

FEDERAL LABORATORY CONSORTIUM

**2013 FLC RECOGNITION  
FOR EXCELLENCE IN  
TECHNOLOGY TRANSFER  
NOMINATION FORM**

FOR TECHNOLOGY TRANSFER

## 2013 FLC Recognition for Excellence in Technology Transfer Submission Guidelines

**USE THIS FORM ONLY – NOT A PREVIOUS  
YEAR’S – TO SUBMIT YOUR NOMINATION.**

**PLEASE READ CAREFULLY TO AVOID  
HAVING YOUR SUBMISSION DISQUALIFIED.**

### Eligibility

1. Nominee(s) must be employee(s) of FLC member laboratories and non-laboratory staff who were actively involved in the transfer process. A member laboratory is any federal laboratory that is a member of the FLC and has 200 or more full-time equivalent scientific, engineering and related technical positions. The laboratory must be owned, leased, or otherwise used by a federal agency and funded by the federal government, as established under 15 U.S.C. Section 3705 or 3707.
2. Nominee(s) must be employee(s) engaged in science and technology and/or technology transfer activities at FLC member laboratories. This also includes technology transfer professionals such as ORTAs. If this submission is selected for recognition, at least one nominee will participate in the 2013 FLC Recognition Presentation in Denver, Colorado.
3. Duplicate nominations of a single technology transfer effort (for an individual or group) are not allowed.
4. The nominated achievement must have taken place within the last five years.
5. Frequently asked questions and answers thereto are set forth at the end of this application.

## Number of Submissions

Each laboratory may submit a maximum of **four** nominations.

## Complete Submission Procedures

A complete submission will consist of the following sections:

- A completed Submission Cover Sheet, Section 1 (3 pages including abstract nominees and nominator pages)
- A completed Submission Narrative, Section 2 (5 pages max)
- A completed Submission Verification Checklist, Section 3 (1 page)

General formatting for these sections should meet the following requirements:

- Use Arial or Times font styles that are no smaller than 12 points. Failure to do so will result in a disqualification of your submission.
- The completed nomination form must adhere to the electronic page format created by the FLC. Alterations to margins, or use of electronic page formats from previous versions of the nomination form, will result in an automatic disqualification of the nomination.
- If the page limit is exceeded, your submission will be disqualified.
- Graphics and photos are allowed to be used, provided they are included within the body of the Submission Narrative (Section 2). Graphics and photos included on separate attachment pages exceeding the 5 pages provided in the Submission Narrative (Section 2) will result in disqualification of the nomination.
- Wherever possible, provide quantitative data.
- Supporting documentation, including brochures, news articles, press releases and URL addresses will not be accepted with the submission.
- **DO NOT** include proprietary information regarding the technology or its transfer. All submissions will become the property of the FLC, which reserves the right to use the submission's content in its marketing and publications.
- **Content in both the Submission Cover Sheet (Section 1) and Submission Narrative (Section 2) must be written in layman's terms, as they will be used at the discretion of the FLC in promotional materials.**
- Although forms may be duplicated, each form must be submitted as single-sided.

Each submission (**except** for Submission Verification Checklist, Section 3) must be sent electronically at **mchambers@utrs.com** in either an MS Word or a standard PDF format. **Please do not send submissions that have been scanned.**

Each Submission Verification Checklist must be faxed to the FLC Management Support Office (attn: Michele Chambers) at **856-667-8009**. **Only the Submission Verification Checklist will be accepted by fax,** not completed submissions.

**\*\*\*\*\* DEADLINE FOR SUBMISSIONS: MONDAY, SEPTEMBER 17, 2012 \*\*\*\*\***

All submissions and checklists must be received by the FLC Management Support Office by 8:00 p.m. EDT (5:00 p.m. PDT) on **Monday, September 17, 2012**. No submissions will be accepted after this time.

Contact Michele Chambers at 856-667-7727 x135, for additional information.

### **Announcement of Results**

The winners of the 2013 Recognition for Excellence in Technology Transfer will be announced in December 2012. Laboratories submitting nominations will be notified prior to the official announcement.

### **Recognition Presentation**

Honorees will be recognized at the 2013 FLC National Meeting in Denver, Colorado.

