Gavin Newsom, Mayor
Edwin M. Lee, City Administrator

City and County of SAN FRANCISCO LIFELINES COUNCIL

Wednesday, February 4, 2010
2:00 PM – 4:00 PM
San Francisco City Hall

Lifelines are the systems and facilities that provide services vital to the function of an industrialized society and important to the emergency response and recovery after a natural disaster. These systems and facilities include communication, electric power, liquid fuel, natural gas, transportation (airports, highways, ports, rail and transit), water, and wastewater.
- American Society of Civil Engineering Technical Council on Lifeline Earthquake Engineering (TCLEE), 2009

CO-CHAIRS

Edwin Lee
City and County of San Francisco
City Administrator
General Services Agency

Chris Poland
Chair, NEHRP ACEHR
Co-Chair, SPUR Resilient Cities Initiative
CEO, Degenkolb Engineers

REPRESENTED AGENCIES

AT&T
BART
CalEMA
CALTEL
Caltrain
Caltrans
Comcast
Department of Emergency Management
Department of Public Works
Department of Technology
General Services Agency
SFFD - NERT
PG&E
Port of San Francisco
San Francisco Airport
San Francisco Fire Department
San Francisco Municipal Transportation Authority
San Francisco Public Utilities Commission
SPUR
URS
Verizon Wireless

LIFELINES COUNCIL MEETING NOTES

1) Welcome and Introductions — Ed Lee and Chris Poland, Co-Chairs

Opening remarks by Ed Lee, City Administrator
Round table introduction of all participants

2) Summary of Initial Meeting — Ed Lee and Chris Poland, Co-Chairs

The Lifelines Council was convened in October 2009 as part of the Citywide Post Disaster Resilience and Recovery Initiative. The Lifelines Council seeks to 1) develop and improve collaboration in the City and across the region, 2) understand inter-system dependencies to enhance planning, restoration and reconstruction, 3) share information about recovery plans, projects and priorities and 4) establish coordination processes for lifeline restoration and recovery following a major disaster event.

- Co-chairs agreed the Lifelines Council is a public-private partnership with all major utilities and lifelines providers that serve the San Francisco and surrounding areas.

- At the first meeting of the Lifelines Council, the San Francisco Public Utilities Commission (SFPUC) gave a presentation outlining their system design, assumptions and priorities with a focus on interdependencies of the networks.

3) Acting in Time Presentation

Dutch Leonard
George F. Baker, Jr. Professor of Public Management
Harvard Kennedy School
Eliot I. Snider and Family Professor of Business Administration
Harvard Business School

Acting in Time Against Landscape-Scale Disasters

Introductory quote: *"You are the answer to my prayers."*
"You're not what I prayed for, but you are the answer I got."

Incident Command System Rule #1

- If the incident is visible from space – this is not a good thing
- Ex: Previous disaster 2003 Firestorm in California

