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Climate Adaptation at SoCalGas and SDG&E

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CPUC/CEC Workshop
July 27, 2015



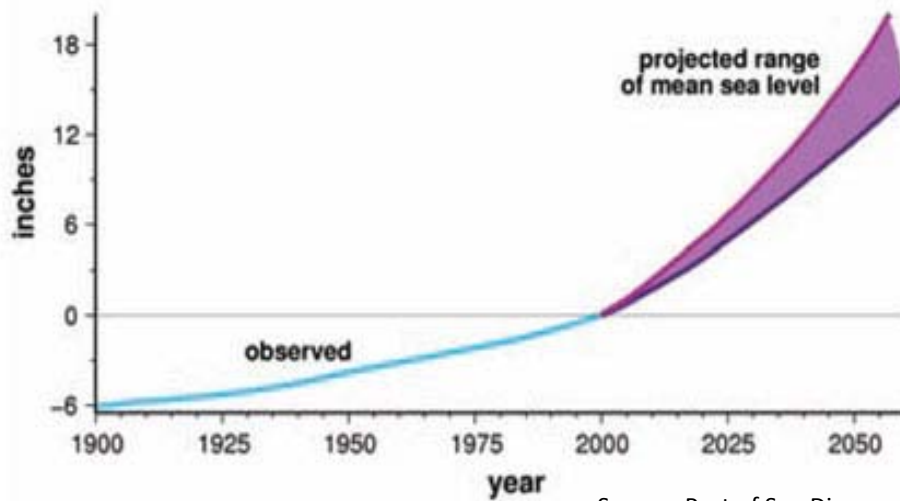
Climate Adaptation – Risk Approach

- Link between climate change and key enterprise risks.
 - Drought increases wildfire risk; sea level rise increases infrastructure integrity risk; extreme temperatures increase natural gas supply risk
- Risk Management:
 1. Identify risks through research and data collection
 2. Consider climate change in risk-informed decisions
 - Internal education efforts
 - SoCalGas natural gas system adaptation efforts
 - SDG&E South Bay Substation
 3. Share knowledge and collaborate with community partners, customers, and other stakeholders

Risk Identification: Data Analysis Indicates Greater Frequency of High-Risk Events (Sea Level Rise & Flooding)

- Data indicates sea level rise is occurring and studies from the Port of San Diego project the trend to continue. (Source: Port of San Diego)

Projected sea level rise for San Diego County coastline over the next several decades



