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Development of Optimized Methodology for Improvement Domestic Energy Management

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Abstract*: Electrical energy management (EEM) is an object that has proceeds appointed importance in the 21th- century in order to its assistance to economic development and ecological ascertainment. "EEM" may be perfected on the supply side "(SS)" or demand side "(DS)". On the supply side, "EEM" is cultivated when: There is an outgrowth desire "(demand requirement is higher than supply)". "EEM" assists to suspend the design a resent generation station. On the "DS", "EEM" is used to minimize the cost of electrical energy consumption and the interrelated forfeitures. The technique utilized for "EEM" is demand side load management that plan at ending valley filling, peak clipping and strategic preservation of electrical systems [1]. Seeming new inventions like "distributed generation (DG)", "distributed storage (DS)" and "DSLM" will modify the method we use and generate energy. A smart grid (SG) is an electrical network that manages electricity demand in an unstoppable sustainable, reliable and economic manner. A smart grid uses smart net meters to overcome the sickliness of traditional electrical grid. "(DSM)" is a vital advantage of "(SG)" to progress power efficiency, minimize the peak average load and minimize the cost. From basic purposes of DSM is shifting load from peak hours to off-peak hours and reducing consumption during peak hours. Generally, a deregulated grid system is considered where the retailer purchases electricity from the electricity market to cover the end users' energy need. In this research, Demand Side Management (DSM) techniques (load shifting and Peak clipping) are used to maximize the profit for Retailer Company by reducing total power demand pending peak demand periods and achieve an optimal daily load schedule using linear programming method and Genetic Algorithm. This method is performed on the 69-bus radial network. Also, a short term Artificial Neural Network technique is used to get forecasted wind speed, solar radiation and forecasted users load for date 15-Aug-2019. The neural network here uses an actual hourly load data, actual hourly wind speed and solar radiation data. Then the forecasted data is used in the optimization to get optimal daily load schedule to maximize the profit for Retailer Company. Then comparison between profit using linear programing and genetic algorithm are made. The optimized DSM succeeded to maximize the profits of the company.

Keywords: Demand-side management, load scheduling, linear programming, genetic algorithm, the Artificial Neural Network technique, load forecasting.

I.INTRODUCTION

Smart" Grid "SG" is the combination of communication and control technologies in a conventional grid in order to transfuse and dispense electricity in an intelligent way". "The tendency of this transformation is to mitigate carbon emission and minimize electricity cost by competent manage the load. "DSM" is a paramount merit of "SG" to manage energy". Managing the load manner can curtail the peak load demand which enhances adequacy of grid; minimize the carbon resurrection and electricity receipt of the customer. [2]
"Dynamic pricing schemes" are the incomparable advantage of the "SG". By usage of "smart meters and automatic metering infrastructure", it is convenient to manage the load conforming to "active pricing schemes". Some of the "effective pricing schemes" which generally used in "DSM programmer" are "Real Time Pricing (RTP)", "Time of Use (TOU)", "critical Peak Pricing (CPP)", "Day period Pricing (DPP)" and "Extreme Day Pricing (EDP)". When these "active pricing schemes" are used along with the "DSM planes,"control of user energy consumption is affected by forfeit and hoofs. However, the causation behind "DSM" is to scrimp "power system stability, sustainability, security and economics" by augmentation system capacity without modifying whole physical basis of the power system. "DSM" more effect in the "electricity market". Electricity price is depending on the energy consuming of the users. With growing in demand the rate is also change and augments. This growing redounds whole customers in the power grid. By minimize the "Peak to Average Ratio (PAR)". "DSM" modulates the electricity price in an "electricity price market". [2]

"DSM" modifies the customer's consumption manner to have the disposition modulate in load shape of power network. The "DSM" planes modulate the format of load ideal by moving the controllable appliances during maximum load, and shift these loads to an agreeable period to minimize the encharge. "These 6th methods for load forming of different types of users peak clipping, valley filling, load shifting, flexible load shape, strategic conversation and strategic load growth". [3]

"A generic approach to DSM was proposed which was referent to the GA and LP paradigm. The proposed GA depend on approach was defined in such a way to discover an optimal load distribution profile".

