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ENERGY TRANSITION PARTNERSHIP

Powering Prosperity and Enabling Sustainability in South East Asia

Demand Side Management for the Philippines

DSM Case Study

By

IIEC
International Institute for Energy Conservation

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UNOPS AFD Federal Ministry for Economic Affairs and Climate Action Department for Energy Security & Net Zero Environment and Climate Change Canada / Environnement et Changement climatique Canada CIFF CHILDREN'S INVESTMENT FUND FOUNDATION SEQUOIA CLIMATE FOUNDATION Australian Government Department of Climate Change, Energy, the Environment and Water

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Table of Contents

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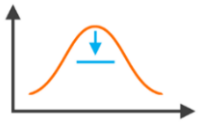
1 CASE STUDY 1: INTERRUPTIBLE LOAD PROGRAM (ILP) BY MERALCO

DSM Sector	Large Business (Commercial and Industrial) Customers
Country	Philippines
Program Name	**Interruptible Load Program (ILP)**
Program Summary	
	Interruptible Load Program (ILP) is a voluntary, demand-side management (DSM) program that allows customers to operate their generating sets and collectively reduce electricity drawn from the grid when power interruptions are imminent to ration limited power supply. The primary goal of the ILP is to enhance grid reliability and prevent power outages during critical times by reducing demand on the grid. It also provides financial incentives for participating businesses. For each 1 Megawatt (MW) of de-loaded capacity, ILP can help spare around 4,000 households and small businesses from power outages.
	Participants of the ILP work closely with MERALCO's Customer Care and Enterprise and National Government Groups. MERALCO guides the participants during the whole process of de-loading. MERALCO has provided detailed implementation guidelines (protocols, compensation, and recovery mechanism) for this program participants that are based on ERC guidelines.
Utility Characteristics	
	MERALCO **Manila Electric Company (MERALCO)** • Largest private sector electric distribution utility company in the Philippines covering 39 cities and 72 municipalities. • Its franchise area is over 9,685 km^2 which accounts for 55% of the country's electricity output. • Private owned utility.
Program Support Agencies	
	• Department of Energy (DOE) • Energy Regulatory Commission (ERC) • National Grid Corporation of the Philippines (NGCP)
Program Design & Objective	

The Interruptible Load Program (ILP) is designed to help utilities like MERALCO manage electricity demand during Red Alert (insufficient power supply in the grid). The relevant load shape objective of ILP is peak clipping. Given its successful implementation and existence of regulatory supports in the Philippines, ILP was selected as the DSM case study for distribution utilities across the Philippines.



ILP encourages large industrial and commercial customers to voluntarily use their own backup power or shift operations to reduce electricity drawn from the grid when the grid is under stress. In exchange for participating in the program, these customers receive financial compensation for their reduced electricity usage.

ILP is open to non-contestable customers (electricity end-users who can only procure their energy supplies from their distribution utility), Contestable customers (electricity end-users who meet the eligibility requirements for contestability and threshold level set by the Energy Regulatory Commission (ERC) to qualify in the contestable market and be served by Retail Electricity Suppliers (RESs)), locators in economic and freeport zones, and directly connected customers of the National Grid Corporation of the Philippines (NGCP).

Program Implementation Approach

ILP was established by the Philippine Department of Energy (DOE) and ERC and open to all distribution utilities (DUs) and the NGCP, the system operator in the Philippines. Implementation of ILP is guided by relevant ERC's resolutions. Prior to implementation, DU shall submit a manifestation in writing with supporting documents to ERC of its intent to offer ILP to its customers, and ERC shall then issue an Order authorizing DU to implement ILP. Interested customers can choose to enroll to ILP and sign the ILP agreement with the distribution utility for captive customers, with the distribution utility and their respective retail electricity suppliers for contestable customers, or with NGCP in the case of directly-connected customers.

ILP was first implemented in Visayas and Mindanao to ration limited power supply and prevent prolonged power outages. In anticipation of a potential power supply shortage in Luzon, MERALCO began implementation of ILP in March 2014.

5 Steps to Implementing MERALCO's ILP

STEP 1: NOTIFICATION

Upon official notification from NGCP of the existence of Yellow Alert and/or Red Alert, MERALCO's Customer Care notifies ILP Participants through their contact persons of grid conditions and requests ILP participants to prepare for possible ILP activation if grid conditions deteriorate and Red Alert is declared.

STEP 2: ACTIVATION

Participants choose between 2 deloading windows that capture morning and afternoon peak: 10AM-1PM and 12NN-3PM.

STEP 3: DETERMINATION OF COMPENSABLE KWH

MERALCO will read consumption meters of participating accounts at the same time as the usual reading for billing & tag hours of ILP activation.

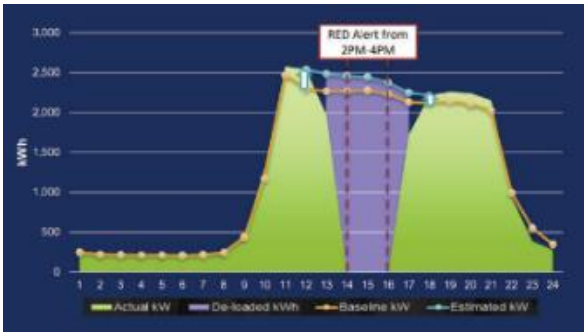
STEP 4: BILLING

MERALCO will compute the Deloading Compensation based on ERC-prescribed formula and send to Participating Customer and/or RES for verification within 7 days from the regular reading date.

STEP 5: SETTLEMENT

The signed conforme letter must be returned to MERALCO within 8 days from receipt. Upon receipt of the signed conforme letter, MERALCO will process payment within 30 days.

Determination of Compensable kWh and Billing



As allowed under the ERC's guidelines, the compensable kWh for ILP takes into account the participant's actual load profile on the day of activation, the baseline consumption profile under the ILP agreement, and one hour before and after the hours of Red Alert.

Source: DOE's Interruptible Load Program (ILP): MERALCO Implementation Presented by MERALCO

Cost Recovery Mechanism

The participating customers are compensated by MERALCO the incremental cost incurred due to the full or partial de-loading, when it deloads as requested. The de-loading compensation is computed based on the formula approved by ERC. The amounts paid to the participating customers by MERALCO are recovered from all distribution wheeling load customers of MERALCO.

