



STRATEGIC RESEARCH ALLIANCE WITH UTSA

INTRODUCTION BY:

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Chief Operating Officer (COO)

PRESENTED BY:

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Manager, Strategic Research and Innovation

June 20, 2019

Approval Requested

OBJECTIVES & TAKEAWAYS



- **PROVIDE OVERVIEW OF STRATEGIC ALLIANCE**
- **UPDATE ON SELECTED PROJECTS FOR 2019-2020**
- **GAIN BOARD APPROVAL FOR 2019-2020 PROJECT FUNDING**

AGENDA



- **STRATEGIC ALLIANCE**
- **RESEARCH VALUE**
- ***PEOPLE FIRST* IN ACTION**
- **PROJECT SELECTION**
- **PROJECT DESCRIPTIONS**
- **REQUEST FOR APPROVAL**

SUCCESSFUL ALLIANCE WITH UTSA



10 YEAR RESEARCH PARTNERSHIP

Our alliance supports local research, education & innovation benefiting our customers & community

- Alliance Agreement commenced on September 22, 2010
 - Authorized to spend up to \$50M by 2020
 - Annual budget to be approved by CPS Energy's Board of Trustees
 - The cumulative spend through 2020 expected to be \$10.2M
(Includes the \$750K to be approved in this presentation)
- Lower spend rate as we aligned to projects versus grant
 - Targeted research projects defined by CPS Energy
 - Areas of focus include Energy Efficiency & Conservation, Distributed Secure Smart Grid, Renewable Energy & Storage, Electric Transportation, Carbon Management, Capture & Reutilization

BENCHMARKING



CPS Energy currently spends ~0.08% of electric revenues on R&D. If we spent 1% of revenue on R&D: this equates to \$28M.

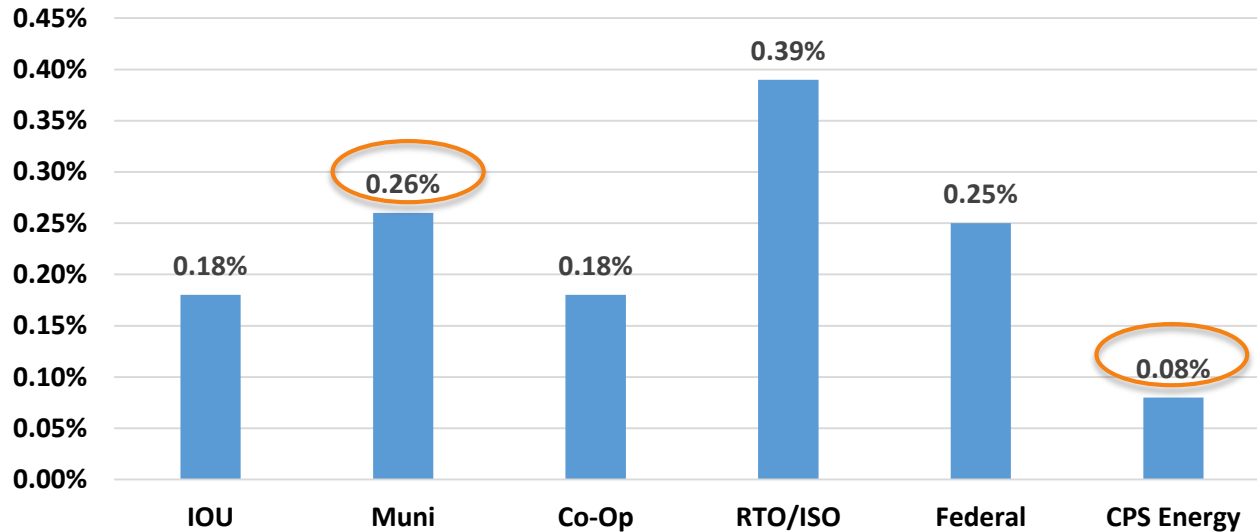
<u>Organization</u>	<u>FY19 \$</u>
EPRI	\$1,175k
UTSA	\$957k
<u>APGA</u>	<u>0</u>
Total	\$2.132M
% of Revenue	.08%

We will assess how we should optimally invest in energy & environmental research in the future.

