Achieving CCEFP Sustainability

Mike Gust – CCEFP ILO
July 28, 2017
CCEFP Vision

Fluid power is the technology of choice for power generation, transmission, storage and motion control.

Creating new markets!

Educating the next generation of leaders

Partnering with industry

Improving existing applications!
The subject of CCEFP sustainability first came up during our 6\textsuperscript{th} year renewal site visit.

Developing an acceptable sustainability plan was a key condition for year 6 grant renewal.

We partnered with an industry association called the National Fluid Power Association (NFPA) to develop a mutual sustainability plan called the “Pascal Society”, a giving society of industry donors.

A $2 million annual fund raising goal was established ($1.5 million minimum).

Despite everyone’s best efforts we were unable to raise enough industry dues to fund both administration and research.

Our ten year NSF CCEFP grant just ended on 6/30/2017, including a one year carry forward.

NFPA Pascal Society funding for research continues until 6/30/2018.

CCEFP has developed a replacement sustainability plan that leverages new sources of government funding.
Lessons Learned

• If it hasn’t already, the subject of sustainability will come up for your ERC before you know it.
  – CCEFP leadership meets weekly on sustainability

• Sustainability has proven to be our greatest challenge.

• Administration costs are the most difficult to cover.

• One should be flexible and open minded to new strategies and directions for sustainability.

• Understand your ERC’s value propositions.

• Communicate with your industry members constantly.
CCEFP Value Propositions

• Research leadership
  – CCEFP has developed the fluid power research strategy that is the model for the world.

• Advocacy
  – CCEFP actively lobbied government agencies to build interest in fluid power research

• Pre-competitive research
  – Not surprisingly, a compelling research program is the key to sustainability.

• Educate
  – We educate the next generation of leaders through our research program. This is highly valued by industry.

• Network
  – We provide a desirable venue for academics, students and industry to meet.
Pascal Society Sustainability Model

• Began transitioning in year 9 with NSF’s concurrence.
• Worked with NFPA to convert industry members over to NFPA “Pascal Society” Foundation supporters.
• NFPA established and collected industry dues.
  – Received $650,000 support in years 9 and 10.
  – $800,000 for years 11 and 12. Funded ten research projects at $80,000 each.
• Universities have low (0-10%) indirect on industry consortium monies for research
• CCEFP to focus on new sources of government funding.
• NFPA covered part of ILO and ED costs
  – ~$150K and $300K the past two years
Current Pascal Society-CCEFP strategy

• Directly support pre-competitive fluid power research with pooled industry donations.

Future Pascal Society-CCEFP strategy

• Maintain core CCEFP administration that will indirectly support pre-competitive fluid power research by creating new government funding opportunities.

Rationale for new strategy

• Unable to directly fund research projects and CCEFP administration.
• Ability to obtain significantly greater funding from government agencies.
• CCEFP has the credentials, network, and experience to succeed.
Off-Highway Vehicles
Strategic Marketing Innovations (SMI) Consultants

SMI supports companies, universities, and academic institutes secure federal funding for research and development, and technology procurement.

• Technical and policy experts, lobbyists, and former executive branch decision-makers.
• Defense, Energy and Human Sciences expertise and networks.
Advocacy Trip to Capitol Hill

• Dudley Shepard of Motion Industries and Randy Hydrick Of Flow Dynamics meet with Representative Robert Aderholt from their home state of Alabama.

• Rep Aderholt is a member of the House Energy and Water Appropriations Committee.

Washington DC – Feb 27 & 28, 2017
Senators and Representatives visited

Sen. Alexander (TN)*
Sen. Baldwin (WI)*
Sen. Boozman (AR)*
Sen. Brown (OH)
Sen. Casey (PA)
Sen. Durbin (IL)*
Sen. Feinstein (CA)*
Sen. Franken (MN)
Sen. Graham (SC)
Sen. Grassley (IA)
Sen. Kirk (IL)*
Sen. Klobuchar (MN)
Sen. Schumer (NY)
Sen. Shelby (AL)*

Rep. Terri Sewell (AL)
Rep. Cheri Bustos (IL)
Rep. Charles Dent (PA)
Rep. Bill Foster (IL)

* Member of Senate Appropriations Committee

Chair & Ranking Member of Energy and Water Development subcommittee shown in bold & italics
FY17: $5 million has been allocated for R&D to improve the energy efficient of fluid power systems for commercial off-road vehicles. UMN is well situated to win an affiliated grant.

