Need of Electronic Early Warning System in Hydro Electric Projects in India

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Abstract: Providing electronic early warning system at downstream locations of the dam of any hydro electric power project in India has been made mandatory by Government in India. Previously installed electro-mechanical hooter based siren systems are not fully effective in preventing accidents at downstream locations during release of water from dam. All these sirens use obsolete technology, which has inherent limitations. The old siren systems are now being replaced with modern electronic siren systems in hydro electric projects in India. Installation of modern siren systems can also be useful for large industries for sending warning messages to public living near the vicinity in the event of industrial accidents. .

***Index Terms* - Electronic early warning system, Sirens, Emergency Operation Center, Remote Terminal Units.**

I. INTRODUCTION AND CONTEXT

Installation of electronic early warning system is very useful in any hydroelectric project, for sending warning messages to people living in downstream areas before release of water from hydro electric dams. Such siren systems can also be useful for large industries for sending warning signals to people living in the vicinity during accidents in industries. These siren systems can also be installed on sea shores to warn people about rising of sea water levels during tsunami, storm, etc. Electronic early warning system is very useful, when large areas and public are to be covered by the warning system. Till date, the equipment of electronic warning system are not manufactured in India and they are mostly imported from developed countries.

II. THE CASE STUDY

The case study or project is for supply and installation of electronic siren system in a Hydro-Electric project in India. The project involved performance of the following major activities:

i) Determination of the distance downstream from the dam within which a significant increase in water level will be experienced when the dam spillway is opened to reduce the reservoir level quickly in anticipation of a flood or in preparation for dam maintenance works.

ii) Identification of vulnerable areas at downstream along the margins of the river, where people do fishing, collect water, wash clothes or bath and where there are villages close to the river banks, which could be exposed to the risk of water surge. By doing this, a caution zone is marked at downstream river bank areas. The same was documented in the office and actually marked at site.

iii) Suggest an appropriate system with warning sirens, which would be remotely operated from a control room. The warning system will have to be AC powered along with back up battery power arrangement. The batteries will be recharged by solar panels and function in all seasons. There will be multiple modes of communication of warning signals to avoid any failure of functioning.

iv) Identification of locations for installation of sirens that will best serve the vulnerable villages on downstream of the dam.

In the electronic siren systems, a warning & notification system (WNS) has been installed, which uses two channels of communication. They are:

i) SMS Notification to each villager living in downstream areas of the dam with mobile number registered on the designated portal.

ii) Audio warning system through high powered electronic sirens installed on towers at identified locations in downstream areas.

The SMS notification utility in the siren system uses a self-registration portal and each villager can register his or her mobile number in the designated portal through the Internet. An Emergency Operations Centre (EOC) has been set up near the dam, which will trigger push SMS notification to all the registered Mobile numbers.

The installed audio or siren warning system is a two tiered system. The first tier is the Emergency Operations Center (EOC) established near the dam site. It is the main command and control center. The second tier is the alert sirens with Horn Speaker and Remote Terminal Unit (RTU) at identified locations in downstream areas of the dam. The speaker horns of Remote Terminal Unit (RTU) are installed on a minimum 9 meter high tower at village locations downstream of the dam. The speaker system produces desired audio dB. The alert received in the speaker systems can be in the form of i) A siren sound ii) A pre-recorded announcement iii) A live announcement

The Emergency Operation Center controls all the Remote Terminal Units (RTUs) installed at downstream locations of the dam. The controller box at each RTU has in-box battery with capability of running on battery power to continue broadcasting audio messages even in the event of power failure. Solar Panel is erected on top of for each siren, to provide charging to in-box battery in the RTU. The caging of controller box is IP65 compliant, for protection from water, dust and harsh weather conditions.

The EOC is connected to all the RTUs via public cellular network (GPRS) and VSAT (Satellite communication). There is option of using the both communication channels. The GPRS is the primary channel, while VSAT is the secondary channel.

The technical specifications of electronic early warning system included the following:

i) EOC (Emergency Operations Centre) for Command and Control is to be installed in the DAM Control Room.
ii) The electronic sirens need to be designed to operate in Omni-direction (360 degree).
iii) The Electronic sirens and poles shall be able to sustain and operate in wind speed up to 100 Kmph.
iv) Internal backup Battery in the Sirens should have adequate Ampere Hour rating to support minimum 30 minutes warning dissemination, after failure of AC Power.
v) Solar Panel of 200 W to provide power to external inverter which feeds Siren RTU and VSAT terminal.
vi) Tower of minimum 9 Meter height will be erected along with associated accessories for mounting of Sirens, Solar Panel, VSAT and RTU Panel along with earthing of electrical equipment.
vii) At each siren location, 150mm thick PCC (M20 nominal mix) base will be laid over a 100mm thick PCC layer (M10 Nominal mix), for a plan dimensions of 6ft x 6ft. At each location of sirens, chain link fencing of 6 feet height with necessary mild steel posts (with PCC foundation) with three layers of barbed wire above the chain link fencing at a vertical spacing of 150mm, is to be provided covering a plan area of 6ft x 6ft. At each siren location, there will be a mild steel gate of size 6 feet(Height) X 3feet (Width) with locking arrangement, to be fabricated and installed along with the chain link fencing.

III. Major Findings and Conclusions

The following are the major findings and conclusion in the project:

i) Installation of electronic early warning system is essential in any hydro-electric project. Installation of such system also needs to be made mandatory in the vicinity of large industries and industrial townships and in human settlements near sea shore.

ii) Locations of sirens need to be decided by detailed field studies of downstream areas of dam in hydro electric projects. In case of large industries, the impact areas of any accident in industries need to be fully covered for installation of sirens.

iii) The equipment to be installed need to of high quality and should have dual modes of electrical power use (AC power and battery operated) and multiple modes of communication of warning signals to avoid failure in functioning.

iv) As on today, most of electronic warning system equipment are not manufactured in India and therefore need to be imported.

v) It has been found that, equipment for electronic early warning system is not expensive. It is affordable to all concerned authorities and industries.

Disclaimer: The findings and conclusions presented in the paper are personal opinion of the author.