they were interested in having a timer installed.

3.5 Potential Regional DSM Programs

There are several DSM programs that would be applicable to most, if not all Pacific Island utilities. The issue is whether individual utilities have the resources to undertake these programs. Hence, there is a need to explore the feasibility of undertaking regional programs coordinated through SOPAC. Another possibility is the larger utilities providing assistance to

https://www.kontrolkalemi.com/forum/

the smaller ones in some aspects of programme implementation. The following programs come under this category:

a. Energy Efficient Lighting – Compact Fluorescent Lamps (CFLs)

All utilities experience an evening peak where residential lighting being the primary contributor. In the smaller utilities the evening peak is very significant resulting in lower system load factor. There are several case studies of utility sponsored CFL programs in Asia (Sri Lanka, India, Thailand and Vietnam) adopting different implementation models that would be applicable in the Pacific region. This programme is applicable for residential and small commercial customers who are normally are on subsidized tariffs. The FEA is promoting CFLs through a local retailer offering "2 lamps for the price of one". They are looking at the options of using their billing system to facilitate payment for CFL purchases in installments through electricity bills and opening the market to competition.

b. Energy Efficient Lighting – High Efficiency Fluorescent Tube Lighting (FTLs)

This programme is mainly applicable to large commercial customers (office buildings, hotels etc) and industrial customers; and to a lesser degree to residential customers. The programme aims to promote the use of high efficiency FTLs (36W and 18W) and low loss ballasts in place of standard FTLs (40W and 20W) and magnetic ballasts. The key feature of this programme is convincing the lighting retailers to import only high efficiency (HE) lamps. International experiences have shown that the HE lamps are slightly cheaper than the standard lamps. A public awareness campaign is normally adopted to educate the public of the benefits. Since these lamps are normally imported to the Pacific Islands, another option is to have import restrictions on the standard FTLs or impose higher duties.

c. Energy Auditing and Implementation Programme

This programme will evaluate all key end-uses (lighting, air conditioning, motors & drives and thermal applications) and target large industrial and commercial customers. The challenge is the ability of utility staff (or engineering consultants) to conduct investment grade energy audits and manage the implementation on behalf of the customer. Securing project financing is also considered to be a constraint.

Under the UNDP project, energy audit training has been provided to FEA and EPC. In the previous Pacific Islands Power Sector Project (PIPSP) a two week training programme was conducted for utility staff from PNG (former ELCOM), Fiji (FEA), Solomon Islands (SIEA), Tonga (former TEPB), Samoa (EPC) and American Samoa (ASPA); and comprehensive energy audit equipment kits were provided to the participating utilities. In a regional programme it would be possible to use the services of experienced engineers from the larger utilities to conduct audits in the smaller PICs.

d. Appliance Standards and Labelling Programme

Almost all residential appliances (refrigerators, freezers, air conditioners, lighting, washing machines etc) available in the PICs are imported. Adaptation of high efficiency appliances offers significant benefits to the customers and electric utilities. Baseline studies conducted under PIPSP in PNG, Tonga and Fiji concluded that a regional programme embracing all PICs was economically feasible. Fiji has since undertaken an S&L Programme initially focusing on refrigerators and air conditioners. There is consideration for including three other countries (PNG, Tonga and Cook Islands) in a pilot regional programme that could be eventually extended to all PICs.

https://www.kontrolkalemi.com/forum/

Chapter 4 DSM Implementation Strategy

4. DSM Implementation Strategy

4.1 Development of Implementation Plan

After the analysis has been performed, data collected, technologies selected and programme designed, the success of a DSM programme often hinges on the ability to deliver the programme to the customers — and to persuade the customers to actively participate in the programme.

A key challenge in successfully achieving DSM objectives is making the DSM programme design work successfully "in the field", that is, among customers. Customer acceptance and market penetration can vary significantly depending on how well the programme is carried out.

As might be expected, implementation is integrally linked to programme design. A poor programme design may be difficult to implement (such as when a key form is left out or important data left out of a form, or when the design fails to allow adequate time between programme steps). Similarly, a good programme design is likely to be easier to implement: steps are well thought out, people are well-trained, and processes flow smoothly.

However, the best programme design is likely to require some adjustment once the programme is actually implemented. It is rare that programme designers can think of everything the first time around!

A variety of delivery mechanisms are often available to assist in the implementation of utility programs. These include:

- in-house staff
- staff hired on a temporary basis to perform programme tasks
- market intermediaries (retailers, wholesalers, contractors, engineers, architects, etc)
- community groups
- outside consultants skilled in programme implementation
- government agencies

Keys to Successful Implementation

The keys to successful implementation are:

- start with good programme design
- respond to early information in the marketplace
- be flexible with the details of programme delivery
- learn from the experience of other utilities in the region

4.2 Development of Market Implementation Strategies

Types of Programme Designs

DSM programs can be typically grouped into four common definitions, each of which requires a different method of implementation:

https://www.kontrolkalemi.com/forum/

Information Programs – where the programme aims to address the lack of information available to customers about energy efficiency. The key programme elements are typically brochures or booklets and seminars. This is usually the base or required component of any programme design.

Technical Assistance Programs – such as providing customers with energy audits of their facilities or design services. These programs address the technical barriers encountered by customers who may understand the benefits of implementing energy efficiency but do not have the technical skills to do so.

Financial Assistance Programs – aim to reduce the cost to customers of implementing energy efficiency measures. Most energy efficiency measures require additional expenditure to obtain the financial benefits however, many customers do not have the capital to invest; or find the financial returns of energy efficiency less attractive. These programs include direct cash incentives or loans for the purchase of energy efficient equipment.

Direct Intervention Programs – are actions which "intervene" in the market by either requiring customers to purchase energy efficient equipment or installing/providing the energy efficient equipment for free or at a greatly reduced cost. Minimum efficiency performance standards which are introduced through regulation by governments are examples of direct intervention.

An indication of the level of effort that is typically involved in each of these programs is given in Figure 4.1.

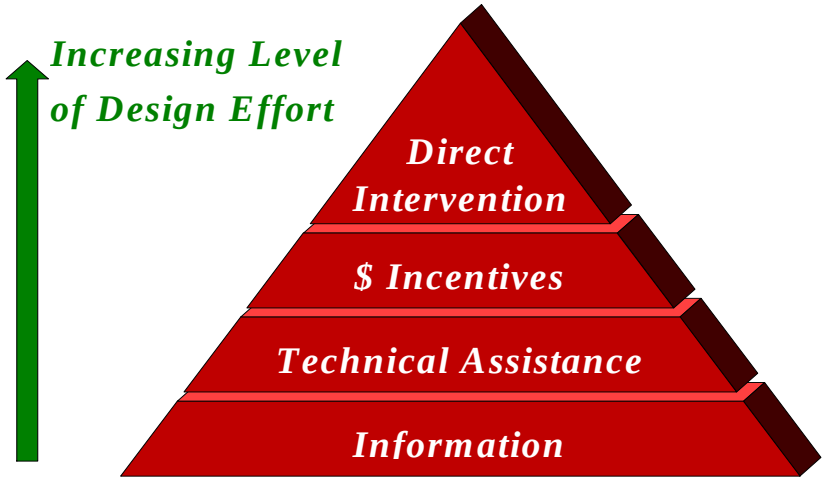


Fig 4.1 – Typical Level of Effort in Programme Implementation

Energy efficiency improvements usually increase the higher one moves up the pyramid. Corresponding with an increasing level of design effort is most often an increase in expenditure on the programme. Generally speaking, information programs are less costly than say monetary incentives or direct intervention.

4.3 DSM Resources

To ensure that DSM programs are implemented successfully, particular consideration should also be given to cost, staff and equipment requirements, responsibilities, and programme procedures should be specified clearly, keeping in mind overall programme goals and utility objectives.

Ideally, planning DSM programs is best performed by a team of people who collectively have a good working understanding of:

- utility characteristics, needs and objectives

https://www.kontrolkalemi.com/forum/

- customer characteristics and needs
- available technologies
- marketing techniques available
- analytic options available to assess the cost-effectiveness of a proposed set of programs

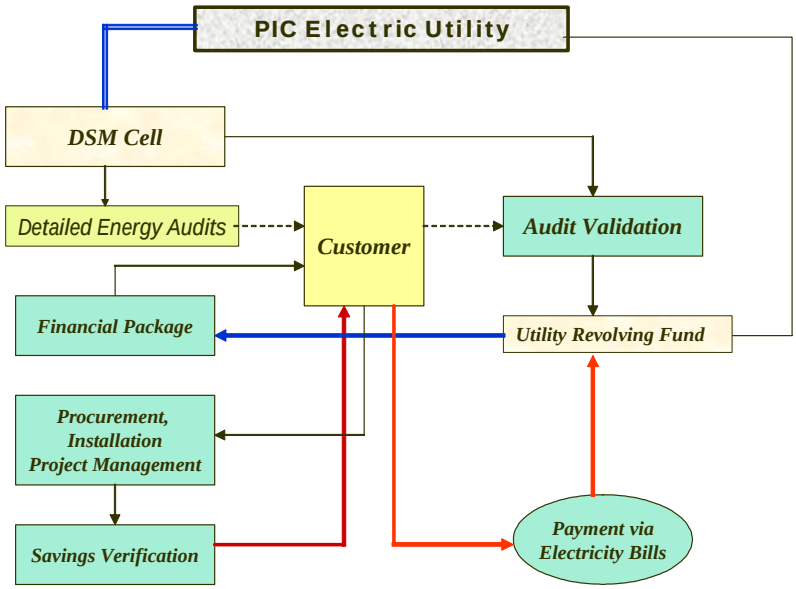
Rarely does one person have all these skills; hence DSM normally involves input from a team of utility staff, and often specialist support from other utilities or consultants.

4.4 Implementation Model for PICs

For more complex DSM programs like energy audit programs in the commercial and industrial sectors, implementation resources (technical and financial) are considered to be major barriers. These barriers could be overcome if the utility could provide both the technical expertise and establish a revolving fund to support DSM activities.