FY18:
1) House committee has recommended $10 million be allocated for energy efficiency improvements for commercial off-road vehicles.
2) Senate Committee recognizes that the commercial off-road vehicle sector consumes over 2 Quads of energy per year and directs the Department to continue activities to reduce the energy consumption of commercial off-road vehicles. This Committee recommends $5 million for off-highway fluid power efficiency improvements.
DOE Off-highway Vehicles Energy Efficiency Program

Annual funding potential is 2.5x greater than the max NSF CCEFP funding of $4M/year
Human Scale Systems
Advanced Robotics Manufacturing (ARM) Institute

- CCEFP has convinced ARM leaders of the necessity of fluid power actuation for future robotics and factory automation.

- ARM leaders are relying on CCEFP to connect with the fluid power industry.

- ARM is headquartered at Robotics Institute at Carnegie-Mellon University in Pittsburgh, one of the world’s leading robotic research centers.

- $253 million in combined research funding has been approved.

- Six CCEFP companies (Bimba, Eaton, Enfield, Innotronics and Parker) and four CCEFP universities (Marquette, Purdue, UIUC and Vanderbilt) are involved.

- CCEFP is coordinating fluid power efforts. We can help your organization get involved.
ARM Project Examples

- Hydraulic cylinders, valves and power supplies for human assist exoskeletons.
- Robots and humans safely interacting in manufacturing environment. Pneumatics or soft robotics makes this intrinsically safe.
In 2016, (13) 4-year awards totaling $26,000,000…(~$500K/yr each)
CCEFP led effort to convinced NSF to include “soft robotics” as one of two upcoming topics in 2017.
Fluid Power Manufacturing
Government Funding for Fluid Power Manufacturing

- Fluid power manufacturing research initiatives have been enthusiastically embraced by CCEFP industry supporters.
- A entirely new community of researchers and supporters have been engaged.
- The CCEFP has just completed a national fluid power manufacturing roadmap.
- Ten key technologies were identified.
- Many opportunities for federal funding already exist. We need to organize our efforts to secure them.
Key Manufacturing Technologies Identified

• Coatings
• Micro-machining
• Composites & Engineered Plastics
• Sintered Metals
• Additive Manufacturing
• Batch-free Heat-treating
• Robotics
• Hybrid Manufacturing
• Metrology
• In-process, Sensing, Feedback and Control
ORNL-CCEFP Project AME (Additively Manufactured Excavator) unveiled at Las Vegas CONEXPO

Over 100,000 visitors to our technology booth!
Multidisciplinary Research Program of the University Research Initiative (MURI)

DOD - Department of Defense (N00014-17-S-F006)

Funding

Amount: $1,250,000 - $1,500,000
Duration: 3 years

Scope

The MURI program supports basic research in science and engineering at U.S. institutions of higher education (hereafter referred to as “universities”) that is of potential interest to DoD. The program is focused on multidisciplinary research efforts where more than one traditional discipline interacts to provide rapid advances in scientific areas of interest to the DoD. Basic research is systematic study directed toward greater knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications towards processes or products in mind. It includes all scientific study and experimentation directed toward increasing fundamental knowledge and understanding in those fields of the physical, engineering, environmental, and life sciences related to long-term national security needs.

