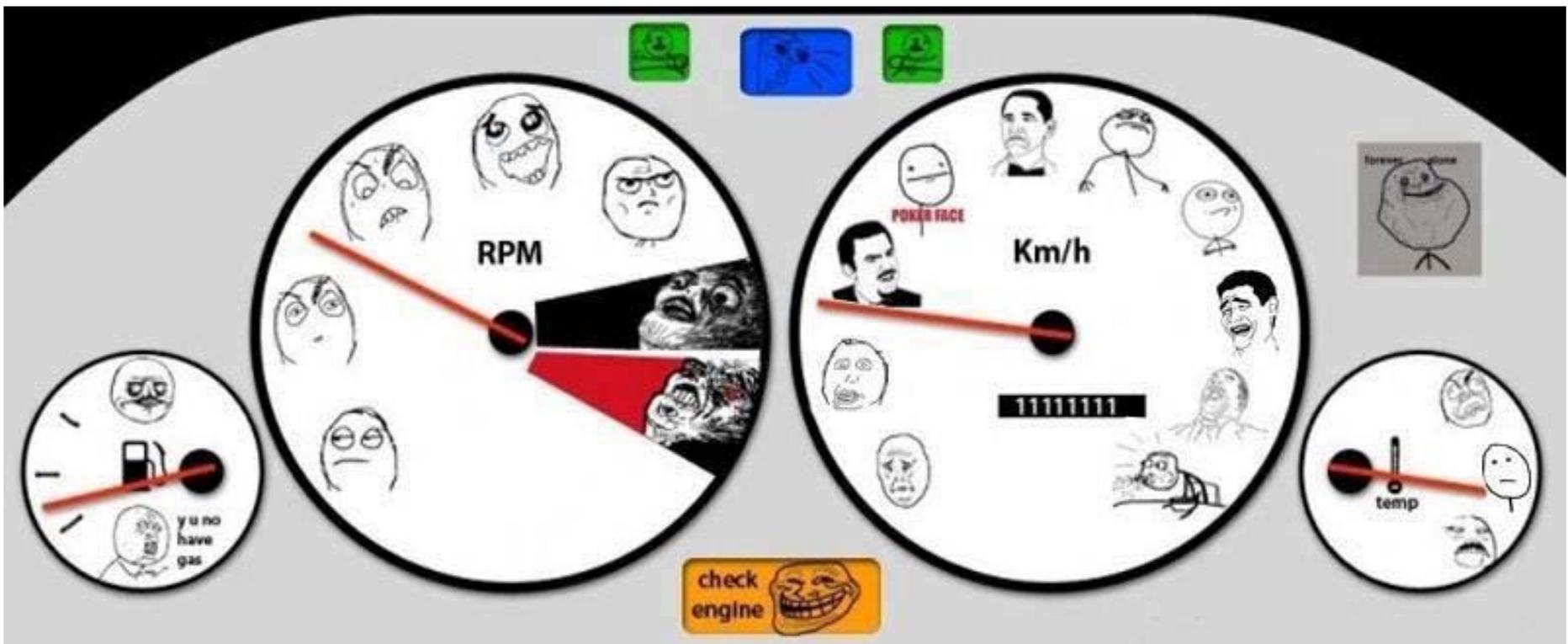




Federal Energy Regulatory Commission Division of Dam Safety and Inspections



THRESHOLD VALUES AND ACTION LEVELS





Federal Energy Regulatory Commission Division of Dam Safety and Inspections



Pre-Workshop Survey Comment:

- I have a few thoughts for your consideration. First, clarification on the semantics associated with the use of Threshold and Action Limits within Chapter 14 is a bit confusing, and could use some clarification.



Ground Rules

- Agree up front that the definitions of the terms “threshold value” and “action level” in Chapter 14 could be interpreted many ways
- Each of us has a slightly different definition or understanding of these terms and how they should be used



Federal Energy Regulatory Commission Division of Dam Safety and Inspections



Purpose

Instrument Threshold Values and Action Levels:

- Evaluate and monitor the development of specific Potential Failure Modes (PFMs)
- Assist in identifying unexpected behavior, which could be an indication of poor performance or development of an unidentified failure mode
- Tools intended to improve dam safety by increasing monitoring efforts on structures that are not performing as expected and trigger intervention when needed to prevent dam failure



Chapter 14 Definitions

Threshold Value:

- A reading that indicates a significant departure from the normal range of readings and prompts an action
- Value used in the analysis or design, or is established from the historic record.



