

**NASA Science & Technology Institute for Minority Institutions (NSTI-MI)  
Annual Progress Report: 2011**

Grant # NNX09AV17A

Administered by UNCF Special Programs Corporation

Type of Agreement: Grant

Project Manager: Brenda J. Collins

Ames Research Center

(650) 604-3540

**PROJECT DESCRIPTION**

The NASA Science and Technology Institute for Minority Institutions (NSTI-MI) was established in 2006 to provide leading-edge research opportunities for faculty and students from MIs that complement NASA's research programs and make original contributions to NASA in astrobiology, biotechnology, information technology, energy, environment research, and other emerging technologies. NSTI-MI brings together the talent and expertise of MIs to communicate, connect, and collaborate with government, the private sector, one another, and majority institutions through the establishment of R&D collaborations and partnerships. By placing MIs within this nexus of business and intellectual property transfer networks, NSTI-MI aims to: stimulate cross-disciplinary research; improve the transfer of information ideas and technology; promote the development of market-based technologies; foster technology management strategies that will move advances from scientific discovery to basic and applied technology; and establish educational frameworks and networks that will continue to expand the Nation's talent base for research and development. The first institutional cluster was located at Ames Research Center. In calendar year 2008, the NSTI-MI project was expanded into an Office of Education national project with new research clusters placed at Glenn Research Center and Johnson Space Center. The NSTI project currently has three active clusters:

**UNCFSP-NSTI Information and Emerging Technologies Cluster (UNITE)**

conducts research that addresses pressing challenges in the areas of Supercomputing, Networking and Intelligent Systems. This Cluster also engages in nano-scale research to support Aerospace and Thermal Protection Systems as well as human exploration of space. UNITE institutions are listed below:

**Information and Emerging Technologies Trust (UNITE)-Ames (ARC)**

San Francisco State University

Texas Southern University (Norfolk University is a sub-contractor)

California State University – Fullerton

Southern University

Tuskegee University

**UNCFSP-NSTI Mission Enabling Technologies Cluster (UNIMET)** conducts human exploration missions enabling research in the areas of Science Missions Payloads, Biotechnology, Astrobiology, Human Factors, Advanced Life Support and Bio-nanotechnology. UNIMET Institutions are listed below: **Mission**

**Enabling Technologies Trust (UNIMET) –Johnson (JSC)**

Jackson State  
University of Texas  
Southern University  
Savannah State University  
Jarvis Christian College  
Tougaloo College

**UNCFSP-NSTI Energy and Environmental Cluster (UNEEC)** addresses energy and environmental issues as it relates to space travel and life on earth. UNEEC institutions are listed below:

**Energy and Environmental Trust (UNEEC) –Glenn (GRC)**

Savannah State University  
University of Texas at El Paso  
Wilberforce University Texas  
Southern University

The program has also grown to include two additional components beyond the institutional research clusters. The other components of the NSTI Project are the Summer Scholars Program and the NSTI Summer Faculty Fellowship Program. The Summer Scholars program offers undergraduate students 10 week internships at the three NASA centers associated with the NSTI Cluster project (Ames, Johnson, and Glenn). Students must have at least a 3.0 grade point average, and attend a minority serving institution to be eligible for this program. The internship pays a small stipend of \$7000.00. The 2011 interns were the program's sixth cohort.

The NSTI Summer Faculty Fellowship project targets early career faculty from minority serving institutions. The faculty must identify a NASA host for their proposed project and create a detailed research plan for their summer activities. The fellowship is a 10-week hands on research experience and occurs in conjunction with the NSTI Summer Scholars Project. Faculty members receive a stipend of \$13,500.00 for the 10 week research experience. This project started in 2009 and all fellows were located at NASA Ames research center that year. In 2010 this project was offered to all centers. In 2011 three NASA centers (Ames, Johnson and Glen) participated.

The NSTI-MI is currently administered by the United Negro College Fund Special Programs Corporation (UNCFSP) through a cooperative agreement and managed by NASA Ames Research Center's Office of Education.

## PROJECT GOALS

NSTI-MI focuses its efforts to meet the goals and objectives listed below:

Goal 1: Link Minority institutions, industry, non-profits, and other entities through close association and alignment of research interests and expertise to create symbiotic partnerships.

