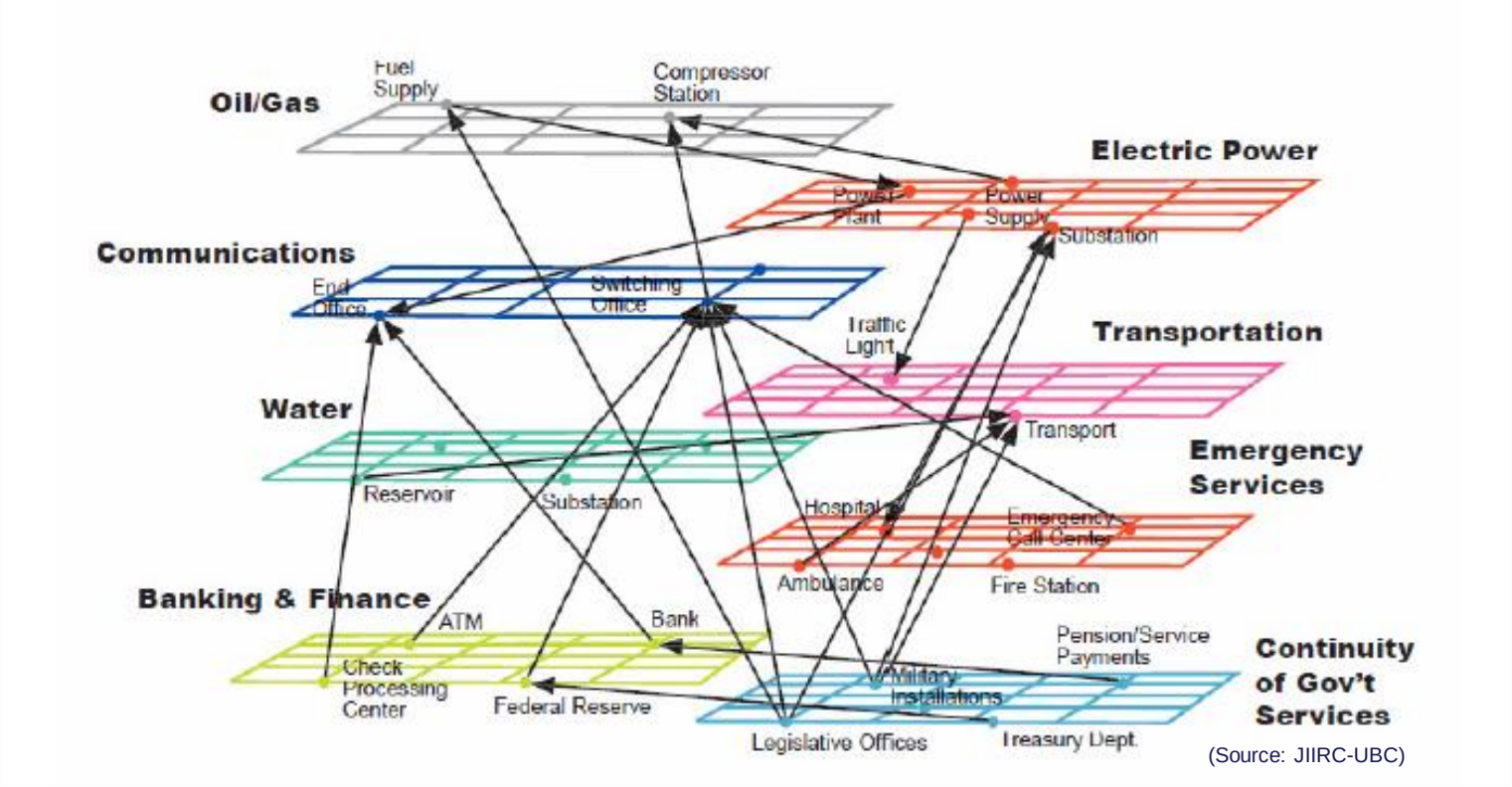
Initiating the CCSF Lifelines Council Interdependency Study



