



NSF INCLUDES: Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science

DSU received one of the 27 NSF INCLUDES Awards of 2017

DSU NSF INCLUDES AWARD

NSF INCLUDES DDLP: Expanding Diversity in Energy and Environmental Sustainability (EDEES) through the creation of learning opportunities for minority students in the Mid-Atlantic region

Participants

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Ms. Jackelyn Jones (DSU)

NSF two-year pilot program

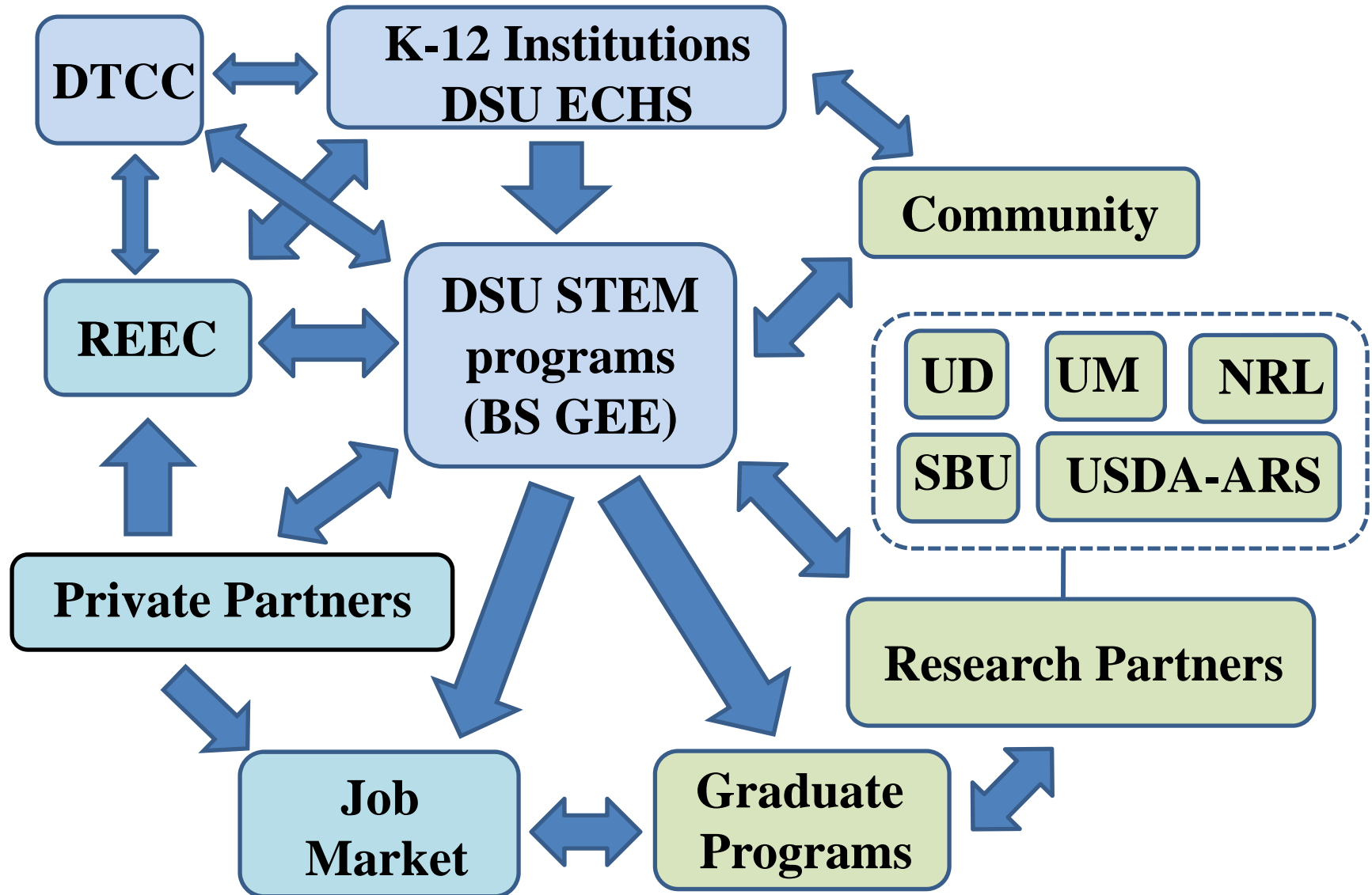
Start 09/15/2017

End 09/14/2019

Goals

- To grow STEM enrollment at DSU by enrolling at least 20 underrepresented minority (URM) students in majors related to green energy and environmental sustainability.
- To establish a BS degree in Green Energy Engineering at DSU based on the existing academic and research infrastructure, the educational and research collaboration within the alliance, and the creation of new coursework in the fields of green energy and environmental sustainability.
- To strengthen the pathway from two-year energy-related associates degree programs to four-year degrees by ensuring at least 5 students/year transfer to DSU in energy-related STEM programs.
- To increase the number of high school graduates from underrepresented groups who choose to attend college in STEM majors.