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"[4] Having in mind the complexity of this task, the proposed solution was leveraged on the GA and LP paradigm as a powerful search heuristics which was utilized to search for the optimal energy demand."

II. CONCEPT OF (DSM)

"The target of DSM is to change the energy end-use, i.e. to influence the power consumption profile besides minimizing of the overall cost of the consumed energy". It contains functions for example minimizing or maximize load consumption, shifting it from high to low tariff periods if variable tariff plan is applied "(e.g. moving the energy use to off-peak intervals such as during the nights, weekends)" etc. "DSM" can be performed by: [5]

1) Energy efficiency progress
2) "Load management"

DSM is described as the designing and monitoring of utility's activities planned to encourage customers to adjust their electricity consuming routines by considering the timing and the level of electricity demand. Thus, help the consumers to use electricity further efficiently. DSM is important advantages of (SG) to eliminate the peak average load, improve energy quality and maximize profit. In more (SG) Central Scheduling Unit (CSU) should be used in all building, digital smart meters will be installed in all customers' flats that are equipped with digital and programmable control unit. "Smart meter has communications with the CSU and antithesis. Also, A distributed (EMC) unit in each user's smart meter [6]".

III. SYSTEM MODELLING

This research performed a (SG) system where the retailer bid in the allocate electricity market for their end users'. Retailers are interface to the users via local area networks. It is been implemented on 69-bus radial network [7] which as clarified in Figure (1)

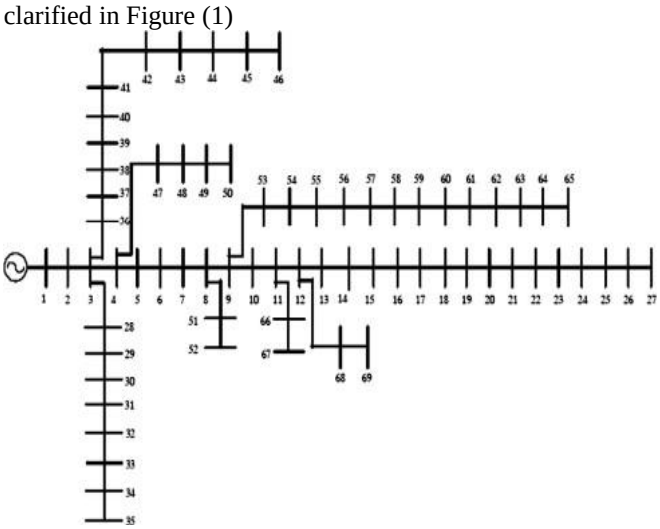

Fig.1. IEEE 69 Bus radial distribution network

A. LOAD FORECASTING (LF)

The main objective of the proposed procedure was to propose the suitable "DSM" mensuration to the "EEM", by taking into consideration the "forecasted energy demand" and anticipate tariff blueprints. (LF) is a necessary component for "(Power system energy management)". Priceless (LF) assists the electric company to make unit affirm resolve, minimize revving standby capacity and arrangement equipments maintenance plan consonantally. "For ideal power system operation, electrical generation must follow electrical load demand". (LF) can be classified to three major categories [8]:[i] "Short-term forecasts": "This is commonly from 1st hour to 1st week, used to prolong substantial data for the system management of day-to-day operations and unit involvement."[ii] Medium forecasts": This is usually from 1st week to 1st year, used to purveys electric utility company management with prognosis of future needs for expansion, equipment purchases, or staff hiring .[iii]"Long-term forecasts": This is more than 1st year, used for the objective of scheduling fuel supplies and unit maintenance. This research discusses the short term (LF) which is a vital part in energy and (DSM)."

