TECHNOLOGY CAFÉ: SESSION A

2 Stochastic Infrastructure Remediation Model

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Wide area chemical, biological, radiological, and nuclear (CBRN) incidents, whether products of terrorism, war, or accidents, have the potential to damage core infrastructure assets. The Stochastic Infrastructure Remediation Model (SIRM) was developed to prioritize remediation of critical infrastructure sectors during such incidents, implementing a stochastic modeling process that simulates the complicated interactions among different sectors during the remediation process.

The SIRM considers each of the infrastructure sectors as an operating efficiency percentage and models the restoration of services in each sector as a set of reactions that use resources from one sector (e.g., Energy) to restore services in other sectors (e.g., Healthcare and Communications). This process models the time required to repair an infrastructure sector, while also allowing the user to consider changes in resource allocation based on user-defined repair factors. The SIRM can dynamically model all the desired sectors and allows the user to draw statistical conclusions specific to a CBRN incident.

There are four key algorithm elements involved in SIRM: 1) the infrastructure interactions, which describe how the sectors interact with each other 2) the repair factors, which model the rate at which external resources are used to bring services back online after outages 3) the rates of reactions, which govern the speed of the response, and 4) critical infrastructure efficiency over time. These parameters, particularly the output parameter of the efficiency over time, allow the SIRM to assist in emergency response and decision making in several ways. The estimated recovery time can be assessed based on the initial scenario parameters and can be adjusted and recalculated as new information becomes available. The repair factors can also be adjusted to model the prioritization of infrastructure recovery by setting higher relative repair factors for higher priority infrastructure sectors. Finally, sensitivity analyses can be used to determine the most influential sectors and possible resource allocation.