

EPA Region 6 P2 Roundtable

UPDATE ON P2 AND SUCCESS STORY

Jalal Rastegary

Program Manager, Business Assistance

July 13, 2022

College of Engineering



BE BOLD. Shape the Future.
New Mexico State University

WERC Environmental Design Contest

INTRODUCTION



BE BOLD. Shape the Future.

What is WERC Environmental Design Contest

The WERC Environmental Design Contest is a unique design competition that brings industry, government, and academia together in search for improved solutions to today's environmental challenges.



Since 1991, the competition has been held annually at New Mexico State University in Las Cruces, New Mexico, drawing hundreds of college students from throughout the United States and around the world. Many professors return year-after-year because of the unique opportunities for their students.



BE BOLD. Shape the Future.

What sets us apart about WERC Design Contest

- We provide real-world environmental problems that face industry right now.
- Teams of students build working bench-scale models that we independently test at the contest.
- Engineering professionals judge the contest and discuss with each team the finer points of design, including consideration of engineering design, economic and logistical feasibility, regulations, and public policy.
- The contest is an excellent real-world capstone design course that prepares students for industry and is an important part of ABET accreditation.



Students take the lead as consulting engineers, developing an entrepreneurial mindset as they work in teams to solve challenging tasks. They report their findings through research papers, oral presentations, and bench-scale demonstrations.



BE BOLD. Shape the Future.

2021 Environmental Design Contest

Participation

- 21 teams
- 14 Universities
- 116 students
- 20 Advisors
- 36 Judges
- Teams represented 12 states (AR, AZ, CA, CO, FL, ID, LA, MT, NM, TN, TX, WA)
- Total participants: 175



Pollution Prevention Award

The Winner: UC Boulder

- presented a proposal for destroying PFAS, a "forever chemical" that is a very challenging pollutant to eliminate from the environment.
- Their process uses biochar made from the organic fraction of municipal solid waste to adsorb PFAS thus recycling waste for beneficial use.
- All emissions from the pyrolysis process for creating biochar and from the ultimate thermal destruction of PFAS were captured and treated in part to create electricity to drive their process and to ensure that pollutants did not enter the atmosphere.



IN THE NEWS

Students pitch solutions to environmental problems at first Flash Talk hosted by NMSU

New Mexico State University students took to the virtual stage this spring to compete in the first-ever Waste-management Education Resource Consortium Environmental Design Contest Flash Talk competition

PFAS Problem: Why Now?

- Polymeric contaminant in water
- Production since the 1940s
- Persistent in the environment
- Negative health effects



Limitations to Current Solutions

- Energy intensive (incineration)
- Creation of shorter chain byproducts
- Adsorption does not destroy PFAS
- Other destruction methods are still in the research phase

Our mission: provide safe, cost- and energy-efficient way to destroy PFAS



BE BOLD. Shape the Future.

31st Environmental Design Contest Sponsors (2021)



BE BOLD. Shape the Future.

Update on P2 and Success Story



BE BOLD. Shape the Future.

Success Story of 2021 P2 Assessment on a Nut Shelling and Processing Plant



BE BOLD. Shape the Future.

Look for Opportunities for Improvement



Energy
saving



Water
saving



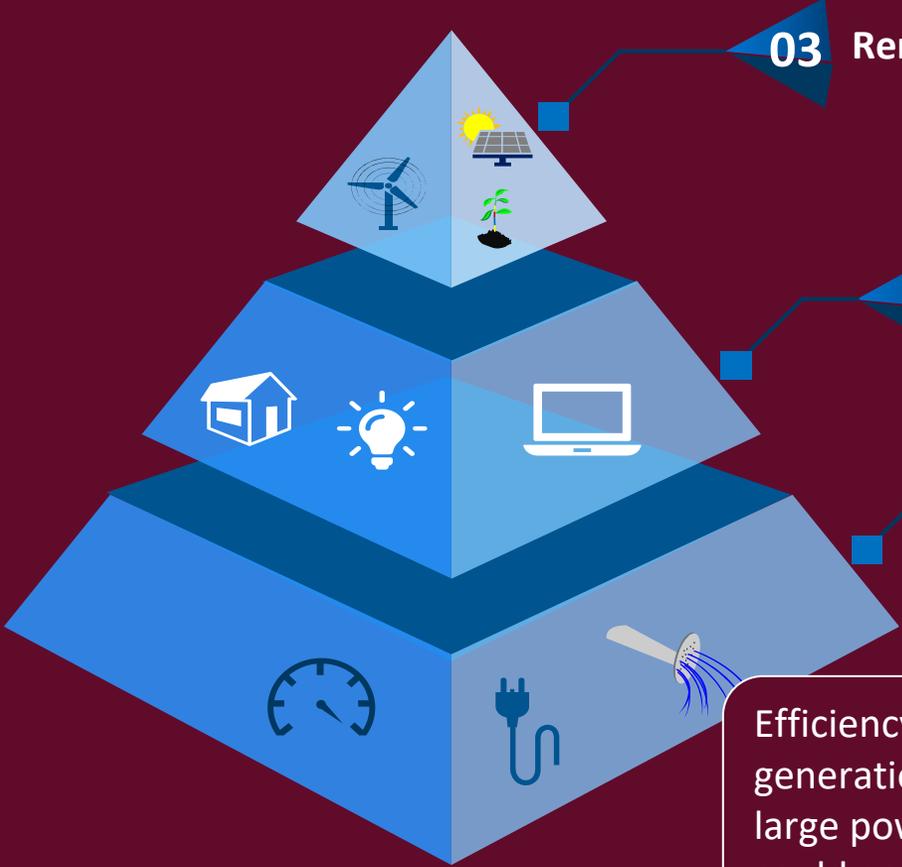
Hazardous material &
Solid Waste Reduction