- Army Research Office (ARO), Air Force Office of Scientific Research (AFOSR) and Office of Naval Research (ONR) are sponsors.
- MURIs are typically only open to U.S. institutions of higher education.
- Typical annual funding per grant is in the $1.25M to $1.5M range.
**Operating cost of CCEFP**

Explanation of Year Over Year Changes:

- **Increase from Yr 11 to Yr 12** - 13 months of expense due to change in fiscal year, additional lobbying and related travel, industry summits, and overhead of 10% applied; offset of expenses from government grant support

- **Decrease from Yr 12 to Yr 13** – 12 months of expense, overhead expense offset and additional government grant support (expense offset)

- **Decrease from Yr 13 to Yr 14** – elimination of lobbying efforts and increase in government grant support (expense offset)

- **Increases thereafter** – inflation
Historical CCEFP Industry Dues

Average annual support over 7-yr period = $700,022
# New CCEFP Sponsorship Structure

<table>
<thead>
<tr>
<th>Company size</th>
<th>Annual global fluid power sales</th>
<th>CCEFP Sponsorship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Large</td>
<td>Over $1.5 billion</td>
<td>$60,000</td>
</tr>
<tr>
<td>Large</td>
<td>Between $500 million and $1.5 billion</td>
<td>$40,000</td>
</tr>
<tr>
<td>Medium</td>
<td>Between $50 and $500 million</td>
<td>$20,000</td>
</tr>
<tr>
<td>Small</td>
<td>Between $10 and $50 million</td>
<td>$10,000</td>
</tr>
<tr>
<td>Start-Up</td>
<td>Below $10 million</td>
<td>$2000</td>
</tr>
</tbody>
</table>

**Supporter Benefits**

- Selection of fluid power research projects funded by CCEFP (based on available budget) ✓
- Elected leadership positions on CCEFP Governance Committee ✓
- Invitation to CCEFP Summits, FPIRC, and other special events ✓
- Participation in IEC monthly teleconferences, research and special topic webinars ✓
- Early access to research progress and results ✓
- Networking opportunities with students, faculty, and other industry supporters ✓
- Notification of government funding programs and industry/academic partnerships ✓
- Tax-deductible donation ✓

**Funding Supports**

- CCEFP research projects, events, fluid power advocacy programs, travel, and administration ✓

New CCEFP will have only one level of membership for all its industry supporters.
## Projected Industry Support

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>Supporter Total</th>
<th>$1,066,000</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current Supporter</strong></td>
<td>43</td>
<td></td>
<td>$1,066,000</td>
</tr>
<tr>
<td>1 - Very Large</td>
<td>5</td>
<td>$300,000</td>
<td></td>
</tr>
<tr>
<td>2 - Large</td>
<td>8</td>
<td>$320,000</td>
<td></td>
</tr>
<tr>
<td>3 - Medium</td>
<td>17</td>
<td>$340,000</td>
<td></td>
</tr>
<tr>
<td>4 - Small</td>
<td>10</td>
<td>$100,000</td>
<td></td>
</tr>
<tr>
<td>5 - Start-up</td>
<td>3</td>
<td>$6,000</td>
<td></td>
</tr>
<tr>
<td><strong>Newly Identified Companies</strong></td>
<td>6</td>
<td>$140,000</td>
<td></td>
</tr>
<tr>
<td>1 - Very Large</td>
<td>1</td>
<td>$60,000</td>
<td></td>
</tr>
<tr>
<td>3 - Medium</td>
<td>3</td>
<td>$60,000</td>
<td></td>
</tr>
<tr>
<td>4 - Small</td>
<td>2</td>
<td>$20,000</td>
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<tr>
<td><strong>Grand Total</strong></td>
<td>49</td>
<td>$1,206,000</td>
<td></td>
</tr>
</tbody>
</table>

### Most Probable:

- 60% of Current Supporter Total: $639,000
- 20% of Newly Identified Co's Total: $28,000
- Total: $665,000
Other Sources of Support

- Private foundations (Eaton, Danfoss, Parker and CAT)
- Individual gifts
- Government grants with administration or project management support
- Education grants
- Job sharing
- Part-time employment
- Travel grants
- Event admissions
Questions