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NUCLEAR REGULATORY COMMISSION
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MEMORANDUM TO: FILE

FROM: Robert E. Kahler, Team Leader
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SUBJECT: DRAFT TECHNICAL INFORMATION REGARDING BACKUP POWER SUPPLY FOR ALERT AND NOTIFICATION SYSTEMS (ANS/SIRENS)

DATE: September 27, 2005

The attached draft technical information has been provided by DHS/FEMA to facilitate NRC discussion points with Entergy when considering backup power supply requirements for an Alert and Notification System (ANS).

Attachment: As stated

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EXECUTIVE SUMMARY

An outdoor Public Alert System (PAS) is critical to an effective alert and notification process.[2] PAS planning includes determining the best method for alerting and notifying the public by considering demography, topography, meteorology, potential hazards, man-made structures or systems (i.e., the built environment), ambient noise levels, and the available power supply.

This bulletin concentrates on providing guidance on site selection and operation of audible outdoor PAS devices as part of a larger PAS. It includes extensive sound propagation and system configuration information related directly to outdoor voice warning, including guidance related to locations where outdoor voice warning is the most effective. Electronic message signs used to provide visible warnings to motorists are also addressed.

The bulletin is structured to present basic information for emergency management officials in the documents main narrative. If a reader is interested in gaining a more detailed understanding of PAS topics (e.g., alerting a sleeping population or speech intelligibility) appendices provide this in-depth topic information.

Whether by use of topographic mapping or by more advanced methods such as geographical information system (GIS)-based design, the outdoor PAS planning process consists of the following condensed steps:

1) Identifying those areas where outdoor alerting methods will be most effective;
2) Identifying the populations in need of alerting;
3) Measuring the surrounding "ambient" noise levels;
4) Evaluating the terrain;
5) Examining weather conditions, including typical conditions and extremes;
6) Understanding where outdoor devices should be avoided;
7) Determining the best possible locations for individual outdoor PAS devices;
8) Evaluating outdoor PAS alternatives;
9) Selecting the appropriate system for local needs; and
10) Estimating the cost of the planned outdoor PAS.

To help emergency managers achieve alert and notification objectives, this bulletin also addresses planning, design, control, testing and operation *means* and *methods*, including:

- Changes in outdoor PAS technology;
- Improvements in analytical methods;
- Integration of electronic message signs into outdoor PAS;

[2] To facilitate the public's timely alert and notification on a consistent basis, complementary warning methods for special populations (e.g., hearing-impaired), institutions (e.g., hospitals, schools, large industrial or commercial facilities), or residences should be included in a comprehensive outdoor *and* indoor PAS.

- Use of computer-based activation, control, monitoring, and testing methods such as supervisory control and data acquisition (SCADA) systems;
- Outdoor voice warning intelligibility and locations where outdoor voice warning is most effective; and
- Audible range methodologies.

Also, the bulletin contains outdoor PAS requirement information. Key requirements include:

- Current warning system protocols;
  - three to five minute steady siren or horn alert signal for natural disaster warning,
  - three to five minute wavering or warbling siren alert signal or short horn blasts to warn of enemy attack,
  - one minute siren alert test signal, and
  - when voice capable equipment is in place, voice warning or instruction following the siren or horn alert
- Back-up power requirements;
  - adequate back-up power should be available to perform at least 15 minutes of alerting,
  - back-up power equipment should be recharged to 80% of the maximum rated capacity from the fully discharged state within 24 hours,
  - back-up power systems should be able to maintain the "standby mode" without alternating current (AC) power for at least 24 hours, and
  - when batteries are used for back-up power, the batteries should be of a maintenance free design with a battery life of 3 years
- Requisite sound and component details;
  - the propagated sound must be 10 dB greater than background noise,
  - the outdoor PAS equipment must be able to project 120 dB of sound at least 100 feet, and
  - officials are encouraged to incorporate control mechanisms such as SCADA systems into outdoor PAS layouts whenever possible.

Finally, a list of outdoor warning systems installations and their associated costs are found in Attachment G-1, and checklist for use by local officials to guide the definition of system selection is included as Appendix H.