B. TECHNIQUES

The technique used in this research is "artificial neural network technique" (ANN) is commonly formative from more thousands of easygoing processing modules, interfacing in parallel and supplying forward in more layers. [9] Short term load forecasting methods required data such as historical load data, historical weather conditions, the predicted weather condition and the normal operation of the day and the season.

C. IMPLEMENTED MODLE

The contemplation in this research anticipates "hourly historical load data" in New England All estimation have been run on MATLAB R 2014 a M-file. The parameter of the applier model is as the following:

"I. No. of layers: 3 (Input layer, Hidden layer, Output layer) as in figure (2)".
II. No of neurons in hidden layer: 10
III. No of neurons in input layer: 1
IV. No of neurons in output layer: 1
V. Training 70%, Validation 15% and Testing 15%
VI. Training algorithm: Back propagation (LEVENBERG MARQUARDT) Algorithm (TRAINLM)"

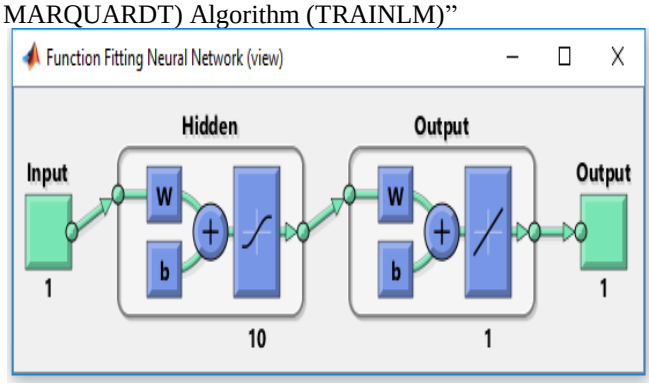

Fig.2. Layers of (ANN)

IV. SIMULATION RESULTS

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A. DATA FORECASTING

Forecasting of load is carried out using (ANN) for one day as shown in figure (3):

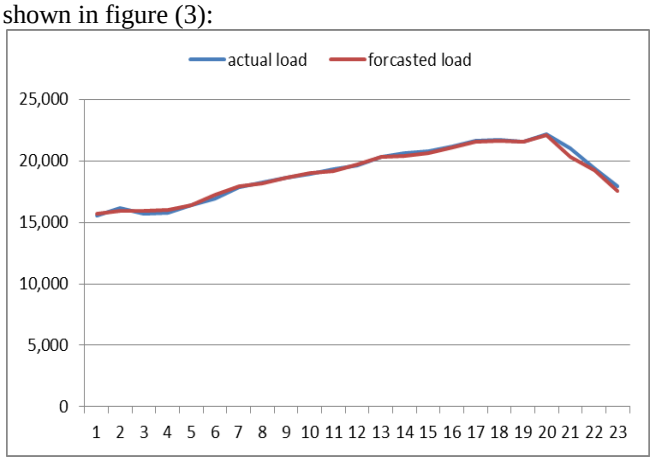

Fig. 3. Power kW vs. time

Figure. 3. Clarifies the forecasted load using the applier model comparative to the actual power demand over 24 hours

B. RENEWABLE ENERGY CONFISCATORY

Wind farm and PV panels are used as a distributed generation that owned by Retailer Company. Distributed Generations (DGs) are small capacity generators connected in distribution networks. DGs improve distribution system performance and economy by delaying power system upgrades, making arbitrage benefits, improve energy transmission efficiency, increasing interests in the environmental issues and the scarcity for more reliable & flexible electric power systems.