Greenhouse Gases
Elimination

We always researching and updating our methods for finding the Opportunities for Improvement and Solutions for Energy Saving, Water Saving, Hazardous material reduction, Solid Waste Recycling and Greenhouse Gases Elimination

Steps to find OFI for Energy Saving in every assessment



03 Renewable Energy

- Solar power
- Wind Power
- Geothermal Power
- Biomass Energy

02 Energy Efficiency

- Using energy more wisely or efficiently using technology that requires less energy to perform same function

01 Energy Conservation

- By saving or using less energy
- by changing energy wasting habit and lifestyles

Efficiency Could provide one-third of total expected electricity generation needs by 2030, avoiding the need for an additional 487 large power plants. Combine with the gains since 1990, saving could amount to the output of 800 power plant by 2030 (ACEEE)

Lighting

Building /Construction

Heating & Cooling

Energy Star Equipment

Fuel efficiency

HVAC Ventilation

Automated Controls

Refrigeration

Renewable Energy



BE BOLD. Shape the Future.

Benchmarking, Calculations and recommendations to Installing Solar System for this Nut Shelling Plant

The initial investment will fully recover in less than seven years.

For this Shelling Company, the energy required to shell, cool, and packaging is increasing each year, culminating to over about 2.0 million kilowatt-hours last year.

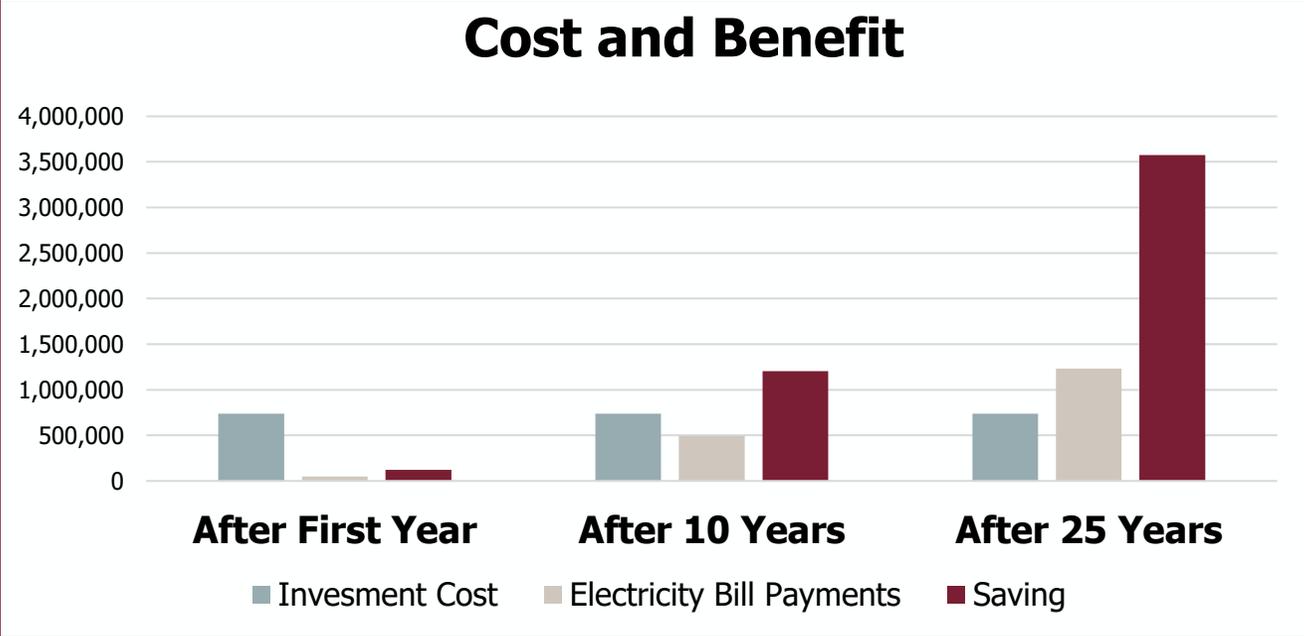
We recommended a ground installation rather than a roof-based one because of the size of the array. Installing that many panels on their roof will invite too many complications.