BENCHMARKING

Relative to peer utilities, CPS Energy spends ~0.08% of electric revenues invested in R&D, less than its peers

R&D Investment by Utility Type



Source: EPRI, R&D Benchmarking Project Survey, August 2016

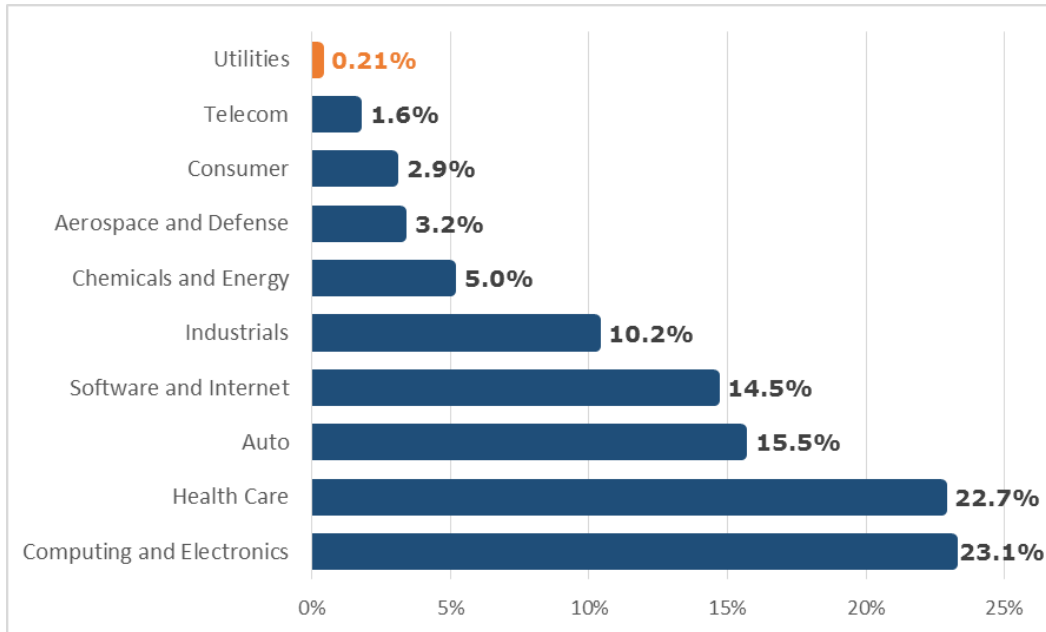
*RTO/ISO: Regional Transmission Organizations (RTO)/Independent System Operators (ISO)

BENCHMARKING

UTILITIES VS OTHER INDUSTRIES



R&D Investment by Sector



Sources: Statista 2018, EPRI

- A lot more knowledge sharing across utility sector resulting in lower R&D spend
- 2016 EPRI benchmark of 48 electric utilities report 0.21% of annual revenues invested in R&D

STRATEGIC ALLIANCE



EXAMPLES OF PAST WORK

- Projects are focused on energy solutions
 - Energy sector has evolved over time, research topics mirrored the change
- Past examples of projects funded
 - Solar rooftop assessment tool
 - Solar forecasting tool

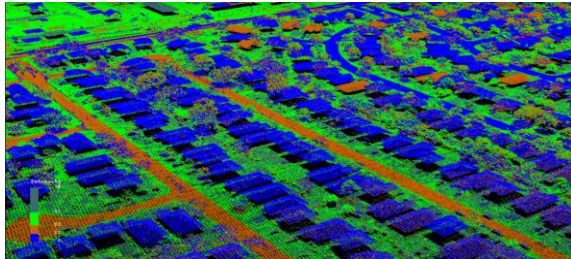
PAST PROJECTS



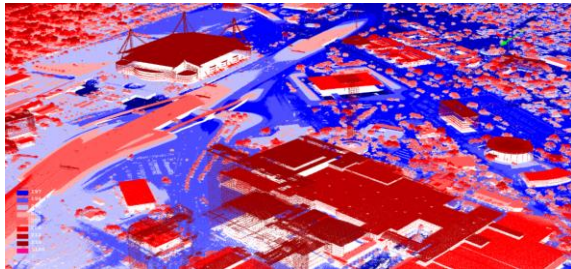
FY	Projects	Amount
2011	Carbon Capture, Secure Smart Grid Network, Energy Efficiency, Education Outreach	\$500,000
2012	Energy Efficiency, Carbon Capture, High Penetration PV, Transportation, Augmented Reality Education Module – Passive Solar Energy	\$1,250,000
2013	Solar Forecasting, Transportation, Energy Efficiency Smart Living	\$1,100,000
2014	Demand response, Solar Forecasting, Electrification of Transportation	\$1,250,000
2015	Integrated Renewable Energy, Energy Efficiency, Electric Transportation, Secure Smart Grid Network	\$1,853,000
2016	Solar, Storage & Load Forecasting for NREL/JBSA Microgrid, Demand-side Analytics, Big Data Analytics, IT/OT Convergence Security	\$620,000
2017	Data Analytics & Forecasting, Security	\$700,000
2018	PEMS for Integrated Control of BESS, Energy Harvesting from Roadways, Smart Grid Security, Machine Based Learning-Microgrid	\$1,263,546
2019	Energy Harvesting from Roadways, Smart Grid Security, Machine Based Learning-Microgrid	\$956,992