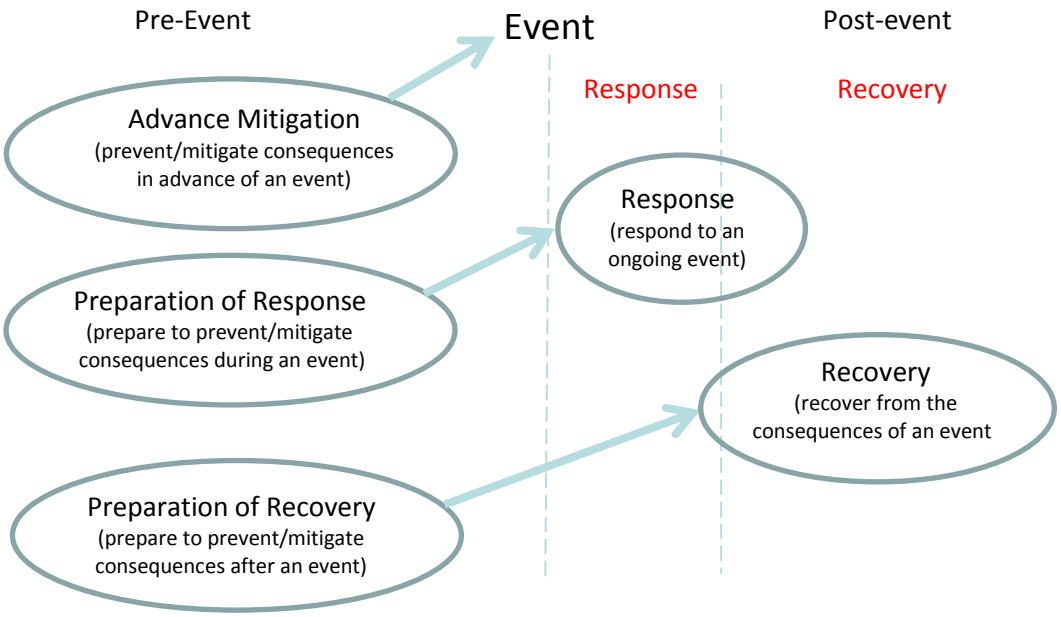
Problems of Acting in Time

1. Can we foresee the hazard? - *Visibility*
2. Can we develop actions that are high value to cost? – *Actionability*
3. Can we mobilize and get it done? - *Mobilizability*

If there is a *no* to answer any one of the above questions, then we cannot act in time.
Only if the answer is *yes* to *all* of the above questions, can we act in time.

The Comprehensive Risk Management Framework

Five Points of Action against Landscape-Scale Social Hazards



Five Points of Action against Landscape-Scale Social Hazards

- Event to divide history into past and future
- Future = Response and recovery period
- Immediate response is rescue period
- Reconstruction
- Reconstitution

In post-earthquake world – psychological implications are critical

- Even if the mitigation is effective, buildings do not collapse, services restorable, the response is effective, people rescued, fires contained etc., there is still massive disruption, displacement, and destruction.

- *Tipping Phenomenon* – the decision for people to stay and invest (*tip in*) or to leave (*tip out*). This decision making process takes place right away.

- The psychological impact from the disruption may strongly affect the population's willingness to stay. Since the infrastructure and services are degraded from the event, the people who we need to stay will easily have the best chances elsewhere.

- Goal is to establish conditions in which people's confidence will be high and recovery will be fast. The Lifelines Council will contribute enormously to the acceleration of recovery so that everyone will see the competence and order of our progress.

What challenges do we have?

- What we do has system implications on one another. When you have tightly coupled components, it is hard to isolate parts of the systems; there are more internal interdependencies *within* each system. Collectively, tightly coupled systems have complex interdependencies *across* your systems.

- All of this is tightly embedded to the San Francisco social and economic ecology.

- Systems become more tightly coupled and complex over time. They are *self-organizing* and *form* rather than are intentionally designed.

Demands for economic efficiency encourage "just in time" elimination of buffers.

- Technology also allows for greater complexity.

Comments about the above ideas:

Think of your systems independently, but remember they are not independent. Your systems depend on others and require an impulse from one or more systems simultaneously. You're embedded in a complex collection of systems which are tightly interdependent to one another. And all of those are tightly coupled within the larger social, political and economical ecology.

Event Examples

Chinese snowstorm in 2008

- Due to excess snow fall, a series of systems simultaneously collapsed on one another and it took 6-8 weeks to get the enterprise back together. This is an example of a series of systems that have grown more and more interdependent over time without anyone noticing.

Food crises 2009

- The world food system is just an example of a tight complex system. We had huge food crisis last year as a result of a relatively small disruption in food distribution. This is because there aren't very many inventories. Why not? Because people have been systematically draining inventories to reduce storage costs. What we have done is tightened down to a "just in time" based system. When there's a disruption in that, it reverberates through the whole system very quickly.

Air traffic control system supported by technology

- We cannot operate an air traffic control system without the modern technology. Technology allows us to develop more interdependent systems thus making us more interactive and more interdependent.

Implications for Lifelines Work

- Examine what increases your system vulnerabilities

- Recognize how you are contributing to the larger system's vulnerability – the swiftness of your recovery means a quicker recovery for your fellow travelers as well

- Recognize that you will be undertaking a rapid restoration strategy in the event of shattered system ecology – so examine what your assumptions are about what will be available to you, then plan from there.

- Pandemic planning: most businesses have worried about the fact that their workers may not show up instead of also looking at the things in their supply chain – think about multiple suppliers to increase redundancy.

- No one else is doing this kind of work and preparation and imagining the post-event world. An active imagination is key to how you will actively reconstruct this world.

Examples

A firm discovered that they had one critical supplier for which they had no inventory - it was supplied in a just-in-time basis from a single distant supplier. In case something happens to their primary supplier, they decided to sign a contract. Now, when they went to check on it, they discovered that the second supplier was buying from the first. So there was no redundancy in that system, it just appeared like there was. So be very careful when thinking about your vulnerabilities, what vulnerabilities you may be creating for others, and what your assumptions are.

