

# Fort Future Utility Systems Tools

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## Background

Utility systems are “enablers” for almost every activity on an installation. They provide the electricity, water, transportation fuel, heating, cooling, compressed air, and communications required for the various steps of force projection.

## Problem

Safe, reliable utility service is often taken for granted. Because of their enabling role in so many activities on military installations, utilities systems are attractive targets for terrorists. Attack or sabotage on a utility system can potentially delay time-critical missions and pose threats to health and life. For example, destruction of an electrical substation could cause a power interruption for thousands of occupants.

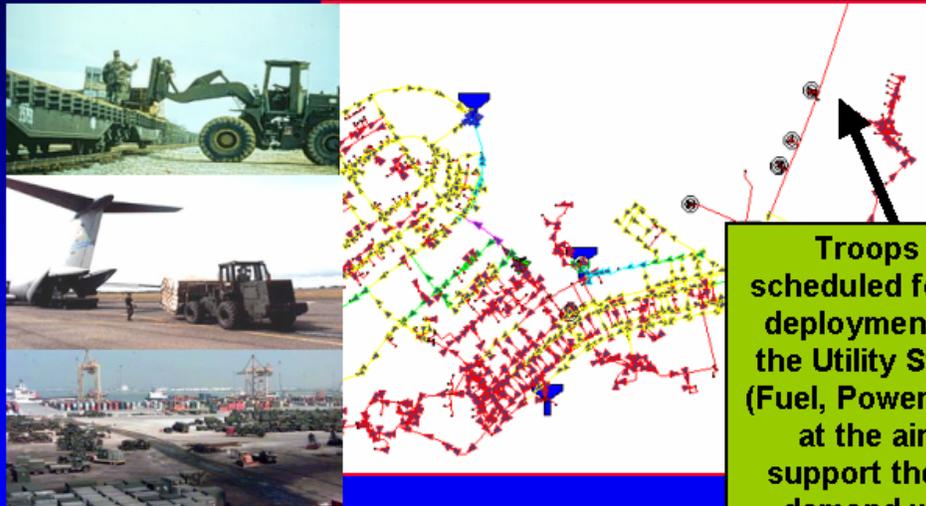
Terrorists could also introduce a chemical or biological contaminant into potable water or fuel supplies. Determination of the best response to such emergencies and threats requires advance planning.

Other utility system problems can also result in serious consequences. One such problem is the unintentional failure of aging utility infrastructure. This can cause service interruptions such as the massive power outage that occurred in the Northeast United States in August 2003. Another problem is inadequate capacity. The ability of today’s utilities systems to support the capacity requirements of the Future Force requires analysis.

## Reliable Utility Systems Enable Key Installation Functions

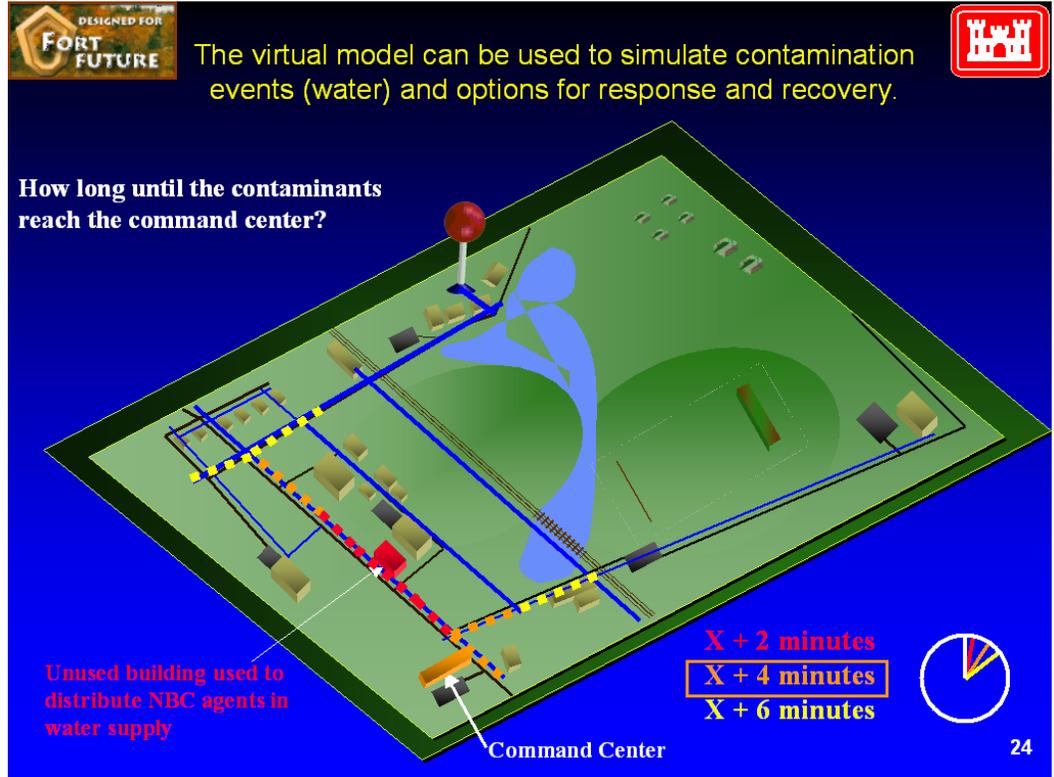
— Force Projection —

Modeling and simulation tools can aid in utility contaminant prevention, detection, and mitigation.



