



# Broader Impacts at NSF

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# NSF Merit Review Criteria



## Intellectual Merit (IM)

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The Intellectual Merit criterion encompasses the potential to advance knowledge.

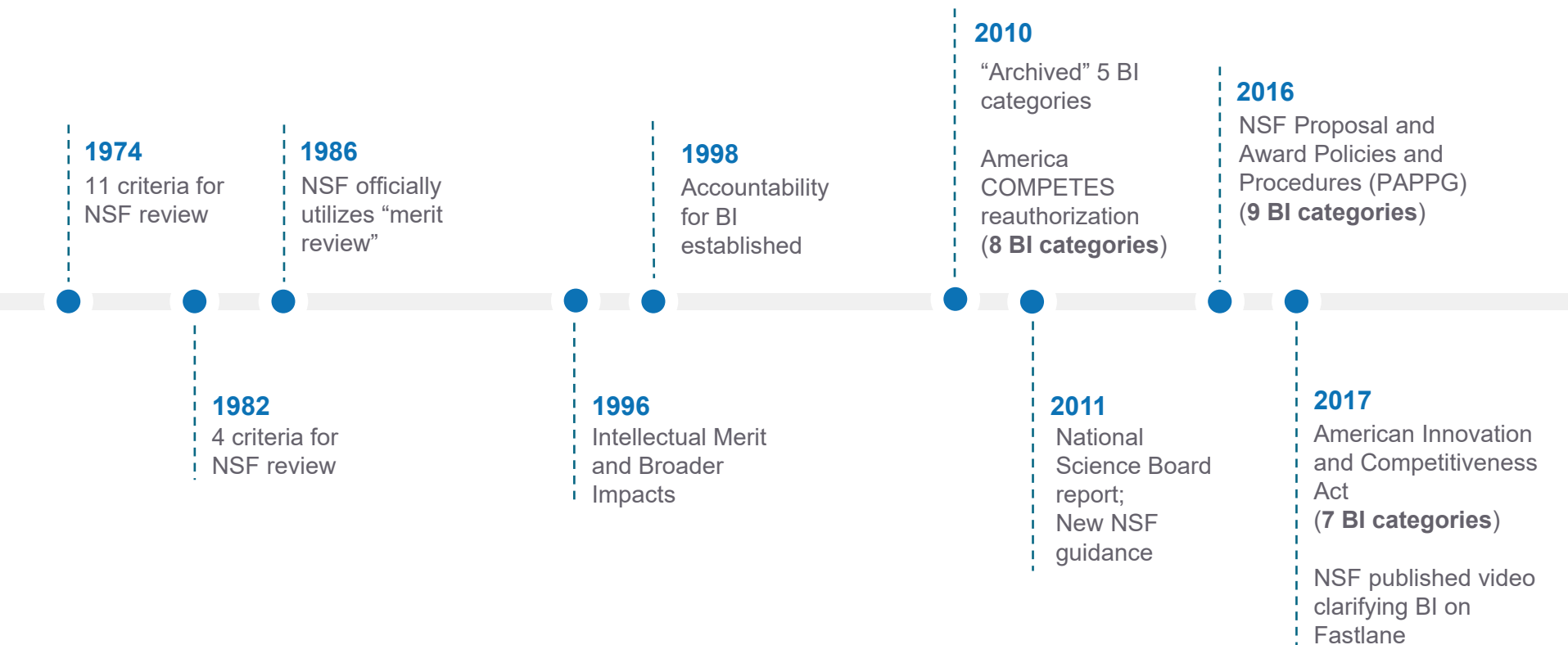


## Broader Impacts (BI)

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The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