BE BOLD. Shape the Future.

Benchmarking, Calculations and recommendations to Installing Solar System for this Nut Shelling Plant

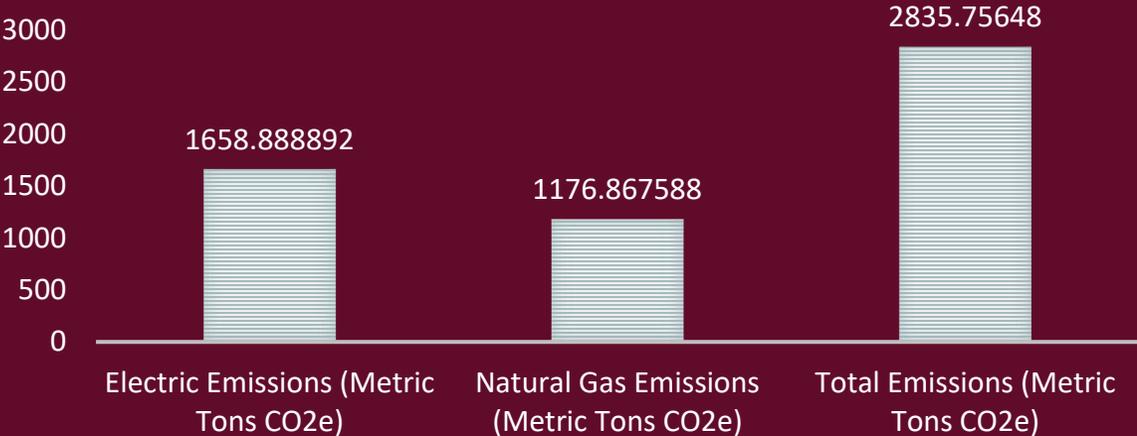
We expect to save over \$120,000 every year in energy costs. Their 1.08 MW solar array is designed to produce over 70% of their energy needs, amounting to about 1.4 million kilowatt-hours per year with hiring a local solar installation company that specializes in agricultural solar projects.



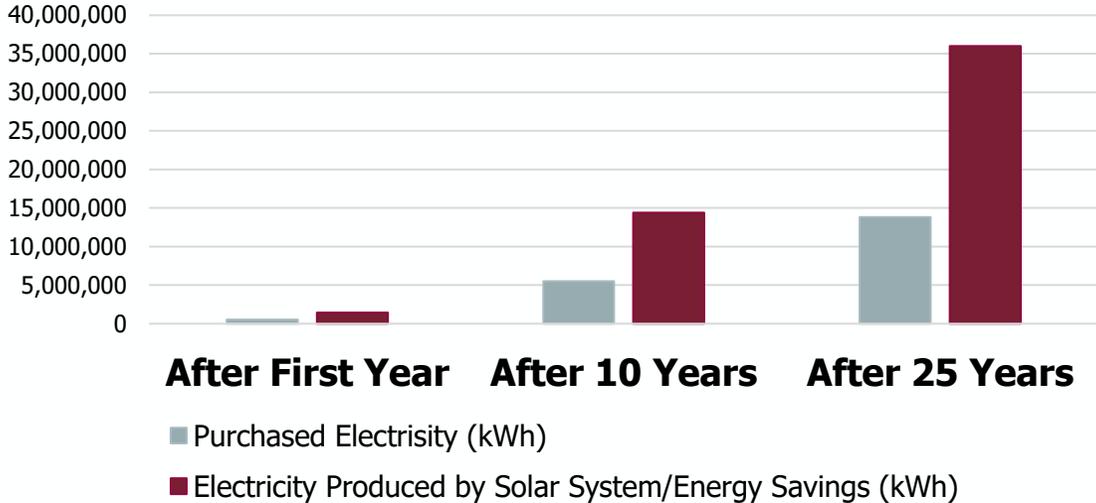
BE BOLD. Shape the Future.

Benchmarking, Calculations and recommendations to Installing Solar System for this Nut Shelling Plant

ANNUAL GREENHOUSE GAS EMISSIONS



Energy Savings



BE BOLD. Shape the Future.