Goal 2: Channel R&D efforts toward the development of market-based concepts that can be leveraged for sustainability.

Goal 3: Provide professional development, including research, business acumen, and leadership building expertise that will groom and prepare faculty, students, and others to be highly-skilled science and technology leaders and managers.

Goal 4: Work with Key Stakeholders to perform the following:

- Select students through a competitive application process to increase their STEM awareness and knowledge through individual experiential opportunities
- Select faculty at minority institutions through competitive application processes to engage in collaborative research and increase their awareness and knowledge of NASA disciplines and missions
- Select minority-serving institutions participating in the NSTI Cluster project through competitive application processes to increase their research capability and capacity for competitiveness for mainstream research and development awards.

NSTI-MI accomplishes its goals through the formation of research clusters that include faculty, students, post-doctoral fellows and collaborates with NASA scientist/engineers, majority institutions and the private sector to engage in NASA-related research and development. NSTI-MI research clusters provide excellent leadership opportunity for faculty from MI's to lead research teams and assist member institutions in competing for new research grants and/or contracts. NSTI-MI provides professional development training in R&D leadership and development, project management, business development, marketing and contract management. NSTI-MI is committed to STEM workforce development. It provides fellowship and internship opportunities for undergraduate students in NASA related programs and activities.

## PROJECT BENEFIT TO OUTCOME

All NSTI-MI goals and objectives are designed to support the Agency Strategic Plan and Education goals. NSTI-MI supports five objectives under Education Outcomes 1: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's Strategic goals through a portfolio of investments.

- Objective 1.1- Faculty and Research Support
  - Provide NASA competency-based education and Research opportunities for faculty, researchers and post-doctoral fellows.
- Objective 1.2- Student Support
  - Provide NASA competency-building education and research opportunities to individuals in order to develop qualified undergraduate and graduate students who are prepared for employment in STEM disciplines at NASA, industry or higher education institutions.
- Objective 1.3 -Student Involvement
  - Provide opportunities for groups of post-secondary students to engage in authentic NASA-related mission-based research and development activities.
- Objective 1.4- Course Development
  - Develop NASA-related course resources for integration into STEM disciplines.
- Objective 1.5- Targeted Institution Research and Academic Infrastructure Support
  - Improve the ability of target institutions to compete for NASA research and development work.

The NSTI project met all five objectives in FY2011. NSTI met Objective 1.1: Faculty and Research Support and Objective 1.2: Student Support through its Faculty Fellowship and Summer Scholars programs In FY2011. Ten undergraduate scholars were selected for the 10-week Summer Scholar Research opportunity. Since 2006, eighty-seven NSTI Summer Scholars have been provided internship opportunities.

The project supports Objective 1.3-Student Involvement by providing hands on research opportunities to students located at one of the cluster schools. In 2011, two NSTI faculty members reported that they provided students the opportunity to work on cluster related research at their universities.

The project supports Objective 1.4: Course Development and Objective 1.5- Targeted Institution research and academic infrastructure support directly

through the NSTI Institutional Cluster portion of the project. The NSTI project provided funding to ten minority serving institutions. The universities reported using NSTI funding to expand research capacity, create or redesign courses, and provide hands-on NASA content related research opportunities to students.

Overall this project is meeting the goals that its designers envisioned. It is building research capacity at minority institutions providing research opportunities for students and faculty. It has built research infrastructure at the university by providing the seed money that allowed many of the researchers to seek additional funding or work collaboratively with other universities and national laboratories.

## PROJECT ACCOMPLISHMENTS

**Outcomes** associated with the UNITE Cluster include the following:

1. One institution (Tuskegee University) modified STEM curricula based on knowledge gained through cluster participation. The course name was Heat Transfer.
2. Fourteen (14) different projects are underway within UNITE involving 7 faculty and 13 students. All 5 UNITE Institutions reported having achieved either most (4 Institutions) of or all of their goals (one institution).
3. Seven (7) cluster-related conferences/workshops/trainings were attended this year, 4 of which were funded by NSTI.
4. In addition, the UNITE cluster institutions conducted mentoring, advised students about NASA programs, and conducted cluster-related outreach activities.