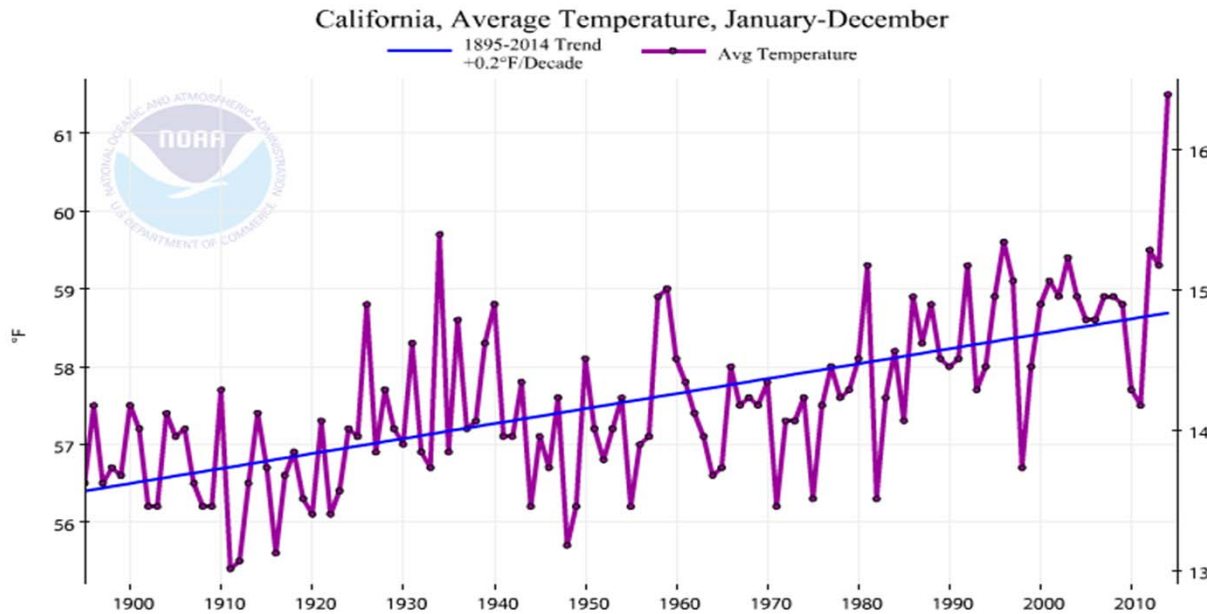
Source: Port of San Diego



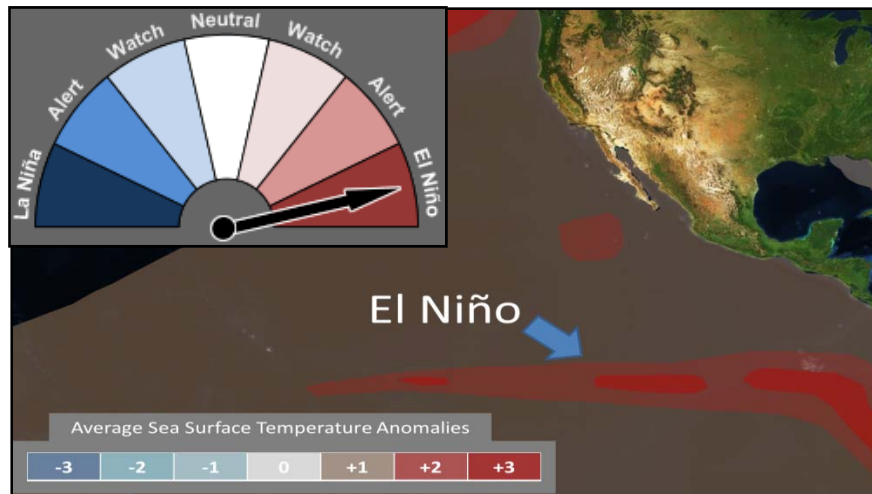
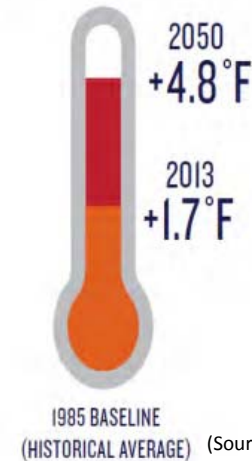
- US Geological Survey predicts coastal flooding will increase, especially during winter storm systems.



Risk Identification: Data Analysis Indicates Greater Frequency of High-Risk Events (Large Climate Swings)



