

ROBERT BERGER CONSULTING, LLC

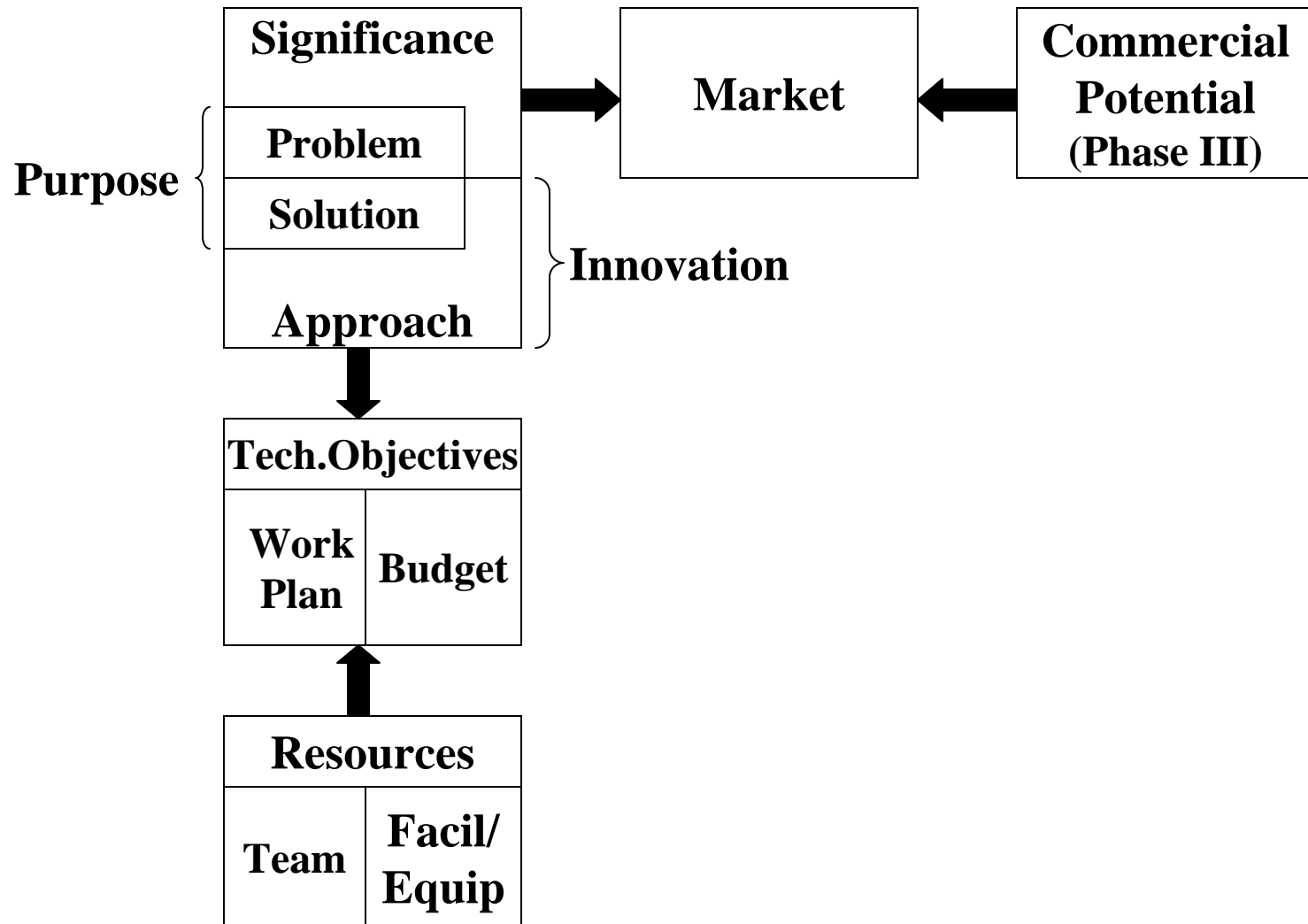
**DEMYSTIFYING
SBIR PROPOSAL PREPARATION**

Robert E. Berger, PhD

**SBIR National Conference
Research Triangle Park, NC
May 2, 2007**

bobberger@comcast.net 410-884-8455 443-226-0066 (cell)

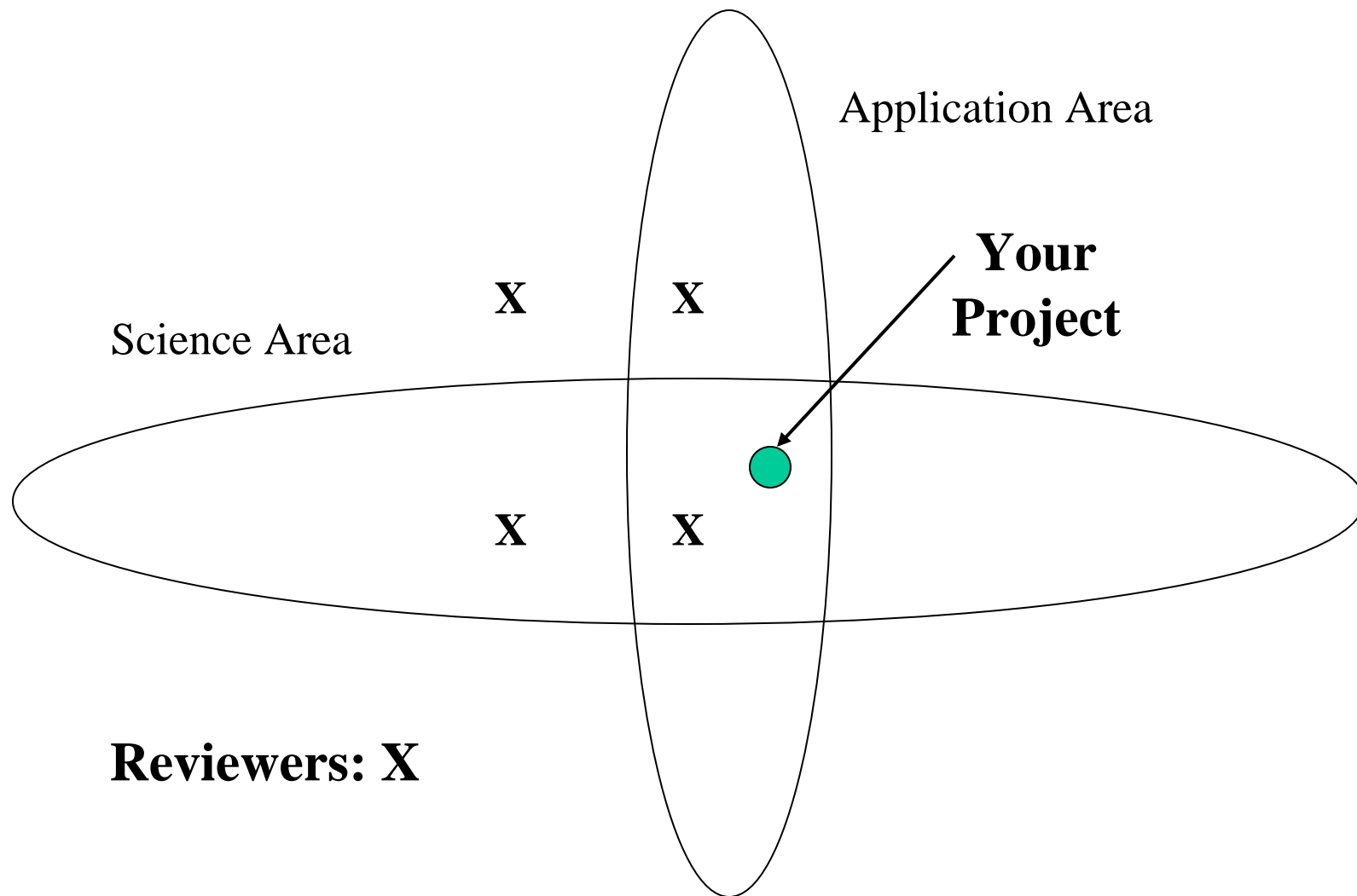
THE FRAMEWORK



REVIEWERS

- They are just like you: busy, conscientious, good at something.
- They are not like you: work in large institutions, little concern with the market or commercialization.
- They cover the full spectrum from lazy to motivated.
- They (usually) want to impress the agency. They do this by playing the game, “See how smart I am!”
- Reviewers in panels are similar, but with some new dynamics.