In this model the utility DSM staff would have the necessary skills to conduct detailed energy audits, provide procurement and project management services. The utility establishes a revolving fund and provide funding for project implementation. The beneficiary customer will service the loan from the savings and payments are paid through the electricity bills. The proposed structure for a PIC utility is shown in Fig. 4.2.

Fig 4.2: PIC Utility ESCO – Proposed Structure



https://www.kontrolkalemi.com/forum/

Chapter 5 Case Studies

5. Case Studies

5.1 Overview

Several utilities across the world have benefited through DSM initiatives and there are now numerous examples of utility-sponsored DSM. Some PIC utilities have undertaken pilot DSM programs but so far there have not been full scale implementation.

This section presents case studies from different sectors, across the world. The DSM case studies cover sectors from residential lighting, residential cooking / heating, municipal street-lighting, municipal water pumping, commercial buildings, agricultural efficiency improvement, and industrial. As shown in Table 4.1, these are case studies from Asia, (including India and South East Asia), North and South America and Europe.

The detailed case studies given in Appendix A are presented using a uniform format, as given below:

Programme Summery	• Programme Overview • Programme Objectives/ Goals • Programme Implementation & Design Strategy • Programme Results • Key Lessons Learned
Utility Characteristics	• Utility name • Utility Characteristics • Phase In Restructuring • DSM Initiatives
Programme Design	• Programme Description • Programme Goals • Customer/ Market Characteristics • DSM Measures (Technology/ Management) • Types of Incentives • DSM Marketing Strategy • Implementing Organization • Projected Savings
Programme Implementation	• Programme Delivery • Staffing • Customer Participation
Programme Monitoring & Evaluation	• M & V Objectives • M & V Types • Organization • Data Collection • M & E Period
Programme Results	• # of Participants by Year • Savings per Year • Cumulative Savings (kW/kWh) • Programme Costs
Programme Benefits	• Benefits to Customers • Benefits to Utility • Other Benefits • Cost of Energy Saved

https://www.kontrolkalemi.com/forum/

A summary of the Case Studies is given in Table 5.1

Table 5.1 – Summary of Case studies

	DSM Sector: Residential	
	Country	Case Study Title
1	USA	Southern California Edison Low Income Relamping Programme – United States
2	Mexico	Illumex- Promoting use of Compact Florescent Lamps- Mexico
3	Sri Lanka	Ceylon Electricity Board Compact Fluorescent Lamp (CFL) Loan Programme – Sri Lanka
4	India	GRIDCO / Paradeep Port Trust- LPG Cooking Initiative –India
5	India	BESCOM Efficient Lighting Programme –India
	DSM Sector: Municipal	
	Country	Case Study Title
6	Thailand	Provincial Electricity Authority Street Lighting Programme – Thailand
7	India	Ahmedabad Electric Company Municipal Water Pumping System Efficiency Improvement Programme – India
	DSM Sector: Commercial	
	Country	Case Study Title
8	USA	New York Power Authority High Efficiency Lighting Programme – United States
	DSM Sector: Agriculture	
	Country	Case Study Title
9	USA	Bonneville Power Administration– WaterWise Programme– United States
10	India	Noida Power Company Ltd– Agricultural Pump-Set Efficiency Improvement Programme – India
	DSM Sector: Industrial	
	Country	Case Study Title
11	China	Ministry of Electric Power - Beijing Industrial DSM Programme– China
12	Philippines	Cagayan Electric Power and Light Company Industrial Demonstration Programme – Philippines

https://www.kontrolkalemi.com/forum/

Appendix A: Details of Case Studies

A-1: Residential Sector

SOUTHERN CALIFORNIA EDISON (SCE) – LOW INCOME RELAMPING PROGRAMME – UNITED STATES

Programme Summary	
Programme overview:	Introduction of Compact Fluorescent Lamps (CFLs) to low income customers
Programme objectives / goals:	To promote efficiency in the utilization of electric energy to be able to meet the desired system load shape To meet Public Utility Commission mandated assistance obligation to low income customers To stimulate awareness of energy conservation To encourage better bill paying behavior
Programme design and implementation strategy:	Utility driven programme Partnership between utility and community organizations CFLs were distributed at no cost to low-income, mostly recent immigrant customers The utility provided the conceptual design, technical and administrative requirements of the project
Programme results: (1985 to 1991)	Energy Savings – 418,500 MWh Demand Savings – 13.85 MW
Key lessons learned:	Benefits from data processing system for customer service and follow up Effective role of community-based organizations (CBOs) in identification of eligible consumers

Utility Characteristics	
Utility Name:	Southern California Edison (SCE)
Utility characteristic:	Private-owned utility Service areas covers the central and southern California Approximately 4 million residential customers registered in 1991
Phase in restructuring:	Private-owned

https://www.kontrolkalemi.com/forum/

Utility Characteristics	
DSM initiatives: (1993)	DSM was an important part of SCE operation Total budget spent between 1973 and 1991 on residential, commercial and industrial DSM initiatives was US$800 million

Programme Design		
Programme Description:	SCE provided up to five CFLs free of charge to low income customers deemed eligible by community-based organizations The programme was a collaborative effort undertaking between SCE and CBO with the latter for service rendered was compensated for the marketing and assistance provided to the entire process of recruitment and evaluation of customers' eligibility and installation of CFLs	
Programme Goals:	Targeted the lighting end use, which is a significant contributor to the SCE peak demand To reduce the system peak during the evening	
Customer / market characteristics:	Low income residential lighting	
DSM measures (technology / management):	Replace Incandescent lamps with energy-efficient Compact Fluorescent Lamps (CFLs)	
Types of incentives:	Free of charge CFLs based on eligibility	
DSM marketing strategy:	CBO marketed programme leveraging their regular interaction with customers SCE distributed programme literatures	
Implementing organization:	SCE Numerous CBOs	
Projected Savings:	Programme Period 1991: Programme launched in 1985 and was terminated in 1991	
	Energy Savings:	1,100,000 MWh (Lifecycle)
	Demand Savings:	3.0 MW

Programme Implementation	
Programme delivery:	SCE and CBO were both responsible for all delivery from marketing, recruitment, evaluation of eligibility, conduct of simple energy audit, CFLs installation, and carry out energy-efficiency education session
Staffing:	SCE assigned 3 staff on a part-time basis CBO employed most personnel needed for marketing and implementation Data processing services were outsourced
Customer participation:	At the end of 1991, about 48% of 750,000 eligible customers had participated in the re-lamping programme (36000)

Programme Monitoring and Evaluation	
M&V objectives:	Standard programme management To evaluate utility benefits To evaluate customers' benefits
M&V types:	Contractor Summary Report to track CBO activity including CFL inventory Customer satisfaction survey
Organization:	External Consultant subcontracted

https://www.kontrolkalemi.com/forum/

Data collection:	Energy savings values are obtained from engineering estimate Progress report were output of the external data processing service Customer benefits were obtained from survey
M&E period:	1985 to 1991

Programme Results	
# of participants by year:	51,647 participants
Savings per year:	17,400 MWh
Cumulative savings (kW, kWh):	121,833 MWh 13.85 MW
Programme Costs:	US$23.55 million

Programme Benefits	
Benefit to the Customers, Benefit to the utility, Other benefits, Cost of energy saved:	Reduced customer's cost of electricity Provided no cost CFLs to customers Peak load reduced, fostered customer relations Contributed environmental benefit to society Cents/kWh at 9% real discount rate: 3.77 (1989); 3.03 (1990); 2.59 (1991)

https://www.kontrolkalemi.com/forum/

ILLUMEX – PROMOTING USE OF COMPACT FLUORESCENT LAMP (CFL) – MEXICO

Programme Summary	
Programme overview:	Promoting the use of CFLs to save electricity in residential sector
Programme objectives / goals:	To promote the concept of electricity energy efficiency among consumers and importers/suppliers To induce customer adoption of CFL technologies in the residential sector and existing commercial buildings
Programme design and implementation strategy:	Utility driven programme Private sector participation – trade allies (lighting vendors and retailers) National electric utility CFE purchased the CFLs in bulk under competitive procurement from manufacturers, receiving a significant discount over retail market price
Programme results:	Energy Savings – 169,000 MWh/year Demand Savings – 1000 MW
Key **lessons learned:**	The utility distribution mechanism tends to have dampening effect on market development at the retail level It appeared that wealthy consumers are leaders in technology adoption, due to ability to pay, knowledge, and/or higher electricity rates Poor power-quality was a factor in higher failure rates and in level of consumer acceptance of the new technology Cost-effectiveness and economic benefits appeared to be lower than originally forecasted because the fuel mix for electricity generation had changed, and because average lamp usage per day is less than originally estimated. Also, a large share of the consumers who purchased CFLs through the project had relatively high monthly electricity consumption Consumers with high monthly consumption pay electricity rates higher than the utility's narginal generation costs, thus lowering the economic benefits to the utility due to lost profits from these consumers

Utility Characteristics	
Utility Name:	The Comisión Federal de Electricidad (CFE)
Utility characteristic:	State-owned utility Mandated to implement DSM programs in the electric power sector
Phase in restructuring:	N/A
DSM initiatives:	CFL Subsidy Programme

Programme Design	
Programme Description:	Designed to reduce the first-cost of CFLs by passing along discounts through bulk purchase from participant manufacturers

https://www.kontrolkalemi.com/forum/

	Focus mainly on CFLs for residential use	
Programme Goals:	To accelerate the adoption of CFL technologies by the residential customers To reduce electricity consumption and demand of low-income residential customers	
Customer / market characteristics:	The project took place in two states: Nuevo Leon and Jalisco which are the largest customer serve by the national electric utility Low-income consumers were particularly targeted by the programme	
D**SM measures (technology / management):**	Energy-efficient CFLs	
Types of incentives:	CFLs sold at subsidized price were approximately 60% cheaper than the regular market price	
DSM marketing strategy:	Utility DSM programme with extensive consumer marketing and outreach activity	
Implementing organization:	The national electric utility purchased CFLs and sold them directly to consumers through its offices	
Projected Savings:	Programme period: 1994 - 1997	
	Energy savings:	135,000 MWh/year
	Demand savings:	78 MW