Initial Network



Initial Network

DSU - Delaware State University

SBU - Stony Brook University

UD - University of Delaware

UM - University of Maryland,

USDA-ARS - US Department of Agriculture-
Agriculture Research Service

NRL - United States Naval Research Laboratories

DTCC - Delaware Technical Community College

ECHS - Early College High School

REEC - Renewable Energy Education Center

Main Initiatives

Initiative 1 (I1): *Develop the research and education activities in the DSU Renewable Energy Education Center (REEC) and promote its integration with the NSF INCLUDES EDEES program to support and engage URM students as they move from middle and high school to a STEM major in the college and university, into graduate school and STEM-related careers.*

Initiative 2 (I2): *Develop DSU's research and education programs in Alternative Energy and Environmental Sustainability including a research internship program that will engage undergraduate and graduate students in laboratory research at DSU and partner institutions.*

Initiative 3 (I3): *Promote careers in alternative energy and environmental sustainability.*

Initiative 4 (I4): *Build partnerships with high-minority K-12 schools through Energy-related outreach programs at DSU and Delaware Technical Community College (DTCC) that will engage high school students in green energy research and STEM education.*

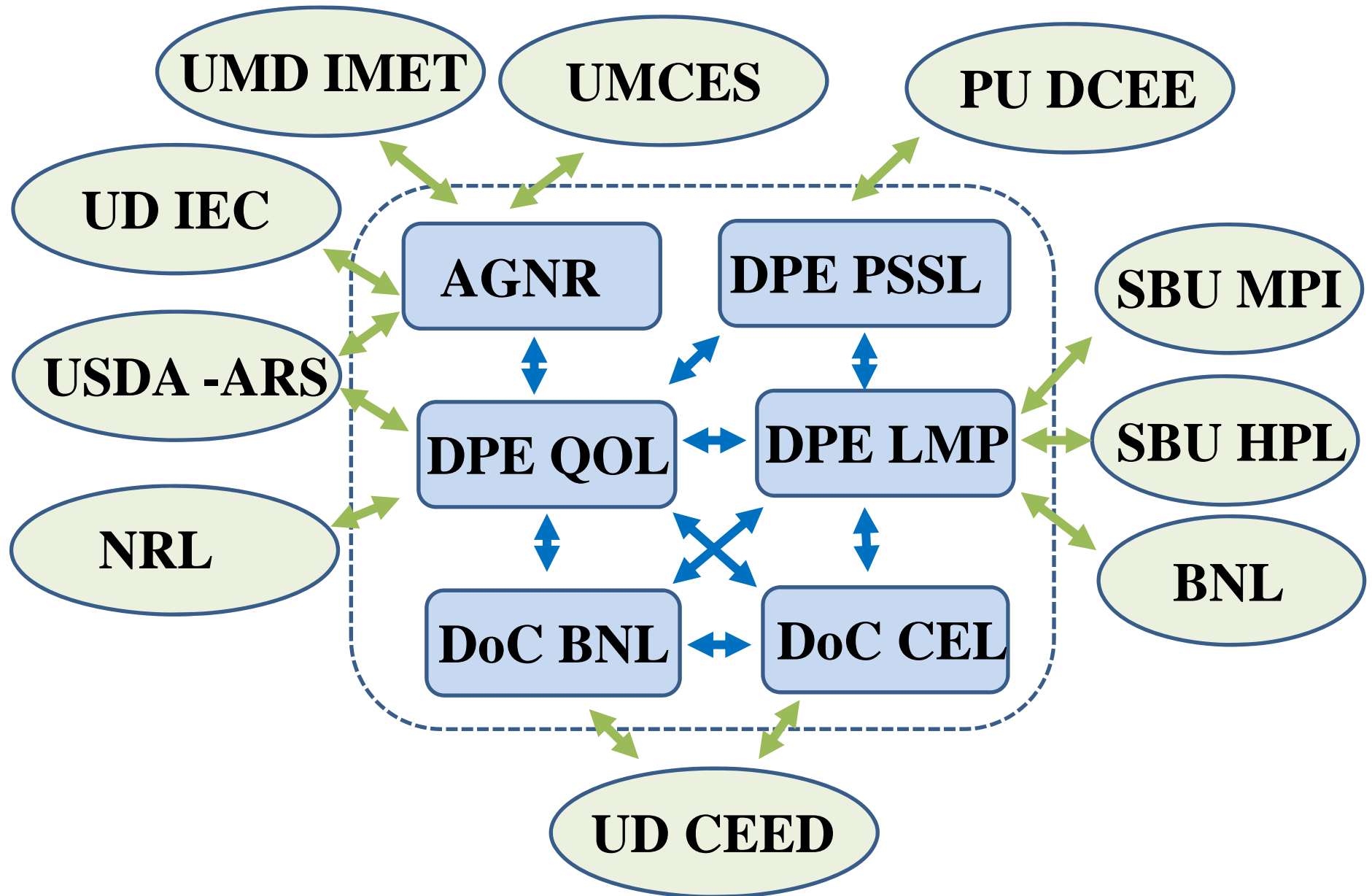
Initiative 5 (I5): *Promote collaboration within and outside the Alliance.*

