



Conventional Energy Source Conservation Practice in Nagpur City, Vidarbha Region, India: A Case Study

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ABSTRACT

Human being uses the earth's bounty in profusion. Energy resources are in verge of extinction due to its over use. Conservation of traditional energy sources and harvesting renewable energy resources like solar energy, wind, biomass and sea-waves can bring out a substantial solution to the problem of energy crisis. To study the same two prime activities undertaken by Nagpur Municipal Corporation were taken into consideration for the study. Many campaigns along with Poornima Diwas Campaign were studied for the project and analysed the amount of energy resources saved through these activities. Along with them, it observed that an aggressive propaganda for harvesting solar energy and marketing several gadgets using solar energy are being systematically done by NMC to bring out a desired effect. The paper ends with the positive note that energy is to be conserved for brighter future.

Keywords: Nagpur, Energy Conservation, Natural Ressources, Poornima Diwas, Solar Energy.

INTRODUCTION

Human being is the most intelligent species on the earth. He uses the earth's bounty in profusion. He seems to be least bothered about the truth that the natural resources that are available on the globe is to be shared by all the living-being on the earth including plants and animal. It is a sorrow state of affair that man is concerned only about his own needs and wants. Our self-centered need has started to take the form of the greed. It is an extremely crucial issue that has to be dealt with in detail, to understand various activities that are undertaken in Nagpur city for conserving non-renewable energy conservation, a project was conducted. The reports that are gained after visits to several NGOs and Nagpur Municipal Corporation (NMC) give a clear picture of the activities conducted at Nagpur level towards conservation of traditional natural resources and the initiatives taken to promote the use of non-conventional energy resources. The present paper aims giving a bird eye view of some

prominent activities done by NMC for conserving non-renewable energy.

As we are aware of the fact that we receive our natural resources from biotic and abiotic material found in the nature. Biotic natural resources include fossil fuels which are formed from organic matter that has decayed. Abiotic resources come from non-living and non-organic material. These resources are further classified into renewable and non-renewable energy resources on the basis of their renewability. Since the resources like coal, petroleum and nuclear energy etc. cannot be replenish once its stock is used up they are known as non-renewable resources, on the contrary the energy sources that are found in abundance in nature and can be revived again and again comes under the category of renewable energy sources. Solar energy, wind, sea-waves and geothermal energy etc. are viewed as renewable energy sources. There is a worldwide debate regarding the allocation of natural resources. Earth minerals, metal ores, fossil fuel (coal, petroleum and natural gas) and ground water are considered to be prominent non-renewable energy sources that are fast depleting due to its over use. The scenario cannot change unless we follow the golden path of reuse, recycle and regeneration of the traditional energy resources and harvesting of the renewable energy resources like solar energy, wind and sea tide etc (Pazare and Raman, 2014).

Nagpur, the second capital of Maharashtra State is uniquely situated in the geographical centre of India. It rich in agriculture and horticulture produce; Nagpur is famous for its oranges and is also known as 'Orange City'. Huge coal and mineral deposits exist in this region. With a population of 2.4 million (2011 Census), Nagpur is estimated to be the 114th largest city and the 143rd largest urban area in the world in 2006 in terms of population. Owing to the availability of rich natural resources in the Nagpur region, mining is a major activity. Several government organisations related to the mining industry are based in Nagpur, which includes Western Coalfields Limited (one of the eight fully owned subsidiaries of Coal India Limited), MOIL (Manganese Ore India Limited) and Indian Bureau of Mines. The Nagpur region has large deposits of coal is a main natural non-renewable source to get electrical energy. The large coal deposits in the region are sufficient to generate 4500 MW of power annually. The planned power generation capacity of Koradi and Khaparkheda will add another 1500 MW of power. But, it is necessary

to understand that this natural resource will not last long so it is essential to look forward for renewable energy and energy efficiency model for the natural resources conservation (Madan and Sirse, 2015).