(Source: JIIRC-UBC)

Lifelines Council Meeting #7

November 17, 2011

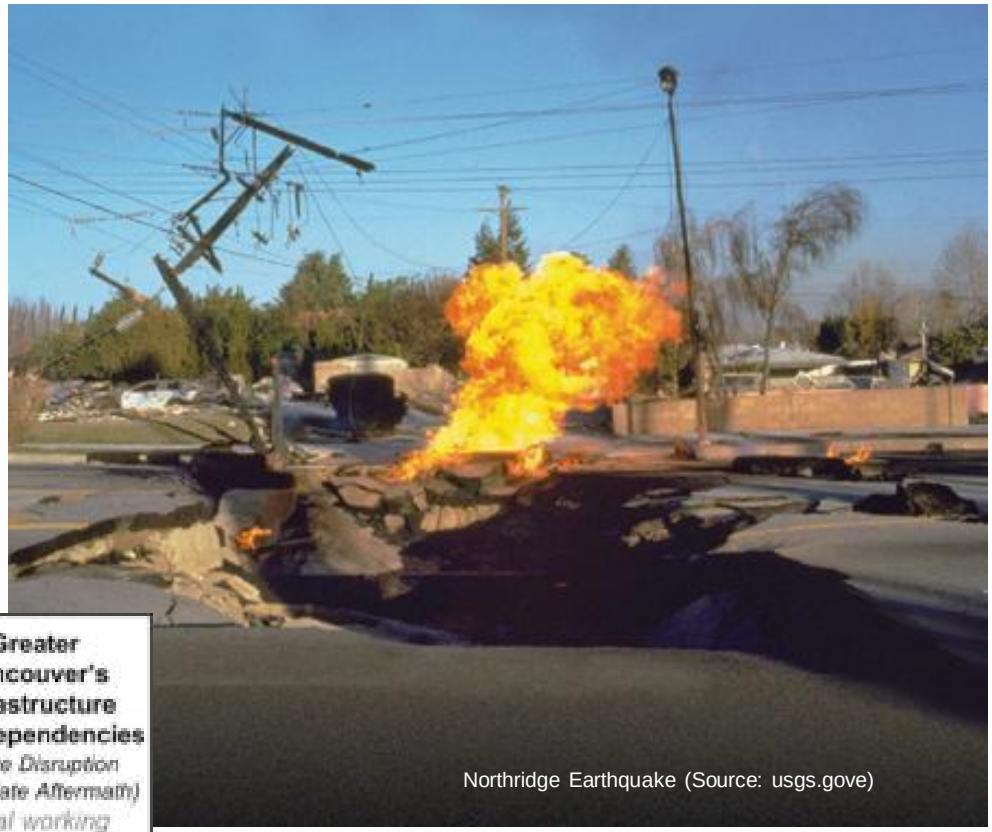
Lifelines Council's Objectives

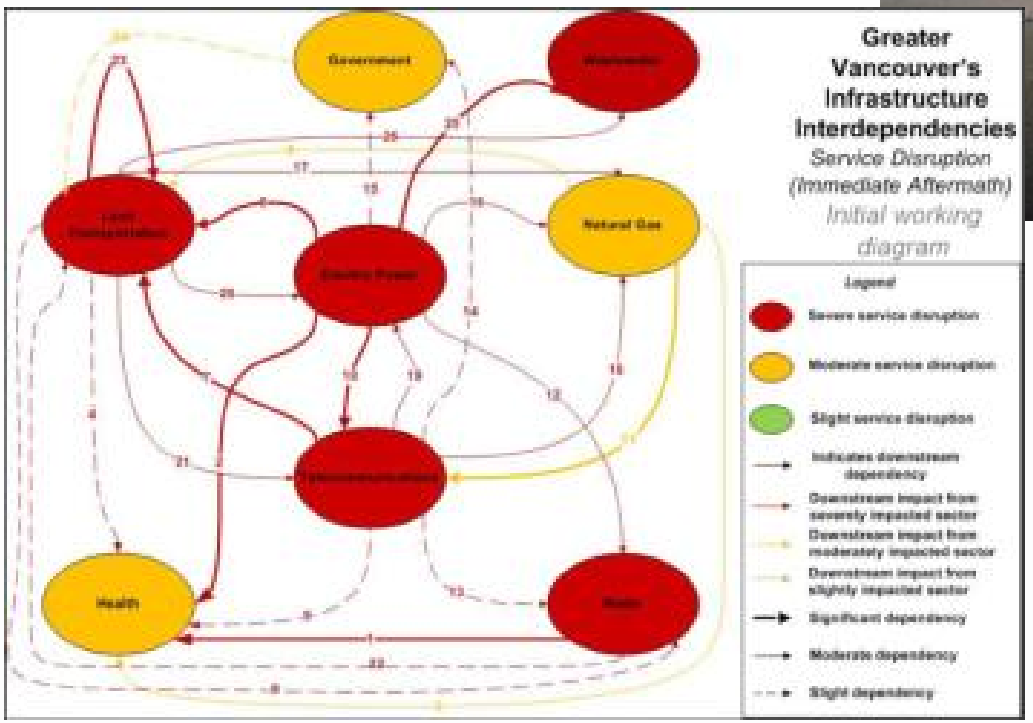
- Develop and improve collaboration in the City and across the region by regularly convening a group of Executive Officers and Senior-level operational deputies of local and regional lifelines providers
- Understand inter-system dependencies to enhance planning, restoration and reconstruction.
- Share information about recovery plans, projects and priorities.
- Establish coordination processes for lifeline restoration and recovery following a major disaster event.

Interdependency Study Progress to Date

- √ Launch study with presentation on interdependency issues and study approaches (April 2011)
- √ Establishing a small working group of Council members and other partners/advisors to design and advise on the study (met on July 21)
- √ Develop system strawman methodology approach (vetted in discussion groups on August 11)
- √ Scenario selection and discussion guide development (Sept – Oct)
- √ Pilot testing of scenario and discussion guide (Nov – Dec)

Research on Past Disasters and Interdependency Study Methods


Northridge Earthquake (Source: usgs.gove)



