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Idam Infrastructure Advisory Pvt. Ltd.

*Making Ideas Work*



## **Presentation on**

**“Demand Side Management Framework in India and Overview of Cost Effectiveness Assessment of DSM Programme Adopted by ERCs”**

*2nd Behavioural Energy Efficiency Pilot Stakeholder Workshop by Oracle Utilities at New Delhi*

- Importance of Cost Effectiveness Assessment of DSM Programme
- Cost Associated with DSM Programme
- Benefit Associated with DSM Programme
- Cost Effectiveness Assessment of DSM Programme – FOR Guidelines
- Framework for Cost Effectiveness of DSM Programme by Other ERCs
- Need of the Hour - Modification in DSM Framework
- Need of the Hour - Modification CEA Framework of DSM Programme
- Conclusion

# Importance of Cost Effectiveness Assessment of DSM Programme



- DSM program requires capital investment like infrastructure projects
- Cost benefit analysis of investment in DSM program is essential which helps in establishing economic viability
- DSM programs are different from other capital expenditure projects as multiple stakeholders usually share benefits as well as costs.
- Cost benefit analysis of infrastructure projects is carried out using standard financial evaluation criteria from the point of view of the person undertaking capital expenditure.
- In case of DSM projects, cost benefit analysis shall be carried out from the point of view of all the stakeholders that share costs.

# Costs Associated With DSM Program

- Costs are involved at every stage of DSM process and broadly categorised into program costs and general costs.
- Costs are broadly categorised under “**Program Costs**” and “**General Costs**” depending on whether these are directly associated with execution of DSM program or not;
- **Program Costs** are defined as the costs incurred to undertake program related activities such as design, development and implementation of DSM programs, monitoring & reporting and evaluation, measurement & verification etc.
- **General Costs** are defined as the costs associated with other activities such as load and market research, technical potential assessment, design and development of DSM plan and administrative costs etc. that are not specific to any DSM program;
- General Costs are real costs incurred by the distribution licensee, there is no direct measurable benefits associated with it.
- **Hence, cost effectiveness assessment shall be carried for program specific costs only by distribution licensee**

- Benefits of DSM program to its stakeholders are multi fold.
  - **Distribution Licensees**
    - Increased energy efficiency and/or better load management
    - Energy saved at high PPA tariff would result in better profitability
    - Reduce technical losses
    - Optimal utilisation of generation & network assets
  - **Consumers:**
    - Reduction energy bill and lower electricity tariff
    - Reduction of probability of load shedding
  - **Government:**
    - Optimal utilization of energy resources available within the economy
    - Reduction in subsidy payment as subsidized customers
- Benefits of DSM program are of two types i.e. energy benefits and non-energy benefits.
  - Energy benefits are easy to estimate and convert into monetary terms;
  - Non-energy benefits are difficult to estimate or convert into monetary terms.

- Energy benefits attributable to DSM Programme are in terms of energy saving as well as demand savings.
- Energy Savings can be calculated as:  
*Energy Savings = (Baseline Usage) – (Post Implementation Usage)*
- Energy benefits of DSM program are calculated in two ways i.e. net energy benefits and gross energy benefits.
  - Energy benefits attributed at consumer end are called net energy benefits
  - Energy benefit calculated at generator end are called gross energy benefits.
- Net energy benefits are important from the consumer perspective whereas gross benefits are important from the distribution utility perspective.
- Most DSM programs also produce demand savings means permanent reduction in demand in MW.

# Benefits of DSM Programme - Non-Energy

Non-energy benefits are also called as co-benefits and some of the co-benefits of DSM program are listed below:

<b>Green House Gas (GHG) Emissions Reduction</b>	<ul style="list-style-type: none"> <li>• GHG emission can be calculated using gross energy savings and emission factor of the grid in which it is operating.</li> <li>• It can be reported as Metric tons of GHG avoided during each year of the DSM program</li> <li>• It can also be quantified in monetary terms if carbon is being priced in the country.</li> </ul>
<b>Delay in Capital Expenditure</b>	<ul style="list-style-type: none"> <li>• Reduction in energy demand and network loading which further delay capital investment requirement for development of network for supplying increasing energy demand.</li> <li>• Delay in capital expenditure is difficult to estimate and convert into monitoring terms</li> </ul>
<b>Reduced Deforestation</b>	<ul style="list-style-type: none"> <li>• Thermal Plant contributes to nearly 60% of India's electricity generation, coal required for power generation for plant comes from opencast mining and underground mining.</li> <li>• Opencast method of coal mining results into deforestation, reduces energy demand and therefore coal demand, would further result in reduction in coal mining and deforestation.</li> </ul>
<b>Reduced Environmental Pollution</b>	<ul style="list-style-type: none"> <li>• Apart from reduction in GHG emissions, DSM program also results into reduction in other environment polluting gases such as Nitrogen Oxides and Sulphur Oxides.</li> <li>• It is difficult to estimate this reduction as grid factors for these gases are not available</li> <li>• Even if these factors are available, it is not possible to quantify benefit in monetary terms. However, the benefit must be recognized.</li> </ul>