# Key Milestones for NSF Merit Review



# Broader Impacts in Policy and Law

|  | <b>“Archived”<br/>List</b>   | <b>America<br/>COMPETES 2010</b>  | <b>AICA<br/>2017</b>   | <b>PAPPG<br/>(current)</b>   |
|--|--|---|--|--|
| <br><b>Training Students,<br/>STEM Education,<br/>and Workforce</b> | Advance discovery, training graduate students, mentoring postdoctoral researchers and junior faculty, involving undergraduates | Development of a globally competitive STEM workforce; improved undergraduate STEM education; improved pre-K-12 STEM education and teacher development | Developing an American STEM workforce that is globally competitive through improved pre-K-12 STEM education and teacher development, and improved undergraduate STEM education and instruction | Improved STEM education and educator development at any level; development of a diverse, globally competitive STEM workforce |
| <br><b>Broadening<br/>Participation</b>                             | Broaden participation of under-represented groups  | Increased participation of women and underrepresented minorities in STEM  | Expanding participation of women and individuals from underrepresented groups in STEM  | Full participation of women, persons with disabilities, and underrepresented minorities in STEM                              |
| <br><b>Enhanced<br/>Infrastructure and<br/>Partnerships</b>         | Enhance infrastructure for research and education  | Increased partnerships between academia and industry  | Enhancing partnerships between academia and industry in the U.S.   | Enhanced infrastructure for research and education; increased partnerships between academia, industry, and others            |
| <br><b>Knowledge<br/>Dissemination and<br/>Scientific Literacy</b>  | Broaden dissemination to enhance scientific and technological understanding  | Increased public scientific literacy  | Improving public scientific literacy and engagement with science and technology in the U.S.  | Increased public scientific literacy and public engagement with science and technology                                       |
| <br><b>Societal Impact and<br/>Economic<br/>Competitiveness</b>   | Benefits to society may occur when results of research and education projects are applied                                      | Increased national security and economic competitiveness of the U.S.  | Increasing the economic competitiveness of the U.S.; advancing the health and welfare of the American public; supporting national defense  | Improved well-being of individuals in society; improved national security; increased economic competitiveness of the U.S.    |

# Critical Clarification - Conceptualizations

## Retrospective

NSF investments have had a large impact

Examples include:

- Billion-dollar tech industries as found in NASEM studies
- Patent studies – connecting NSF proposals to patent applications