TYPICAL RELATION BETWEEN REVIEWERS AND PROJECT



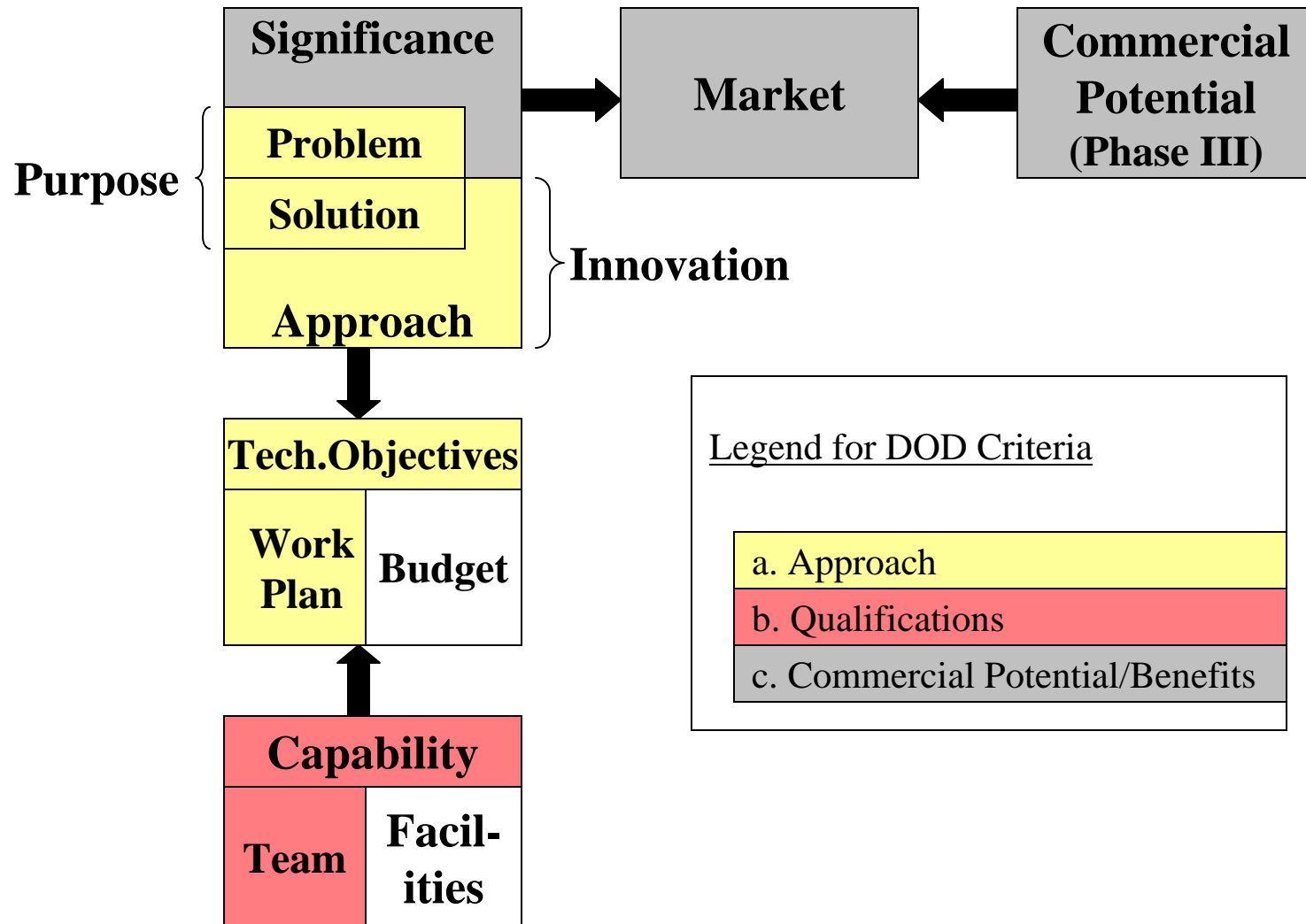
SPECTRUM OF REVIEWERS

Knowledge of Subject	High	Good 1/6	Challenging 1/3
	Low	Best 1/6	Good 1/3
		Lazy	Motivated
		Industrious	

DOD CRITERIA

- a. The soundness, **technical merit, and innovation of the proposed approach** and its incremental progress toward topic or subtopic solution.
- b. The **qualifications** of the proposed principal/key investigators, supporting staff, and consultants. Qualifications include not only the ability to perform the research and development but also the ability to commercialize the results.
- c. The **potential for commercial** (Government or private sector) **application and the benefits** expected to accrue from this commercialization as assessed utilizing the criteria in Section 4.4.