# Cost Effectiveness Assessment of DSM Programme – FOR Guidelines (1/2)

- Forum of Regulators had issued guidelines for cost effectiveness assessment of DSM programme.
- Basic premise of any DSM Programme is that it should results in optimal utilization of the resources
- It is also important to ensure that proposed programme is cost effective as compared to the supply side options available to the utility prior to implementation of the same.
- FOR defined two separate criteria for distribution utilities and consumers to take care of interest of each category of stakeholders.
  - Cost Effectiveness Index
  - Cost of Conserved Energy



# Cost Effectiveness Assessment of DSM Programme - FOR Guidelines (2/2)



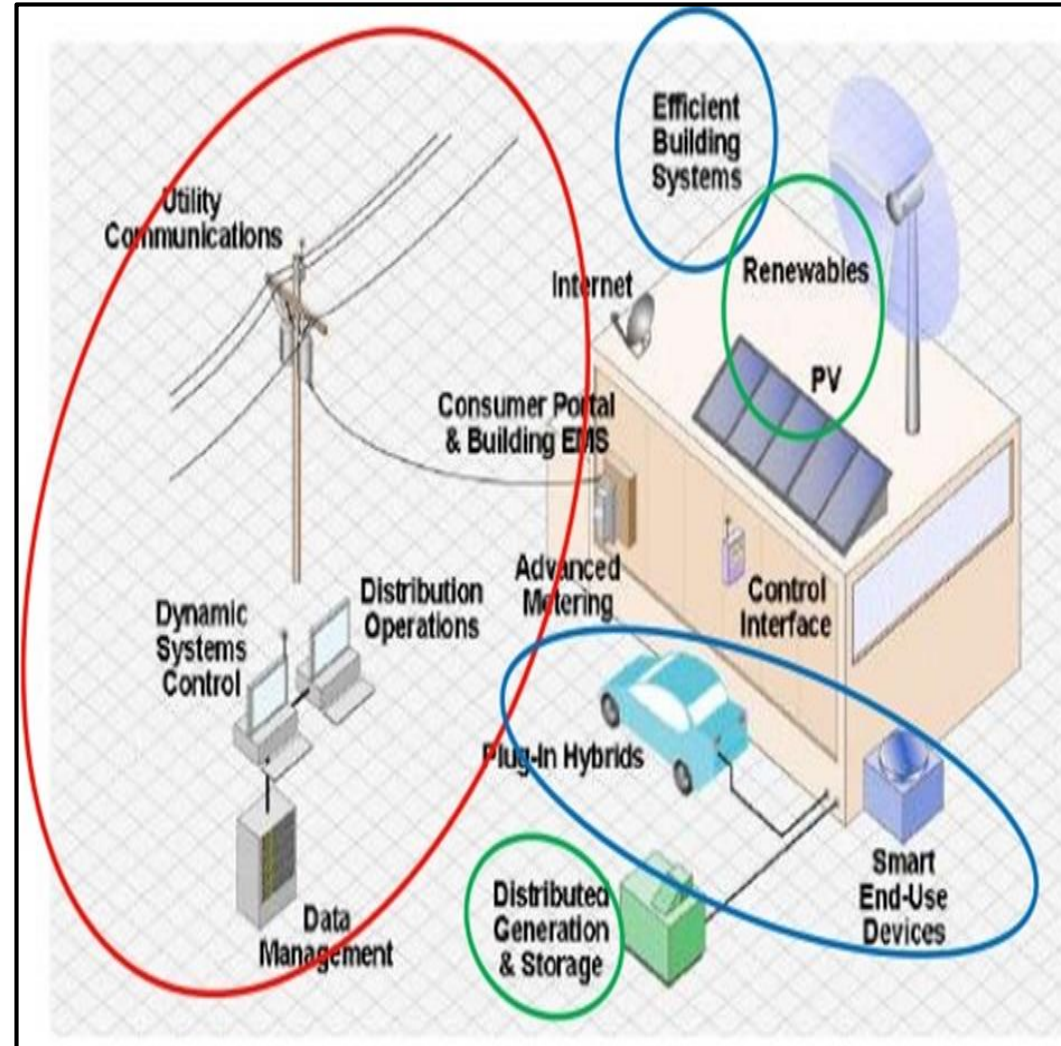
Cost Effectiveness Index (CEI)	Cost of Conserved Energy (CCE)
<ul style="list-style-type: none"><li>• CEI has been proposed to assess the viability of the DSM programmes by the distribution utility</li><li>• CEI is sum of the present value of the benefits of DSM programmes divided by the sum of the present value of the costs associated with the DSM programmes.</li><li>• CEI greater than one would mean that the full cost of an investment will be recovered through the benefits.</li><li>• Programme with higher CEI would represent better profitability</li></ul>	<ul style="list-style-type: none"><li>• CCE has been proposed to assess the viability of the DSM programme from the point of view of the participating consumers investing in the Programme</li><li>• It is based on the principle that a consumer benefits only if he saves electricity at a cost that is less than the applicable electricity tariff.</li><li>• CCE is the annualized incremental cost of investment in efficient option divided by annual energy saved due to adoption of efficient option.</li><li>• If Avg. Tariff - CCE &gt; 0, DSM Programme is viable from the point of the participating consumers</li></ul>