Interactions among Lifeline Systems in Earthquakes

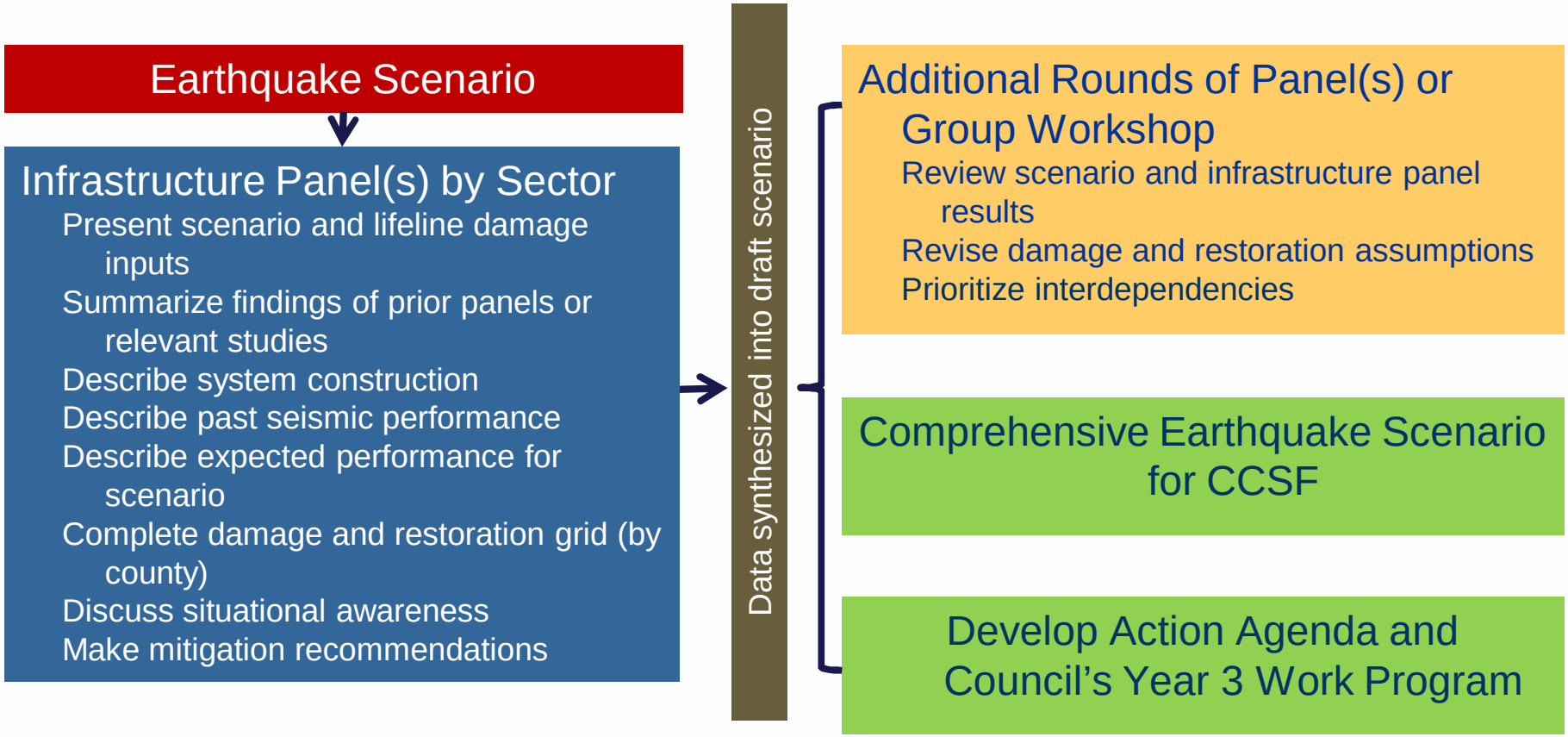
(Yao et al 2005, based on Kameda, Nojima, 1992; Scawthorn 1993; and others)

- Type A – Functional disaster propagation, due to failure of interdependence among lifelines
  - Example: Malfunction of electric power reduces serviceability of water supply system in the same area
- Type B – Collocation interaction, physical disaster propagation among lifeline systems
  - Example: Bridge collapse also disrupts telecommunication cables fixed on the bridge
  - Example: Water from a broken water pipe degrades the transmission performance of telecommunications fiber-optics in proximity to the water pipe
- Type C – Substitute interaction, influences on alternative systems
  - Example: Gas system failure results in excessive requirements for power systems
- Type D – Restoration interaction, various hindrances in the restoration stage
  - Example: system interference in recovery/reconstruction of buried lifelines (e.g. water-gas, power-water, sewer-water)
- Type E – Cascade interaction, increasing impacts on a lifeline due to initial inadequacies
  - Example: Increasing degradation of water service in a conflagration as structures collapse and break service connections, reducing system pressure and water supply for fire-fighting
- Type F – General interaction, between internal components of a lifeline system
  - Example: Connected electrical substation equipment

Interdependencies - Previously Identified by Lifelines Council members

	Power	Water	Transportation	Telecom	Other
Power		Low	High	High	
Water	High		High	High	Fuel
Transportation	Medium	Low		High	Fuel
Telecom	High	High	High		Fuel Access Security

