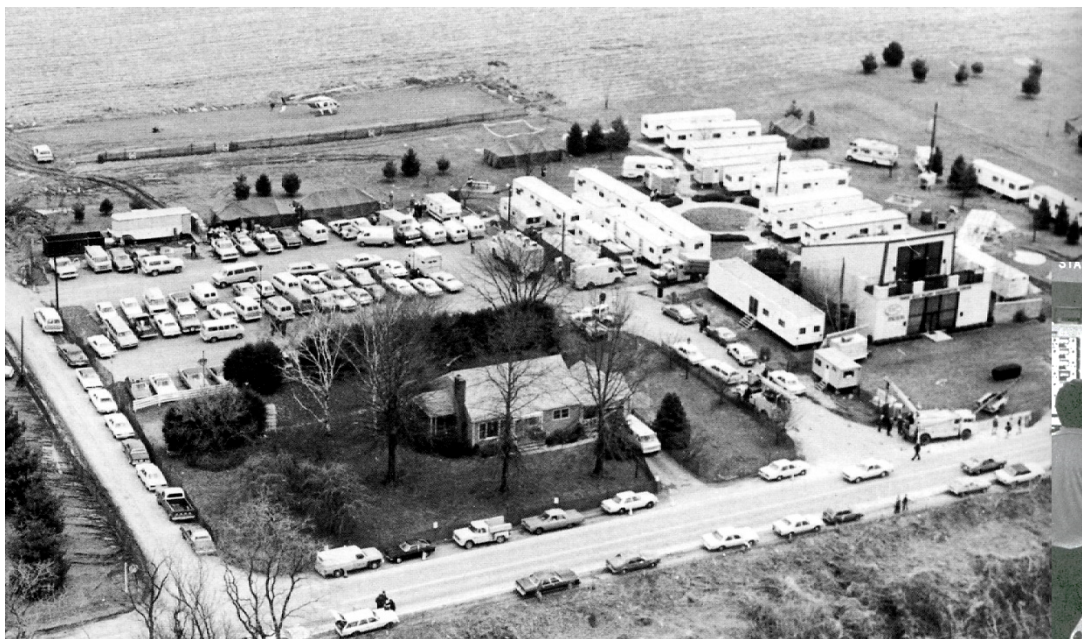


Licensee Emergency Response Facilities

- One of the significant lessons learned from the 1979 accident at Three Mile Island Nuclear (TMI) Generating Station was the need to have adequate emergency response facilities (ERFs).
 - During the accident, plant responders flocked to the main control room because it was the only area designed for post accident habitability.
 - An ad hoc collection of house trailers developed around what was then the Observation Center (e.g., visitor's center).
 - A mess tent was erected to feed the plant staff (the cafeteria on the island was not useable) and the hundreds of support staff called to the site.
 - Onsite dosimetry processing was lost.
 - A "JIC" was established in an unused auditorium near the Harrisburg Airport only after a fiasco in the release of information to the public.





TMI "Trailer City." Performed many functions of current technical support center (TSC) and the emergency operations facility (EOF)



Some of the crowd in the control room



The "joint information center" (JIC)

1979



2014



Emergency Response Facilities

- Main Control Room (MCR)
 - The MCR is the onsite location from which the nuclear power plant is operated.
- Technical Support Center (TSC)
 - The TSC is an onsite facility located close to the MCR that provides plant management and technical support to the operators in the MCR. Primary focus is **onsite**.
- Operations Support Center (OSC)
 - The OSC is an onsite assembly area separate from the MCR and TSC where licensee operations support personnel from which personnel can be assigned support tasks.

Emergency Response Facilities

- Emergency Operations Facility (EOF)
 - Is a support facility for the management of the licensee's overall emergency response, and coordination of radiological assessments, and making protective action recommendations. Primary focus is **outward** from the site.
- Safety Parameter Display System (SPDS)
 - Provides a display of plant parameters may be assessed in the MCR, TSC, and EOF. Displays are structured to enable quick assessment of the plant safety status.
- Emergency Response Data System (ERDS)*
 - Provides a limited subset of plant parameters necessary for NRC oversight to the NRC HQ and regional operations centers.
 - Activated on an Alert emergency

**Replaces the Nuclear Data Link described in NUREG-0696*

Regulatory Basis

- Main Control Room (MCR)
 - 10 CFR Part 50 Appendix A, General Design Criterion 19
 - ...actions can be taken to operate the unit safely in normal and accident* conditions...”
 - Adequate radiation protection shall be provided to permit access and occupancy without doses exceeding:
 - 5 rem (0.05 Sv) whole body or its equivalent to any part of the body for the duration of the accident OR
 - 5 rem (0.05 Sv) total effective dose equivalent (TEDE)
 - Equipment provided outside MCR with instrumentation and controls to effect a prompt hot shutdown and, subsequently, a cold shutdown.
 - See NUREG-0800 Chapter 6.4 and RG 1.97 for guidance