Minimizing Water Use

Our main areas we considered for minimizing water use:

Process

- Improved Production Scheduling
- Compared Batch vs. Continuous Operations
- Calculated Water Treatment

Equipment

- Improved Design
- Monitoring Water

Facility

- Monitoring Water
- Improve Plumbing Design

Water Conservation (Annual)

11% Minimizing Water Usage (Gallons)	863,235
Water use (Gallons)	7,331,222



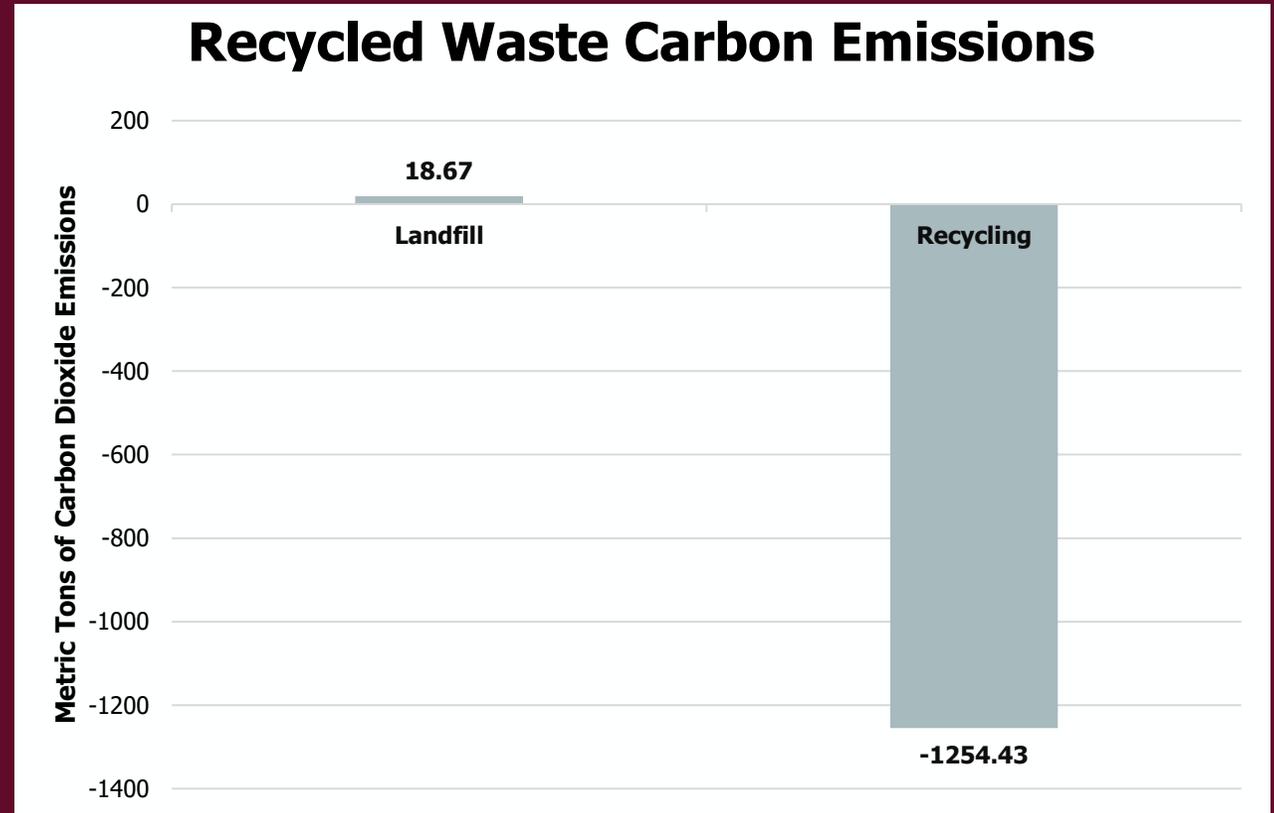
BE BOLD. Shape the Future.

Maximized Solid Waste Recycling

Calculated and recommended to Bailed and recycled cardboard, Bags, Straps, paper, and aluminum waste

Calculated cost saving of selling the broken wood pellets

Recycling can save a considerable amount of carbon dioxide from entering and damaging the atmosphere. Chart is showing the calculated of waste recycling of this shelling company to emphasize this point.



BE BOLD. Shape the Future.

TOTAL SAVINGS

Annual Savings

Energy Savings (kWh)	MTCO2e emissions (tons)	Solid Waste reduced (tons)	Water Savings (gal)	Annual Savings from P2 (\$)
1,440,000	4,862.48	1134.53	863,235	1,413,325.13



BE BOLD. Shape the Future.

Thank you

Jalal Rastegary

Phone: 575 646 1510

[https://engrbusinessassistance.nmsu.edu](https://engrbusinessassistance.nmsu.edu/u/)
[u/](https://engrbusinessassistance.nmsu.edu/u/)

Email: rastegar@nmsu.edu



BE BOLD. Shape the Future.