Program Benefits

Benefits for Utility Companies (e.g., MERALCO):

- ***Avoiding or Mitigating Emergency Situations***: When the grid is placed on Red Alert, ILP can quickly allocate available supply by reducing consumption of customers with large load, which can help avoid or mitigate emergency situations like brownouts or blackouts for customers with smaller loads, such as households.
- ***Cost Savings***: ILP is a cost-effective temporary solution for allocating available supply during grid emergencies until the grid can have sufficient generation capacity and reliable infrastructure to adequately serve demand requirements.

Benefits for Participating Customers (e.g., Businesses):

- ***Financial Compensation***: ILP participants receive financial incentives through payment of De-loading Compensation for operating their backup power or shifting their operations to reduce consumption from the grid, which they would have done anyway even if they are not enrolled in ILP. This can lead to cost savings for businesses, which can be significant, especially for large industrial and commercial customers.
- ***Risk Mitigation***[1]: ILP participants are given advance notice on power situation outlooks, which allow them to adjust operations and advise their own customers /

[1] ILP participant testimonials: https://www.philstar.com/business/2023/04/04/2256622/meralco-secures-additional-ilp-capacity

tenants of de-loading or switching to gensets before the actual ILP de-loading schedule. For participants that use gensets, ILP allows them to test the reliability of their back-up power.

- ***Enhanced Corporate Social Responsibility***: Participating in ILP can be viewed as a positive contribution to the community by helping to stabilize the grid and prevent power disruptions during emergencies.
- ***Energy Efficiency***: ILP often encourages participating businesses to improve their energy efficiency and reduce electricity waste, which can have long-term benefits beyond the program itself.
- ***Reliability and Business Continuity***: By reducing their electricity consumption during critical times, businesses can enhance their own reliability and business continuity, minimizing disruptions caused by power outages.

Program Results

In 2019, ILP has spared as many as 2 million customers from rotational brownouts.

As of September 30, 2023, there are 110 companies with a total committed de-loading capacity of 539.26 MW that have signed up with MERALCO and with RESs as ILP participants.

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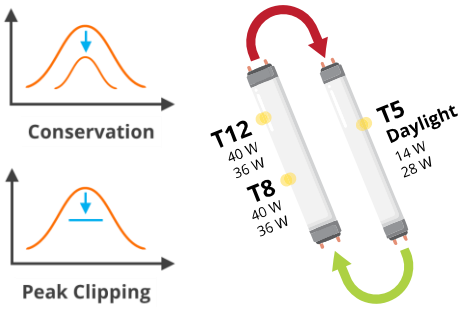
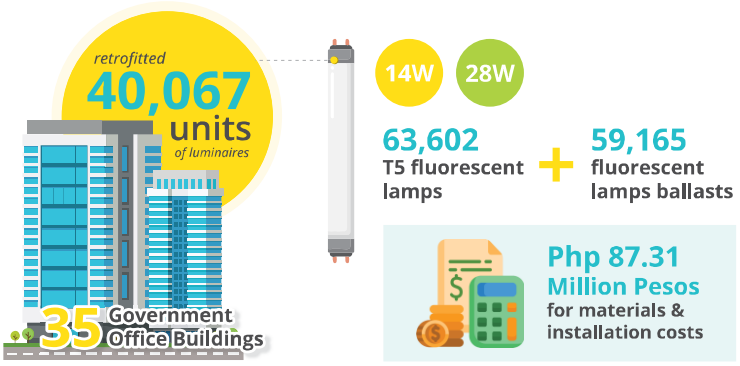
2 CASE STUDY 2: RETROFITS OF 35 GOVERNMENT OFFICE BUILDINGS

DSM Sector	Government Buildings
Country	Philippines
Program Name	**Retrofits of 35 Government Office Buildings**
Program Summary	
	The Philippine Energy Efficiency Project (PEEP) was designed to implement a series of activities to reduce electricity consumption in the residential and public sectors, reduce peak load power demand, reduce health risk associated with residual mercury and kerosene (in the off-grid areas) and establish a certification process for energy and environmentally efficient commercial buildings.
	The Philippine Energy Efficiency Project (PEEP) was established by the Philippine Government and is being implemented by the Philippine Department of Energy (DOE) with support from Asian Development Bank (ADB) and IIEC. The project, with a total approved budget of 46.5 million US dollars, was implemented between 2010 to 2011 and covered a series of following activities: • Nationwide distribution of 5 million energy efficient lamps • ***Retrofits of 35 government buildings in Metro Manila*** • Retrofits of park lights in Baguio City • Retrofits of streetlights and traffic lights in Cagayan de Oro City • Retrofits of 159 traffic intersections with LED in Metro Manila
Program Funder	
	ADB Asian Development Bank (ADB)
Program Design & Objective	
	Retrofits of 35 Government Office Buildings aimed to reduce wasted energy in government office buildings resulting from the use of inefficient lighting equipment. Older-style fluorescent lamps, incandescent bulbs, and inefficient magnetic ballasts were replaced by energy-efficient alternatives – *new T5 fluorescent lamps, CFLs, and electronic ballasts*, respectively. The relevant load shape objective of the project is both energy conservation and peak clipping.  The program is consistent with the Administrative Orders[2] issued by the Philippine Government on the Government Energy Management Program (GEMP) which