Programme Implementation	
Programme delivery:	The significant retail price reduction was attributed to the subsidy provided by the national electric utility and discount price given by manufacturer from bulk purchases
Staffing:	Representatives from distribution utilities , consultants, Research Institutes, and lighting equipment suppliers
Customer participation:	The utility sold about 1.7 million CFLs with no difficulty due to residential customers positive response to the promotional programme

Programme Monitoring and Evaluation	
M&V objectives:	To assess the extent to which the programme was achieving the targeted benefit and reductions in greenhouse gas emissions
M&V types:	Billing analysis Survey
O**rganization:**	Data not available
Data collection:	Energy savings values are obtained from engineering estimate Programme parameters gathered from survey
M&E period:	Data not available

Programme Results	
# of participants by year:	Data not available
Savings per year:	169,000 MWh/year
Cumulative savings (kW, kWh):	1000 MW
Programme Costs:	Total programme budget of US$ 23 million (funding from the Global Environment Facility (US$ 10 million

https://www.kontrolkalemi.com/forum/

	grant), the Norwegian government (US$ 3 million grant) and the CFC (US$ 10 million)

Programme Benefits	
Benefit to the Customers, Benefit to the utility, Other benefits, Cost of energy saved:	Reduced customer's cost of electricity Provided low cost CFLs to customers Peak load reduced, fostered customer relations Contributed environmental benefit to society Lower utility rates Clean air; reducing CO2 emissions by 27,500 tonnes/ year, SO2 emissions by 1,500 tonnes/year and NOx emissions by 175 tonnes/year Energy savings

https://www.kontrolkalemi.com/forum/

CEYLON ELECTRICITY BOARD (CEB) – COMPACT FLUORESCENT LAMP (CFL) LOAN PROGRAMME – SRI LANKA

Programme Summary	
Programme overview:	Introduction of Compact Fluorescent Lamps (CFLs) Technology Financing mechanism for CFLs procurement by residential customers
Programme objectives / goals:	To promote efficiency in the utilization of electric energy to meet the desired system load shape To be able to implement sets of pilot programs to demonstrate the potential of DSM as an energy resource Reduce the environmental costs and risk in energy production
Programme design and implementation strategy:	Utility driven programme Private sector participation – trade allies (lighting vendors / suppliers) CEB fund was drawn on to finance the subsidy for CFL procurement assist the residential customers and by participating lamp providers for import taxes and other duties In the scaled-up programme, Energy Conservation Fund (ECF) joined in the implementation of the loan scheme by offering financing in the public sector utilizing its own funds
Programme results: (1995 to 1999)	Energy Savings – 64,100 MWh per year Demand Savings – 46.7 MW
Key lessons learned:	Utility endorsement of CFLs was key to marketing strategies

Utility Characteristics	
Utility Name:	Ceylon Electricity Board (CEB)
Utility characteristic:	State-owned utility Service areas include 12 provinces in Sri Lanka Installed capacity of 1699 GWh, 91% is self generated and the balance produced by private sector and hired power producers Transmission and distribution of power are shared by CEB with Lanka Electricity Company (LECO)
Phase in restructuring:	Restructuring framework on the separation of generation, transmission, and distribution functions of CEB was put in place in mid 2000 Generation function to be split into IPP, Thermal and Hydro. The Hydro generation function and Transmission will remain within the government, but the distribution companies will be private entities A Regulatory Commission will be setup with 6 members appointed by the Executive Department

https://www.kontrolkalemi.com/forum/

Utility Characteristics	
DSM initiatives:	CEB has been undertaking DSM initiative since 1995. Some of the initiatives undertaken are: Compact Fluorescent Lighting Programme Energy Audit Programme Power Factor Correction Programme Customer Awareness and Education Programme

Programme Design		
Programme Description:	Subsidy provided by the CEB to include import taxes and other duties Programme advertisement through brochures, seminars and electronic media 2 year manufacturers warranty on the lamps Customers were required to sign an agreement with the CEB to pay for the lamps (limit of 4 lamps per customer) in twelve monthly installments through their electricity bills The customers collect the lamps from participating dealer network that would be reimbursed by the CEB for the full cost of the lamps Customers have the option to buy the lamps upfront The ECF programme involves a service charge of 7% and cost recovery through participant's salary	
Programme Goals:	To give opportunity to residential, religious and public sector customers to purchase CFLs Reduce the system peak during the evening CFLs are able to provide the same light output as an incandescent lamp with considerably less energy input Improvement of system load factor Improvement of power quality Improvement of customer relations	
Customer / market characteristics:	The Residential and Religious sector accounts for 88% of CEB's customers and consumes about 40% of electricity consumption Residential lighting causes the system peak demand Efficiency improvement on lighting will have a considerable impact in Residential Sector's energy consumption	
DSM measures (technology / management):	Lighting retrofit Incandescent Lamps with Compact Fluorescent Lamps (CFLs)	
Types of incentives:	The lamps offered to customers at a subsidized price	
DSM marketing strategy:	Mailed programme information, brochures of participating suppliers and application form Newspaper advertisements outlining the key benefits and programme participation details Suppliers' marketing strategy including billboards and newspaper advertising and TV commercials	
Implementing organization:	CEB' s DSM Branch provided overall administration and management, and Regional Offices implemented the programme LECO was responsible for the customers in franchise area and received funding from CEB for the loan scheme ECF of Ministry of Irrigation and Power was responsible for programme implementation in the public sector utilizing its own funds Five participating vendors provided CFLs for the programme	
Projected Savings:	Programme Period: 1995 - 1999	
	Energy Savings:	64,100 MWh per year
	Demand Savings:	46.7 MW

Programme Implementation

https://www.kontrolkalemi.com/forum/

Programme delivery:	Pilot programme was launched in 1995 and terminated in 1996 Scaled-up programme was implemented during the period 1997-1999 with the inclusion of public sector employees and use of the Energy Conservation Funds (ECF) CEB's DSM Branch approved list of participating CFL suppliers / vendors for the programme Total investment cost for the Programme amounted to 250,000 Rs (Srilanka) and which produced sales of 262,410 Rs (Srilanka) for direct sales A total of 171,617 CFLs were utilized by the Programme
Staffing:	CEB's DSM branch and regional office staff managed and implemented programme. Adequate and relevant support provided by other agencies
Customer participation:	Data not available

Programme Monitoring and Evaluation	
M&V objectives:	Evaluation of Utility benefits Evaluation of Customers' benefits Evaluation of Financing and Repayment Scheme
M&V types:	Billing analysis - to evaluate system benefits, customers' acceptance of the programme, and CEB's procedures and systems effectiveness Survey – to estimate lamp performance and participation statistics
Organization:	SRC International (SRCI)
Data collection:	Energy savings values were obtained from engineering estimate Daily lamp use was obtained from the survey of participants Other implementation aspects were evaluated through interviews and impact assessment
M&E period:	October 2001 up to last quarter of 2002

Programme Results	
# of participants by year:	55,000 villages
Savings per year:	64,100 MWh per year
Cumulative savings (kW, kWh):	256,400 MWh 46.7 MW
Programme Costs:	2.96 million Rs (Srilanka)

Programme Benefits	
Benefit to the Customers, Benefit to the utility, Other benefits, Cost of energy saved:	Reduced cost of electricity Availability of low cost CFLs to customers Peak load reduction, fostered customer relations Environmental benefit to society 3.06 Rs (Srilanka) per kWh 1200 Rs (Srilanka) per kW per year

https://www.kontrolkalemi.com/forum/

GRID CORPORATION (GRIDCO) – PARADIP PORT TRUST COOKING FUEL SUBSTITUTION PROGRAMME – INDIA

Programme Summary	
Programme overview:	Introduction of LPG as a domestic cooking heating medium to replace electric stoves used by Paradip Port Trust employees for household cooking
Programme objectives / goals:	To reduce system peak demand
Programme design and implementation strategy:	Utility driven programme Private sector participation – utility customer Initiated and funded by Paradip Port Trust which is a bulk customer of GRIDCO
Programme results:	Energy Savings – LPG fuel replaced electricity, which was used in electric stoves Demand Savings – 2.3 MW morning peak load and 3.2 MW evening demand
Key lessons learned:	The most important attribute of this case study is the nature of the customer. Paradip port trust is a single bulk customer, supplying electricity to its employees with greater control on the supply conditions. This kind of DSM activity is suitable for public-sector, private-sector and other organizations providing residential facilities to its employees in a single large complex

Utility Characteristics	
Utility Name:	GRIDCO, the electricity supply company of Orissa
Utility characteristic:	GRIDCO is involved with the transmission and bulk distribution of electricity in Orissa
Phase in restructuring:	The electricity company in Orissa was unbundled & trifurcated in the 1990's, GRIDCO is now a semi-private agency
DSM initiatives: (since 1996)	GRIDCO is not known to have DSM programs

