

Proposal Development Strategies

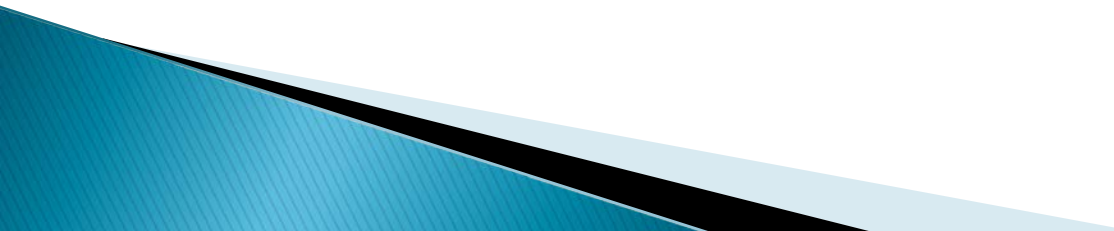
responsive to modifications in NSF merit
review criteria

GPG 13.1 http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf13001

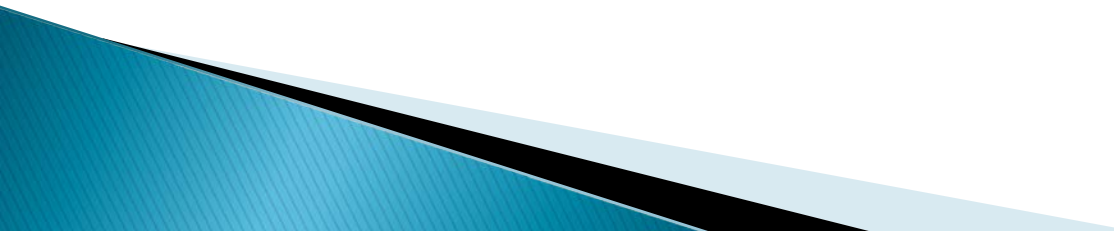
General strategy for developing your proposal (*regardless of sponsor*)

- ▶ Consider how it will be reviewed
 - Review (selection) criteria
 - Review (selection) process
 - Guidance to reviewers – available??

Outline – NSF merit review criteria & impact on proposal development

- ▶ *Merit review* – What's changed (and what's the same)?
 - ▶ Why the changes?
 - ▶ Some other 'procedural' changes
 - ▶ What reviewers will consider during review
 - ▶ Putting it all together – strategies to develop the project description and other materials
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NSF review criteria remain...

- ▶ Intellectual merit (IM)
- ▶ Broader Impacts (BI)

But the BI criterion has been *clarified*

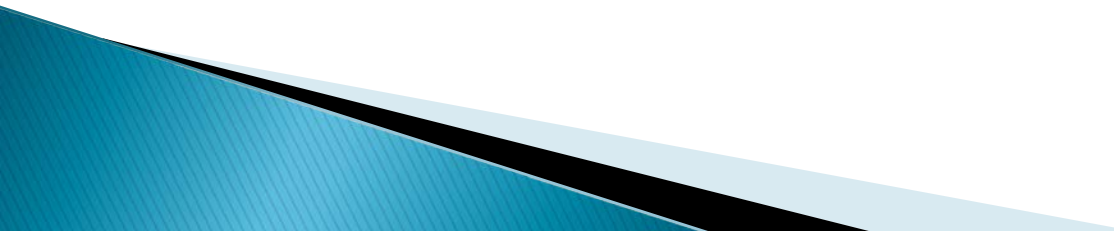
Previous: GPG 11.1 – What are broader Impacts of the activity?

- ▶ How well does the activity advance discovery and understanding while promoting teaching, training, and learning?
- ▶ How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)?
- ▶ To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships?
- ▶ Will the results be disseminated broadly to enhance scientific and technological understanding?
- ▶ What may be the benefits of the proposed activity to society?