[2] Administrative Order (AO) Nos. 103, 110, 110-A and 126

	promotes the use of energy efficiency concepts and technologies for reducing energy consumption by a minimum of 10%. This program demonstrates how low-hanging fruit energy efficiency technologies deliver energy saving results in government entities/facilities and, hence, this program was selected as the DSM case study for the Philippines.
Program Implementation Approach	
	The 35 government office buildings were chosen based on the following main criteria: ✓ At least 45% of the total linear lamps installed are inefficient (T12 40W, T8 36W). ✓ The office building is owned by the Government Agency. ✓ The office building is accessible or located in a non-restricted area. ✓ The office building operates its lighting system at extended/longer time. ✓ The office building has budget constraints to comply with Administrative Orders (AO) 126 and 183. This means Government Agency is still using T12 18W and 40W lamps. ✓ The office building can serve as a demonstration of an energy efficiency retrofitting for other buildings. Prior to the implementation of the project, DOE signed memorandum of agreements (MOAs) with each of the government agencies. The MOA stipulated and defined the roles of the DOE, the recipients/beneficiaries of the retrofitting project, and IIEC. DOE was responsible for procurement of materials and services required for retrofits of 35 government buildings in Metro Manila and all installations of energy efficient lighting followed the Philippine Electrical Code. **Pre-Installation Site Visit** DOE and IIEC representatives conducted on-site visits and met with representatives from various government agencies specifically the designated energy officers to discuss the target area for retrofitting, the lighting surveys were conducted to determine the bill of quantities as well as the project implementation schedule. **Installation of Energy Efficient Lighting** The retrofits of 35 government buildings lighting were completed in 7 months (started in July 2011 and completed in February 2012). Completed installations were inspected by the DOE and IIEC representatives. Overall 40,067 units of luminaires including 63,602 fluorescent lamps and 59,165 fluorescent lamp ballasts were replaced and the total funding requirement was about 87.31 million pesos for materials and installation costs. 

Representative luminaires installed in the offices before and after retrofitting at Department of Energy (DOE)

Program Measurement and Evaluation

Calculation of potential energy savings and GHG emission reductions followed the International Performance Measurement and Verification Protocol (IPMVP) 2010 as described below.

- ***Operating Hours:*** Calculate average annual operating hours using installed hour-meters.
- ***Savings in Energy Consumption:*** Compute weighted unit savings (kW) by finding the difference in lighting load between existing and new luminaires. Multiply load reduction by the total number of retrofitted luminaires. Calculate total energy consumption (kWh) by multiplying load reduction (kW) by estimated annual operating hours for each luminaire.
- ***Annual Emission Reductions:*** Calculate potential GHG emission reduction by multiplying annual energy savings (kWh) by 0.54 kg CO_2e / kWh[3].

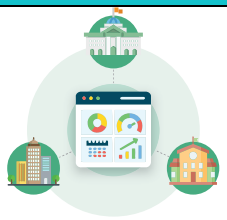
In addition, the financial benefits of these retrofits were also determined through the simple payback period of energy efficient lighting investment in each building.

Cost Recovery Mechanism

The lighting retrofits of 35 government buildings were funded by the government budget (ADB loan) and the investment costs by the government were recovered through electricity cost savings, hence the lower annual budget for operating expenses in the selected buildings. In addition, the Implementing Rules and Regulations (IRR) directing the Institutionalization GEMP, approved in May 2008, allow government entities/facilities to utilize the savings generated to finance additional energy efficiency measures and incentivize employees for further energy efficiency improvements.

Program Benefits

The results of the lighting retrofits directly support the Philippines in achieving the 10% energy reduction target in GEMP. This successful initiative can serve as the model for replication in other government entities/facilities and a useful guide for other private establishments on how to implement an energy efficient lighting retrofit project and to verify savings generated.



Program Results

The retrofits of lighting systems in 35 government buildings has decreased the power consumption by almost 24.50 % and increased illumination level by 52 %, based on the monitoring and measurements conducted before and after the installation of the replacement lamps. The payback period on the investment is 6.20 years. Longer payback periods may be due to luminaire costs for aesthetic improvements. Excluding the cost of the luminaires, the payback period is 3.91 years. The potential GHG emission reduction is 760,596.38 kg CO_2e / year and Total savings in energy consumption is 1,408,511.82 kWh / year.

[3] Grid Emission Factor

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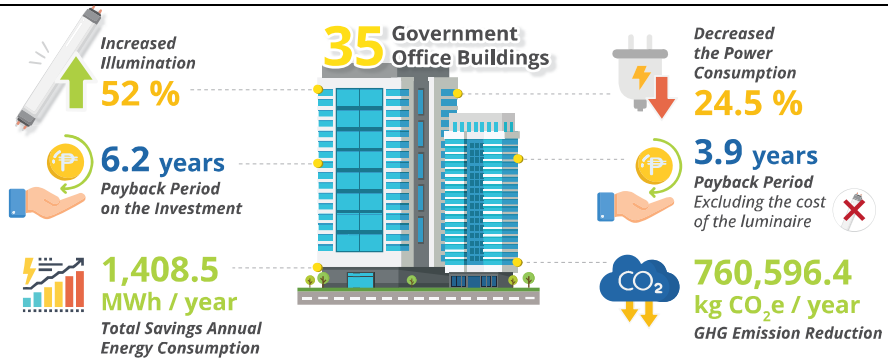

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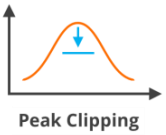
3 CASE STUDY 3: INSTALLATION OF SOLAR POWERED LED STREETLIGHTS ALONG EPIFANIO DELOS SANTOS AVENUE (EDSA)

DSM Sector	Municipal Sector
Country	Philippines
Program Name	**Installation of Solar Powered Light Emitting Diode (LED) Streetlights Along Epifanio Delos Santos Avenue (EDSA)**
Program Summary	
	The Metropolitan Manila Development Authority (MMDA) was created under Republic Act 7924 (R. A. 7924) on July 25, 1994. The main function of MMDA is to formulate, coordinate and regulate the implementation of medium- and long-term plans and programs for the delivery of metro-wide services, land use and physical development within Metropolitan Manila, consistent with national development objectives and priorities. MMDA is also involved in the installation of streetlighting along major roads in Metro Manila.
	Epifanio de los Santos Avenue, commonly referred to by its acronym EDSA, is a circumferential highway around Manila. The avenue which has 23.8 km stretch passes through 6 Metro Manila cities: Pasay, Makati, Mandaluyong, San Juan, Quezon City, and Caloocan. According to MMDA's Traffic Engineering Center (TEC), there were a total of 6,344 solar powered LED streetlights installed in Metro Manila under MMDA, as of August 2022. 
Program Implementing Agencies	
	The Metropolitan Manila Development Authority (MMDA)
Program Design & Objective	

The goal of the project is to promote the use of renewable technology and energy efficiency through the deployment of solar-powered LED streetlights in cities and municipalities; and to help contribute in reducing their electricity consumption.

The relevant load shape objectives of the project include both energy conservation and peak clipping (evening). Given the replication potential in areas where evening peak demand and energy conservation in public lighting are concerns, the installation of solar-powered LED streetlights was selected as the DSM case study for distribution utilities and local government units (LGUs).



