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Oconee Flood Issue
Jocassee Dam Failure Frequency

Division of Risk Assessment
10-1-2008

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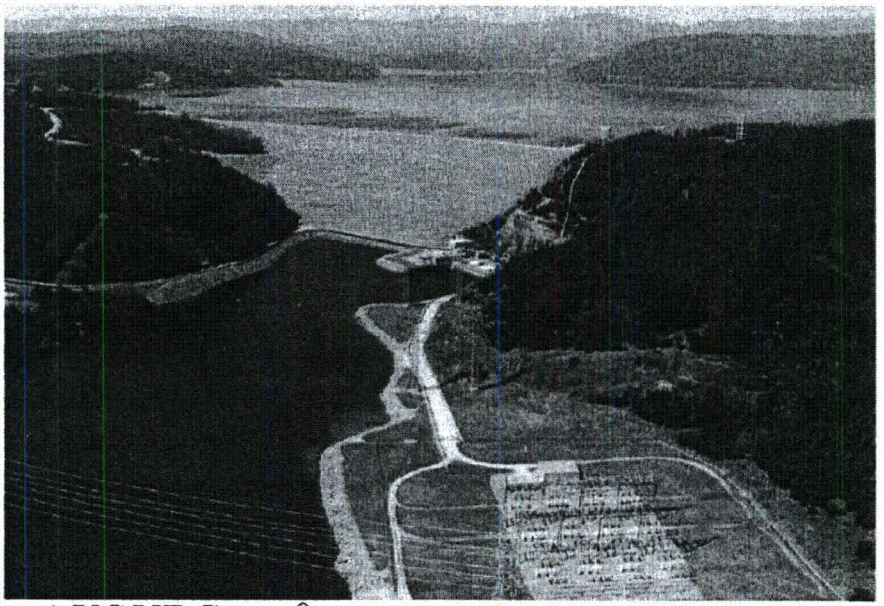
Jocassee Pumped Storage Project



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Derivation of the Random Jocassee Frequency

- Two Catastrophic Failures Derived from NPDP – National Performance of Dams Program
  - Frenchman (Montana)
    - Failure in 1952
    - 63-ft height (some literature shows it as 44-ft)
    - Low hazard class
  - Skagway (Colorado)
    - Failure in 1965
    - 79-ft height
    - Significant hazard class

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Parsing The Frequency Of Random ("Sunny Day") Failure Modes

- Pros
  - Get higher resolution of failure modes contributing to the catastrophic failure frequency.
  - Concentrate on specific engineering/operational improvements to reduce overall frequency.
- Cons
  - Cannot statistically justify if the overall catastrophic failure data is sparse.
  - Method is not well developed relying on the assumption that each failure mode is statistically independent without consideration of common cause.
  - Uncertainty needs to be addressed for each failure mode which might yield distributions that are too wide to be confidently used.
- Conclusion
  - This could be a viable approach to evaluating dam failure providing there is sufficient data. However, for this case, the scarcity of data makes this method unacceptable.

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Reliability vs. Statistical Treatment of Jocassee Dam Failure

- Reliability Approach
  - Pros
    - Detailed event and fault trees are developed for individual contributors to dam failure.
    - Evaluate which failure modes and scenarios are most likely.
  - Cons
    - Difficult to properly categorize historical data in fault tree structure.
    - Potential overlap and double-counting of data.
    - Requires large populations of detailed data.
- Statistical Approach
  - Pros
    - Develop an simple single frequency of dam failure.
    - Incorporation of historical details of dam failure by use of Bayesian update tools.
  - Cons
    - Does not lend itself to evaluate details of the initiating event.