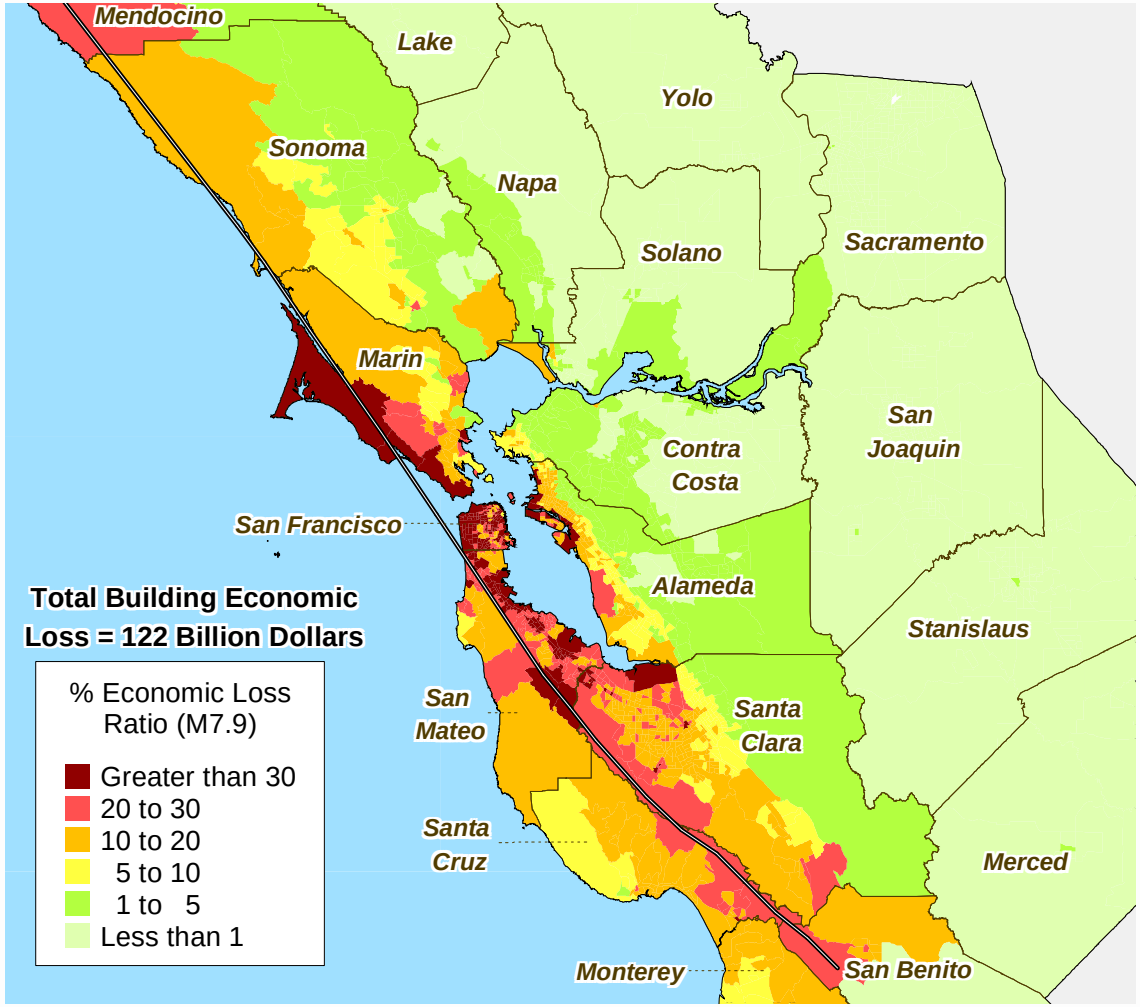
Lifelines Council Interdependency Study Approach
(modeled after work in Vancouver and Los Angeles)



Aug 11 Small Group Discussions Results

- Scenario Selection
  - Size of earthquake
  - Regional vs. city
  - Details on impacts, consequences
- Interdependency Analysis Approach
  - Conduct analysis by sectors, operators, systems and/or assets
  - Questions and Information to be provided (and at what resolution)
- Establishing Goals and Outcomes of the Analysis
  - Help define next phase in the analysis
  - Work program for next year(s)
- Understanding Community Expectations for Lifeline Performance

Scenario Selection: M7.9 San Andreas earthquake (Repeat of the 1906 earthquake) affecting19-counties in Northern California (EERI, Charles A. Kircher et al. 2006)