NMC have sensed this threat of energy crisis in time and take some major initiative for creating awareness and culture that will promote a sustainable reinforcement to the use of natural resources. Nagpur was selected under the Local Renewables Model Communities Network as a Model Community in 2006. The Nagpur Renewable Energy and Energy Efficiency Resource Centre (REEERC) was established in November 2006. The Resource Centre has over the years been actively involved in several awareness generating programmes and has developed into a knowledge base for renewable energy and energy efficiency for city officials, citizens, local businesses, etc. In 2007, Nagpur adopted a City Level Renewable Energy and Energy Efficiency Policy, making it the first city to do so in India (along with Bhubaneswar). Under the policy, Nagpur aimed to reduce conventional energy consumption in the city by 3% from 2005 levels by 2012 and municipal conventional energy consumption by 20% from 2005 levels by 2012 (Kale, *et al.* 2013). In addition to the awareness activities, Nagpur has also undertaken several pilot demonstration projects. Some projects and initiatives undertaken by NMC as a part of their action plan to achieve the target for reduction in conventional energy usage for the conservation of natural resources. Some of the projects have been undertaken by NMC for natural conservation are as follows:

Long Term Projects

- Leak Detection, Water Audit & Energy Audit of Water Supply
- Recycling & Reuse of Wastewater in Power Projects
- Use of Culture in existing STP to reduce energy consumption in aeration unit.
- Conversion of Garbage to Carbon Pallets
- Use of Compact Fluorescent Lamps (CFL) Technology in Street Lighting.
- Change of Electric Traffic Signals to Solar Signals.

Short Term Projects

- Installation of 500 LPD Solar Water Heating in NMC's Panchpaoli Maternity Nursing Home.

- Installation of SPV System at Renewable Energy & Energy Efficiency Resource Centre.
- Energy efficient lighting in NMC girls school.
- Energy Audit of NMC main office building.
- Solar Lights installed in Nagpur Municipal Corporation premises.
- Solar Lights installed at High Court premises.
- Installation of Solar Lights in Gardens, parks, etc.
- Installation of Solar based Traffic Signals.
- Installation of SPV System at Renewable Energy & Energy Efficiency Resource Centre
- NMC started offering 10% rebate on Property Tax for SWH installation.

Awareness Generation Activities

- Establishment of Renewable Energy & Energy efficiency Resource Centre for common citizens.
- National & International level workshops
- Celebration of Akshay Urja Diwas.
- Promotion of Solar Water Heater in Residential/Commercial sectors
- Training Programme for School Children.
- National Science Day Celebration
- Participation in Science Express Train Exhibition coupled with renewable energy and energy efficiency exhibitions/stalls.
- Tree Plantation Programme at Schools & in Slum areas.
- Celebration of Earth Day.
- Celebration of World environment day.
- Poornima Diwas (Full Moon Day) campaign

To promote the renewable energy technology at local level NMC passed a resolution on 16th November 2007 to provide 10% rebate in the property tax for the citizens of Nagpur who installs Solar Water Heating System. The tax rebate is applicable for a period of three years upon Solar Water Heating installation. The Local Renewables Model Communities Network is an initiative by ICLEI (International Council for Local Environmental Initiatives – South Asia) Local Governments for

Sustainability to enable local governments to anchor the development and promotion of renewable energy resources and energy efficiency in their municipal development strategies and to initiate related activities at city level. The project was supported by German Federal Ministry for Economic Cooperation and Development (BMZ) with the technical support from Gesellschaft für Technische Zusammenarbeit (GTZ) Germany. Some of the key elements of LR Model Communities project include:

- Citywide Energy Assessments
- Preparation of City Energy Status Report
- Creating Local Policies
- Involving stakeholders
- Establishing competence centres of renewable energy and energy efficiency known as Resource Centres (REEERC)
- Capacity building and Awareness generation activities.

Based on the available data for 5 prime energy sources (Electricity, LPG, Petrol, Diesel and Kerosene), the supply energy scenario for year 2007-08 is developed. The sample survey conducted in the city shows that penetration of SWH in the city is 0.4%. Other renewable have very low penetration and are too small a percentage to be reflected here. The pie-chart mentioned below depicts the usage of energy sources in percentage for supply side energy balance for the 2007-08 (Pazare and Raman, 2014).

From this analysis, it is very clear that the LPG is the major source of energy consumed by the city and the second major source of energy is electricity which needs attention for effective and optimal use through energy efficiency measures. In addition, for the generation of 1 Unit of electricity 0.5 kg of coal and 7.5 litres of water is utilized also it causes 1 kg of greenhouse gasses (GHG) emission. Share solar energy which is one of the best renewable resources in fuels in supply side energy balance for Nagpur city is only 0.4%. Thus, it is necessary to spread the awareness among the citizens about the conservation of non-renewable natural resources and harvest the renewable natural resources (Pazare and Raman, 2014).