Program Implementation Approach

The installation of solar powered LED streetlights was undertaken by MMDA. A total of 2,401 units of 250 watts high pressure sodium (HPS) lamps were replaced with 100 watts solar powered light emitting diode (LED) streetlights. MMDA started the replacements in December 2020 and completed in March 2022.

Photo by Google Street View

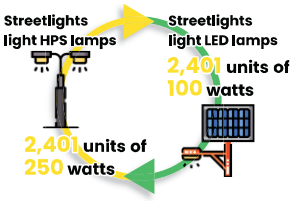
Photo by MMDA Website

Program Measurement and Evaluation

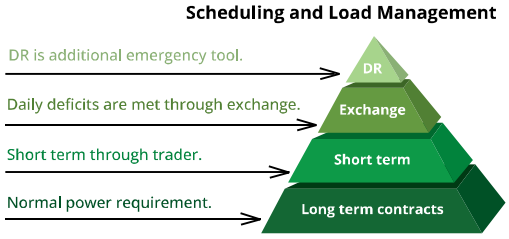
New solar powered LED streetlights are fully operating in an off-grid mode without consumption of grid electricity. Calculation of the total energy savings was undertaken by multiplying the estimated power of the old 250 watts HPS streetlights with the estimated annual operating hours for streetlights in the Philippines. The total power consumption by a 250-watt HPS streetlight is about 335 watts, i.e., 250 watts for HPS lamp and about 80 watts by lamp accessories (ballast and ignitor). The international protocol for estimation of energy savings and emission reduction of energy efficient outdoor and street lighting technologies (AMS-II.L. - Version 2.0) allows the use of the average number of hours between sunset and sunrise for streetlights controlled by ambient light sensors. In case of the Philippines, the average daily hours of operation of streetlights is 12 hours.

Cost Recovery Mechanism

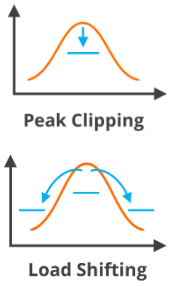
The replacements of 2,401 250-watt HPS streetlights were funded by MMDA budget approved by the Congress as part of the General Appropriation Act (GAA), and the

	investment costs were recovered through savings of the electricity and maintenance costs achieved from the operation of solar powered LED streetlights. MMDA can also utilize the savings generated to finance additional energy efficiency measures and incentivize employees for further energy efficiency improvements.
Program Benefits	
	Solar powered LED streetlights benefit both LGUs and distribution utilities (DUs) depending on who would take the ownership of the investment. LGUs consider solar powered LED streetlights as one of the most viable options in reducing their electricity consumption and this successful implementation by MMDA can be replicated by LGUs across the Philippines.
Program Results	
	 Through installation of 2,401 units of 100 watts solar powered LED streetlights , MMDA realized a reduction of 3,523 MWh of grid electricity consumption annually or about 35 million Peso of electricity cost.
Contact Information	
	The Metropolitan Manila Development Authority (MMDA) Hotline 136 digitalmedia@mmda.gov.ph --- **Energy Utilization Management Bureau (EUMB)** **Department of Energy (DOE), Philippines** +63 2 8840-2289 doe.eumb@gmail.com **Energy Transition Partnership (ETP)** +66 988321614 etp@unops.org **International Institute for Energy Conservation (IIEC)** +66 2 285-6346-7 iiecbangkok@iiec.org

4 CASE STUDY 4: DEMAND RESPONSE PROGRAM FOR LARGE CONSUMERS

DSM Sector	Large Commercial and Industrial Consumers
Country	India
Program Name	**Demand Response Program for Large Consumers**
Program Summary	
	Demand Response (DR) Program for Large Consumers is a voluntary, demand-side management program that involves high tension (HT) commercial and industrial consumers in Mumbai and expects them to reduce their demand during peak hours or in case of system constraints for the utility. The objective of the DR is to enhance grid reliability and prevent power outages during critical times by reducing load on the grid. It also provides financial incentives for participating consumers.
	This program operates through an aggregator model, where the aggregator works as a bridge between utility and consumers. It works closely with consumers for deciding protocols for demand reduction during DR event and also provides financial incentives after measurement and verification of the demand reduction. The utility gives a call for DR events to the aggregator, which communicates with the eligible consumers. 
Utility Characteristics	
	Tata Power Company • One of the oldest power utilities in India having presence for more than 100 years. • It is India's one of the largest integrated power company.
Program Support Agencies	
	Maharashtra Electricity Regulatory Commission (MERC)
Program Design & Objective	
	The DR Program was designed to involve customers during high-cost power purchase and transmission / distribution network constraints. The program was designed for maximum 100 hours in a year, with 2 hours maximum for each event. Customer

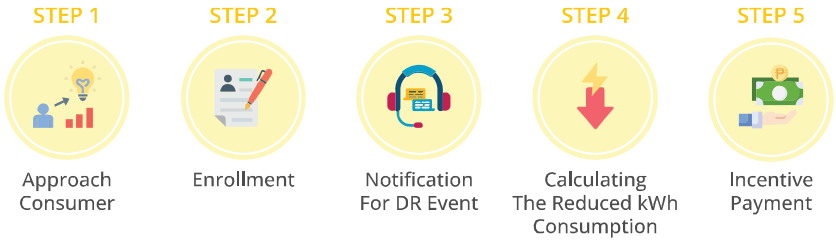
participation is voluntary, without penalties. Enrolled consumers receive incentive payments per kWh of verified load curtailment. The relevant load shape objectives of the DR program include peak clipping and load shifting. This program was selected as the DSM case study for the Philippines as it demonstrated a successful voluntary DR program with different implementation approach.



Program Implementation Approach

The utility's role is to facilitate the DR program by coordinating with the aggregator and consumers. The utility connects the aggregator with consumers, provides information about the DR program, sends notifications for DR events, and verifies and processes payments based on the calculated reduction in energy consumption.

The aggregator acts as an intermediary between the utility and consumers. The aggregator approaches consumers, explains the program, facilitates enrollment, communicates DR event details to enrolled consumers, collects and calculates the reduced kilowatt-hour (kWh) consumption, and manages the incentive payment process.



STEP 1: CONSUMER APPROACH

The aggregator will contact consumer through the utility for explanation and enrollment in the DR program. Presentation on program outline and benefits will be explained to consumer.