Programme Design	
Programme Description:	The programme involves replacement of all the electric stoves with LPG cooking stoves Almost 90% of the 3592 households in the residential facility used electric stoves for cooking, adding approximately 3.23 MW to the electricity demand for household use
Programme Goals:	Reduction of electricity demand, by almost 7,076 MWh per annum by replacing 2155 electric stoves with LPG stoves

https://www.kontrolkalemi.com/forum/

Customer / market characteristics:	The project was planned for the household cooking activity in the residential sector as this activity contributed to approximately 60% of the electrical usage in each household. As electricity is supplied to the employees at a subsidized average flat rate of Rs.132 per month, the Port trust has to bear an annual loss of around Rs.31 million. The maximum contract demand of Paradip port was 7.5 MVA. The peak demand often reached 9 to 10 MVA, resulting in levy of penalty charges. The industrial load does not exceed 4 MVA at any point in time but the domestic use exceeds the contract quantity by 2 to 3 MVA during peaks. As electric stoves are the largest contributors to the peak demand, replacing these with LPG cooking stoves would result in considerable energy and cost savings	
DSM measures (technology / management):	The electric stoves were replaced with LPG cooking stoves. The package includes, cooking stoves and LPG cylinders. As the flat rate for electricity supply was reduced and slabs were fixed for charging flat rate or GRIDCO rate, individual meters were installed for monitoring the electricity consumption by individual households. A LPG cylinder bottling plant, with assured gas supplies from the port was planned in the area to ensure adequate supply of LPG cylinders	
Types of incentives:	The Port trust offered the customers the following incentives to move from electric stoves to LPG stoves: 100% subsidy on purchase of LPG connection and gas stove 100% reimbursement of cost of the LPG cylinder, upon showing the proof of purchase Flat rate electricity tariff reduced from Rs.132 to Rs.80 Limit of electricity consumption for flat tariff fixed at 108 units a month. Any consumption above this, to be charged at the full purchase price of Rs.3.37 per unit	
DSM marketing strategy:	The end-user in this project is an employee of the Port and is thus directly connected to the promoter of the scheme. The area being a finite, controlled geographical area, it is easier for the Port to create awareness, market and control the programme	
Implementing organization:	The Port was the implementing agency, directly replacing the electric cookers with LPG cooking systems. As the port was in economically sound condition, they could self-finance and manage this project	
Projected Savings:	Programme Period: Data not available	
	Energy Savings:	A 60% uptake of the LPG replacement scheme is assumed for calculation of the projected savings. The annual projected savings, of Rs.15 million, after deducting the direct costs, of Rs.19 million, gives a simple payback period of 1.3 years. This is assumed at an Internal Rate of Return (IRR) of 88%
	Demand Savings:	Data not available

Programme Implementation	
Programme delivery:	The Port trust is the main stakeholder responsible for the financing, procurement, and implementation and monitoring of the project. The major investment in this project is the procurement and installation of the LPG cook-stoves and electric meters in individual households in the residential facility, was as follows Gas stoves for 2874 houses @ Rs.1200 Rs.34,48,800 Enrolment fees for 2874 houses@ Rs.1000 Rs.28,74,000 Fire resistant panel in huts @ 1000 Rs.12,62,000 Security cages, pipes for cylinders@ 800 Rs.10,09,600 Fire extinguishers for huts -200 @ 5000 Rs.10,00,000 Electricity meters for all houses @ 2500 Rs.89,80,000 Publicity & Safety trainings - 2874 @ 400 Rs.11,49,600 Total Initial Costs Rs.1,97,24,000 This entire cost was to be borne by the Port trust and recovered through electricity and cost savings
Staffing:	The Housing department of the Port trust was responsible for this entire programme. The additional cost of running the programme was identified as Rs.200,000 per year
Customer participation:	The bulk customer, namely the Port trust, is the sponsor and implementation agency for the programme. The port trust is responsible for involving the end-user in the conversion programme through various awareness and publicity programs

Programme Monitoring and Evaluation	
M&V objectives:	Data not available
M&V types:	Data not available
Organization:	Data not available

https://www.kontrolkalemi.com/forum/

Data collection:	Data not available
M&E period:	Data not available

Programme Results	
# of participants by year:	
Savings per year:	Demand savings 2.3 MW & 3.2 MW in morning and evening peak load respectively
Cumulative savings (kW, kWh):	Data not available
Programme Costs:	Data not available

Programme Benefits	
Benefit to the Customers, Benefit to the utility, Other benefits, Cost of energy saved:	Data not available

https://www.kontrolkalemi.com/forum/

BESCOM EFFICIENT LIGHTING PROGRAMME (BELP) – INDIA

Programme Summary	
Programme overview:	Pilot programme to promote efficient lighting among residential sector in India First-of-its kind efficient lighting in India
Programme objectives / goals:	To promote efficient lighting among Indian domestic consumers by facilitating removal of price and quality barriers Demonstration of the first utility-driven efficient product branding and promotion in India
Programme design and implementation strategy:	Utility driven programme adhering to the transparent procurement procedures in one of the un-bundled distribution utility in India BESCOM short-listed suppliers on the basis of pricing, number of years in business in India, ability to honor 12-month warranty to its consumers and willingness to participate in the joint marketing campaign Programme targeted design of utility-driven CFL branding exercise in India with potential replication in
Programme results: (2005)	Energy Savings – 24.3 Million Units Demand Savings – 13.5 MW
Key lessons learned:	Utility branding helped remove the price barrier for promoting CFLs Utility-sponsored warranty helped influencing the trust in technology

Utility Characteristics	
Utility Name:	Bangalore Electricity Supply Company (BESCOM)
Utility characteristic:	Distribution utility under the state government Service area includes 4 districts and 1.3 Million customers; pilot programme (BELP) was designed only for the urban sector Installed capacity of close to 3000 MW
Phase in restructuring:	Un-bundling process for the power sector complete; Karnataka state has 4 DISCOMS; BESCOM being the largest among all Annual tariff-setting process involves BESCOM making proposals to Karnataka Electricity Regulatory Commission (KERC)
DSM initiatives:	BESCOM has been undertaking several DSM initiatives such as rural load management system, TOD, TOU tariff and in is the process of evolving agricultural DSM programme.

Programme Design

https://www.kontrolkalemi.com/forum/

Programme Design		
Programme Description:	BESCOM went through the following steps before the launch of the programme: • Short-listing of suppliers based on competitive tendering process • Design of joint marketing campaign and training of BESCOM officials on programme implementation • Design of tamper-proof hologram to be used on CFLs After the programme launch BESCOM completed the following: • Focused marketing campaign in specific geographical areas within BESCOM urban territory • Sensitization workshops for Residents' Welfare Association • Training of BESCOM consumer center staff on issuance of vouchers and tracking programme success	
Programme Goals:	To remove barriers for CFL uptake such as high price and treat from cheap imported CFLs. Utility backed-up warranty for free replacement of CFLs was also one of the important programme features. Creation of a business model for utility driven DSM programs in India	
Customer / market characteristics:	Most of the domestic sector customers under the BESCOM territory are subsidized. This programme allowed 1.3 Million domestic sector customers to avail of low price and 12 month warranty backing, also allowing them repay in 9 monthly installments BELP also raised awareness about 36W fluorescent tube-light to be used in domestic sector replacing 40W conventional fluorescent tube-light	
DSM measures (technology / management):	Lighting retrofit – Replacing Incandescent Lamps with Compact Fluorescent Lamps (CFLs)	
Types of incentives:	BESCOM moderated 12 month warranty to its consumers also bringing down prevailing market rates by almost 20%	
DSM marketing strategy:	Use of marketing materials such as posters, leaflets, car stickers and moving advertising boards (during launch) Mailed programme information, brochures of participating suppliers Newspaper advertisements outlining the key benefits and programme participation details Suppliers' marketing strategy including billboards, newspaper advertising and TV and radio commercials (electronic media)	
Implementing organization:	BESCOM partnered with International Institute for Energy Conservation supporting the Bureau of Energy Efficiency under a bilateral funding from USAID. Three participating vendors provided CFLs for the programme using their distributors and retailers during the road-shows and generic implementation	
Projected Savings:	Programme Period: December 2004 to June 2005 (extended up to end of September 2005)	
	Energy Savings:	BELP was a pilot programme with no specific savings target
	Demand Savings:	BELP was a pilot programme with no specific savings target

Programme Implementation	
Programme delivery:	Pilot programme was launched in December 2004, which was supposed end to in June 2005. BESCOM however, extended the programme through September 2005 In addition to programme for consumers, BESCOM also initiated a programme targeted to its employees. A specific design of the programme to support use of CFLs for connection was evolved too. Participating suppliers reported an increase in sales by over 100%, resulting in added sales of 300,000 CFLs
Staffing:	BESCOM appointed three dedicated staff to oversee the programme in addition to the top management review periodically. Staffing under the USAID technical assistance through IIEC also helped BESCOM to keep the programme under regular review.
Customer participation:	BESCOM was able to ensure participation of some of the Residents' Welfare Associations in promoting this initiative to wider base of consumers

https://www.kontrolkalemi.com/forum/

Programme Monitoring and Evaluation	
M&V objectives:	Evaluation of Utility benefits Evaluation of Customers' benefits Evaluation of Financing and Repayment Scheme
M&V types:	Billing analysis - to evaluate system benefits, customers' acceptance of the programme, and BESCOM's procedures and systems effectiveness Survey – to estimate lamp performance and participation statistics
Organization:	IIEC
Data collection:	Energy savings values were obtained from engineering estimate Daily lamp use was obtained from the survey of participants Other implementation aspects were evaluated through interviews and impact assessment
M&E period:	August to September 2005

Programme Results	
# of participants by year:	More than 50,000 individual consumers
Savings per year:	24.3 Million units (estimated)
Cumulative savings (kW, kWh):	-- Million units 13.4 MW
Programme Costs:	Programme design ensured cost neutrality for BESCOM. In this market-driven approach, participating suppliers contributed Rs. 15,00,000.

