MARKET-MAKING FOR LOW-CARBON ENERGY TECHNOLOGIES: THE UJALA SCHEME IN INDIA

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ACTION AREA: Mitigation

FOCUS AREA: Delivering

COUNTRY: India

SECTORS INVOLVED: Energy; Manufacturing

TIMEFRAME: 2014-ongoing

CASE SUMMARY:

The UJALA (Unnat Jyoti by Affordable LEDs for All) programme was initiated by the Indian Ministry of Power in 2014 to reduce national energy consumption (and thereby CO2 emissions) by increasing the market penetration of energy-efficient LED bulbs. To stimulate demand for LED bulbs, the Indian public sector company Energy Efficiency Services Ltd (EESL) took measures to make them more affordable. One key step was procuring LED bulbs in bulk, which enabled EESL to buy them at a significantly lower cost, the benefit of which they passed on to consumers to make the bulbs affordable and increase residential users' uptake.

The initiative has been largely effective in achieving its objectives. As of February 2018, UJALA has deployed nearly 290 million LED bulbs (UJALA Dashboard 2018), driving down the procurement price of LEDs by nearly 90% from the start of the programme (PIB, 2016). This impacted the market retail prices too, falling by around 70% from an average price of around INR 600 (USD 9.2) (Motilal Oswal Securities 2016)[1] to an average of INR 150 (USD 2.3) today[2]. Emission reductions amount to more than 30 million tonnes of CO2 per year.

In 2016, EESL expanded UJALA coverage to ceiling fans and LED tube lights, which are the most common appliances used in Indian homes, and has already distributed over 4.4 million LED tube lights (National Tubelight Dashboard 2018), and 1.4 million energy efficient fans (National Pavan Dashboard 2018). All this is realised through a zero-subsidy model.

The programme design includes stringent quality control measures, including after-sale and warranty servicing, transparent reporting with real-time data available on a public dashboard, and robust MRV processes, which have built trust in the programme and further enhanced its deployment and impact.

[1] Conversion rate used throughout the document: USD 1= INR 65

[2] As per interview conducted with EESL and ELCOMA reports (Industry body- Electric Lamp and Component Manufacturers association)

MARKET-MAKING FOR LOW-CARBON ENERGY TECHNOLOGIES:
THE UJALA SCHEME IN INDIA

BACKGROUND:

UJALA is a residential energy efficiency programme in India, implemented by EESL, with the objective of financing and delivering energy efficiency (EE) solutions to drive market transformation for EE products.

EESL was established as a state-owned ESCO (energy service company) under the Ministry of Power. It is responsible for the implementation of the National Mission for Enhanced Energy Efficiency (NMEEE), which is one of the eight national missions under the Prime Minister's National Action Plan on Climate Change.

EE figures prominently in India's Nationally Determined Contribution (NDC) to the Paris Agreement on climate change, under which India has set itself the target of reducing carbon intensity of its GDP by 33-35 percent by 2030 compared to 2005 levels.

India is at the stage of development where rising disposable incomes and improving energy access for the millions living without it is going to lead to a surge in demand for energy and a resulting rise in emissions. EESL's role is to address this issue by increasing the use of EE products across various segments. In the absence of any subsidies, EESL's strategy is to create and sustain markets for EE by aggregating demand and carrying out competitive bulk procurement of high quality EE products.

EESL launched the UJALA programme with a target to distribute 770 million LEDs, making it the largest LED distribution programme in the world. In late 2016, UJALA's scope was expanded to include other high-use household appliances such as tube lights and ceiling fans. Besides LED bulbs, the UJALA programme now distributes 20W LED tube lights and 5-star rated energy efficient fans, all being significantly more energy efficient in comparison to the conventional alternatives and cheaper than the prevailing retail prices[3].

By regularly procuring large volumes of appliances with strong technical specifications, EESL has ensured high quality of products and spurred development of manufacturing capacity. EESL's initiatives are also recognized for their transparency: a publicly accessible dashboard tracks each new LED bulb, LED tube-light, or energy efficient ceiling fan distributed under UJALA in real-time.

UJALA has reached all Indian states and territories and has achieved estimated energy savings of over 37000 million kWh and CO2 reductions of more than 30 million tonnes of CO2 per year (as per the parameters used for calculations in the UJALA Dashboard 2018[4]).

