BEFORE THE HON'BLE HARYANA ELECTRICITY REGULATORY COMMISSION

AT PANCHKULA, HARYANA

Filling No:-_____

Case No: - HERC/_____

In the matter of: Petition filed under the provisions of Section 78 "Power to remove the difficulties " and Section 79 " Power to relax" of *'The Haryana Electricity Regulatory Commission (Terms and Conditions for Determination of Tariff for Generation, Transmission, Wheeling and Distribution & Retail Supply under Multi Year Tariff Framework) Regulations, 2012'* seeking approval for Demand Response (DR) by introducing dynamic pricing or Time of Day (TOD) tariff and under the provisions of Section 16 for "Power to remove the difficulties" of *'The Haryana Electricity Regulatory Commission (Electricity Supply Code) Regulations, 2014'* seeking approval for Peak Load Management (PLM) through remote disconnection and through "brown out" concept through advanced smart grid technology on pilot basis in Panipat City Sub-Division

AND

In the matter of: Uttar Haryana Bijli Vitran Nigam, Vidyut Sadan, Sector 6, Panchkula, Haryana……(Petitioner)

THE PETITION

The Petitioner respectfully submits as under:

- The Petitioner is the holder of the Haryana Distribution and Retail Supply License for the Northern Distribution Zone of Haryana.

1.1 By virtue of this petition the petitioner seeks approval for implementing below technological advancement mechanisms through pilot smart grid project in area of Subdivision Panipat

- Peak Load Management through
  a. Demand Response by introducing the dynamic pricing model.
  b. Demand Management by remote disconnection in case of unauthorized load and partial load shedding by introducing the 'Brown Out" Concept.

2. BACKGROUND

2.1 "Panipat smart grid project" is one of the fourteen pilot Smart Grid projects allocated by Ministry of Power that are being implemented by state-owned distribution utilities in India

2.2 Smart Grid Pilot project at Panipat under Indian Smart Grid Task Force has been approved in the 28th steering committee meeting. Under this 50 % of the approved DPR cost would be given by the MOP, India as Grant and balance 50 % cost shall be borne by the DISCOM. Currently, MOP, India has sanctioned the cost of DPR as Rs. 20.07 Cr by excluding the OMS/SCADA and Renewable from the proposed Scope. The DPR attached herewith

2.3 The above project is also selected by NEDO (New Energy and Industrial Technology Development Organization), Japan for potential funding (grant) under India Japan collaboration.

2.4 Currently NEDO has completed pre-feasibility study and has proposed to do AMI/PLM; OMS with Simplified SCADA along with Renewable Integration in 3 number feeders in Panipat (Around 10,000 Consumers) which was started in the month of March 2014 with the approval of MOP, GOI.

2.5 Earlier Uttar Haryana Bijli Vitran Nigam (UHBVN) entrusted Power Grid Corporation of India Ltd. (POWERGRID) to prepare Detailed Project Report (DPR) for deployment of Smart Grid technologies in City Subdivision of Panipat area. The development of smart grid is being undertaken to address pressing issues of energy efficiency, AT&C losses and outage management.

2.6 Consequently, a DPR has been prepared by M/s Power Grid Corporation of India which proposes the various applications of Smart Grid Technology that will improve the performance of distribution system of City Sub-Division of Panipat as well as empower consumers to participate in energy management and efficiency. The report has been prepared based on the sample physical examination of the distribution network of City Sub-Division of Panipat.

In addition to the implementation of R-APDRP scheme, smart grid initiatives will also support the distributed generation from renewable sources.

2.7 The report has highlighted few remedies to improve the performance in the area

- AMI (smart meters) implementation
- PLM implementation
- SCADA and OMS implementation

