Integration of Science and Technology Roadmapping & Decision Analysis Tools for Strategic Mission Planning & NEPA

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NDIA NATIONAL DEFENSE INDUSTRIAL ASSOCIATION

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Roadmap Process Tools and Decision Architecture Streamline and Significantly Improve Strategic Plans & EIS Projects






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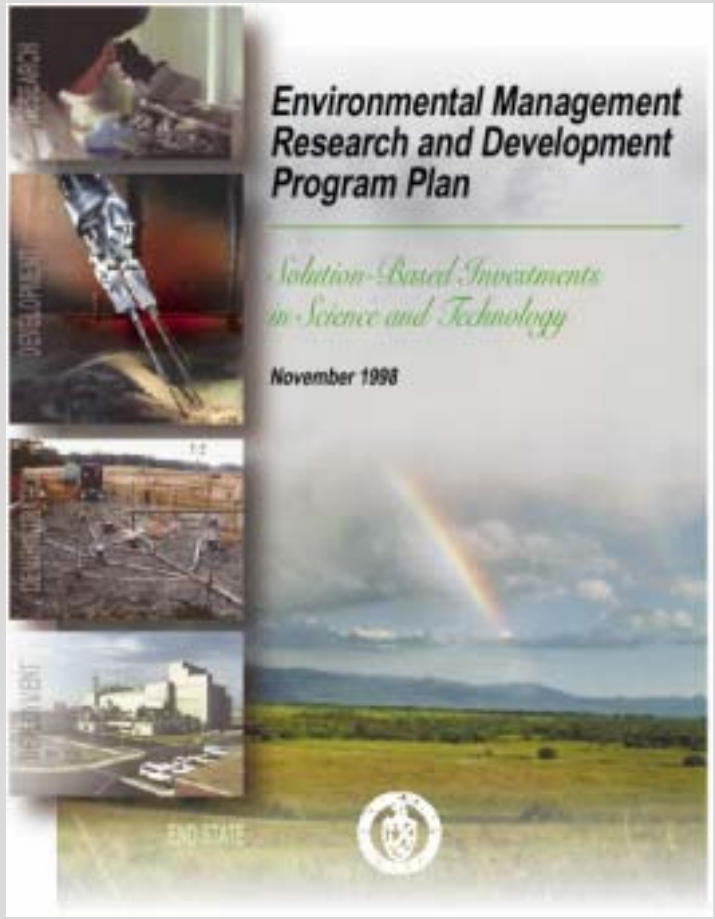
Science and Technology Roadmapping

Used for Critical Long Term Strategic Planning in DOE is..

"A critical and strategic planning process used to identify technical capabilities needed, map them into technology alternatives, and develop project plans to ensure that the critically required technologies will be available when needed"



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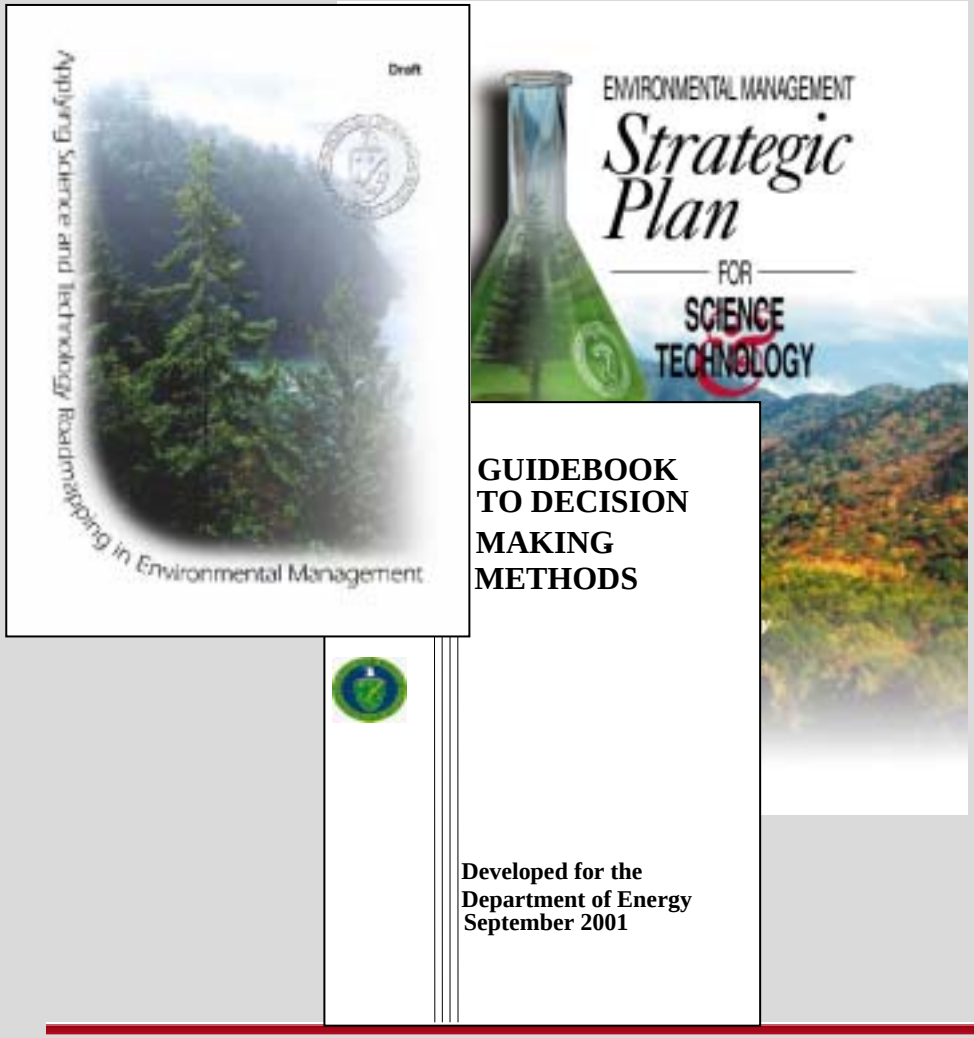
Guidance for Roadmap Application in EM Cleanup and Decision Analysis



Our focus today is on Roadmap and Decision Analysis process integration we learned while working on critical technology to meet our national nuclear waste cleanup program

- **These processes helped tie Research and Development with Real Day to Day Operations, with large risk and uncertainty exist day to day**

- **Once understood by Decision Analysis and Architecture it is used Roadmap to define most direct paths to solutions**

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DOE Applies Roadmap to its' Strategic Planning for Critical Management and Nuclear Cleanup

EM Strategic Plan

EM R&D Program Plan

SNF Multi-Year Program Plan
Nuclear Fuel

TFA Multi-Year Program Plan
High Level Waste

DDFA Multi-Year Program Plan
D&D Waste

SCFA Multi-Year Program Plan
ER Waste

PFA Multi-Year Program Plan
NM

MWFA Multi-Year Program Plan
Mixed Waste

Roadmaps

- INEEL Voluntary Consent Order Tanks
- Hanford Ground Water/ Vadose Zone
- Complex-wide Vadose Zone
- Complex-wide Hydrogen Gas Generation
- Complex-wide Long Term Steward-ship
- DOE-wide Robotics Intelligent Machines
- SRS HLW Salt Disposition Alternatives
- INEEL HLW Calcine Alternatives
- INEEL Sodium Bearing Waste Treatment Alternatives