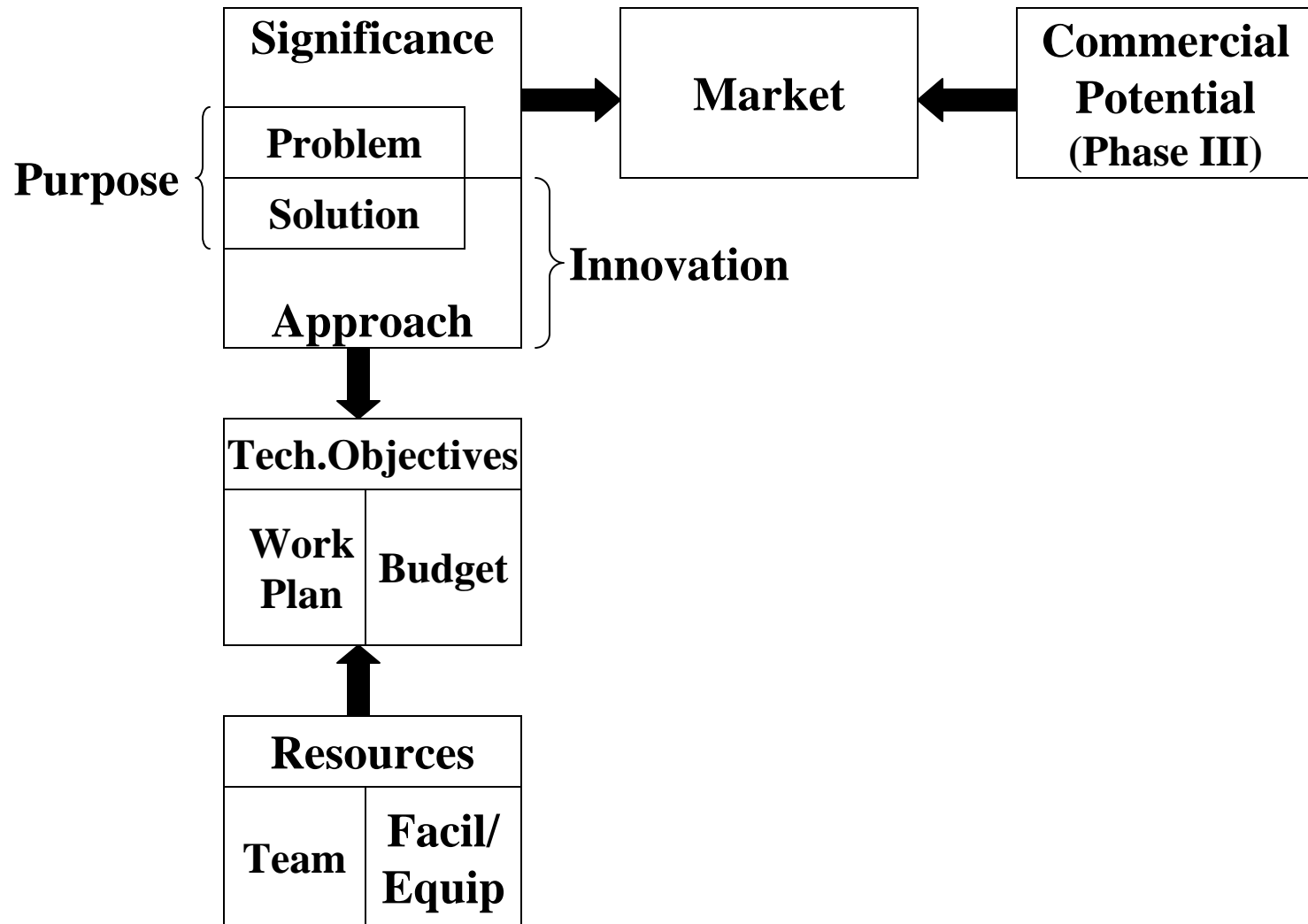
THE FRAMEWORK, WITH DOD CRITERIA



ESSENTIAL PRE-WRITING ACTIVITIES

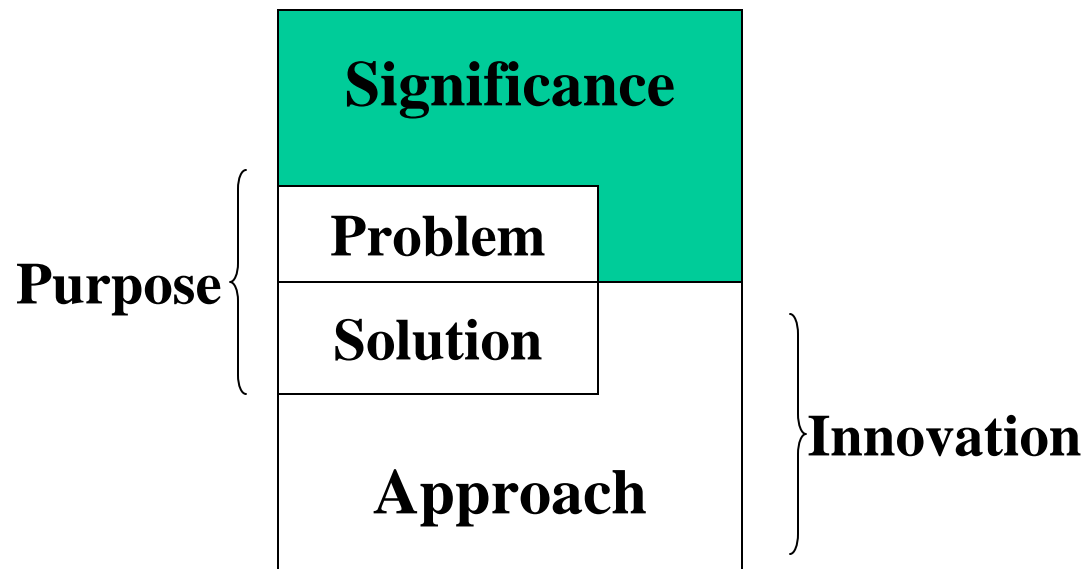
- 1. Identify a problem and a solution (approach to the problem).**
2. Assure that the agency is interested in what you want to do. Contact the agency if there is any doubt.
3. Assure that you can document the state-of-the-art. Do a literature search. Talk to other researchers.
4. Assemble the research team
5. Prepare the list of what you need to know in order to be sure that your idea will work.
6. Identify the Phase I technical objectives.

THE FRAMEWORK



SIGNIFICANCE OF THE WORK

The Heart of the Proposal



SIGNIFICANCE OF THE WORK

Key elements:

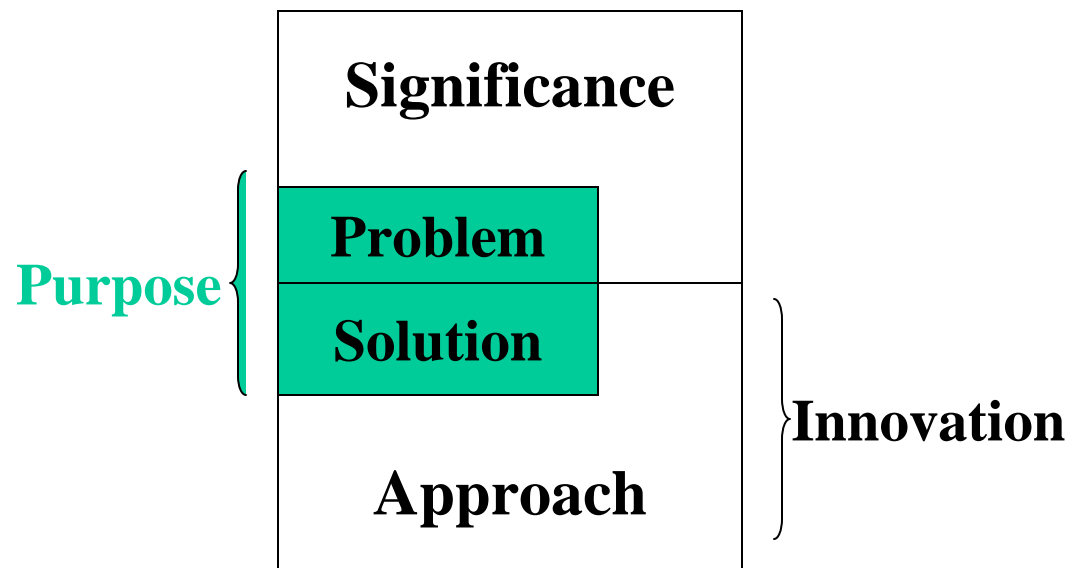
- There is a big problem that needs solving.
- We have found that part of the problem that, if solved, is the key.
- If we solve it, there will be big benefits.
 - Economic or societal benefits
 - Technical benefits

ECONOMIC/SOCIETAL BENEFITS

- *The impact of the proposed work will be considerable and immediate, as it would provide a relatively simple recipe to enhance efficiency and could be adopted, through licensing, by any company intent on developing devices for general illumination.*
- *If successful, this project would represent an improvement over currently available BW agent detection systems. The increased sensitivity and selectivity is critically needed in the war on bioterrorism.*
- *The key economic benefit of the proposed work is that it takes a geologic sequestration option, carbon-dioxide-enhanced coal-bed-methane recovery, and makes it more interesting by adding the ability to convert the sequestered carbon dioxide back into a methane fuel, making methane a renewable resource.*

FRAMEWORK: HEART OF THE PROPOSAL

Problem: The specific technical problem, which, when solved, will have significance to a more general problem



EXAMPLE: Solid-Acid Catalyst for Refinery Alkylation

High-octane alkylate, a major blending component of reformulated gasoline, is currently made using liquid-acid catalysts. For nearly three decades, major oil companies have been active in developing solid-acid catalysts as an alternative to hazardous liquid acids.