Programme Benefits	
Benefit to the Customers, Benefit to the utility, Other benefits, Cost of energy saved:	Reduced cost of supply of electricity Availability of low cost, high quality CFLs to customers under utility branding and warranty moderation Peak load reduction, fostered customer relations Environmental benefit to society

https://www.kontrolkalemi.com/forum/

A-2: Municipal Sector

PROVINCIAL ELECTRICITY AUTHORITY (PEA) – STREET LIGHTING PROGRAMME – THAILAND

Programme Summary	
Programme overview:	Introduction of High-Pressure Sodium Lamp (HPS) Technology Socio-economic service to rural village life
Programme objectives / goals:	To promote efficiency in the utilization of electric energy to be able to meet the desired system load shape To develop the organizational capability of PEA and EGAT to deliver large scale DSM programs To increase the security of rural village life
Programme design and implementation strategy:	Utility driven programme Private sector participation – lighting manufacturers A GEF grant (55 million baht) managed by EGAT is drawn on to finance the procurement and installation of street lighting project Collaboration between PEA and Electricity Generating Authority of Thailand (EGAT) wherein the former provided the administrative requirements of the project and the latter acted as adviser and funder
Programme results: (1997 to 1998)	Energy Savings – 79,883 MWh Demand Savings – 3,300 kW and US$969.70 avoided cost per kW
Key lessons learned:	The programme has no impact on peak demand as peak hours (1400-1700 on weekdays) are outside the hours of street lighting operation HPS introduced by the programme is positioned as premium products with relatively higher mark-up than the standard product The project's viability drops significantly when the expected replacement costs of HPS is included, and to be cost-effective lamp price would have to drop by half or lamps that generate higher savings would have to be used Programme's cost-effectiveness is only valid for first time installation with a subsidy The methodology for the analysis of the programme impact, which is survey questionnaires did not achieve the objectives due to the absence of metering and billing data indicating the consumption for street lighting First cost for the lighting gears is zero as service is free-of-charge and the electric poles already existed to carry power lines.

Utility Characteristics	
Utility Name:	Provincial Electric Authority (PEA)

https://www.kontrolkalemi.com/forum/

Utility characteristic:	State-owned electric distribution utility Distribution systems and retail service areas cover Nonthaburi and Samut Prakarn provinces and all areas of country except Bangkok Operates the distribution (wire) business of 22kV and below Power produced by EGAT is supplied to PEA via the high-voltage transmission lines.
Phase in restructuring:	PEA was set for restructuring in 2000-2002 with its current function organized into 4 network business units and 12 regulated delivery companies, while non-core businesses retained by PEA
DSM initiatives:	The distribution utility does not have the mandate to implement DSM, but collaborates with EGAT (generating entity) which has a full-time DSM Office

Programme Design		
Programme Description:	The programme was a collaborative initiative between PEA and EGAT with financial assistance from the GEF Fund Relighting installation project replacing existing street lighting system constructed of two-36W Fluorescent tubes with 70W high-pressure sodium lamps Procurement of lamps through purchase agreements with Thai manufacturers No advertising and/or promotion made in order to disseminate information about the programme implementation A subsidy of 200 Baht per unit is provided to offset the incremental procurement cost of 275,000 lamps at 383.2 million baht total cost Street lighting fixtures were installed by PEA free-of-charge and that there are no charges for the street lighting service Street lights of 5 fixtures per village are installed along secondary rural roads that connect villages to the main access road About 55,000 villages which spread across PEA territory benefited in the programme	
Programme Goals:	Targets the street lighting end use, which is a significant contributor to the PEA peak demand To reduce the system peak during the evening To show that HPS lamps are able to provide higher light output as a Fluorescent tube with considerably less energy input To stimulate local manufacturers and importers to produce and import energy-saving and efficient lighting system	
Customer / market characteristics:	Participating villages spread across PEA territory Streetlights are installed on secondary rural roads to illuminate villages situated along the main access road The villages have no financial resources to pay for luminaries	
DSM measures (technology / management):	Replace street lighting fixture of Fluorescent tubes with High-pressure Sodium Lamps (HPS)	
Types of incentives:	Street lighting service is free of charge	
DSM marketing strategy:	Tie-up with Thai lighting manufacturer No advertising and / or promotions	
Implementing organization:	PEA EGAT DSM Office	
Projected Savings:	Programme Period: 1997	
	Energy Savings:	1.107 baht per kWh
	Demand Savings:	6,324 baht per kW per year

https://www.kontrolkalemi.com/forum/

Programme Implementation	
Programme delivery:	Pilot programme launched in March 1997 and was terminated in August 1997 HPS and lighting gears supplied by Thai manufacturers The lighting fixtures installed on existing power line poles and on secondary rural roads that connect villages to the main access road Villages were not charge for street lighting service, but the free service was limited to 5 fixtures per village. If any village wished to have more than 5 fixtures they had to pay for the extra unit Total procurement cost for the 275,000 HPS fixtures was 383.2 million Baht
Staffing:	Consultants were dispatched during the 2 missions intended for the programme design and the impact assessment
Customer participation:	Participants from the pilot villages provided information in survey questionnaires distributed early in the study

Programme Monitoring and Evaluation	
M&V objectives:	Evaluation of utility benefits Evaluation of customers' benefits
M&V types:	Engineering algorithm: to estimate cumulative energy savings for the life expectancy of HPS lamps compared to Fluorescent tubes Survey: to define the total amount of light from the lamp per unit of power used
Organization:	Third party paid by PEA for consulting services
Data collection:	Technical and cost specifications of lamps and utility system parameters collected from the EGAT System Planning Department and the DSM Office
M&E period:	March 1997 to December 1998

Programme Results	
# of participants by year:	55,000 villages
Savings per year:	79,883 MWh
Cumulative savings	17,215 MWh 4.3 MW
Programme Costs:	US$2.2 million

Programme Benefits	
Benefit to the Customers, Benefit to the utility, Other benefits, Cost of energy saved:	Energy saving 17,215 MWh per year Increased security of rural village life Improved load factor, fostered customer relations CO_2 emissions reduced by 11,135 tonnes 143.5 million baht

https://www.kontrolkalemi.com/forum/

AHMEDABAD ELECTRIC COMPANY (AEC) – MUNICIPAL WATER PUMPING SYSTEM EFFICIENCY IMPROVEMENT PROGRAMME – INDIA

Programme Summary	
Programme overview:	Improving energy efficiency of water pumping system in a municipal water supply company
Programme objectives / goals:	To promote efficiency in the utilization of electric energy to be able to meet the desired system load shape To improve the pumping system efficiency in order to reduce the peak demand and save energy for the electricity and water utility
Programme design and implementation strategy:	Utility driven programme Pilot-scale project on promoting energy efficient pumping system Demonstration of actual energy savings achieved with the implementation of a renovation of pump assembly and installation of capacitors on the 85 HP pump-set at Ahmedabad Municipal Company (AMC) pumping station
Programme results: (1997 to 1998)	Energy Savings – Data not available Demand Savings – Data not available
Key lessons learned:	Hands-on demonstration by AEC in the pilot project Considerable energy efficiency potential in the water pumping operation which can reduce electricity bills of consumer and lower system peak demand of the electric utility Water pumping hours, pumping systems and pumping time coincidence with the peak load on electric utilities are factors common across the country Programme is replicable across India in various municipalities and any initiative by the electric utility will be effective

Utility Characteristics	
Utility Name:	Ahmedabad Electricity Company (AEC)
Utility characteristic:	Private-owned utility Service area is the Ahmedabad region in Gujarat with a total customer base of 1,112,000 including industrial, commercial, residential and a small number of agricultural users Generated about 3,169 MUs and purchased 10% of power requirement from Gujarat electricity Board (GEB) The system demand ranged from 300 – 575 MW with load factor of 70%, which peak recorded in 2002-2003 was 693.5 MW
Phase in restructuring:	Private-owned utility

https://www.kontrolkalemi.com/forum/

Utility Characteristics	
DSM initiatives:	Piloted programs under the 1994 USAID funded Energy Management Consultation and Training (EMCAT) project include: DSM cell (1995-1997): 1 to 9 High rise building water pump programme Flour mill programme Time-of-use meters programme Motor programme High-tension industrial energy audits Energy conservation at AMC DSM budget (1995-1997): Rs. 5.2 – 11.0 million

Programme Design		
Programme Description:	Pilot scale programme designed to demonstrate the energy savings achieved from improving the energy efficiency of the 85 HP equivalent capacity of AMC's water pumping system	
Programme Goals:	To increase system efficiency of the 200 units 85 HP pump-sets by as much as 15% To improve unit power factor to attain energy savings and lower peak loads for the electric utility	
Customer / market characteristics:	AMC is the largest bulk customer of AEC, contributing almost 8% of the system peak Daily total demand varied between 15 MW and 30 MW over 24 hours with maximum peak demand for only 3 hours per day Out of this total demand of AMC, water supply system consumption contributed about 79%	
DSM measures (technology / management):	High efficiency motors Power factor capacitors Optimization of pump performance for energy efficiency	
Types of incentives:	Implementation was a demonstration supported with grant	
DSM marketing strategy:	Demonstration project focused on single host consumer The need for a marketing campaign, media or outreach planning was not considered	
Implementing organization:	AEC AMC	
Projected Savings:	Programme Period: 1994 to 1995	
	Energy Savings:	Data not available
	Demand Savings:	Data not available

Programme Implementation	
Programme delivery:	The utility intervention to improve the pumping efficiency of AMC was initiated with AEC conducting the energy audit to look at the existing pumping system for energy conservation opportunities AEC entirely managed the demonstration project and provided the conceptual design, technical and administrative requirements of the project AMC hosted the project and provided access to facilities data, personnel and equipment EMCAT Project provided the funding assistance necessary for the implementation of the energy efficiency measures identified during the project development phase of the programme Installation of project managed by AEC staff and carried out in-house by AMC personnel Due to the very good results seen in the demonstration project, AMC decided to replicate the measures in the remaining pump-sets

https://www.kontrolkalemi.com/forum/

Staffing:	AEC staff was responsible for designing the demonstration programme and interacting with the designated AMC personnel
Customer participation:	Consumer perspective has been considerably change and an increasing interest in energy conservation initiatives has emerged

Programme Monitoring and Evaluation	
M&V objectives:	To monitor project status To report impact of the programme
M&V types:	Billing analysis Energy audit of substation
Organization:	AEC AMC
Data collection:	Energy savings values are obtained from engineering estimate Hourly performance measurements as recorded on pump station logbook
M&E period:	1994 to 1995

Programme Results	
# of participants by year:	Data not available
Savings per year:	Data not available
Cumulative savings (kW, kWh):	Data not available
Programme Costs:	Data not available