[3] As per EESL, LED tube lights sold at a distribution price of INR 230 viz. The prevailing retail price of INR 700 and energy efficient fans sold at a distribution price of INR 995 viz. the prevailing retail price of INR 1500.

[4] Key parameters used: 1) Operating Hours: 7.11 hours; 2) Power capacity difference: 50 W; 3) Operating Days: 365; 4) Grid Emission Factor: 0.82 kg CO2e/ kWh; 5) Volumes: As per actuals.

ACTIVITIES:

- **AWARENESS PROGRAMMES:** EESL engages with potential consumers to disseminate information about the benefits of energy efficiency appliances in order to generate demand for the products. Awareness programmes may be realized in the form of for example government launch events, fliers, advertisements, street plays, and are conducted in partnership with state governments and state electricity Distribution Companies (DISCOMs) at times.

- **TENDERING FOR BULK PROCUREMENT:** EESL estimates the aggregated demand for its products periodically and undertakes bulk procurement of large quantities of energy efficient appliances, driving down the costs for the company. The procurement is done through open tenders, with technical specifications of the required products clearly detailed.

- **QUALITY ASSURANCE:** EESL ensures quality through clear technical specifications, a three-step testing process, and requires manufacturers to provide reliable replacement warranties for the products. Technical specifications are developed in line with efficiency standards and a stakeholder consultation process to ensure the products are aligned with existing consumer behaviour.

- **DISTRIBUTION:** EESL contracts distribution agencies to distribute energy efficient appliances at a lower cost relative to the retail market by passing on the maximum benefits of bulk procurement to consumers. The distribution agency is responsible for transporting appliances to the point of sale, collecting payments, maintaining records of sales data, and collecting appliances for replacement. Going forward, especially in rural areas, EESL will leverage government infrastructure to foster the deployment and outreach of the programme.

- **MONITORING AND REPORTING AND VERIFICATION (MRV):** UJALA's deployment data is collected from the sales points, and uploaded to the National UJALA dashboard, which is available for open access. The MRV system includes calculations of energy saved, costs saved, and carbon dioxide emissions reduced, which are also reported on the dashboard in line with each unit distributed.

INSTITUTIONS INVOLVED:

- **MINISTRY OF POWER** is the nodal government body which plans and coordinates India's EE efforts through the NMEEE. Under the NMEEE, the government leverages the institutions of BEE and EESL to design and implement various programmes and initiatives to achieve EE goals.

- **BUREAU OF ENERGY EFFICIENCY (BEE)** is the nodal agency for implementing the NMEEE. Within the overall framework of the Energy Conservation Act 2001, the agency assists in developing policies and strategies with the primary objective of reducing energy intensity of the Indian economy.

- **ENERGY EFFICIENCY SERVICES LTD (EESL)** was established in 2009 as a public sector ESCO to address some of the key barriers to scaling-up EE programme implementation. It is a joint venture between four Public Sector Undertakings – National Thermal Power Corporation (NTPC), Power Finance Corporation (PFC), Rural Electrification Corporation (REC), and Power Grid Corporation of India (PGCIL).

- EESL partners with **STATE ELECTRICITY DISTRIBUTION COMPANIES (DISCOMS)** for the implementation of UJALA in each state.

COOPERATION WITH: No direct cooperation with any international agency was sought to design and develop UJALA.

FINANCE: EESL's current sources of funding include: equity capital by its four promoters, proceeds from four domestic bonds issued in the last two years, loans from multilateral and bilateral donors, including KfW, Agence française de développement (French Development Agency, AfD), Asian Development Bank (ADB), World Bank, as well as lines of credit from commercial banks to finance its working capital, which it utilizes to fund its UJALA programme. EESL has been successful in raising public finance for its various initiatives and programme components, securing over USD 500 million in the last five years.

EESL's LED programme was intended to demonstrate the viability of EE technology in the absence of subsidies. Instead, EESL has used concessional sources of finance, which allow it to undertake the entire upfront investment for procuring LED bulbs in bulk to receive volume discounts, assume sales and consumer repayment risks, and pass on the benefit of reduced costs to the consumer in the form of reduced LED bulb prices.

IMPACT OF ACTIVITIES: —— UJALA has sold nearly 300 million EE products to the residential segment since its launch in 2014. This has significantly impacted the manufacturing and consumer segments, the energy sector and India's climate change mitigation targets. increased confidence in energy efficient technology and stimulated demand. UJALA is a successful example of making a technologically advanced and green product affordable and easily accessible to all consumer segments of the market.