C. RENEWABLE ENERGY FORECASTING

Wind speed and solar radiation for date 15-Agust-2019 are got from Ontario in New England [11] then forecasting for these data is implemented using (ANN) after that calculating the power converted from the wind and solar into electrical energy. "Distribution of RES generated energy (from photovoltaic and wind turbines) is existed in Figure (4)"

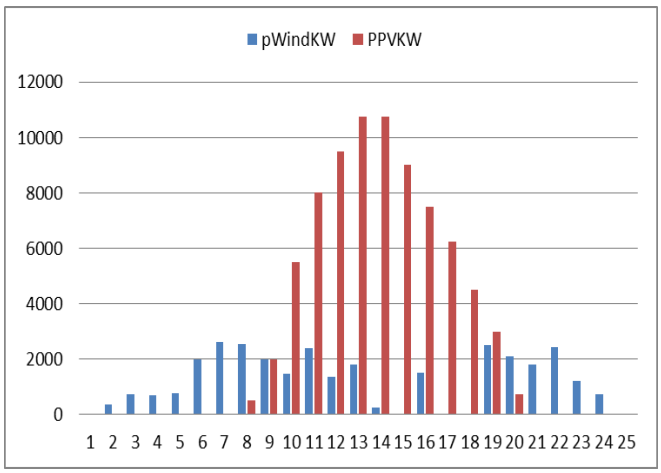

Fig. 4. Renewable energy power for day-long

"A dynamic billing mechanism RTP between the Retailer Company and wholesale electricity market is considered". The RTP data from Ontario Hydro Rates for date 15 Aug (Cents/KWh) [11] which is explicated in figure (5)

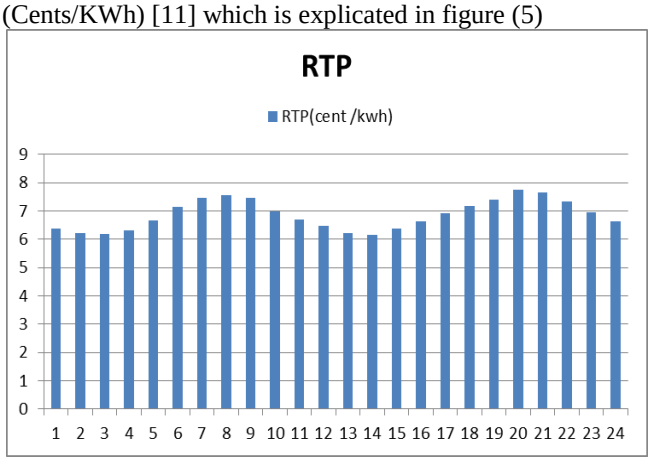

Fig.5.Electricity price

V. OPTIMIZATION MODEL FOR (DSM)

A. TYPES OF LOADS

"Customer loads are divided into three categories based on the user's choice". [5]

- **Uninterruptable loads**: are non-manageable loads with not adjustable time of use or consumption and are represented by the set (P_f).
- **Controllable loads**: shift-able loads are loads that can only be shifted in time and are represented by the set (P_{con}).
- **Curtailment loads**: Curtailment loads are loads that can be reduced or clipped in time and are represented by the set (P_{cur}).

"Having in mind the above listed categories, identification of the Curtailment and controllable load is a prerequisite that Select and apply suitable DSM measure."

B. ENERGY COST

Fixed cost is used for critical loads and are symbolized by the set C_f = 7.3cent per KWh. Fixed cost is used for Controllable loads and are symbolized by the set C_{con} =6.9 cent per KWh. Fixed cost is used for Curtailment loads and are symbolized by the set C_{cur} =6.5 cent per KWh. The cost of critical loads is the biggest cost then cost for Controllable loads then value of Curtailment loads. Cost for Curtailment loads is the smallest cost. [11]

C. OPTIMIZATION PROBLEM FORMULATION

The difficulty of determining optimal Potential of DSM (load shifting and load clipping) can be intended to increment revenue to Retailer Company. Here, common RTP tariff venture is assumed where the RTP tariff is applied to retailer. An Integer (LP) and (GA) are used to schedule both the optimal power and ideal Potential of DSM (load shifting and load clipping) for all hours through one day to increment revenue to Retailer Company then make comparison between results.