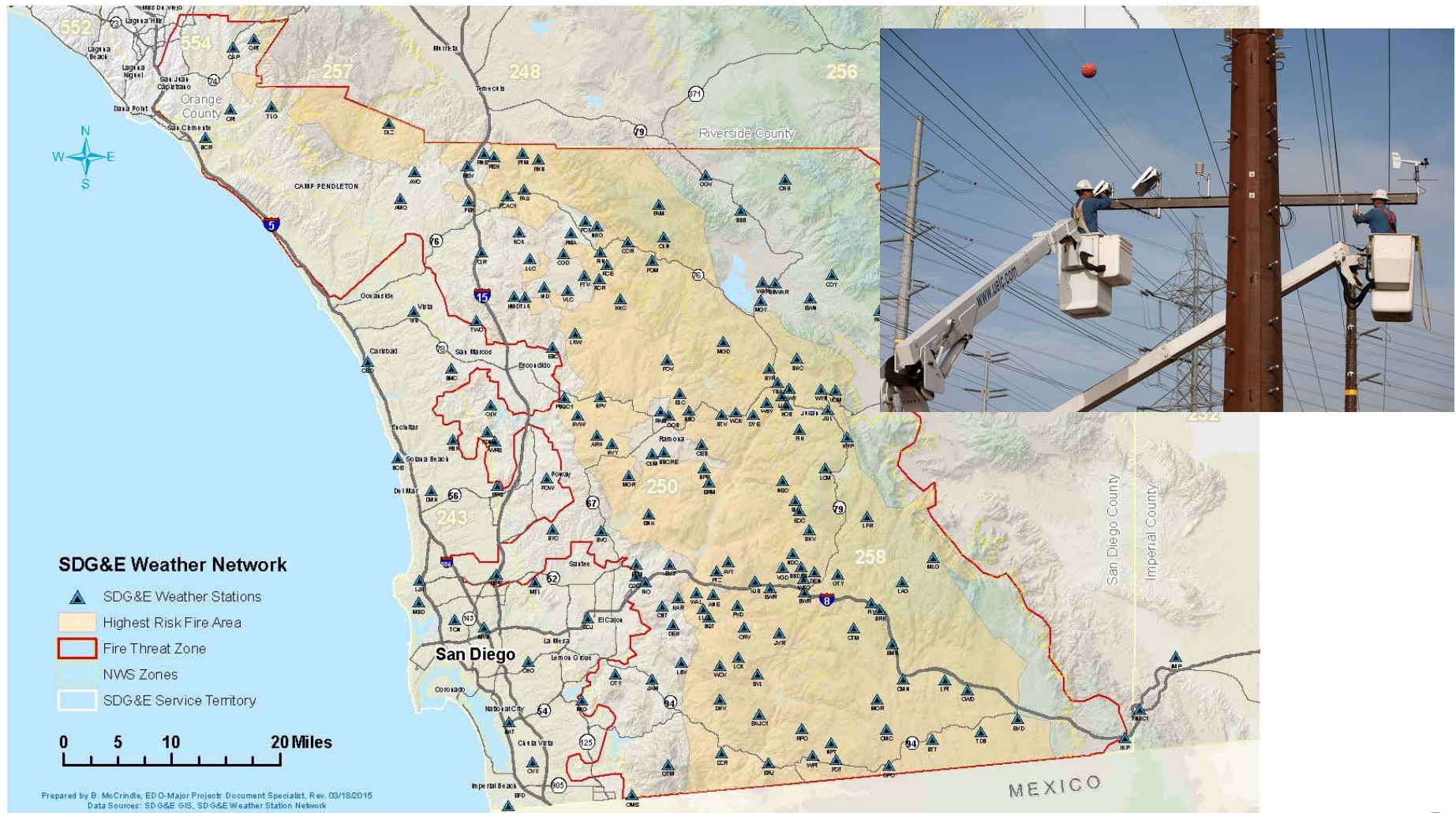
ANNUAL AVERAGE TEMPERATURE IS
INCREASING AND WILL CONTINUE TO INCREASE
BETWEEN NOW AND 2050:



- Rapidly increasing temperature trends are forecasted to continue, which increases demand for cooling. (Source: Climate Education Partners)
- Strength of current El Niño is indication of large climate swings continuing into the future. (SDG&E Meteorology)

Data Collection and Analysis (Building Climate Data set)

