# TERRORISM AND NUCLEAR REACTORS: SECURITY AND VULNERABILITIES

An overhead photograph of the southern New Jersey Salem I and Salem II reactors (www.maptech.com)

## Nuclear Power Reactors

- Nuclear reactors are potential terrorist targets because of their highly radioactive fuel.
- Nuclear fuel generates immense amounts of heat and radiation. A complex cooling system must constantly cool fuel. Loss of cooling would result in a catastrophic "meltdown."
- An attack on a nuclear power plant is capable of causing a large number of casualties, widespread and long-term social disruption, mass panic, and massive economic losses.

## Security

- Power plants are surrounded by between 30-40 armed security guards, monitored fences, and guarded checkpoints.
- Power Plant security is supposed to protect against the Design Basis Threat (DBT). The Nuclear Regulatory Commission (NRC), an independent federal agency, is the body that specifies the DBT.
- Prior to 9-11, the DBT included:
  - 3 attackers aided by 1 individual with inside knowledge of the power plant
  - a truck bomb the size of the WTC bombings in 1993
- The NRC staged mock attacks, Operational Safeguard Response Evaluations (OSRE), to test that power plants were adequately guarding against the DBT.
  - From the late 1970s to 1998, 46% of the plants tested failed.
  - From 1998-2000, 9 of the 11 plants tested failed.
  - OSREs were terminated after 9-11
  - In order for power plants to be adequately protected against terrorist attack, the NRC must update the DBT to include an attack of 20 individuals, comparable to the attack on 9-11.
  - The NRC must resume OSREs to ensure that power plants are sufficiently protected. If a power plant fails an OSRE twice, the security at the plant should be federalized.

## Defense In Depth

- Little consideration has been given to designing reactor safety systems to protect against sabotage as opposed to an accident.
- Reactors are protected against accidents using a "Defense in Depth" philosophy, multiple redundant systems designed to protect against chance malfunctions.

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- Past accidents at Chernobyl, Three Mile Island, and Browns Ferry[1] have shown that redundancy does not always protect against operator error or multiple failures with a common cause.
- Deliberate disabling and destruction in parallel of multiple safety systems may easily thwart "Defense in Depth," leading to a catastrophic radiation release.

## Current Vulnerabilities

- Backup diesel generators required to provide control and coolant to prevent meltdown in the event of the loss of external power are exposed to sabotage
- Water coolant intakes required for long-term cooling exposed to attack by boat
- NRC regulations require reactors to consider the effects of a fire in only a single room. A fire in multiple rooms or a fire accompanied by sabotage elsewhere could lead to destruction of all systems required to prevent meltdown
- Lack of regulation requiring operators to consider security aspects when critical safety systems are shutdown for maintenance while a plant continues to operate

Prepared by the Princeton University Woodrow Wilson School undergraduate task force on Nuclear Reactor Terrorism, May 2002. Prepared for the Coalition for Peace Action as part of the Princeton University Community Based Learning Initiative.

[1] The 1986 Chernobyl accident in the Ukraine was the worst nuclear power plant accident ever, resulting in thousands of latent cancer fatalities and affecting the lives of millions. The 1979 Three Mile Island accident in Harrisburg, Pennsylvania was the worst nuclear power plant accident in the United States, resulting in significant reactor damage but no radiation release. In the 1975 Brown's Ferry accident, a technician started a cable fire while using a candle flame to check for air leaks. The fire raged for hours while operators struggled to control the reactor before the fire was eventually extinguished. All three accidents were largely the result of human error.

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