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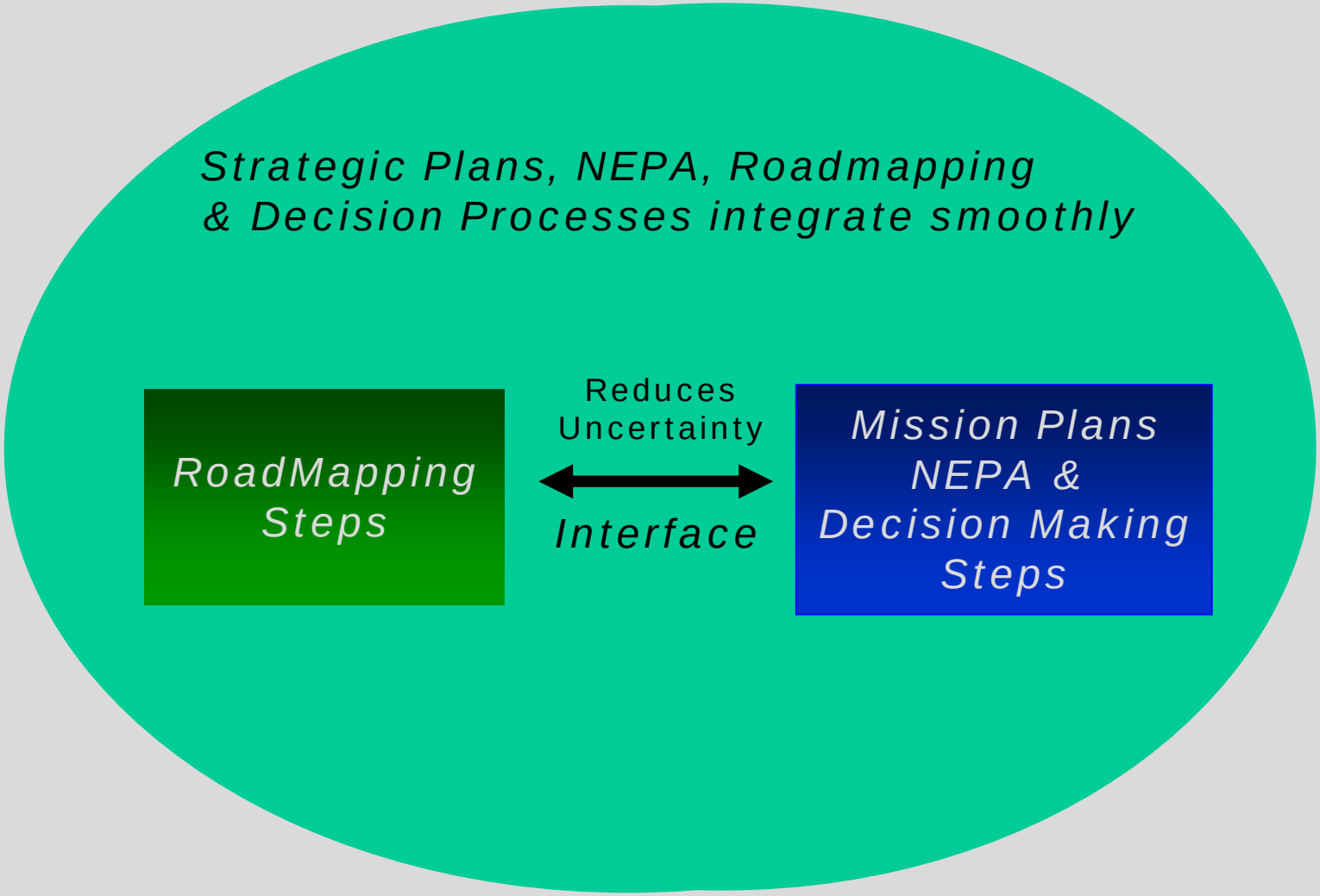
Three Separate Processes Integrate Smoothy

- Decision analysis helps define what's critical need, uncertain and risk, what alternatives to consider and prioritizes uncertainty resolution
- Roadmap process focuses on defining and resolving the uncertainties associated with what's important to the decision about the alternatives
- Roadmap defines crucial data collection and any development needed to support the decision
- Decision architecture then used to improve NEPA and provide improved clarity and portrayal of Decisions

Processes Integrate to Improve Analytical Focus and Reduce Fog Among Scientist and Interdisciplinary Teams, and Command Levels



Roadmap Process & Types

Roadmap Process

- **Phase I, Roadmap Initiation**
  - Identify Charter, Define Scope, Project Boundaries, Group Needs, Criteria or Requirements
- **Phase II, Technical Needs Assessment (Uncertainties)**
  - Gaps and needs data for technology selection
- **Phase III, Technical Response**
  - Activity, logic, duration, ROM$
- **Phase IV, Implementation Plan**
  - Prioritized to fit budget constraints and need dates

Types of Roadmaps

Program Level Roadmaps

- National in Scope
- Focus on Long Term R&D
- Broad Programmatic EISs

Project Level Roadmaps

- Solve Site Specific Problems
- Focus on Near Term Needs
- Evaluate Alternative Technologies Site Specific EIS

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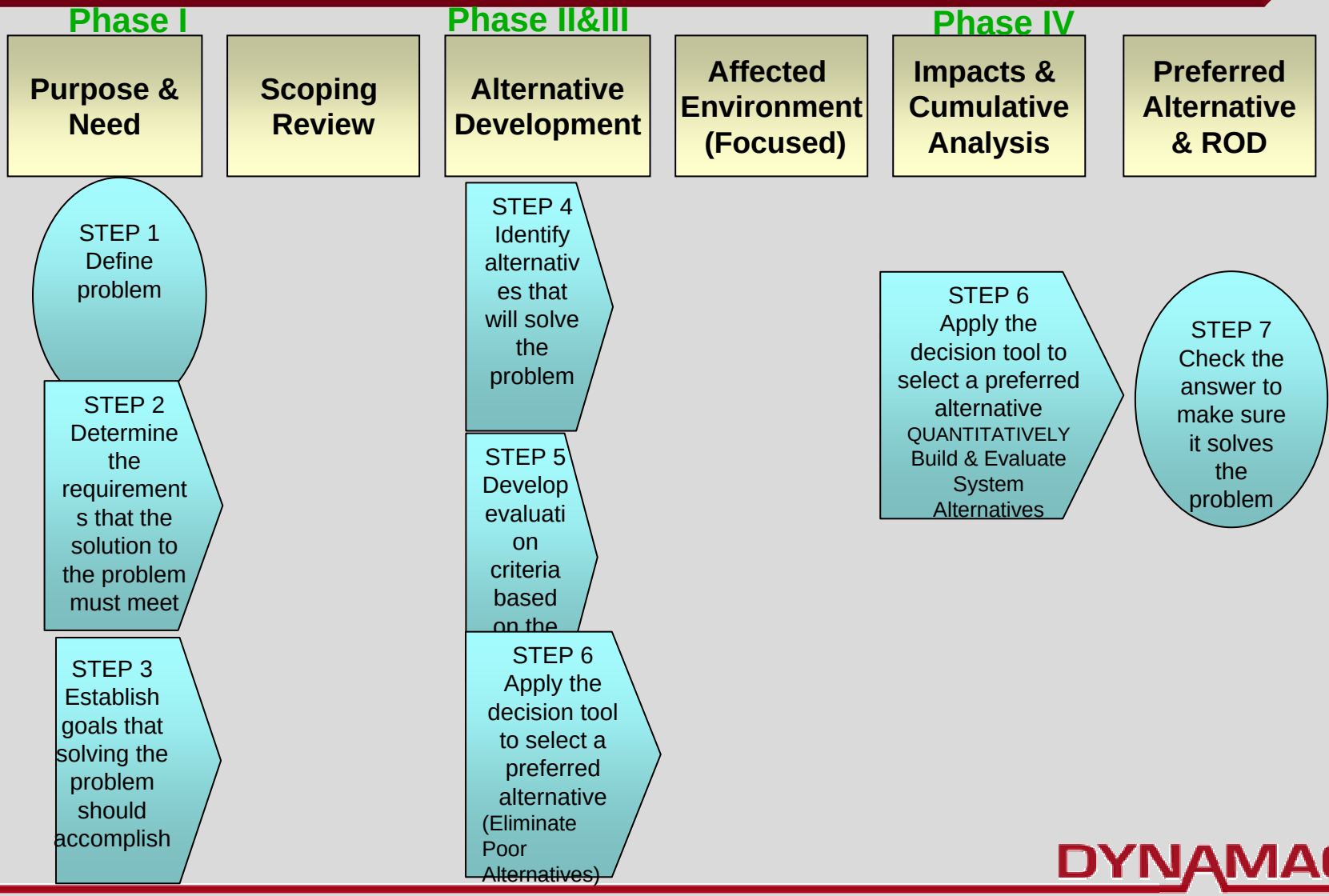
Key NEPA Steps, Roadmap and Decision Processes