- **REDUCED EMISSIONS SIGNIFICANTLY:** The success of UJALA resulted in a large-scale deployment of EE technologies in the residential segment of the Indian market, resulting in significant emissions reductions, which currently amount to over 30 million tonnes CO2 per year (UJALA Dashboard 2018).

- **AVOIDED PEAK DEMAND:** To date, UJALA's various initiatives have led to an avoided peak demand of over 7,400 MW and achieved energy savings of over 37,000 million kWh per year (UJALA Dashboard 2018). In India, the share of coal in total power capacity is about 62%, but the share in generation is about 80% (The Hindu 2017). Against this background, UJALA could already be said to have led to a significant contribution to avoided coal capacity.

- **REDUCED ENERGY BILLS:** The UJALA scheme is a success as it has been able to bring about notable cost reductions in household electricity bills by transitioning to LED lighting and EE appliances. This frees up households' disposable incomes which can then be utilized for other essential needs.

- **SPURRED MARKET DEVELOPMENT IN THE LED SEGMENT AND EE TECHNOLOGY SECTOR:** EESL's initiatives, including UJALA, aim to spur market development. With multiple rounds of procurement and deployment, as already done for LED bulbs, EESL was able to signal continued demand to manufacturers and incentivize the creation of capacity among manufacturers for the production of EE products. UJALA's operations contributed to raising the share of the LED lighting segment by value from 6% in 2010 to 54% in 2016, with demand increasing 50 times from 2014 to 2017 (Prayas 2017). This led to an increase of 3-5 times in manufacturing capacity (ELCOMA 2018). Heightened demand for energy efficient products is sparking stronger R&D investment in EE technology, and increased manufacturing and sales in the sector.

WHY IS IT GOOD PRACTICE: ——

- **TRANSFORMATIONAL IMPACT:** UJALA is credited with bringing about the fastest LED price reductions in the world, which helped transform India into the fastest growing LED market. Through bulk procurement, the UJALA model was able to drive demand for higher-cost LEDs, creating a competitive market, and hence, making the technology affordable and accessible. UJALA's procurement price of LEDs has been driven down by nearly 90% in the 2014 to 2017 period. The lower overall costs of using EE technologies increased confidence in energy efficient technology and stimulated demand. UJALA is a successful example of making a technologically advanced and green product affordable and easily accessible to all consumer segments of the market.

- **FINANCIAL VIABILITY:** The UJALA model has proven to be one of the few market-driven government initiatives that has successfully entered the complex and diverse Indian market in a very short period of time without the use of any direct public subsidies. UJALA's self-sustained business model, which serves the public good but does not rely on government funding, renders it attractive for sub-national governments who are keen on deploying it in their states. It has also attracted private players by creating a large demand for energy efficient technology and benefitted a large consumer base by making LED technology affordable through bulk procurement and cost recovery.

- **TRANSPARENCY:** The National UJALA Dashboard tracks and updates the distribution of its products in real-time, on an open and accessible dashboard. The Dashboard automatically updates every minute and is available as a website or a phone app. The distribution numbers are updated in real-time, along with the associated impact on carbon dioxide emission reductions, avoided energy consumption and cost savings. The dashboard sets a strong precedent for improving the transparency of national programmes and providing real-time information for a robust MRV and planning system, which can be replicated for future initiatives at the national level.

- **EFFECTIVENESS:** The UJALA model's multi-stakeholder approach is a key contributor to its effectiveness. The programme involves all segments of the market, and successfully encourages and includes private players into a public scheme. In the absence of a market for energy efficient LEDs, it has in fact been pivotal in creating a healthy and competitive market. Further, UJALA has been able to successfully change consumer behaviours through its awareness and marketing campaigns, the lower prices offered, and by its cost-recovery models which makes EE products affordable and attractive for all consumer bases.

SUCCESS FACTORS:

- **MARKET CREATION THROUGH A ROBUST BUSINESS MODEL:** UJALA's exemplary market model was designed to create a win-win situation for all stakeholders, including the private sector and consumers. To make the products attractive, EESL bore the primary risk and undertook the entire upfront investment for bulk procurements, using its own balance sheet. Adopting this strategy, UJALA was able to generate a market appetite for EE appliances which accelerated its deployment. Furthermore, through raising awareness as well as first-hand exposure to the benefits of energy efficient technologies, UJALA reached a wide base of consumers, strengthening the case for EE and driving demand. The higher demand for LEDs attracted private manufacturers to the market, stimulated competition, and further drove down the prices.