RECEIVED:

SUBMISSION NUMBER:

## 2013 FLC Recognition for Excellence in Technology Transfer Section 1 – Submission Cover Sheet

Laboratory Name:

Title of Nominated Technology Transfer:

**Injectable Calcium Apatite Permeable Reactive  
Barrier For Radionuclide Immobilization**

Dates that transfer took place (Beginning 2011 – present time/ ongoing)

### Summary:

Radioactive compounds of uranium, plutonium, neptunium and americium are common contaminants in areas where there was production of plutonium, largely from the 1940s through the 1970s. Uranium, lead, and cadmium are common contaminants from mining operations. All of these elements are hazardous to human health, and have migrated into groundwater and drinking water supplies. For many situations, complete or even partial removal of the contaminant(s) is not possible.

An alternative remediation solution for contaminants in problematic geological sites, the Injectable Calcium Apatite Permeable Reactive Barrier for Radionuclide Immobilization (ICAP), developed by Sandia National Laboratories (SNL) researcher Dr. Robert Moore, immobilizes the contaminants in place in an insoluble form, preventing further migration and keeping them out of the groundwater. The technology, developed using SNL Laboratory Directed Research and Development (LDRD) funding and transferred through an Inter-Entity Work Order, is the use of a formulation of environmentally safe, inexpensive chemical reagents that when injected into soil to utilize the natural soil microorganisms to produce calcium apatite. By injecting the solution in a series of wells in the path of contaminate(s), a permeable reactive barrier of calcium apatite is formed.

Moore responded to an LDRD proposal requesting funds for this research because he had heard about the large levels of contamination at the DOE Hanford 100 N reactor site, and the difficulty associated with its remediation.

An application of the technology has been successfully completed at the DOE Hanford site for immobilization of radioactive strontium at a site contaminated since the 1970s. Attempts to remediate the site were not successful until the ICAP technology was applied there. Using the calcium apatite formulation, a permeable reactive barrier was constructed by injecting the solution into the path of the radioactive strontium next to the Columbia River. The ICAP permeable reactive barrier has succeeded in reducing the amount of radioactive strontium being released into the river by 95% or more.

The recipient of the technology was Fluor, Inc, and CH2MHILL at the Hanford site. Fluor along with Pacific Northwest National Laboratory performed the initial testing of the ICAP barrier. CH2M HILL is currently monitoring the effectiveness of the barrier and expanding it to 2500 ft. along the Columbia River. The ICAP technology is currently being enhanced to sequester technetium, the primary radionuclide of concern at the Hanford site. This work is being funded by CH2MHILL.

## 2013 FLC Recognition for Excellence in Technology Transfer – Section 1

### NOMINEE INFORMATION INSTRUCTIONS:

- List the names (including Mr., Ms., Miss, Mrs., Dr., etc.) and job titles of nominees below.
- Designate one nominee as the primary contact who will be responsible for disseminating information from the FLC to the rest of the team.
- If the address is a PO Box, also include the street address.
- If the project leader is not the primary contact, please provide their information below the primary contact section and designate them as the project leader.
- If any nominee(s) has a different address than the primary contact, provide this information.
- If there are more than two nominees, add their contact information below and on an additional page(s) within **Section 1 only** (if necessary)

**Nominee/Primary Contact: Dr. Robert C. Moore**

**Title: Principal Member of Technical Staff**

**Organization: Sandia National Laboratories**

**Address: P.O. Box 5800**

**City: Albuquerque**

**State: NM**

**Zip: 87185-1136**

**Phone: 505.844.1281**

**Fax: 505.284.4276**

**E-mail: rcmoore@sandia.gov**

**Nominee:**

**Title:**

**Organization:**

**Address:**

**City:**

**State:**

**Zip:**

**Phone:**

**Fax:**

**E-mail:**

## 2013 FLC Recognition for Excellence in Technology Transfer – Section 1

### NOMINATOR INFORMATION INSTRUCTIONS

- List the names (including Mr., Ms., Miss, Mrs., Dr., etc.) of the nominators below.
- If the nominator holds more than one of the positions listed below (e.g. FLC Representative and ORTA Representative) it is only necessary to list the name of the nominator in the entry of the second position.
- If the address is a PO Box, also include the street address.

