Cover Page

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Executive Summary

The South Texas Industrial Assessment Center (ST-IAC), per its statement of project objectives (SOPO), provides small to mid-size manufacturing companies and water treatment plants in the Rio Grande Valley of Texas, free energy assessments to help them reduce costs and stay competitive for sustainable development. The ST-IAC operates within the University of Texas Rio Grande Valley (UTRGV), and is the largest Hispanic-serving IAC in the U.S. Created in 2016, the ST-IAC, situated in the most economically disadvantaged region in the country, has been successful in training students and assessing local industries served by a predominantly Hispanic population. UTRGV, now the second largest Hispanic Serving Institution (HSI) of higher education in the U.S., has a student population of 32,000, of which 90% is Hispanic. While Covid-19 had a negative impact to our program during Budget Periods (BP) 4 and 5, the center still managed to provide opportunities for individuals, manufacturing and water industries in the local region. The program developed an energy engineering program in the region and further advanced national priorities. Those include resilience and sustainability of operations by implementing energy efficiency processes, renewable energy sources, decarbonization, battery storage, and cybersecurity in south Texas.

Major Tasks

Project Activities:

Task 1: Training

The ST-IAC at UTRGV provides an outstanding means of delivering energy efficiency training to our students. This training is completed by the in-house faculty as well by invited subject matter experts from related industries. Regular meetings are held on a weekly basis with all the students. Students gain training and experience by becoming familiar with 15-minute interval data and smart meter functions. Students receive further equipment training by our team during the assessment equipment check day. This ensures that all students are prepared to use their assigned equipment during the field assessments. Experienced students who have been trained by faculty in using assessment equipment are also encouraged to mentor new students in the proper use of the equipment during equipment check day and during field assessments. A particular point of note for our center is that we are incorporating student leaders in the preassessment process. Student leaders accompany staff during site visits prior to an assessment. This helps students become familiarized with company management and facilities so that the students are better prepared to deal with any issues and are more efficient in the day of the assessment. The ST-IAC faculty participated directly in all assessments and preassessments. It is of note that courses specifically using the essentials of assessments documents and others have been implemented for all ST-IAC students. These courses are taught by our faculty in the Energy Assessments and Delivery Systems and Advanced Energy Systems program and have a large student enrollment. The subject matter taught includes the following topics:

- Energy principles: 2 weeks
- Energy Assessment: 1 week
- Motors, lighting, & heat: 2 weeks
- Thermal applications: 1 week
- Industrial waste: 0.5 weeks
- Wide area energy transmission: 0.5 weeks
- Distributed energy resources: 2 weeks
- Intelligent energy grids: 2 weeks
- Optimal energy analysis: 1 week
- Examples from around the world: 3 weeks

Task 2: Identification of Manufacturing Companies

The ST-IAC developed marketing and outreach campaigns to inform manufacturing companies of the energy assessment services available from the project. The ST-IAC has collaborated with regional partners, including economic development agencies, to best identify clients. Furthermore, per DOE direction, we have expanded to incorporate water treatment plants in our energy services. Many water treatment plants have been evaluated. Outreach has been conducted, per our SOPO,

in McAllen, Brownsville, Harlingen, Edinburg, and more. Furthermore, the ST-IAC has developed an outreach engagement plan.

Task 3: On-Site Energy Assessments

An ST-IAC Laboratory was established at UTRGV to enable students to conduct on-site assessments effectively with state-of-the-art measurement equipment: The ST-IAC facility continues to be updated and is comprised of an assessment lab which the students utilize in preparing the assessment reports and recommendations. The students use the lab to do equipment checks before the assessment day. The assessment project leader conducts a pre-assessment meeting with the project students planning out the assessment day procedures and duties for every student on the team. The project leader along with faculty supervise the students during the assessment day to accomplish the specific tasks as planned. Over thirty-one assessments were completed during the active period prior to COVID-19 pandemic. Once the pandemic shut down protocols were in place, our on-site assessments were halted. Our center continued training students despite the COVID-19 pandemic.

The following were the assessments conducted during each budget period:

- BP1: 8 (Inaugural year for the ST-IAC)
- BP2: 4
- BP3: 19
- BP4: 8 (COVID-19 impacts ST-IAC mid-way through BP4 operations)
- BP5: 0 (No assessments conducted during BP5 due to COVID-19. Student training continued during this period)

Total: 39 Assessments completed

As demonstrated through BP3 and BP4 results, the center operations had ramped up to meet assessment requirements under the SOPO. Unfortunately, the negative impact from COVID-19 on our center was substantial as no on-site assessments were able to be conducted through the second half of BP4 and BP5. We utilized this time to complete implementation surveys from previous site visits to client facilities and to train students on writing proper assessment reports. Additionally, students categorized completed assessments based on recommendation types.