## Prospective

BI is a review criterion

Mostly conceived of as activities in a project that have potential

**Broad Scope** *(Like IM)*

BI has 9 PAPPG suggestions

**Varying Scope** *(Like IM)*

Depends on the program and PI knowledge/expertise



# NSF BI Re-Examination Outcomes (2015 – 2017)



Increased understanding of BI role in Merit Review



Merit Review Criteria video developed on BI and review quality

*~15,000 reviewer views*



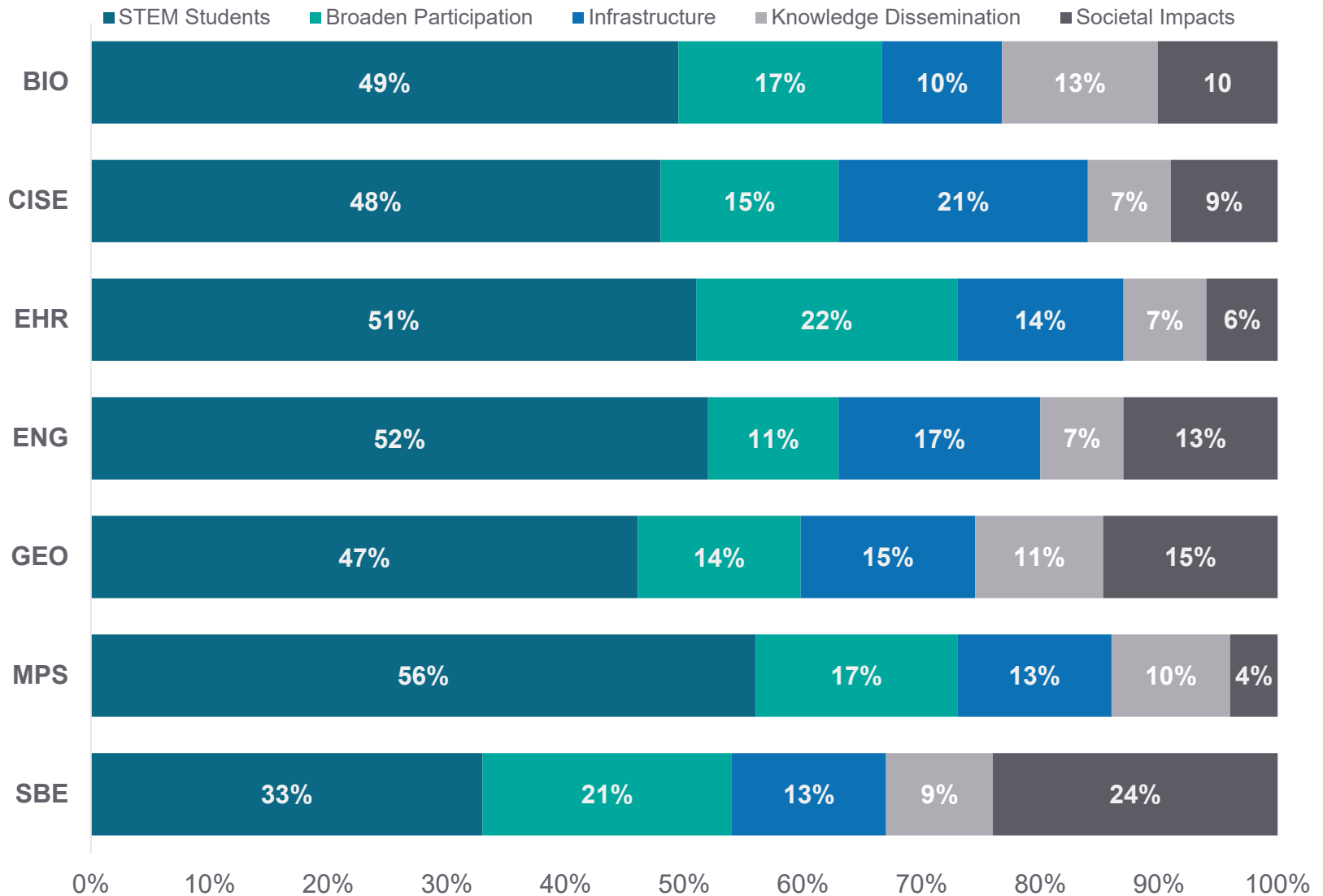
Funding of ARIS (formerly NABI) – aimed at increasing collective impact of BI