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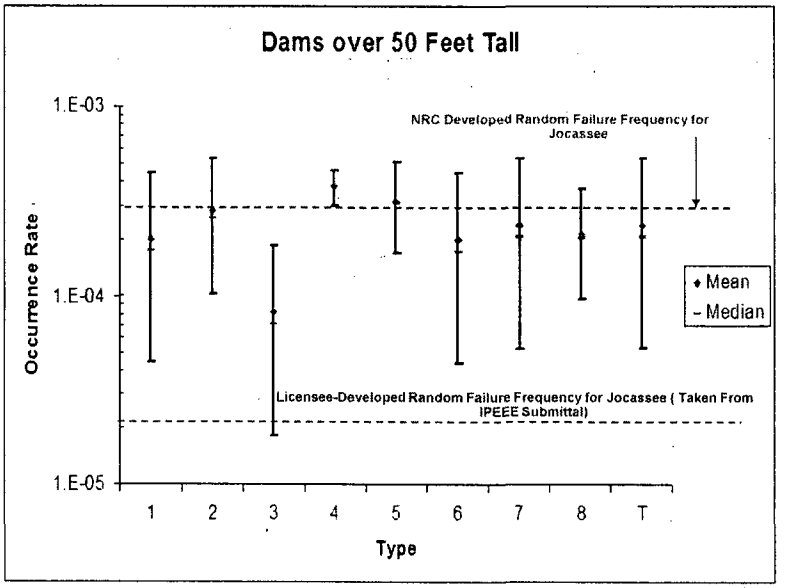
Comparison of Random Dam Failures by Type

1	Buttress Dams Over 50 Feet High
2	Arch Dams Over 50 Feet High
3	Concrete Dams Over 50 Feet High
4	Earth Dams Over 50 Feet High
5	Gravity Dams Over 50 Feet High
6	Masonry Dams Over 50 Feet High
7	Multi-Arch Dams Over 50 Feet High
8	Rockfill Dams Over 50 feet high
T	Total



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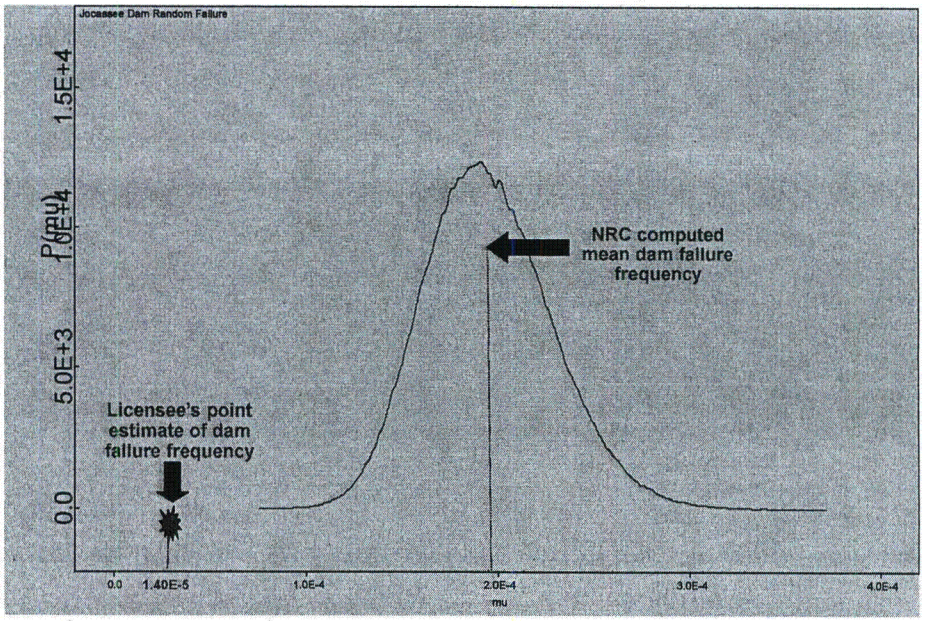

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Evaluation

- Uncertainty bands are narrow for rockfill (similar to Jocassee) and earthen dam types.
- Frequencies are in the 10^{-4} per year range.
- Discussion

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