Task 4: Assessment Findings and Reporting

Reports with energy assessment recommendations were generated by the ST-IAC team for each manufacturing company and water plant visited. Each report provided to the client companies contains information on implementation of recommendations. The ST-IAC team protocol when possible, consists of :

1. Making sure that the client company understands all the recommendations provided
2. Answers any questions about the recommendations
3. Help in finding various quotes for implementing recommendation

4. Working with company in finding rebates and incentives in implementing some of the recommendations

We were able to perform assessments for three large water plants with each having two to three different plant locations. Additionally, our commitment to decarbonization was realized through several renewable energy generation recommendations made to several different industries. The recommendations had reasonable payback of less than 8 years. We conducted several on-site energy assessments for local industry which focus on the processing and manufacturing of products made of varied materials including plastics, metals, and polymer composites. We provided different recommendations on energy saving for processing at plastics at high temperature and pressure using injection molding, extrusion and compression molding, and other processing methods used to manufacture aluminum and steel-based products. Some of these recommendations and analysis were aimed at reducing the energy cost and usage, of major energy consuming equipment. Several reports were submitted to the DOE /IAC at Rutgers which included a summary of the manufacturer's production costs, energy consuming equipment, energy consumption, cost savings, cost to implement ST-IAC recommendations, payback periods, products produced, sales volume and number of employees.

Cooling degree days reports for the cities and dates coincident with energy assessments were generated for some of the visited manufacturing companies. High correlation of electrical usage data and ambient temperature would indicate excessive use of electricity to cool the plant. The maximum temperatures in the RGV for the summer months of May to September is above 90 degrees F; the winters are short, with temperatures rarely below 40 degrees F.

Task 5: IAC Trained and Certified Students

The ST-IAC was able to complete energy training for students during each of the five BPs with one certification. The training per year is broken down by each BP:

- BP1: 16 students (Est)
- BP2: 17 students
- BP3: 18 students
- BP 4: 19 students
- BP 5: 1 student (1 certified)

Total: 71 students trained and one student certified

The ST-IAC team has focused its effort in ensuring a diverse and inclusive team, through:

1. Outreach programs to ensure inclusion of women and underrepresented minority students at the ST-IAC
2. Internal training sessions to train staff to have successful career in STEM fields, especially in energy sector along with leadership positions
3. Outreach programs & industry initiatives to create opportunities for the improvement of communities that have been historically underserved.

Active and planned activities at the ST-IAC are summarized in Figure 1. We have had several female students along with a majority Hispanic student distribution at our center. We have created a mentoring system at the ST-IAC, where each student is paired with a senior member who is responsible to provide the new mentee support and training. Additionally, assessments have focused on serving businesses in disadvantaged communities.