# Framework for Cost Effectiveness of DSM Programme by Other ERCs

- DSM Regulations have been issued by 19 states/territories in line with Model Regulations.
- ERCs are not come-up with CEA and Evaluation Measurement & Verification (EM&V) Guidelines for DSM programme despite of being states in DSM Regulations
- Various DSM programme implemented across country adopted deemed saving approach for assessment of saving and benefits of DSM programme
- DERC to be first in India to examine Behavioural Program CEA and EM&V

# Need of the Hour - Modification in DSM Framework

- Existing DSM framework are designed considering the traditional role of Distribution Licensee and Consumer as supplier and consumer resp.
- With the advancement of New Technologies Distribution Licensee and Consumers are not restricted to their traditional role
- Consumer will be playing role of generator and utility will be playing role of facilitator
- Further, behavior of the consumer (generator/consumer/energy storage) is also play important role
- **Hence, behavior aspects are also need to be brought-in into new DSM framework**



# Need of the Hour - Modification CEA Framework of DSM Programme

- Existing CEA framework only consider energy benefit for evaluation of DSM programme.
- Non-energy benefits such as GHG emission, deforestation, air pollution etc. are not even estimated for DSM programme
- Advancement in technologies which result into fuel switch (Electric Vehicle) will improve non-energy benefits of DSM programme
- Hence, non-energy benefits need to be incorporated into evaluation of DSM programme



- Advancement in Technology both at distribution licensee and consumer end require modification in existing DSM framework
- Behavior aspects are untouched in existing framework, which need to be brought-in into new DSM framework
- Cost effectiveness framework shall consider non-energy benefit while evaluating DSM programme
- Methodology to assess non energy benefits of DSM programme



# Thank You

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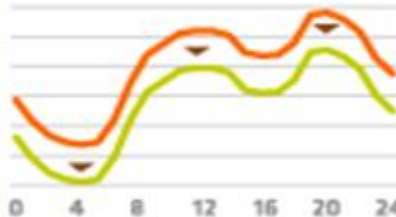
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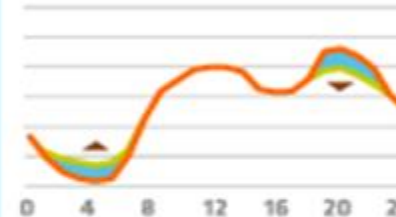
# Objective of DSM Programme

**1** **Reduction in consumption**



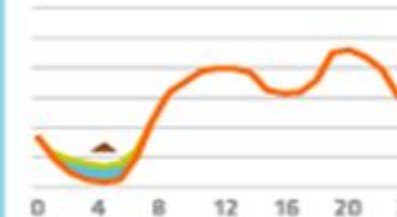
- Improving efficiency of equipment and processes.
- Energy saving awareness.

**2** **Shifting consumption from peak hours to valley hours**



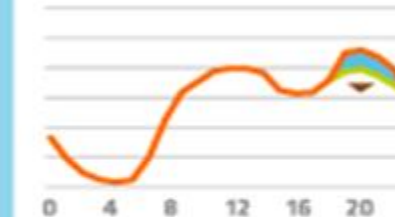
- Time of use tariffs.
- Response to electricity market prices.

