Gavin Newsom, Mayor
Edwin M. Lee, City Administrator

City and County of SAN FRANCISCO LIFELINES COUNCIL

Thursday, June 17, 2010
2:00 PM – 4:00 PM
SPUR Urban Center
654 Mission Street

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
BARC-first
BlackRock
CalEMA
CALTEL
Caltrans
Champion Telecom
Comcast
CPUC
Department of Emergency Management
Department of Public Works
Department of Technology
FEMA
General Services Agency
Harvard Kennedy School
PG&E
San Francisco Airport
San Francisco Fire Department
San Francisco Municipal Transportation Authority
San Francisco Public Utilities Commission
SPUR
UC Berkeley
URS
Verizon Wireless

MEETING #3 – TELECOMMUNICATIONS

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) Review of Previous Meetings — Chris Poland, Co-Chair

- The meeting packet included a summary of the previous two Lifeline Council Meetings.
- Meeting #2 – PG&E Notes are still in draft form. Please provide notes and comments to Heidi Sieck, GSA at heidi.sieck@sfgov.org.
- Copies of the presentations presented at the last meeting "Acting in Time Against Landscape-Scale Disasters" by the Harvard Kennedy School and the "Interdependency Case Study" by PG&E are available upon request.

3) Performance of Lifelines in Chile — Laurie Johnson, Ph.D, AICP

The information from this presentation was gathered from a variety of sources, including the GeoEngineering Extreme Event Reconnaissance (GEER) investigation, the Earthquake Engineering Research Institute, Pacific Earthquake Engineering Research Center

reconnaissance reports, Technical Council on Lifeline Earthquake Engineering (TCLEE) and the USGS National Earthquake Information Center. Dr. Johnson had the opportunity to be part of a GEER investigation team sponsored by the National Science Foundation that focused on geologic issues related to the earthquake and tsunami that occurred in Chile.

Chile suffered from an 8.8 magnitude earthquake at 3:34 am on Saturday, February 27, 2010. It was the fifth largest earthquake ever recorded. The largest earthquake ever recorded also occurred in Chile in 1960, with a magnitude of 9.5. The strong shaking lasted for over 90 seconds. It affected over 2/3s of the country's population in some form, but about 1/8 or 1.8 million people were affected directly. A state of catastrophe was declared in 6 of the country's15 regions mostly in Central Chile.

A few statistics on Chile:

- *Chile has a population of around 17 million. It has a middle income average in the world.*
- *Its major industries include fishing, shipping, mining, refineries, forestry, winemaking, and agriculture. Unemployment is at 8.5%.*
- *National Debt is very low at 4.1% of GDP, so the country should be able to finance its own recovery.*
- *The economy is growing, the literacy rate is growing, and lifestyle has been changing dramatically.*

The earthquake occurred on a very busy vacation weekend in Chile. Areas directly impacted by the earthquake shaking, as well as the tsunami, were on the coast and filled with people. There were many aftershocks, some of which were large, that occurred in the following hour. For example, Chile had the equivalent of Loma Pieta and the North Ridge Earthquake within a short amount of time. Impacted extended about 400 miles inland.

While there was a tsunami warning that was initially issued for the entire Pacific. There were heights of over 3 meters that came on shore in Chile in 15-30 minutes. Most of the casualties were caused by the tsunami. Even though tsunami hazard maps existed and some cities had tsunami response plans, the information had not made it out to facilities located on the coast. People staying in the hotels and campgrounds right on the beach were the most vulnerable and did not know what to do.

Thirty cities and towns were badly damaged. 81,000 housing units were destroyed, and an additional 109,000 housing units sustained major damage. All the infrastructure and social services were initially disrupted.

Total economics losses were about $30 billion with insured losses about $8 billion, about one-fifth of Chile's GDP.

Earthquake and Tsunami Science Insights

EARTHQUAKE PREDICTION

In both Haiti and Chile, these countries had forecasts issued by scientists about a year before, warning of a very high likelihood of rupturing in the near period.

California also has a similar forecast based on the same prediction techniques. In 2007, USGS predicts a near 100% likelihood of a 6.7M or greater in the next 30 years. The study also said that there is over a 40% likelihood of an8M earthquake in California in the next 30 years.

In the Bay Area the most likely trigger for an earthquake is the Hayward Rogers Creek fault. The last major earthquake that occurred on that fault was in 1868. It has a recurrence interval of about every 140 years. It is now overdue. The southern California fault systems are also overdue.

