emi sig
EMERGENCY MANAGEMENT ISSUES SPECIAL INTEREST GROUP

Launching Emergency Management Leadership

Tapping Your Site's Collective Intelligence for the Technical Planning Basis

J.D. Jamison

SAIC

Richland, WA

Hazard Characterization

Chlorine (Cl_2)

Molecular Wt 70.9

Boiling point .....-29.3°

Vapor pressure ...85 psig @ 70 °F

XM Cylinders (2)...147 lbs/cylinder

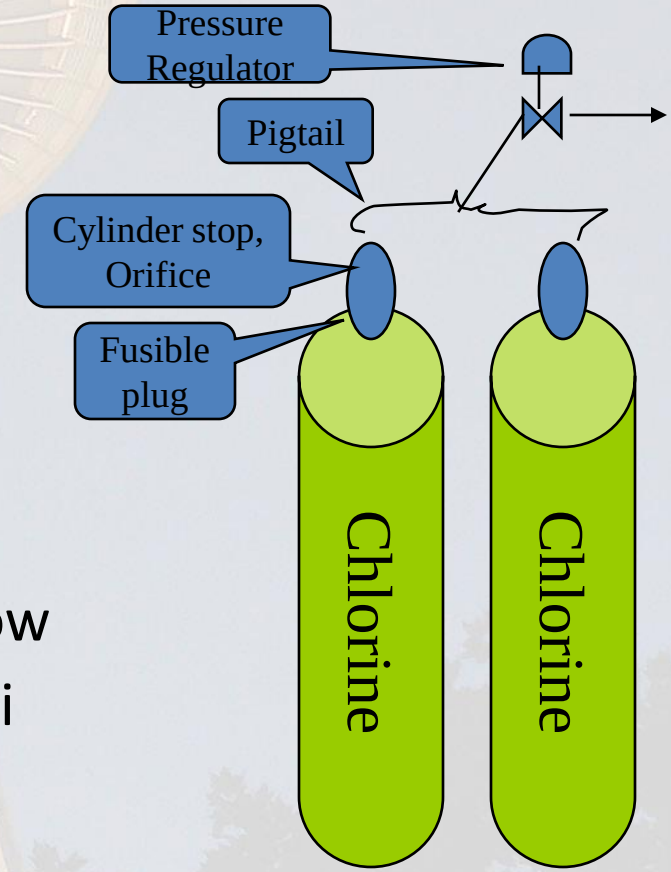
Fusible plugs .....Melt at 165°F

Pigtails ..... 1/4" ID flexible metal hose

Cylinder Orifices .....5 lb/min maximum flow

Pressure regulator.....set to deliver at 3 psi

Low pressure gas piping....3/4" welded SS



Hazard Characterization

Nitric Acid (HNO_3)

From EPI:

Molecular Wt 63.02

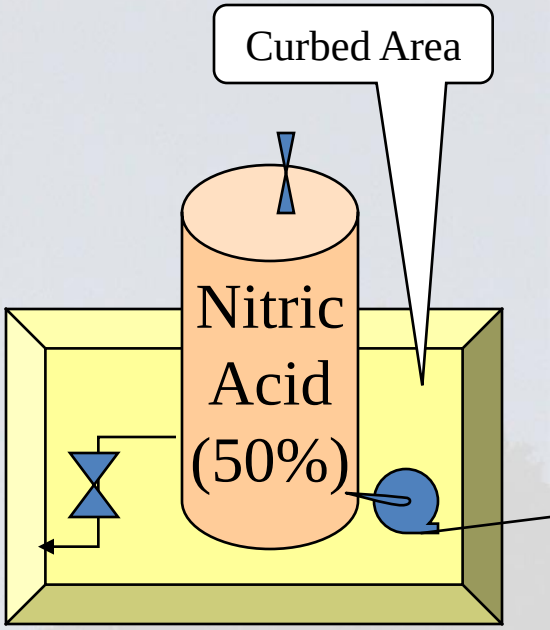
Boiling point .....86°C

Vapor pressure ...62 mm (Hg) @ 25 °c

Outdoor Tank ...1000 gal.capacity

Curb (20'x20'x8") around tank

50% HNO_3 (nominal)