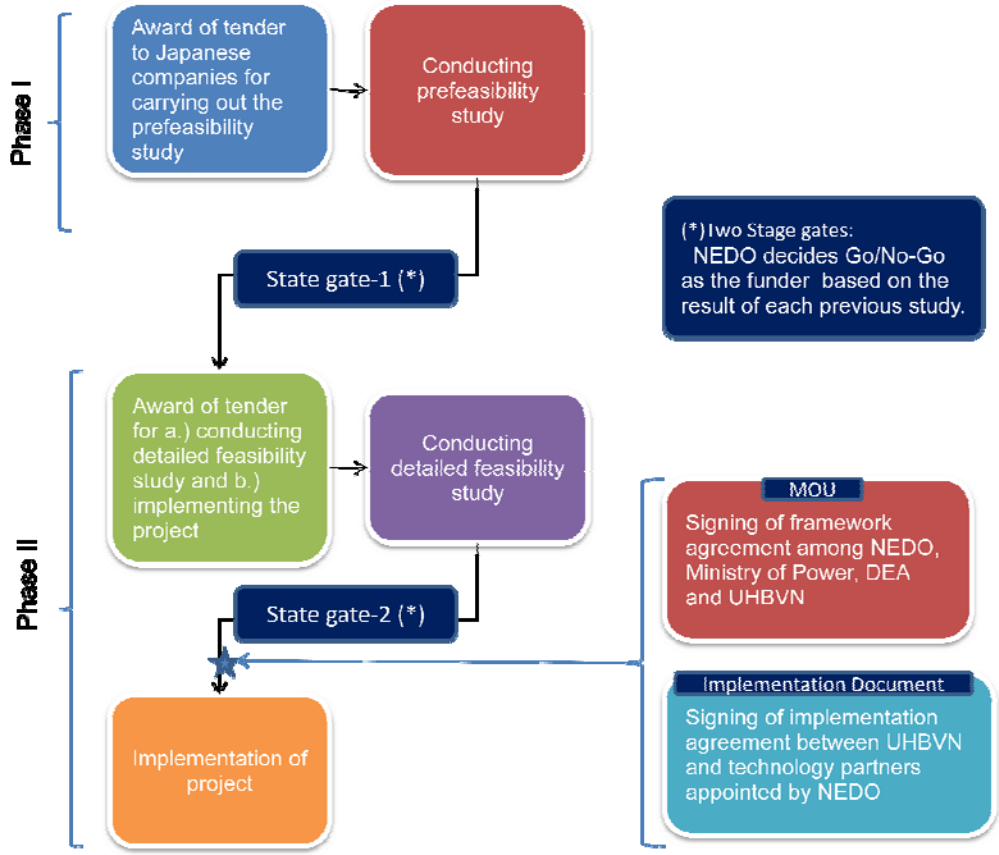
2.8 Using AMI Demand Side Management shall be done by way of unauthorized excess load curtailment using device control mechanism.

2.9 Simultaneous IT work is underway for R-APDRP which would implement GIS mapping, AMR meters for 11kV feeders, Distribution Transformers & HT consumers, billing software, etc. This IT infrastructure set up shall be used for implementation of Smart Grid to economize costs.

2.10 The status of IT work under R-APDRP in City Sub-Division of Panipat is briefed below

- Infra Survey Completed
- AM – Asset Mapping Completed
- AP – Asset Painting Completed
- CI – Consumer Indexing Completed
- AMR (DT Metering) – Completed
- IT Installation – Completed
- Roll Out – Planned In September 2014

2.11 The status and timelines for implementation of smart grid (as submitted by NEDO) is depicted below:



2.12 However, in order to implement the above, certain regulatory provisions need to be relaxed. In particular, UHBVN seeks approval of the Hon'ble Commission to introduce the below technological advancement mechanisms

- Peak Load Management through
  - Demand Response by introducing the dynamic pricing model.
  - Demand Management by remote disconnection in case of unauthorized load and partial black-out by introducing the 'Brown Out" Concept

3. ABOUT SMART GRID PROJECT AND PILOT AREA

3.1 "Smart Grid" is the next generation electricity distribution system that delivers electricity to consumers using two way digital technologies to enable efficient management of consumer's end uses of electricity as well as efficient use of the grid to identify and correct supply-demand imbalances instantaneously. It also detects faults in a "self –healing" process that improves service quality, enhances reliability, and reduces costs. The "Smart Grid" encompasses a broad set of applications, including software, hardware and intelligent technologies including communication that enable utilities to integrate, interface with and intelligently control & automation innovations.

3.2 The improvements expected from the above implementation are increased billing, reduced AT&C losses, consumer empowerment to participate in energy management, improvement in reliability through reduced outage rate and duration, improvement in consumer awareness and satisfaction, integration of renewable generation sources.