**Based on the plant design basis accidents (DBA), including LOCA.*

Regulatory Basis

- All Emergency Response Facilities (TSC, OSC, EOF)
 - 10 CFR 50.47(b)(8):
 - Adequate emergency facilities and equipment to support the emergency response are provided and maintained.
- Technical Support Center (TSC)
 - 10 CFR Part 50 Appendix E, §IV.E.8
 - A licensee onsite technical support center... ...from which effective direction can be given and effective control can be exercised during an emergency.
 - 10 CFR Part 50 Appendix E, §IV.E.9
 - Provision for communications among, MCR, TSC, EOF, State and local EOCs, and field assessment teams, NRC HQ, and NRC regional operations center.

Regulatory Basis

- Emergency Operations Facility (EOF)
 - 10 CFR Part 50 Appendix E, §IV.E.8
 - ...and an emergency operations facility from which effective direction can be given and effective control can be exercised during an emergency.
 - ...may serve more than one nuclear power reactor site.
 - Located:
 - between 10 miles and 25 miles of the site, OR,
 - primary facility within 10 miles and a backup located between 10 miles and 25 miles of the site.
 - >25 from site requires Commission approval via license amendment
 - The location requirements are not applicable to plants having an EOF approved prior to December 23, 2011.

Regulatory Basis

- Emergency Operations Facility (Con't)
 - EOF required capabilities:
 - capability to obtain and display plant data and radiological information for each reactor that the EOF serves,
 - capability to analyze plant technical information and provide technical briefings on event conditions and prognosis to licensee and ORO for each reactor that the EOF serves, and,
 - capability to support response to events occurring simultaneously at more than one nuclear power reactor site if the facility serves more than one site.
 - 10 CFR Part 50 Appendix E, §IV.E.9
 - Provision for communications among, MCR, TSC, EOF, State and local EOCs, and field assessment teams, NRC HQ, and NRC regional operations center.

Regulatory Basis

- Onsite Operational Support Center (OSC)
 - 10 CFR 50.47(b)(8):
 - Adequate emergency facilities and equipment to support the emergency response are provided and maintained.
- Joint Information Center (JIC)
 - 10 CFR 50.47(b)(7)
 - ... the principal points of contact with the new media for dissemination of information during an emergency (including the physical location or locations) are established in advance...

Regulatory Basis

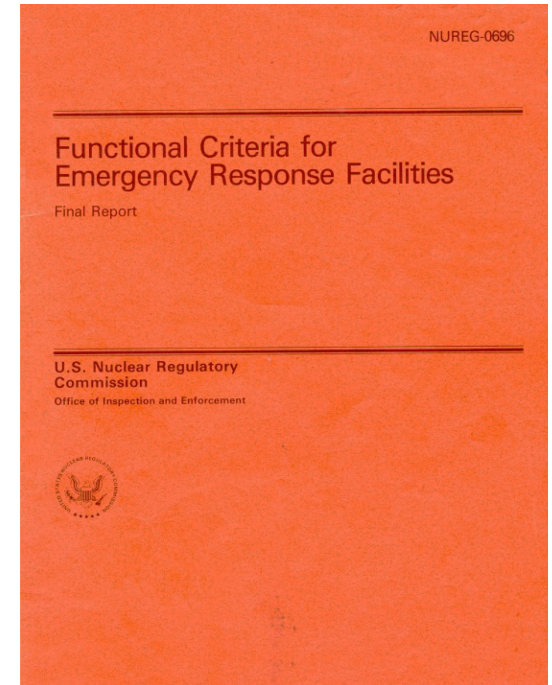
- Safety Parameter Display System (SPDS)
 - 10 CFR Part 50 Appendix E, §IV.E.8
 - Adequate emergency facilities and equipment to support the emergency response are provided and maintained.
- Emergency Response Data System (ERDS)
 - 10 CFR 50.72(a)(4)
 - The licensee shall activate the ERDS as soon as possible but not later than one hour after declaring an Alert or higher emergency.
 - 10 CFR Part 50 Appendix E, §VI identifies the subset of plant parameters that the licensee is to transmit and provides other requirements.