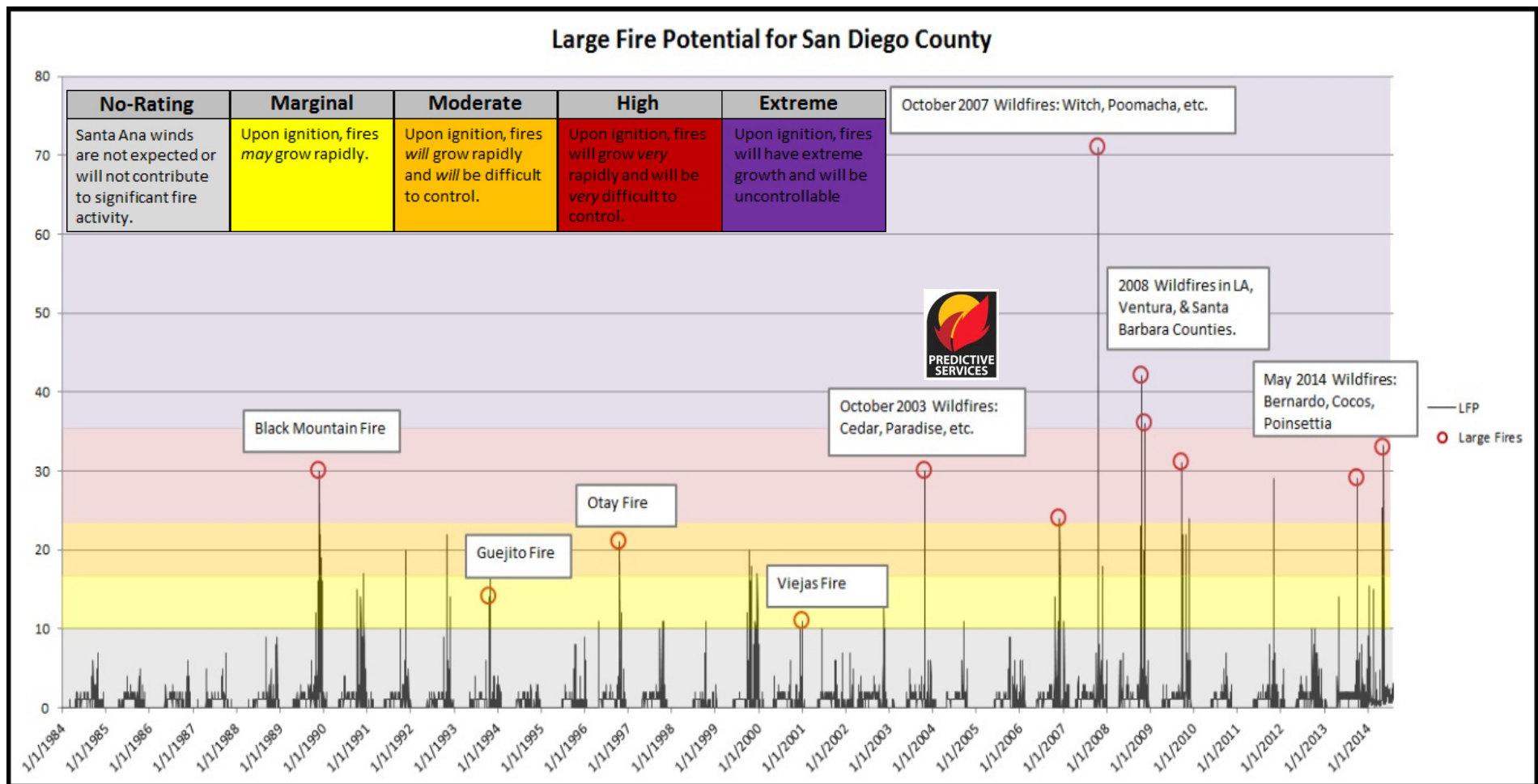
171 weather stations and archived climate data enable measurement of climate change





Risk Identification: Data Analysis Indicates Greater Frequency of High-Risk Events (Drought & Fire Risk)

- Higher probability of drought years in the future, and large fire occurrences increase during drought years (Source: Climate Education Partners)





Santa Ana Wildfire Threat Index

- Categorizes Santa Ana winds based on fire potential, from No Rating to Extreme
- Used for utility system operational decisions
 - Protocols
 - Internal fire crews
- Responders resource planning
- Science being integrated back into the community
 - Fire Agencies
 - General Public
- Serves as a model for future collaboration and adaptation tools