3.3 The below table reflects the present business statistics of City Sub-Division of Panipat for FY 2013-14.

Table 1: Present business statistics of Panipat Sub-Division

Energy Input (LUs)	**1558.8**
Energy Billed (LUs)	**1138.7**
Energy Unbilled (LUs)	**420.1**
Billing Efficiency (%)	**73.1**
Collection Efficiency (%)	**99.7**
AT&C Losses (%)	**27.2**

3.4 The details like area, infrastructure, consumer profile and Cost are given the DPR attached with the petition

4. PEAK LOAD MANAGEMENT (PLM)

4.1 PLM works in two ways:

a) Demand Response

b) Demand Management

4.2 Demand Response refer to mechanisms used to encourage consumers to voluntarily reduce electricity usage at deficit times of the day (such as peak hours) during high electricity prices (Time of Use tariffs), or during emergencies (such as preventing a blackout). Depending on the generation capacity, however, Demand Response may also be used to attract demand (load) at times of high production and low demand (Surplus Situations). In demand response the consumer voluntarily manages his demand in response to price signals/incentives given by DISCOM. Dynamic/ TOU pricing of electricity and other incentives/schemes are communicated to the consumer via smart meter/ Web and SMS. The consumer responds by reducing consumption by agreed percentage or limiting consumption to agreed kW. The smart meter communicates with the IHD over Zigbee/Wi- Fi, etc.

4.3 To implement Demand Response UHBVN seeks approval from Commission to introduce dynamic pricing model in the pilot project only

4.4 In this regard a visit to Japan was made by the concerned team of UHBVN including MD, UHBVN. The Demand response introduced there in Higashida area is given for understanding of implementation of "dynamic pricing" in Kitakyushu Smart Community Creation Project.

4.5 A demonstration project on "dynamic pricing" (from FY 2011-12) which flexibly changes electricity rates in response to electricity supply and demand has been carried out in the Highashida area. A "dynamic pricing" system is being implemented which permits price fluctuations depending on the season, day and time period. There are three types of electricity Pricings prevalent in Highshida area as given below:

Sr No	Type of Pricing	Applicability
1	Basic Pricing	Set according to basic seasons and periods
2	Real time Pricing	Based on demand forecast based in detailed time periods
3	Critical Pricing	When demand is high

In FY 2011-12 when the forecasted temperature of the previous day exceeded 30^0 C, electricity rates were set high for the time periods in which it was expected that electricity demand will be particularly high. In contrast where, for times when the frequency was expected to be low, prices were set lower which enabled energy demand level out through the use of peak shifts/ peak cuts. The report on the "Dynamic pricing" is attached in Annexure 2. Load curtailment in different pricing levels was observed and it was found that at max around 20 % of load in the peak hour can be shifted using dynamic pricing.

4.6 The “Dynamic Pricing” is essential part of smart grid implementation. If not possible on high scale similar to Highashida case, Japan, TOD tariff which also works on energy conservation by price and could be the simplest and easiest form to implement the “Dynamic Pricing” can be initially introduced in the smart grid pilot area.

Proposed Dynamic Pricing Model:

I. Opt-In/Opt-Out Approach: Dynamic Pricing scheme would not be mandatory and any consumer can opt in and opt out from the scheme by giving 7 days notice to the Sub-Division Office.

II. Consumer Awareness & approach to the pricing model: Massive Consumer Awareness Campaign would be launched by the utility during the implementation phase of the pilot where in detail survey would be done to understand the willingness of consumer to participate in demand response programs and to visualize drivers in terms of penalties and rebates in the tariffs which will motivate the consumers to participate in the program in a way that the pricing structure would result in saving in energy bills of the consumers without much discomfort in case they respond well to the demand response signals