Regulatory Basis

- Alternative facility(ies)
 - 10 CFR Part 50 Appendix E, §IV.E.8
 - ...an alternative facility or facilities that would be accessible even if the site is under threat of or experiencing a hostile action, to function as a staging area for augmentation of the ERO and collectively having:
 - the capability for communication with the EOF, MCR, and plant security;
 - the capability to perform offsite notifications; and
 - the capability for engineering assessment activities including damage control team planning and preparation;
 - when onsite emergency facilities cannot be safely accessed during hostile action.

NUREG-0696

- Detailed guidance for MCR, TSC, OSC, EOF
 - Also provides guidance on:
 - Safety Parameter Display System (SPDS)
 - Intended for MCR, but may also be available in the TSC.
 - Operational during all plant operating conditions
 - Nuclear Data Link
 - This requirement was retracted; replaced by the Emergency Response Data System (ERDS) which is to be activated at an Alert emergency.
- NUREG-0696 was amended in part, in 2011 by “Interim Staff Guidance: Emergency Planning for Nuclear Power Plants,” NSIR/DPR ISG-01. (mostly EOF changes)



NUREG-0696 - Activation

- Until the TSC, OSC, and EOF are activated, all emergency response functions of these facilities are performed in the control room.
 - Direct supervision of reactor operations and manipulation of reactor controls remains in the MCR.
- The TSC and OSC are to be activated for Alert and higher emergency classification levels (optional at lower levels).
 - The TSC performs EOF functions until the EOF is activated.
- The EOF is to be activated for Site Area and General Emergency classifications (optional at lower levels).
- Activation times for ERFs are established by the licensee's emergency plans.

NUREG-0696 - Reliability

- Data systems, instrumentation, and the facilities of the ERFs are to be designed and constructed to provide a high degree of reliability.*
 - The reliability criteria for data systems, instrumentation, and the facilities are described in terms of an unavailability goal:

$$\text{Operational Unavailability} = \frac{\text{Downtime}}{\text{Operating Time above cold shutdown}} = < 0.01$$

- The systems are to be designed such that scheduled maintenance outages will not exceed 16 hours per calendar quarter and the functions are restorable within 30 minutes.

**This does not imply that the systems, instrumentation and facilities need to meet safety-related equipment treatment requirements.*

Disclaimer

- The discussion that follows is a high level summary of the significant guidance for each ERF.
- Much of the guidance in NUREG-0696 is very detailed.
- It is, however, guidance and the licensee may have proposed alternatives that the NRC staff found acceptable during initial licensing.

NUREG-0696- TSC

- Function

- Provide plant management and technical support to plant operations personnel.
- Relieve the reactor operators of peripheral duties and communications not directly related to reactor system manipulations.
- Prevent congestion in the MCR.
- Perform EOF functions until the EOF is functional.

- Location

- TSC is to be as close to MCR as possible, not to exceed a two-minute walk to allow face-to-face discussions.
- Generally, the TSC will be located within the plant's protective area boundary to avoid delays at security checkpoints.

NUREG-0696- TSC

- Size

- Working space of 75 ft² per person for 20 licensee and 5 NRC personnel.
 - If the licensee's maximum TSC staff exceeds 20, then the TSC size needs to increase.
- Space for the required instrumentation, data systems, communication systems, space for plant records and historical data.

- Structure

- A well-engineered building capable of withstanding the most adverse conditions (e.g., earthquakes, high winds, flooding) expected during the design life of the plant.
 - Does not need to meet seismic or engineered safety feature design criteria.

- Habitability

- The same radiological habitability as the MCR during accident conditions for direct and airborne radioactivity from in-plant sources.
 - TSC ventilation system functions in a manner comparable to the MCR ventilation, except:
 - Does not need to be seismic Category I, redundant, instrumented in the MCR, or automatically actuated.
- Radiation monitoring and protection to be provided in TSC
 - Fixed or portable radiation monitoring equipment dedicated to TSC.
 - Protective clothing and equipment for persons who have to transit between TSC and MCR or TSC and EOF.
- If the TSC becomes uninhabitable, the TSC plant management function will be transferred to the MCR.

NUREG-0696- TSC

- Communications

- The TSC will be the primary onsite communication center for the plant during an emergency.
- Primary function is plant management communications and the immediate exchange of plant status and operation information. Will have reliable and backup voice communications to:
 - MCR, OSC, EOF,
 - NRC,
 - state and local emergency operations centers (prior to activation of EOF), and
 - license field monitoring teams (prior to activation of EOF).
- Specific guidance on communication hardware is provided in NUREG.