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The percentage of load transposed from peak hours to off peak hours at period t can be represented byΔ(t) the percentage of load shaved at peak hours at period t can be represented by Θ(t) Then the optimization problem for profit maximization can be written as follows:

$$Max\ Z=\sum_{t=1}^{24} P_{f(t)}*C_f + \Delta(t)*P_{con(t)}*C_{con} + \Theta(t)*P_{cur(t)*}C_{cur} + RTP(t)*P_{G(t)} - LCOE * P_{w(t)} - LCOE* P_{pv(t)} \quad (1)$$

Where,

Z: Profit

$P_{G(t)}$: Total power from utility at period t

$P_{w(t)}$: Total power generated by wind farm at period t

$P_{pv(t)}$: Total power generated by PV panel at period t

Pf(t): Fixed power demand at period t

$P_{con(t)}$:Controllable power demand at period t

$P_{cur(t)}$: Curtailment power demand at period t

C_f: Fixed cost

C_{con}: Cost for controllable load

C_{cur}: Cost for curtailment load

RTP: Real time price

LCOE: Levelized cost of energy= 0.049 $/KWh from HOMER program for optimization

Δ(t)= Potential of DSM (load shifting) at period t

Θ(t)= Potential of DSM (load clipping) at period t

We choose that potential of DSM (load shifting and load clipping) will not be more than 15% according to user preference

D. PROPOSED ALGORITHM FOR DSM

(LP) and (GA) are used to solve DSM problem then make comparison between results. The (LP) technique is the suitable approach to this problem according to [12]. "A (LP) problem predefined as the problem of maximizing or reducing a linear function subject to linear constraints .The constraints may be equalities or inequalities." For each hour we need to get optimized generated power from wholesale market and optimized potential of DSM to increment revenue for Retailer Company. Genetic Algorithm is a random based optimization technique.GA is pending on natural evolution of organisms. With the aid of biological background we can understand GA. GA is pending on theory of survival the fittest. The best solutions are the ones that will be used to produce other solutions. Gene is capable of enhance the results when changed. Each individual has a fitness value. The best individuals are selected by a fitness function. The quality of the solution can be illustrated by the fitness value. In a mating pool higher quality individuals has higher possibility of being selected. Parents are the diagnoses in the mating pool. Offspring (children) can be generated from mating pool [2]. "The purpose of the GA optimization process was to exist the Optimal " individual" within a search space defined by the given (i.e. forecasted) energy load profile and corresponding constraints (such as energy consumption, maximal peak energy consumption, total demanded energy preservation)." GA optimization for the intent of this research was officiated over the inhabitance of 100 individuals. "The individual in this context considers a sum of values (per one or multiple loads) indicating consumed energy per corresponding load for one time step or over a time span of the given window interval. The result of the GA optimization should be the optimal load profile (i.e. individual in GA terminology), i.e. the optimal point in multidimensional search space representing the proposed energy load distribution which yields the lowest possible cost under the applied tariff scheme. Each individual of the inhabitance was evaluated pend on the predefined GA fitness function which calculated its cost, while taking into consideration the defined prices per corresponding energy carrier (as portion of the given tariff scheme). The fitness function value of the corresponding individual was calculated by determining the price of the energy carriers required at the supply side to recompense the demand side. By redistribution and reallocation of the demanded energy among different loads, i.e. by gene modification of the individual, the task of the GA was to discover the optimal load profile individual in qualification of the cost of the consumed energy indicated by the fitness function."