STEP 2: ENROLLMENT

If interested, the consumer will sign an agreement with the aggregator for enrollment in the program. The aggregator will assist the customer to decide protocol for demand reduction during DR events.

STEP 3: NOTIFICATION FOR DR EVENT

The aggregator will send notifications to the enrolled consumer for duration of DR events. This will be through various channels, such as SMS, emails, phone calls, etc.

STEP 4: CALCULATION OF REDUCED kWh CONSUMPTION

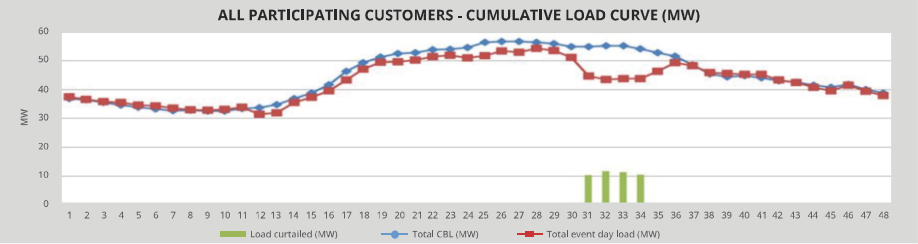
The aggregator will collect the meter data of participated consumer for measurement and verification (M&V) and calculate the reduction in energy consumption during DR event by the approved methodology of calculation.

	STEP 5: INCENTIVE PAYMENT Upon the calculation of kWh reduction, the aggregator will send the details to the utility. The utility will verify and process the payment to the aggregator, who will in turn pay incentive amount to the consumer. The aggregator will share the incentive payment details to the utility for records.
Program Measurement and Evaluation	
	• **Baseline Consumption** In case of a DR event, the baseline for the participating consumer is established by collecting the utility meter data. The baseline for the DR event is calculated based on the previous days data as explained in the agreement. • **Load Reduction Verification** The aggregator collects the utility meter data for the event day and compares with the baseline consumption to verify that the load is actually reduced during the DR event. • **Event Performance Analysis** After the DR event, the aggregator evaluates the performance of the DR event. This includes assessing the overall load reduction achieved. • **Incentive calculation** The aggregator calculates the incentive for the participating consumer based on the agreed methodology established for M&V of the event. The financial settlement is done based on the energy consumption reduced during the DR event. • **Reporting** The aggregator provides a report to the participating consumer detailing their performance during the DR event, including kWh reduction achieved and incentive earned. This report is also sent to the utility company. • **Regulatory Compliance** The utility company ensures that the program is implemented as per the regulator's guidelines, which in effect benefits both the grid and the consumers. • **Continuous Improvement** Based on the results of evaluations and feedback, the pilot program can be converted to a full-scale program with revised incentive structure and improved participation.
Cost Recovery Mechanism	
	As per the Maharashtra electricity regulatory commission (MERC) DSM regulations[4], distribution licensees are authorized to recover justifiable costs associated with demand side management (DSM) activities, encompassing planning, designing, implementing, monitoring, and evaluating DSM programs. These costs can be added to their annual revenue requirement for funding through tariffs. Alternatively, distribution licensees may implement programs at consumers' premises, ensuring an

[4] https://merc.gov.in/wp-content/uploads/2022/07/English-5-1.pdf

appropriate Return on Investment. However, all DSM-related activities must adhere to certain principles. They should be cost-effective for both consumers and the Licensees, safeguard consumers' interests equitably, and ultimately lead to overall tariff reductions for all consumers under the licensees. This approach aims to strike a balance between recovering incurred costs and promoting efficiency, affordability, and fairness in the implementation of DSM initiatives.

Program Benefits



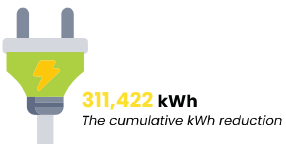
Benefits for Utility Companies

- ***Grid Security:*** For the peak period, emergencies and system constraints, DR helps the grid operator by providing additional resources. This reduce the need of load shedding, and improve overall grid stability.
- ***Economic Benefit:*** DR helps the utility to create additional resources to tackle peak loads. It eliminates the need of an additional generation plant and infrastructure for addressing peak or critical peak demand. This reduces the investment by utility and saves on the capital expenditure.
- ***Environmental Benefits:*** Elimination of fossil fuel based additional power generating station reduces the overall GHG emissions by utility and help environment.

Benefits for Participating Customers

- ***Financial Incentives:*** Participating consumers receive incentives from participation in the DR program.
- ***Enhanced Corporate Social Responsibility:*** DR event participation is considered as one way to help environment by reducing the energy consumption. This is also viewed as a part of corporate social responsibility.
- ***Energy Efficiency improvement:*** DR event participation can help consumers to understand about improving energy usage by reducing wastage and increasing energy efficiency. This helps them to improve their profits by achieving long term benefit beyond the DR program.

Program Results



- The pilot program was operated from 2011 to 2015. The cumulative kWh reduction achieved was 311,422 kWh. The maximum load reduction achieved in a single DR event 14 MW.
- The participating consumer mix included commercial establishments for information technology, information technology enabled services, offices, hotels, malls, hospitals, and municipal corporations.

Contact Information

Note: This document is for reference purposes only.

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5 CASE STUDY 5: ENERGY EFFICIENT AIR CONDITIONER PROGRAM

DSM Sector	Residential Sector
Country	India
Program Name	**Energy Efficient Air Conditioner Program**
Program Summary	
	This initiative strives to encourage energy efficiency and environmentally friendly practices within households while reducing power consumption during peak loads. The program encompasses the substitution of non-star, outdated, and up to 3-star air conditioning units to 5-star-rated models. The air conditioning units subjected to the exchange program have rated capacity of 1, 1.5, and 2 tons. Domestic consumers possessing old air conditioners (up to 3 stars) in operational condition are eligible to voluntarily participate in this program. The project was implemented from May 2018 to May 2019. [5,6]
	The program components of **BYPL's Air Conditioner Replacement Scheme** involved a strategic collaboration with renowned air conditioner manufacturers, including Havells (Lloyd), Godrej, Blue Star, LG, and Voltas. This initiative, designed to promote energy efficiency in East and Central Delhi, aimed to replace old and inefficient air conditioners (ACs) with new, energy-efficient 5-star rated models. The scheme provided consumers with the opportunity to choose from a range of reliable brands. This collaborative effort with leading vendors played a pivotal role in the successful execution of the program, aligning with BYPL's commitment to fostering the adoption of sustainable and energy-efficient technologies in the region.
Utility Characteristics	
	BSES Yamuna Power Limited **BSES Yamuna Power Limited (BYPL)** • Stands as a key player in driving power distribution reforms within Delhi. Recognized for its commitment to providing quality, reliable power, and customer-friendly services, BYPL was established in 2002 through a joint venture between Reliance Infrastructure Limited and the Government of National Capital Territory (NCT) of Delhi. • Operating across a 200 sq.km. license area in Eastern and Central Delhi, the company ensures efficient service reach through three circles and fourteen divisions.

