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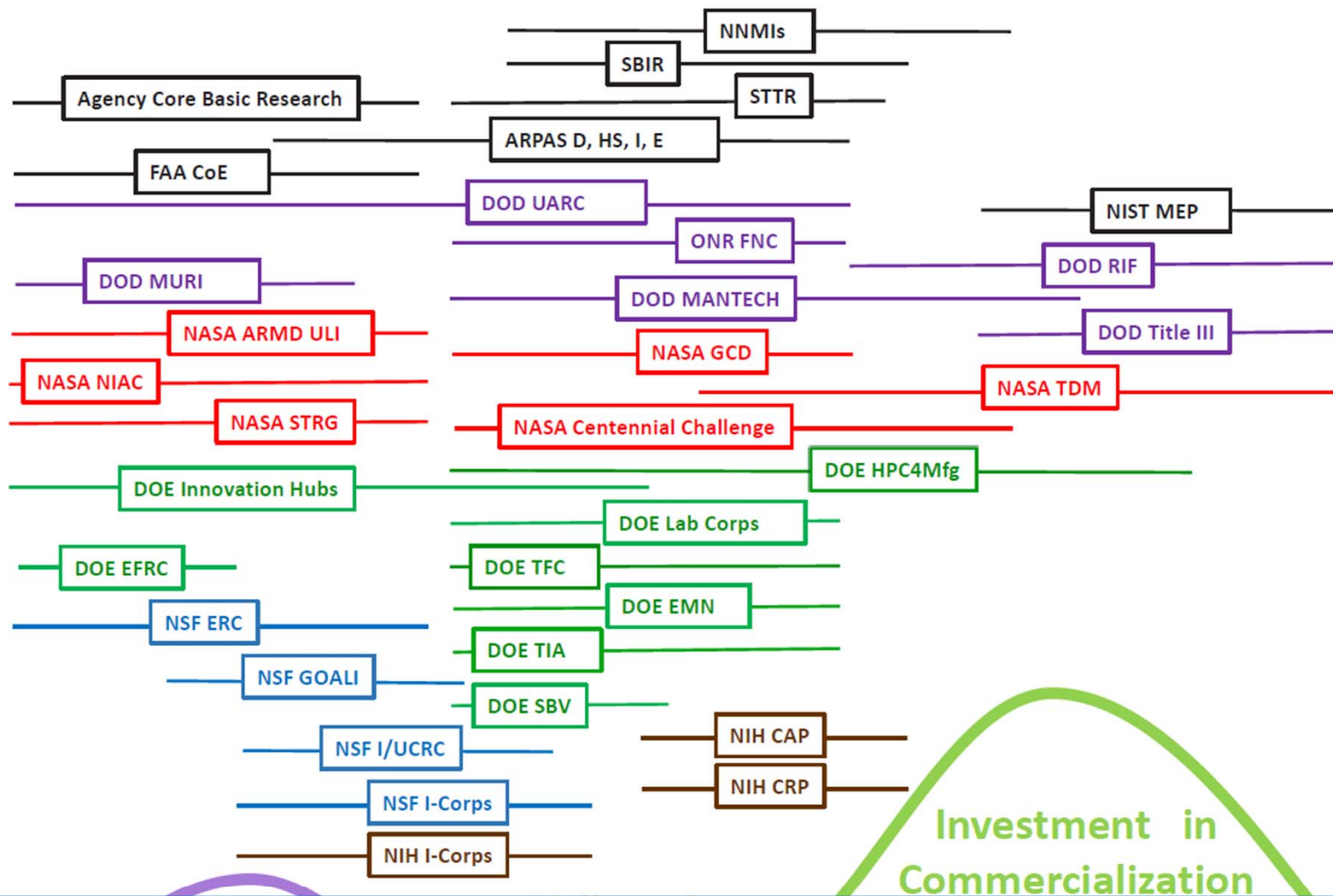
2016 Triennial Review of the National Nanotechnology Initiative

Celia Merzbacher, Committee Chair
James Murday, Committee Vice Chair
Erik Svedberg, Study Director

Statement of Task

- A. Examine and comment on the **mechanisms** in use by the National Nanotechnology Initiative (NNI) **to advance focused areas** of nanotechnology **towards advanced development and commercialization**, along with the **approaches taken to determine** those **focus areas** and to implement the NNI's Signature Initiatives. If warranted, recommend possible improvements.

- B. Examine and comment on the **physical and human infrastructure needs for successful realization in the United States of the benefits of nanotechnology** development. Consider research and development, product design, commercialization, and manufacturing needed both to advance nanoscience and engineering and to grow those portions of the American economy that are spurred by advances in nanotechnologies. If warranted, recommend possible improvements.



Recommendation:

- ✓ Identify federal programs that assist with transitioning to higher TRL
- ✓ Enhance their exploitation by:
 - Encouraging the basic research community to use them
 - Convince transition program managers to include nanoscale solutions.

TRL 1-3

TRL 4-6

TRL 7-9

Advancing Focused Areas

Nano-inspired Grand Challenges require advances in areas outside the NNI.

Conversely, the NNI is investing in technology areas that are critical to the goals of other Federal initiatives.

Recommendation:

- ✓ The NSET should **strengthen engagement with other initiatives** to determine critical nano-enabled technological dependencies and should focus NNI efforts to address those dependencies.

Advanced manufacturing is a particularly promising example.

Recommendation:

- ✓ NNI agencies should **support the early stage (TRL 1-3) nanomanufacturing** research needed to enable goals of current advanced manufacturing programs, in particular the MIIs.

Physical Infrastructure

NNI has built an impressive suite of facilities, but there is a lack of support for sustainment.