Programme Benefits	
Benefit to the Customers, Benefit to the utility, Other benefits, Cost of energy saved:	Reduced customer's cost of electricity Avoid load-shedding measures Peak load reduced, fostered customer relations

https://www.kontrolkalemi.com/forum/

A-3: Commercial Sector

NEW YORK POWER AUTHORITY (NYPA) – HIGH EFFICIENCY LIGHTING PROGRAMME – UNITED STATES

Programme Summary	
Programme overview:	Introduction of energy efficient lighting and other devices to public sector and institutional customers
Programme objectives / goals:	To promote DSM as the least cost and most beneficial way of providing reliable electricity under its mandate
Programme design and implementation strategy:	Utility driven programme Guaranteed 3-year cost recovery of up-front costs Customers were given option of borrowing full up-front cost through the utility's Conservation Loan lending facility
Programme results: (1992)	Energy Savings: 1,700,000 MWh at various stages of development Lifecycle Savings: 1.39 million MWh with additional 15.9 MW savings in development Demand Savings: 14.2 MW per year
Key lessons learned:	It is possible for a utility to very quickly "ramp" up an aggressive DSM programme (allocated 50% of 5-year budget and realized 50% of estimated 5-year energy savings in less that 3 years) Without guarantee, actual payback estimated to stretch up to 4-6 years Higher than expected, installed cost of capacity saved (US$2,000 per kW versus US$1,500 per kW) Actual customer savings (25% to 35%) were significantly lower than initial utility's proclamation (50% to 75%) Avoid shortage of key lighting equipment and components (e.g., ballast) Incentive compensation based on milestone and benchmark for implementation contractors instead of hourly wages

Utility Characteristics	
Utility Name:	New York Power Authority (NYPA)
Utility characteristic:	State-owned utility Mandated by the state to supply New York State with lower-cost electricity Customers includes designated companies and state government facilities and the investor-owned utilities which resale power without profit to their customers Owns generation and certain transmission assets Number of customers – 166 Energy Sales – 36.200 million MWh Energy Sales Revenue – US$872 million Net rated output – 6,875 MW

https://www.kontrolkalemi.com/forum/

Utility Characteristics	
Phase in restructuring:	State-owned utility
DSM initiatives:	DSM initiatives are a central part of the utility's strategic plan Budget for energy efficiency programs in 2003 is about US$100 million annually

Programme Design		
Programme Description:	Cash incentives / options programme offered to customers interested in implementing energy efficient lighting and other devices in public sector and institutions Eligibility of customers for cash incentives is establish by a facility review or an energy audit conducted at the site for the purpose of identifying energy saving package which would become the basis for an action plan	
Programme Goals:	To promote DSM as the least cost and most beneficial way of providing reliable electricity under its mandate	
Customer / market characteristics:	Primarily targeted lighting in government (state) and other public/semi-public institutional customers in southeastern New York Scope expanded to include HVAC and drive power technologies Opened out to participants from public school sector in Long Island	
DSM measures (technology / management):	Fluorescent lamps Electronic ballasts Specular reflectors CFLs High efficiency discharge lamps (HIDs) Photocells Occupancy sensors Converted exit sign lighting from incandescent to CFL HVAC upgrade measures were made available in March 1992	
Types of incentives:	Guaranteed cost recovery Concessionary financing Full service implementation	
DSM marketing strategy:	"Glossy, powerful brochure" Multimedia (diskette, video, etc) Personal communication at high level (NYPA Chairman visits large customers)	
Implementing organization:	NYPA with oversight over private Implementation Contractors that bid for contracts to perform audit, design and oversee retrofits Subcontractors that perform the installations NYPA handled certain smaller projects internally	
Projected Savings:	Programme Period 1990 to 1992: Implemented over a period of three years when it was launched in 1990 and terminated in 1992	
	Energy Savings:	151,647 MWh
	Demand Savings:	30.9 MW

Programme Implementation	
Programme delivery:	Programme marketed using varied strategy to targeted sectors and institutions Enticed customers submitted expression of interest and assented to all conditions stipulated by signing a cost sharing agreement with the programme

https://www.kontrolkalemi.com/forum/

	NYPA performed a facility review and/or an energy audit performance subcontracted to external consulting firm An action plan with recommended saving package presented to the customer Cash incentives/options available to customer estimated and a Customer Implementation Contract signed by both NYPA and the participant Retrofits are installed Consultants are hired for the programme evaluation
Staffing:	100 NYPA personnel (Energy Conservation, System Planning, etc) were assigned to the programme working on part-time basis including 20 full-time equivalent staff
Customer participation:	At the end of 1991, 48% of 750,000 eligible customers had participated in the relamping programme

Programme Monitoring and Evaluation	
M&V objectives:	To monitor project status To report impact of the programme
M&V types:	Bill impact analysis Monthly progress reports – "Trustee" Reports on overall DSM prepared for NYPA senior management
Organization:	NYPA System Planning Division – assigned to monitor of each Implementation Contractor Contracted external consultant – performed programme evaluation
Data collection:	Energy savings values are obtained from engineering estimate Daily lamp use is obtained from survey of participants
M&E period:	Implementation period

Programme Results	
# of participants by year:	Data not available
Savings per year:	50,549 MWh
Cumulative savings	151,647 MWh 30.9 MW
Programme Costs:	US$55,342

Programme Benefits	
Benefit to the Customers, Benefit to the utility, Other benefits, Cost of energy saved:	Reduced customer's cost of electricity Provided no cost CFLs to customers Peak load reduced, fostered customer relations Contributed environmental benefit to society 4.26 Cents/kWh at 9% real discount rate

https://www.kontrolkalemi.com/forum/

A-4: Agricultural Sector

BONNEVILLE POWER ADMINISTRATION (BPA) - WATERWISE PROGRAMME - UNITED STATES

Programme Summary	
Programme overview:	Introduction of water-saving, energy-efficient irrigation systems and system management to northwestern United States
Programme objectives / goals:	To reduce BPA electrical load through reduction in load for water irrigation system
Programme design and implementation strategy:	Utility driven programme Diverse sectors participation – public utilities, consultants and irrigators Funds allocated for irrigation system evaluation and design work for new and expanding systems; and financial incentives for electrical efficiency improvements to upgrade existing irrigation systems Consultants were used by public utilities to provide technical assistance to irrigators on system testing and design work, hardware retrofits, and irrigation management techniques an as-needed basis
Programme results: (1983 to 1993)	Energy Savings – 506,300 MWh Lifecycle Energy Saving – 1,419,000 MWh Demand Savings – 11.0 MW Cost (to BPA) – US$24.5 million
Key lessons learned:	A programme involving a number of diverse players can be successful Working with the agricultural community takes patience when trying to market new technologies Farmers need to see demonstrated benefits Farmers tend to trust each other so word-of-mouth marketing is important Monetary incentives such as rebates are important, but structuring of incentives need to be fine tuned to elicit greater participation The need to target large irrigators and to expand measures that qualify for support under the programme Improving irrigation system efficiency does not always yield water or energy savings (e.g., in cases of under-watering) Complex irrigation systems can require professional consultant services (auditing and scheduling) and analytical software Large potential for irrigation scheduling

Utility Characteristics	
Utility Name:	Bonneville Power Administration (BPA)
Utility characteristic:	Government entity that sells wholesale power from 30 federal dams and 1 non-federal nuclear plant to large customers Clients include private utilities and large industrial facilities in Washington, Oregon, Idaho, and Montana, plus parts of California, Nevada, Utah, and Wyoming Owns large transmission assets in the Pacific Northwest

https://www.kontrolkalemi.com/forum/

Phase in restructuring:	Customer utilities were both public and private
DSM initiatives: (1982 to 1993)	**Residential** Residential Weatherization (Weatherwise) Manufactured Housing Acquisition (MAP) Appliance Efficiency Oregon & Washington State Energy Codes SGC Manufactured Homes Consumer Rebate Long-term Super Good Cents Super Good Cents **Commercial** Energy Smart Design Energy Edge Project Lighting Design Lab Commercial Retrofit & End-Use Study (CREUS) **Industrial** Sponsor Designed Plan Aluminum Smelter Conservation/Modernization Energy Savings Plan Agricultural Irrigated Agriculture (WaterWise) Expenditure – US$1.343 billion

Programme Design	
Programme Description:	The initiative was made a part of BPA's Conservation and Renewable Discount Programme in December 2003 A regional pump testing and system evaluation programme was operated by participating utilities, but financed by BPA The programme provided incentives and rebates for encouraging irrigators to adopt cost-effective energy conservation measures Programme also offered contracts with certified analyst to test and evaluate irrigation system
Programme Goals:	To reduce BPA electric load through water and energy savings in irrigation systems
Customer / market characteristics:	Irrigation systems under the 39 participating retail utilities with combined consumption equivalent to 15% of total load of all irrigation systems in the Northwest region Direct market covers farm lands that require extensive amounts of irrigation and pumping due to lower natural precipitation and availability of water for crops Large irrigators and the irrigation districts that use extensive pumping and distribution systems pump directly from the Snake and Columbia Rivers Smaller irrigators sourced water from on-site groundwater wells
DSM measures (technology / management):	Good pumping system maintenance and operating practices Improved irrigation system design and management techniques
Types of incentives:	Administrative reimbursements for utilities One-time incentive payments provided to eligible participating irrigators
DSM marketing strategy:	Customer bill inserts, basic promotional materials Awareness campaign at local fairs and utility organized meetings Information sharing with engineers and other professionals Third-party word-of-mouth

https://www.kontrolkalemi.com/forum/

Programme Design		
Implementing organization:	Participating utilities	
Projected Savings:	Programme Period: 1983 – 1993	
	Energy Savings:	Data not available
	Demand Savings:	Data not available

Programme Implementation	
Programme delivery:	Energy audit conducted by local utility and/or Consultant to determine eligibility of farmer applicant Energy saving measures implemented, and monitoring and verification of results carried out to determine incentive payment
Staffing:	3 full-time equivalent BPA staff during 1990-93
Customer participation:	From the 2,575 irrigation system that applied for the programme, 75% of them were evaluated for eligibility requirement and only 40% of these eligible systems carried on to receive incentives (1983-93)