Interoperability Service (DMIS). HazCollect can serve as a one-stop location for the collection, relay, and distribution of non-weather emergency messages (e.g., Civil Emergency Messages) to the NWS dissemination infrastructure, other national systems such as DMIS, and to the EAS. State and local emergency officials could also use this emerging technology during emergencies to target encrypted, nearly instantaneous messages at authorized individuals in certain regions. Finally, additional redundancy may be available through the use of EM-Net, a satellite-based warning and messaging system designed to meet the needs of the emergency management community.

3.6 Back-up Power Supply for Outdoor Warning Systems

House Report 107-740 directed that all warning systems be operable in the absence of alternating current (AC) power supply. More recently, language in the Energy Policy Act of 2005 mandated the following with respect to outdoor warning systems in the vicinity of nuclear power plants:

> (b) BACKUP POWER FOR CERTAIN EMERGENCY NOTIFICATION SYSTEMS.—For any licensed nuclear power plants located where there is a permanent population, as determined by the 2000 decennial census, in excess of 15,000,000 within a 50-mile radius of the power plant, not later than 18 months after enactment of this Act, the Commission shall require that backup power to be available for the emergency notification system of the power plant, including the emergency siren warning system, if the alternating current supply within the 10-mile emergency planning zone of the power plant is lost.[22]

Despite this emphasis above on nuclear power plants, warning systems are primarily used for severe weather and other emergency conditions. Due to the volatility of the high wind and lightning associated with severe weather, it is not feasible to depend solely on AC power. To overcome this concern, systems have been designed to allow operation that can be backed up by a battery supply or other alternative power supplies. As long as the batteries or other alternative power sources are in good condition, the warning system will operate until the alternative power source looses its capacity.

AC power supply is most commonly provided by the local electric distribution grid. In order to operate in the absence of AC power, the following configurations are typically used:

- Primary power from local electric distribution grid backed by emergency or standby power systems (e.g., engine-driven generators);
- Primary power from local electric distribution grid backed by stored emergency power supply system (SEPSS) (e.g., batteries);
- Primary power from on-site power system (e.g., engine-driven generator) backed by SEPSS;

[22] H.R. 6. "Energy Policy Act of 2005." p. 208

- Primary power from uninterruptible power supply (UPS) that "floats" on local electric distribution grid; or
- Photo-voltaic or thermo-voltaic devices, (i.e., solar cells, used to charge SEPSS to supply steady electric power.)

Each outdoor PAS should receive adequate power to perform its design functions (e.g., maintain sound output, rotation, speech intelligibility, or brightness as applicable). This criterion includes the associated activation, control, monitoring, and testing components (e.g., radio transceivers, testing circuits, sensors to monitor critical operating parameters) co-located with the PAS.

At a minimum, UPS or SEPSS for each outdoor PAS device should be designed for PAS operation in standby mode (radio transceivers, testing circuits, sensors fully operational and providing polling data to the activation, control, monitoring, and test system located at central facilities) for at least 24 hours without AC power from the local electric distribution grid.

In addition, the UPS or SEPSS should be capable of operating an outdoor PAS device in its alerting mode at its full design capability (e.g., maintain its full sound output) *without recharge* for a period of at least 15 minutes. Furthermore, this ability should be available under: 1) the most unfavorable temperature conditions specified for outdoor PAS operation; and 2) batteries that are approaching the end of their design life.

Automatic charging should be sized such that batteries in the UPS or SEPSS are fully recharged to at least 80% of their maximum rated capacity from the fully discharged state in a period of not more than 24 hours. The trickle and fast charge rates for the battery should not exceed the battery manufacturer-recommended rates in order to promote maximum battery life.[23]

Battery design life should be determined by the vendor. This can be based on either: 1) voltage per cell limits (such as specified in NFPA 1221 2002 Edition, Tables 10.4.3 and 10.4.4); or 2) on the time when deterioration to less than 80% of the battery maximum rated capacity at the 1-hour rate is predicted to occur. Batteries should be of a maintenance-free design, and the charging system should be designed to ensure a minimum battery life of at least three years.[24]

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[23] Applicable standards for primary and secondary power sources used for PAS components located at central facilities are described in NFPA 1221 Sections 4.7 and 10.4 (Power). In addition to the NFPA 1221 requirements, these components should receive adequate power to perform their design functions upon loss of primary power (typically the local electric distribution grid provides primary power) for durations not less than those for the outdoor PAS.

[24] Refer to UL 2017, Section 58.2, Power Sources, for additional standards applicable to power supplies for an outdoor PAS device