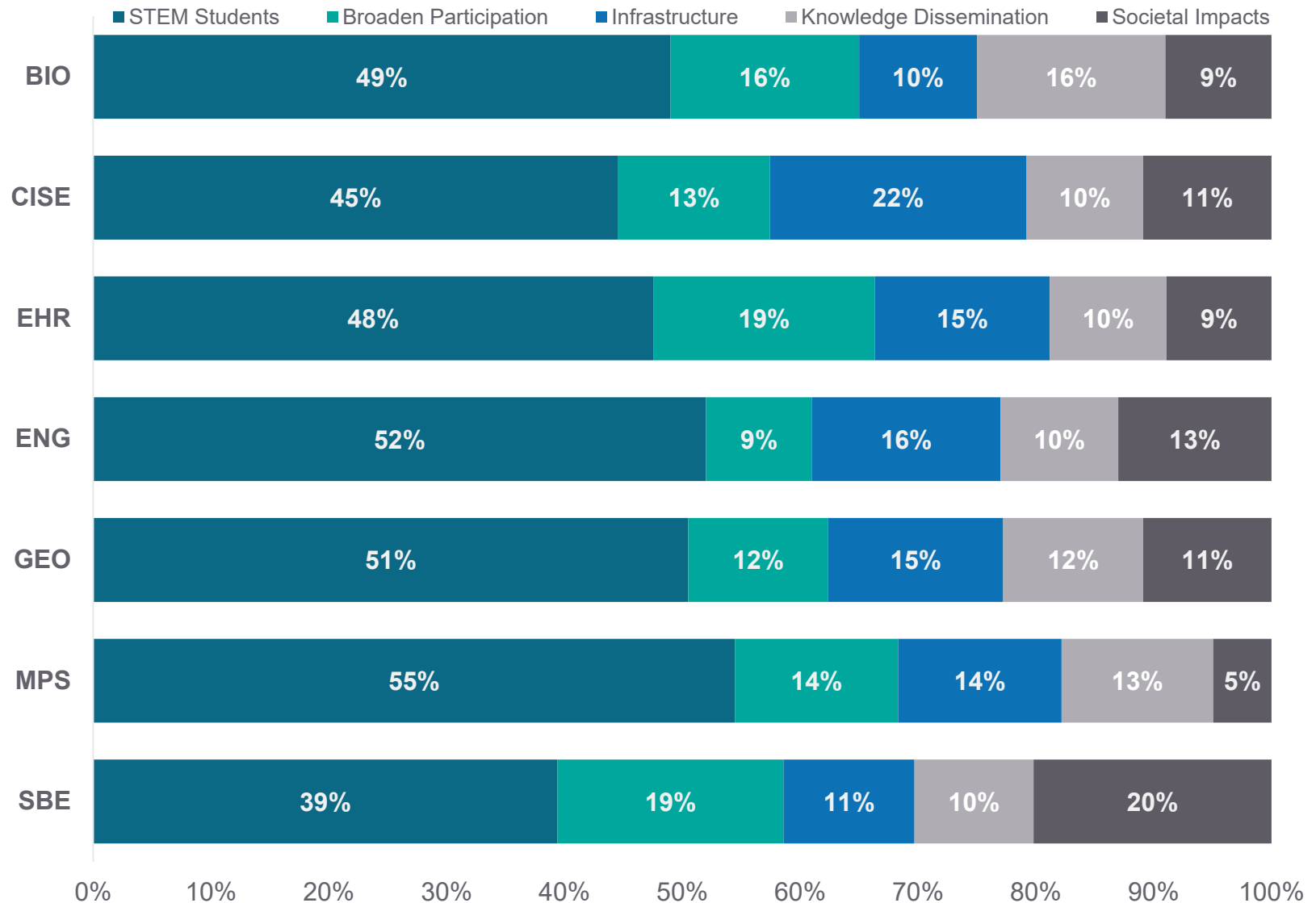
BI Data Analysis – Extensive empirical evidence shows that over 50% of PIs emphasize the importance of human capital development in their BI\*

\* A gap observed: Every year, **~27,000 NSF-funded graduate students** and **~4,500 post-docs** are trained by PIs to lead the next generation of scientists and engineers.

# Directorates: Project Summary FY18



# Directorates: Reviews 2018





# Potential Next Steps

- Attend to student mentoring and development across all NSF-funded projects
  - Recommendation in Graduate STEM Education for 21<sup>st</sup> Century (2019 NASEM study)
  - Congressional focus
  - Societal context
- Update and make the Merit Review Criteria video (slide 11) mandatory for all NSF reviewers
- Fund more institutional/scientific communities collective impact pilots
- Pilot changes in NSF to better support BI
  - E.g., put a BI professional on every CoV
- Reframe IM and BI for a more dynamic perspective
  - IM = Knowledge Creation
  - BI = Knowledge Mobilization



A wide-angle photograph of a snowy landscape, likely a beach or dunes, covered in soft, undulating mounds of snow. Several small, clear pools of water are scattered across the snow. In the background, the ocean meets the horizon under a vast sky filled with wispy, white clouds. A bright sun is setting or rising, creating a strong lens flare and casting a warm, golden glow across the scene. The overall color palette is dominated by cool blues and whites of the snow and sky, contrasted with the warm yellows and oranges of the sunset.

# Thank You

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## Merit Review Criteria Video

# MERIT REVIEW CRITERIA

**Assessing Broader Impacts:**

In assessing Broader Impacts,

# In Every NSF Solicitation...

Broader impacts may be accomplished through the research itself

Through activities directly **related to specific research projects**

Through **activities** that are **supported by**, and **complementary to, the project**

NSF values the advancement of scientific knowledge and activities

Societally relevant outcomes that contribute to achievement include:

- Full participation of women, persons with disabilities, and underrepresented minorities in STEM
- Improved 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 U.S.
- Enhanced infrastructure for research and education

