



U.S. Department of Energy
Office of Civilian Radioactive Waste Management

Multiple Lines of Evidence

Presented to:
Nuclear Waste Technical Review Board

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**YUCCA
MOUNTAIN
PROJECT**

What the Board Has Said

- **“The Board has recommended that the DOE focus significant attention on four priority areas dealing with managing uncertainty and coupled processes, which, in the Board’s view, are essential elements of any DOE site recommendation.”**
- **“... (4) Development of multiple lines of evidence to support the safety case of the proposed repository. These lines of evidence should be derived independently of performance assessment, and thus, not subject to the limitations of performance assessment.”**

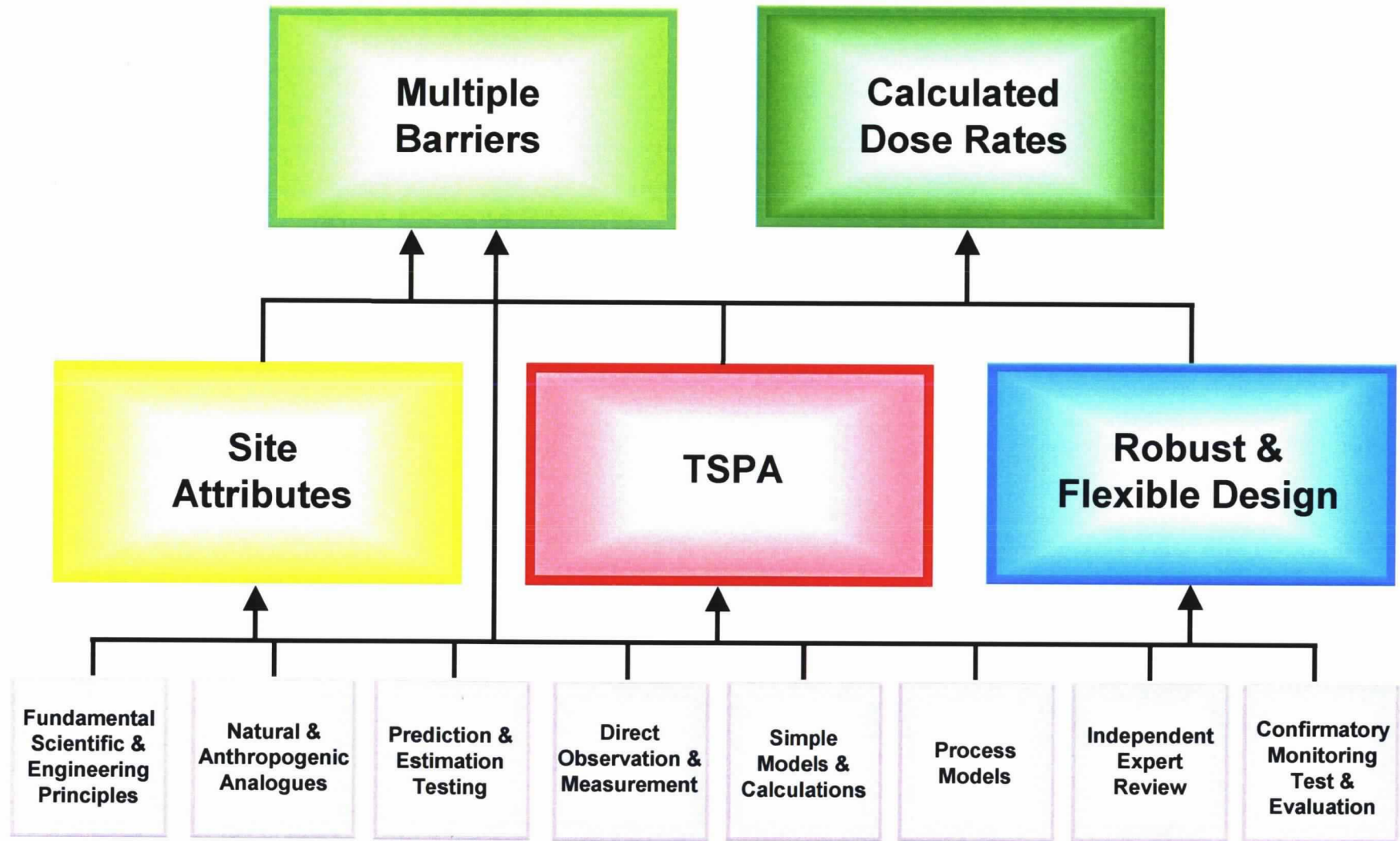
Transcript of NWTRB Meeting, Amargosa Valley, Nevada
January 30, 2001