This is incredibly important work for the City and a great example of what can be done. Put yourselves in the post-event world, imagine what you will be dealing with, and figure out how you will be contributing to the rapid and effective restoration of services– make people tip in and realize that recovery will go well, services and businesses are going to be here, and that we will invest to be here for them.

Questions & Answers

What kinds of lessons learned? What have you come across?

- It is hard to find this level of effort in a consortium. People typically try to build robust individual systems; so, we tend to see individual rifle shots into the resilience problem and no whole picture efforts where a company is considered as a network of others. The Lifelines Council will be the first to create this strategic model, for which there are no other examples.

- Many mistake the internet for not being a robust system. The internet, by virtue of how it is designed and evolved is a counter example. It is a system that has a high degree of resilience, because it is massively redundant.

- Planning efforts in Israel. The level of intentionality, care and willingness to put resources into preparation and practice is remarkable. You are our current best help for taking it seriously here.

Are there other models of vulnerability or risk assessment? Are there different methods of evaluating interdependencies and vulnerabilities?

- First you have to assess what is required to keep your system working. When one piece of a system is vulnerable, what must be relied upon on to fix it? Examine your own system and what your assumptions are about what is available, then try to build the model that captures the vulnerabilities.

- There are resources present in Lifelines Council for Interdependent Systems Analysis. Chris Poland, Heidi Sieck and Laurie Johnson are great resources to connect with other existing groups developing methodologies.

The system analysis folks are trying to put models together. They are struggling to get the actual information they need to make the models. What is the time period to help the tipping point? Is it hours, days, months, years?

- This is going to be a long-term effort. It will be a continuing process to gain people's confidence. Where are the areas you are able to do something? The Lifelines Council will help each of you answer that. When will the lights, phone lines, water, and internet come on? We have yet to determine a timelines.

- The key elements of the design that will help you alleviate vulnerabilities are:

1) Buffers - inventory to absorb the shock so that it will not destroy the rest of the system. Doing the analytical work of understanding the vulnerabilities, and the inventories you will need is the only way you're going to be able to find the solutions to your problem.

2) Isolation - trying to contain a problem within one part of the system. How can you make the other part this system feeds less affected by the upstream modules? Break the system into smaller components that interact with each other for buffered relationships.

Remarks by Ed Lee

Two key words to remember from the presentation:

1) Interdependency
2) Assumptions

We are not just here to meet. We are here to lay the groundwork for long-term collaboration and examination of our interdependencies, identifying gaps and where our assumptions are not met.

4) Interdependency Case Study – PG&E

Edward Salas
Senior Vice President
Engineering and Operations
Gas, Electric and Transmission Distribution

- The purpose of this presentation is to give the Lifelines Council a sense of the breadth of the PG&E seismic program which has been in place since 1985. PG&E uses an advanced mitigation system. We are one of the only utilities in the world that have a full time geosciences staff that serves the entire network to identify and mitigate risk.

Notion of Systems and Interdependencies

- PG&E has a large and complex system that exists in the western 14 states. If an event happens in the Midwest, we can feel it in San Francisco. We have a hierarchical structure in the distribution system of energy covering 70,000 square miles, serving 15 million people and comprised of 44,000 facilities. PG&E has 169 dams in California and is the largest owner in the U.S.

Kent Foray – Review of System Modifications

- Our goal is to reduce earthquake risk to an acceptable level – we have defined the "acceptable level" into the resumption of services established as an internal standard. Additionally, we have Federal, State and Local regulations to follow for risk mitigation. FERC – Federal Energy Regulation Commission creates the standards. PG&E is in full compliance.

- Following the standard industry guidelines are sometimes not enough. For example, there is no law or regulation in some of our service territory that requires retrofit of concrete buildings. However, PG&E has 25 must run facilities retrofitted for chemical, mechanical, energy, and plumbing systems.

- Since the Loma Prieta Earthquake, PG&E has replaced hundreds of damaged of power circuits. PG&E also has a gas pipeline replacement program costing up to $2 billion dollars a year in investment.

- PG&E focuses on system redundancy, identifying immediate occupancy facilities and ensuring critical data centers are equipped with base isolators.

Mike Peterson, Corporate Security – Preparation and Response

- PG&E has a dedicated business continuity management system to maintain an internally functional robust system. This team makes the fixes, keeps business running, and gets finances together. Their work helps crystallize the broader recovery picture.

- We use real world situations to build training scenarios to challenge emergency response people in speed and effectiveness of recovery.

