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NEURAL NETWORK BASED OPTIMIZATION TECHNIQUE FOR SMART GRIDS

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ABSTRACT

Nowadays energy system is changing, due to the rise of global energy consumption and the reduction of fossil energy sources. Also current power system networks have to face a number of challenges increasing like emission of greenhouse gases, electricity demand, reduction of losses, costs of electricity and voltage deviation. From the view of global warming alleviation and reduction of energy resources, renewable energy such as solar generation, wind generation are getting attention in supply systems. Moreover all-electric apartment houses or residence such as dc keen houses are swelling. Though due to the fluctuating power from renewable drive sources and loads, supply demand complementary power system becomes challenging .Smart grid is a key to this problem. With influence problem of energy and smog, smart grid is becoming ever important. In other words, smart grid offers an groundwork for the management of energy demand and generation towards a defensible future.

Keywords: *Smart grid, Optimization techniques.*

I. INTRODUCTION

Due to worldwide heating and fatigue of fossil fuels, it is required to reduce co2 productions and energy consumption. Though co2 emissions and energy consumption is increasing rapidly due to the propagation of all-electric houses. As counter -measures in contradiction of these problems, installation of photovoltaic system, in residential sector, are proposed. On the other hand, many of the isolated generators such as PV can be linked to DC sources and DC schemes are expected to be of tall proficiencies and rectifier circuits. Though, installation of renewable energy causes frequency variation and distribution voltage fluctuation because output power from renewable source varies due to climate condition. It is possible to decrease electricity cost by attaining load subsequent control using power storage facility. It is necessary to smooth power flow from distribution system to achieve above technical problems and reduce electricity cost. As of the above issues, smart grid concept is developed which helpfully balances power supply-demand between supply side and demand side. By applying the smart grid impression, we can suppose high efficiency power supply, energy preservation and low-carbon emission [5].

II. SMART GRID

The basic perception of Smart Grid is to enhance, analysis, monitoring, control, and communication capabilities to the nationwide electrical delivery system to exploit the quantity of the system while reducing the energy depletion. The Smart Grid will allow services to move electricity around the system as capably and economically as probable. It will also allow the proprietor and corporate to use electricity as economically as possible. Smart Grid forms on many of the technologies already used by electric utilities but enhances communication and control capabilities that will optimize the operation of the whole electrical network. Smart Grid is also situated to take advantage of new technologies, such as plug-in hybrid electric vehicles, many forms of dispersed generation, solar energy, smart metering, lighting management schemes, distribution automation, and many more.

Advantages of smart grid

- Energy savings through reducing consumption
- Better customer service and more accurate bills

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- Fraud detection and technical losses
- Reduced balancing cost
- Increased competition
- Leveling of the demand curve (Peak reduction)
- Reduction of carbon emissions

III. BLOCK DIAGRAM

Figure1 shows the smart grid block diagram, it consist of 6 houses and control system. 6 houses and control system are connected to the smart grid. Pit is interconnection point power from power system to Smart grid.

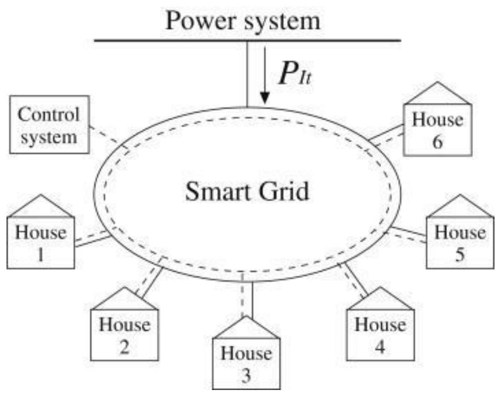

Figure1. Block diagram of smart grid

A. DC Smart House Model

Figure 2 shows the smart house model, Power from the PV and Eb are fed to the Direct current C bus. From the DC bus power is transfer to Smart house.Smart house consist of loads and Battery

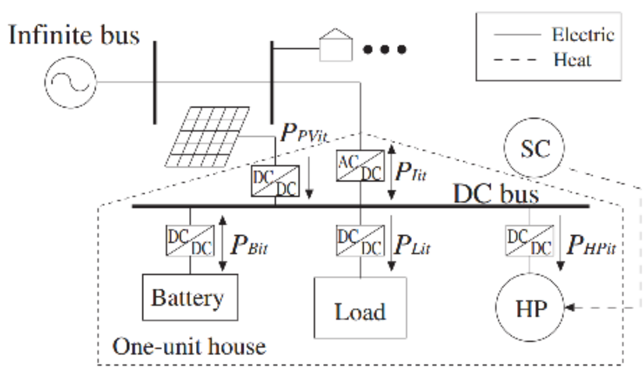

Figure2. DC house model

B. Optimization method

Function minimizes interconnection point power flow
Objective function
Min F=Σ(Blcen-Pit)2, (1)
PLt=Pit+PBt+Ppvt-Phpt, (2)
Pit=PLt-PBt-Ppvt+Phpt, (3)
Pit=PL-PBt-Ppvt,where PL=Phpt+PLt.
Blcen=Interconnection point power flow reference.