RESEARCH VALUE

SOLAR ROOFTOP ASSESSMENT TOOL



LiDAR imagery of Residential Rooftops

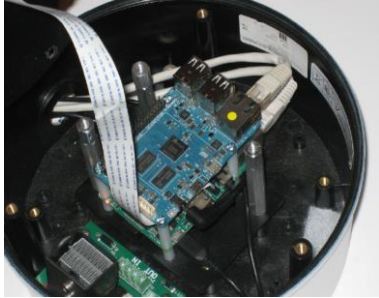


LiDAR imagery of Commercial Rooftops

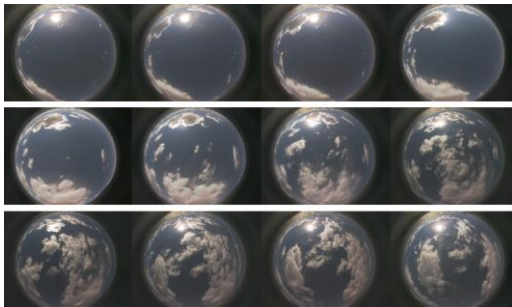
- Light Detection and RADAR (LiDAR) imagery provided value to us in helping to determine which rooftops are best suited for photovoltaic panel installations
- This research contributed to the promotion of increased solar penetration

RESEARCH VALUE

SOLAR FORECASTING



Sky-imager lens



Sky-imager cloud images

- Solar generation is intermittent in nature, increasing the value of accurate forecasting
- Sky-imager camera detects cloud cover, direction and speed every 15 seconds to estimate intra-hour solar production
- CPS Energy owns partial rights to licensing