ENGINEERING

Chile has had building codes in place since the 1930s and seismic upgrades since 1985. Out of 12,000 buildings, very few actually collapsed or will need to be demolished. However, there were spectacular failures in design, construction quality, and enforcement. Even modern engineered structures suffered a tremendous amount of damage.

NON STRUCTURAL LOSS IMPACT

A lot of buildings were fine structurally but had to be abandoned or vacated because of the non-structural damage such as interior walls that are there for design, ceiling tiles, and ceiling fixtures. Also includes the mechanical, electrical and plumbing equipment and all the distribution systems, such as sprinklers. While the buildings had seismic provisions to these non-structural aspects, they were not very well enforced.

LIFELINES

Refineries: Chile's oil refineries were initially shut down. The North refinery was restarted in 10 days. The Southern Concepcion refinery was impacted not so much by structural damage but by auxiliary issues such as a fallen heated refractory and ground failures that damaged tanks and a number of pipelines. Thus, they are having to continue to import gas and diesel into the region creating a 3 to 7 month delay before the operation of the southern plant will be restored.

Ports: Four ports that had significant damage from Santiago to the south of Concepcion including lateral ground displacement to walls, sheet pile walls, wharf structures and pile foundations. The wharf basically pulled away as the surface got unstable. Also, there was some damage to cranes and other facilities because of the tsunami.

Roads and Bridges: Damage to roads greatly impacted response. Chile's Route 5 which runs down their valley, is similar California's I-5. Freeway surface and bridges were lost after the earthquake. This has impacted the economy and the recovery. What would take 4 hours would now take 20 hours to get through this region. All bridges need to be retrofitted.

Electric Transmission Network: Chile has been focusing on upgrade its electrical transmission network and thus was ready for restoration within 24 hours. The subsystems were fairly good shape because of seismic anchoring of equipment and connections. Systems not above ground were without power for two to three weeks but most electrical systems were restored within two weeks. The area affected benefited from having lots of mutual aid with other countries and other parts of Chile as well.

Telecommunications: Landline and wireless systems were restored within 7 days for most of the region. The telecom performance was significantly affected by the overhead impacts of the tsunami. Some of the fiber optic lines along the Bridges were severed. Only the main offices had back up systems and back up power generators. Cell sites and remote offices, while they might have had batteries, didn't have back up systems for any long period of time. The event happened in the middle of the night and roads were out so it was very difficult to reach these

places. A lot of the delay for the system had to do with lack of adequate battery or auxiliary power. Other disruptions were caused by unanchored battery racks and selves, fallen antennas, and tower installation collapse.

Water and waste water systems: These systems were heavily damaged. One large company, SBO, serves over 4 million people. They had about 3000 small line breaks and 72 main line break. Waste water systems were heavy damaged from ground deformation. Untreated sewage discharged into the rivers and ocean. The water companies and the government water trucks provided relief supplies.

INSIGHTS
So how do we make better use of these rupture forecasts? There will be a lot of lessons that translate both into code changes as well as model changes to your insurance. There are also lessons in the non-structural and business continuity losses, evacuation planning, level coordination.

4) ShakeAlert Earthquake Early Warning System — Richard Allen

ShakeAlert is a collaboration of UC Berkeley, CalTech, The Seismological Laboratory, Swiss Seismological Service, NSF and USGS to create a prototype early warning system. The system can rapidly detect the earthquake nucleation, give instant alerts of forthcoming ground shaking, give updated shaking predictions as ground motion propagates, and provide rapid 'post-earthquake' information.

ShakeAlert purports to provide an early warning from 5 – 30 seconds. Loma Prieta would have resulted in a 20 second warning. Sensors in 400 locations throughout the region would generate the reading, calculating strength of shaking and time it will begin. These numbers can pop up on any kind of mobile device, including the iPhone.

User Categories
1) Personnel Protection: Would allow time to move to a safe zone, away from falling hazards and windows, hazardous chemicals and machinery and duck/cover/hold.
2) Automated Mechanical Response: Some mechanical systems could shut down or responde automatically before shaking begins. Some examples include: trains, toll and meter lights, elevator stop and open at nearest floor, hazardous material containment, etc.
3) Situation Awareness: Notice at emergency operations centers and control centers can help provide information and prevent cascading failures.