Programme Monitoring and Evaluation	
M&V objectives:	Evaluation of utility benefits Evaluation of customers' benefits Evaluation of incentives payment
M&V types:	Billing analysis -- system benefits Survey – factors influencing irrigation system electricity use
Organization:	Pacific Northwest Laboratory
Data collection:	Energy savings values were obtained from use of engineering algorithm Incentives payments were determined through survey of system
M&E period:	1986 up to 1990

Programme Results	
# of participants by year:	421 participants (1983-93)
Savings per year:	14,892 MWh (1993) 1.6 MW (1993)
Cumulative savings (kW, kWh):	94,608 MWh (1983-93) 11 MW (1983-93)
Programme Costs:	BPA costs: US$24.5 million (1983-93); US$7.41 million (1991-93)

Programme Benefits	
Benefit to the Customers, Benefit to the utility, Other benefits, Cost of energy saved:	Reduced customer's energy and water costs Increased crop yields based on irrigation management techniques Peak load reduced, fostered customer relations Contributed environmental benefit to society Levelized cost of saved energy (cents/kWh, 9% real discount rate): 3.68 (1991); 3.79 (1992); 1.64 (1993)

https://www.kontrolkalemi.com/forum/

NOIDA POWER COMPANY LTD. (NPCL) – AGRICULTURAL PUMP-SET EFFICIENCY IMPROVEMENT PROGRAMME – INDIA

Programme Summary	
Programme overview:	Promotion of energy efficient agricultural pump-sets
Programme objectives / goals:	To reduce energy consumption and losses in the electrical distribution system by improving the energy efficiency of agricultural pump-sets
Programme design and implementation strategy:	Utility driven programme Private sector participation – trade allies (pump suppliers) and financial institutions Pilot-scale programme
Programme results: (2001 to 2002)	Energy and demand savings – induced by pump power input rating reduction and power factor improvement
Key lessons learned:	Demonstration of considerable energy savings from converting existing distribution line to high voltage system in rural areas which was incidental to retrofitting agricultural pump-set with high efficiency unit of appropriate motor rating Significant benefits in terms of cost savings and equipment performance can be achieved by installing capacitors on pumps.

Utility Characteristics	
Utility Name:	Noida Power Company Ltd (NPCL)
Utility characteristic:	Private-owned utility Services the Greater Noida region of Uttar Pradesh Provides transmission and distribution services to about 335 sq. km of Greater Noida city and 118 neighboring villages covering around 23,000 customers Total supply was distributed as follow: 19% for agricultural pump-sets; 64% for large industry; and 17% for urban, institutional and small industry consumers
Phase in restructuring:	Private-owned by RPG Group since 1993
DSM initiatives: (since 1996)	Agricultural Water Pumping System Improvement Programme

Programme Design

https://www.kontrolkalemi.com/forum/

Programme Design		
Programme Description:	Pilot scale programme designed to showcase the benefits from improving agricultural pumping system performance through retrofit with efficient design and optimum motor size matched to average load of pump-set Funding mechanism offered to agricultural customers provides free of charge pump-sets and a scheme of 70% debt and 30% equity in purchase and installation of capacitors and metering device Reduction of system losses in power supply line for an agricultural pump-set through extension of high voltage distribution system to pump site	
Programme Goals:	To achieve energy savings by as much as 51% from improving electrical performance of motor through high efficiency and unit power factor To reduce line loss by increasing the HT:LT ratio	
Customer / market characteristics:	The agricultural sector consumed about 19% of the total electricity demand from NPCL Distribution system servicing the sector is characterized by high T&D loss, low revenue generation and high cases of theft and pilferage	
DSM measures (technology / management):	Energy efficient pumping system Power factor correction capacitor Metering system High voltage distribution system	
Types of incentives:	Replacing pump-sets is free of charge	
DSM marketing strategy:	Outreach activity undertaken by involving local community institutions	
Implementing organization:	NPCL provided the conceptual design, technical and administrative requirements of the project	
Projected Savings:	Programme Period: 2003-04	
	Energy savings:	Data not available
	Demand savings:	Data not available

Programme Implementation	
Programme delivery:	Outreach undertaken jointly by NPCL and local community institutions in the area to promote and entice agricultural customers to participate in the programme NPCL used its staff engineers to conduct the survey to look at the existing pumping system for opportunities to improve efficiency particularly in unit power factor and motor appropriate sizing New pump-sets with a lower capacity at 3 HP replaced the existing 5 HP drive and capacitors required to improve its power factor to 0.8 were installed together with the metering system for the pump station HT mains on the power distribution system in the area extended while insulated LT lines installed on the power service entrance of the pumping system
Staffing:	NPCL staff were directly involved in evaluating the potential for high voltage distribution system Pump-set suppliers were involved with verifying efficiency levels of pumping system
Customer participation:	Customer gave access to pump-sets and provided some information on usage and system parameters for evaluation

Programme Monitoring and Evaluation	
M&V objectives:	To monitor project status To report impact of the programme
M&V types:	Energy audit
Organization:	NPCL used in-house technical personnel to analyze operations reports from the field and relied on local

https://www.kontrolkalemi.com/forum/

	community organizations for assistance and guidance
Data collection:	Data output from metering of substation Hourly performance measurements as recorded on pump station logbook
M&E period:	Data not available

Programme Results	
# of participants by year:	Data not available
Savings per year:	Data not available
Cumulative savings (kW, kWh):	Data not available
Programme Costs:	Data not available

Programme Benefits	
Benefit to the Customers, Benefit to the utility, Other benefits, Cost of energy saved:	Improved water discharge (from 17 to 21 liters/sec) Cheaper cost of electricity due to reduced demand and metering Reduced peak load and energy demand, fostered customers relations Contributed environmental benefit to society

https://www.kontrolkalemi.com/forum/

A-5: Industrial Sector

MINISTRY OF ELECTRIC POWER – BEIJING INDUSTRIAL DSM PROGRAMME – CHINA

Programme Summary	
Programme overview:	Introduction of DSM practices in Beijing industrial sector
Programme objectives / goals:	To promote efficiency in the utilization of electric energy to be able to meet the desired system load shape
Programme design and implementation strategy:	Government agency driven programme The Ministry of Electric Power funded the programme with 17.72 million RMB particularly intended for peak load shifting initiatives by the industrial customers Demonstration project
Programme results:	The key results were, reduction in peak demand of about 50 MW and improvement in the load factor due to the 150,000 MWh increased in consumption during the valley load period
Key lessons learned:	The project was successful primarily because it focused on peak load management which is easier to implement than other DSM programs Gained experience from the success of the load management project proved useful for the development of programs that result in long-term reductions in demand through efficient end use technologies

Utility Characteristics	
Utility Name:	China State Power Corporation (CSPC)
Utility characteristic:	State-owned utility Utility functions are generation, transmission, and distribution Service area is the entire Beijing city
Phase in restructuring:	In 2002, the China State Council decided to restructure the electric utility sector by proposing the creation of five generation companies, two grid companies and a regulatory commission which sets pricing mechanism to regulate them The new State Electricity Regulatory Commission (SERC) initiated the reforms such as development of regional power grids in the northeast and eastern parts of the country in 2003, and the launching of competitive bidding for about 20% of the power in East China in 2004
DSM initiatives:	Utility has designed numerous DSM programs which have not been put into implementation because of structural, regulatory and financial impediments in carrying out these initiatives

Programme Design	
Programme Description:	The programme was designed to meet demand management objective with load shifting strategy employed to reduce peak load during peak hours while building load in the off-peak time is allowed

https://www.kontrolkalemi.com/forum/

Programme Goals:	To reduce the peak demand and improve the system load factor through load management programme which encourages industrial customers to shift discretionary and large load to off-peak from peak hours To promote the load factor increase through opening up the power market in off-peak hours	
Customer / market characteristics:	Industrial sector accounted for over 55% of the typical winter daily electricity consumption, thus, considered as the primary baseload in Beijing's power network About 51% of the system's morning peak and 50% of the evening peak were attributed to the demand of the industrial sector	
DSM measures (technology / management):	System load management Time-of-use rate structured from the price differential between the peak and valley hours tariffs	
Types of incentives:	The investment to produce the peak load shift of 50 MW was 12.05 million RMB in 1997 and 5.67 million RMB in 1998	
DSM marketing strategy:	Involvement of government agencies, medium and large power consumers, research institutes, universities and other organizations in promoting the use of DSM in China Stakeholders gained experiences from international exchange and cooperation, training courses, pilot studies, demonstration projects and educational activities	
Implementing organization:	State Development and Reform Commission (SDRC) State Grid Company	
Projected Savings:	Programme Period: 1997 - 1998	
	Energy Savings:	Data not available
	Demand Savings:	50 MW

Programme Implementation	
Programme delivery:	Beijing Power carried out power market survey to determine the condition of customer's electric equipment and consumption patterns prior to developing effective measures for peak load management Marketing of the programme initiated with large industrial customers and was focused on convincing customers to employ load management through the rational arrangement of discretionary load Signed interruptible load agreements with large customers, first on a pilot basis, then on a more widespread basis Provided financial assistance based on actual upgrading and retrofitting needs
Staffing:	Utility personnel
Customer participation:	Rearranged production schedules so that scheduled maintenance can take place during peak hours Upgraded and retrofitted high loss electrical equipment, installed reactive power compensators for high and low voltage equipment, and arranged equipment to operate at peak hours or off-peak hours depending on their diversity factors