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Pit=Interconnection point power flow from power system to smart grid.
PL=Power consumption in controllable load.
PBt=Battery output power.
Ppvt=pv output power.
Phpt=Power consumption in Heat pump.
Constrains Pimin<Pi<Pimax. |Pb|<Pbmax.
Assume,(12 hours)
Blcen=5000,PL=3000w,Pv=8000W.
1000<=Pb<=36000,1000<Pi<5000.

C. Calculation

Power consumption in one day for Smart house
Total number of hours per day=12hrs.
Assume power consumption of load =3000w.
Solar panel rating =100w.
Number of panel=80.

TABLE I:. One day Power

Time Duration	Average Power	Total Power(KWh)
6 am-9am	50(3hrs)	24
9am-3pm	100(6hrs)	48
3pm-6pm	50(3hrs)	24

Saving of power in battery

(6am-9am&3pm-6pm)=24-18=6kwh.
Saving of power in a battery(9am-3pm) =30kwh.
Battery rating=12v,100w.
Number of battery=30.

IV. NEURAL NETWORK

To understand the artificial networks, the basic elements of the neuron should be understood. Neurons are the major elements in the central nervous system. A Neural network is a machine learning method stimulated by the way in which the mind performs a particular learning task.

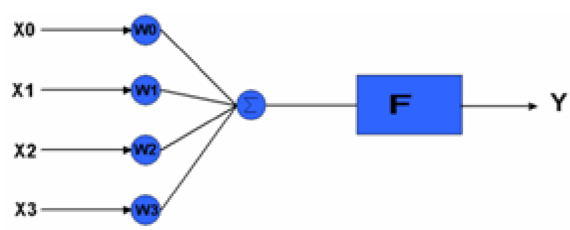

Figure3. Basic Neural Network

Artificial Neural Network are made up of many nonlinear elements and this gives them an advantage over linear techniques in exhibiting nonlinear systems. ANN are trained by adaptive learning, the network learns 'how to do tasks, perform functions based on the data given for training.

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A. Simulink Model

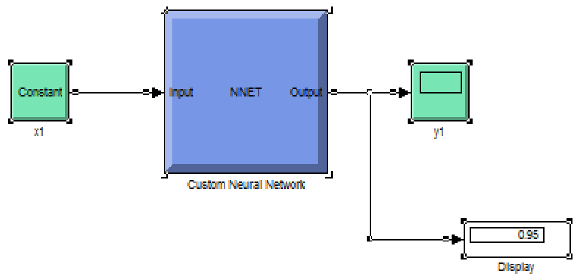
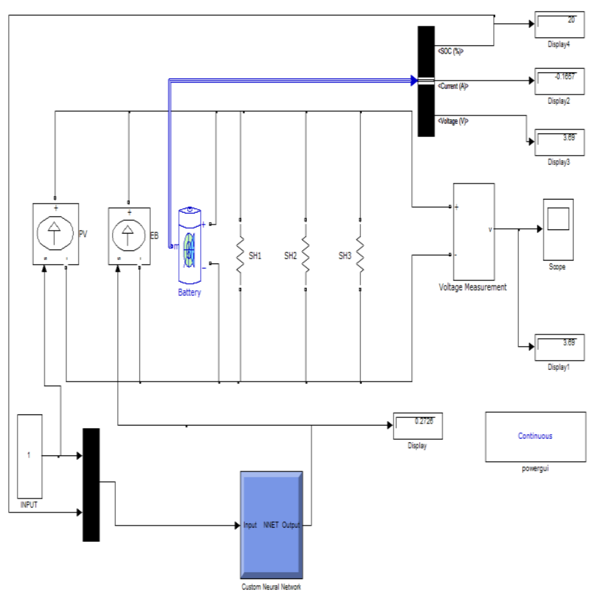


Figure4. Simulation model



Figur5. Detailed Simulink model

NN tool box is trained by hundred inputs and targets. EB power, Photovoltaic cell is obtained by variable current source blocks. The resistive loads are considered as SMART HOUSES. Run the model for regulated value 1 is constant input, the output is no change. Then reduction in the input value the output is changed, the EB output is also changed. Recompense the variable EB output by using PV. PV is not satisfied to meet the demand. Battery is also filling the load demand. Output, current and storage capacity are displayed by display units. Battery and PV systems are providing minimize the power flow fluctuations from the EB. Neural Network tool box is providing optimum operation of simulation. It is more time consuming over than other optimization techniques.

V. CONCLUSION

As an optimization method, here we used the neural network which controls the operation method of controllable loads, to suppress interconnection point power flow variation, based on information obtained by the communications infrastructures. By smoothing interconnection point power flow, it is possible to reduce electricity cost due to the reduction of the contract fee of the electric power company. Power consumption in smart grid is smoothed by achieving the neural network, so we can suppress the impact of PV against power system. Consequently, we can expect high quality power supply and reduce the cost by accommodating control in smart grid.

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