Multiple Lines of Evidence Alternative Viewpoints

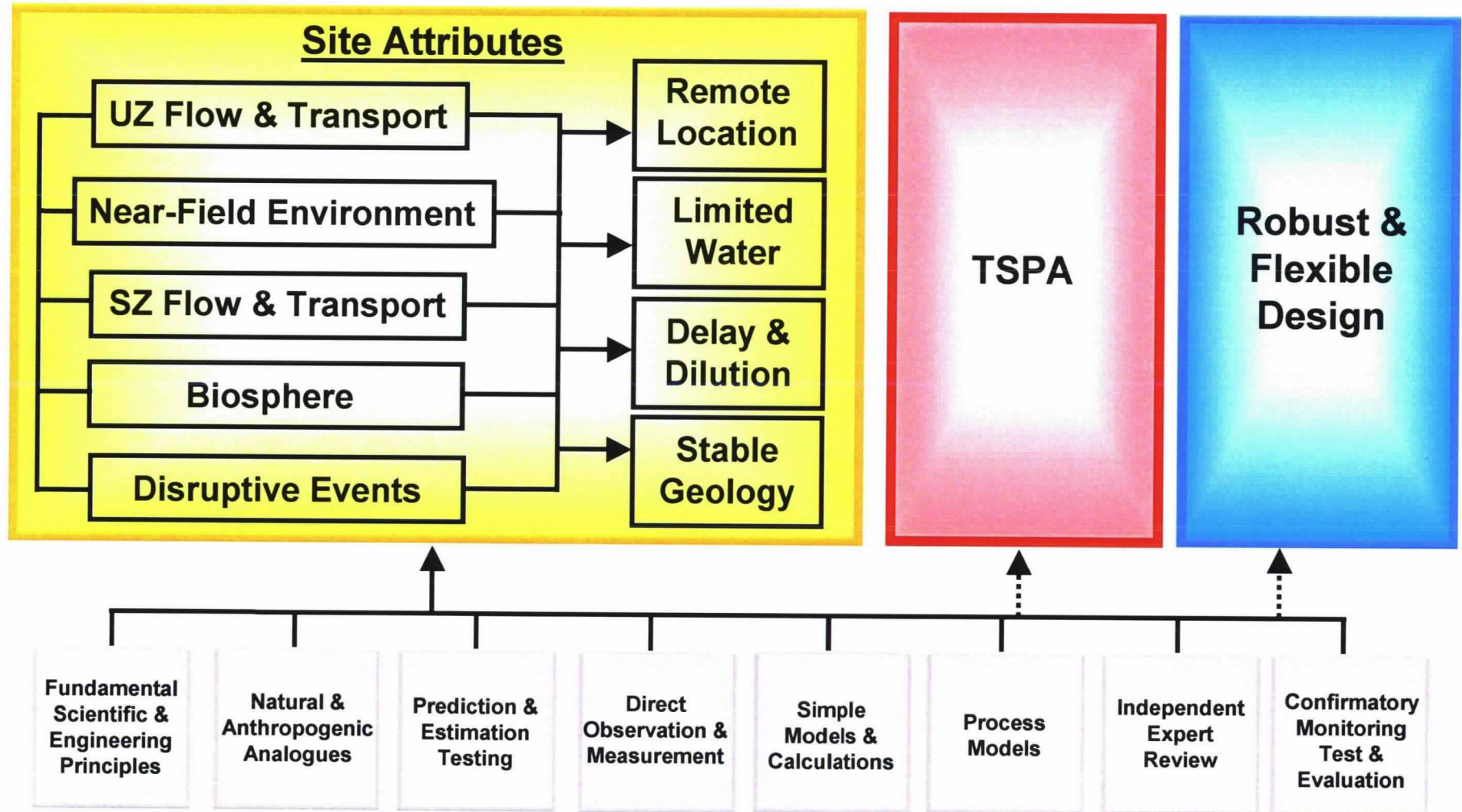
Multiple lines of evidence means use the TSPA. If there is more evidence, put it into the TSPA. Make the TSPA robust.

Multiple lines of evidence are inherent in the scientific method and embrace essentially all of the Project's technical activities.

