LNG TERMINAL ENGINEERING AND MAINTENANCE STANDARDS (LNGTEMS)

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Presentation Preview

- Project Background
- Project Description
- Final Product
Project Background

- Numerous projects proposed in California
- Lempert-Keene-Seastrand Oil Spill Prevention Act gives CSLC jurisdiction
- Project Commencement – 2006
- Schedule spread over 3 years due to funding
- Halcrow – Prime
  - Aker Kvaerner (LNG systems)
  - Energo Engineering (fixed platforms)
  - Granherne Engineering (deep water mooring)
  - Steve Dickenson (geotechnical)
Project Scope

- 4 Configurations
- Conventional Pier/Wharf
Project Scope

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- Conventional Pier/Wharf
- Deep Water Port (Cabrillo Port)
Project Scope

- 4 Configurations
- Conventional Pier/Wharf
- Deep Water Port
- LNG Vessel Adjacent to Existing Platform (Clearwater Port / Grace)
Project Scope

- 4 Configurations
- Conventional Pier/Wharf
- Deep Water Port
- LNG Vessel Adjacent to Existing Platform
- Gravity Based Structure (GBS)
Adriatic LNG – Offshore Italy
Not Covered

- Vessels
  - FSRUs
  - LNG Tank Vessels
  - Tugs
- Siting
Topics

- Similar to MOTEMS
  - Structural Loading, Analysis, Performance
  - Mooring and Berthing
  - Geotechnical Hazards
  - Component Structural Analysis and Design
  - Fire Prevention, Detection, Suppression
  - Piping and Pipelines
  - Mechanical / Electrical
  - Audits and Inspections
- Focus on LNG Specific Design Issues
- Extra Emphasis on Hazards and Risk Analyses
Project Status

- Draft Document Completed June 2009
- Industry Workshop Held In Houston
- Project Completed June 2010
Challenges

- Varying Levels of CSLC Jurisdiction
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- Nearshore vs. Offshore Design
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- Nearshore vs. Offshore Design
- Seismic Design Standards
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- Varying Levels of CSLC Jurisdiction
- Nearshore vs. Offshore Design
- Seismic Design Standards
  - ISO vs. API
  - Some Europeans pushing for 10,000 year RP
Challenges

- Varying Levels of CSLC Jurisdiction
- Nearshore vs. Offshore Design
- Seismic Design Standards
- New Technologies
Challenges

- Varying Levels of CSLC Jurisdiction
- Nearshore vs. Offshore Design
- Seismic Design Standards
- New Technologies
- Risk Perception
LNG Risk

- Perceived by many to be comparable to nuclear power plants
LNG Risk

- Perceived by many to be comparable to nuclear power plants
- Attempting to capture “best practice”
- Need to accept that we can’t eliminate risk completely
Contents

- Chapter 1 – Intro
- Chapter 2 – Risk Assessment
  - Methods of Sandia study of spill over water
  - API RP 75
  - API RP 14J
  - Safety critical elements, hazard identification, consequence analysis, risk register
Contents

- Chapter 3 – Structural Design – Onshore
  - Same as MOTEMS
  - Different return periods for seismic

- Chapter 4 – Structural Design - Platforms
  - API RP 2A for structure
  - 475 / 2475 year RP earthquakes
  - API RP 2FB for Fire and Blast loading
  - Fatigue, minimum deck elevations, steel embrittlement from LNG spill
Contents

- Chapter 5 – Structural Design – GBS
  - ISO Codes
  - Concrete design per Norwegian Standards, British Standards, or DNV.
  - ACI not as commonly used for offshore GBS

- Chapter 6 – Geotechnical
  - Site specific seismic hazards analysis
  - Dynamic soil response, liquefaction, slope stability
Contents

- Chapter 7 – Mooring and Berthing
  - Onshore uses MOTEMS
  - Floating uses API RP 2SK and OCIMF Single Point Mooring Guides

- Chapter 8 – Geotechnical
  - Facility layout
  - Emergency shutdown and response
  - LNG spill containment
  - Fire and gas detection
  - Fixed and passive fire protection
Contents

- Chapter 9 – Pipelines
  - Cryogenic risers and subsea pipelines

- Chapter 10 – Mechanical systems
  - Focus on LNG specific equipment and systems

- Chapter 11 – Electrical and Instrumentation
  - Includes seismic instrumentation

- Chapter 12 – Inspection
  - Uses API RP 2SIM (Structural integrity management)