[5] 'Compendium on DSM measures by Electricity Distribution Companies (DISCOMs)', Bureau of Energy Efficiency (BEE) https://beeindia.gov.in/sites/default/files/publications/files/Compendium_on_DSM_measures_by_DISCOMs_BEE.pdf

[6] DERC - https://www.derc.gov.in/sites/default/files/Petition%20no%2023_2018%20filed%20by%20BYPL%20-%2018.05.2018%20(1).pdf

- Over the years, BYPL has significantly reduced aggregate technical and commercial losses, witnessing a notable drop from 63.1% in 2002 to 6.43% in FY 2022-23, marking a substantial 56% reduction.

Program Support Agencies

Delhi Electricity Regulatory Commission (DERC)

Program Design & Objective

BSES Yamuna Power Ltd. (BYPL) launches the AC Replacement Scheme with a clear objective to promote energy efficiency and green initiatives in East and Central Delhi. The program aims to achieve peak load reduction, flatten the load curve, and phase out inefficient non-star rated ACs. By offering substantial discounts on energy efficient 5-star rated ACs, BYPL intends to accelerate the adoption of these efficient models. The initiative also strives to enhance awareness among consumers about the cost and energy savings associated with the Bureau of Energy Efficiency (BEE) 5-star rated ACs. With a target of replacing 3,000 ACs with capacity 1/1.5/2 ton of refrigeration (TR), BYPL is committed to fostering a more energy-conscious community. The relevant load shape objectives of The ACs replacement program include both energy conservation and peak clipping. This program was selected as the DSM case study as it showcased how a distribution utility can collaborate with energy efficiency technology suppliers in the implementation of a DSM program.

1 Ton/ 1.5 Ton/ 2 Ton Window/ Split Inverter AC

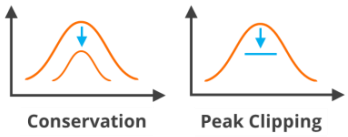
Manufacturer	Models	Market Price (in Rs.)	Offered Price (in Rs.)
BLUE STAR	09 models	38000-84000	16742-38493
Godrej	08 Models	48900-69000	22899-42296
LLOYD	06 Models	49990-85990	18926-36447
LG	06 Models	68990-85990	28659-37345
VOLTAS	10 Models	49990-93990	22463-41979

Note: For model wise price, please visit www.bsesdelhi.com or customer care centers

Rates of Additional Accessories and Extended Warranty including taxes

ITEM DESCRIPTION	UOM	BLUE STAR	VOLTAS LIMITED	GODREJ	LG ELECTRONICS	LLOYDS
Extended Warranty By OEM (1 Year)	Rs/Year	1180	2990	1500	3450	2200
Extended Warranty By OEM (4 Year)	Rs/Year	----	----	5900	----	----
Stabilizer as per standard Rating (4 KVA)	Rs	2360	2500	2650	1500	2350
Stabilizer as per standard Rating (5 KVA)	Rs	3540	3500	----	----	3500
Standard Copper beyond Piping Kit	Rs/Mtr	944	850	1200	750	750
Standard Electrical wire beyond Kit	Rs/Mtr	142	130	126	100	120
Standard Drain Pipe beyond Piping Kit	Rs/Mtr	118	110	75	120	100
Standard MS Stand	Rs/Stand	885	800	850	1200	650
GrillCutting & Framing Maximum Charge for Window AC /Window Inverter AC	Rs/AC	590	1000	As per actual site conditions	500	Depeding on site
Delivery Charge above first floor if lift facility is not available	Rs/Floor	236	100	300	300	100
Electrical plug	Rs/Plug	118	100	150	50	80
Extra Wall Hole	Rs	295	100	300	100	75
Extra Wall Hole with core cutting	Rs	590	1500	----	1450	----

credit: www.bsesdelhi.com



Program Implementation Approach

STEP 1: SCHEME LAUNCH

BYPL initiates the AC replacement scheme, aiming to champion energy efficiency and green initiatives.

STEP 2: SELECTION OF AIR CONDITIONER BRANDS

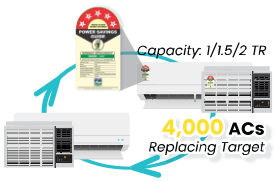
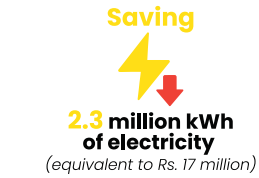
Consumers are empowered to choose from five prominent AC brands: Blue Star, Godrej, Havells (Lloyds), LG, and Voltas.