New GPG 13.1 – The BI criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

1. What is the potential for the proposed activity 1.b. *to benefit society or advance desired societal outcomes?*
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

The IM criterion has not changed

1. What is the potential for the proposed activity 1.a. to advance knowledge and understanding within its own field or across different fields;
 2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
 3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
 4. How well qualified is the individual, team, or organization to conduct the proposed activities?
 5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?
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New: Merit review *guiding principles*

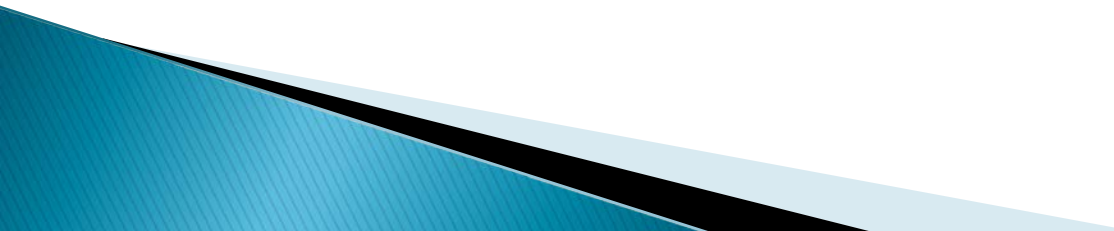
1. All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
2. NSF projects, in the aggregate, should contribute more broadly to achieving societal goals.

- These broader impacts may be accomplished
 - through the research itself,
 - through activities that are directly related to specific research projects, or
 - through activities that are supported by, but are complementary to, the project.

The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.

3. Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects.
- If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

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- 

Changes respond to two doc's

1. America COMPETES Act, 2010 §526
 - <http://www.nsf.gov/nsb/publications/2011/nsb1211.pdf>
 - BI specifically addressed
 - Appendix B
2. NSF Merit Review Task force report
 - <http://www.nsf.gov/nsb/publications/2011/nsb1211.pdf>
 - Confusion about BI criterion
 - Inconsistent interpretation

America COMPETES Act, 2010

§526 – Broader Impacts Review Criterion

- ▶ The foundation shall apply a BI review criterion to achieve the following goals:
 - ↑↑ economic competitiveness of US
 - develop globally competitive STEM workforce
 - ↑↑ participation of women & URM in STEM
 - ↑↑ partnerships between academic and industry
 - Improve pre-K through 12 STEM ed and teacher partnerships
 - Improve undergrad STEM education
 - ↑↑ public scientific literacy
 - ↑↑ national security
- 

Merit review task force report

“In the final analysis, NSB believes that the IM and BI review criteria together capture the important elements that should guide the evaluation of NSF proposals. Because of the great breadth and diversity of research and education activities that are supported by NSF, the Board has decided not to recommend a specific set of activities related to Broader Impacts, just as it would not recommend particular types of research– those decisions are best left to the PIs to describe and to the NSF to evaluate, for relevance to *programmatic priorities and alignment with NSF’s core strategies for achieving its mission*,** as described in the NSF Strategic Plan for FY 2011– 2016 “Empowering the Nation through Discovery and Innovation:” (http://www.nsf.gov/news/strategicplan/nsfstrategicplan_2011_2016.pdf)

- ▶ Be a leader in envisioning the future of science and engineering.
- ▶ Integrate research and education and build capacity.
- ▶ Broaden participation in the science and engineering research and education enterprises.
- ▶ Learn through assessment and evaluation of NSF programs, processes, and outcomes.

** emphasis added

So.. How to address “potential to benefit society and contribute to the achievement of specific, desired societal outcomes”

- ▶ Reflect on § 526 America COMPETES Act, 2010
 - ▶ Read and reflect on the NSF 11–16 strategic plan, the three strategic goals, and the associated performance goals that emerge from core strategies
1. **Transform the frontiers**
 2. **Innovate for society**
 3. **Perform as a model organization**

Four performance goals for transformation goal

1. Transform the frontiers

T-1: Make investments that lead to **emerging** new fields of science and engineering and shifts in existing fields.