Interdependency Study Analysis Questions

- Only need general information on damage
- Systems have vastly different capabilities and geographic coverage. Focus on percent service restoration by time period for different cities/counties in the region
- Acknowledged that there is an order/sequence in which operator/sector analyses should be performed
- Participating agencies need a single point of contact, even if study work involves more staff
- Need to keep in mind confidentiality issues, and state/federal restoration priorities

Near-term Study Goals (2 – 5 years)

- Build a workable understanding of system interdependencies and consequences to help expedite response and restoration planning among agencies
- Identify key assets and restoration priorities/schemes to prioritize post-disaster restoration and reconstruction activities for the city, and ultimately the region
- Identify consequences of existing conditions
- Develop a collective set of lifelines performance expectations under current conditions

Desired Outcomes for the Study

- Development of a more detailed and comprehensive scenario of lifeline system impacts and restoration assumptions, for agencies to use in emergency response planning, table-top exercises
- Development of a economic loss model that reflects lifeline system impacts and restoration assumptions
- Identify key critical nodes and chokepoints in system interdependencies for continued work on inter-agency coordination and reducing lifeline interdependencies between sectors and systems
- Identify priorities for public funding (e.g. city bonds, infrastructure financing districts) necessary to underwrite or encourage correcting choke points that affect multiple systems
- Identify priorities for legislative and regulatory changes, and barriers that need to be overcoming for utilities to improve lifeline post-disaster performance and restoration
- Obtain credentialing for personnel to work on system restoration and recovery
- Launch a regional lifelines interdependency study
- Publish updated expectations so business and community partners know results of gap analysis and understand how their dependencies will be affected.

Community Expectations for Lifeline Performance

- Public misconception about the impact of major disasters on lifelines because their most relevant benchmark for post-disaster restoration is the 1989 Loma Prieta earthquake
- Disconnect between community perception of how prepared and how resilient the city actually is at its current state
- Public lack a regional perspective on the likely widespread damage to transportation infrastructure and lack of redundant access and means of evacuation.
- Most in the private sector and business community don't have adequate contingency plans, and the public in general is insufficiently prepared due to a lack of understanding about what lifelines are truly critical (e.g. electricity vs. water and sewage)

Interdependency Study Progress to Date and Next Steps

- √ Launch study with presentation on interdependency issues and study approaches (April 2011)
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- √ Develop system strawman methodology approach (vetted in discussion groups on August 11)
- √ Scenario selection and discussion guide development (Sept – Oct)
- √ Pilot testing of scenario and discussion guide (Nov – Dec)
- Finalize guide and operator panel schedule (Dec – Jan '12)
- Operators identify internal working team to participate in the study (Dec – Jan '12)
- Complete first round of operator panels (Jan – Mar '12)

Discussion: Opportunities and Barriers for Financing Lifeline Mitigation

Internal Agency Issues

1. Has your agency undertaken a major seismic mitigation project?
   - If so, what were some of the internal agency motivations that made this project happen? Please discuss how your agency prioritizes improvements and mitigation projects.
   - If not, what are some of the internal agency barriers and impediments to undertaking seismic mitigation?
2. How does your agency handle the life-cycle of its infrastructure (e.g. inspection and improvement, scheduled maintenance, retirement and replacement)?

External Issues

1. Has your agency undertaken a major seismic mitigation projects?
   - If so, how did you secure the necessary funding?
   - What was the response from the public/board of directors/shareholders to this decision and any funding requests?
   - If the response to the mitigation project was positive, was it possible to leverage it for further improvements or improved public relations?
   - What regulatory or legislative issues were involved?
2. Does your funding depend on the public (ratepayers, tax payers, users, consumers) or does your funding for improvements come from your agency's budget?

Community Issues

1. What does your community need to know and understand about a lifeline mitigation project in order to support funding it via public mechanisms?
2. What examples of lifeline mitigation projects you have supported or opposed?