- **STRONG GOVERNMENT AND PUBLIC SECTOR SUPPORT:** The UJALA programme was designed to advance the Indian Government's energy efficiency efforts under the direct aegis of the Ministry of Power and with the backing of four key public sector entities from the energy sector – National Thermal Power Corporation (NTPC), India's largest power utility; Rural Electrification Corporation (REC), a leader in providing financial assistance to the power sector in all segments; Power Finance Corporation (PFC), a leading non-banking financial corporation in the energy sector; and Power Grid Corporation of India, the central transmission utility of the country. This level of backing and support from a range of public sector entities and the government ensured that UJALA was able to achieve buy-in and support from key public entities.

- **GENERATING INTEREST AND BUY-IN FROM PRIVATE SECTOR:** The regular demand signal provided by multiple frequent rounds of bulk procurement served to incentivize the creation of additional manufacturing capacity, especially for LED bulbs. The open procurement tenders, with multiple bidders being selected, also widened the acceptance of the programme amongst the manufacturing sector. This enhanced the development of local manufacturing capacity, while protecting EESL from the risk of a single supplier being unable to meet the order on time.

- **EFFECTIVE PUBLIC STAKEHOLDER ENGAGEMENT:** Stakeholder involvement and support from all segments was highly necessary for the success of such a large-scale programme. To facilitate this, EESL effectively uses partnerships with related stakeholders to implement its programmes, while also creating a network of regional offices to expand its reach. Before a programme is implemented in a new region, EESL enters into agreements with the relevant local authorities,

municipalities and DISCOMs, which is done through a series of discussions and negotiations. The UJALA programme is then implemented in consultation and coordination with them, which allows UJALA to leverage government infrastructure such as post offices, petrol pumps and public service facilities to support its deployment.

- **BUILDING CREDIBILITY AND TRUST FOR THE PROGRAMME:** Through specific initiatives, including the UJALA Dashboard and regular multi-stakeholder engagements, EESL has been able to demonstrate UJALA's success in a transparent manner, building credibility for the programme and its products. The stringent technical specifications, quality assurance process and the enhanced after sales services ensures high quality of the products and trustworthiness for the products from the consumers perspective. Also, the parameters for the MRV processes are calculated based on data that have been collected through mass surveys and studies, and are periodically reviewed by third-party verifiers. UJALA's strong credibility is proven by the fact that it has been deployed and scaled-up in collaborations with national and state governments and international institutions.

- **EASY TO REPLICATE:** The programme's easy replicability potential enabled it to deploy at a hitherto unprecedented speed and scale. UJALA has been able to successfully enter the different Indian states, covering different geographies and market segments. The success of UJALA's original LED bulbs initiative also resulted in the model being replicated to cover other commonly used household appliances and replacing these with standardised energy efficient technologies – LED tube lights and EE ceiling fans. EESL is also implementing similarly ambitious models for streetlights, air-conditioners and water pumps.

OVERCOMING BARRIERS / CHALLENGES:

WHAT WERE THE MAIN BARRIERS / CHALLENGES TO DELIVERY?

INFORMATION: Lack of awareness of energy efficiency products and benefits, along with lack of trust in what is considered to be "unproven" technologies.

INSTITUTIONAL: The diversity and geographical spread of India makes reaching the entire market and scaling-up programmes to their full potential a challenge.

HOW WERE THESE BARRIERS / CHALLENGES OVERCOME?

AWARENESS DRIVERS: EESL's programmatic interventions for awareness building through advertisements, demonstrations, kiosks and informational fliers led to greater awareness of the benefits of UJALA's products and EE in general. Going forward, as EESL focuses more on the rural market, it will use established government infrastructure (such as public distribution shops, post offices) and channels (such as petrol pumps) for increasing its reach and gaining stronger consumer trust.

QUALITY ASSURANCE: EESL ensured high quality through a mandatory 3-step quality assurance process, and reliable long-term replacement warranties (3 years for LED bulbs and tube lights and 2.5 years for fans), which helped build credibility for EE products in the market.

