BSEE Technology Challenge
BSEE Technology Challenge: Outline

- Project Introduction & Goals
- Technology Challenge Concept
- STEM Activities
- Piezoelectric Science & Design
- Challenge Day
- 2016 Participants
- Awards
Project Introduction

BSEE Technology Challenge: Purpose & Outcome

• Develop and execute a “showcase” promotion of a high school level STEM competition benefiting all stakeholders, and highlighting BSEE as active youth and young professional educators

• Establish and integrate the value of safety practices in early learning through a high quality learning experience

• First year effort in Houston area, then establish future events in all regions

• Increase science literacy, and engage youth by connecting them with the Nation’s natural resources, with a specific exposure to oil and gas programs

• Support DOI Strategic Plan Mission Area #4 : Engaging the Next Generation
Participation Opportunities

• Contest Communication Campaign
• Opening Ceremony Remarks: Key Note
• Judging & Mentoring
• Award Presentations
• Photo Opportunities
• Offshore Technology Conference (Showcase Winner)
• Public Affairs – Press Releases
STEM Supporting Activities

• Research Database Study
• Team Development with Roles and Responsibility
• Project Management with Scheduling and Milestones
• Electrical Circuit Assembly from Procedures and Drawings
• Piezoelectric Technology
• Optimization of Design using Math and Probability
• Design and Procedural Safety Processes
• Quality of Product including Efficiency
• Risk Mitigation
• Parent / Teacher Workshop during student activity
A competition among high school teams to design and develop a technological solution to a problem related to the conduct of safe and environmentally responsible offshore operations.

**WHAT**

2015 - 2016

**WHEN**

**YOUR SCHOOL**

**WHERE**

BSEE mission is to promote safety, protect the environment, and conserve resources offshore through vigorous regulatory oversight and enforcement. OESI was created to [insert OESI mission statement].

BSEE and OESI continue to look for opportunities to collaborate on projects that are aimed at driving down risks associated with offshore operations. Both institutions are deeply committed to supporting science and technology programs in schools to help pave the way for next generation's leaders.

**WHY**

You get to work as a team to design and develop a solution that will help improve safety and environmental protection offshore. Your work will be judged by a panel of experts, including governmental officials, industry experts, and academics from related fields of study.

**WIN NATIONAL RECOGNITION AND PRIZES!!**
Technology Challenge: Concept

“Adapt NASA Engineering innovations to solve Oil & Gas subsea challenges”

EVENT DATE: March 4, 2016
PARTICIPANTS: 120 High School Students (15 teams), Ages 14-17, from 5 Academic Institutions

CHALLENGE STATEMENT: Investigate NASA science technologies and develop an innovative concept that applies an aerospace proven technology to a current challenge within the oil & gas deep water offshore operations industry

CHALLENGE TASK:
Step 1: Conduct a data study of the NASA Technology Transfer Office research archives, and the OESI Ocean Energy Technology Portal (OETP) relative to offshore Oil & Gas challenges
Step 2: Develop a energy conservation concept using piezoelectric technology compatible with Gulf of Mexico and/or Arctic environments utilizing selected data that provides proof of concept for the harvesting and storing of energy
Step 3: Construct a working model demonstrating the design/product application (Piezoelectronic kits provided)
Step 4: Charge a storage device using a piezoelectric circuit using a device to simulate an offshore energy source
Step 5: Install the device into an RC helicopter and execute an efficient flight plan to an offshore platform mockup.
<table>
<thead>
<tr>
<th>TASK DESCRIPTION</th>
<th>Description</th>
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<tr>
<td>Adapting NASA Aerospace Technology to Oil &amp; Gas Sub-sea Challenges</td>
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### Concept Benefits
- NASA Technology Transfer and Cross-Industry Collaboration

### Phase #1
Select Your Team

### Phase #2
Develop Team into Project Groups:
- Research Group A: NASA Technology
- Research Group B: Oil & Gas Challenges
- Design/Development/Test Group
- Manufacturing and Quality Control Group
- Designate Leads for each Group
- Define responsibilities and requirements

### Phase #3
Research Phase:
(i) Review NASA Technology Database
(ii) Review Offshore Operation Challenges
(iii) Review Quality Control and Safety processes to apply to your development effort to ensure your design/product performs with the highest percentage of reliability, and safety

### Phase #4
Concept Development Phase:
- Review the target technology and its NASA application
- Develop the technology concept conversion to the Oil & Gas industry application