**THE FLC STRONGLY RECOMMENDS THAT ALL LISTED NOMINATORS HAVE AN OPPORTUNITY TO REVIEW AND APPROVE THE FINAL NOMINATION BEFORE IT IS SUBMITTED FOR JUDGING!!!**

**FLC Representative: Ms. Jackie Kerby Moore**

**Organization: Sandia National Laboratories**

**Address: P.O. Box 580 MS-1495**

**City: Albuquerque**

**State: NM**

**Zip: 87185-1495**

**Phone: 505.845.8107**

**Fax: 505.844.1389**

**E-mail: jskerby@sandia.gov**

**Nominee Supervisor: Mr. Gary Rochau**

**Organization: Sandia National Laboratories**

**Address: P.O. Box 5800 MS 1136**

**City: Albuquerque**

**State: NM**

**Zip: 87185-1135**

**Phone: 505.845.7543**

**Fax: 505.284.4276**

**E-mail: gerocha@sandia.gov**

**ORTA Representative/**

**Technology Transfer Manager: Dr. Peter A. Atherton**

**Organization: Sandia National Laboratories**

**Address: P.O. Box 5800-0351**

**City: Albuquerque**

**State: NM**

**Zip: 87185-0351**

**Phone: 505.284.3768**

**Fax: 505.844.4394**

**E-mail: prather@sandia.gov**

**Laboratory Director: Dr. Paul J. Hommert**

**Organization: Sandia National Laboratories**

**Address: 1515 Eubank Blvd. SE, MS 0101**

**City: Albuquerque**

**State: NM**

**Zip: 87123-0101**

**Phone: 505.844.7261**

**Fax: 505.844.1120**

**E-mail: pjhomme@sandia.gov**

# 2013 FLC Recognition for Excellence in Technology Transfer

## Section 2 – Submission Narrative

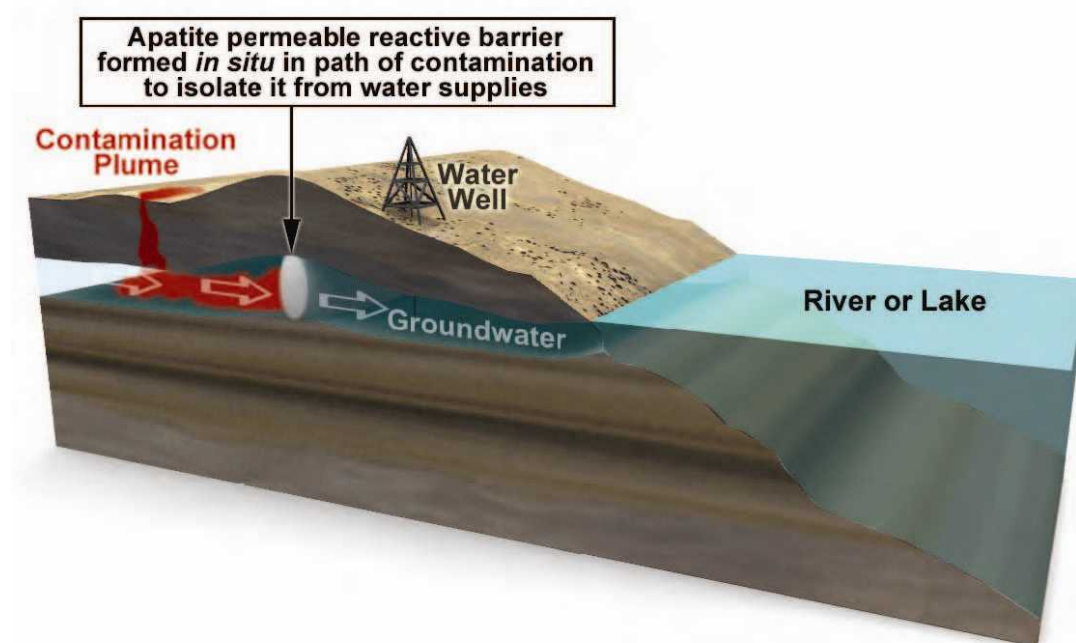
**Laboratory Name: Sandia National Laboratories**

**Title of Nominated Technology Transfer:**

**Injectable Calcium Apatite Permeable Reactive Barrier  
For Radionuclide Immobilization**

### Description of Technology Transferred

The injectable calcium apatite permeable reactive barrier for radionuclide immobilization (ICAP) technology developed by Sandia National Laboratories (SNL) engineer Dr. Robert Moore relies on a calcium phosphate mineral to sequester, absorb, and bind a variety of radioactive elements such as uranium, plutonium, neptunium, americium, strontium, and heavy metal contaminants such as lead, cadmium, and cobalt.



