Dynamic Infrastructure Interdependency Simulation & Analysis (DIISA)

The National Infrastructure Simulation and Analysis Center (NISAC)), a program under the Department of Homeland Security's (DHS) Infrastructure Protection/ Risk Management Division (IP/RMD), provides advanced modeling and simulation capabilities for the analysis of critical infrastructures, their interdependencies, vulnerabilities, and complexities. These capabilities help improve the robustness of our nation's critical infrastructures by aiding decision makers in the areas of policy analysis, investment and mitigation planning, education and training, and near real-time assistance to crisis response organizations.

NISAC is a partnership between Sandia National Laboratories (SNL) and Los Alamos National Laboratory (LANL), integrating the two laboratories' expertise in infrastructure disruption/vulnerability modeling and simulation.

DIISA Approach

DIISA analysts use system dynamics modeling to quantify and evaluate the effects of infrastructures and their interdependencies on supply and demand under different conditions (e.g., time of day, time of year, unusual event, new regulations, incentives, market structures).

Dynamic simulation modeling allows analysts to identify:

- Quantified consequences for evaluating risks
- Limiting factors under different, ambient conditions, hypothetical events and policies
- Effects of alternatives, pathways, redundancies, and inventories
- Potential magnitude, location and timing of disruptions that propagate to other infrastructures and regions
- Positive and negative feedbacks created by interdependencies and their net effect on supply/demand balance

Scenario Analysis Project

The DIISA team works with industry and DHS to identify infrastructure security and disruption issues for analysis. The results of previous analyses, news stories and discussions with infrastructure experts are used to formulate issue descriptions and recommendations for project analysis. All the identified issues are presented to DHS for review and prioritization.

This is the first year for a formal issues identification, prioritization and analysis project. While this project has been initiated by the DIISA team, the goal is to utilize the best available tools throughout NISAC for the analyses and to perform the analyses to the level of detail necessary to support decision making. This project provides impetus for maintaining contacts with industry experts and for soliciting their feedback on NISAC models and analyses.

A detailed project plan and an initial list of proposed analyses have been developed and are being reviewed by DHS program management. The proposed analyses are included to illustrate the nature and scope of this project.

Influenza

This task anticipates the need for analysis of the potential impacts of the influenza vaccine supply limitations. Scenario characteristics will be defined based on a literature search to identify the medical community's anticipated characteristics of influenza epidemic in the United States. Review of existing analyses and projections will provide an indication in the potential distribution and uncertainty in the magnitude of this year's flu outbreak.

The influenza scenario will be modeled to simulate the effects of the epidemic on different age groups in the general population and health care professionals. The simulation will account for differential vaccination rates, vaccine effectiveness and influenza strain virulence. The simulated effects on public health will be used to evaluate the potential effects on the labor pool and quantify the subsequent effects on other infrastructures.

Long-term Disruption in Crude Oil Supply

This task anticipates the need for analysis of the effects of tightening of the international crude oil market and continues the collaborations with petroleum industry experts on energy infrastructure disruptions, infrastructure interdependencies and issues. It also simulates the potential effects of long-term loss of import capacity that could occur due to disruptions in foreign ports, production regions, or transport capacity. A detailed petroleum system model and other system models will be used to quantify the scenario effects.

BBC NEWS WORLD EDITION

Last Updated: Thursday, 7 October, 2004, 20:33 GMT 21:33 UK

US oil climbs to $53 price peak

US crude oil prices reached a fresh record high on Thursday, amid surging demand, worries over possible supply shortages and a strike in Nigeria.

Hundreds of people wait for hours October 18 for a flu vaccine outside a pharmacy in Alhambra, California.

Banking and Finance Analysis

The goal of this analysis is to identify what magnitude of events can cause large-scale financial collapse. The initial step is a literature search for relevant scenarios, conditions that are perceived to lead to collapse. A series of simulations will be used to quantify and compare the timing, magnitude, distribution and duration of potential economic impacts and propagating effects for the identified disruption scenarios.

Adaptive Terrorist Tactics

A workshop will be used to conduct a game theory designed exercise to develop scenarios of adaptive terrorist tactics. Simulations of the adaptive terrorist scenarios using appropriate system or agent-based models will be used to quantify and compare the potential consequences of terrorists adapting approaches based on existing or new security measures.

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