Chapter 14 Definitions

Action Level:

- Instrument reading that triggers increased surveillance or an emergency action
- Developed to aid in immediate field-verification of instrumentation readings and/or assist in determining if readings are approaching a level which would cause concern

Design Basis Value:

- Value used in the design analysis of the project.



Chapter 14 Definitions

- According to these definitions, design basis values can be thresholds and thresholds can be action levels
- Definitions overlap creating confusion and differing interpretations
- Don't get caught up in specific interpretation of these terms when they can often be interchangeable
- This part of the guidelines is general to allow judgement for use on a wide range of projects – “ambiguous by design”
- Owners: define your interpretation in your DSSMP



Federal Energy Regulatory Commission Division of Dam Safety and Inspections



CEATI Performance Action States

ACTION STATE	DESCRIPTION	RESPONSE
NORMAL – PERFORMANCE AS EXPECTED		
NORMAL – GREEN	Observations and measurement indicate expected and acceptable values.	Continue inspection, monitoring, and maintenance program.
THRESHOLD LEVEL		
CAUTION – YELLOW	One or more indicators of performance are above expected values.	Review the data for reliability. Meet with Evaluation Team to decide what to do. Inform all involved parties of the current condition and the recommended plan of action. Take steps to reduce chance that reading will exceed the Limit Level.
LIMIT LEVEL		
ALERT – RED	One or more indicators are above the Limit Levels established for each instrument.	Inform all parties to stop any work in affected area. Implement contingency plan. Develop safe steps to proceed.



Bottom Line

- Regardless of the terminology in your DSSMP, you meet the intent of Chapter 14 by using judgement to develop instrument levels requiring action that will improve your monitoring program and the safety of your dam
- Ongoing critical evaluation of performance monitoring data and your overall program, including action levels, is necessary to continue to meet the intent of FERC guidelines



Federal Energy Regulatory Commission Division of Dam Safety and Inspections



Best Practice

- When possible, use combination of historic readings and design basis values to determine levels triggering action
- Identify instrument readings, visual observations or trends requiring:
 - Reading verification
 - Evaluation by an engineer
 - Increase in monitoring
 - Formal investigation
 - Implementation of risk reduction
- Each action should include a specified time period for implementation and notification procedures.



Federal Energy Regulatory Commission Division of Dam Safety and Inspections



Pre-Workshop Survey Comment:

- I am curious about action levels for instrumentation. Is there a preferred methodology for setting action levels?
- How often should they be reviewed and possibly be adjusted?
- If an instrument is in a long term downward trend should the actions levels also be adjusted downward?