### Phase #5
Design Phase:
- Design the new device using quality control verification and safety procedures

### Phase #6
Test Phase:
- Develop and test a Prototype using quality control verification and safety procedures

### Phase #7
Manufacturing Phase:
- Complete the manufacturing of the final product using quality control verification and safety procedures

### Phase #8
Final Report Phase:
- Produce a Final Test Validation and Quality Report
- Provide design details regarding commercial production requirements
- Discuss opportunities/applications for additional technology collaboration and engineering enhancement utilizing your design/product
Piezoelectric Science

• Piezoelectric Effect
  • The electric charge that accumulates in certain solid materials (crystals, certain ceramics) in response to applied mechanical stress or vibrations.
  • Video: https://www.youtube.com/watch?v=uNKMD8Z3-e4
Piezoelectric Design

• Piezoelectric Harvesting Circuit
Challenge Task: Offshore Energy Harvesting

Energy Harvesting Concept
• Harness underwater acoustics from deep-sea drilling operations and convert to stored electrical energy
• U/W vibrations (via mechanical exciter) simulates acoustic energy of U/W drilling operations

Piezoelectric Technology
• Harvesting circuit built by student teams
• U/W acoustic and topside mechanical vibration energy collected, measured, and stored

Competition Scoring
• LED display with amp meter to confirm harvested charge value in battery
• Power remote control device (RC helicopter) and optimize RF signal flight time
## Competition Scoring

### Scoring Criteria

<table>
<thead>
<tr>
<th>Category</th>
<th>Points</th>
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<tbody>
<tr>
<td>Circuit Design</td>
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</tr>
<tr>
<td>Team Work</td>
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</tr>
<tr>
<td>Quiz Score</td>
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</tr>
<tr>
<td>Safety Awareness</td>
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</tr>
<tr>
<td>Team Spirit</td>
<td>10</td>
</tr>
<tr>
<td>Research/Preparedness</td>
<td>20</td>
</tr>
<tr>
<td>Time of Flight</td>
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</tr>
<tr>
<td>Course Points</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
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### Challenge Course

![Challenge Course Diagram]
Tech Challenge: Event Schedule

9:00 am – 9:30 am  Opening Ceremony & Introductions
9:30 am – 10:00 am  STEM Challenge Presentation
10:00 am – NOON  Circuit Design & Assembly, Start Charging
NOON – 12:30 pm  Lunch (working lunch with quiz scoring activity
12:30 am – 1:00 pm  Keynote Presentation and Top Gun Circuit Challenge Competition
1:00 pm – 1:30 pm  Cut Charging Circuit at 1:00 pm sharp
1:30 pm – 3:00 pm  Challenge Judging Activity
3:00 pm – 4:00 pm  Award Ceremony & Photos
Technology Challenge: 2016 Participants
(120 Houston area students)

- Energy Institute High School
  Lori Lambropoulos

- Charles H. Milby High School
  Roy de la Garza

- Westside High School
  Peggi Stewart

- Young Women’s Preparatory Academy
  Delesa Thomas

- Southwest High School
  Anne Ford

Independent Petroleum Association of America
Petroleum Equipment & Services Association

Anne Ford, Executive Director of the Energy Education Center
BSEE Technology Challenge Awards - 2016

First Place Prize for Educator/Institution of Winning Team
$1,500 Teaching Grant, Invite & Admission to OESI sponsored event
(Institution and Team featured at the 2016 Ocean Technology Conference)

Second Place Prize for Educator/Institution
$750 Teaching Grant, Invite & Admission to OESI sponsored event

Third Place Prize for Educator/Institution
$500 Teaching Grant, Invite & Admission to OESI sponsored event

Fourth Place Prize for Educator/Institution
$250 Teaching Grant, Invite & Admission to OESI sponsored event

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First Place Team Prize
$2500 US savings bond/or cash prize, Invite & Admission to OESI sponsored event
(Team featured at the 2016 Ocean Technology Conference)

Second Place Team Prize
$2000 US savings bond/or cash prize, Invite & Admission to OESI sponsored event

Third Place Prize Team Prize
$1500 US savings bond/or cash prize, Invite & Admission to OESI sponsored event

Fourth Place Prize Team Prize
$1000 US savings bond/or cash prize, Invite & Admission to OESI sponsored event
BSEE Technology Challenge
2nd Annual Event Planning

• OTC 2016/17 Announcement
• Registration campaign for expansion to additional regions
• Engagement opportunities during communication campaign
• Multiple site competitions in 2016/17
• Opportunities for collaboration with industry
• Future Budgeting
• 2016/17 STEM Challenge Task