E. COMPANY PROFIT WITHOUT APPLYING DSM TECHNIQUE

We calculate profit without applying DSM and calculate Total power from utility for every hour through one day

$$\Delta(t)= \Theta(t)=1$$

Table-I: Company profit without applying DSM technique

Hour	optimal power demand from utility	optimal total hourly revenue
1	15711.00381	4500.474856
2	15553.26359	7972.922913
3	15206.97471	9149.923251
4	15301.57933	7779.56394
5	15620.46957	1622.546125
6	15515.48194	-4783.588993
7	15326.50391	-8765.865852
8	15089.70497	-9568.768805
9	14643.55336	-6021.86801
10	12092.35285	6948.635393
11	8762.233277	16577.04958
12	8850.357533	19369.45075
13	7755.422898	24555.32209
14	9410.541559	23163.55827
15	11640.60704	18293.10806
16	12053.66524	15403.06969
17	15307.66117	6248.228593
18	17129.07761	-1775.508263
19	16078.91337	-3583.651357
20	19224.07662	-17374.8267
21	18504.71508	-16426.7446
22	16805.87784	-7564.967831
23	16310.93669	-2937.822639
24	16289.67192	385.0660653

It is clear that total profit for Retailer Company without applying DSM technique for date 15 Aug-2019 is **83165.307**price unit.

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F. COMPANY PROFIT WITH APPLYING DSM TECHNIQUE USING AN INTEGER (LP)

Using an Integer Linear Programming we get optimal Potential of DSM (load shifting and load clipping) and get Total power from utility for every hour through a single day. A Table 2 shows that loads will be transposed from peak hours to off peak hours for Controllable loads also loads will be reduced in peak hours for Curtailment loads. In these peak hours Retailer Company sells less power from allocate electricity market due to high electricity price according to Table II.

Table- II: Optimal Potential of DSM and total power from utility through one day using linear programming

Hour	optimal percentage of controllable load	optimal percentage of curtailment load	optimal power demand from utility	optimal total hourly revenue
1	1.15	1	16396.61944	4856.994981
2	1.15	1	16182.95801	8401.115119
3	1.15	1	15759.88891	9542.492336
4	1.15	1	15839.60582	8102.379834
5	1.15	0.85	14228.97315	1984.832841
6	0.85	0.85	13047.19759	-3373.279313
7	0.85	0.85	12770.67205	-6467.182568
8	0.85	0.85	12450.45632	-6935.927281
9	0.85	0.85	11914.92487	-3599.650291
10	0.85	0.85	9288.566249	8093.393708
11	1.15	0.85	6928.014276	17109.82333
12	1.15	1	9397.632134	19610.25158
13	1.15	1	8270.777059	24905.76292
14	1.15	1	10008.62674	23606.14131
15	1.15	1	12264.43899	18617.50067
16	1.15	0.85	10397.24799	15903.04189
17	0.99648494	0.85	12950.21505	7255.135234
18	0.85	0.85	13945.93262	24.88830763
19	0.85	0.85	12854.8191	-985.8009666
20	0.85	0.85	15932.84734	-13549.53039
21	0.85	0.85	15480.83229	-13225.20532
22	0.85	0.85	14016.79154	-5552.658798
23	0.85	0.85	13767.97107	-2088.228632
24	1.15	0.85	15347.81809	781.5230463

As clarified in Table II profit for Retailer Company with applying DSM technique using Linear Programming for date 15-Aug-2019 is 113017.8 price units.

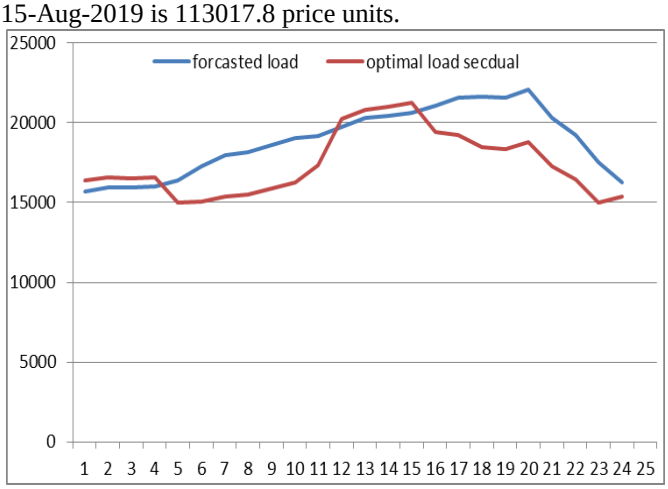

Fig 6. Load distribution before and after applied DSM using LP optimization

Figure (6) clarifies that the LP success in managing the load scheduling with the minimal cost under the implemented tariff plan. For state, the maximum power used at 20h is curtailed to 15h and power used from the night hours is transferred to the interval 12-15h because RES generated energy is increased in these hours and the minimal electricity cost in the morning hours.