Initiative 6 (I6): *Conducting continuous evaluation and shared metrics to improve the project and set it on a path to long-term sustainability.*

Initiative 7 (I7): *Promote a transition to a 100% energy self-sustainable city of Dover, Delaware.*

Initiative 1 (I1): Launch the research and education activities in the DSU REEC and promote its integration with the NSF INCLUDES EDEES program.

Research Partner of the Initial Alliance



The Research Alliance

DSU Internal Group

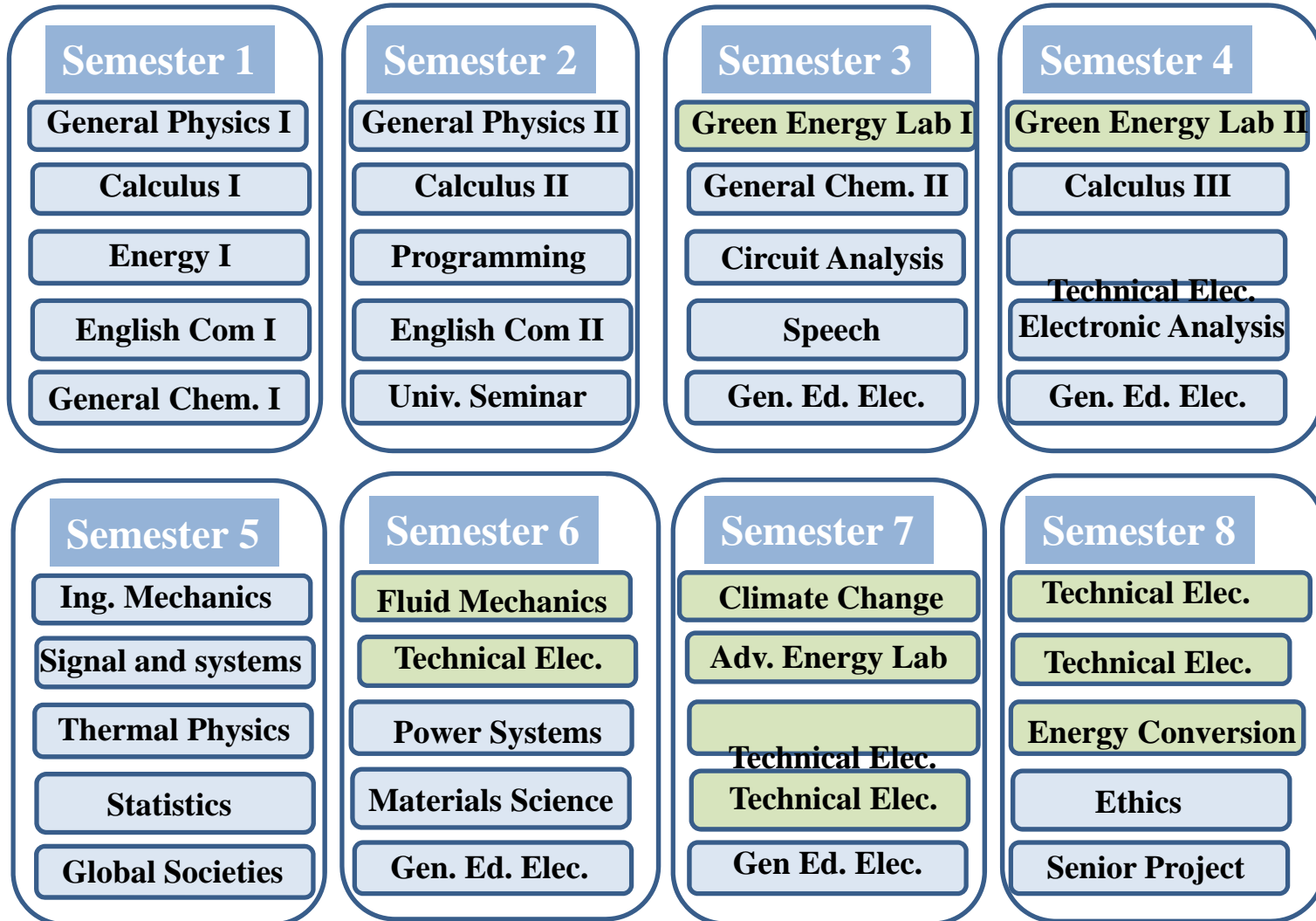
- DPE QOL – Quantum Optics Laboratory, Department of Physics and Engineering
- DPE LMP – Laboratory of Mineral Physics, Department of Physics and Engineering
- DPE PSSL – Photonic Sensor Laboratory, Department of Physics and Engineering
- DoC CEL – Clean Energy Laboratory, Department of Chemistry
- DoC BNL – Bionanotechnology and Biomedicine Laboratory, Department of Chemistry
- AGNR – Department of Agriculture and Natural Resources