Although some solid-acid catalysts catalyze the alkylation reaction, they deactivate rapidly on stream, due to coke formation. The problem of rapid deactivation has prevented virtually every known solid-acid catalyst from being a commercially viable and environmentally-superior alternative to conventional liquid-acid alkylation processes. This project will develop a practical solid-acid catalyst that solves the problem of rapid deactivation by optimally distributing the acid sites within the catalyst pellet, thereby significantly reducing olefin concentration at acid sites. During Phase I, the new class of solid acid catalysts will be synthesized, characterized, and tested for paraffin alkylation. Performance of this new class of catalysts will be compared to the performance of conventional solid-acid catalysts.

REVIEWER CONCERNS: PROBLEM/SOLUTION

Proposed Solution Does Not Appear to Address Problem

- *Difficulties with the cladding material are primarily due to instabilities that occur during radiation. The proposed fabrication technique does not seem to offer an obvious improvement to preventing this effect.*

Awareness of Alternative Solutions Not Demonstrated

- *The proposal omits any reference to the most common laser diagnostic methods. The authors should discuss the advantages and disadvantages of their approach compared to more conventional technology, both in terms of instrument performance (accuracy, precision, sensitivity, stability) and practicality (long-term reliability, complexity, size, etc.).*

REVIEWER CONCERNS: PROBLEM/SOLUTION

Not Enough Information to Evaluate Solution

- *While the overall plan is sound, the proposal lacks detail about how such a network will be constructed and what class of known and unknown attacks will be handled.*

Agency's Problem Does Not Appear to be Addressed

- *This proposal is for the development of low-cost packaging for semiconductor lasers, which would be welcome for the data transmission industry. However, for nuclear physics' needs, the cost of active packaging is acceptable. The applicant should adapt commercially available optical packages rather than develop new technology. This proposal looks more like industry production development than innovative packaging.*

ESSENTIAL PRE-WRITING ACTIVITIES

1. **Identify a problem and a solution (approach to the problem).**
2. Assure that the agency is interested in what you want to do. Contact the agency if there is any doubt.
3. Assure that you can document the state-of-the-art. Do a literature search. Talk to other researchers.
4. Assemble the research team
5. Prepare the list of what you need to know in order to be sure that your idea will work.
6. Identify the Phase I technical objectives.

ASSURING YOUR IDEA WILL BE RESPONSIVE TO THE TOPIC/SUBTOPIC

- Call the agency
- Identify the decision maker or the author of the topic/subtopic
- Be relentless in your search, but gentle for the conversation
- Make it clear that you are not seeking a competitive advantage
- You merely want to describe your idea, to ascertain responsiveness
- But if you get the right person, and that person is communicative, go for it.

ESSENTIAL PRE-WRITING ACTIVITIES

- 1. Identify a problem and a solution (approach to the problem).**
2. Assure that the agency is interested in what you want to do. Contact the agency if there is any doubt.
3. Assure that you can document the state-of-the-art. Do a literature search. Talk to other researchers.
- 4. Assemble the research team**
5. Prepare the list of what you need to know in order to be sure that your idea will work.
6. Identify the Phase I technical objectives.

REVIEWERS MAY BE PREDISPOSED TO ENDORSE THE RESEARCH TEAM

- *If I were to pick one group in the world to develop these techniques, it would include all the key members listed in this proposal. Simply put, these are the folks who have led the way for the past decade and are the most qualified to attempt the proposed experiments.*

REVIEWERS CAN BE PERSUADED

- *Their credentials look fine to me. They have demonstrated their knowledge of all of the key technologies in the text of the proposal. I have no reason to believe they are not qualified to do the work.*

EXPERTISE MISSING IN A SCIENCE AREA

- *The experience of the research team is excellent in optics and instrument development. However, the group lacks direct knowledge of molecular biology, as needed for the successful completion of this interdisciplinary program.*

EXPERTISE MISSING IN APPLICATIONS AREA

- *While the qualifications of the PI and other key staff are considerable in several key project disciplines (particularly neural networking), no individuals are listed with experience in designing or developing intrusion detection systems. Without this experience, the learning curve will be tremendous.*

FINDING PARTNERS TO COMPLETE THE RESEARCH TEAM

- Identify where expertise may be needed.
- Identify who has the expertise.
 - Ask the agency
 - Conduct a literature search, review journal articles
 - Perform an Internet search
- Call the expert. The pitch:
 - Here's my idea
 - Would you consider being a part of the team
 - Please read proposal, identify weaknesses, how to correct them, and identify a role for yourself on the team
 - If we win, you will be a consultant or a subcontractor
- Things to negotiate: confidentiality agreements, how to share intellectual property, how to share commercialization rights

LEVEL OF EFFORT REQUIREMENTS

	<u>Small Business</u>	<u>Research Institution</u>	<u>Other Consultants Subcontractors</u>
SBIR	2/3 in Phase I 1/2 in Phase II	Participation optional	Participation optional
STTR	40% in Phase I and Phase II	30% in Phase I and Phase II	Participation optional

IMPLICATIONS FOR RESEARCH INSTITUTIONS

Maximum dollars available per project:

	<u>Ph I</u>	<u>Ph II</u>	<u>Total</u>
• SBIR	33K	375K	408K
• STTR	60K	450K	510K

Plus potential commercialization royalties

REVIEWERS ENDORSE PARTNERSHIPS

- *The PI is unknown in the field (as verified by a publication search). However, his management background and education are on a level commensurate with an ability to study the given problem. The consultants at Argonne are better known and have plenty of experience in high energy physics investigations. The combination of experience both within the company and at Argonne should be more than adequate to develop a viable product.*

