Understanding SBIRs for Researchers

Dr. Edward Vincent Clancy, PE, Esq.
Professor Emeritus, Cal Poly University
Chief Technology Officer – ACTA Technology

Dr. Kris Johansen, PhD, MBA
SBIR/STTR Program Administrator
Office of Intellectual Property and Technology Transfer, Iowa State University

Session 3 – Tips – A Competitive Advantage
Outline For Today’s Class

- Reminder – Common Mistakes
- Homework 2 Discussion
- Looking at actual proposals
- Parts of the proposal
- Each drawing should tell a story
- References
- Budget tips
Mistake #1: Not doing your “homework”

- SBIR Solicitation – read it!
- Competition? Yes you do have it and you should tell them in the proposal about your competition
- Current research – prove you are leading-edge
- Understand your customer
  - Federal agency
  - End user/purchaser
Mistake #2: Failure to communicate with agency

- Related to not doing your homework
- Know whether solicitation is released or “pre-released”: may not be able to contact directly
- Have defined objectives for communication
  - Get feedback on your idea (“responsiveness”, innovation)
  - Familiarize the agency with your company (build credibility)
  - Have questions answered or clarifications made (strategic, not those that are obvious in the solicitation)
- Communication prior to solicitation release provides more time to build credibility
  - Network at conferences, industry days or by direct contact
  - An opportunity to submit ideas and topics to agency
Mistake #3: Underestimating commercialization

- Lack of commercial potential can doom your proposal in Phase I
- You need to have a plan for commercialization *before* you start your Phase I application
- You need to demonstrate pull for your technology
- You need to demonstrate you understand the market space and have realistic expectations for sales and growth
- You need to know how your technology fits into a larger system
- You will need resources beyond SBIR to finance commercialization
Mistake #4: Lack of credibility

- No business expertise in the company or no scientific collaborators to round out the team
- No letters from collaborators or consultants
- Facilities are inadequate
- “While the researchers appear to have good engineering experience for tackling the design challenges presented by this project, a major weakness of the proposal is that the company lacks expertise in manufacturing, sales, and marketing…”
Mistake #5: Lack of attention to detail

- Have someone proofread your proposal before you submit.
- Do you know what counts towards the page limits, and do you know what the page limits are?
- Did you address all the items specified in the solicitation?
- Did you submit on time?
Homework 2
Discussion
Common Sections of Proposal

- Abstract or Summary
- Specific aims
- Background and significance (or identification of problem or opportunity)
- Work plan
- Related Work
- Related research or research and development
- Commercialization strategy
- Key personnel
- Company and facilities
- Subcontracts and/or consultants
- Prior, current, or pending awards
- Cost proposal
- Literature cited

Tip—NIH significantly revised its application guidelines this year and now has a Research Strategy section
Proposal Writing Tips

- Use formatting to indicate key sections of the proposal and label them with the same language used in the solicitation.
- If a section does not apply to your proposal, write “not applicable” under that heading.
- Be clear and concise.
- Double check spelling and grammar.
- Avoid jargon.
- Spell out acronyms on first usage.
Proposal Writing Tips

- Pay attention to font style and size (follow directions)—Tip—page limitations vary widely among the agencies
- Pay attention to how figures and tables will reproduce
  - Some colors will end up being the same shade of gray
- Use positive language and be specific
- Make your narrative flow logically
- Support your arguments
- Do not make reviewers work to find essential information
A Good Header Example

Company Name ➔ ACTA LLC
- Reference Number - DE-FOA-0000161
- Topic 4 - Geothermal Energy Technology Development,
  - Subtopic F - GHP Component R&D
  - Nanofluids for Geothermal Heat Pumps (GHP)

Help the Program Manager
direct your proposal to the
 correct set of reviewers
Each Figure should be an opportunity to tell a story

Figure 2 – illustrates a horizontal slinky loop design. The high initial cost of the system is the greatest barrier to GHPs. A nanofluid will reduce the amount of circulating loop piping, thereby reducing the installation cost.
Figure 5 – ACTA’s Nanofluids can reduce the size of the circulation loop because of increased heat transfer efficiencies of nanoparticles.
Each Graph needs an explanation

Figure 1 – Multi-walled Carbon Nanotubes’ thermal conductivity (k) is 42,000 times greater than the thermal conductivity of typical refrigerants.
NIST – TT Proposal – Evidence of Commercialization landscape

TELL Why You are using a Graph

Rheometer Patent Landscape

- Chip Manufacturers
- Callaway Golf
- Biotech (Ricoh/ Genetech)
- Research Universities
- Tire & Rubber
- Procter & Gamble, Unilever
- Chemical Companies
- Issued Patent 2000-2010

Figure 5 – Patent Distribution
Lead the reviewers through each picture and graph.

