A study for a sustainable rural energy supply through a mix of diesel and renewable energy resources

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Dedicated to

My Father, Mother, Sisters, Brother
and
My Teachers.

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ABSTRACT

This Master thesis examines whether it is feasible from an economic, social and ecological perspective to run a village electricity system by using locally produced bio-mass through a mix of diesel and renewable energy resource. It is assessed whether the cultivation and processing of SVO (Strait vegetable Oil) in the village using different bio-mass fuel contributes to rural development and poverty reduction. In remote areas of Pakistan supply of energy from national grid is insufficient for sustainable development. Integration and optimization of local alternative renewable energy sources is an optional solution of this problem.

In this research, we study for electrification of Chakri village of District Attock in Pakistan, which is completely non-electrified rural area with almost 1500 population. The need of rural electricity is met by conventional approaches is not so far. In economic perspective, non-conventional forms of rural electrification may least-cost in research. In this research we are trying to manage electrification for non-electrified rural areas of Pakistan by using Bio-fuel and renewable energy resource to reduce the burden on electricity supply shortfalls and urgency of costly grid extension planning. Renewable energy from photovoltaics, wind turbines and small hydro plants is most suitable for off-grid electricity supply and has been successfully introduced in countless cases in developing countries. The application of biomass as a sustainable electricity source seems promising, it is still seldom perceived as an option for generation of electricity to the rural areas.

Energy plays an important role in the economic and technological advancement of modern society and plays crucial role in human life. In hilly and rural areas, energy situation in terms of availability and demand is very different from that in the urban areas. Large parts of hilly and remotely located regions are still un-electrified.

This research carried out for load management during a typical rainy, flood, winter, and summer for different seasons.

The results with different parameters by using C++ by YOGISOFT, MATLAB, HOMER Energy and ETAP 6.0.0 software are presents.

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LIST OF ABBREVIATION AND NOMENCLATURE

ANN	:	Artificial Neural Network
AI	:	Artificial Intelligence
BP	:	Back Propagation
EC	:	Evolutionary Computing
MLP	:	Multi-Layer Perceptron
MSE	:	Mean Square Error
STLF	:	Short-term Load Forecasting
SD	:	Standard Deviation
LED	:	Light Emitting Diode
iv	:	The current velocity of particles
Vi,j (t)	:	Previous rate of change
ix	:	The current positon of particle
Ep	:	Sum squared error over number of input/output patterns
δ	:	Error associated with each unit for weight adjustments
Wkj (t)	:	Weight between output and hidden layer's node at time t
Wkj (t+1)	:	New value of weight between output and hidden layer's node
η	:	Learning coefficient
it	:	Number of iteration
bpij	:	Parallel susceptance between buses i and j
Bij	:	Serial susceptance between buses i and j
Gij	:	Serial conductance between buses i and j
Pij	:	Active power flow from bus i to bus j
Buspcc	:	Point of common coupling bus

Busst : Bus of connection to all the collector system circuits with the evacuation line represents the wind farm substation.

Bus_{WTG} : Bus in which the wind turbine is connected to the system.

Nc : Number of electric circuits in the wind farm.

N_{WF} : Number of wind turbines in the wind farms.