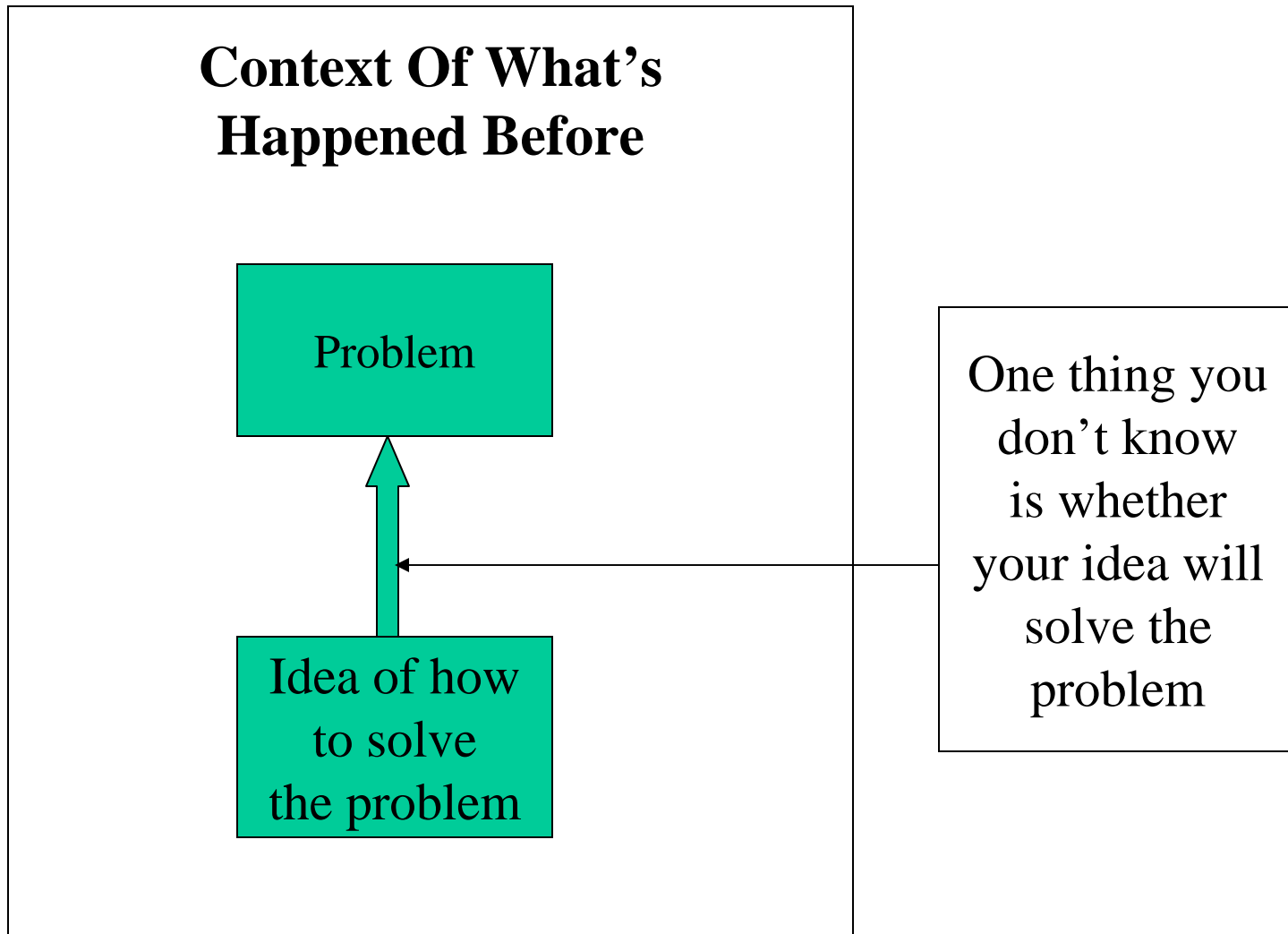
BUT PARTNERSHIPS MUST BE DOCUMENTED

- *The other key staff, specifically the consultants and collaborators called out in the proposal, do have the combined qualifications to carry out the proposed research, **but there is no clear indication of commitment of these outside consultants and collaborators.***

ESSENTIAL PRE-WRITING ACTIVITIES

- 1. Identify a problem and a solution (approach to the problem).**
2. Assure that the agency is interested in what you want to do. Contact the agency if there is any doubt.
3. Assure that you can document the state-of-the-art. Do a literature search. Talk to other researchers.
4. Assemble the research team
5. Prepare the list of what you need to know in order to be sure that your idea will work.
6. Identify the Phase I technical objectives.

IDENTIFYING WHAT YOU DON'T KNOW



EXAMPLE: Viscous Liquid Grouts for Use in Sludge Removal

Leakage of contaminants during the removal of sludge from underground storage tanks at DOE's Hanford facility poses a serious risk to the environment. Contaminated sludge is planned for removal by sluicing the tanks with water to dislodge the sludge and then pumping from the tank. Unfortunately, as a result of tank deterioration, the potential exists for the release of a large volume of radioactive contaminants into the subsurface that can migrate to the groundwater. This project will develop technology for injecting viscous liquid grout in the subsurface area around the tank(s) to prevent the release of contaminants mobilized by the sluicing of the tanks for sludge removal. In Phase I, a series of injection and column tests are proposed on two types of liquid grouts, colloidal silica and polysilixane, to determine injectability and compatibility with the subsurface soils at Hanford. Test measurements will include gel time, gel strength, cure time, and properties. After the grout is cured, hydraulic testing will be performed to determine soil hydraulic conductivity.

RESEARCH QUESTIONS FROM EXAMPLE

- What is the best material to use for the grout? How to determine? What tests? How many materials to explore?
- Once a material is identified, how to determine whether it can be injected into the soil?
- Once injected, will it be compatible with the soil? Will it maintain its integrity in the soil? Will there be any adverse effect on the soil?
- Once in the soil, will the material contain the contaminant?
- What can go wrong? How to address what may go wrong?
- What will be the costs of implementation (material, installation, equipment)? Will the solution be cost effective?

TWO LISTS

Within the context of what's happened before,

What I need to know to be sure it will work

-
-
-
-
-
-

The Research

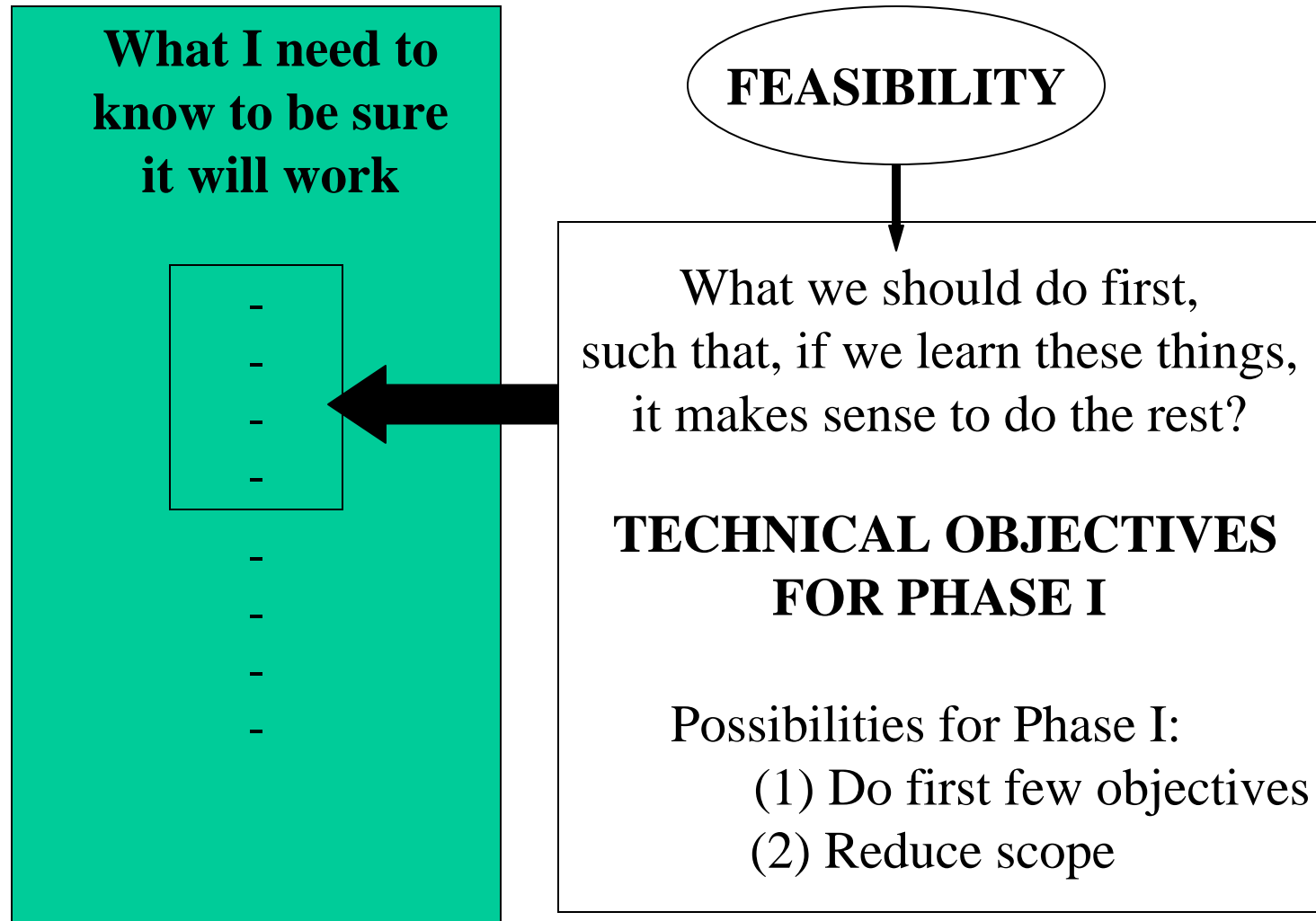
What is needed to solve the problem

-
-
-
-
-
-

The Approach



THE PHASE I / PHASE II DISTINCTION



REVIEWERS UNDERSTAND PHASE I/PHASE II DISTINCTION

- *A number of design, fabrication, and packaging issues can be investigated toward proving feasibility without producing actual devices. Of course, some issues (e.g., device performance and production yield) cannot be investigated without going through actual fabrication steps. These would have to be postponed until Phase II, but this is not unjustified considering the number of complex issues to be addressed.*
- *The scientific/technical approach is credible, but the scale proposed in Phase I (identifying a full range of terrorist threats, targets, and scenarios) is not credible. The proposal should be restricted to one or two targets and threat scenarios. I do not believe they fully understand the scope of the problem.*

