COST EFFECTIVE APPROACH OF ENERGY MANAGEMENT, USING MICROGRIDS AND EFFECIENT BATTERY

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Abstract- New method proposed for reducing electricity costs and power interruption. Used different renewable sources connected smart micro grids and effective battery. The multiple objective optimization is converted to a single objective by adding up the costs of the individual micro grids. The solution of peak demand is sharing the power to other connected micro grids and reduce electricity cost. Control unit regulate the charging and discharging of battery.

Keywords-Micro grid, Energy management, Multi objective optimization, Energy storage, Renewable Energy

I.Introduction

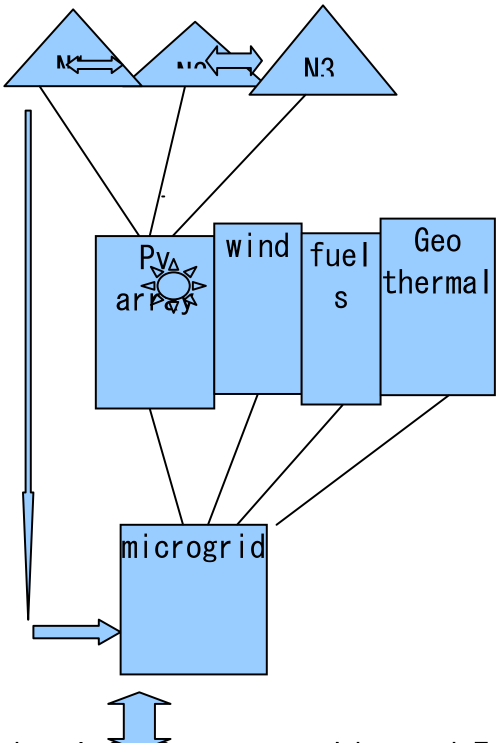
Power management and renewable energy sources are more important in coming years. Distributed generation backed up by distributed energy storage can increase penetration of renewable energy, reduce transmission losses, and enhance simplicity of grid. Environment friendly approach is the benefit of the system.by participating in this open energy market, micro grid operators can lower their electricity costs and help the grid reduces its dependence on conventional spinning reserve for peak demand.

For the purpose of this work a micro grid is defined as a small electricity consumer, example a residential home that is potentially equipped with an energy storage device and renewable s

The objective for each micro grid is the net cost of electricity that is buying minus selling, and any applicable peak demand cost. Sharing constraints are also introduced to regularise the problem.

II. SYSTEM CONFIGURATION

Assume that our community have NoG+NoI micro grid units, out which NoG units decide to join forces and enter in to a partnership. The remaining NoI units would stay as regular utility customers by choice. The utility operator would come in to partnership to treat them as one large customer. All the metered power readings positive or negative from these customers are added up and the partnership is billed monthly for its aggregated electricity consumption. The other NoI customers who are not participating in the scheme would be billed as usual. The centralised controller which would be owned and operated by the partnership, controls the storage devices in the individual units and also calculates their electricity costs using the optimization framework proposed in the study. Battery charge or discharge commands would be sent to local power converters over communication network. The coordinated control scheme result is share the power and resources and also reduce the electricity costs



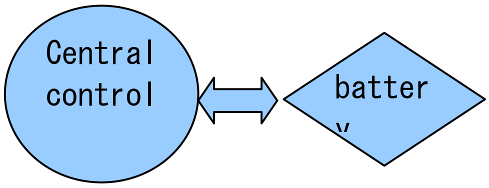


Fig. 1.multiple renewable energy sources connected to a micro grid with active battery

III. ELECTRICITY PRICING

Electricity rates for local power exchange among the micro grids are denoted by Cbl and Csl for buying and selling respectively. The price of buying, grid or local, to higher or at least equal to the corresponding price of selling. By setting the prices of buying local to less than buying from the grid , and selling local to higher than selling to the grid, local transactions are made preferable over grid transactions. While the grid rates are set by the utility operator, the local rates are agreed upon by the micro grids participating in the network sharing scheme. The local trading rates do not have to necessarily reflect the actual cost of local generation but are rather mutually agreed upon by the participating micro grids for the purpose of local power transactions.

Cbg> Cbl> Csl> Csg

This is straight forward as long as the rates are known in advance in the window of optimization and would be done during the conversion of the optimization problem to its linear counterpart by a change of variables.

IV. MULTI-OBJECTIVE OPTIMIZATION PRELIMINARY

Multi objective optimization problem is

formulated as

F(x) = [F1(x),............,Fk(x)]

Single objective counter parts, the concept of optimally in multi- objective optimization problems is no evident. In, fact, there is typically no single global optimal solution for such problems, but rather there exists a family of solutions that satisfy some notion of optimally. More renewable energy sources are coordinated to form a multi objective optimization model.

V. POWER EXCHANGE CONSTRAINTS

Local buy price is set to less than the grid buy price, and the local sell price is higher than the grid sell price to incentive local exchange of power. Given this pricing structure, it is important to distribute opportunities for buying and selling power locally fairly among all micro grids to given them incentive to participate the network-based resource sharing.

Pil min< Pil+Pig< Pil max

VI. BATTERY CONSTRAINTS

For the ith micro grid, the stored energy in the battery can be expressed by a discrete – time dynamic model.

Pibat min , Pibat < Pi bat max

Local Decision Variables	
Pil	Local exchange power of ith micro grid
Pibl	Local imported power to the ith microgram
Pisl	Local exported power from the ith micro grid
pig	Exchange power of the utility grid with ith micro grid
Pibg	Purchased power from the utility grid by ith micro grid
Pisg	Sold power to the utility grid by ith micro grid
Pibat	Charging/Discharging power of ith micro grid

VII. PEAK SHAVING CONSTRAINTS

The term Cp Pp in the objective function represents a peak power cost , associated with the peak power demand over a base demand Pb at the point of coupling to the utility grid

Pp>0

Pp>Pg(k)-Pbat

VIII. SIMULATION RESULTS

Different operation scenarios are considered to analyse the performance of the proposed multi – micro grid energy management optimization model. The simulations are carried out by MATLAB. The electricity usage data is from the utility operator customers with peak usage over 50 kW and the solar energy generation units are capable of up to 30 kW output power.++

IX. CONCLUSION

This paper presents multi objective optimization model with effective battery and reduce electricity cost and improve the efficiency. The micro grids in the network would be treated and billed as a single customer by the grid operator. The costs of electricity including the peak cost for the micro grids are the components of the objective vector in the optimization model. The proposed Optimization model the in its original form was nonlinear. The results showed substantial reduction in the overall electricity cost using the proposed resources sharing scheme

X. REFERENCE

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