**Outcomes** associated with the UNIMET Cluster include the following:

1. Jarvis Christian College reported that it created/modified STEM curricula based on knowledge gained through cluster participation. Specifically, it reported revising three biology and one nursing (nutrition) course.
2. Six (6) different projects are underway within UNIMET involving 5 faculty and 9 students. Two institutions reported having made excellent (50%) or good progress (50%) toward achieving their research progress goals within their research project plans.
3. Nine (9) cluster-related conferences/workshops/trainings were attended this year, five of which were funded by NSTI.
4. The UNIMET cluster institutions conducted mentoring, advised students about NASA programs, and conducted cluster-related outreach activities.

**Outcomes** associated with the UNEEC Cluster include the following:

1. Two institutions created/modified STEM curricula based on knowledge gained through cluster participation. Savannah State University revised *Aquarium*

*Systems 2* to incorporate algal/biomass cultures for bio-fuels. Texas Southern University revised one course on alternative energy technology.

2. Twelve (12) different projects are underway within UNEEC involving 7 faculty and 17 students. Each institution reported either achieving their goals or at least making excellent progress toward achieving the research goals within their research project plan.
3. Each cluster institution reported attending one (1) cluster-related conferences/workshops/trainings this year (for a total of 4), 2 of which were funded by NSTI.
4. In addition, UNEEC cluster institutions conducted mentoring, advised students about NASA programs, and conducted cluster-related outreach activities.

**Outputs** associated with the UNITE Cluster include the following:

1. 22 graduate students and one undergraduate student is currently involved with UNITE research projects.
2. Two partnerships with NASA Centers were established.
3. One higher education institutions/agencies/businesses partnership that facilitate cluster work was established within the UNITE cluster this year by Texas Southern with the University of Houston.
4. Four grant applications were submitted by the UNITE cluster to the National Science Foundation (3 applications) and one to the National Oceanic and Atmospheric Administration.
5. One grant thus far has been earned by Southern University from NSF for Developing Multi-Media Material for Health Information Technologies in the sum of \$500,000.
6. No patents were applied for/earned by UNITE, although Tuskegee University reports developing an apparatus for simulating high heat fluxes. The researcher states there is little commercial application for this device although it was useful as an educational tool.
7. Ten (10) cluster-related research articles have been published and 6 have been submitted for review or are in development for peer reviewed journals. One book chapter is in development by Texas Southern University. Eleven presentations have been made and four are in development by the UNITE cluster.

**Outputs** associated with the UNIMET Cluster include the following:

1. Ten students are currently involved with UNIMET research projects.
2. Two new and 6 ongoing partnerships with NASA Centers were reported by UNIMET.
3. Of the partnerships with higher education institutions/agencies/businesses that facilitated cluster work were established within the UNIMET cluster this year, Jarvis Christian College formed a new partnership with the University of Texas at Tyler to complement its on-going partnerships with the University of Toledo and the Health Science Center at University of Texas. Savannah

State University maintained its 3 partnerships (2 with NIH, one with NSF) while Texas Southern University began a new partnership with Sikkim Manipal University in India to conduct a STEM student exchange program. Tougaloo College maintained its partnership with the National Institute of Minority Health and Health disparities through the NIH.

4. Jarvis Christian College has two grant applications pending; One from NSF for \$365,944 and one from NIH for \$369,000.
5. All three proposals submitted by Savannah State University were awarded. One proposal was funded by the National Science Foundation for \$308,000 and two were funded by the National Institutes of Health for a total of \$4,230,000. Two proposals submitted by Texas Southern University were funded; 1) NSF, one million dollars, and 2) NOAA for 3 million dollars. Tougaloo College has on-going funding through NIH for \$350,000 a year,
6. Although no new patents were applied for/earned by UNIMET, Texas Southern University reports developing improved fluorescent techniques to detect membrane damage in cells.
7. Four (4) cluster-related research articles were published in peer reviewed and non-peer reviewed journals and eight publications are in development including one book chapter. Three (3) professional cluster-related presentations were conducted this year and four are in development.