NUREG-0696- TSC

- Instrumentation, Data Systems, Power Supplies
 - The TSC will have equipment to gather, store, and display data needed in the TSC to analyze plant conditions (see RG 1.97).
 - Data systems will operate independent of actions in the MCR and will not interfere with MCR functions.
 - Data system will provide access to accurate and reliable information sufficient to determine:
 - plant operating conditions prior to the accident (>2 hour pre-event),
 - transient conditions causing the transient event (>12 hours post event), and
 - plant system dynamic behavior throughout the accident.
 - The TSC will have sufficient alternate or backup sources of power to maintain continuity of the TSC functions and immediately restore data systems.

NUREG-0696- TSC

- Records Availability and Management
 - The TSC will have a complete and up-to-date repository of plant records, drawings, and procedures at the disposal of TSC personnel to assist in their technical analysis and evaluation of emergency conditions, including:
 - technical specifications,
 - operating and emergency operating procedures,
 - final safety analysis report (FSAR),
 - plant operating records, and
 - up-to-date as-built drawings, schematics, and diagrams.
 - Method of storage and presentation will ensure ease of access under emergency conditions.
 - Records will be updated as necessary.

NUREG-0696- OSC

- **Function**

- Provides a location where plant logistic support can be coordinated during an emergency.
- Restrict control room access to those support personnel specifically requested by shift supervisor.

- **Habitability**

- If the OSC habitability is NOT comparable to the MCR, the licensee's E-plan will have procedures for relocating the OSC functions.

- **Communications**

- Direct communications with the MCR and with the TSC:
 - one dedicated extension to the MCR
 - one dedicated extension to the TSC, and
 - one dial telephone capable of reaching onsite and offsite locations.

NUREG-0696- EOF*

- Functions
 - Licensee controlled and operated offsite support center. The EOF will have facilities and capabilities for:
 - management of overall licensee emergency response,
 - coordination of radiological and environmental assessment,
 - determination of recommended public protective actions,
 - coordination of response activities with Federal, State, and local agencies,
 - notification of offsite agencies (when performed at EOF per licensee emergency plan),
 - coordination of event, plant, and response information provided to public information staff for dissemination to the media and public,

**This section updated to reflect NSIR-ISG-DPR-01.*

NUREG-0696- EOF

- obtaining and displaying key plant data and radiological information for each unit or plant the EOF serves,
 - analyzing plant technical information and providing technical briefings on event conditions and prognosis to licensee staff and offsite agency responders for each type of unit or plant, and
 - effectively responding to and coordinating response efforts for events occurring simultaneously at more than one site for a co-located or consolidated EOF.
- Location, and Structure
 - The location of the EOF, and whether a backup facility is required, should consider the following factors:
 - whether the location provides optimum functional and availability characteristics for carrying out EOF functions, and
 - whether the EOF functions would be interrupted during radiation releases that would require the development of protective action recommendations for the public.

NUREG-0696- EOF

- Location should be coordinated with State and local officials.
- If the EOF is located greater than 25 miles from the site, provisions will be made to locating NRC and offsite agency staff closer to the site.
 - NUREG-0696, as amended by NSIR/DPR-ISG-01, provides guidance for this close-in capability.
- Size
 - Working space of 75 ft² per person for 25 licensee and 9 NRC and one FEMA personnel.
 - If the licensee's maximum EOF staff exceeds 25, then the EOF size needs to increase.
 - Space for the required instrumentation, data systems, communication systems, space for plant records and historical data.

NUREG-0696- EOF

- Habitability

- EOF Habitability criteria is based upon location:

Item Needed	Within 10 miles of the TSC	At or Beyond 10 miles of the TSC
Structure	Well engineered for design life of plant	Well engineered for design life of plant
Protection factor	≥ 5	None
Ventilation protection	Isolation with HEPA filters (no charcoal)	None
Backup EOF	Located within 10 to 20 miles of the TSC	None

- Radiological Monitoring

- Installed monitors or dedicated portable instruments

NUREG-0696- EOF*

- Communications

- The EOF should have reliable primary and backup means of communication with the TSC, MCR, NRC, and State and local emergency operations centers:
 - ENS and HPN telephones in NRC office space,
 - direct access telephones for management communications to TSC and MCR,
 - telephones providing access to onsite and offsite locations,
 - Licensee will provide EOF telephone access to common-carrier services that bypass local telephone switching stations that may be overwhelmed with call load or lose power.
 - radio communications to licensee field monitoring teams,
 - communications to State and local operation centers, and
 - facsimile transmission between TSC, EOF and NRC operations center.