**3** **Filling valleys**



- Pumping storage station.
- Energy storage technologies.
- Charging of electric vehicles.

**4** **Reduction in consumption during peak hours of the system**



- Interruptibility service.
- Automatic load management.

# Non-Energy Benefits (1/2)

- **Green House Gas (GHG) Emission Reduction**
  - Reduction in GHG emissions are the most commonly known and quantified co-benefit of the DSM program.
  - It can be calculated using the net energy savings and emission factor of the grid in which it is operating.
  - It can be reported as Metric tons of GHG avoided during each year of the DSM program and also quantified in monetary terms if emissions have value or carbon is being priced in the country.
- **Delay in Capital Expenditures**
  - Reduction in energy consumption results in reduction in energy demand and network loading which further delay capital investment requirement for development of network for supplying increasing energy demand.
  - It also results into optimal utilisation of network assets as well as avoided capacity addition in generation and network assets.
  - However, delay in capital expenditure is difficult to estimate and convert into monitoring terms



# Non-Energy Benefits (2/2)

- **Reduced Deforestation**

- Thermal power sector contributes to nearly 60 percent of India's electricity generation and coal required for power generation for thermal power plant comes from both opencast mining and underground mining.
- Opencast method of coal mining results into deforestation, reduces energy demand and therefore coal demand, would further result in reduction in coal mining and therefore deforestation.

- **Reduced Environmental Pollution**

- Apart from reduction in GHG emissions, DSM program also results into reduction in other environment polluting gases such as Nitrogen Oxides and Sulphur Oxides.
- It is difficult to estimate this reduction as grid factors for these gases are not available
- Even if these factors are available, it is not possible to quantify benefit in monetary terms. However, the benefit must be recognized.

# Background

- Demand Side Management (DSM) includes planning, implementing and monitoring the activities including educating and encouraging consumers to modify their level and pattern of electric usage to meet the utility's energy and demand goals
- DSM can complement supply-side strategies to help meet electric service demands by assisting utilities avoid or delay costly capacity additions by slowing demand growth.
- In May 2010, FOR had also issued Model Demand Side management Regulations for adoption by State ERCs.
- FOR had also issued Cost Effectiveness Assessment and Evaluation, Measurement and Verification Guidelines for DSM Programmes
- DSM Regulations have been issued by 19 states/territories in line with Model Regulations.
- MERC had also issued DSM Regulations and Cost Effectiveness Assessment Regulation in 2010 and adopted different approach for evaluation of DSM programme

# Model DSM Regulations (1/3)

- Regulations provide for DSM Objectives and targets to be set by the SERC for the Distribution Licensee
- Provides for guidelines on various aspects of DSM processes:
  - Load and market research,
  - Implementation of DSM programmes
  - Cost Effectiveness Assessment of DSM programmes
  - Monitoring and Reporting and Evaluation
  - Measurement and Verification of savings through DSM programmes;
  - Eligibility criteria for DSM programmes,
  - Guidelines for setting targets;
  - Database development framework guidelines etc.
- Guidelines may be modified without modifying Regulations.

# Model DSM Regulations (2/3)

- Provides for various activities to be undertaken in the DSM framework
  - Load research and development of baseline data, formulation of DSM Plan, Commission review and approval of DSM plan, preparation and approval of DSM Programme Document, and implementation of DSM programmes
- Third party intervention in performing the most important task such as Evaluation, Monitoring and Verification is envisaged and responsibility has been kept with SERC;
  - Considering the reach of the Distribution Utility, most of the execution related tasks have been assigned to them. In addition, the responsibility of assessment of technical potential and market research has been placed on them.

# Model DSM Regulations (3/3)

## DSM Regulation Includes.....

- Constitution of DSM Cell, its roles & responsibilities
- Load and market research and development of baseline data
- Formulation of DSM Plan
- Authority for review & approval of DSM plan
- Preparation of DSM Programme Document
- Approval of DSM Programme
- Implementation of DSM programmes
- Mechanism for Cost Recovery
- Monitoring and Reporting
- EM&V of DSM Programme

## Activities Covered.....

- Load and market research,
- Implementation of DSM programmes,
- Cost Effectiveness Assessment of DSM programmes,
- Monitoring and Reporting and Evaluation,
- Measurement and Verification of savings through DSM programmes;
- Eligibility criteria for DSM programmes,
- Guidelines for setting targets;
- Database development framework guidelines etc.