**Outputs** associated with the UNEEC Cluster include the following:

1. Seven undergraduate students, nine graduate students, and one postdoctoral fellow, are currently involved with UNEEC research projects.
2. Nine existing partnerships with higher education institutions/agencies/businesses that facilitate cluster work were continued within the UNEEC cluster this year by Savannah State University, Texas Southern University, and the University of Texas at El Paso. Savannah State University formalized three external partnerships (Global Alternative Fuels LLC, Menova Energy, Inc., and Four Peaks Energy, Inc.) to work with the University of Texas at El Paso Algae Biofuels Consortium. Texas Southern University also formalized a partnership with the University of Texas at El Paso. The University of Texas at El Paso formalized three external partnerships with Sandia National Laboratory, Oxford Catalysts, and Acclergy Corporation to conduct research on an on-going basis.
3. Two proposals submitted by the University of Texas at El Paso were awarded.
4. Savannah State University reports one potentially patentable device (an Algae Dewatering Device) in development.
5. Two (2) cluster-related research articles have been published in peer reviewed and non-referred journals and one has been submitted for review. Eight (8) publications and three book chapters are currently in development. Fifteen (15) professional cluster-related presentations have been conducted this year.

## PROJECT CONTRIBUTIONS TO PART MEASURES

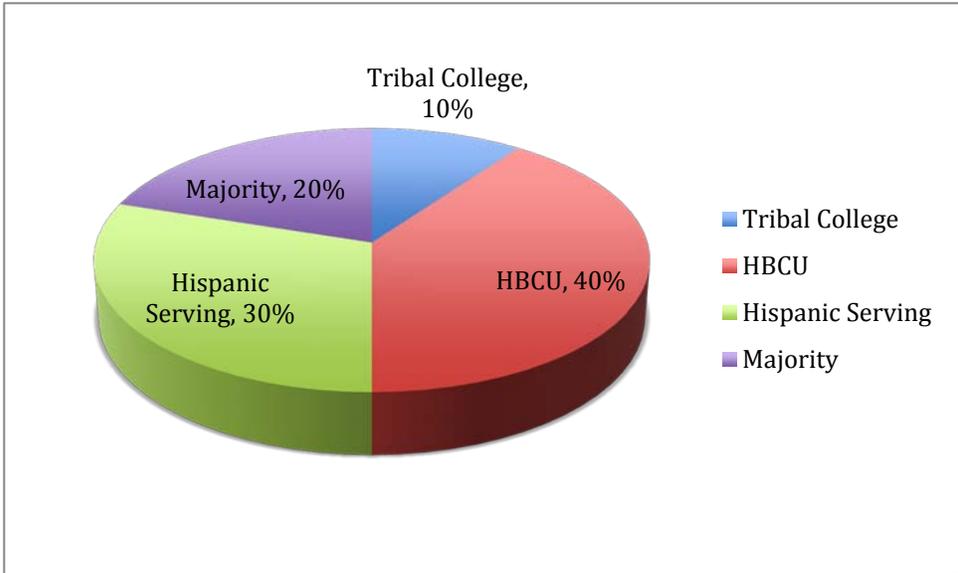
**For the period: October 1, 2010 through September 30, 2011**

### **Summer Scholars Program**

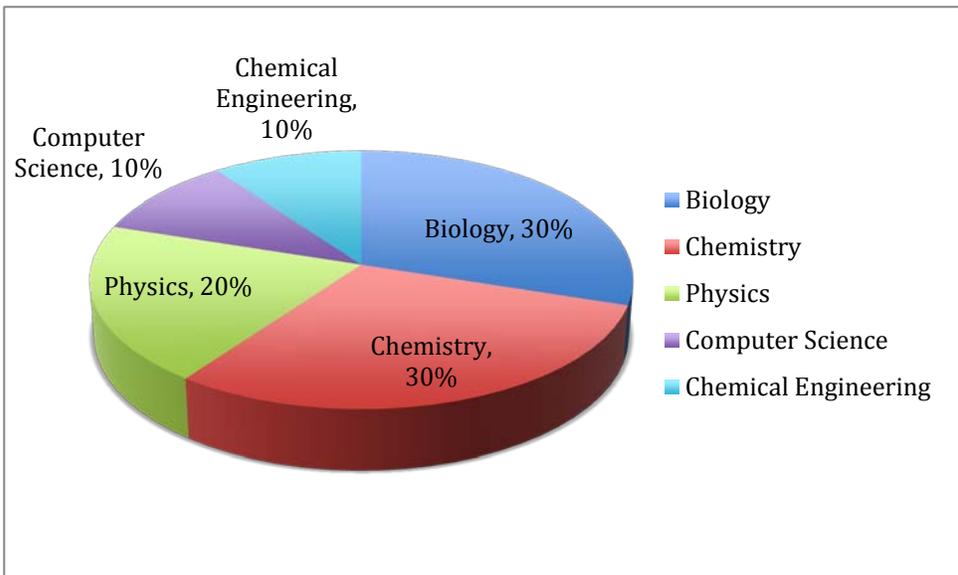
- Objective 1.3: Total number participants reported FY11 (Cohort 6): 10
- Number of participants continuing in school: 10
- Objective 1.2: Underserved and Under-represented Students Ethnicity and Gender