III. Demand Response Intimation & Forecasting: Next day expected demand curve will be formed in the control centre by using weather forecasting and consumers historical data and in case of critical peak is observed, intimation of peak hours/duration and penalty (In Multiple of Base Tariff) will be intimated the consumer through Home Display Units/Tablets provided to the consumers or through SMS. Rebate along with off-peak hours/duration will also be intimated to the consumer so that they can plan their next day activities to shift the peak. One example of this case would be using electricity to charge the inverter batteries in off-peak hours along with running other devices like washing machines, ironing in off-peak hours and running the essential load on inverter during critical peak hours, thereby making saving in their energy bills. Penalty, duration and frequency of Demand Response events in a year will be decided after the consumer survey reports to avoid devising impractical or ineffective pricing scheme. On the next day actual demand curve would be compared to the estimated demand curve of the participating consumers to analyze the % drop in demand in response to the price signal. Prices in terms of penalties and rebates shall be modified as per the response to optimize the prices which would result in maximum possible load shift as per the agreement with the participating consumers.

4.7 In case of Demand Management, DISCOM in a sense "owns the switch" and sheds loads either when the stability or reliability of the electrical distribution system is threatened or to manage peak load as agreed with consumer. While demand response places the "on-off switch" in the hands of the consumer using devices such as a smart grid controlled load control switch, in demand management utility have the control. Utility can control the consumer load by using the following three methods:

- **Settable Relay**: The smart meter fitted with a relay designed for operation till a threshold load. Any increase in load will operate the relay and cut-off power supply. Meter or consumer reconnects the load when it is below threshold load up to 3 times with 5 minutes interval (configurable). If the connected load is still more than the limits, meter will lock out for configurable period (say 30 minutes). Meter will attempt to reconnect after lock out period and If the consumption is still above the limit, the process as defined above in i) and ii) gets repeated.
- **Critical and Non-critical load circuit:** Wherever consumer agrees to segregate load at meter point between critical and noncritical loads meter can feed the two separate load circuits. The DLC relay in non-critical load circuit is control switch in hands of DISCOM to be operated either from the control centre or meter.
- **Device Control:** The consumers who opt for price based load management (Demand Response customer) can deploy smart meter which control individual devices in the premise. It can communicate with devices over Home Area Network (HAN) to turn them on/off or regulate thermostats in heating and cooling devices in synch with customer choice and price signal from DISCOM, thus, regulating their consumption. Communication in HAN can be over RF/Zigbee/Wi-Fi, etc.

4.8 The justification for introduction of smart meters for Demand Response and Demand Management is as follows:

- These advanced meters are capable of two way communication.
- Consumers often use more appliances than sanctioned load. Most of the cases consumers even don’t take approval from UHBVN except Industrial and Non Domestic consumers who require high connected load.
- This excess usage knowingly or unknowingly disturbs the whole distribution network and affects all consumers connected to such network. Since, the system planning is based on the sanctioned load being provided to the consumers, the distribution network is capable of bearing load to the extent of sanctioned load subject to some positive deviation. When the sanctioned load is violated, the system frequency is hampered resulting to higher system losses, breakdown, outages, etc. As such, every consumer has to bear the consequences of outages due to load violation of few consumers.
- The consumers on many occasions had been pursued to declare their actual connected load but the response from consumer is not very positive.

- Also in the absence of proper technology used at present, the process of remote disconnection is not possible and hence the system (distribution network) suffers damages due to over-loading.
- UHBVN proposes to introduce the technology for remote disconnection in the City Sub-Division of Panipat under the smart grid project. Under this technology, temporary tripping shall be put to effect remotely and proper notification shall also be served through display at consumer house/SMS services. Restoration of supply shall automatically occur once the load is within reasonable limit. It is therefore imperative that consumers should gauge their load and furnish request for enhancement in sanctioned load wherever required in order to enjoy smooth and continuous supply.

4.9 The proposed PLM system will initially be driven on Demand Management. Accordingly the following subsystems are part of project:

- Centralized control Center for tracking and monitoring consumer load
- Use of Settable Relay to limit the consumer from violating his Contract Demand thereby avoiding unauthorized extension of load.

4.10 UHBVN also proposes to introduce innovative concept of "brown-out" where the load is reduced and supply is partially maintained rather than "black-out" where complete load shedding is put to effect. Through the use of Smart Grid technology, in case of unforeseen reasons resulting to non-availability of power, the consumers shall be notified through SMS services about the extent of their load being curtailed along with the duration so as to provide power to all consumers at a certain load. In case the consumer violates the load restricted, his supply will be automatically disconnected temporarily (Momentarily) remotely and proper notification shall also be served through SMS services. Restoration shall automatically occur once the load is within reasonable limit. This would work as a win-win situation for the consumers as well as UHBVN.