Commercial reviewers may not understand the science and not read it – it is your job to communicate effectively.

Can repeat main point in technical and commercial sections.
Background and Objectives (Aims)

- Good writing style – Objectives First– not Background
- Do not lose the reader in the background. First say what you are going to do then tell the background as evidence of your command of the material.
Part 2: Background and Phase I Technical Objectives

Our research plan aims at developing long lasting, stable, and economical nanofluid systems that can be used in today’s vapor compression system. Our goal is to produce a product that will have a payback period of two years or less.

The research objectives consist of the following:

1) Determine the most cost effective, optimum size nanoparticles, volume percentage, and type of nanoparticles to be used with targeted refrigerants (HFC134a, HFC 22, and HFC 142b).
2) Development of a technique to obtain a stable long lasting suspension of nanoparticles in the targeted refrigerants.
3) Develop a novel membrane and regeneration system that will collect the nanoparticles at the outlet of the condenser and return these nanoparticles to the inlet of the condenser.
4) Determine the improvement in thermal conductivity, viscosity, and heat transfer coefficient.
5) Determine whether the increase in thermodynamic properties will increase the energy efficiency of the vapor compression system by at least 10 percent.
b. Identification and Significance of the Problem

The objective of proposed activity is to develop an economical, stable, and thermally responsive circulating fluid that will exceed the performance and reduce the payback period of the current generation of Geothermal Heat Pumps (GHPs). This new fluid will increase the heat transfer efficiency of the GHPs by improving the heat transfer coefficient of the ground loop fluid (propylene glycol). We are also proposing a novel pre-cooler / pre-heater system that will save energy and enable GHPs to take advantage of the temperature of the ground source fluid with minimum modifications.

Conventional GHPs have the potential to provide significant energy savings over typical air-source heat pumps or typical furnaces with air conditioners. GHPs are a proven technology and savings in the range of 30 to 60 percent have been documented [40]. The National Earth Comfort Program identified first cost, confidence or trust in the technology, and design and installation as the primary barriers to GHPs acceptance in the market place [41]. The greatest barrier being their long payback periods and high initial installation costs [44]. Countries in Europe are accepting GHPs at a higher rate than USA because of their higher operating efficiency [44].
Identification and Significance of the Problem

Therefore, the significance of this project is that there is a need to develop a new fluid and a smart pre-cooler/pre-heater system for GHPs that will significantly improve the efficiency and reduce the payback period of these systems.

*Do not assume reader will see the significance of the problem. Tell Them.*
Technical Objectives

In the Technical Objectives you specify what it is you intend to accomplish. They should be regarded as a link between what you are ultimately trying to achieve (discussed in the significance part of the proposal) and the detailed technical work (work plan). It is preferable to state an objective as a result, not as a question that you intend to study. It is vital that your objectives be challenging but realistic.
Work plan

- May also be known as experimental design
- Indicates in detail:
  - What will be done
  - How it will be done
  - Why it will be done that way
  - Whom will be doing it
  - Where it will be done
  - What the difficulties may be and what the alternative approaches are
Work plan

- Should be the strength of the proposal—logical, reasonable and defensible
- Follow the agency’s format exactly and use their terminology
- Make sure you know the page limits
Work plan

- Provide rationale for approach
- Indicate expected outcomes
- Anticipate reviewer criticism:
  - What could go wrong?
  - How will you overcome technical hurdles?
  - Is your plan vague or general?
- Allude to how Phase I will drive Phase II
- Use formatting to make key points obvious
Timelines are available from MS Word. Make sure project timeline is the same as the proposal – Phase 1 – usually 6 or 9 months.