Hazard Characterization

Transuranic (TRU) Waste

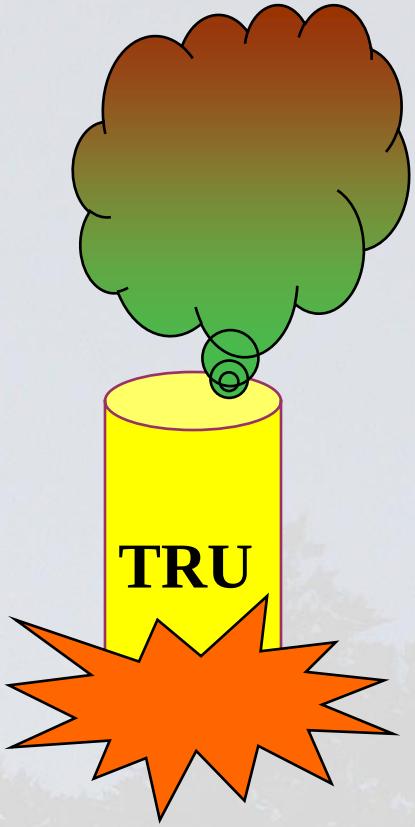
Waste consolidation/storage area

- ~ 70% combustible material
- Weapons grade Pu mix
- Specific Activity 0.08 Ci/g
- 55 gal steel drums (<25 drums)
- 400 g Pu/drum (max)
- 35 g Pu/drum (average)
- <1% of drums exceed 200 g Pu