T-2: **Prepare and engage a diverse STEM workforce** motivated to participate at the frontiers.

T-3: Keep the United States globally competitive at the frontiers of knowledge by increasing international **partnerships and collaborations**.

T-4: Enhance **research infrastructure and promote data access** to support researchers' and educators' capabilities and enable transformation at the frontiers.

2. Innovate for society, and

3. Perform as a model organization

Three performance goals for innovation goal..

1. Transform the frontiers

2. **Innovate for society**

I-1: Make investments that lead to **results and resources** that are useful to society.

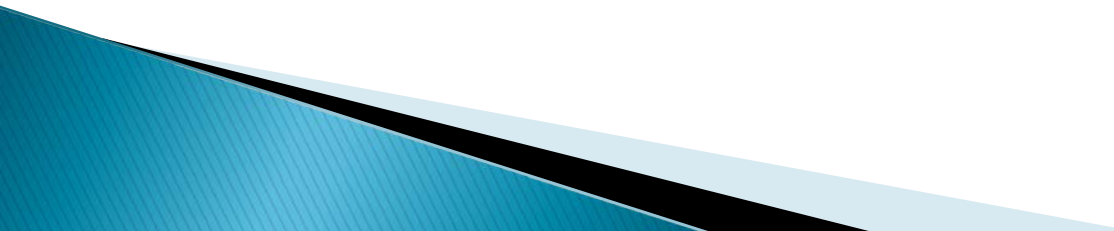
I-2: **Build the capacity** of the nation's citizenry for addressing societal challenges through science and engineering.

I-3: Support the development of **innovative learning systems**.

3. Perform as a model organization



Outline – NSF merit review criteria & impact on proposal development

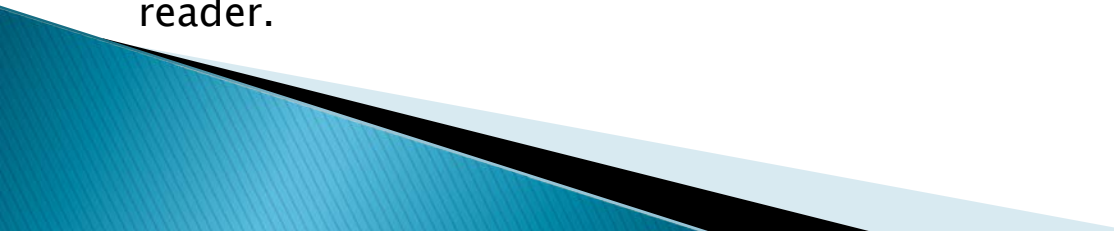
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FASTLANE changes...

Project summary:

- ▶ Must be entered in 3 text boxes in FASTLANE: overview, IM, BI.
 - 4600 characters and spaces, cumulative for all three sections
 - 51 lines
- ▶ unless you have 'special characters' – in that case, a 1 pg doc can be uploaded
- ▶ **Overview:** describe activity that would result if the proposal were funded and a statement of objectives and methods to be employed.
- ▶ **Intellectual merit:** describe the potential of the proposed activity to advance knowledge.
- ▶ **Broader impacts:** describe the potential of the proposed activity to benefit society and contribute to the achievement of specific, desired societal outcomes.

3rd third person, informative to other persons working in the same or related fields, and, insofar as possible, understandable to a scientifically or technically literate lay reader.



Other changes ...