### Phase I – Tasks/Responsibility

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task 1</td>
<td>Determine the best technique to obtain a stable long lasting suspension of nanoparticles in propylene glycol.</td>
</tr>
<tr>
<td>Task 2</td>
<td>Use a computer model to predict performance of a GHP using nanofluid.</td>
</tr>
<tr>
<td>Task 3</td>
<td>Determine the best size, volume percentage, and type of nanoparticles to use with propylene glycol in order to obtain a 20% reduction in initial cost.</td>
</tr>
<tr>
<td>Task 4</td>
<td>Perform economic analysis of alternatives. ACTA</td>
</tr>
<tr>
<td>Task 5</td>
<td>Protect additional Intellectual Property. ACTA</td>
</tr>
<tr>
<td>Task 6</td>
<td>Publish results and produce a technical report summarizing experimental and theoretical accomplishments of the research.</td>
</tr>
</tbody>
</table>
Related research or research and development

- May be known as relationship to Phase II R/R&D
- Describe the anticipated outcomes of Phase I through Phase II if the project is successful
- Describe the relationship of Phase I with Phase II—how it lays the foundation for continuing success
- Should be about half a page in length
Follow solicitation instructions carefully
  ◦ Know what is “allowable” and “unallowable”

Be specific
  ◦ Do not round numbers
  ◦ Get quotes or other documentation for equipment, etc.

Generally speaking, grant applications are not treated like a bidding process
Proposed budgets should:
- Cover 100% of the project-related expenses
- Enable you to recover some of your *indirect costs*

Do not exceed funding limits: budget requests that exceed the ceiling specified in the solicitation may cause the proposal to be rejected without review.
Cost Proposal

- Types of costs:
  - **Direct**: Costs directly related to performing the project (would you still have them if you didn’t do the work?)
    - Labor
    - Materials
    - Consultants
  - **Indirect**: Costs associated with ongoing operations
    - Calculated using a logical and consistent method
    - May be capped at a certain rate
    - May be negotiated by federal agency for each organization
Cost Proposal

Direct Labor
- Rates should be fair and reasonable
- Can calculate hourly rate by dividing annual salary by 2080 (40 hrs per week x 52 weeks per year)
- Fringe benefits can be a direct cost included with direct labor, or can be an indirect cost
Cost Proposal

- Other direct costs
  - Consumables
  - Equipment*
  - Travel*
  - Publication costs*
  - Machining/Prototyping
  - Keep documentation for auditing purposes—get written bids/quotes if possible

*What’s allowed varies by agency: know their rules!
Cost Proposal

- Indirect costs
  - Covers costs of operations not related to a specific project
  - General lab supplies
  - Fringe (employee benefits)
  - Overhead (infrastructure)
  - General and administrative (G&A; management and administration)
  - Indirect cost rates vary from organization to organization
  - Agency rules vary
BUDGET TIPS

- There are two keys to preparing a good budget: be realistic, and follow the instructions.
- As a general policy, cost-sharing is not required.
- Most agencies provide budget sheets as part of their SBIR solicitations.
- **Tip** – 7% FEE (PROFIT) allowed – Use it.
Equipment over $5,000 is owned by US Government – **TIP** – recommend lease or lease to own.

PI must be 51% time – budget accordingly.

If the Panel has problem with the budget – it can be fitted later by agreeing to change it. **Tip** – do what they want.
Postbox Mentoring Plan – NSF

- No postbox plan – no award – YOUR proposal is not reviewed. This is a serious deficiency.
- **Tip** – If using a university as subcontractor – need statement of work. Universities are very slow in getting the budget and budget justification to you – do not wait until the last minute.
Budget (Cont’d)

- Tip – no commercialization expenses allowed.
- Tip – no patenting cost allowed.
- Budget is for research only.
- Tip – maximum consultancy fee is $600 per day – must be in writing.
- Tip – Need budget justification.
- Sub awards must have their own budget and budget justification.
- NSF – may need Postbox mentoring plan.
Budget Justification

- Careful balance between providing enough, but not too much, detail
- Tie budget requests back to experimental design, specific aims or impact:
  - “Purchase of enzymes and reagents is requested for PCR testing of …”
  - “Principal investigator will be responsible for…”
  - Request funds for travel to awardees conference if submitting to NSF (you are required to go)
Agency Budget Nuances to be Aware of

- **NSF:**
  - No publication costs or travel allowed (except for SBIR awardees conference).
  - **Tip** – 50% or below F&A (overhead) for NSF is approved.
  - Don’t request equipment unless you want NSF to own it.
  - Pay attention to maximum daily consulting fee.