- PG&E has motion instruments tied to USGS shake maps and others instruments directly on facilities allowing for early recognition to measure potential impacts on system. Additionally, PG&E has a post event recovery system including structural engineers, who can be activated to assess and repair with credibility checks to ensure a high quality repair.

- The PG&E GIS system can take USGS and shake motion data, combine it, identify facilities, and target assessment immediately to those locations. This allows the ability to address the worst problem first.

- Emergency Planning and Response: PG&E has a primary and alternate Emergency Operations Center – one in San Francisco and the alternate in San Ramon. It is not a "hot EOC" but it is tested frequently. The EOC and emergency response is structured under the ICS system and meets NIMS certification.

- PG&E also has a Business Continuity System, mission critical measurements, resource recovery plan that includes ID people and equipment, training and exercise with federal, state, and regional entities. Major partners include CalEMA and the California Utility Emergency Association which is a great network to tap into for other reliable resources.

Ben Almario, Incident Commander – Response Activity

- Key PG&E interdependencies – communication and transportation.

- A 72 hour service interruption is general threshold for the resumption of services. This may differ depending on the level of damage.

Questions & Answers

Examples of what PG&E is working on:

- Transbay Cable: PG&E does not currently share number of transmission lines. However, there is one path in and one path out of San Francisco. This limitation will be mitigated by the transbay cable. The transbay cable will not be sufficient to power the entire City but it is a redundancy.

- PG&E is currently working on contingency plans regarding moving material. We established a center in Vacaville to reduce the possibility of it being damaged in an event that affects San Francisco.

Comments about where else to focus:

- Debris management and priority route.
- Identifying the interdependencies of the 25 must-run facilities for the Department of Public Works.
- Refining PG&E protocols with Fire Department.
- Distribution side: having a system that measures where, when, and what occurred is valuable.

5) Interdependency Response — *All Participants*

What are the concerns based on the presentations?

Verizon

- PG&E is one of the utilities we need the most. We do have back up power. Cell sites all have batteries that last about 8 hours. All facilities have the ability to get generators at the sites but fuel will be needed. Zoning is difficult in San Francisco and the density of buildings is such that it is not easily accessible to attach these generators. This makes PG&E all the more critical.

- PG&E relies a lot on callers to indicate where services are out. Verizon has mechanisms to know immediately where their circuits are out.

AT&T

- AT&T has very similar programs as the CPUC and FCC mandates restoration priorities. We have also our own internal requirements. There is a hierarchy that establishes priority. Hospitals are number 4 on the priority list.

- There are major interdependencies between telecom companies and energy providers. We have done much internally to create redundancy. Thirty or forty years ago, power was generated in our central offices. Now, it generated on different sites but we also have backup generators. Generators are prepared for 72 hours but will have an interdependency for getting fuel or the ability to transport additional generators to sites.

CalTel

- Emphasized interdependence of communications and power. Multiple carriers are also very interdependent and thus will be using the same power facilities. This is a very good thing for this group to look at.

PG&E

- The different carriers have fundamental differences in design and capacity based on policy - AT&T and Verizon Wireless that have a need for fail-safe performance thus they will do whatever they need –generators, batteries or any other kind of technology - to preserve continuity. There is no systemic change in policy from a capacity standpoint. They build capacity to meet demand, a normal evolution of business. If you want to change the design, you change the rule set, but there is nothing driving it but a desire for quicker restoration period.

- PG&E cannot offer a cookie-cutter approach to restoration criteria. We want to defer to the City to manage its own risk, such as SFPUC who have their own back up generator systems. We build in our own internal threshold for response, as should other utilities. From experience, we know that certain entities such as Police and Fire have built certain redundancies such as backup generators. When critical facilities are out, we are notified immediately and respond to the best of our ability. PG&E has dedicated staff that works with the Department of Emergency Management to identify critical facilities and then prioritize the list.

- The 72 hour standard is an objective that is based on the scale of a particular event and projected damage. There is a process to go through when changing design standards and a process of data analysis to determine whether or not this is a prudent and useful standard to continue. Any actual projections must be based on different scenarios.

Harvard

- Recommend a case study for the ice storm in Quebec and in Pennsylvania 2008: Both of these have a similar size of distribution for the area that was affected. It would be interesting to look at how long it took to reconnect some things.

6) Adjourn

Meetings will continue on a quarterly basis - Next meeting is June 2010

- Next meeting will be focused on Telecommunications.
- Members may request copies of the Harvard presentation.
- Meeting notes will be distributed to participants.