Initiating Events & Barrier Failure Modes

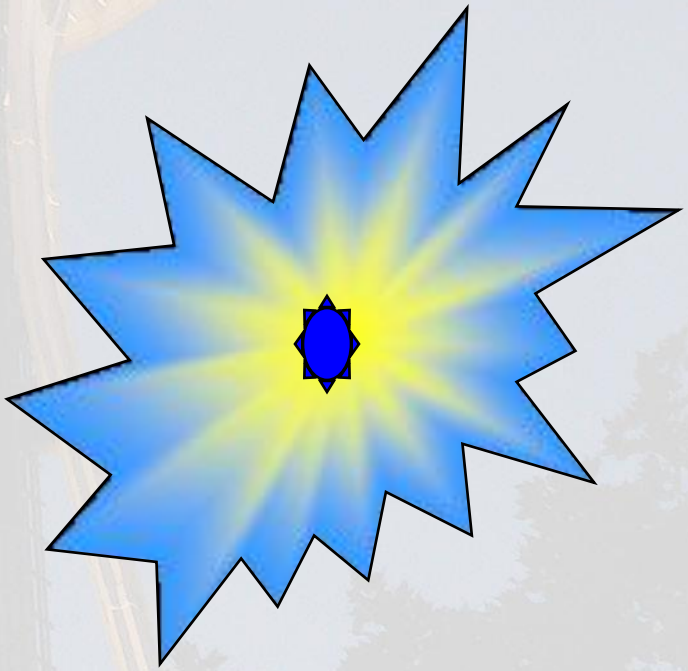
Primary Barrier: Drum/Waste form

Failure Mode: Combustion

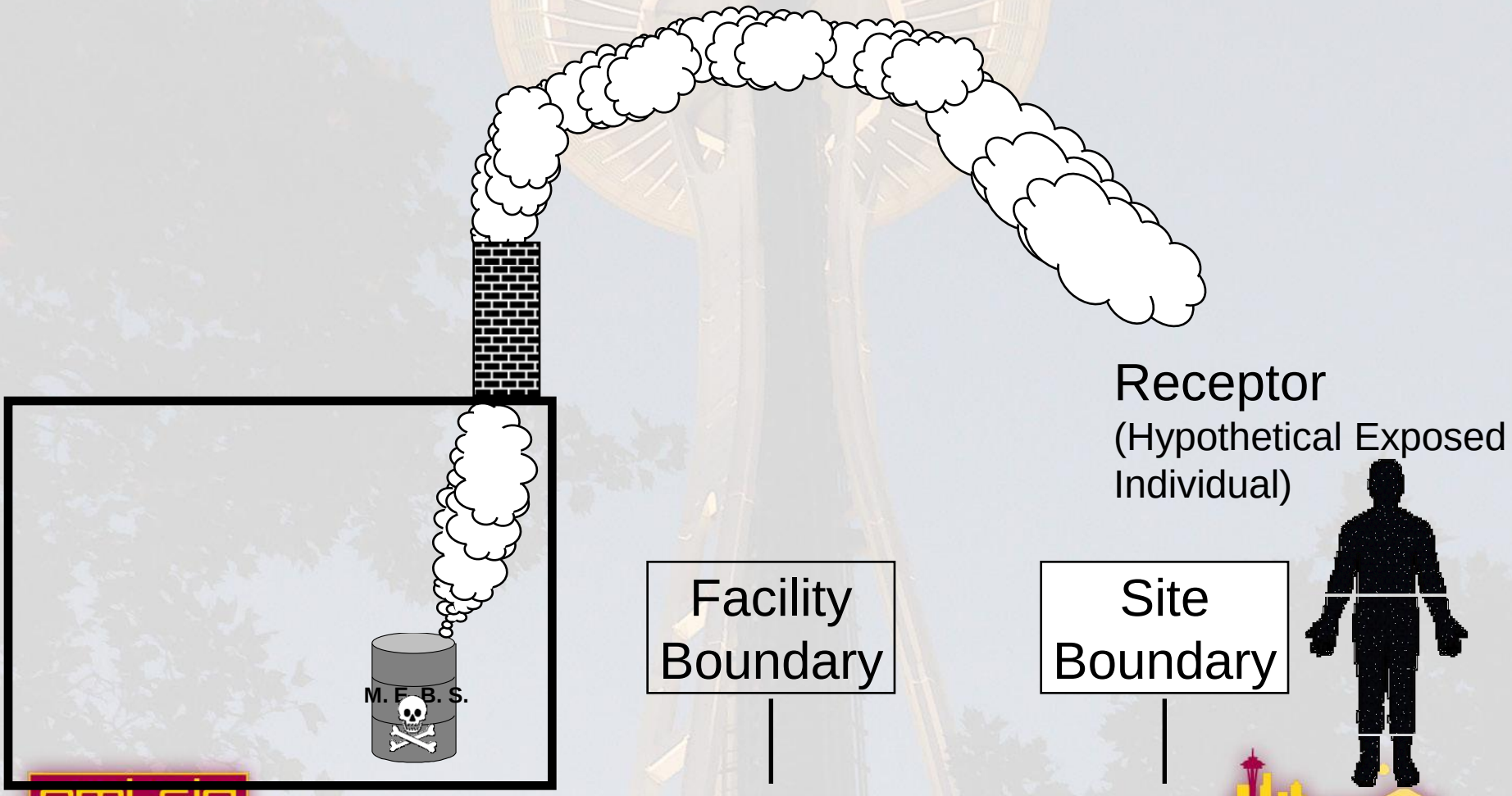


Postulated Barrier Failure & Release

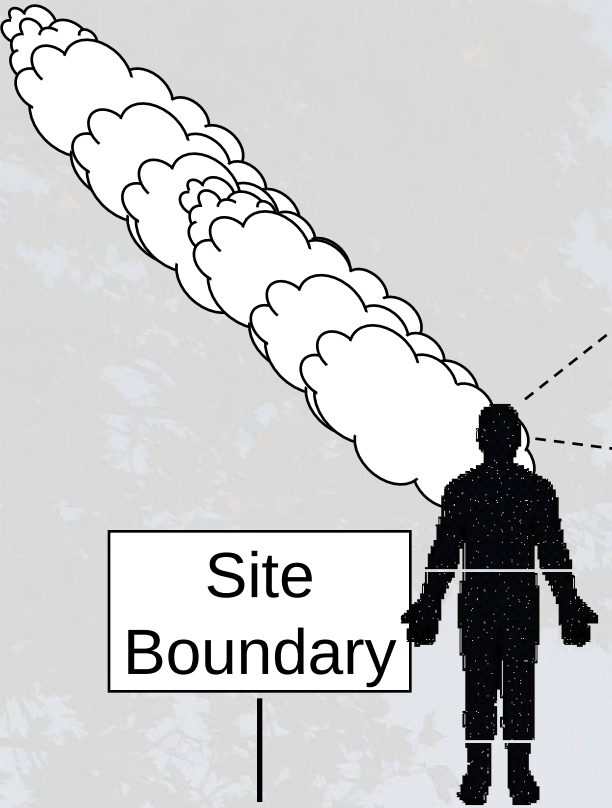
- Detonation of HE in experiment package
- 1 kg Pu metal
- 10 lbs HE (TNT equivalent)



Development of EALs



Development of EALs



ALERT: PAC exceeded at > 30m but not beyond facility boundary

SAE: PAC exceeded beyond facility boundary but not offsite

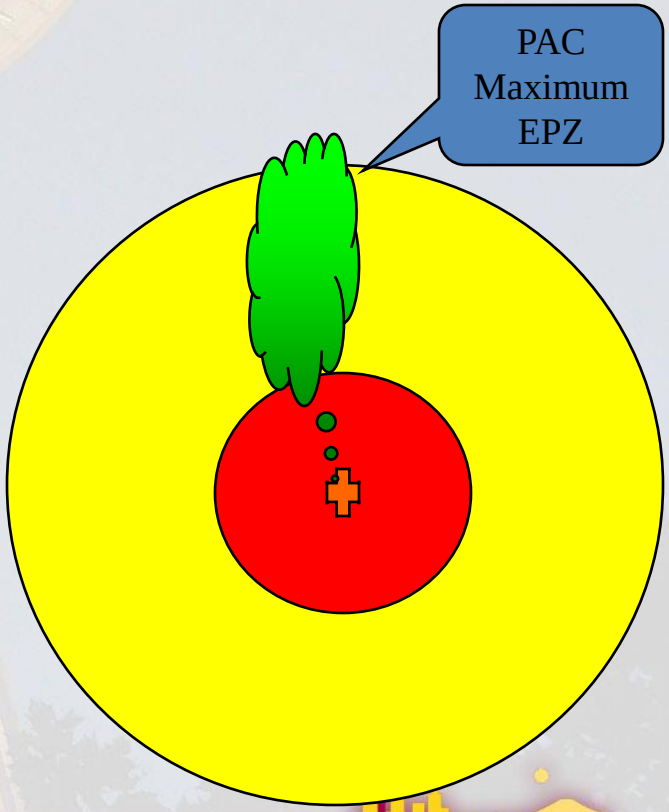
GE: PAC exceeded offsite

PAC: Protective Action Criteria

Developing Proposed EPZs

Step 2: Determine largest EPZ radius

- Maximum distance where PAC exceeded
- Severe met conditions
- Exclude
  - beyond DB natural phenomena
  - “extreme” malevolent acts
- Not to exceed 16 km (10 miles)



What's the Paradigm?

- Known material properties
- Known quantities
- Predictable release phenomena
- Atmospheric transport can be modeled
- Health impacts proportional to exposure

Like this….

But this?

What about…..

- Multiple small quantities?
- Multiple substances?
- Material scattered throughout facility?
- Properties & quantities not known?
- Unknown/highly variable material behavior under release conditions ?
- Legacy contamination in ducts?
- Etc, etc, etc…

For poorly understood hazards…

- …does a quantitative analysis by a single person, based almost entirely on guesses and assumptions, provide a meaningful basis for planning?
- Might less quantitative, holistic examination of such problems that combine different points of view give a result that is just as valid, or even more so?