PEOPLE FIRST IN ACTION



TALENT PIPELINE

- 7 former UTSA Staff/Student researchers are now in diversified roles



Michael Cervantes
Grid Support



Tania Hernandez*
Fleet Ops Safety & Business
Continuity



Tuan Le, PhD
Demand Side Analytics



Gaelen McFadden
Customer Engagement



Touseef Mohammed
Demand Side Analytics



Jaro Nummikoski
Grid Transformation



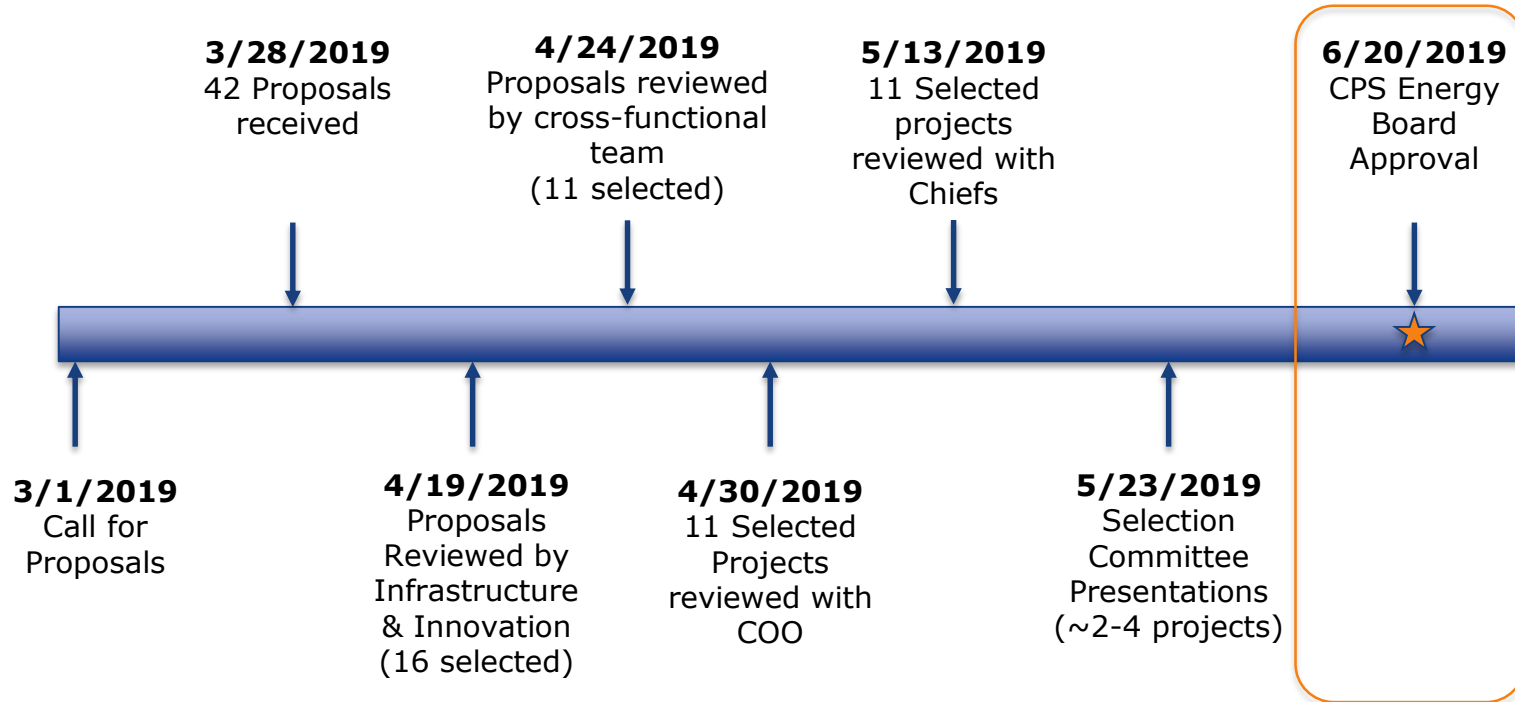
Rolando Vega-Avila, PhD
Advanced Analytics and
Intelligence

* Participated as an intern for the SAFE Program

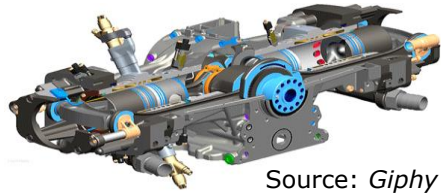
FOSTERING INNOVATION

- Research teams are assisted by technical subject matter experts
- Project results are communicated to employees for growth
 - Solar forecasting report out in May 2017
 - Project status presentations at UTSA where prototypes and labs were shown in May 2018

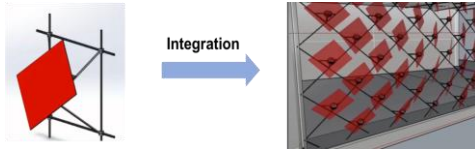
PROJECT SELECTION



PROJECT DESCRIPTIONS



Source: Giphy



Artificial Intelligence Smart Grid IoT Cyber Security

Research Area	Project	Value
Power Generation	Supercritical Carbon Dioxide (sCO ₂) Power Generation	\$400,000
Smart Buildings	Building-Integrated Robotic Photovoltaic Tracking System	\$115,500
Cyber Security	Cyber-Physical Security using Data Analytics and Artificial Intelligence	\$234,500

3 projects selected from 42 total submitted projects from UTSA

INNOVATION KEY TO FUTURE



LOCAL PARTNERSHIPS ON GLOBAL CHALLENGES

- We want a comprehensive approach to research & innovation that includes local institutions and national/global entities
 - Department of Energy, National Labs, EPRI, Corporate partners
 - Local universities, Southwest Research Institute

We will come back to the Board of Trustees same time next year with a comprehensive plan to optimize research spend, technology innovation, and local impact

REQUEST FOR APPROVAL



Seeking Board approval of **\$750,000** to fund proposed research projects which will:

- Support CPS Energy's **leadership in energy innovation** while keeping research dollars locally and increase visibility at the national level
- Support the Strategic Alliance with UTSA which contributes to our **Flexible Path** and focused research areas
- Expand our **People First** commitment by supporting the student experiential learning of **our future workforce**



Thank You