PHASE II CONSIDERATIONS

- Much of the Introductory sections will be the same.
- The excellent science is still in the combined project.
- Major changes required:
 - “Heart of the Proposal” includes section on Phase I.
 - Technical Objectives will be replaced by the remainder of the objectives you did not address in Phase I
 - Work Plan rewritten to address Phase II technical objectives.
 - Many more details on Commercialization Potential.

PHASE II CONSIDERATIONS (continued)

Exception: When you learn in Phase I that it makes sense to change the problem or the solution. Then:

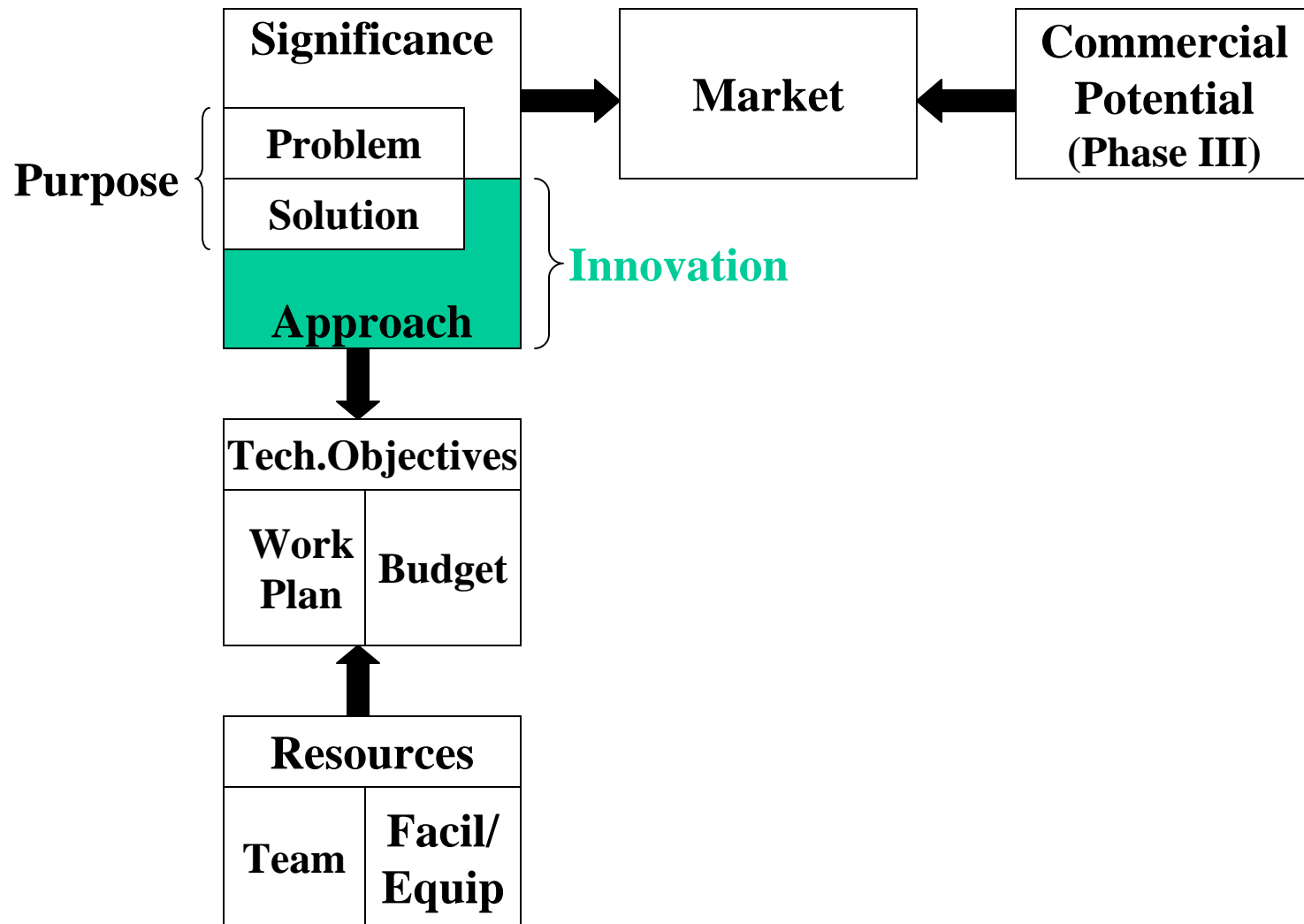
- Check with technical monitor to see if the agency still has interest in new problem/solution.
- In general, re-write “Heart-of-the-Proposal” as if new problem/solution was intended all along.
- But, write “What Happened in Phase I” honestly, showing how it led to modified approach. Explain that you checked with agency.
- Modify Phase II Technical Objectives as appropriate.

STARTING TO WRITE THE PROPOSAL:

A general, logical sequence, written in a context of what's happened before

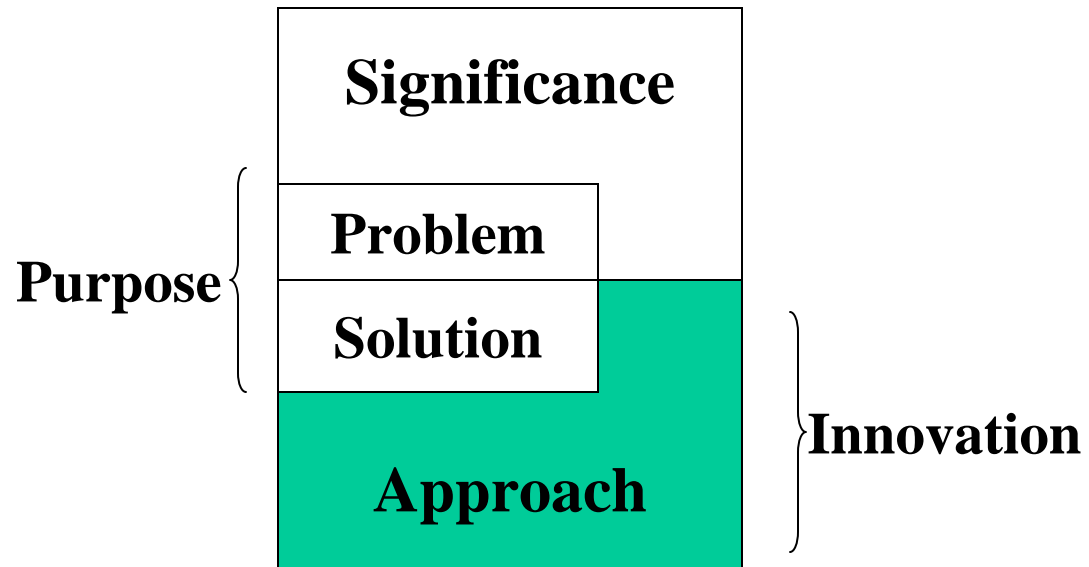
1. The general problem, and the benefits of solving it
2. The specific technical problem, and proposed solution
3. What you must to learn to determine whether the proposed solution works
4. Your approach to solving the specific technical problem
5. The Phase I technical objectives

THE FRAMEWORK - The Heart of the Proposal



THE APPROACH

The Heart of the Proposal



THE APPROACH

Key elements:

- How we're going to solve the problem.
- What are the different components of the solution.
- What must we learn, and how we will find out what we don't know?
- What makes our solution new? Why is our approach to the problem better than what else is available or what has been tried before?
- Where might our approach go wrong? How will we address such things?
- What makes this work challenging?