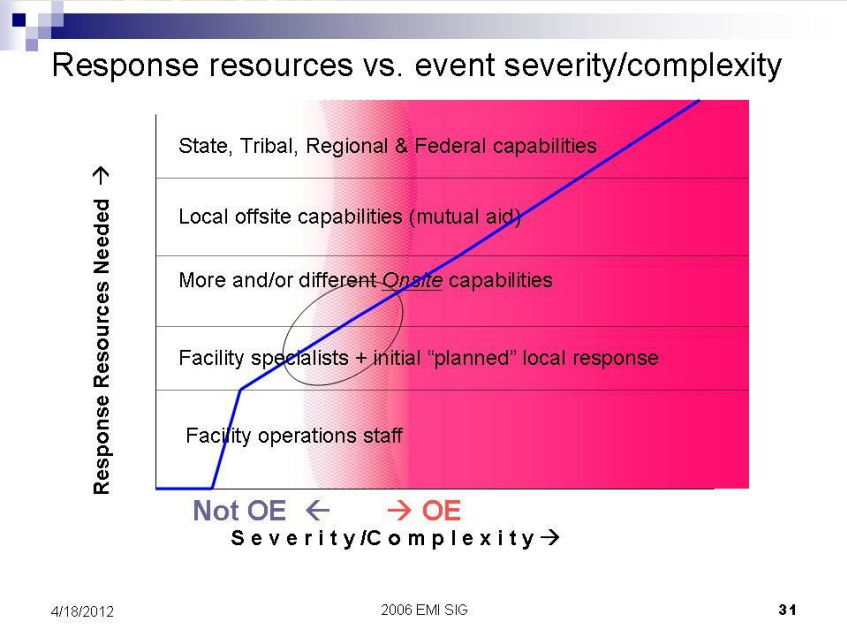
DOE G 151.1-2, Section 1.5

"If, on the other hand, the facility contains an ***aggregation of small quantities*** … that may be released during large-scale destructive events…A site may consider defining such events as categorized [but not classified] OEs if it appears that the condition would meet all the aspects of an OE. The potential "**HAZMAT**" aspect of these destructive events may be used as a ***qualitative factor*** or ***criterion*** (i.e., without the support of detailed quantitative calculations of consequences) in defining specific OEs related to these events."

Response resources vs. event severity/complexity

In other words….

- You are expected to use ***all the information and experience at your disposal*** to decide in advance whether the ***emergency management function*** would be needed



Question

How do you decide the best *answer* when you actually know very little about the *problem*?

- Theoretical approaches
- Quantitative models
- Trend extrapolation

Tapping "collective intelligence"