Specific names and institutions of students participating in the NSTI program:

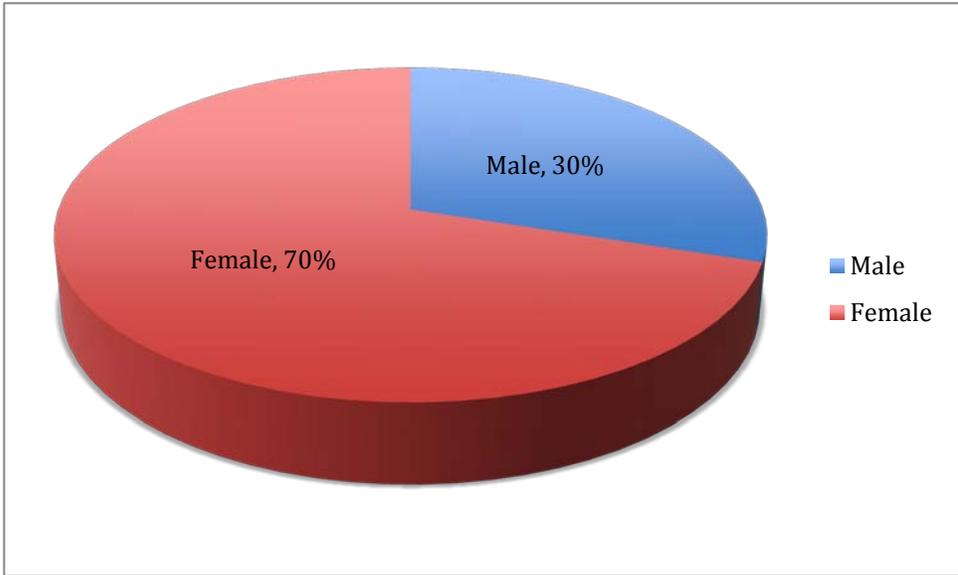
<b>2011 NSTI Summer Scholar</b>	<b>Institution</b>	<b>Assigned NASA Center</b>
Kellie-Ann Daley	Howard University	Ames
Trena Rashae Sharpe	Tuskegee University	Ames
Joanne Ignacio	Navajo Technical College	Ames
Demitrius Boyson	Tougaloo College	Johnson
Deidra Huff	Jarvis Christian College	Johnson
Daniel Luis Gonzales	Angelo State University	Glenn
Karen J. Guerrero	University of Puerto Rico – Mayaguez	Glenn
Brittany L. Johnson	Allegheny College	Glenn
Maria del Mar Maldonado	University of Puerto Rico – Rio Piedras	Glenn
Thomaz Lago Santana	Florida International University	Glenn



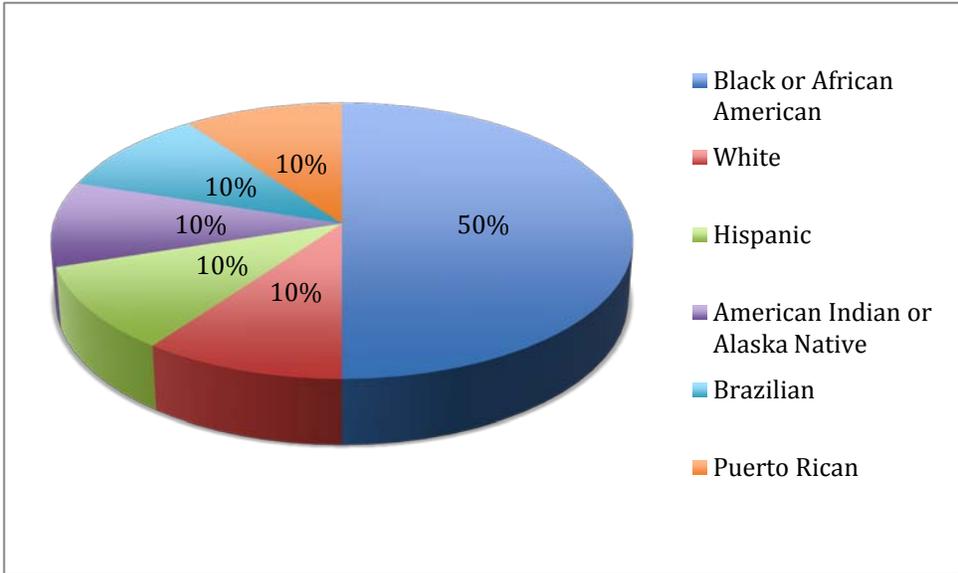
**Figure 1: 2011 NSTI SS Cohort 6 by Institution Type**