REVIEWER CONCERNS: THE APPROACH

Will Approach Really Lead to a Solution of the Problem?

- *The model selected for study – liquid flow in a tube – does not adequately represent the hydrological application for groundwater seepage. Flow in a porous medium would be significantly slower, and it is unclear how the difference in upstream and downstream travel time would be related to the average linear velocity.*

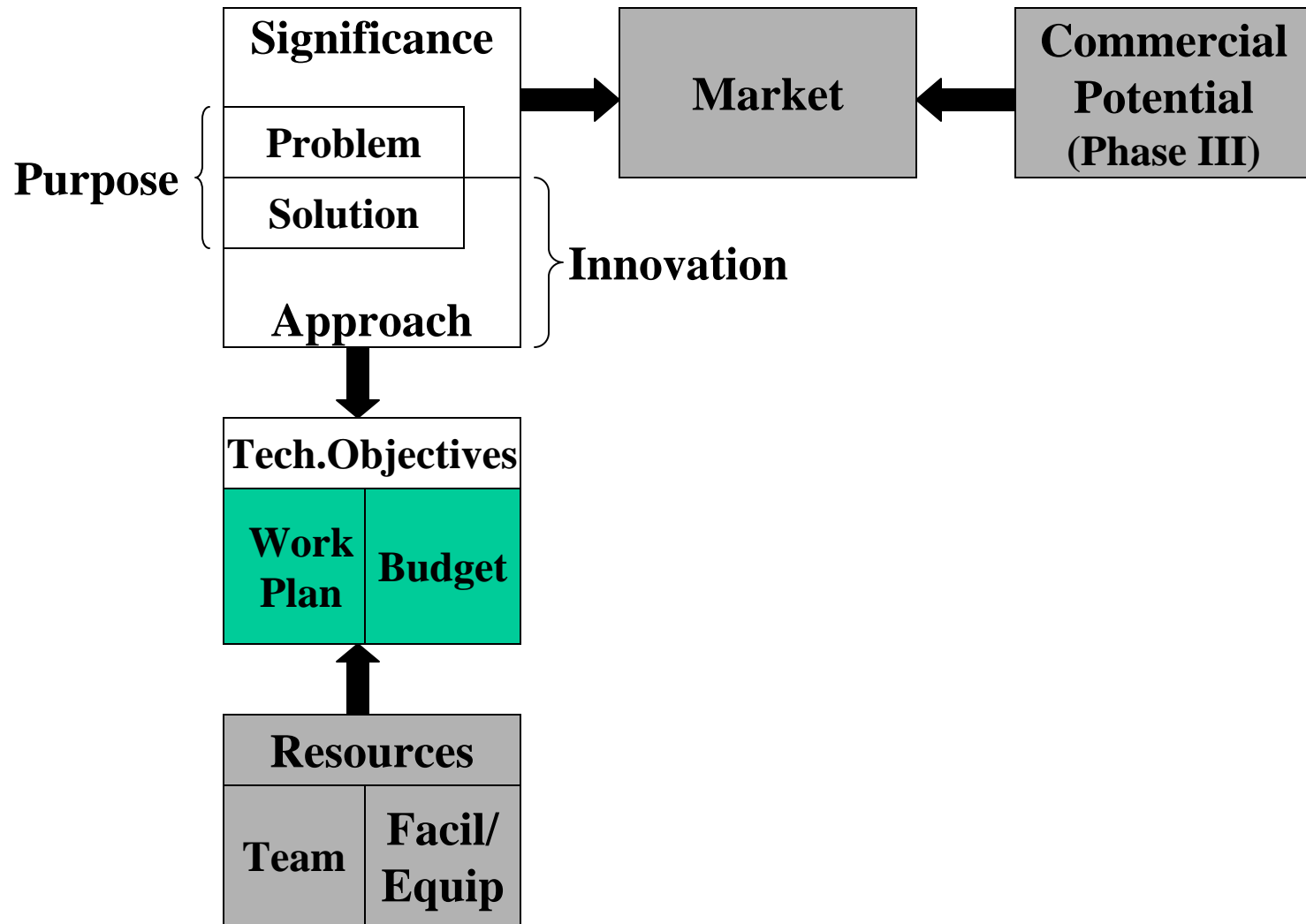
What Can Go Wrong?

- *There was no discussion of how to prevent corrosion on the outside of the housing of the temperature measuring device. This corrosion would greatly reduce responsiveness and accuracy of the measurement.*

Is It Doable?

- *The application to commercially viable products is extremely high risk. No data is provided to suggest that this approach will produce components with performance superior to conventional materials.*

THE FRAMEWORK - Can You Get It Done?



THE WORK PLAN

Objectives vs. Tasks

Technical Objectives

Objective 1

Objective 2

Objective 3

-
-
-

For each objective, state the criteria by which you will determine whether or not you have accomplished the objective.

Work Plan

Task 1

Task 2

Task 3

-
-

For each task, state what will you do, why it is necessary, who will do it, what you will need to get it done.