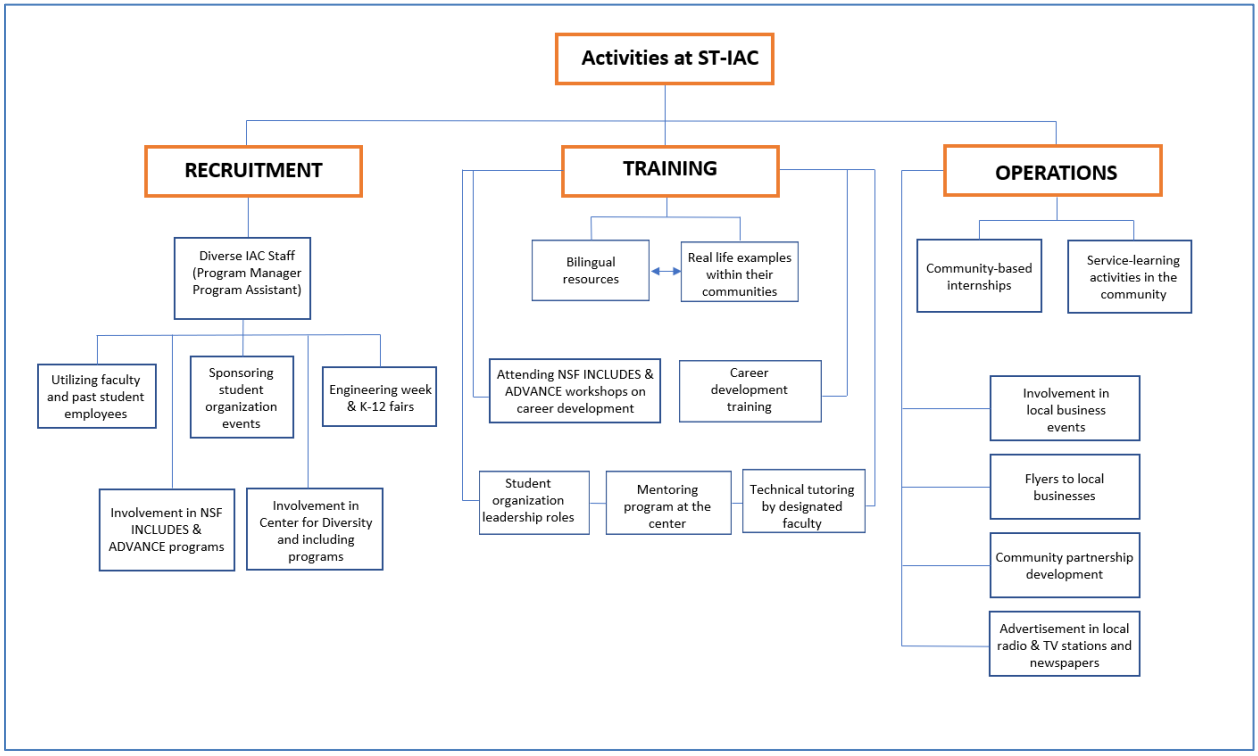

Figure 1. Activities at ST-IAC include recruitment, training, and operations

Task 6: Energy Symposium

The ST-IAC conducted symposia to assist students in their energy training. However, during COVID-19 the training symposia were conducted via on-line meetings.

Technical Information:

The assessment equipment used to conduct energy studies at client facilities is primarily handheld. The equipment is stored at the ST-IAC laboratory and is listed in Figure 2. All students are trained in the proper use of the test equipment and are also, trained in terms of safety. A safety lead is assigned to each assessment team.

Supplier:	Part:	Price	MSC Item/Part #	Mfr model #	Part Parameter
Grainger	Combustion Analyzer kit	$3,203.00	468G43	2410-1112	
	Ultrasonic Leak Detector	$530.20	1WXG9	TMULD-300	
	Mini Thermo Anemometer	$170.00	40GR97	S%168CP 4	
	Pressure Data Logger	$440.00	43Y052	SD750	
	Portable Digital Micromanometer	$119.00	3LYA9	60B	
	Digital pocket thermometer	$20.99	21EP01	39240	
	Red Electrical Safety Glove kit natural rubber size 12		32xe94	Salisbury 32XE94	
	Arc Flash safety gloves	$40.90	35ZW97	12-3265-60-XXXL	
	Switchboard mat rated 17KV	$140.50	5ZV96	M30-1Y	
	Switchboard mat rated 17KV	$103.50	6RA10	83150035BY	
	Arc Flash Faceshield assembly	$85.75	15W975	FM400DCAF25	
	Faceshield frame full crown (per unit 6 is needed)	$34.60	3NLY2	82782-00000	
	Full brim Hard Hats (20 units needed) hi vis Orange	$14.80	22EY74	489360	
	Safety glasses (20 units needed) clear lens	$2.40	4VCK9	4VCK9	
	Power Analyzer/Data Logger 1 to 3000a	$4,867.28	4YNN7	DBEPFLEX3K-4	
McMaster-Carr	Compact digital camera	$167.15	1041T73		
	8GB Memory card	$9.91	12075T28		
MSC	Stroboscope	$1,469.99	91488445	Fluke820-2	7.5 inch long, 30-300K flash per minute
	Light Ballast Tester	$251.85	65444986	Fluke1000FLT	Electronic and Magnetic and Fluorescent fixture tester
	Light intensity meter	$611.39	92912666	Extech	
	Infrared Temp Gun	$380.67	79241576	Fluke 63	
	Thermal camera	$575.80	52785755	FLIR 72001-0101	Thermal imaging camera
	Thermometer	$575.27	44743540	Extech V1R50	Video Thermometer
	AC Clamp on Ammeters (purchase 3 units)	$264.29	42786954	Fluke A3001	
	Safety suit for arc-flash kit	$480.66	75719963	Stanco Safety Products 2XL	
Omega	Digital pressure gauge	$420.00	DPG2001B-15A		
	Pressure transducer	$625.00	X409-USBH		
	Digital thermometer	$280.00	HH911T		
	Thermo-Anenometer	$270.00	HHF91		

Figure 2. Equipment list at ST-IAC Laboratory

Publications:

The ST-IAC had four students graduate with a master's in engineering and were required to complete a thesis as part of their degree program. The thesis topics are:

1. Application of solar water heaters for industrial use
2. The optimization of efficiency and infrastructure for modern potable water treatment plants
3. Planning a renewable Power System in Texas as an Introduction to Smart Power Grid
4. Improving demand Response Strategies Utilizing Data Collected by Industrial Assessments to Reduce Costs for Users