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U.S. Department
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ANL Strategic Planning for Hard X-ray Science and Imaging

George Srajer

X-Ray Operations and Research

November 19, 2008

Outline

- Timeline and strategic planning process
- Prioritization process
- Hard X-Ray Science and Imaging Themes
 - Structure of Position Papers

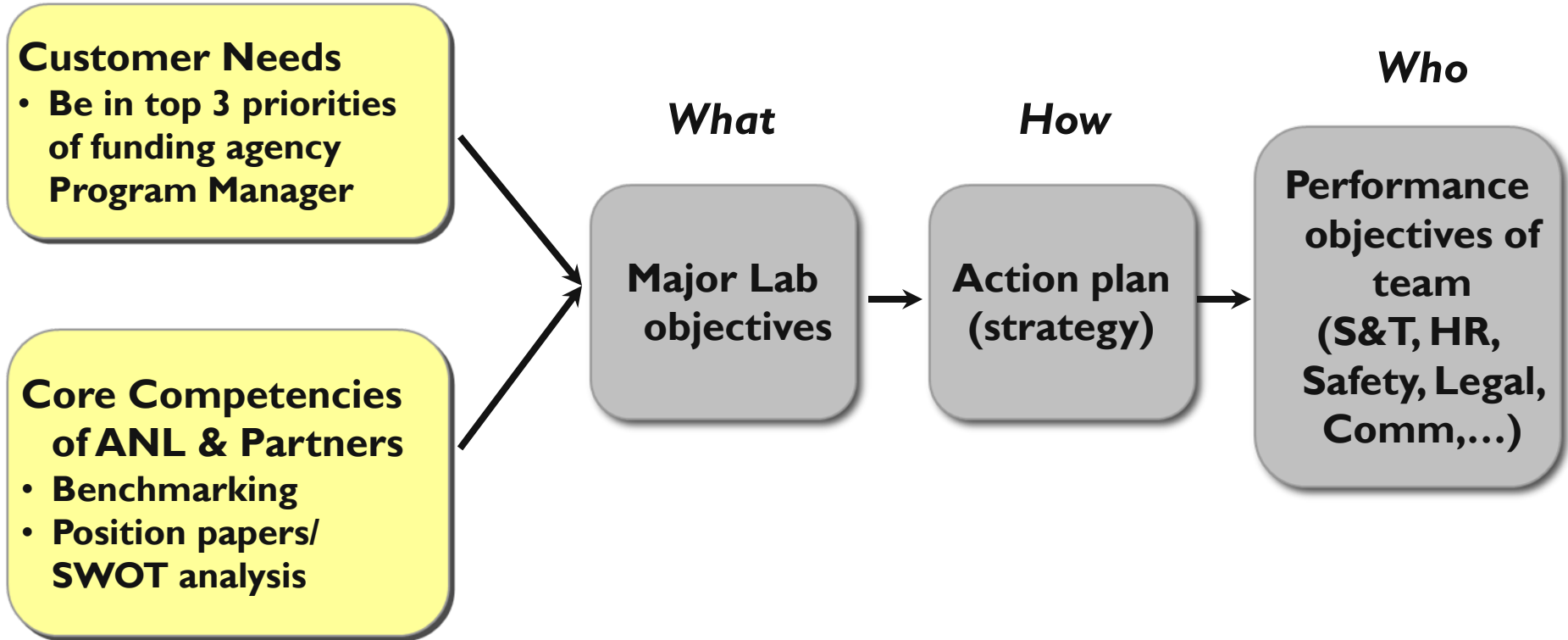
Timeline

| Step | Month | | | | | | |
|----------------------------------|-------|-----|-----|-----|-----|-----|-----|
| | Sep | Oct | Nov | Dec | Jan | Feb | Mar |
| Gather Thematic Input | | | | | | | |
| Conduct SWOT Analysis | | | | | | | |
| Benchmark Capabilities | | | | | | | |
| Strengthen and Winnow Themes | | | | | | | |
| Translate Themes To Future State | | | | | | | |
| Refine Vision, Mission & Values | | | | | | | |
| Perform Gap Closure Analysis | | | | | | | |
| Codify Major Objectives | | | | | | | |
| Develop Strategy & Action Plans | | | | | | | |
| Document Process For Future Use | | | | | | | |

October 31, 2008

Strategic Planning Process

Key Inputs



Where We Are Today

Seventeen themes that we* will strengthen and winnow to four to six Lab Key Objectives

4. Energy Computing for Energy and the

Imaging committee:

M. Bode, A. Petford-Long,
G. Srajer, S. Vogt, B.
Kabius, E. Isaacs

- 4. Nuclear Energy
- 5. Energy Storage
- 6. Transportation Science & Technology
- 7. Hard X-ray Science
- 8. Nanoscale and Materials Science

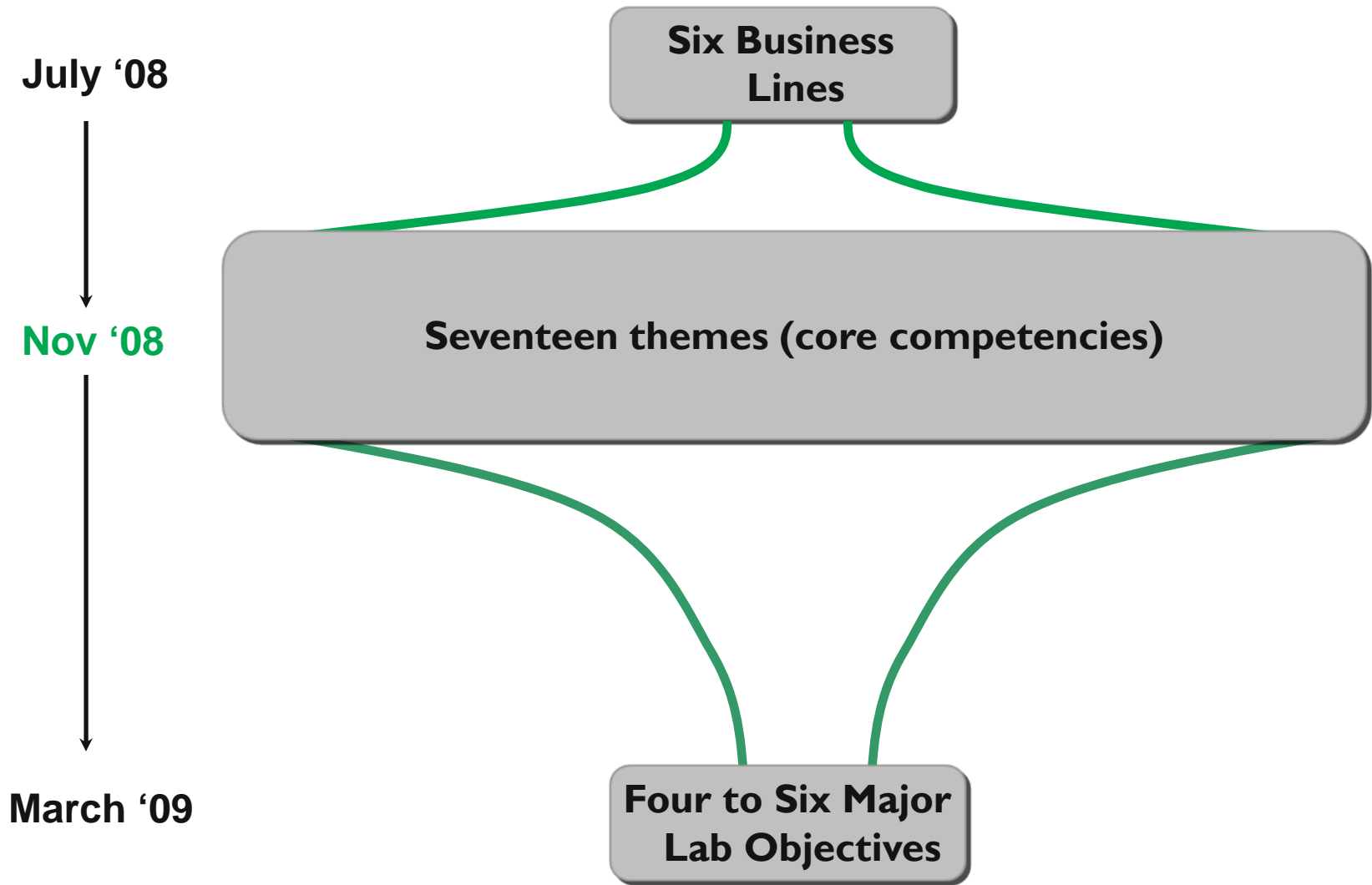
9. Chemical Processes for Energy

Hard X-ray Science committee:

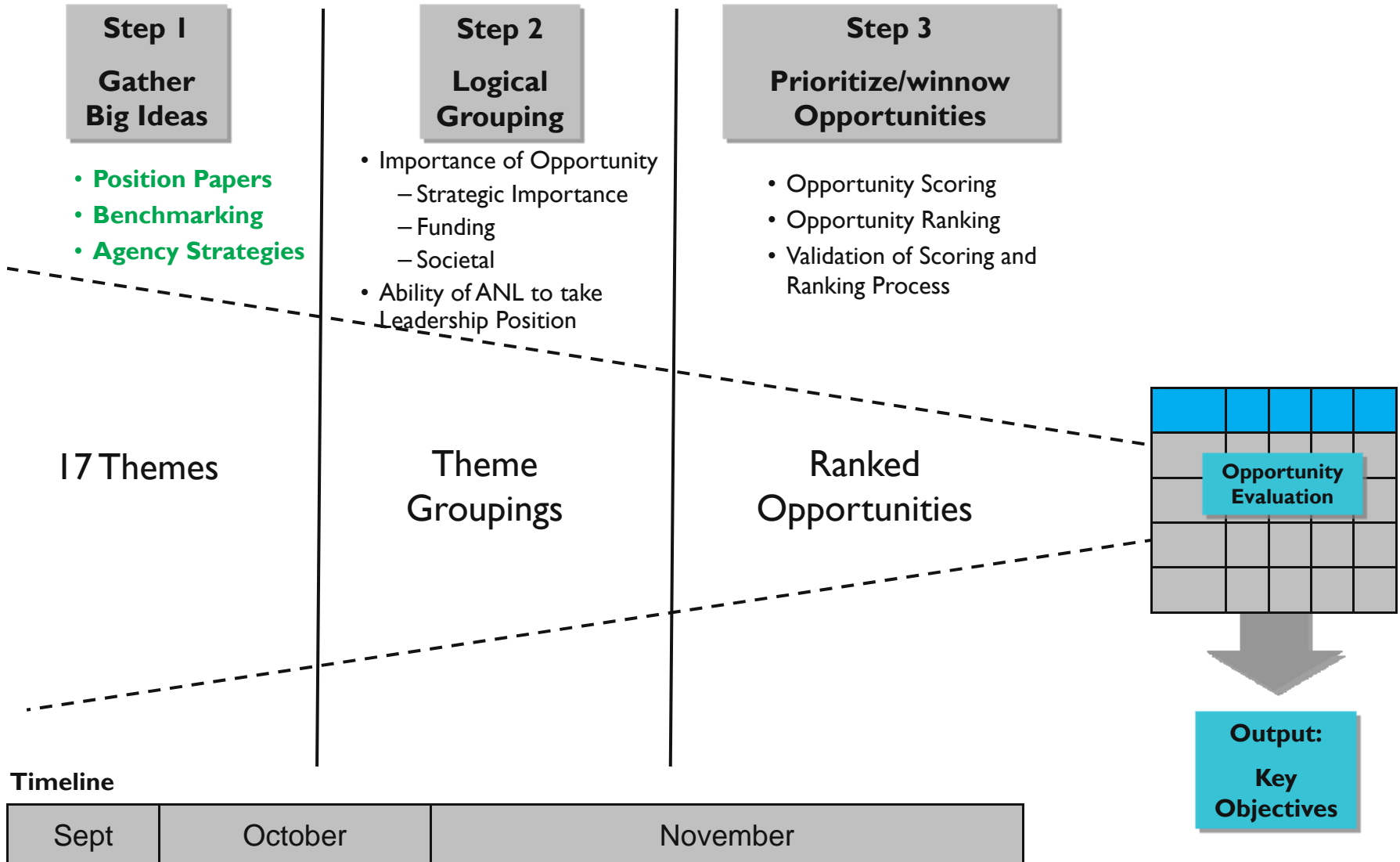
B. Stephenson, G. Srajer, P.
Fenter, M. Gibson, L. Makowski,
N. Markovic, S. Streiffer, L.
Young

- 13. Detectors, Sensors & Device Physics
- 14. National and Homeland Security
- 15. Accelerator Science and Technology
- 16. Imaging
- 17. Solar Energy Science & Technology

Process and Timeline



Evaluation Methodology

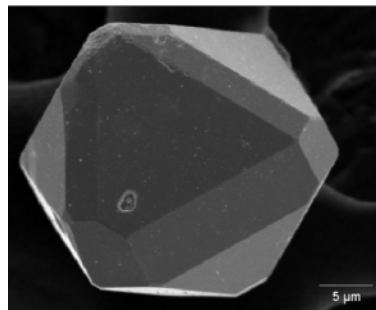


Opportunity Prioritization Criteria

The ANL senior management will prioritize opportunities based on two major sets of criteria:

- **Ability for ANL to take leadership position**
 - Current benchmark position among comparable programs
 - DOE / Agency strategy alignment & support of current programs
 - Critical mass of scientific talent to perform the research
 - Degree of cross-cutting across facility, division and/or externally
- **Magnitude of opportunity**
 - Program size in terms of yearly operating budget
 - Strategic importance to ANL, DOE and the country

Materials Design and Discovery: Crystal Growth



Benchmarking Summary, Inorganic Solids

new thermoelectrics

NU key partner

| | Effort Size | Pubs 2003-2008 | Citations 2003-2008 | Career Pubs | Career Citations | Career H-Index |
|-----------------------------|-------------|----------------|---------------------|-------------|------------------|----------------|
| ANL ⁽¹⁾ | 5-6 | 111 | 868 | 572 | 19,307 | 71 |
| ANL/Mitchell | 4-5 | 78 | 591 | 188 | 3648 | 32 |
| ANL/NU ⁽²⁾ | ~30 | 259 | 2061 | 1141 | 30503 | 81 |
| ORNL/Mandrus | 5-6 | 71 | 582 | 159 | 3747 | 33 |
| Ames/Canfield | 11+ | 199 | 1529 | 612 | 11541 | 52 |
| MPI/Steglich | >>10 | 157 | 773 | 630 | 12320 | 57 |
| Tokura/Tokyo ⁽³⁾ | >>10 | 492 | 4807 | 1288 | 41,988 | 92 |



new multiferroics

Can Argonne become a National Center for single-crystal growth?

Hard X-ray Science Position Paper

Introduction

“Hard x-ray science must be viewed as one of the primary backbones of the ANL scientific plan”

Science Examples

- Interfacial Science
- Catalysis and Energy Conversion
- Biology
- Transportation and Combustion
- Ultra-fast Science
- Ultra-small Science

Hard X-ray Science Position Paper - Near Term

Recommendations for Execution (5-10 years)

- *Mechanisms for better joint planning and execution between APS and the rest of the Laboratory*
- *Enhancing beamline capabilities, capacity and staffing at APS in the areas of importance to ANL programs*
- *Enhancing existing joint research efforts with programmatic divisions such as magnetism research, photo-excited reactions, battery development research and catalysis*
- *A new, deeper level of joint programs such as the creation of scientific institutes associated with beamline facilities*
- *Inclusion of university and industry partners for the benefit of the national scientific community*
- *Development or expansion of dedicated beamlines and programs in areas such as hard x-ray techniques and instrumentation, detectors, optics, and advanced accelerator technologies that drive scientific capabilities and capacity.*

Hard X-ray Science Position Paper - Long Term

Recommendations for Execution (10-20 years)

- *New source (possibly fully coherent)*

“ANL should currently be strongly engaged in developing both the technical options and scientific case for future hard x-ray facilities”

Imaging Theme

Open Forum Meeting:

Friday, November 21, 10:00-12:00, Bldg 212, A157

Position Paper:

Description of recommended research focus

Combine diverse imaging tools, in particular:

- hard X-ray microscopy (XM)
- scanning probe microscopy (SPM)
- electron microscopy (EM)

Imaging Theme: Position Paper

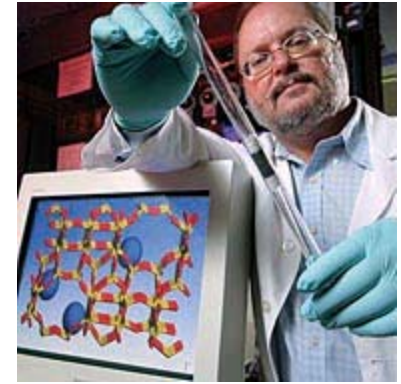
Research objectives

- Understanding chemical processes in heterogeneous catalysts under reactor conditions
- Understanding emergent behavior in complex condensed matter systems, arising from symmetry breaking in the solid state
- Nanoscale applications in Biology

Why is ANL better suited than other institutions to lead

Strength: “Argonne houses the world-leading science experts in hard X-ray microscopy, electron microscopy and scanning probe microscopy, gathered together in one place.”

Weakness: “...is the lack of a coherent, high-level strategy that ties together all of the investments that have been made.



[https://wiki.inside.anl.gov/inside/Laboratory Strategic Planning](https://wiki.inside.anl.gov/inside/Laboratory_Strategic_Planning)

Contact: Theme Leaders/Members or send comments to future@anl.gov