COLLABORATING FOR SCALE: Central government support (through its directives, energy efficiency schemes and policies) helped EESL in getting buy-in from state governments, with whose support EESL was able to get the DISCOMs on board to facilitate the programme deployment. The DISCOMs then supported the programme by allocating space for kiosks, participating in awareness building activities and providing a database of potential consumers.

FINANCIAL: High upfront costs of energy efficient products make them unaffordable for consumers, even if they are able to understand their cost benefits over a longer time-period.

BULK PROCUREMENT APPROACH: EESL made the entire upfront investment using its own balance sheet, and thus bore the bulk of the risk. It then leveraged a bulk procurement approach to drive down the price of the products procured and passed on the bulk of this lower price benefit to the consumers. This made the products more affordable compared to the prevailing retail prices and generated increased demand.

OPTION FOR PAYBACK IN INSTALMENTS: Initially, EESL offered and encouraged consumers to use the option of paying for EE appliances in instalments through an on-bill financing mechanism. This helped reduce the upfront cost of purchase for the consumer, and allowed recovery of payment through charges to electricity bills. Reducing the initial incremental cost of LEDs can facilitate uptake by consumers who would otherwise not be able to afford these.

LESSONS LEARNED: UJALA's deployment has demonstrated one of the fastest product uptakes at a large scale, covering a diverse market. The key lessons learnt from UJALA are the following:

- **UNDERSTANDING AND ADDRESSING KEY BARRIERS:** In the initial stages, UJALA recognised that customers would be wary to spend a relatively higher price on a product which is yet unknown to them. In order to address this situation, EESL adopted an approach including a partial upfront payment and partial cost recovery through on-bill-financing, theoretically from the energy savings itself. This demonstrated the programme's confidence in the products and its capability to achieve its objectives.

- **LEVERAGING MARKET-BASED MECHANISMS:** For a zero-subsidy model to be replicated and sustained, it is important to put market-based mechanisms to use, which EESL applied in UJALA by aggregating demand and procuring in bulk using its own balance sheet. EESL understood that there was a large latent demand potential for EE products, which was repressed due to the higher prices of these products. Aggregating the demand would allow EESL to purchase in bulk, thus securing lower prices. Aggregated demand and bulk procurement would also attract private manufacturers to the segment, increase competition in the market and further drive down prices, thus stimulating consumer demand.

- **MAINTAINING QUALITY AND CREDIBILITY:** When scaling up the programme, it is important to strengthen the MRV process in order to ensure quality, build credibility and sustain the model. Once UJALA had reached all parts of the country and started producing in larger quantities with more manufacturers in play, it realised that the likelihood of producing defective products also heightened. In cognisance of this, UJALA is creating stricter quality assurance tests and reviewing its standards and processes. UJALA is also undertaking third-party verification of its parameters and programme to validate and if necessary, modify its standards and ensure they are credibly linked to carbon mitigation and energy consumption reporting.

HOW TO REPLICATE THIS PRACTICE:

- **RECOGNISE THE TRUE BARRIERS TO UP-SCALING THE DIFFERENT ENERGY EFFICIENT TECHNOLOGIES AND ADDRESS THESE USING INNOVATIVE MECHANISMS** – such as demand aggregation, bulk procurement and on-bill financing - while taking strong measures to build credibility around the product quality.

- **CREATE A MODEL WHICH BENEFITS ALL KEY STAKEHOLDERS,** especially the private sector to allow for a self-sustaining market. UJALA's decision to procure from the private players in the domestic market maximised the role of the domestic manufacturing segment, and strongly demonstrated the potential of this new product segment.

- **REDUCE BUREAUCRATIC COMPLEXITIES** and simplify regulatory procedures.

Notably, the EESL's UJALA programme has already been replicated in another region altogether, with the launch of its initiative in Melaka (Malaysia) in September 2017. Similar initiatives are underway in South-East Asia and Africa.

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FURTHER KEY RESOURCES:

ELCOMA Vision 2020. Available at www.elcomaindia.com/wp-content/uploads/ELCOMA-Vision-2020.pdf UJALA Website: www.eeslindia.org/EN/Ujala/About

WEBSITES:

EESL – UJALA: www.eeslindia.org
National UJALA Dashboard: www.ujala.gov.in
National Pavan Dashboard: http://fan.ujala.gov.in
National Tubelight Dashboard: http://ledtubes.ujala.gov.in

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