2019-2020: Energy Systems Research Center

Definition of Unit:

Reporting Year:
2019-2020

Providing Department:
Energy Systems Research Center

Department/Unit Contact:
Satish M. Mahajan

Mission/Vision Statement:

Mission: The Center for Energy Systems Research (CESR) is a research center and was established to advance and apply scientific and engineering knowledge and academic programs associated with energy systems and in particular with electric power while supporting the instructional program of Tennessee Technological University (TTU). Research efforts, both theoretical and experimental, are focused on solving current and anticipated problems associated with energy systems. Special emphasis is given to the needs of the electric power industry.

Vision: The center will be known and be recognized nationally for its research contributions in energy systems and Infrastructure areas.

Goals: The 5 current Goals have been developed on the basis of the mission of the Center. The numerical objectives have been arrived at using historical data with a view on advancement towards reaching the vision.

Reporting: Reporting for the center is done on a fiscal calendar to align with state funded center requirements.

Goal 1. Increase research activity in the areas of the Center

Define Goal:

Goal 4. Add Laboratory Facilities

Define Goal:

Add laboratory facilities.

Intended Outcomes / Objectives:

1. Continue to support the development of the wireless power laboratory.

Goal 5. Increase Outreach Activities

Define Goal:

Increase Outreach Activities.

Intended Outcomes / Objectives:

1.

Assessment Tool 2: Number of Journal Publications and Conference Publications

Goal/ Outcome/ Objective:
Goal 1 and Goal 2 and Goal 3

Type of Tool:
Tracking Spreadsheet

Frequency of Assessment:
Annually

Rationale:
Papers represent the increase in knowledge from research activities. By concentrating on journal and peer reviewed conference papers the quality of the research is acknowledged by peers in the field of study. By examining the list of authors on these publications we can get a measure of the success in the collaboration goal.

Assessment Tool 3: Number of M.S. and Ph.D. graduates during the year

Goal/ Outcome/ Objective:
Goal 1 and Goal 2 and Goal 3

Type of Tool:
Tracking Spreadsheet

Frequency of Assessment:
Annually

Rationale:
If the graduates this year took a long time getting their degrees then this measure might not directly correlate to effectiveness in achieving the goals but on average this assessment tool is expected to historically follow the quantity of research achieved in the center. By examining the graduate committee for each student we can get an indication of the amount of collaborative research.

Assessment Tool 4: Number of M.S. and Ph.D. students supported by the center during the year

Goal/ Outcome/ Objective:
Goal 1 and Goal 2 and Goal 3

Type of Tool:
Tracking Spreadsheet

Frequency of Assessment:
Annually

Rationale:
While quantity of students may not directly measure the amount or quality of research being conducted by the center, it is generally perceived that statistically this metric will be relevant to the goals.

Assessment Tool 5: Number of undergraduate research projects supported

Goal/ Outcome/ Objective:
Goal 1, Goal 2, and Goal 3

Type of Tool:
Tracking Spreadsheet

Frequency of Assessment:
Annually

Rationale:
Often undergraduate student research results in some of the best innovations since the undergraduate is not burdened knowing what can or can't be done. Including this metric with the others is important to assess the total amount of research being conducted by the center.

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Rationale:

This metric will directly reflect energy expended toward Goal 3. By comparing proposals to activations an effectiveness can ultimately be determined to guide future proposal writing endeavors.

Assessment Tool 7: Laboratory projects completed/initiated

Goal/ Outcome/ Objective:
Goal 4

Type of Tool:
Tracking Spreadsheet

Frequency of Assessment:
Annually

Rationale:

The number of laboratories created, renovated, and/or expanded, etc. will directly affect the research infrastructure making more meaningful, and up-to-date research possible.

Assessment Tool 8: Number of seminars by external speakers to our faculty and students ensures exposure to new ideas.

Goal/ Outcome/ Objective:
Goal 5

Type of Tool:
Tracking Spreadsheet

Frequency of Assessment:
Annually

Rationale:

Seminars are important to inform researchers what the current state of the art is in various research disciplines and provide new contact opportunities to promote collaborative efforts. This tool directly reflects the efforts expended toward Goal 5.

Assessment Tool 9: Number of outreach activities planned for the upcoming year with a list of persons to be invited for the activities.

Goal/ Outcome/ Objective:
Goal 5

Type of Tool:
Tracking Spreadsheet

Frequency of Assessment:
Annually

Rationale:
This assessment tool forces Center administration to be forward thinking about Goal 5 since many of the activities related to this goal must be planned well in advance.

funding of the center over last 35 years indicates crossing of $ 2M level only 4 times including the current fiscal year. It also indicates a record level of external funding for the CESR, two years in a row !!!. Of course, the external funding handily meets the goal of matching the state appropriations for the center. A full listing of activations can be found in the attachments.

The target goal of 5 publications is appropriate for the 3 researchers (Director, Research Assistant Professor, and the R & D Engineer) in the Center. The 7 publications listed in the attachment can be summarized as 3 conference papers and 4 journal articles which surpasses the goal of a total of 5 publications. This metric is to be on a 3 year average but since the metric has changed, 3 years of data has not accrued yet.

Attachments:
CESR publications 2019-2020.pdf; SM 3 List of Activations 2019-2020 - with PIs Names.xlsx

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The highlighted undergraduate researcher this year is William Stump who investigated unipolar capacitive wireless power transfer technology for wireless charging of Electric Vehicles (EVs).

Increasing student research activity can be partially assessed by the number of students supported. Students have been supported by the Center in a number of ways including financially, office space, and R&D Engineering support.

Table 1. Students supported by the Center.

Number of Students Supported by the CESR

during Fiscal Year 2019-2020

B.S.	M.S.	Ph.D.

Attachments:

SM-10 HOURLY STUDENT 2019-2020.docx; SM-11 Undergraduate Student Research 2019-2020.xlsx; SM-9 GRAS Support 2019-2020v2.xlsx

Results for Goal 3. Increase Collaborative Research

Results:

Increase Collaborative research

- Develop and submit two collaborative proposals with interdisciplinary focus. The number of collaborative proposals submitted per year should be at least two per year.

This goal intersects the University Flight Plan's Multidisciplinary Research Innovation sub goal.

The collaborative proposals listed in the Attachment include 7 proposals with an 'internal to TTU' collaborative aspect, 15 with collaborations with an 'external to TTU' component. There were also 7 project activations with a collaborative component.

Attachments:

2019-2020 Collaboration Efforts CESR Aug 18 2020.xlsx

Results for Goal 4. Add Laboratory Facilities

Results:

Add Laboratory facilities

- Continue to Support the development of the wireless power laboratory.

The Wireless Power Laboratory is an exciting area of research supported in part by the CESR.

This year we added a golf cart as a demonstration test-bed for wireless charging.

Figure 1. Golf cart wireless charging test-bed.

Results for Goal 5. Increase Outreach Activities

Results:

Increase outreach activities

- Organize a minimum of two seminars by external speakers per year.

This goal intersects the University Flight Plan's Co-Curricular Undergraduate Program sub goal and the Multidisciplinary Research Innovation sub goal. By having research area experts from outside the university come teach seminars, workshops or short courses the students will be exposed to a broader base of information and hopefully promote collaborative efforts from TTU researchers with those at other institutions.

The 4 seminars presented by external speakers in the fiscal year 2018-2019 are presented in the attachments.