▶ **Project description:**

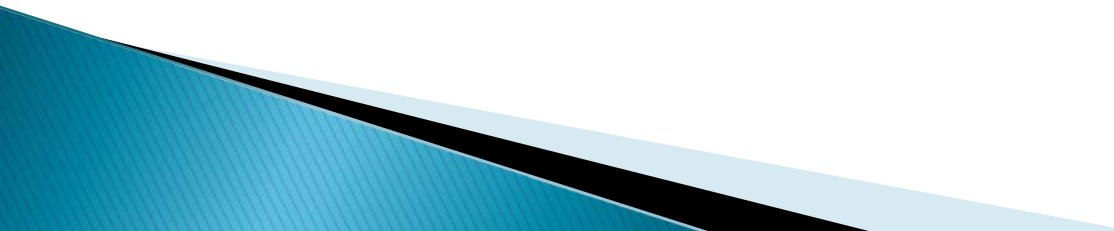
- must have separate sections for intellectual merit and broader impacts;
- NSF prior results must now include IM and BI activities

▶ **Annual Progress Reports.**

- IM and BI will also be reported separately in annual progress reports (among other changes)

▶ **Face page certifications for OSP**

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Strategy for developing your proposal

- ▶ Consider how it will be reviewed
 - Review criteria
 - Review process
 - Guidance to reviewers

The review process

When evaluating NSF proposals, reviewers should consider **

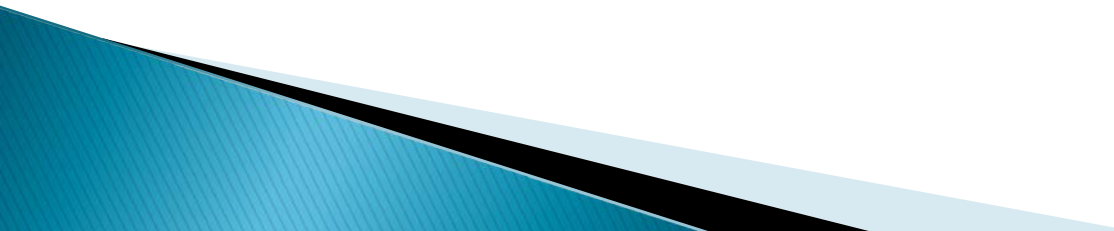
1. what the proposers want to do,
2. why they want to do it,
3. how they plan to do it,
4. how they will know if they succeed, and
5. what benefits would accrue if the project is successful.

These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions.

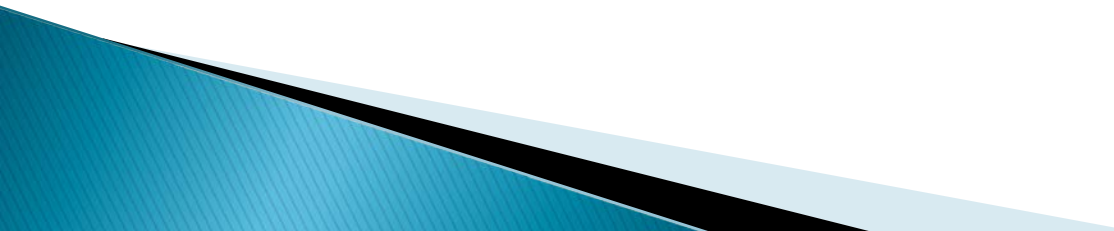
**http://www.nsf.gov/pubs/policydocs/pappguide/nsf13001/gpg_3.jsp



How will the review be conducted?

- ▶ Question #1 "In the context of the five review elements, please *evaluate the strengths and weaknesses* of the proposal with respect to intellectual merit."
 - ▶ Question #2 "In the context of the five review elements, please *evaluate the strengths and weaknesses* of the proposal with respect *to broader impacts*."
 - ▶ (Question #3) (new), "Please evaluate the strengths and weaknesses of the proposal *with respect to any additional solicitation-specific review criteria*, if applicable."
 - ▶ The "Summary Statement" will remain the same.
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Given the America COMPETES Act & NSF's strategic plan for BI

What do you want to do that's consistent with one / more of those goals?