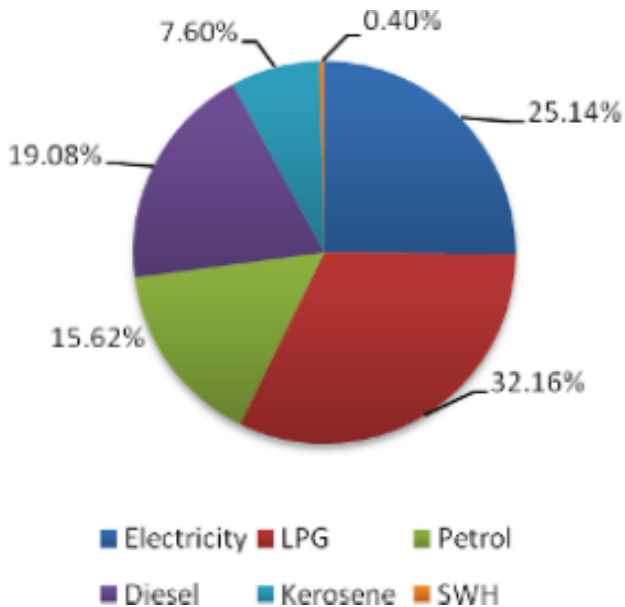


Fig. 1 Shares of Fuels in Supply Side Energy Balance

Solar energy is the largest source of all carbon-neutral energy sources. It is reported that more energy from sunlight strikes the Earth in one hour (4.3×10^{20} J) than all the energy consumed on the planet in a year (4.1×10^{20} J). Solar energy is thus a compelling solution to our needs of energy which is projected to double by 2050 and to more than triple by the end of the century. Solar energy is readily available, abundant source of energy and is secure from geopolitical tension. Nagpur (Latitude 21.1 N, Longitude 79.1 E) receives good amount of solar radiation. Monthly and average solar radiation is $5.09 \text{ kWh/m}^2/\text{day}$. for Nagpur is obtained from NASA SSE Satellite data, MNRE Solar Radiation Handbook 2008 and Data from Synergy Enviro Engineers (India) Private Ltd., Hyderabad.

The main aim of NMC is to develop city as model solar city in which the following list provides the present status of works undertaken by NMC:

- Five solar power plant of 25 kW has been installed and producing 3,150 Units of electricity per month.
- The NMC targeted total 2,82,900 Units of electricity will be saved per month by all solar water heaters.
- The work of installation of solar power plant of capacity of 960 kW to producing 1,15,200 Units of electricity per month.
- In addition, NMC has also sanctioned the installation of 200 kW solar power plant for Suresh Bhatt hall of

the city, it will be capable of producing 25,200 Units of electricity per month.

- An ambitious project of NMC is to install the solar power plant of capacity of 27 MW at different places for domestic and street lighting to the generation of 34,02,000 Units of electricity per month.
- The Nagpur Metro Rail Corporation Ltd (NMRCL) has decided to installed capacity of 25 MW using the metro railway stations as sites for solar panels.

Poornima Diwas (Full Moon Day) campaign is a new and unique initiative has been taken by NMC to save the electrical energy. In this campaign, the NMC appealed citizens, shopkeepers and residents of particular area to switch off their non- essential electric gadgets and electric appliances for an hour on full moon day during 8:00 PM to 9:00 PM. Due to this campaign total 85639.02 unit's electricity saved in 33 weeks between 15th Jan. 2014 to 14th Nov. 2016.

CONCLUSIONS

In summary, following conclusions are drawn from the present study:

- NMC has taken initiative to develop Nagpur city as Nagpur Model Solar City with Ministry of New and Renewable Energy.
- The presently installed 25 kW solar power plant and 2,189 solar water heaters by the NMC leads to reduce the pressure of 2,86,050 Units of electricity per month from thermal power plants. This saves 1,43,025 kg of coal and 21,45,637 litres of water also it prevent 2,86,050 kg of GHG emission.
- NMC calls the applications from the citizens of Nagpur city to distribute the rest of 1,252 solar water heaters.
- NMC had sanctioned various solar power plants of around 1.16 MW capacity on buildings of NMC and Suresh Bhatt hall.
- A ambitious project of installation of solar power plant of 27 MW by NMC is under study.
- NMRCL has decided to fix solar panels on the roof of Metro stations which could be able to generate 25 MW of electricity which will meet their 40% of the energy requirement including traction power.
- Private firms such as Haldiram have taken initiative to be independent and installed power plant of 1.5 MW.

Social awareness programme Poornima Diwas (Full Moon Day) campaign by NMC successfully saved the electricity of 85639.02 units which leads to the saving of 6,67,084 litres of water and 42,387 kg of coal and reduction of 85,639 kg of GHG emission

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