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At the Start Identifying Strategic Goals, Objectives, Issues

These Tools Expedite Start-up of Plans & EISs By:

- **Developing Joint Strategies for Engaging Interested Parties and Conducting Stakeholder Involvement Activities**
- **Identify Common Critical Resources, Utilize GIS Visualization Techniques, and Data Necessary to Respond to Public Issues and Needs**
- **ID Team Processing for Scoping of Issues and Planning Problem Analysis**
- **Identify and Meet Citizen Participation Objectives**
- **Systematic Development of Informed Consent**

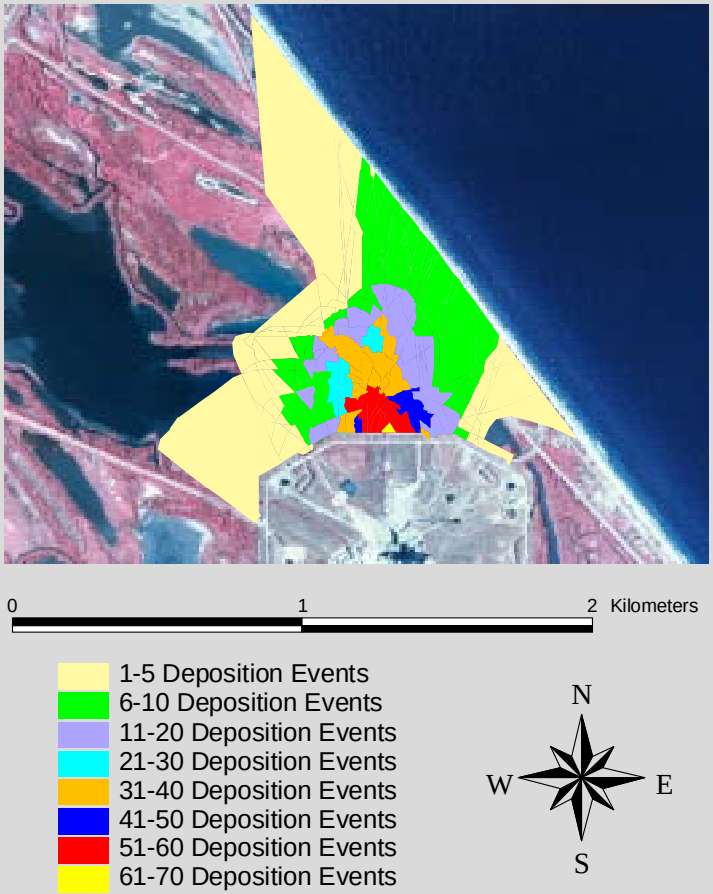
Integrating Roadmapping and NEPA Tools Yields Better Plans and EISs Because

- ***Significant uncertainty exist in agency resource data, land management options, and environmental impacts***
- ***Our unique tool set help resolve:***
  - ***Conflict among critical resources identified quicker***
  - ***Unified Management choices can be made faster***
  - ***NEPA Analysis on significant impacts are made more focused, clear, accurate, and scientific***
  - ***Affected State and Federal agencies & stakeholders are engaged and participate more***
  - ***Joint Executive Management Decisions are more clearly understood and portrayed visually for Public***

When Identifying and Formulating Strategic Plan or Project Proposal Alternatives

- Roadmapping Tools Integrate Well with RMP and NEPA Steps to Gather and Expedite Scientific Data
- Team Work Groups are Facilitated
- Functional Analysis on Resource Programs (Data and Use Needs or Allocations) are Addressed Utilizing GIS
- Decision Analysis (Provides Quantified Alternative Selection Rankings and Support for Land Use Allocation Decisions)

GIS Tool Applications and Technology



- New GIS tools improve visual portrayal of issues as in fuel deposition in air shown in this Space Shuttle Launch Analysis
- Used in Fire Management and Analysis Network (FireMAN) for gauging effects of smoke and fire on human health.
- GIS and Internet share information used for controlled burning and wildfire response to fuel types and quantities, moisture content, meteorological conditions, and level of fire risk.

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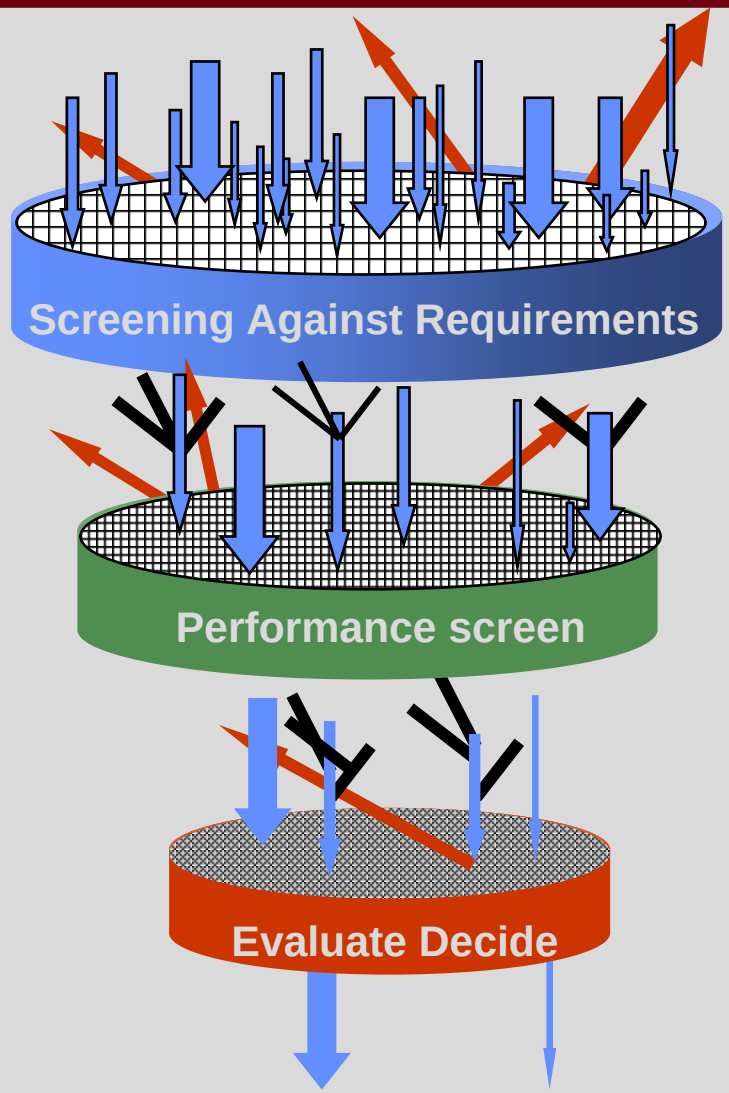
NEPA and RMP Alternative Development & Screening