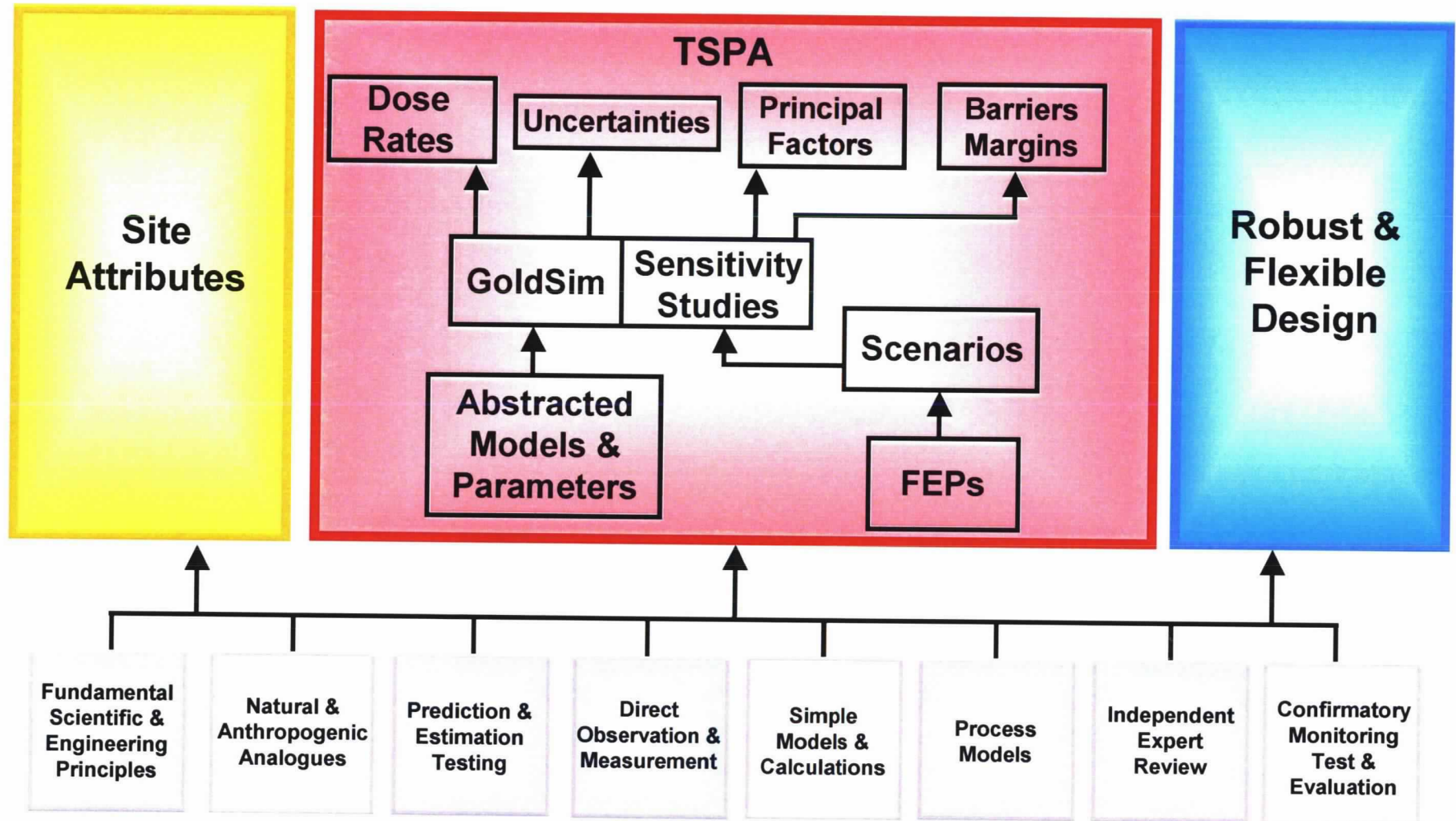
Multiple Lines of Evidence General Framework