Advancing Climate Adaptation Internally

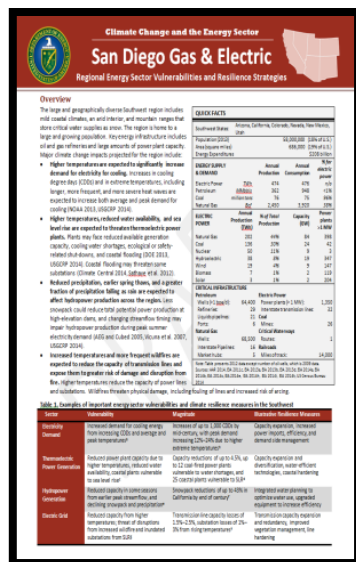


CEC Sea Level Rise Grant Request

- Models sea level rise and maps to assets

SDG&E Climate Vulnerability Report

- Provides info to determine threats to system



<http://toolkit.climate.gov/>

Climate Advisory Group Cross Internal Team

- Advances company wide resilience strategies

Adaptation Solutions—Natural Gas Systems

Adaptation strategies

- **Identifying and monitoring is key**
 - Strain gauge
 - Satellite monitoring (Differential Interferometric Synthetic Aperture Radar (DInSAR))
- **Landslides**
 - Landslides may cause excessive compression stress, bending stress, causing pipes to yield or fail.
 - Drainage systems improvement (Best Management Practices)
 - Tie back systems (soil nails) coupled with Shotcrete
 - Geo-Fab; retaining walls
 - Riprap/vegetation
 - Bury deeper or Horizontal Directional Drilling