NEPA Steps Evaluation

- *Scope Issues Identify Alternatives Screen Alternatives*
- *Eliminate Poor Performers*
- *Impact Analysis Mitigations*
- *Alternative Selection*



Requirements Review

Qualitative Analysis

Quantitative Analysis

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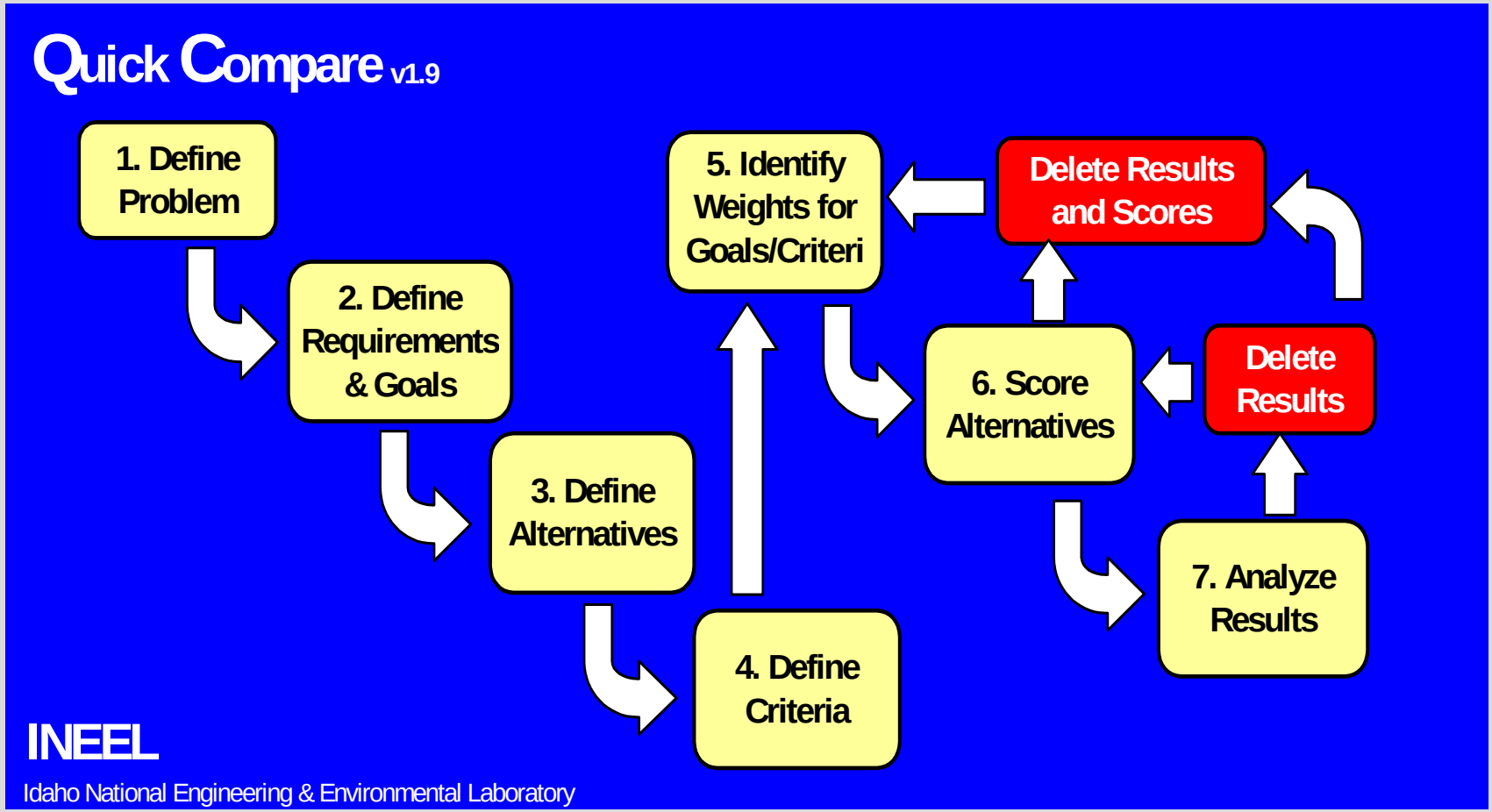
Quick Compare Decision Analysis



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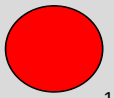
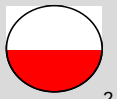
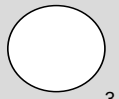
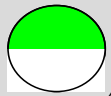
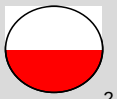
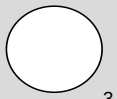
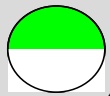
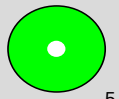
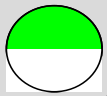
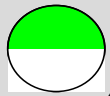
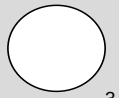
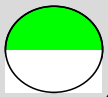
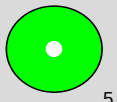
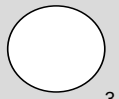
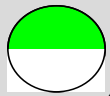
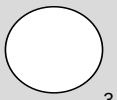
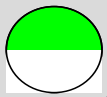
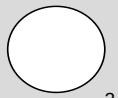
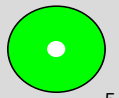
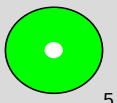
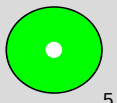
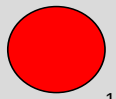
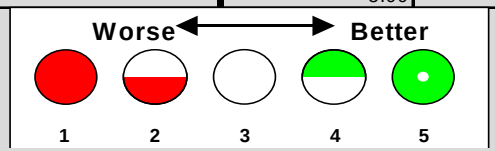
Alternative Ranking Decision Support From Quick Compare

Problem Trying to Solve: Enter problem here.

Scoring Method: 1 to 5 Scale

Criteria	Alternatives			
	Alternative 1 Overall Score: 50.3%	Alternative 2 Overall Score: 77.8%	Alt 3 Overall Score: 55.3%	Alt 4 Overall Score: 76.9%
Critera 1	 1.00	 2.00	 3.00	 4.00
Criteria 2	 2.00	 3.00	 4.00	 5.00
Criteria 3	 2.00	 4.00	 4.00	 3.00
Criteria 4	 4.00	 5.00	 3.00	 4.00
Criteria 5	 3.00	 4.00	 3.00	 5.00
Crit 6	 5.00	 5.00	 2.00	 1.00