STEP 3: CONSUMER ELIGIBILITY CRITERIA

	Eligibility extends to all domestic consumers with a BYPL metered connection, provided there are no outstanding electricity bills, and the old AC is up to 3 stars and operational. **STEP 4: REGISTRATION PROCESS** Consumers engage in the registration process through diverse channels, including the BYPL website, virtual call center, and mobile app. **STEP 5: VERIFICATION AND PRE-INSTALLATION** BYPL verifies consumer details and documents. Upon successful pre-registration, consumers submit the registration slip and signed indemnity bond during the booking of the selected AC model. **STEP 6: INSTALLATION AND POST-INSTALLATION** The implementing agency swiftly installs the new AC within 7 days from the order booking date. Consumers subsequently submit the signed post-installation form and indemnity bond. **STEP 7: DOCUMENTATION AND PROOF SUBMISSION** During the online registration, consumers upload essential forms such as the consumer application form, undertaking and indemnity bond, and AC installation form. ID and address proofs are also submitted for verification. **STEP 8: AFTER SALES SUPPORT AND WARRANTY** Post-installation issues, defects, or deficiencies are the sole responsibility of consumers and the respective AC manufacturer. BYPL explicitly disclaims responsibility for product quality, performance, or after-sale services. **STEP 9: ENVIRONMENTAL DISPOSAL OF OLD ACS** Old ACs collected under the scheme undergo environmentally friendly disposal in compliance with applicable laws and safety standards. **STEP 10: DISBURSEMENT OF REBATE** Upon successful supply and installation of the air conditioner at the consumer's end, BYPL initiates the transfer of the rebate amount to the original equipment manufacturer (OEM).
Program Measurement and Evaluation	
	• **Base Load Research** After conducting load research studies and reviewing energy audit reports at the distribution transformer (DT) level over the years, it has been observed that the highest utilization of air conditioning appliances takes place during late-night hours, specifically from 22:00 to 04:00. This indicates a rise in the average daily operating hours to 8 hours per day over a week, compared to the previous duration of 6 hours. • **Estimation of Energy Savings**

	Considering the efficiency of older AC's, base load profiles and operational time of AC's savings in energy consumption and power demand is calculated. • **Calculation of Rebate/Discount Rate** From the estimated savings and cost of efficient AC's, rebate/discount rate on purchase of energy efficient AC's is calculated for ensuring benefits to utility and consumers. • **Calculation of Impact of Scheme on Utility Load Curve** Impact of energy efficient AC's on reducing peak power demand for utility was estimated and benefit in terms of avoided purchase of expensive power is calculates.
Cost Recovery Mechanism	
	As per Delhi Electricity Regulatory Commission (DERC) DSM regulations[7], the distribution licensee is required to identify any net incremental costs associated with the planning, design, and implementation of DSM programs. They have the flexibility to propose a methodology for recovering these costs through tariffs or other mechanisms. However, for any DSM program to qualify for cost recovery, certain conditions must be met. These include obtaining prior approval from the commission, implementing the program in accordance with specified conditions or guidelines, and ensuring cost-effectiveness and self-sustainability. Additionally, the commission reserves the right to direct distribution licensees to undertake DSM programs that may not be cost-effective but bring significant societal benefits, and in such cases, the commission will provide the necessary resources for these programs. This framework aims to balance the economic viability of DSM initiatives with the broader societal interests.
Program Benefits	
	 *credit: www.bsesdelhi.com/web/bypl* **Benefits for Utility** • ***Reduction in the Summer Peak Load****:* BYPL identified a surge in peak load during summer, primarily attributed to a concentrated influx of AC load from 22:00 to 04:00. This resulted in the necessity to procure costly power during these hours. The integration of energy-efficient ACs through the scheme aimed to mitigate this peak, alleviating the need for expensive power procurement. • ***Flattening of Load Curve*****:** The program contributes to flattening the load curve for DISCOMs. This effect facilitates smoother generation scheduling and ramping expensive plants is avoided. **Benefits for Participating Customers (e.g., Residential consumer)**

[7] https://www.derc.gov.in/sites/default/files/DSM-Regulations-2014.pdf

	• ***Financial Support***: Consumers are given subsidies to purchase the new energy efficient ACs, which increase the willingness to replace the old AC's making replacement economically viable for consumers. • ***Saving in Energy Cost***: Consumers saves on energy bill due to reduced energy consumption for AC.
Program Results	
	 • A total of 4,000 air conditioners, with capacities ranging from 1 TR (Ton of Refrigeration) to 2 TR, have been distributed.
	 • The distribution of energy-efficient air conditioners led to a conservation of 2.3 million kWh of electricity, amounting to savings equivalent to Rs. 17 million[8].
Contact Information	
	BSES Yamuna Power Limited (BYPL) 011-40746103 BYPL.DSM@relianceada.com **Delhi Electricity Regulatory Commission (DERC)** secyderc@nic.in --- **Energy Utilization Management Bureau (EUMB)** **Department of Energy (DOE), Philippines** +63 2 8840-2289 doe.eumb@gmail.com **Energy Transition Partnership (ETP)** +66 988321614

[8] Equivalent to approximately 204,830 USD of cost savings.

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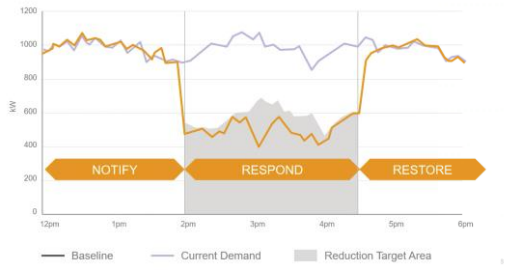
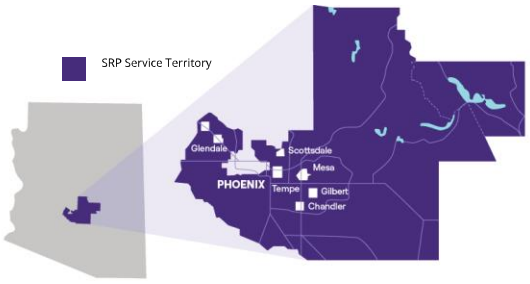
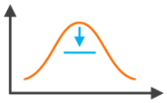
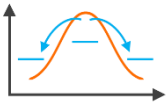
6 CASE STUDY 6: SRP BUSINESS DEMAND RESPONSE PROGRAM

DSM Sector	Large Business Electricity Customers
Country	USA
Program Name	**SRP Business Demand Response Program**
Program Summary	
	The Salt River Project (SRP) Business Demand Response Program [9] [10] stands as a strategic solution to address the challenges posed by increasing energy demand, the retirement of generation assets, and the integration of renewable resources. In response to potential capacity needs, especially during hot summer period, SRP has pioneered an innovative approach demand reduction. This load-shaving program incentivizes larger electricity customers to curtail energy use during peak demand, contributing to grid stability. The program, a key component of SRP's sustainability goals, has a proven track record. The success underscores the program's resilience, adaptability, and crucial role in providing reliable power.
	The project is rolled out for large consumers (commercial and industrial), and Salt River project (SRP) utility has partnered with Enel X (smart energy management solution provider) for implementation of the project. Enel X created a network operation center for monitoring and implantation of this demand response (DR) project. Consumers are provided with detailed guidelines for load reduction and are given financial incentives for providing DR at the time of event notified by SRP.  Notify: When a dispatch is called, we immediately notify your site contacts via phone, text and/or email. Respond: Your site responds by curtailing load manually or automatically. Restore: When the dispatch is over, your operations can return to normal levels.
Utility Characteristics	
	Salt River Project (SRP) ***Region - Central Arizona*** *Annual Statistics for FY23* • Electricity service area = 2,800 square miles • Electricity customers = 1,135,988 • Peak - SRP retail customers (MW) = 7,620 • Total electricity sales (GWh) = 37,401