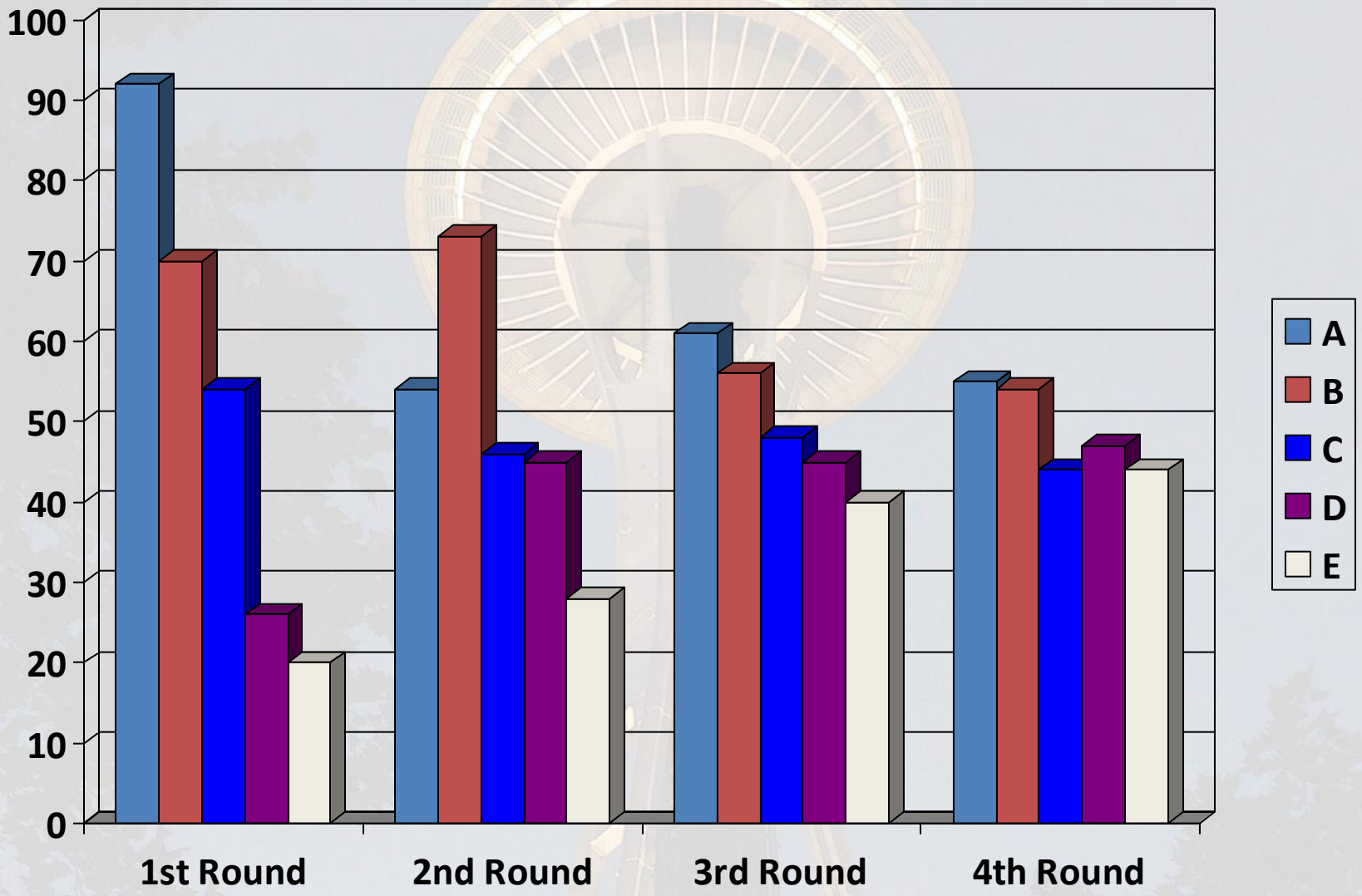
- The Delphi Method (RAND Corp.)
  - Forecasts/decisions from a structured group are more accurate than those from unstructured groups
  - A structured communication technique
  - Systematic, interactive forecasting
  - Used widely military, economic, public policy and technology forecasting

Tapping "collective intelligence"

- In regular group meetings, participants tend to stick to previously stated opinions and often conform too much to group leader.
- Delphi method prevents this through structured information flow among "experts"
  - Panel director controls information flow
  - Participants remain anonymous

Process

1. Director presents questionnaire to experts
2. Experts provide their responses to Director
3. Director provides summaries of the responses to all experts
4. Experts comment on their own forecasts, the responses of others
5. Director again summarizes responses, resubmits to experts
6. Repeat


100
90
80
70
60
50
40
30
20
10
0
1st Round
2nd Round
3rd Round
4th Round
A
B
C
D
E

Who are your "experts"?

- Emergency management analysts & planners
- Emergency responders (CA, security, ES&H)
- Incident Commanders
- Fire & HazMat specialists
- Hazardous material management specialists
- Scientists (physical chem., aerosol physics)
- Facility/process specialists and past workers ("corporate memory")

What kind of questions?

- What extent of hazardous material impact would you expect from (event) at (facility)?
  - Inside facility only
  - Local area -- out to ~100 m
  - Wide area-- out to (distance)
- What inherent limitations exist that would prevent this occurrence or mitigate the consequences?

The mechanics…

- The process could be carried out entirely on-line
- Outside experts could be included from other sites
- A time limit or number of cycles could be established, after which results would be assessed and actions decided

Summary

"If you're not moving forward, you're moving backwards."

G.A. HARKER