G. COMPANY PROFIT WITH APPLYING DSM TECHNIQUE USING GENATIC ALOGORITHM

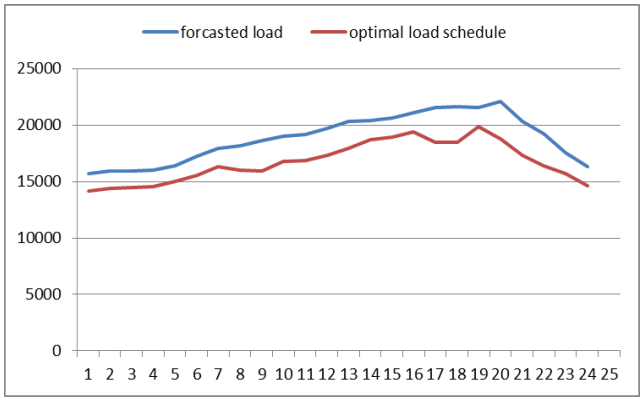

Fig.7. Load distribution before and after applied DSM

Figure (7) shows that the optimal load schedule solved by GA optimization tool after applied DSM. GA is a simple algorithm, but it offers lower efficiency so Results of an Integer Linear Programming are better than results of Genetic Algorithm.

The optimal Potential of DSM (load shifting and load clipping), total power from utility and the profit after applying DSM for every hour through a single day are shown in Table (III)

Table-III: Optimal Potential of DSM and total power from utility through one day using GA

Hour	optimal percentage of curtailment load	optimal percentage of controllable load	optimal power demand from utility	optimal total hourly revenue
1	0.85	1	14187.5025	4317.6547
2	0.85	1	14047.1487	7551.21075
3	0.85	1	13699.093	8682.47881
4	0.85	1	13838.9579	7487.03965
5	0.85	1.15	14228.9732	1984.83284
6	0.85	1	13532.3855	-3494.57628
7	0.85	1.15	13673.0402	-11458.673
8	0.85	1	12928.3426	-7256.11111
9	0.85	0.85	11914.9249	-3599.65029
10	0.85	1	9791.21439	8053.18186
11	0.85	1	6421.47846	16998.3855

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12	0.85	1	6477.22639	19274.5255
13	0.85	1	5395.85808	23894.6439
14	0.85	1.15	7682.3614	22815.2111
15	0.85	1.15	9948.30801	18339.565
16	0.85	1.15	10397.248	15903.0419
17	0.85	0.85	12242.2671	7276.37367
18	0.85	0.85	13945.9326	24.8883076
19	0.85	1.15	14373.9914	-1745.38711
20	0.85	0.85	15932.8473	-13549.5304
21	0.85	0.85	15480.8323	-13225.2053
22	0.85	0.85	14016.7915	-5552.6588
23	0.85	1	14504.8224	-2125.0712
24	0.85	1	13924.3999	5315.30619

As clarified in Table III total profit for Retailer Company with applying DSM technique using GA for date 15-Aug-2019 is **105911.4761** price units

H. COMPARISON BETWEEN COMPANY PROFIT AND SCHEDULED PEAK LOAD WITH AND WITHOUT APPLYING DSM TECHNIQUE

Comparison between two company profit (Company profit without applying DSM technique and Company profit with applying DSM technique using an Integer (LP) and (GA) are made as clarified in Table (IV).