[9] Case study- https://www.srpnet.com/assets/srpnet/pdf/energy-savings-rebates/business/rebates/BDR-Case-Study.pdf

[10] Fact sheet - https://www.srpnet.com/assets/srpnet/pdf/energy-savings-rebates/business/rebates/BDR-Fact-Sheet.pdf

Program Support Agencies	
	Enel X
Program Design & Objective	
	The SRP Business Demand Response Program is meticulously crafted to address the dynamic challenges of high energy demand periods. Enrolled organizations play a pivotal role by strategically curtailing their energy usage when the need is most pressing. This deliberate effort to ease power demand during peak times, especially in the scorching peaks of the year, stands as a proactive measure by SRP to avert potential power outages and concurrently reduce operational costs. The program's ingenious design not only ensures the reliability of the electric grid but also transforms downtime into a lucrative opportunity for participating organizations. By being on standby and responding as needed, these entities unlock a dual benefit – contributing to grid stability and earning financial incentives. Tailored for commercial, institutional, industrial, educational, or municipal entities with substantial energy consumption, the program accommodates a diverse range of organizations capable of strategically limiting operations on weekdays, weekends, or both, thereby fostering a collaborative approach to sustainable energy management.  *credit: www.enelx.com*  Peak Clipping  Load Shifting The relevant load shape objective of the program is peak clipping and load shifting. This program was selected as the DSM case study for the Philippines as it demonstrated a successful voluntary DR program in collaboration with a private sector organization.
Program Implementation Approach	
	STEP 1: PILOT LAUNCH AND OUTREACH Demand response program for businesses is launched on the website. Basic information about program is provided covering participation, benefits and demand response dispatch, etc. **STEP 2: ENERGY REDUCTION POTENTIAL ESTIMATION** SRP has partnered with Enel X for implementation of this program. Once consumers confirm the willingness in participation, the Enel X team conducts energy audit at consumers' premises to understand DR potential, and provides custom energy reduction plan outlining these measures. **STEP 3: INSTALLATION OF METERS** Enel X installs metering devices at consumer's premises for communication with their network operating center (NOC).

STEP 4: ENROLLMENT

After metering, consumers are enrolled for the program. The app created by Enel X can be used by consumers to monitor their DR performance.

STEP 5: NOTIFICATION

When high power demand is expected, SRP will send notification to the consumers through Enel X over phone call, email, etc. for dispatching DR.

STEP 6: RESPONSE

At the start of dispatch, consumers can reduce their demand as per the reduction plan provided by Enel X or can dispatch automatically through NOC. During and after the dispatch, consumers can communicate to Enel X for any assistance required.

STEP 7: SETTELMENT

Enel X calculates the incentives according to the participation and dispatch provided by consumers and consumers are compensated accordingly.

When SRP needs resources, Enel X "dispatches" its participating facilities to reduce electricity consumption

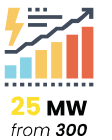
Program Measurement and Evaluation

- **Establishment of Network Operating Centre (NOC):**
  Enel X has established NOC for measurement, verification and control of consumer demand for DR program. Enel X installed meters at consumers' premises to facilitate communication and control through NOC.

- **Monitoring and Controlling DR Dispatch:**
  At the time of DR event, Enel X monitors the dispatch provided by each consumer manually or controlled automatically through NOC.

- **Communication During Event:**
  The Enel X team will remain in communication with consumers to help them with controlling their loads and provide instructions to maximize their profits though the DR event.

- **Financial Settlements:**
  From the data collected through NOC, financial incentives are calculated for each consumer based on DR provided by consumers.

Cost Recovery Mechanism	
	According to SRP annual report 2022[11], The district's price plans include a base price component and a Fuel and Purchased Power Adjustment Mechanism (FPPAM). Base prices recover costs for generation, transmission, distribution, customer services, metering, meter reading, billing and collections, and system benefits charges that are not otherwise recovered through the FPPAM. The difference between operating cost of DR programs and avoided cost of power generation (system benefits) is adjusted in base prices.
Program Benefits	
	Benefits for Utility • ***Positive Impact on Grid Stability*:** By engaging in load-shaving during peak demand, the DR program positively contributes to grid stability. This proactive measure helps prevent overloads and potential disruptions, promoting a more stable and resilient energy infrastructure for the benefit of all SRP customers. • ***Operational Flexibility*:** The DR program offers operational flexibility by allowing participating businesses to curtail energy use during specific high-demand events. This flexibility ensures that businesses can adapt to changing grid conditions while still contributing to the overall reliability of the power supply. • ***Alignment with Sustainability Goals*:** The program aligns seamlessly with SRP's 2035 Sustainability Goals, reflecting a commitment to innovative and sustainable solutions for meeting energy challenges. **Benefits for Participating Customers** • ***Achieve Corporate Sustainability Goals*:** Helps customers to contribute to corporate sustainability goals by participating in the grid stability programs. • ***Financial Incentives*:** Customers receive financial incentives by participating and providing DR to the utility during the high demand periods. • ***No-Cost, No-Risk Earnings:*** Customers need not to make any investment for the DR program as the energy reduction plan designed by Enel X is customized for each consumer considering their operational constraints. Customers also receive notification in advance which helps them plan their operations efficiently to gain maximum benefit.
Program Results	
	 • Enlisted 300 response sites amounting to about 25 MW of available capacity. • In summer 2020, enrolled consumers successfully delivered more than 25 MW demand response capacity over 8 events.  • The program is currently ongoing.
Contact Information	
	Salt River Project (SRP)

[11] https://www.srpnet.com/assets/srpnet/pdf/about/2022-annual-report.pdf

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