4.11 The reason to introduce "brown-out" is that sometime due to unforeseen reasons like Power Transformer breakdown, EHV line breakdown, power plant outage, etc. the UHBVN or any DISCOM has to resort to blackout or power cut. This results in substantial loss of revenue for consumers (whose businesses are dependent on quality power supply) as well as UHBVN. Although, it is difficult to contain the unforeseen reasons, UHBVN expects to optimize power cut through the implementation of Smart Grid technology.

4.12 To implement the "Brown- Out" concept UHBVN requests following protocols to be approved for the implementation of "brown-out":

- Whenever, the situation arises where in 11 KV feeder/feeders becomes overloaded to the extent that will result in the tripping of the feeder, brown out shall be implemented on the consumers attached with those feeders till the above situation of overloading continues. Consumers shall be intimated through

display communicated with smart meter/ SMS before calling brown out.

4.13 Whenever, the situation arises where in power is partially available due to failure in transmission network or generating station or in substation, the above procedure will be followed.

4.14 Further the billing of excess load, notice to the consumer, levy of penalty and other general requirements, Disconnection and reconnection will be followed as per the section 9 and section 10 and the subsections therein of the 'The Haryana Electricity Regulatory Commission (Electricity Supply Code) Regulations, 2014'.

5. Outage Management System (OMS)

5.1 In addition to the PLM, the Nigam also intends to implement OMS in order to improve availability, reliability, and customer satisfaction.

5.2 OMS detects faults in a self-healing process that improves service quality, enhances reliability, and reduces costs.

5.3 The OMS in its holistic approach needs action in two sub system:

- **Grid Elements**: The distribution system needs to be robust (multiple feed points, ring feeders as opposed to radial), switching/isolating devices to restore power to part of consumers bypassing the faulty portion of grid etc.
- **Sensor and communication Elements**: These provide information system for proactive intervention to minimize duration and nos. of outages and also collect information to localize search and rectification. In its ultimate form the information system is directly in hands of maintenance team in the form of hand held device complete with GIS navigation route map, resource need (Link to equipment history for possible causes and list of spare which might be required) and tools requirement. DT wise load monitoring (AMI feed information) can be used for curtailment of load on transformer approaching full load, Oil level indicators are helpful in timely oil topping up in transformers thus avoiding probable outage and failures of equipment's. By using OMS UHBVN can utilize infrastructure for longer periods. In this system online data is monitored on a distribution system model mapped with GIS Mapping by suitable DMS system. The OMS system is comprised of a number of technologies and applications that are integrated to perform as one:
    - **Meters**
    - **Fault Passage Indicators**
    - **Transformer Monitoring Unit**
    - **Wide area communication network**
    - **Outage Management Software**
    - **Operational Gateways**
    - **SCADA system**

5.4 The Smart Meters help in providing data about transformer and outage at consumer level while the Fault Passage Indicator helps in localizing the area to work, avoidance of trial and error method for fault identification, & reduction in restoration time.

6. PRAYERS TO THE HON'BLE COMMISSION

6.1 UHBVN would request the Hon'ble Commission to pass suitable order to allow dynamic pricing model for all categories of the consumer under the pilot area of Panipat subdivision only.

6.2 UHBVN would request the Hon'ble Commission to pass suitable order to allow remote disconnection for the pilot area only (automatic disconnection for **5 Minutes** interval on 3 instances of violation and meter lock out for 30 minute if violated at 4th instance) through Smart Grid technology in cases where excess load is used for all category of consumers where Smart Meters are installed except for CT operated meters.

6.3 UHBVN would also request the Hon'ble Commission to pass suitable order to allow introducing the concept of "brown-out" wherein the consumer load is restricted to the extent of essential load which will provide availability of power to all consumers where smart meters are installed.

Annexure 1: Detailed Project Report prepared by Power Grid.

Annexure 2: Excerpts from the report on Demand Response by Dynamic Pricing in Highashida area of Japan.