NIH:

- **Tip**—NIH wants you to request a reasonable budget and a reasonable timeframe, but pay attention to whether you are submitting under the Omnibus solicitation or a specific RFP or PA: RFPs and PA sometimes have specified funding ceilings

- **Tip**—NIH will accept a 40% indirect cost rate without negotiation on Phase I and Phase II proposals (but rates are subject to audit at any time: propose only what you can support)
Agency Budget Nuances to be Aware of

- USDA:
  - Equipment purchases are limited to 10% of Phase I budget request
  - Agency may negotiate fee requests (i.e., you may get less than 7%)
  - If you don’t have a negotiated G&A rate, can put in a reasonable dollar amount, but will have to provide an indirect cost rate proposal if selected for funding
Writing Tips

- A proposal is a written document. Accordingly, all the considerations which go into writing any persuasive piece apply to proposal writing. You must consider what your audience wants to hear, how they like to hear it, and what criteria they use in evaluating what they hear. The proposal usually requires 150–200 professional hours to complete.

**Tip** – Agencies give you the criteria and who will evaluate the proposal. NSF – important to have a PhD and university partner. DOD – tier one DOD contractor as partner, DOE – DOE lab as partner. Know who is going to review your proposal.
It is vital to remember that it is exceptionally difficult to produce a good proposal under time pressure.

**Tip** – Leave yourself plenty of lead time.

**Tip** – We recommend writing your proposal in four major steps: 1) outline, 2) preliminary draft, 3) review, 4) and final draft.

**Tip** – Your arguments must be logical and persuasive.

**Tip** – The research should be high risk – high return.

**Tip** – Get a non-scientist to read the proposal. Have you written your proposal cleanly and concisely.

**Tip** – Use good spelling, good grammar, etc. No jargon – all abbreviations should be clarified.
REFERENCES – TIPS

- Applicants are expected to know the STATE OF THE ART in the field.
- Consider that the reviewers are volunteers who are generally academics with expertise in the field of study, therefore YOU MUST HAVE knowledge of current literature and related prior successful proposals,
- TIP – You should reference 25 to 70 references in the proposal.
NSF Checklist

- Checklist is available at http://www.nsf.gov/eng/iip/sbir/PhI_Check_List.pdf
- Phase I Proposal Check List Start Early
- **Tip** – It is recommended to submit your proposal 1–2 days prior to the deadline date.
- **Tip** – Review the Frequently Asked Questions
- **Tip** – Call Program Manager before preparing the proposal. Run your idea through him first.
Bios / Facilities / Letters of Support

- Biographical Sketches Module: Provide 1–2 page bios on all “key” contributors to the project; this includes consultants and sub awardees.
- Facilities, Equipment and Other Resources Module (see NSF web site for info) Tip – incubator can help with your facilities.
- Letter(s) of support for technology Tip – You need them in order to be competitive. Letters should look different to be creditable.
Additional Requirements

- Company Commercialization History Uploaded (if applicable)
- Letter(s) regarding human subjects Institutional Review Board or IACUC approval of animal use.
- Prepare Documents (it is highly recommended to convert all files to PDF and then upload the PDF files to Fast Lane).
- Submitted by 5:00 P.M. (submitter’s time)
Competitive Proposals Have

- A strong principal investigator is critical.
- Good innovative science with some significant work to be done (a technical barrier to overcome)
- Grantsmanship is an essential.
- A product or process that will make a technical and/or economic impact.
- Specific commercialization strategy with clear and measurable milestones.
- Outside funding sources to leverage resources
Key Ingredients

- Validate commercial potential.
- A strong internal and/or external team.
- The commercial viability will be judged by the same academics evaluating the science.
- **Tip** – Written business plan is necessary for Phase II but important for Phase I as well.
- **Tip** – Proposal should be focused on one main idea or concept.
- Avoid the “shopping bag” of ideas approach.
- Must be at the “cutting-edge” of the subject. vices, software, batteries, etc.
Avoid

- Tip – Avoid small improvement in a mature technology.
- Tip – Avoid saying no competitors.
- Tip – Avoid over estimating market share – 5% of the laptops sold in USA within 5 years. Must be creditable.
- Proposal concept should have significant commercial potential.
Common Reviewers Criticisms

- Poorly written and presented.
- Principal Investigator lacks necessary technical expertise.
- Insufficient technical information.
- Cannot be completed in six months.
- Inadequate bibliographical information.
Common Reviewers Criticisms (Cont’d)

- Lacks letters from consultants / Letters of Support.
- Research already done by others.
- Too vague and unfocused.
- Failure to indicate where project would go in Phase II. Poor commercialization potential.
- Doubtful economic prospects.
- Inadequate detail in experimental plan
Resources

- Grants writing books – library and bookstores.
- [http://www.sbir.gov](http://www.sbir.gov)
Homework 3
Discussion
See Example Project
Summary and Objective Statement
Questions?