Groups Currently in Collaboration with DSU Scientists

- UD CEED – University of Delaware Civil and Environmental Engineering Department.
- UD IEC - University of Delaware Institute of Energy Conservation
- UMCES - University of Maryland Center for Environmental Conservation
- UMD- IMET - Institute of Marine and Environmental Technology of the University of Maryland.
- PU DCEE - Center for Mid-Infrared Technologies for Health and Environment and the Department of Civil and Environmental Engineering of Princeton University.
- SBU MPI - Mineral Physics Institute of Stony Brook University.
- SBU HPL - High-Pressure Laboratory of the same University.
- BNL - Brookhaven National Laboratory.
- PU DCEE - Department of Civil and Environmental Engineering of Princeton University.

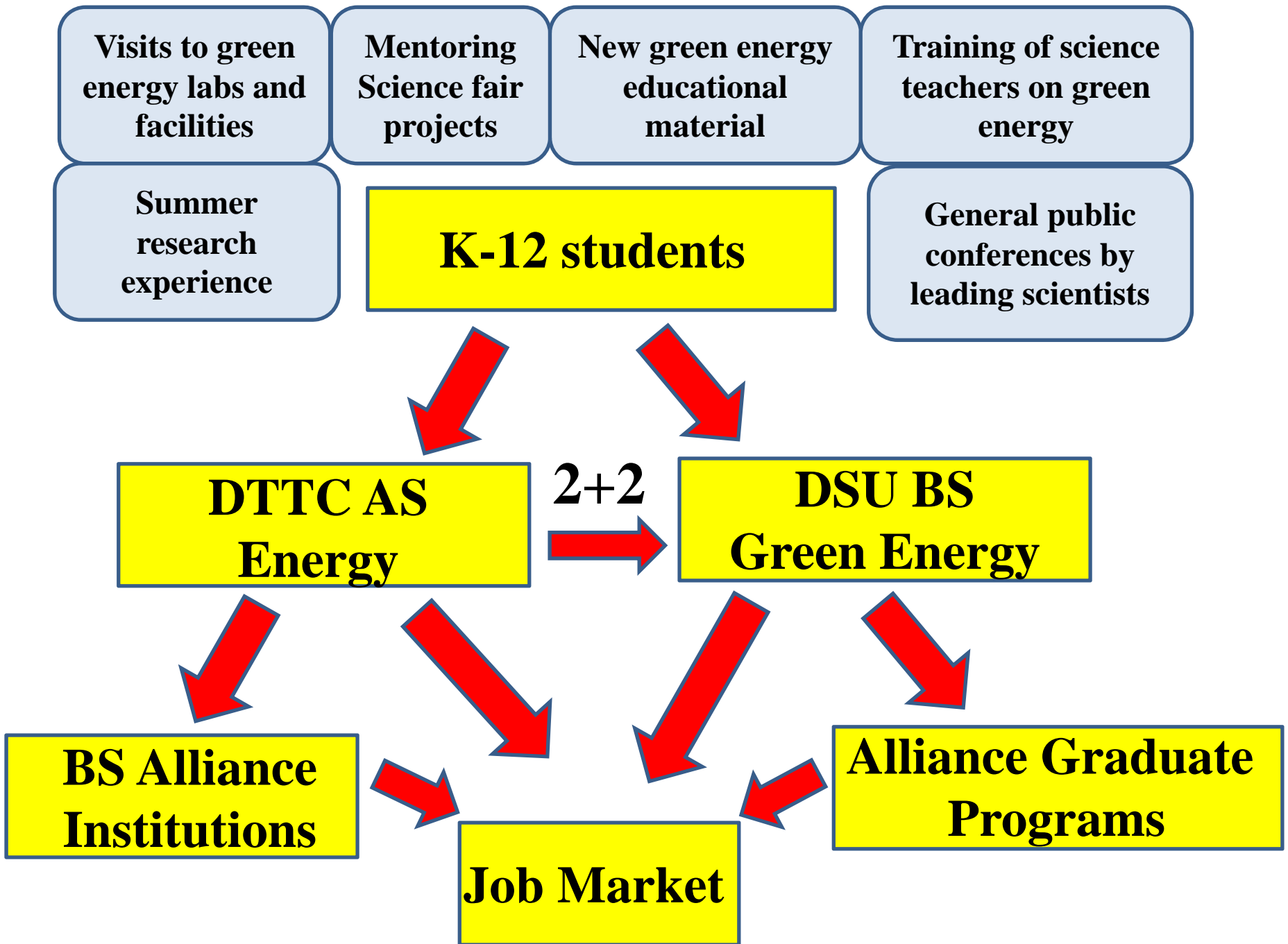
**Initiative 2 (I2): Develop DSU's
research and education programs in
Alternative Energy and
Environmental Sustainability.**