Recommendation:

- ✓ **Identify funding mechanisms for acquiring and maintaining state-of-the-art equipment** and computational resources to sustain leading-edge capabilities at nano user facilities.

The intersection of nanomaterials and biological systems—including nanomedicine— is of growing importance.

Recommendation:

- ✓ **The Nanotechnology Characterization Lab (NCL) model should be expanded** (1) to address nanomaterials being developed for medical applications in addition to cancer and (2) to address nanomaterial-biological system interactions beyond medicine.

Human Infrastructure

Commend the recent NSEE report to NSF: *Nanoscale Science and Engineering Education (NSEE) – The Next Steps (Journal of Nano Education (2015) 7, 1-63)*

Recommendations:

- ✓ **Identify STEM undergraduate programs** at NNI agencies and seek to take advantage of them to support students in nano-related activities.
- ✓ **Work with states that have incorporated nano into K-12** (a) to create a strategy to share with others and (b) to measure impact.
- ✓ **Require educational materials** developed with NNI funds to **be put on nanoHUB**.

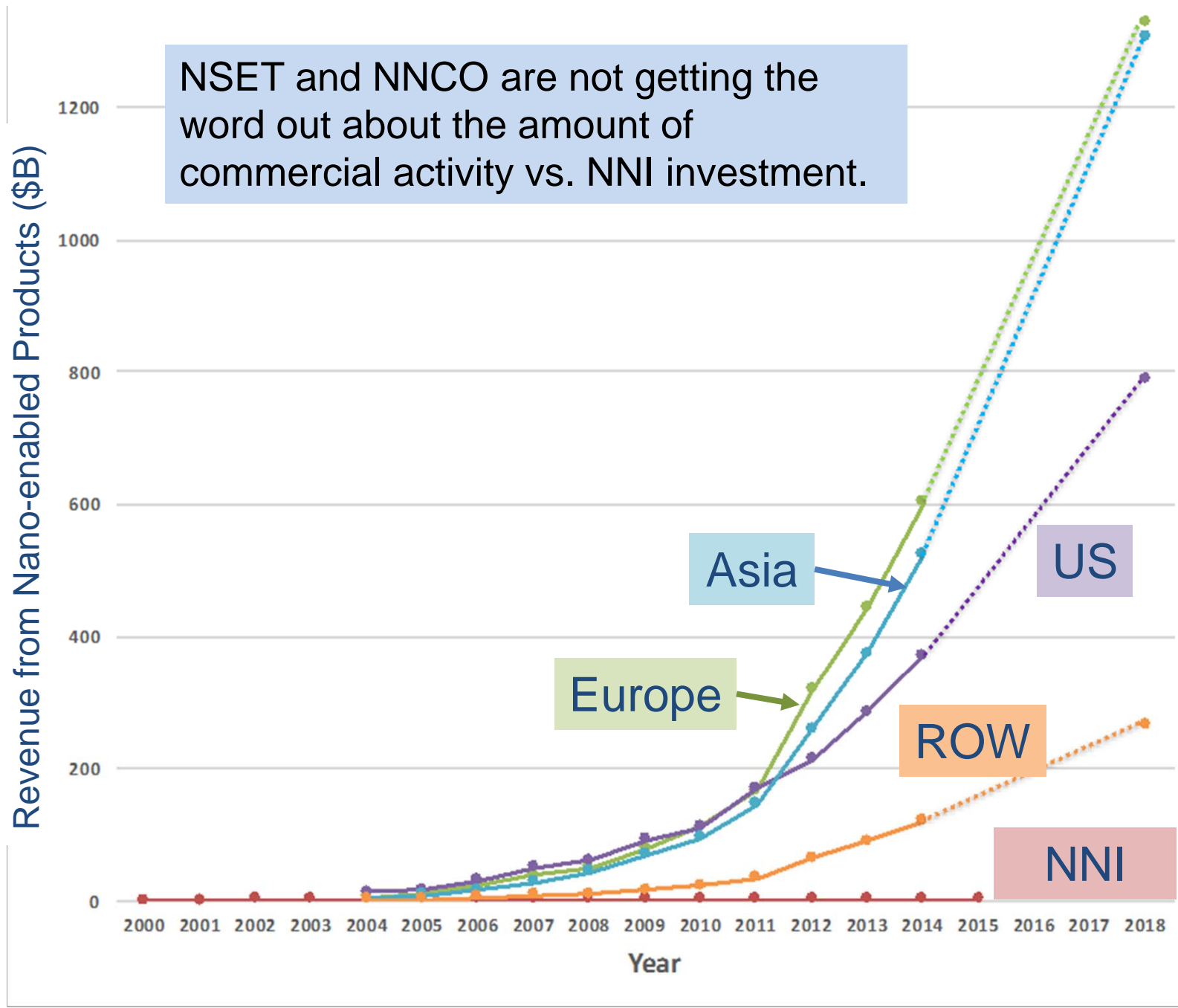
Main Messages

Nanotechnology can/will contribute to achieving many Federal priorities and initiatives. The NNI should **focus on research that enables progress and success in Federal priorities and initiatives.**

There are **various programs and funding sources** that are not specifically targeted at nanotechnology, but which **can be used to advance nanotechnology**—for education, innovation, instrumentation, etc.

Nanomedicine is an area with high potential. Progress will depend on the ability to characterize and manufacture nanomaterials for medical uses.

Communication and coordination are key to maximizing NNI return on investment.



Nano-Inspired Grand Challenge For Future Computing

- The Grand Challenge is a Grand Challenge
- A lot of effort in relevant areas
- But not coordinated
- Achieving the GC will take leadership and \$\$

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