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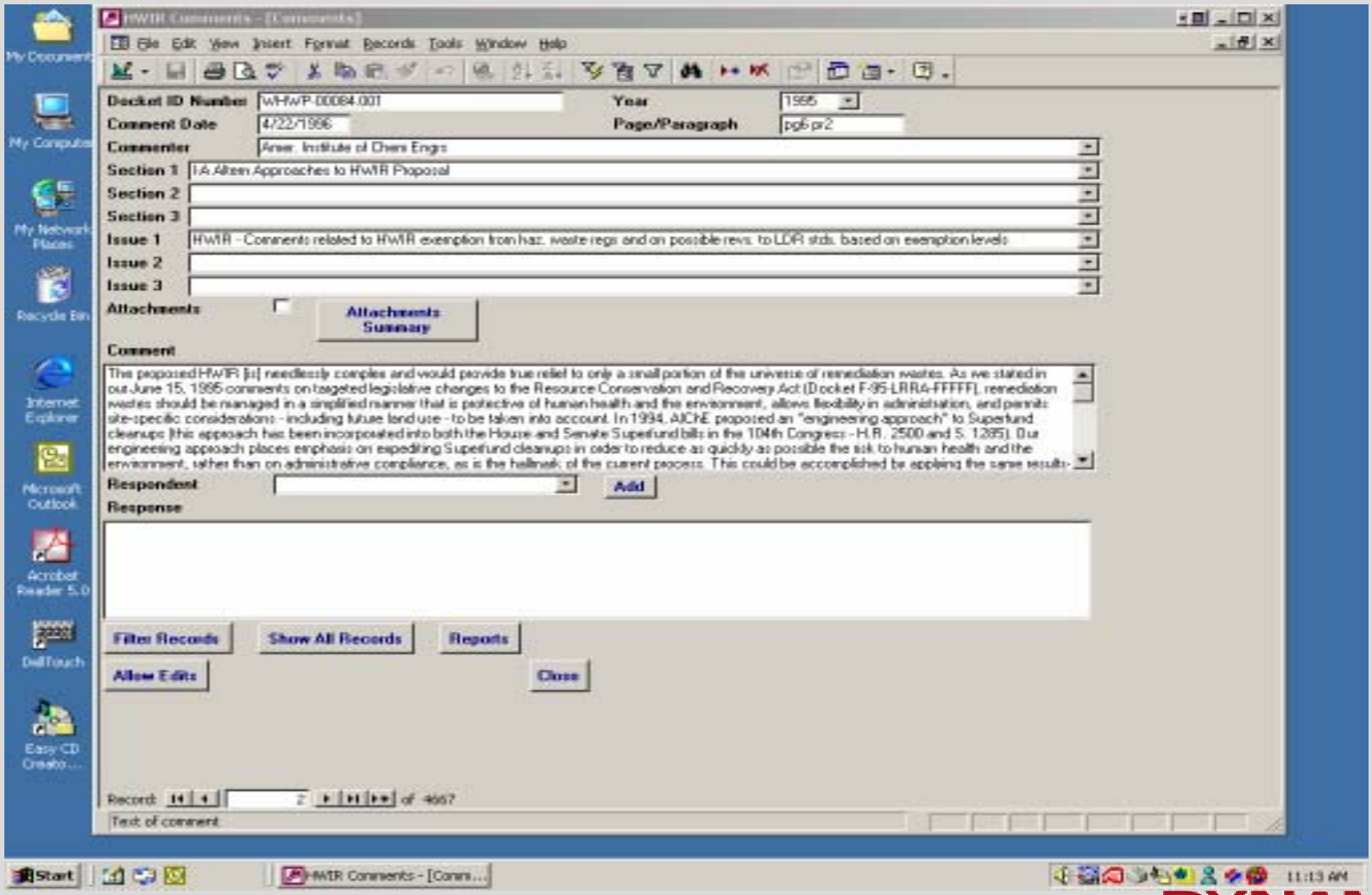
Efficiency with Lap Top Computers & Real-Time Facilitation Tools

Provide Tools for the ID Team engineers and specialist, the project manager, the decision maker, and the public.

Advantages of Computer Assisted Facilitation

- More effective use of the team's time by working simultaneously.
  - Reduced meeting length by up to 50%.
- Evaluate the quality of the idea by anonymous participation.
- Your thoughts in your words.
- A complete and immediate record of the team meeting.
  - Document how and why decisions were made.
  - Keep key information and "hidden gems."
- Reducing project down time waiting for meeting results to be transcribed.

Computerized Comment Analysis Systems and Access Data Base Software



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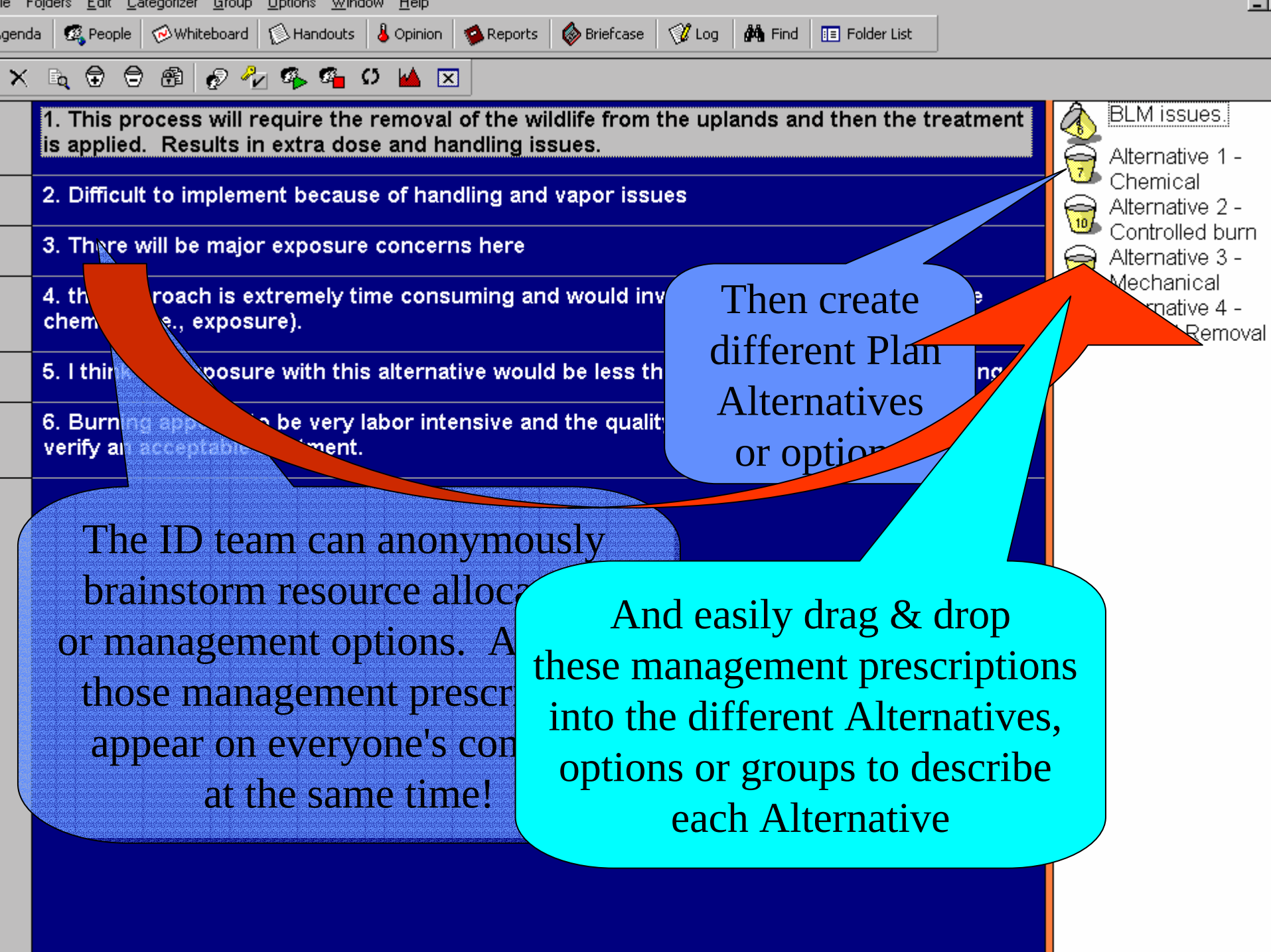
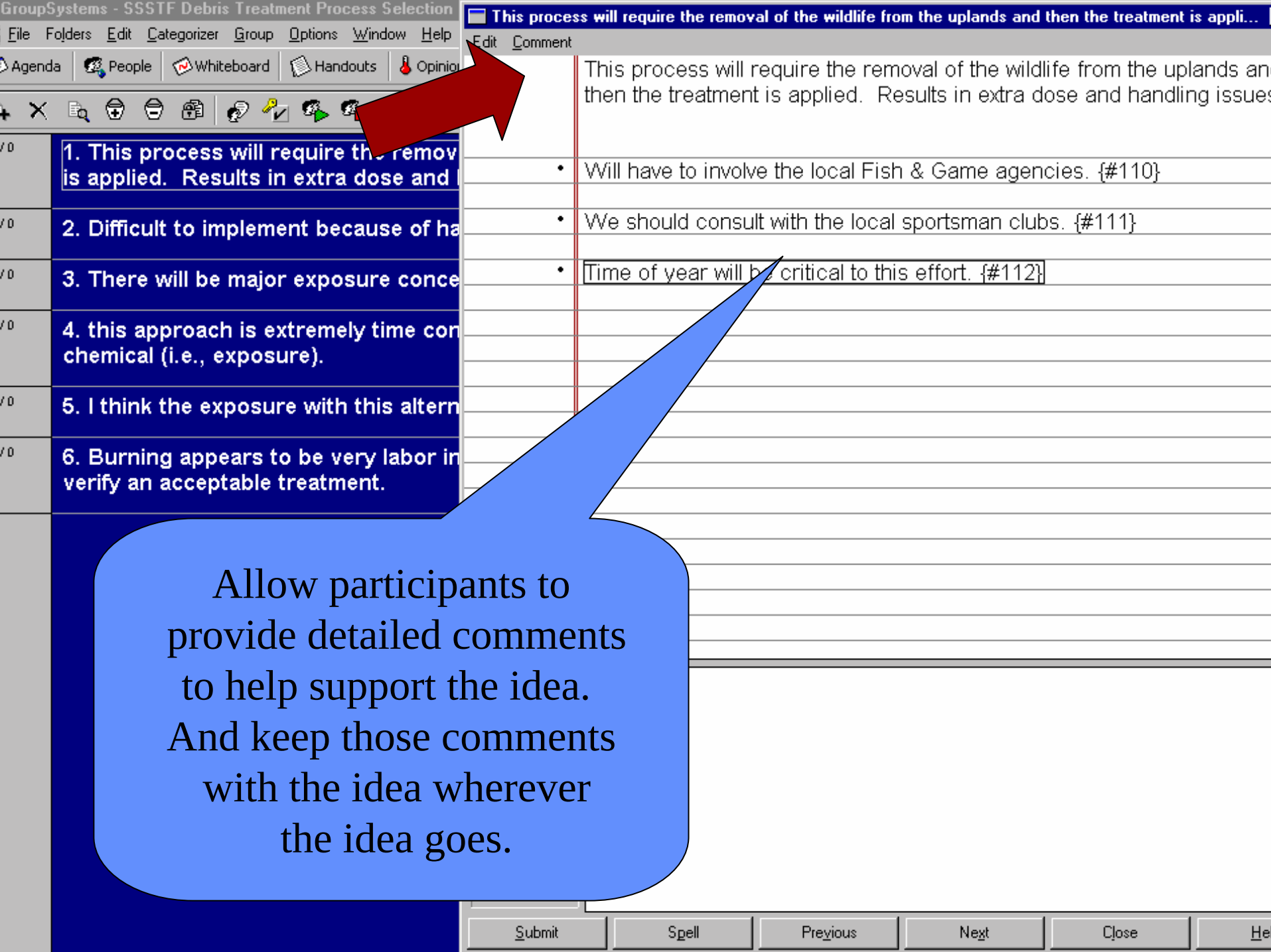
Group Systems Improve Work Group Thought and Expedite Planning & NEPA Process