ShakeAlert is looking for new partners to participate in prototype testing and use.
Contact Richard Allan, Associate Director, Berkeley Seismological Laboratory, University of California, Berkeley at rallen@berkeley.edu or (510) 642-1275.

5) Case Study: Telecommunications – AT&T Chris Salkeld and Joe Smock

AT&T has been part a key leader in national emergency response for decades dating from the National Communication System (NCS) created by President Kennedy. AT&T now operates by the internal program called "One AT&T" which calls for all services - wireless, wireline, data and other support services - to all partner together with the local response to accelerate restoration capability.

AT&T is part of the National Security and Emergency Preparedness organization (NSEP) and participates on a national security telecom advisory council created by President Reagan in the mid 80s. AT&T also participates in the California Emergency Utility Association (CEUA), the statewide coordination organization.

AT&T Network Recovery Disaster (NDR) Team

- The NDR organization is the national organization that coordinates AT&T's restoration in an emergency. AT&T has hundreds of responders trained across all disciplines organized under the Incident Command System (ICS). They respond to event location and facilitate communications with the local state, the federal government, and other utilities, to restore our facilities and assist with other utilities across California.
- AT&T has strategically placed warehouses across the nation to facilitate the company's ability to deploy equipment and staff to an impacted area at a moments notice. These include millions of dollars in restoration trailers and emergency communications vehicles.
- AT&T's has five regional Emergency Operations Center (EOC) and a Global Operations Center is in New Jersey that integrates all networks.
- For a Bay Area event, AT&T would activate its Sacramento local restoration center. The Western Region EOC is located in San Diego.
- AT&T plans toward a 72-hour restoration target.

AT&T Response Levels

Based on the internal ICS structure, the company responds to four levels of service disruption.

1) Level 1 Local Service Disruption - includes a cut cable or a conduit system that is having a problem and can handled by the local business unit in its region.
2) Level 2 Local Restoration Event –Any time the outage exceeds the local teams to respond to and restore, the Sacramento local restoration center responds with the local operation center as incident command.
3) Level 3 Regional or Geographic Incident – a disruption that require coordination of multiple disciplines and multiple operation centers. (i.e. normal Gulf Coast hurricane).
4) Level 4 Major Event – requires deployment of extensive resources and coordination.

TELECOMMUNICATIONS INTERDEPENDENCIES

- POWER - While central offices have significant generator and battery back-up power, the communications network architecture is vastly more distributed, especially wireless.
- WATER - The switching centers are critically dependent on running water to cool the equipment.
- FUEL – In a major power failure, fuel is essential to keep our central offices running after our 72 hour diesel reserves are depleted.

- SECURITY AND ACCESS ISSUES – Access to essential facilities is critical in order for us to be able to provide support and restore service during a disaster. It is essential for AT&T to connect with local EOCs to plan restoration priorities.

6) Questions and Response from Telecom Providers — All Participants

- The AT&T network is not engineered for everyone to be on their phone at the same time. During a disaster event, AT&T activates congestion controls that blocks calls coming into the affected area to ensure that responders and people inside the area can make calls.
- AT&T participates in a federal program called GETS (Government Emergency Telecommunications Services) that allows priority access for first responders. WPS (Wireless Priority Service) is the same service for cell phones.
- AT&T owns many COWs, COLTs and GOATs – temporary cell sites – to support wireless restoration.
- PG&E faces similar issues as AT&T regarding parking permits and access to their facilities.
- DEM needs to know potential areas that telecommunications providers would need access to in case of an emergency. The City has a priority route program that may or may not meet the needs of the Council participants. DEM proposed to have a workshop or table top conference to figure out where routes should be.
- DEM also would like to have information regarding the number of trucks, the workers that will be brought in, and where these workers be housed. DEM asked for either detailed plans or a high level targets in order to talk about access and security.
- CPUC commented on a California firestorm in an outlying area that took 30 days to for service restoration because of a pole ownership issue..
- CALTEL brought up the additional challenges of VoIP (Voice over IP) services that relies almost entirely on commercial power.

7) Adjourn

- Next quarterly Lifelines Council meeting proposed October 2010 focused on Transportation and Interdependency Analysis.
- Members may request copies of the Performance of Lifelines in Chile presentation and the ShakeAlert Earthquake Early Warning System presentation.