THE WORK PLAN – OBJECTIVES VS. TASKS

Technical Objectives

Objective 1

Objective 2

Objective 3

•

•

•

Work Plan

Task 1

Task 2

Task 3

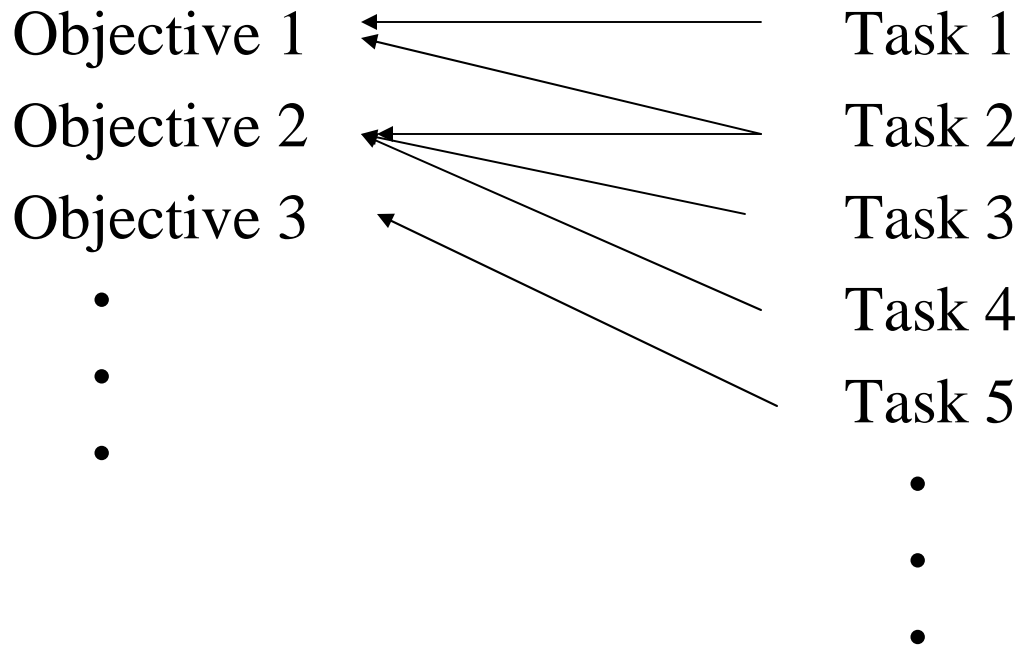
Task 4

Task 5

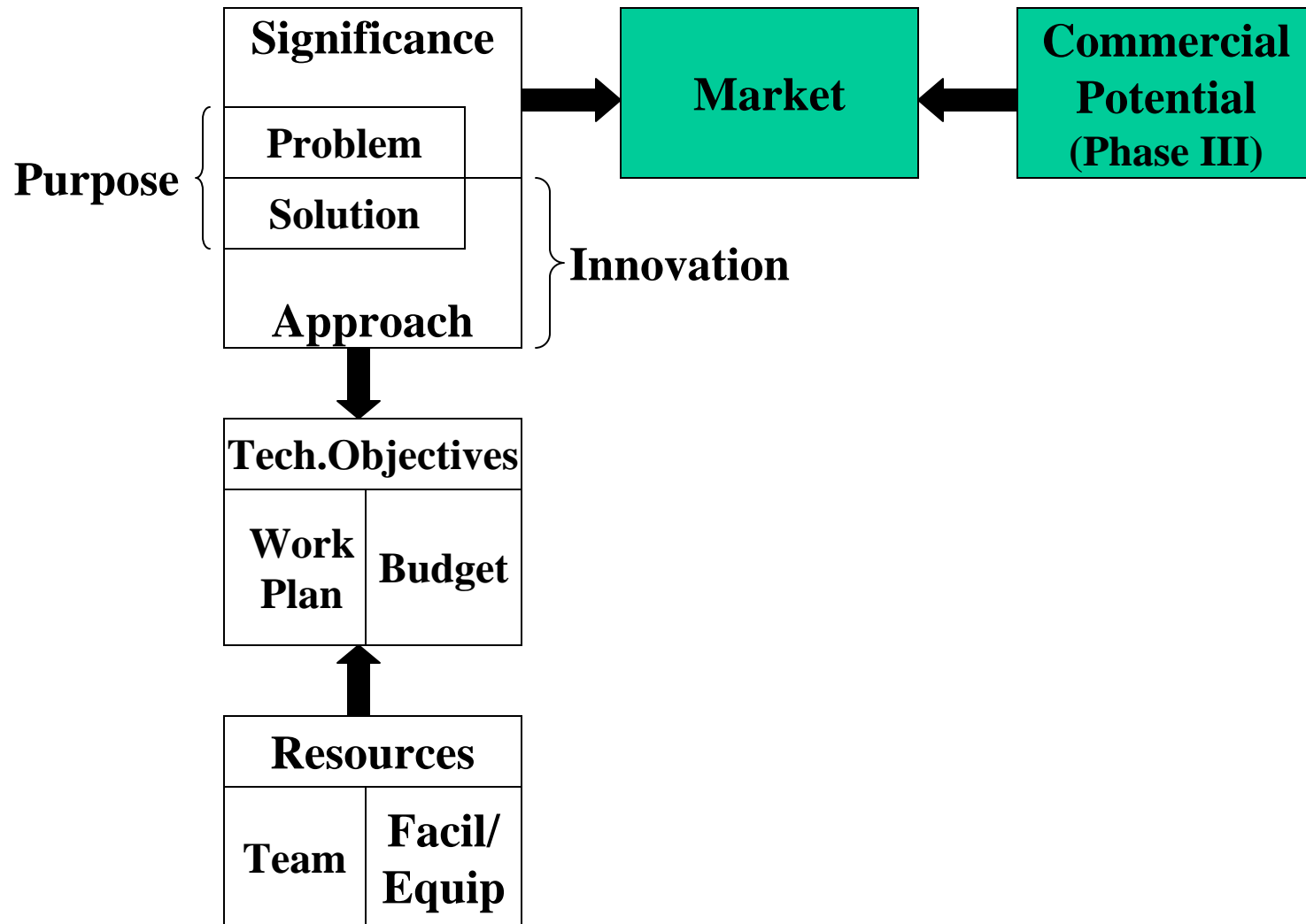
•

•

•



THE FRAMEWORK - Phase III



PHASE III

Agency Criteria Related to Commercialization

- **DOE:** The likelihood that the proposed work could lead to a marketable product or process
- **DOD:** The potential for commercial (government or private sector) application, and the benefits expected to accrue from this commercialization
- **NIH:** Does the proposed project have commercial potential to lead to a marketable product or process?
- **NSF:** Does the outcome of the proposed activity lead to a marketable product?
- **NASA:** Potential commercial applications in the private sector or use by the Federal government

THE SEQUENCE FOR WRITING THE PROPOSAL

- 1. The general problem, and the benefits of solving it**
 - a. There is a big problem that needs solving
 - b. Solving the problem leads to big benefits, economic/societal and technical
- 2. The specific technical problem, and proposed solution**
 - We have identified the key technical issue
 - The idea for solving the problem
 - Components of the solution
 - Why the idea is innovative
- 3. What you must learn to determine whether the proposed solution works**
 - The research questions
- 4. Your approach to solving the specific technical problem**
 - How we will find what we don't know
 - Why the approach is better than others that have been tried
 - What might go wrong and how we will address it
 - Why the work is challenging
- 5. The Phase I technical objectives**

THE SEQUENCE FOR WRITING THE PROPOSAL

(Continued)

6. The Work Plan and the Budget

- Link tasks to objectives
- Criteria to determine when objectives and feasibility are accomplished
- Details of what will be done
- Budget: Link to tasks, use budget explanation page if appropriate

7. Resources: Research Team and Facilities/Equipment

- Link resources to tasks
- Identify and document partners to address weaknesses

8. Potential for Phase III

- Description of the market
- Pathway to the market
- Potential commercialization partners and investors

DOD FORMAT

- (1) Identification and Significance of the Problem or Opportunity**
- (2) Phase I Technical Objectives**
- (3) Phase I Work Plan**
- (4) Related Work**
- (5) Relationship with Future Research or Research and Development**
 - State the anticipated results of the proposed approach if the project is successful
 - Discuss the significance of the Phase I effort in providing a foundation for Phase II research
- (6) Commercialization Strategy**
- (7) Key Personnel**
- (8) Facilities/Equipment**
- (9) Subcontractors/Consultants**

DOD FORMAT

SEQUENCE

- (1) **Identification and Significance of the Problem or Opportunity** **(1),(2),(3),(4), Context**
- (2) **Phase I Technical Objectives** **(5)**
- (3) **Phase I Work Plan** **(6) with (7)_{substance}**
- (4) **Related Work** **References**
- (5) **Relationship with Future Research or Research and Development**
 - State the anticipated results of the proposed approach if the project is successful..... **(1b)_{reprise}**
 - Discuss the significance of the Phase I effort in providing a foundation for Phase II research **(3)_{reprise}**
- (6) **Commercialization Strategy** **(8)**
- (7) **Key Personnel** **(7)_{details}**
- (8) **Facilities/Equipment** **(7)_{details}**
- (9) **Subcontractors/Consultants** **(7)_{details}**

ROBERT BERGER CONSULTING, LLC

YOU ARE NOW OFFENSIVE COORDINATORS!

For additional help with proposal preparation,
please contact Bob Berger at:

bobberger@comcast.net
410-884-8455, 443-226-0066 (cell)