Will Demonstrate How Group Systems and Computerized Facilitation tools improve Team efficiency because it

- **Facilitates Work Group refinement of issues and alternative solution prescription options**
- **Quickly consolidates critical mutual Goals and Objectives**
- **Determines Alternative range, mix and responsiveness and suitability of criteria fit**
- **Helps develop the viable Alternatives among complex choices**
- **Greatly enhances selection of Environmentally Preferred Alternatives based on balanced consistently applied criteria and evaluation**

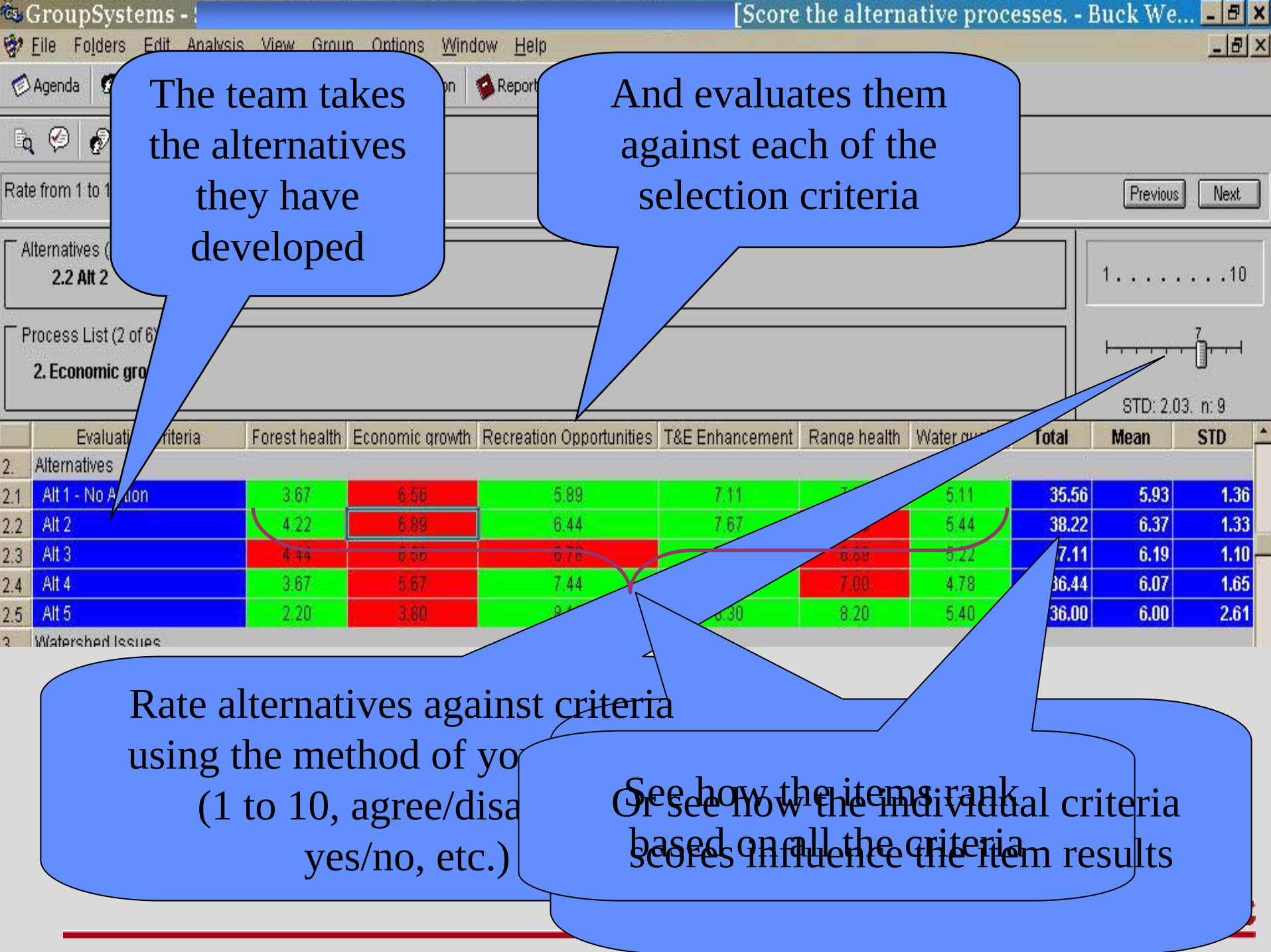

Folders Edit Categorizer Group Options Window Help
People
Whiteboard
Handouts
Opinion
Reports
Briefcase
Log
Find
Folder List
1. This process will require the removal of the wildlife from the uplands and then the treatment is applied. Results in extra dose and handling issues.
2. Difficult to implement because of handling and vapor issues
3. There will be major exposure concerns here
BLM issues.
Alternative 1 - Chemical
Alternative 2 - Controlled burn
Alternative 3 - Mechanical
Then create different Plan Alternatives or option
The ID team can anonymously brainstorm resource alloc or management options. A those management prescr appear on everyone's con at the same time!
And easily drag & drop these management prescriptions into the different Alternatives, options or groups to describe each Alternative