**Figure 2: 2011 NSTI SS Cohort 6 by Academic Major**



**Figure 3: 2011 NSTI SS Cohort 6 by Gender**



**Figure 4: 2011 NSTI SS Cohort 6 by Race**

## Summer Faculty Fellowship Program

- Total Number of Participants (Cohort 3): 2
- Objective 1.1- Faculty and Research Support: 2
- Objective 1.5- Minority Institutions Represented: TCU 100%

Names and institutions of participating faculty members in the NSTI Faculty Fellowship program:

<b>2011 NSTI Faculty Fellow</b>	<b>Institution</b>	<b>Assigned NASA Center</b>
Grace Bulltail	United Tribes Technical College	Ames
Rebekah Olsen	United Tribes Technical College	Ames

## IMPROVEMENTS MADE IN THE PAST YEAR

### **Student Summer Scholars Program**

This year (2011) is the first year we had a student from a Tribal College (TCU). Joanne Ignacio from Navajo Technical College worked with William Warmbrodt at NASA Ames, designing simple wind turbines to be tested in wind tunnels 20 inches by 20 inches at Ames.

Other research projects conducted by NSTI Summer Scholars included Trena Sharpe, who helped to develop vertically aligned carbon nanotube thermal interface materials at NASA Ames and Karen Medina-Guerrero who transformed algae to fuel for aviation at Glenn. One out of this year's nine Summer Scholars was an alumnus of the NSTI internship program. Brittany Johnson from Allegheny returned to Glenn to work with Kenneth Smart researching lunar soil.

### **Summer Faculty Fellowship Program**

This year (2011) is the first year the NSTI Faculty Fellowship Program has been entirely comprised of faculty Tribal Colleges and Institutions (TCUs). Two faculty members from the United Tribes Technical College were placed at the NASA Ames Research Center in Mountain View, CA. Grace Bulltail, an Earth Resources Engineering Professor, worked with NASA Scientist, William Warmbrodt. Rebecca Anne Olsen worked with NASA Scientist, Steve Hipkind, on an Environmental Science project. As a part of the Faculty Fellowship Program, the faculty served as mentors to teams of Native American students conducting summer research at Ames through the Tribal Colleges and

Universities Project (TCUP). In addition to mentoring and summer research, the faculty developed sustainability methods designed to infuse and enhance the curriculum at their home institutions with NASA-relevant research.

## PROJECT PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

Through our UNCFSP Institute for Advancement, the NSTI is able to provide minority institutions, students and faculty the tools, training and access to resources designed to strengthen their institutional infrastructure and collaborative research efforts.

Three mandatory online professional development trainings are held during the 10-week internship and fellowship experience. Summer Scholars participate in a variety of onsite professional development training sessions on topics such as, *Leadership Development*, *Understanding Your Online Presence: How to use Social Media to Your Advantage*, *Scientific Communication*, *Presentation Skills*, *Developing a Professional Portfolio*, *Team Building*, *Interviewing Techniques*, *Resume Building and Networking Skills*, and *Responsible Research Ethics*. Faculty participate in STEM Curriculum Training, and scientific forums dedicated to exploring ways in which NASA related content can be infused into traditional classroom environments.

Cluster representatives are annually provided relevant trainings such as *Developing the R&D Enterprise*, *Winning Government Contracts*, and *Understanding STEM Policy*.