CHALLENGING ISSUES
ONE WATER UTILITY’S PERSPECTIVE

MCEER ANNUAL MEETING
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BILL HEUBACH
SEATTLE PUBLIC UTILITIES
CHALLENGING ISSUES

- Mitigating the effects of earthquake-caused pipeline damage
- Developing “realistic” economic loss estimates for earthquake-caused water outages (to be used in life-cycle cost analyses to evaluate seismic mitigation options)
MITIGATING THE EFFECTS OF EARTHQUAKE-CAUSED PIPELINE DAMAGE

SPU system two hours after 500-year earthquake
MITIGATING THE EFFECTS OF EARTHQUAKE-CAUSED PIPELINE DAMAGE

SPU system ten hours after 500-year earthquake
MITIGATING THE EFFECTS OF EARTHQUAKE-CAUSED PIPELINE DAMAGE

• Cost to replace SPU “vulnerable” pipe in poor soils is approximately $500 million

• Alternate strategies?
  – Isolation/control
  – Emergency Planning
  – Prioritization of pipeline replacement (possibly with “seismic” pipe similar to Japanese S-joint ductile iron)
ESTIMATING ECONOMIC BENEFITS OF SEISMIC IMPROVEMENTS

- Repair cost
- Loss of revenue
- Fire
- Loss of business opportunity
ESTIMATING ECONOMIC BENEFITS OF SEISMIC IMPROVEMENTS - TYPICAL APPROACH

\[ E = 0.5t \times \left[ \sum_a \sum_j (1 - r_j) \times w_a \times Q_{j,a} \right] \]

where

\( t \) = the outage duration/time to repair

\( r_j \) = the resiliency factor (ability to continue production without water) for industry “j”

\( w_a \) = fraction of service area “a” without water

\( Q_{j,a} \) = economic product for industry “j” in area “a”
ESTIMATING ECONOMIC BENEFITS OF SEISMIC IMPROVEMENTS - ISSUES

• Relationship between water value and quantity is not linear

• Estimates need to be deaggregated so only losses from water outage is considered
• Should only consider portion of value-added economic product that is lost
• Geographic boundary of analysis
• Recovery