BS in Renewable Energy Engineering proposed



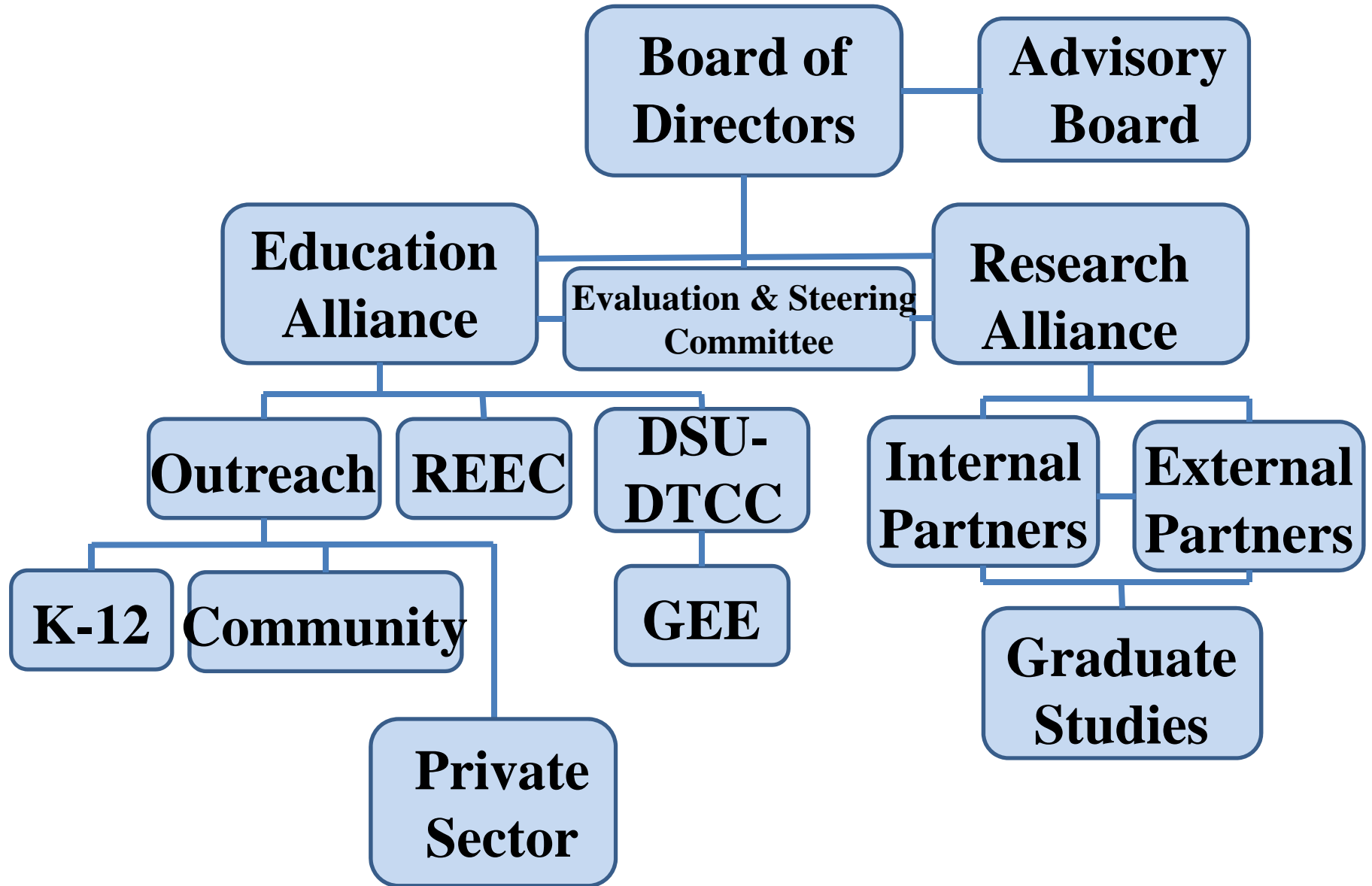
Initiative 3 (I3): Promotion of careers in alternative energy and environmental sustainability:

Initiative 4 (I4): Building partnerships with DTCC and high-minority K-12 schools:



**Initiative 5 (I5). Promoting
collaboration within and outside
the Alliance:**

Management Structure



**Initiative 6 (I6): Conducting
continuous evaluation with shared
metrics**

EVALUATION PLAN

Input

- Delaware State University (DSU)
- DSU's Renewable Energy Education Center (REEC)
- DSU Early College High School (ECHS) and other local high schools
- Delaware Technical & Community College (DTCC)
- Research partners (see Figure 3)

Activities

K12 Education and Community OUTREACH

- Summer workshops for K12 students and teachers
- Develop five new educational modules in Green Energy
- Community outreach events

DSU Institutional and Research Alliance Capacity Building

- Develop new degree program (BS GEE) at DSU
- Develop new courses in Green Energy
- Create articulation agreement for students to transfer into DSU in energy-related programs
- Faculty increase green energy and environmental sustainability collaborations
- Organize one Energy Fair per year

Outputs

- Five K12 students participate in five educational experiences per year
- Ten undergraduate students participate in lab/activity development
- Two teachers trained in content and pedagogical content knowledge per year
- Two community engagement events reaching twenty participants
- Outreach component of website and over twenty discussants
- At least forty participants in Energy Fair
- Six new courses on green energy developed and offered
- Five ECHS URM students enroll in green energy course(s)
- Ten undergraduate students participate in green energy capstone and research experiences per year
- Ten URM students declare GEE major in two years
- Five students transfer to DSU green energy programs
- Six new research collaborations
- Five new undergraduate research opportunities

Outcomes

Students demonstrate:

- Increased interest in green energy
- Increased STEM self-efficacy
- Increased scientific identity and belongingness
- Increased intent to persist in green energy and sustainability
- Increased civic engagement

Teachers demonstrate:

- Increased understanding of content related green energy
- Increased science teaching self-efficacy

- DSU establishes partnerships with URM-majority middle and high schools and strengthens partnership with DTCC.
- Research Alliance expands and provides more opportunities for students.

Impacts

- Greater number of people interested in careers related to green energy and environmental sustainability
- Higher representation of URM individuals in green energy and environmental engineering related graduate programs
- Higher representation of URM individuals in green energy and environmental engineering related employment
- Community engaged to work for a 100% green city of Dover, Delaware

Initiative 7 (I7). Promotion of a 100% energy self-sustainable city of Dover , Delaware:

The EDEES program will promote the idea to achieve a 100% energy self-sustainable city for Dover, Delaware, by developing wind, solar, advanced energy storage systems, and biomass power plants. The technology to complete the transformation exists. Several cities in the world have already done so. The initiative will be a case-study for our senior GEE students as part of the capstone class. We will also publicize their ideas and solutions to encourage public discussions with the local community to promote the idea of 100% green Dover, and the EDEES website will feature an open debate about the initiative.