- What goal do you want to address?
- What kind of results (and so data) would indicate that you are making progress toward achieving that goal(s)?
- What kinds of activities would generate those data
→ 'results'
- How would you perform those activities?
 - And who needs to be involved in them, and when?

Guidance from the GPG 13.1 on the project description

- ▶ Provides a clear statement of the work to be undertaken and include:
 - **objectives** for the period of the proposed work and expected significance;
 - relation to **longer-term goals of the PI's project**; and
 - relation to the **present state of knowledge in the field**, to work in progress by the PI under other support and to work in progress elsewhere.
- ▶ Should outline the general plan of work, including the broad design of activities to be undertaken, and, where appropriate, provide a clear description of experimental methods and procedures.
 - Proposers should address what they want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. *Guidance to reviewers*
 - The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified. *From guiding principles*
 - These issues apply to both the technical aspects of the proposal and the way in which the project may make broader contributions.

Guidance from the GPG 13.1 on the project description

- ▶ Must contain, *as a separate section within the narrative*, a discussion of the BI of the proposed activities.
 - BI may be accomplished through the research itself, through the activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to the project. *From guiding principles*
 - NSF values the advancement of scientific knowledge and activities that contribute to the achievement of societally relevant outcomes.

Guidance from the GPG 13.1 on the project description

- ▶ Must contain, *as a separate section within the narrative*, a discussion of the broader impacts of the proposed activities. ...
 - Such outcomes include, **(America Competes Act and Strategic Plan)** but are not limited to:
 - full participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM);
 - improved STEM education and educator development at any level;
 - increased public scientific literacy and public engagement with science and technology;
 - improved well-being of individuals in society;
 - development of a diverse, globally competitive STEM workforce;
 - increased partnerships between academia, industry, and others;
 - improved national security; increased economic competitiveness of the United States; and
 - enhanced infrastructure for research and education.

Guidance from the GPG 13.1 on the project description

- ▶ Plans for data management and sharing of the products of research, including preservation, documentation, and sharing of data, samples, physical collections, curriculum materials and other related research and education products should be described in the Special Information and Supplementary Documentation section of the proposal (see [GPG Chapter II.C.2.j](#) for additional instructions for preparation of this section).

Project development – strategies

Concept (given guidance to reviewers):

1. what do you want to do, *the NSF goal; other goal from blue-ribbon report (idea, problem)*
2. why do you want to do it, *rationale, need, motivation*
3. how will you do it, *the approach, including rationale for selection, potential pitfalls and alternatives, and analysis / evaluation*
4. how will you know you are successful, *results, and interpretation, (integration of all) (vs alternative possibilities) and outcomes, and*
5. what benefits would accrue if the project is successful.
So what?

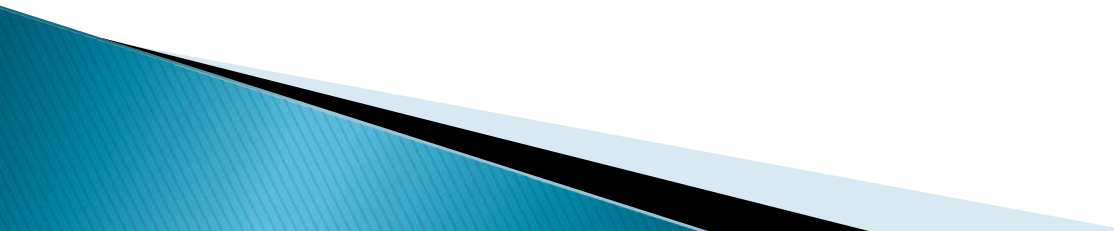
Mapping review criteria with concept

1. What is the potential for the proposed activity to
 - a) Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); *What you want to do, so what?*
 - b) benefit society or advance desired societal outcomes (Broader Impacts)? *What you want to do, so what?*
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts? *Why you want to do it? idea, state of knowledge, approach, so what?...*

Mapping review criteria with concept

3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success? *How you will do it? Work plan / Approach (including prelim results); rationale for project design, each method, etc; pit-falls; evaluation (or positive / negative controls)...*
4. How well qualified is the individual, team, or organization to conduct the proposed activities? *Preliminary results, Biographical Sketches, References cited, FER, letters of collaboration*
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities? *Facilities, equipment, Resources (FER)*

Importance of FER..