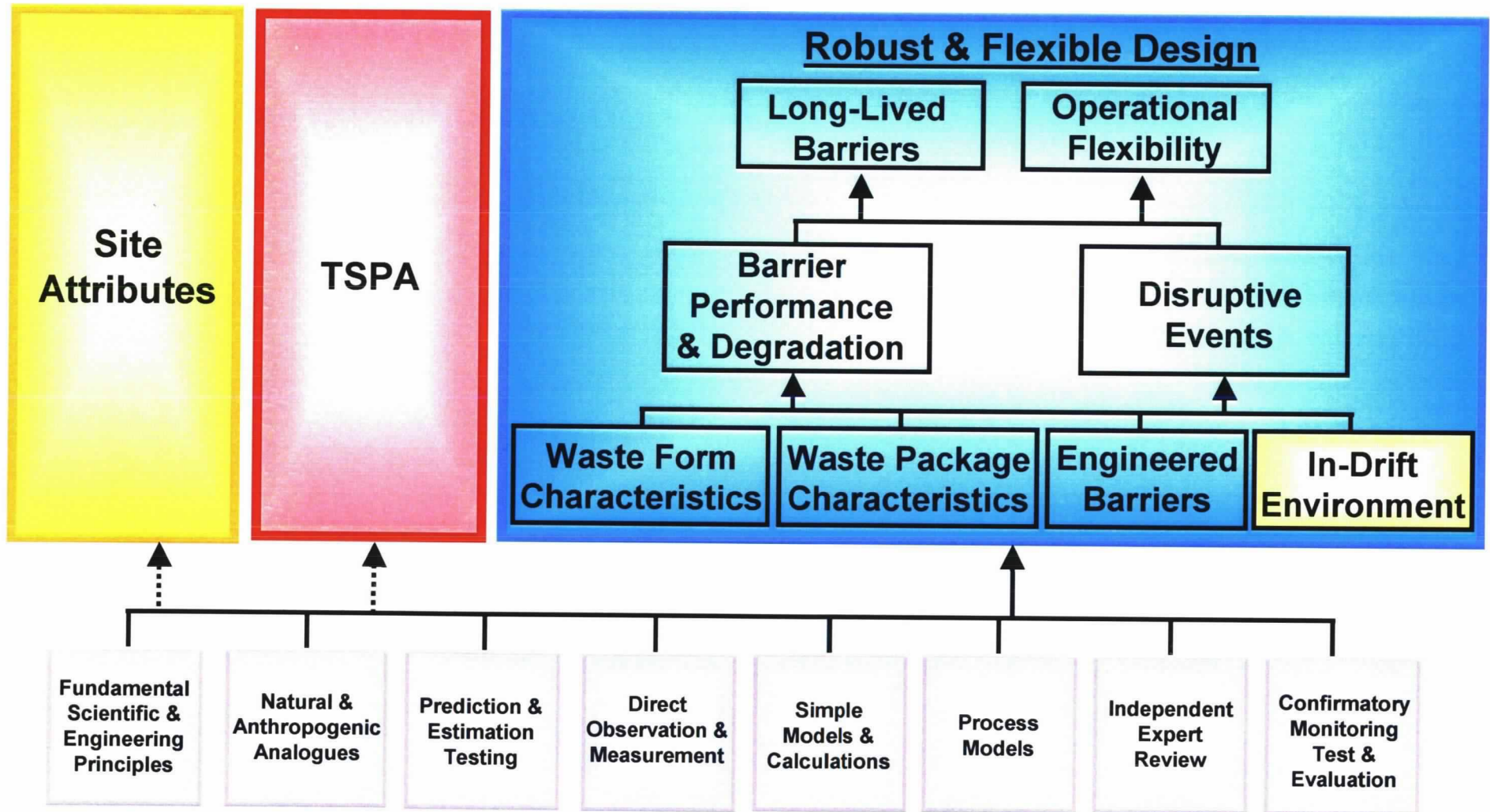
Inside Site Attributes



Inside the TSPA



Inside Robust and Flexible Design



Lines of Evidence

Can These Be Independent of TSPA?

YES

- They do not use abstracted models
- They do not use GoldSim
- In general, results are not expressed in dose rates

BUT

- They are drawn from the same body of data, science, and knowledge
- Some use the same or similar process models

RESULT

- They serve to create a safety case that is more than a probabilistic total system performance assessment

Multiple Lines of Evidence Continuing Discussion

**Fundamental
Scientific &
Engineering
Principles**

**Natural &
Anthropogenic
Analogues**

**Prediction &
Estimation
Testing**

**Direct
Observation &
Measurement**

**Simple
Models &
Calculations**

**Process
Models**

**Independent
Expert
Review**

**Confirmatory
Monitoring
Test &
Evaluation**