Table-IV: Comparison results

Approach	Without DSM	With LP Based DSM Applied	With GA Based DSM Applied
Optimal Total Hourly Revenue Price Units	83165.30653	113017.8135	105911.4761
Scheduled Peak Load (KW)	22089.54362 at 20 h	21264.43899 at 15h	19871.42739 at 19h

VI. CONCLUSION

- Smart grid system is considered in this paper and the proposed technique is succeeded in maximizing the retailer profit and covering end users energy need by applying demand side management techniques. It is been implemented on 69-bus radial network.
- Total profit for Retailer Company with applying DSM using an Integer (LP) is larger than using GA and reduces its peak load demand by following the constraints.
- Genetic Algorithm is a simple algorithm, but it offers lower efficiency so Results of an Integer Linear Programming are preferable results of Genetic Algorithm.
- Linear Programing provides a powerful where it provides higher priority to increment revenue of utility rather than user comfort.
- Company emboldens consumers to be controllable and curtailment loads by giving them benefits by diminishes their electricity bill.

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REFERENCES

1. Afua Mohamed, Mohamed Tariq Khan (A review of electrical energy management techniques: supply and consumer side (industries) Department of Electrical Engineering, Cape Peninsula University of Technology,2018
2. M. Awais1, N. Javaid1 ,*, N. Shaheen1, Z. Iqbal2, G. Rehman1, K. Muhammad3, I. Ahmad2,(An Efficient Genetic Algorithm Based Demand Side Management Scheme for Smart Grid) COMSATS Institute of Information Technology, Islamabad 44000, Pakistan.
3. K. Maharjan, Demand Side Management: Load Management, Load Proling, Load Shifting, Residential and Industrial Consumer, Energy Audit, Reliability, Urban, Semi-Urban and Rural Setting. Saar-brcken, Germany: LAP (Lambert Acad. Publ.), 2010.
4. Nikola Tomaš ević , Marko Batić , Sanja Vraneš Genetic Algorithm Based Energy Demand-Side Management. University of Belgrade, Institute Mihajlo Pupin.
5. Nörstebö V.S., Demiray T. H. et al., EPIC-HUB Deliverable D1.3 - Performance indicators, 2013.
6. Sahar Rahim, ZafarIqbal, NusratShaheen, Zahoor Ali Khan, Umar Qasim, Shahid Ahmed Khan and Nadeem Javaid "Ant Colony Optimization based Energy Management Controller for Smart Grid," 2016 IEEE 30th International Conference on Advanced Information Networking and Applications (AINA).
7. Arnab Maiti, Ritu Parasher, "load flow analysis of radial distribution network using linear data structure," Master of Technology in Department of Computer Science & Engineering, Yagyavalkya Institute of Technology, Jaipur Rajasthan Technical University, Kota 2014.
8. Swarpoor R., Hussien A. Abdelqader, "Load Forecasting For Power System Planning And Operation Using Artificial Neural Network At Al Batinah Region Oman," Journal of Engineering Science and Technology Vol. 7, No. 4 (2012) 498 – 504
9. Samsher Kadir Sheikh1, M. G. Unde," Short-Term Load Forecasting Using Ann Technique", International Journal of Engineering Sciences & Emerging Technologies, Feb 2012.
10. H.S. Hippert, C.E. Perdreira, and R.C. Souza, "Neural networks for short-term load forecasting: a review and evaluation," IEEE Trans. Power Syst., vol. 16, pp. 44-55, Feb. 2001
11. https://www.wunderground.com/history/daily/us/our/ontario/KONO/date/15-8-2019
12. Hsin-Hui Kuo, Sipun Kr. Pradhan, Chao-Lin Wu, M, Pei-Hsuan Cheng, Yifei Xie and Li-Chen Fu "Dynamic Demand-side Management with User's Privacy Concern in Residential Community," 2016 IEEE International Conference on Automation Science and Engineering (CASE) Fort Worth, TX, USA, August 21-24, 2016.

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