GroupSystems - SSSTF Debris Treatment Process Selection
File Folders Edit Categorizer Group Options Window Help
Agenda People Whiteboard Handouts
1. This process will require th removal of the wildlife from the uplands and then the treatment is applied. Results in extra dose and
2. Difficult to implement because of ha
3. There will be major exposure conce
4. this approach is extremely time con chemical (i.e., exposure).
5. I think the exposure with this altern
6. Burning appears to be very labor in verify an acceptable treatment.
This process will require the removal of the wildlife from the uplands and then the treatment is applied. Results in extra dose and handling issues
Edit Comment
This process will require the removal of the wildlife from the uplands an
Will have to involve the local Fish & Game agencies. {#110}
We should consult with the local sportsman clubs. {#111}
Time of year will be critical to this effort. {#112}
Allow participants to provide detailed comments to help support the idea. And keep those comments with the idea wherever the idea goes.
Submit
Spell
Previous
Next
Close

Selection of NEPA EIS Preferred Alternative

Systems Help Select Preferred Alternative

- Our RMP EIS Analysis Tools and Decision Significantly Enhance Process Steps and Documentation
- Computer-assisted Facilitation for ID Teams Make Plan and NEPA Steps faster and more efficient
- Quick Compare for Issues and Alternative Ranking Systems Provide a basis for Selection
- EIS Decisions are Supported by Sound Analysis and Rationale


The team takes the alternatives they have developed
And evaluates them against each of the selection criteria
Rate alternatives against criteria using the method of yo
(1 to 10, agree/disa
yes/no, etc.)
See how the items rank based on all the criteria
Or see how the individual criteria scores influence the item results
GroupSystems -
[Score the alternative processes. - Buck We...
File Folders Edit Analysis View Group Options Window Help
Agenda
Report
Rate from 1 to 1
Previous
Next
Alternatives (
2.2 Alt 2
Process List (2 of 6)
2. Economic gro
1 10
STD: 2.03. n: 9
Evaluati iteria
Forest health
Economic growth
Recreation Opportunities
T&E Enhancement
Range health
Water qu
Total
Mean
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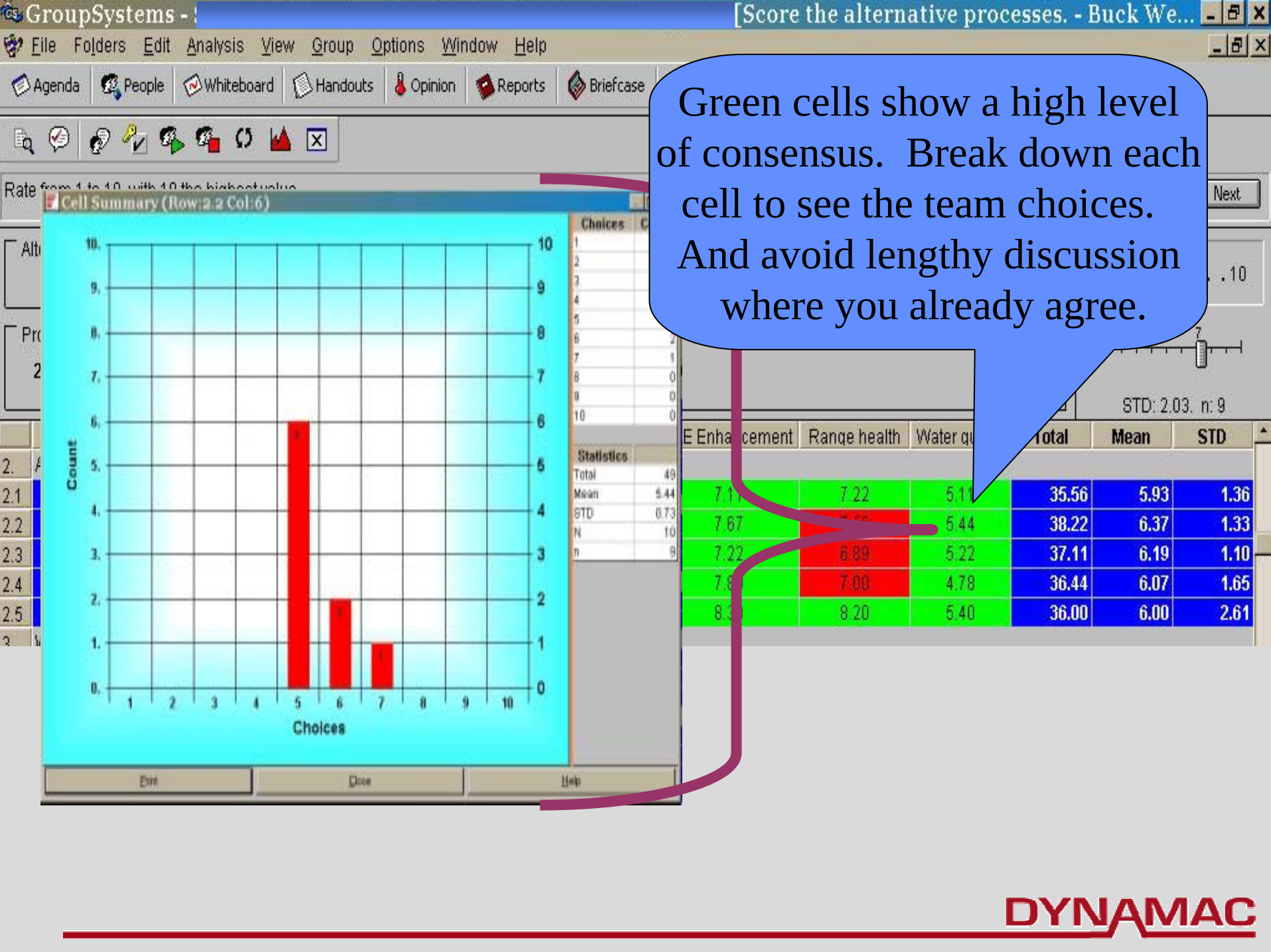
2. Alternatives
2.1 Alt 1 - No A tion 3.67 6.56 5.89 7.11 5.11 35.56 5.93 1.36
2.2 Alt 2 4.22 6.89 6.44 7.67 5.44 38.22 6.37 1.33
2.3 Alt 3 4.44 6.78 5.22 7.11 6.19 1.10
2.4 Alt 4 3.67 5.67 7.44 7.00 4.78 36.44 6.07 1.65
2.5 Alt 5 2.20 3.80 8.30 8.20 5.40 36.00 6.00 2.61
3 Watershed Issues


GroupSystems -
[Score the alternative processes. - Buck We...
File Folders Edit Analysis View Group Options Window Help
Agenda People Whiteboard Handouts Opinion Reports Briefcase
Next
Cell Summary (Row:2.2 Col:6)
Choices
Statistics
Total 49
Mean 5.44
STD 0.73
N 10
n 9
Count
Choices
Print Close Help
STD: 2.03. n: 9
Range health
Water qu
Total
Mean
STD
2.1 7.22 5.11 35.56 5.93 1.36
2.2 7.67 5.44 38.22 6.37 1.33
2.3 7.22 6.89 5.22 37.11 6.19 1.10
2.4 7.00 4.78 36.44 6.07 1.65
2.5 8.20 5.40 36.00 6.00 2.61
Green cells show a high level of consensus. Break down each cell to see the team choices. And avoid lengthy discussion where you already agree.