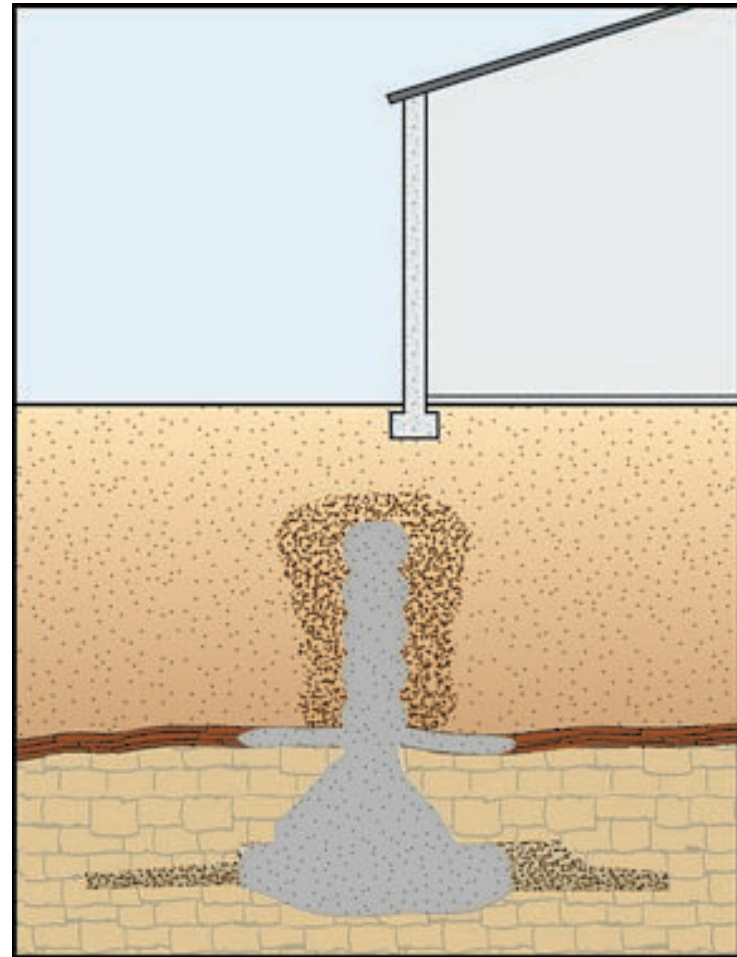


Example landslide tieback system

Adaptation Solutions—Natural Gas Systems

Adaptation strategies

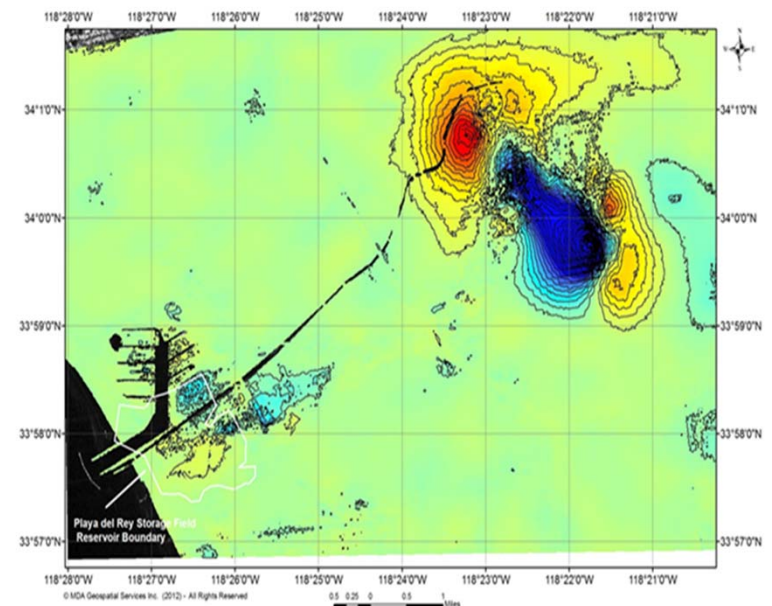
- **Flash Flood**
 - Flash floods may damage aboveground structures or expose buried pipes, causing corrosion
 - Alter/create channel/drainage path
 - Use of a protective structural wall and/or retention pond
 - Bury deeper
- **Subsidence**
 - Subsidence beneath pipeline may cause span, and weight above unsupported pipeline may cause excessive stress
 - Known areas of subsidence (mines, landfills, etc.) can be grout filled
 - Underground water management



Graphic of grout filling void due to subsidence

Pipeline Geohazard Risk Reduction Using Radar Satellites

- Industry champion of satellite technology applications for pipeline geohazard detection and monitoring
- Useful for applications such as ground subsidence monitoring, asset security monitoring, and pipeline route planning
- Early detection of potential outside force threats throughout pipeline lifecycle
- Status of ground surface change during and after adverse weather episodes (radar wavelength independent of cloud cover)
- Broad area assessment following major earthquakes



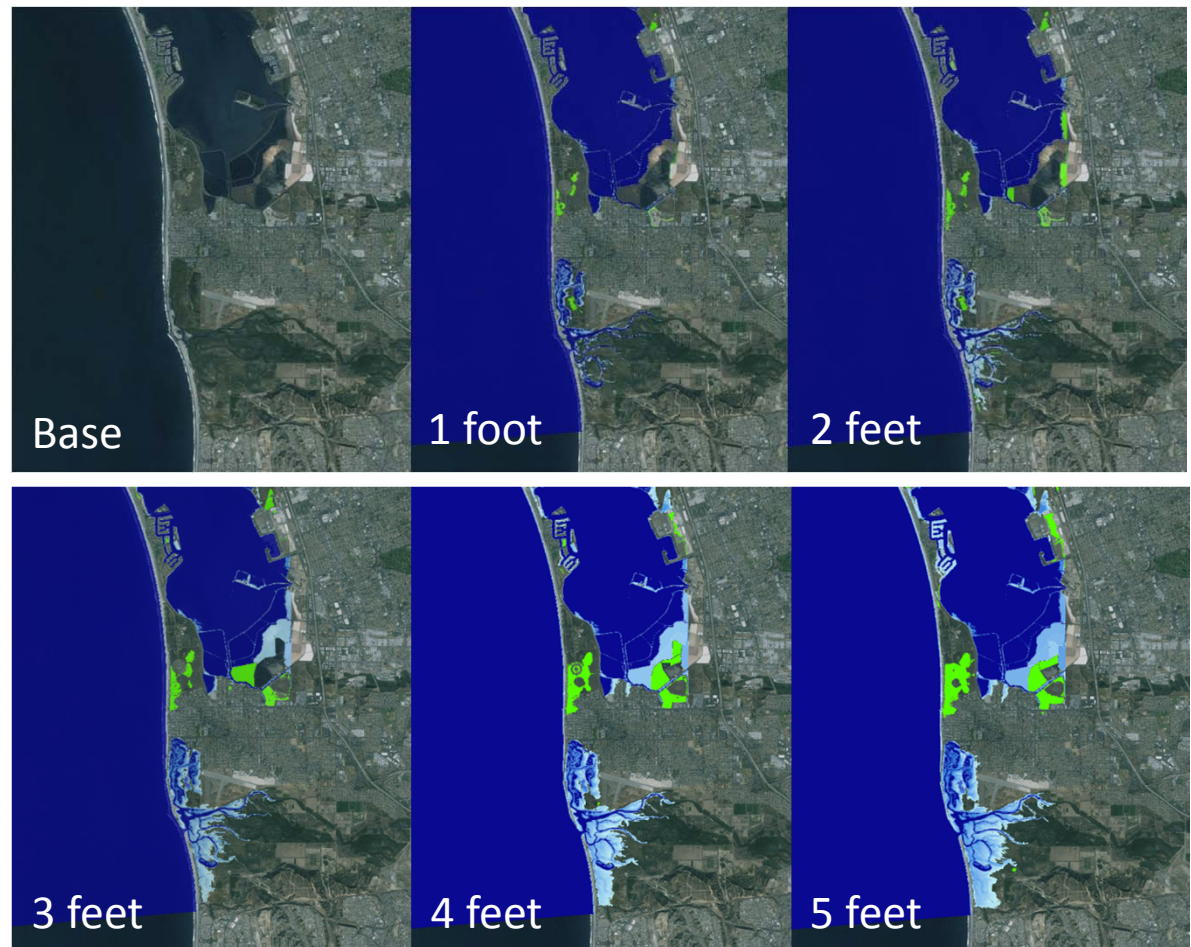
Climate Adaptation at South Bay Substation