- ▶ Assess the adequacy of the resources available to perform the effort proposed to satisfy both Intellectual Merit and Broader Impacts review criteria.
 - ▶ Describe **only** those resources that are directly applicable.
 - ▶ Include an aggregated description of the **internal and external resources** (**both physical and personnel**) that the organization and its collaborators will provide to the project, should it be funded.
 - ▶ The narrative description must not include any quantifiable financial information.
 - ▶ If there are no FER to describe, a statement to that effect should be included in this section of the proposal and uploaded into FastLane
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Generic Project Description Outline

- I. **Motivation / rationale** for project (1st pg)
 - Problem statement or integrated project goal and BI activities if appropriate (**what do you want to do and why it is important**)
 - Place idea in context (see forest from trees)
 - What will you do i.e., objectives to achieve goals
 - Significance of each objective's outcomes to overarching project goal
- II. **State of knowledge / art** (Cite yourself as well as any controversies) (**original, creative, innovative, transformative**)
 - what is known (and unknown)
 - where do you hope to contribute?
 - why is your proposed contribution important, significant or needed?
- II. **Foundational / preliminary data** (*sometimes in approach*)
 - **Qualifications / capabilities of team**
 - NOTE: State of knowledge / preliminary results should re-enforce both the significance of and the rationale for your idea as well as the feasibility and appropriateness of the approach(es) proposed

Generic Project Description Outline

- iv. **Approach (or work plan) – is plan well-reasoned, well-organized, and based on a sound rationale? Plan incorporate a mechanism to assess success?**
 - Organize by objective or present general methods followed by specific methods for each objective
 - a) **Experimental design** (if applicable including power calc's)
 - b) **Rationale for design and approach selected** (why have you selected the approach / method / technique you have – *why is it the best way to address the objective from among all available?*).
 - c) **Experimental methods/conditions** to be employed including positive / negative controls (if applicable); or describe artifacts to be collected, how collected / by whom, and how quality determined.
 - Describe anticipated challenges and barriers and ways to overcome
 - d) **How will data be analyzed** (including rationale for approach)
 - e) **What results are expected?** that indicate success or 'failure' –
 - f) **How are results interpreted** in context of objectives and overarching goal (hypothesis); how are 'failures' or unexpected results / outcomes interpreted? (and their significance)

Generic Project Description Outline

▶ Timeline

- Present timeline for activities and major events
- *How much time will you allocate to each objective?*
- *Who will do the work? Do you have evidence they on board?*

▶ Space Allocation (total – 14 pg):

- Rationale – 1 pg
- Research (IM) – 9 pg (approach: 4 – 5 pg)
- Broader Impacts – 3 pages
 - Broader Impacts activities may be integrated in IM sections, however, must have separate section, so at minimum – have outcomes be explicit / separate and organization allow reviewers to address each review criteria.
- Timeline & Integration of research / education – 1 pg

General comments

- ▶ The proposal – *in its entirety* – conveys
 - You've a great idea
 - It's too important not to fund
 - Your work plan uses approaches that are most appropriate for the objectives/ questions at hand
 - The project team is both qualified and capable to do the work proposed (have demonstrated their abilities to do project and have all required 'stuff')
 - Value
- ▶ A clearly written proposal describes your thought process at each stage, increasing reviewer confidence of success, reducing risk of failure – and so impact of the investment of tax payers \$\$\$.
- ▶ After the award comes it, it becomes a tool to help manage your efforts 😊