NUREG-0696- EOF

- Instrumentation, Data Systems, Power Supplies
 - The EOF will have equipment to gather, store, and display data needed in the EOF to analyze plant and environmental conditions (see RG 1.97).
 - Data systems will operate independent of actions in the MCR and will not interfere with MCR functions.
 - Data system will provide unhindered access to accurate and reliable information sufficient to:
 - assess environmental conditions,
 - coordinate radiological monitoring activities, and
 - develop protective action recommendations for the public.
 - Data storage
 - >2 hour pre-event and >12 hours post event.

NUREG-0696- EOF

- The EOF will have sufficient alternate or backup sources of power to maintain continuity of the EOF functions and immediately restore data systems.
- Records Availability and Management
 - The EOF will have ready access to plant records, drawings, emergency plans, and procedures needed to exercise overall management of the licensee emergency response TSC personnel to assist in their technical analysis and evaluation of emergency conditions.
 - Method of storage and presentation will ensure ease of access under emergency conditions.
 - Records will be updated as necessary.
 -

Safety Parameter Display System

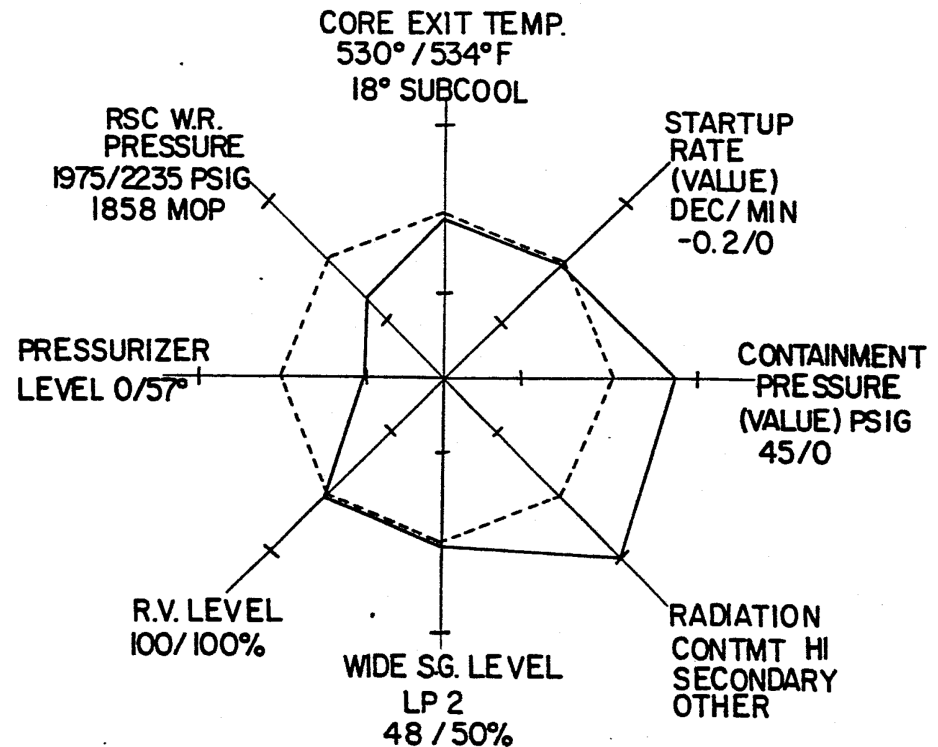
- Function

- The purpose of the safety parameter display system (SPDS) is to assist MCR personnel in rapid detection of abnormal operating conditions.
- The SPDS continuously provides an human-engineered indication of selected parameters that are representative of the safety status of the plant, e.g.,
 - reactivity,
 - core cooling and heat removal,
 - reactor coolant inventory,
 - radioactivity control, and
 - containment integrity.
- The SPDS will be in operation during normal and abnormal operating conditions.

Safety Parameter Display System

A typical SPDS display

- The hashed line connects the parameter values in normal operating conditions.
- The solid line connects the present parameter value.
- At a quick glance, the operator can identify problems.
- The display here suggests the beginning of a loss-of-coolant accident at a PWR.
- The SPDS generally has system mimics and parameter trends and tables.



Emergency Response Data System

- Function

- The Emergency Response Data System (ERDS) is a supplement to the voice-based Emergency Notification System (ENS).
- The purpose of the ERDS is to provide subset of plant parameters to the NRC operations centers in HQ and the regions, once the system is activated.
- The licensee is required to activate the ERDS within one hour of declaring an Alert or higher emergency.
- Specific PWR and BWR parameters are listed in 10 CFR Part 50 Appendix E §VI in the following categories:
 - reactor core and coolant system,
 - reactor containment,
 - radioactivity release rates, and
 - meteorology data.