Troops are scheduled for rapid deployment. Can the Utility Systems (Fuel, Power, Water) at the airfield support the extra demand we are expecting?

A simulation of what will happen if a contaminant is introduced into a water system can help engineers plan the best response.



Each installation is unique in terms of physical location, characteristics, condition of facilities, and mission. All of these factors impact the capability of a utility network to provide safe and reliable service. Unfortunately, due to the nature of utility systems, no “one-size-fits-all” solution exists.

## Approach

Methods, simulation tools, and models are being developed to enable installation and military planners to assess and optimize the ability of utility systems to provide safe, reliable utility service to support the current and future force.

Water, electric, fuel, and natural gas distribution system representations are being added to the Fort Future Virtual Installation. Existing data from the installation’s Microstation, AutoCAD, or other electronic drawing/map repository will be used when creating the utility system layers within the Virtual Installation. Thus, tedious and/or duplicate data entry will be minimized. Users will be able to view utility system layouts and components within the Virtual Installation by simply switching them on.

The user will be able to easily set up scenarios for analysis within the Virtual Installation. This includes the “as-is” scenario, proposed new facilities or activities, or potential emergency situations. For example, the user will be able to add new buildings, simulate a fire, introduce a contaminant into the water system, or interrupt the power at specified locations within the Virtual Installation by simply pointing and clicking on the map and specifying some very basic information.

Engineering analysis algorithms and models will then be used to simulate what would happen in the scenario. The results will be shown to the user on a Virtual Installation map. “Post-analysis” algorithms and heuristics will identify problems or deficiencies based on the results of the engineering analysis, including inadequate capacity, inadequate backup, or vulnerability to contamination or interruption of service.

**Virtual model can be used to assist short term and master planning (capacity issues)**



Simulating a firefighting situation can help determine if the water system's capacity is adequate.

Water level in tank:

70 ft  
50 ft  
30 ft

Top of standpipe



**Caution! Water level is low!**

**DANGER!!**

**Water level is very low!**

Utility system analysis software as it exists today typically requires that scenario information be input manually, and that an expert user be available to interpret the results. The cross-functional nature of the Virtual Installation allows easy setup of scenarios for analysis. The post-analysis algorithms within the Fort Future utilities tools will provide a basic interpretation of the results to non-technical users and will help determine if a proposed solution is worthy of further, more detailed consideration.

### Benefits

Fort Future utilities tools will enable the user to:

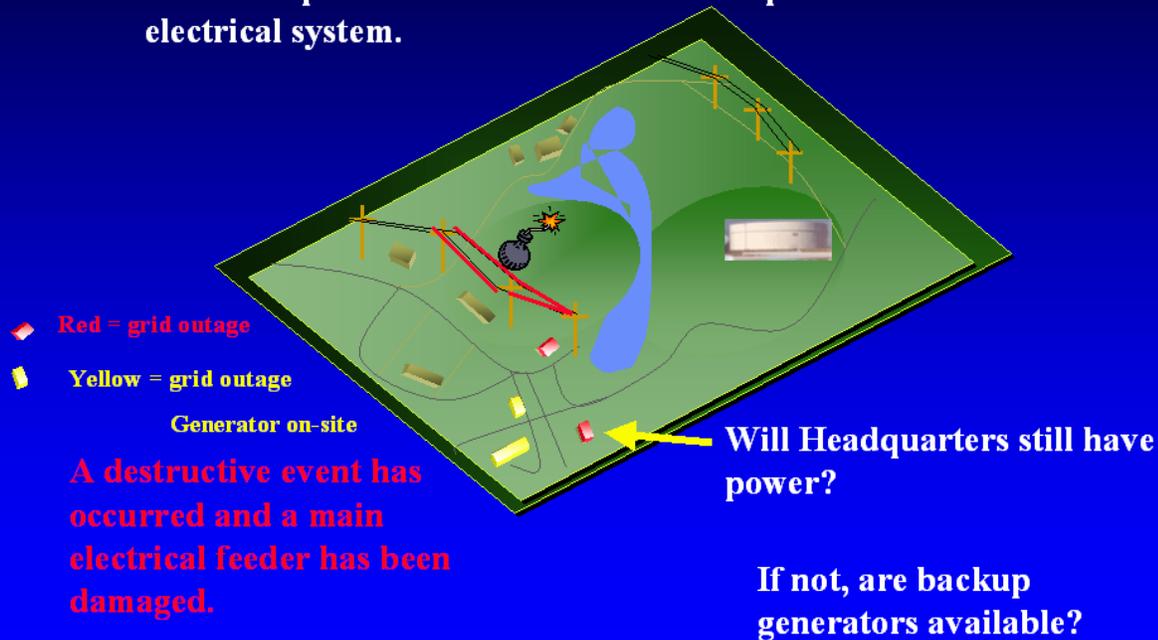
- Easily create a virtual model of each installation's "as-is" electrical, potable water, fuel, and natural gas distribution systems as part of the "Virtual Installation"

- Identify areas with inadequate utility system capacity in the present or future, based on actual or proposed plans and activities
- Pinpoint locations that are the most vulnerable to interruption or denial of utility service
- Simulate contamination events and analyze potential responses (water and fuel)
- Test alternative solutions to the utility system problems or deficiencies that are identified
- View analysis results and their interpretation on the map.



## Virtual utility service interruptions can be simulated and their impact can be determined.

This example illustrates a service interruption scenario for the electrical system.



The impact of a service interruption can be modeled so an installation can take appropriate preventive action.

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