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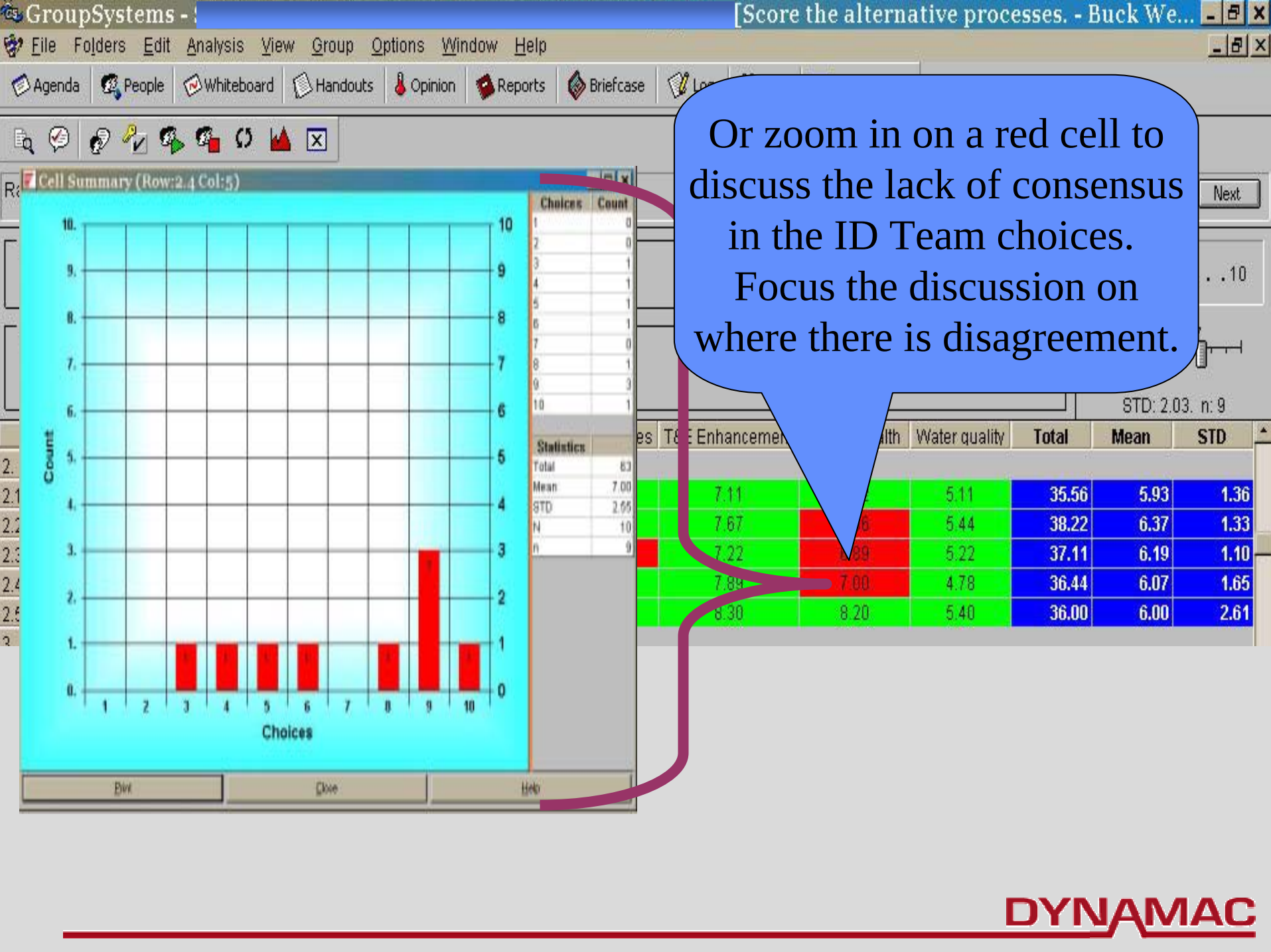
GroupSystems -
[Score the alternative processes. - Buck We...
File Folders Edit Analysis View Group Options Window Help
Agenda People Whiteboard Handouts Opinion Reports Briefcase
Next
Cell Summary (Row:2.4 Col:5)
Choices Count
Statistics
Total 63
Mean 7.00
STD 2.65
N 10
n 9
Count
Choices
Print Close Help
STD: 2.03. n: 9
Water quality Total Mean STD
7.11 5.11 35.56 5.93 1.36
7.67 5.44 38.22 6.37 1.33
7.22 5.22 37.11 6.19 1.10
7.89 7.00 4.78 36.44 6.07 1.65
8.30 8.20 5.40 36.00 6.00 2.61
Or zoom in on a red cell to discuss the lack of consensus in the ID Team choices. Focus the discussion on where there is disagreement.

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3 Process Integration Results at DOE Labs

Purpose

- **Clarifies Plan Steps and EIS Alternative Analysis**
  - Saves ID Team analysis and documentation time, solves right problems due to improved focus, shortens schedule and lowers cost
  - Expands capabilities for alternative screening/selection
  - Builds consensus on plan selection and path forward
  - **Focuses on Plan Selection, Resolving Uncertainties, Decision Rationale**
  - Supports decisions by having the right information available at the right time
  - Prioritizes resource management plan based on consequences and desired end results

Results

Faster - **SRS resolved salt disposition viability issues in 10 months vs. 36 months**

Cheaper - **INEEL reduced calcine R&D costs from $105 Million to $25 Million**

Better - **Hanford resolved Vadose Zone Cs transport issues supporting credible risk assessment and closure planning**

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Beneficial Elements of Decision Architecture

As described in the paper are:

- The requirements and objectives sharpen the statement of purpose and need (problem described without solution)
- Stakeholder involvement refines objectives and goals
- The alternatives attempt to fulfill the objectives and goals
- The criteria are directly measuring the effectiveness of the alternatives to the objectives
- The data collected are connected to the criteria that support objectives measuring the effectiveness of the alternatives to solve the problem

In Summary

- ***Integration of Roadmapping and Decision Analysis with the NEPA Process greatly improve Projects by making them faster, cheaper and better.***
- ***Combining the tools and applying them in Strategic Plans from beginning to end will help you:***
  - ***Eliminate unnecessary data and excess baggage***
  - ***Help the Top focus on elements that are crucial***
  - ***Strengthen data quality and Teams ability to utilize data***
  - ***Measure Alternatives within the Mission or Plan Goals***
  - ***Poor performing Alternatives are screened out early***
  - ***Enhances documentation of analysis and decision rationale***
- ***This makes the completion of the Plan or NEPA Draft EIS easier, provides criteria for selection of a preferred alternative, improves impact analysis and mitigation, reduces cost and effort for the Final EIS, and yields a Legally Sound Defendable Decision/ROD***

For More Information or Demonstration of Tools and Capabilities Give Me a Call

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