Programme Monitoring and Evaluation	
M&V objectives:	To assess the actual impact of load shifting on the energy use and demand for the equipment and plant systems
M&V types:	Energy audit
Organization:	CSPC
Data collection:	Energy and demand savings values are obtained from engineering estimate Equipment and plant performance parameters were gathered in the energy audit
M&E period:	1997 to 1998

https://www.kontrolkalemi.com/forum/

Programme Results	
# of participants by year:	Data not available
Savings per year:	50 MW (Demand savings)
Cumulative savings (kW, kWh):	Avoided cost of new generation capacity at 24.8 million RMB
Programme Costs:	12.05 million RMB (1997) 5.67 million RMB (1998)

Programme Benefits	
Benefit to the Customers, Benefit to the utility, Other benefits, Cost of energy saved:	Reduced customer's cost of electricity System load reduced, fostered customer relations

https://www.kontrolkalemi.com/forum/

CAGAYAN ELECTRIC POWER AND LIGHT COMPANY (CEPALCO) – INDUSTRIAL DEMONSTRATION PROGRAMME – PHILIPPINES

Programme Summary	
Programme overview:	Introduction of DSM technologies and practices in industrial sector
Programme objectives / goals:	To promote efficiency in the utilization of electric energy to meet the desired system load shape To induce customers to adopt energy-efficient technologies and production processes in the industrial sector that can reduce system demand
Programme design and implementation strategy:	Utility driven programme CEPALCO provided 75% of the funding for the cost of equipment while customer shouldered the installation cost Utility provided the conceptual design, technical and administrative requirements of the project A grant from the USAID funded Philippine DSM Project was extended to CEPALCO for the equipment procurement for the demonstration project
Programme results:	Energy savings and demand reduction. Energy savings 1245 MWh
Key lessons learned:	Project completion encountered delays because of technical difficulties in the process of finalizing the agreement between the utility and customers due to the complexity of the negotiation process held with respective recipients of the programme The demonstration projects were assisted by USAID Consultants in various stages of baseline measurements, engineering design and commodity procurement as some technologies and/or their application in these projects have not been applied before in the Philippines Most of the project met the expected average pay-back period at 3 years and below

Utility Characteristics	
Utility Name:	Cagayan Electric Power and Light Company, Inc (CEPALCO)
Utility characteristic:	Private-owned utility Power distribution company with generation capacity Service area include a prime city, three municipalities and industrial estate Total substation capacity is 75 MVA distributed among the Company's four power substations that are strategically located in the franchise area Maintains and operates a total of 38 kilometers of 69 kV transmission line, and has a total peak load of 91 MW
Phase in restructuring:	Private-owned

https://www.kontrolkalemi.com/forum/

Utility Characteristics	
DSM initiatives:	Compact fluorescent Lamp (CFL) Programme High Efficiency Fluorescent Lighting Programme Commercial and Industrial Energy Audit Industrial Demonstration Programme Energy Service Company

Programme Design		
Programme Description:	The demonstration programme showcased cost-effective application of energy efficient equipment and plant practices for improving energy use in industry in a utility-led undertaking which provided customers the assistance needed in financing, engineering, procurement, installation and performance monitoring of the project Committed industrial companies hosted demonstrations involving production process changes and energy-efficient technologies including: lighting, motors, and adjustable speed drives External assistance given to utility in various stages of baseline measurements, engineering design and commodity procurement The retrofit consisted of application of high efficiency motors, variable speed drives, energy-efficient lighting and process optimization	
Programme Goals:	To accelerate the adoption of energy efficient equipment and process optimization strategy by the industry To reduce electricity consumption and demand of industrial customers of CEPALCO	
Customer / market characteristics:	CEPALCO' s industrial sector accounts for 0.41 % of its customers and which consumes about 30.7 % of total electricity supplied Electric motor accounts for 90 % of the electricity used in a typical industrial customer, while about 10% for lighting and other means of electric heating, thus any improvement in efficiency will have a considerable impact on industrial energy consumption	
DSM measures (technology / management):	High efficiency motor (HEM) retrofit and optimum unit size matching the average load of equipment Energy efficient lighting (32w fluorescent fixtures, HPS) Process optimization	
Types of incentives:	The projects were provided funding of 75% of total cost of installed equipment and customers had the option to pay the 25% of the remaining project cost in full or apply for a 1-, 2- or 3-year installment plan, included in the monthly service fees or service connection fees (for new customers)	
DSM marketing strategy:	Increased consumer awareness of the DSM technologies' benefits was realized through technical seminars and technology presentation during site visits of the plants	
Implementing organization:	CEPALCO Technical Services Division	
Projected Savings:	Programme Period: 1996	
	Energy Savings:	668 MWh
	Demand Savings:	Data not available

Programme Implementation	
Programme delivery:	Project was a collaborative undertaking between CEPALCO and the customers, and procurement of equipment done under a competitive bidding process participated by local vendors The engineering aspects of the project execution were provided by CEPALCO, while the required scope of installation was subcontracted to customer's accredited contractor External technical assistance to these demonstration projects was provided at various stages of baseline measurements, engineering design and commodity procurement

https://www.kontrolkalemi.com/forum/

Staffing:	CEPALCO technical services staff USAID consultants
Customer participation:	Involvement of customer's personnel was mainly in coordinating the installation work to arrange the schedule of facilities shutdown to facilitate installation of the units and that the utilization of plant manpower did not create any distractions to their usual work Provided unimpeded access to the equipment site in carrying out of the monitoring activity

Programme Monitoring and Evaluation	
M&V objectives:	To assess the actual reduction in energy use and demand for the equipment and plant systems
M&V types:	Energy audit that include systematic series of checks and measurements on the project
Organization:	CEPALCO
Data collection:	Energy savings values obtained from engineering estimate Equipment and plant performance parameters gathered in the energy audit
M&E period:	1997 to 1998

Programme Results	
# of participants by year:	3 industrial facilities
Savings per year:	Industrial lighting : 411 MWh Process improvement : 694 MWh High efficiency motor : 140 MWh
Cumulative savings (kW, kWh):	1245 MWh
Programme Costs:	Industrial lighting – US$127,000 Process improvement – US$123,000 High efficiency motor – US$11,000

Programme Benefits	
Benefit to the Customers, Benefit to the utility, Other benefits, Cost of energy saved:	Reduced customer's cost of electricity Lighting levels at workstations improved, minimized motor burnouts System load reduced, fostered customer relations

https://www.kontrolkalemi.com/forum/

Glossary

Achievable potential: An estimate of the amount of energy savings that would occur is all cost-effective, energy-efficient options promoted through DSM programmes were adopted.

Administrative costs: Expenses incurred by a utility for DSM program planning, design, management and administration.

Baseline: Represents the energy performance of a typical model for a given product or a description of what would have happened to a product's energy use if labels and/or standards had not been implemented

Cash incentive: Monetary award or inducement in the form of a rebate or payment.

Coincident Peak Demand: Load (in kW) of an end-use, customer, or group of customers at the time the utility experiences its greatest demand for electricity.

Compact fluorescent lamps (CFLs): Smaller version of standard fluorescent lamps that can directly replace standard incandescent lights. These lights consist of a gas-filled tube and magnetic or electronic ballast.

Comparative labels: Appliance Labels that present information that allows consumers to compare performance among similar products, either using discrete categories of performance or a continuous scale.

Demand-Side Management (DSM): Planning, implementation and evaluation of utility activities designed to encourage customers to modify their electricity consumption patterns, both with respect to the timing and level of demand (kW) and energy (kWh)

Economic potential: Estimate of possible energy savings assuming that all energy-efficeint options will be adopted and all existing equipment will be replaced with the most efficient equipment when-ever it is cost-effective to do so.

Energy-efficiency labels: Informative labels affixed to manufactured products indicating a energy performance (usually in the form of energy use, efficiency, and/or energy cost) that provide consumers with the data necessary for making informed purchases.

Energy-efficiency ratio (EER): Measure of the instantaneous energy efficiency of room air conditioners: the cooling capacity in Btu/hr divided by the watts of power consumed at a specific outdoor temperature.

Energy-efficiency standards: Set of procedures and regulations that prescribe the energy performance of manufactured products, usually prohibiting the sale of products that are less energy-efficient than a minimum standard; also known as “norms.”

Energy service company (ESCO): Company that specializes in undertaking energy-efficiency measures under a contractual arrangement in which the ESCO shares the value of energy savings with its customers.

Greenhouse gas (GHG): Gas, such as water vapor, carbon dioxide, tropospheric ozone, methane, and low-level ozone, that is transparent to solar radiation but opaque to long-wave radiation and that contributes to the greenhouse effect by absorbing infrared radiation in the atmosphere.

Kilowatt hour (kWh): Unit or measure of electricity supply or consumption; equal to 1,000 Watts over the period of one hour; equivalent to 3,412 Btu.

Life-cycle cost (LCC): The sum of purchase cost and annual operating cost discounted over the lifetime of the appliance; includes consideration of lifetime of the appliance and consumer discount rate.

Load Research: Monitoring of demand (kW) and energy (kWh) consumption of a selected sample of customers in order to determine their usage patterns.

https://www.kontrolkalemi.com/forum/

Load Shifting Programmes: Aim to move electricity consumption from one time to another, usually from peak to off-peak during a single day.

Market penetration: Level of ownership, i.e., the percentage of households that own and use the product or equipment in question.

Market transformation: Permanent shift in the market toward greater energy efficiency, accomplished by specific interventions for a limited period of time.

Net present value (NPV): Value of a personal portfolio, product, or investment after depreciation and interest on debt capital are subtracted from operating income. NPV can also be thought of as the equivalent worth of all cash flows relative to a base point called the present.

Participant Cost: Expenses associated with taking part in a DSM programme paid by the customer and not reimbursed by the utility.

Peak clipping programmes: Aims to reduce electricity demand (kW) at certain critical times, typically when the utilitiy experiences system peaks.

Technical potential: Is the impact of a DSM measure in terms of total energy and demand savings if it were adopted wherever technically feasible.

Utility Perspective: A way of estimating the impact of a DSM program on the utility's financial position

Valley-filing programmes: Seek to increase off-peak electricity consumption (without necessarily reducing on-peak demand).

https://www.kontrolkalemi.com/forum/