**Figure 1** Formation of a calcium apatite permeable reactive barrier using an aqueous solution of calcium citrate and sodium phosphate. The apatite forming solution is injected into the soil where the natural soil bacteria biodegrade the calcium citrate, resulting in the formation of calcium apatite precipitate throughout the soil for sequestering contaminants.



An alternative remediation solution for contaminants in problematic geological sites, ICAP creates a reactive barrier which immobilizes the contaminants in place in an insoluble form, preventing further migration and keeping them out of the groundwater. The ICAP technology, developed using SNL Laboratory Directed Research and Development (LDRD) funding, is the use of a formulation of environmentally safe, inexpensive chemical reagents that when injected into soil utilize the natural soil microorganisms to produce calcium apatite. By injecting the solution in a series of wells in the path of contaminate(s), a permeable reactive barrier of calcium apatite is formed.

Radioactive compounds of uranium, plutonium, neptunium and americium are common contaminants in areas where there was production of plutonium, largely from the 1940s through the 1970s. Uranium, lead, and cadmium are common contaminants from mining operations. All of these elements are hazardous to human health, and due to industrial activity over the last century, have migrated into groundwater and drinking water supplies. For many situations, complete or even partial removal of the contaminant(s) is not possible.

An application of the ICAP technology has been successfully completed at the DOE Hanford 100 N reactor site for immobilization of radioactive strontium. The site has been contaminated with strontium since the 1970s. Attempts to remediate the site were not successful until the technology was applied there. Using the calcium apatite formulation a permeable reactive barrier was constructed by injecting the solution into the path of the radioactive strontium next to the Columbia River. The permeable reactive barrier has succeeded in reducing the amount of radioactive strontium being released into the river by 95% or more.



**Figure 2** Soil column showing apatite crystal formed in the sediment.

### **The Technology Transfer Story**

Dr. Robert Moore responded to an LDRD proposal requesting funds for this research because he had heard about the large levels of contamination, its prevalence, and the difficulty associated with its remediation. Moore contacted the industry contractors who were responsible for the cleanup at Hanford which was proving to be almost impossible. Industry partners wanted to provide funding to determine if this technology would be viable in the field. Another national lab, Pacific Northwest National Laboratory (PNNL), was invited to join in the remediation effort since they had an intimate knowledge of the geophysical characteristics of the site.

The role of Moore and SNL was to develop a new technology for sequestering and immobilizing radioactive contaminants and hazardous contaminants. The goal was to capture the contaminants and prevent their mobility since they were an imminent threat to water supplies. CH2M HILL, with Fluor and PNNL, had the goal of remediating radioactive contamination at Hanford. They worked to verify the ICAP technology through additional experimentation at Hanford, where the radioactive contaminants were threatening the Columbia River.



**Figure 3 Drilling an injection well next to the Columbia River at the Hanford site.**

Moore contacted the contractors in charge of cleanup at Hanford, Fluor and CH2MHILL. Through LDRD funding, research was done which led to the two patents covering ICAP technology. Subsequently Fluor and CH2MHILL funded more experiments by Robert Moore at SNL using their groundwater stimulant to confirm the results of previous experiments. The ICAP technology was transferred to PNNL through an Inter-Entity Work Order (IEWO). Then PNNL, with their expertise on the geohydrology of the Hanford area, was contracted to work with the companies to see if ICAP technology could be applied to the Hanford site. Moore of SNL worked with PNNL for a year on the initial deployment at Hanford.

### **Key Contributions to the Technology Transfer**

Moore responded to an LDRD proposal requesting funds for this research because he had heard about the large levels of contamination at Hanford, its prevalence, and the difficulty associated with its remediation. Moore contacted the industry contractors who were responsible for the cleanup at Hanford which was proving to be almost impossible. The industry partners, Fluor and CH2MHILL, provided funding to determine if this technology would be viable in the field. Another national lab, PNNL, was invited to join in the remediation effort since they had an intimate knowledge of the geophysical characteristics of the site.