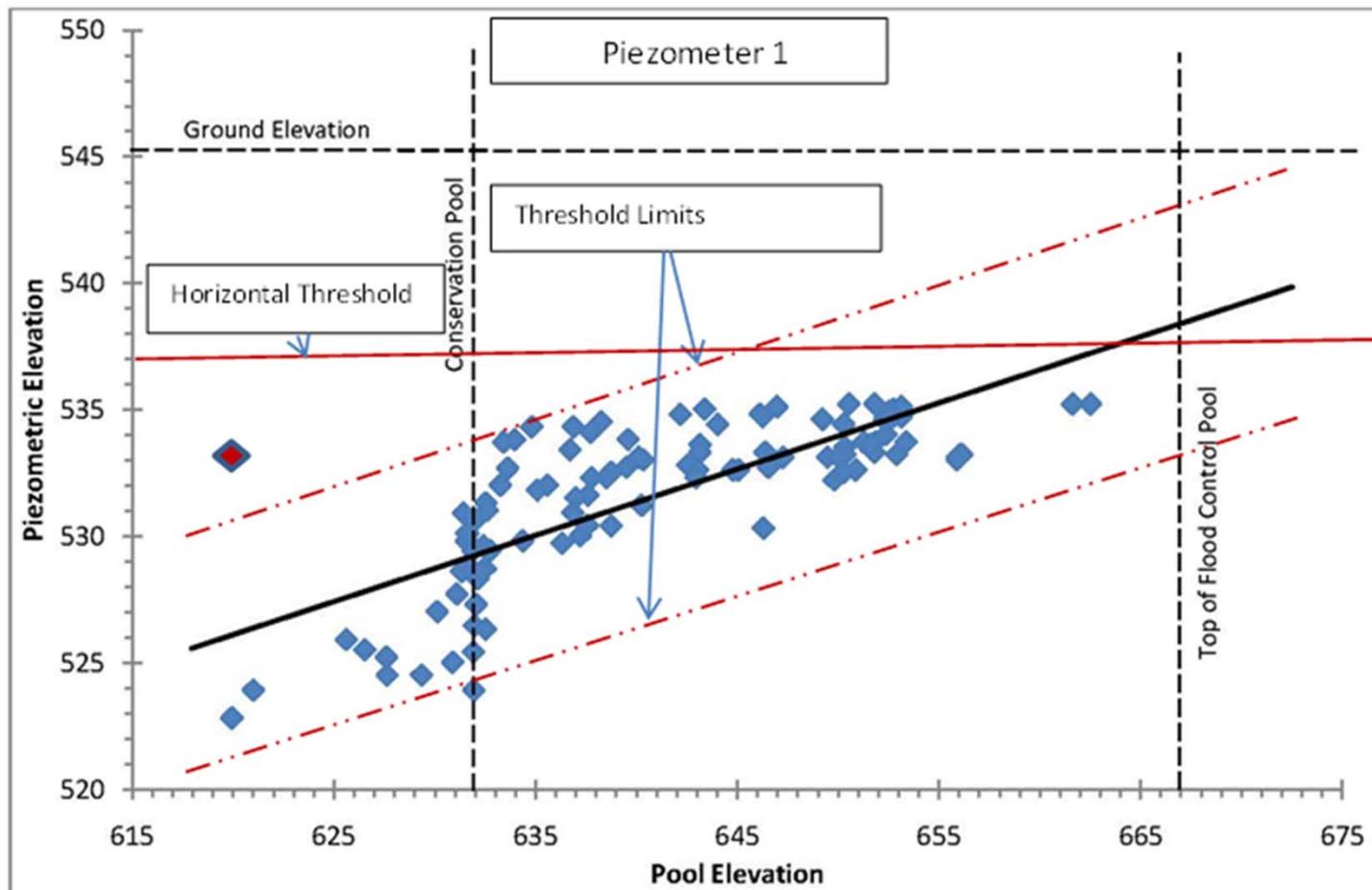


Developing Thresholds and Action Levels

- Piezometers:
 - Related PFMs
 - Stability – look for elevated level and trends
 - Piping – look for episodic behavior
 - General Health
 - Look for values outside the expected range, anomalous behavior or trends



Piezometer Thresholds and Action Levels





Federal Energy Regulatory Commission Division of Dam Safety and Inspections



Developing Thresholds and Action Levels

- Deformation Monuments:
 - Related PFMs
 - Stability
 - Piping
 - Structural failure
 - General Health
 - Anomalous behavior or trends



Thresholds and Action Levels for Deformation Monuments

- Typically rate of change thresholds established based on survey accuracy and historic readings
- Unusual readings or trends may be an indication of poor performance or poor performance of survey crews or master monuments.



Developing Thresholds and Action Levels

- Water level indicators
 - May be used to indicate failure in progress, can be automated
 - Thresholds based on rate of change or max/min levels
- Extensometers, inclinometers
 - Can monitor internal movement of embankments, thermal expansion and contraction of concrete structures, movements in rock abutments
 - Can use rate of change, trends or design values to establish thresholds and action levels



Federal Energy Regulatory Commission Division of Dam Safety and Inspections



Developing Thresholds and Action Levels

- Weirs:
 - May be related to piping, stability/drain efficiency or general health monitoring
 - Difficult to tie to design or analysis
 - Thresholds based on historic readings and rate of change



Developing Thresholds and Action Levels

- Surveillance:
 - Visual observation is a critical element of your surveillance and monitoring program
 - Observations can be linked to events in virtually every PFM
 - Often, observations that require action are self-evident
 - Subtle changes identified in the PFMA process may also be linked to required action



Federal Energy Regulatory Commission Division of Dam Safety and Inspections



Questions?