Designed for aggressive forecast of sea level rise

- Site graded to an elevation of 16 to 21 feet above mean sea level
- If the most aggressive predictions of sea level rise are realized (4.6 feet), South Bay Substation would still be 4 feet above the projected sea level in 2100

This project is currently leveraging recycled water to be drought adaptive

Serves as a model for future construction projects



➤ Images Above: <http://toolkit.climate.gov>

Projections of 1-5 foot sea level rise near Imperial Beach.



Knowledge Sharing and Collaboration with Agencies & Community Stakeholders



- SoCalGas conducts regular outreach to first responders for general emergency planning, including climate related natural disasters.
- Through the Energy Resource Center, SoCalGas offers training and workshops to address issues such as water conservation and equipment efficiency.
- SDG&E works with 53 first responder agencies including American Red Cross, 2-1-1 San Diego, San Diego Fire Chiefs' Association and The Burn Institute to support disaster preparedness.





Knowledge Sharing and Collaboration with Agencies & Community Stakeholders (Cont'd)



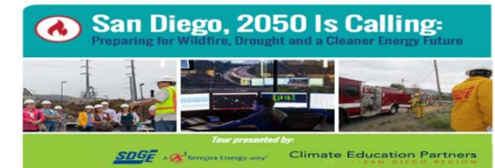
SDG&E is an initial member of the DOE's **Partnership for Energy Sector Climate Resilience**.

Member of a sea level rise focused network for public agencies that serve the San Diego region



SDG&E hosted climate adaptation seminars educating regional leaders on current initiatives

U.S. Department Of Energy, SDG&E Partner To Improve Resiliency Of Nation's Electric Grid





Additional Research and Changes Needed

- Work with DOE, CEC and NOAA to develop maps focusing on climate projections such as sea level rise, flood elevations, drought, and heat projections to support design standards.
- Funding to conduct a cost-benefit analysis for climate adaptation investments (e.g., estimating benefits from resilience investments, non-climate co-benefits, and costs of inaction)
- Development of appropriate metrics (e.g., for damage, performance, blue sky versus extreme event)
- Resilience design standards, either related to technical information (e.g. sea level rise projections, flood elevations) or equipment performance standards.
- Expanded use of recycled water through changes in regulation