### **Outcomes of the Technology Transfer**

An application of the technology has been successfully completed at the DOE Hanford 100 N reactor site for immobilization of radioactive strontium. The site has been contaminated with strontium since the 1970s. Attempts to remediate the site were not successful until the ICAP technology was applied there. Using the calcium apatite formulation, a permeable reactive barrier was constructed by injecting the solution into the path of the radioactive strontium next to the Columbia River. The permeable reactive barrier has succeeded in reducing the amount of radioactive strontium being released into the river by 95% or more. After installation of the calcium apatite barrier and its success, the pump-and-treat system being used previously was permanently decommissioned, resulting in a savings of more than \$1 million per year.

Once the ICAP technology was developed, CH2M HILL provided funds to conduct additional experiments on the applicability and viability of the technology. CH2M HILL partnered with Fluor and Pacific Northwest National Laboratory (PNNL) to verify the technology through additional experimentation. PNNL was hired to install the calcium apatite permeable reactive barrier. The ICAP technology is still in its test phase and it was expanded in size over the last year. CH2M HILL has taken over from Fluor and plans to expand the barrier from 900 ft. to 2500 ft. in the near future.

The technology is currently being enhanced to sequester technetium, the primary radionuclide of concern at the Hanford site. This work is being funded by CH2MHILL.

One of the focuses of work at SNL is protecting the people, environment and infrastructure of the U.S. This technology provided a solution to a major contamination problem threatening the Columbia River and Washington State.

The users of the technology were able to solve the remediation problem at the Hanford 100 N reactor site. Before this technology there was no acceptable remediation technology available. The technology is being evaluated for use at other sites on the Hanford reservation and other contaminated sites.



**Figure 4 Hanford 100 N reactor site.**



Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000. SAND# XXXX-XXXX.

## 2013 FLC Recognition for Excellence in Technology Transfer Criteria

The highest score possible is 100 points. The total point score will be used for ranking. Scoring will be done by judging the Submission Narrative (Section 2) against the criteria listed on this page.

***Carefully review the criteria before writing your Submission Narrative. How closely you adhere to the guidelines provided may be the deciding factor in whether your laboratory is selected as an honoree!***

### Criteria – FLC Recognition for Excellence in Technology Transfer

#### A. Description of Technology Transferred

1. Describe the technology transferred, including advantages, benefits, and other relevant features (10 points)
2. Who or what was the recipient of the transferred technology, and when did the transfer take place? (5 points)

#### B. The Technology Transfer Story

1. How and by whom was the partnership for the technology initiated? (5 points)
2. What were the specific roles, goals, objectives, and expectations of each partner? (10 points)
3. What technology transfer mechanisms, resources, and/or activities were used to transfer the technology? (25 points).

#### C. Key Contributions to the Technology Transfer

1. Describe each nominated team member's role in the technology transfer, including any innovation or creativity demonstrated by team members in transferring the technology. (20 points)

#### D. Outcomes of the Technology Transfer

1. What was the result of the technology transfer effort? (10 points)
2. Describe how this technology transfer effort met the mission requirements of your laboratory. (10 points).
3. How well were the goals and expectations of the partners met? (5 points)

FLC Laboratory Representatives should carefully review the criteria before preparing a nomination. It is important to understand that this recognition is specifically for **transferring technologies**; they are **not** given for a research effort that does not include an element of technology transfer—no matter how innovative it might be.

Because each item of the criteria is worth points, each criterion must be addressed in the Submission Narrative in the section they are being asked or points may be deducted. If an item is not applicable, please indicate this in the narrative, and this will be taken into account by the judges. When writing your Submission Narrative, be as specific and concise as possible.

# 2013 FLC Recognition for Excellence in Technology Transfer

## Section 3 – Submission Verification Checklist

(This page will only be accepted via fax at 856-667-8009)

**Laboratory Name:**

**Title of Nominated Technology Transfer:**

Please review each item below and determine whether your nomination meets the stated requirements. For the last two items, you must simply agree to comply with these requirements in the event that the nomination is chosen as a winner.

- ☐ The technology transfer achievement took place in the last five years.
- ☐ The technology involved is clearly described in layman's language.
- ☐ The Submission Cover Sheet (Section 1) is completed per instructions.
- ☐ The nomination was reviewed and approved by all the nominators listed on the Submission Cover Sheet (Section 1).
- ☐ The Submission Narrative (Section 2) uses the page format established by the FLC, is typed in 12 point type or larger, addresses all items listed in the criteria, and comprises pages 2-1 through 2-5 of the nomination.
- ☐ Section 1 and Section 2 of the nomination package are being submitted electronically in either an MS Word or standard (non-scanned) PDF format to the FLC Management Support Office via [mchambers@utrs.com](mailto:mchambers@utrs.com) by **Monday, September 17, 2012**.
- ☐ No supporting documentation is attached.
- ☐ The nomination does not include any proprietary or confidential information and the FLC may use this entire submission as a resource document and for media purposes.
- ☐ In the event of being chosen as a winner, at least one nominee will participate in the recognition presentation at the 2013 FLC National Meeting in Denver, Colorado.
- ☐ The nominee(s) will provide a poster display for an exhibit at the 2013 FLC National Meeting in Denver, Colorado.

**As the nominating official and FLC Representative from this laboratory, I understand that entries not conforming to this checklist will be returned without consideration.**

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Phone

## **2013 FLC Recognition for Excellence in Technology Transfer Frequently Asked Questions**

- 1. I want to nominate someone from a partnering company for this recognition. Would he/she be eligible?**

Yes, non-laboratory staff is eligible for nomination.

- 2. I want to be sure someone in our laboratory's technology transfer office who provided their expertise and assistance is recognized. Is this possible?**

Yes, technology transfer professionals, including ORTAs, are eligible for nomination.

- 3. One of my potential nominees is now retired/deceased. Can I still include their name in the submission?**

Yes. Any individual who was employed at the laboratory at the time of the technology transfer is eligible to be nominated.

- 4. Is there a limit on the number of individuals I can nominate?**

No. All eligible individuals who were actively involved in the technology transfer process can be nominated, regardless of number. However, each individual effort must be specifically identified in the nomination write-up. Failure to do so may result in the individual being removed from the nomination or total nomination disqualification.

- 5. Our laboratory just completed a joint technology transfer effort with another laboratory. Can I submit this joint project as a nominee?**

Yes, joint technology transfer projects between federal laboratories are eligible for nomination, even if the laboratories are affiliated with different federal agencies. However, only one of the laboratories may submit a nomination. Please consider submitting this joint effort as an Interagency Partnership Recognition.

- 6. The technology that my laboratory has produced has great potential, but has yet to be formally transferred. Can my submission be given serious consideration by the judges on basis of technology alone?**

No. This recognition is given on the basis of successful technology transfer efforts, as opposed to the potential of the technology itself. It is advisable to only submit a technology for nomination once it has formally been transferred.

- 7. The narrative I plan to submit is rather extensive and I don't want to leave anything out. Can I use more than five pages in Section 2?**

No.



## **2013 FLC Recognition for Excellence in Technology Transfer Frequently Asked Questions (continued)**

- 8. I am running behind schedule in completing my submission. Is it acceptable to send the submission after September 17, 2012, provided I make arrangements to do so in advance?**

No. An electronic copy of your submission and a faxed copy of the Submission Verification Checklist must be received by the FLC Management Support Office by 8:00 p.m. EDT (5:00 p.m. PDT) on **Monday, September 17, 2012**. No submissions will be accepted after this time.

- 9. Though the deadline has passed, it has come to my attention that a section of my submission is incomplete. Can I send the missing information?**

No. It is important to make sure that your submission is completed and meets the necessary requirements before you send it. The Submission Verification Checklist (Section 3) exists for this reason.

- 10. How will I know that my submission has been received?**

Upon receipt of your submission, you will receive an electronic confirmation.

- 11. I have included proprietary information in my submission. If my submission is selected as an honoree, can this information be deleted?**

The FLC reserves the right to use your entire submission as a resource document and for media and/or promotional purposes, so only include non-proprietary information in your submission.

- 12. When will I be notified if my submission is selected as an honoree?**

Laboratories will be notified prior to the official public announcement in December 2012.

- 13. Do the honorees receive a cash prize?**

The FLC does not distribute cash as part of its recognition program.

- 14. Does the FLC cover travel expenses for the winner?**

The FLC does not cover travel expenses. However, honorees are eligible for discount fees pertaining to the National Meeting and recognition-related events.