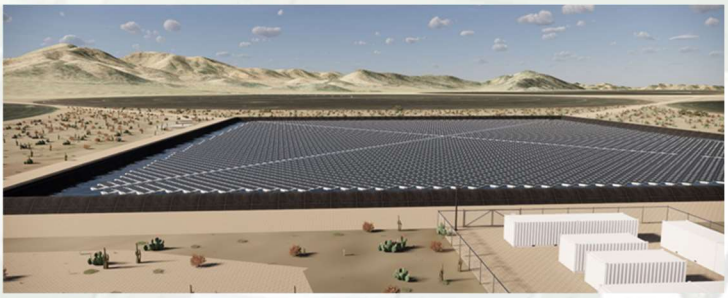
OCTOBER 17, 2022

CENTER PIVOT UTILITY ISLANDS
CALAWAY FARMS – RED LAKE, AZ

POWERING OFF-GRID FARMS USING RENEWABLE ENERGY

Front End Engineering Design (FEED) Document
Revision 7.0



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EXECUTIVE SUMMARY

This part of the report contains summarized information intended for the review of managment. It is designed to depict top level information for decision making and project review. A more complete version of the report showing design considerations is available upon request and written execution of a Non-Disclosure Agreement with Associated Energy Developers, LLC. Reprinting or redistribution of this information in any form to persons outside of Associated Energy Developers, LLC, Solar Integrated Roofinf Corporation, or Calaway Farms is expressly forbidden without written permission from Associated Energy Developers, LLC.

EXECTUTIVE SUMMARY

THE CHALLENGE - THE SOLUTION

The Challenge –

Design a Center Pivot irrigation energy supply for a proposed farm near Kingman, AZ that can:

- derive its energy from renewable, sustainable resources,
- operate autonomously,
- limit land requirements to center pivot areas (no additional land required),
- be modular and scalable,
- and do so at a CapEx and OpEx that will be less than traditional utility costs to service the project site.

The Solution –

AED is pleased to present this state-of-the-art design which accomplishes all of the above goals. The design consists of commercially available products and requires no new technology breakthroughs. The project is designed to be accomplished within one year.

The 'Energy Island' design concept is built around clusters of 4 center pivot fields each. Solar energy is used to pump water from underlying aquifers to provide irrigation needs for each cluster of 4 pivot irrigation circles. The 'heavy lifting' of drawing the water up from wells from the aquifer, which accounts for more than 67% of all the annual energy required at the farm, is stored in irrigation ponds located between center pivots. These ponds are of a traditional design, but enlarged to allow 3 days of sunless storage. This greatly reduces the the need for expensive electrical storage used to run the farm when the sun is not shining.

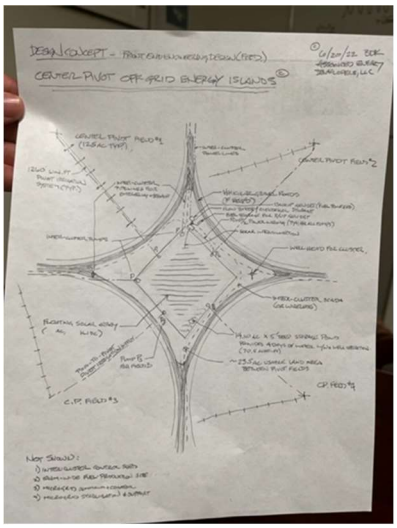
The solar panels are co-located on the storage ponds using a Floating Photovoltaic (FPV) methodology in order to

eliminate the need for additional land outside the circles. The FPV system provides additional benefits in reducing pond water evaporation, increased solar cell efficiency, cleaning of the array, and allowing the array to track the sun without expensive and troublesome equipment.

Additional electric storage, as well as a backup generation system is provided to drive the pivot sprinklers and provide control and communication. Each Utility Island on a farm becomes its own generation source for that cluster of irrigation circles, and can be interconnected with other Utility Islands for greater redundancy and resilience. The design creates a scalable, repeatable, and environmentally friendly way of turning raw land into farm land without the need for a local electric utility.

DESIGN HIGHLIGHTS

- **Commercial Viability:** The final design of the project contains only elements that are in commercial existence, and are not considered 'conceptual'. All components, including the floating photovoltaic arrays, solar panels, BESS and electric switchgear, are available from vendors and are available with warranties from companies considered 'financeable'. All design calculations have been made in accordance with specific industry practices.
- **Energy Islands:** Eight 'energy islands' will be used to power the farm consisting of 32 center pivot fields, which are organized into 8 'clusters' of 4 fields each. The farm may be built out 'by cluster', and not necessarily all at once.
- **Float-o-Voltaics:** Each Energy Island consists of 1.8 MW DC of photovoltaics which float on the irrigation ponds. The use of renewable energy for this purpose drives up the value of the company in view of escalating ESG (Environment, Sustainability and Governance) attitudes.
- **Storage of Water vs Electricity:** If the intended result is to use renewable energy to produce a water supply, it is much less expensive to store the 'energy' in the form of fresh water rather than electricity. Water storage costs on the order of $1-2 per gallon, while the cost of an electric battery capable of storing enough energy to produce the same amount of water will cost 8 to 10 times as much. Therefore the design includes large irrigation ponds which will act to buffer the solar itermittancy as well as balance the availability of water between wells on the farm. Additional energy will be needed in the form of electricity (to drive motors, controls, etc.), and this energy will be provided for using a combination of a Battery Electrical Storage System (BESS).



- **Multple Use of the Land:** Floating the solar arrays over the irrigation storage ponds provides several advantages, including the reduced land area required, reduction of evaporative losses and algea growth from the ponds, cost reductions during solar installation, increased capacity factors due to cooler environment, safety (with the pond forming a 'moat' around the array), and other benefits. The concept uses water supplied by the underground aquifer to provide irrigation instead of local rivers and aquaducts, which have been experiencing increasing numbers of shortages in recent years, especially in the southeastern US. The use of renewable energy provides for long-term sustainability of energy required for crops.
- **Redundancy:** The design configuation provides for the ability of one cluster to help supply the needs of its neighbor if needed and to balance the supply and demand between wellheads and clusters. The clusters act like a neural network, with each cluster providing neighboring clusters with water or power under certain conditions such as equipment replacement and operations and maintenance.
- **Control Room/Visitors Center:** While the farm can be operated remotely during normal operations, a small visitor's center (trailer) will be included to allow the project to be shown to interested on-site visitors, investors, etc.
- **Additional Generation:** Although the solar arrays and BESS now provide enough energy to carry the farm's energy requirements through the year, the farm has enough land area to consider the generation of bio-diesel or other fuels (Anhydrous Ammonia, Jojopa oil) if desired as an additional cash crop. The use of Anhydrous Ammonia (NH3) can be achieved using water and atmospheric Nitrogen, and the end product used for both fertilization and power generation, with product sold to neighboring farms.

THE PROJECT SITE

The project site is located northeast of Kingman, AZ. Lat/Long: 35°39'22.24"N x 114° 6'47.37"W

The site straddles Stockton Hill Road. A series of existing Center Pivot fields (circa 2015) are being rejuvenated and added to.

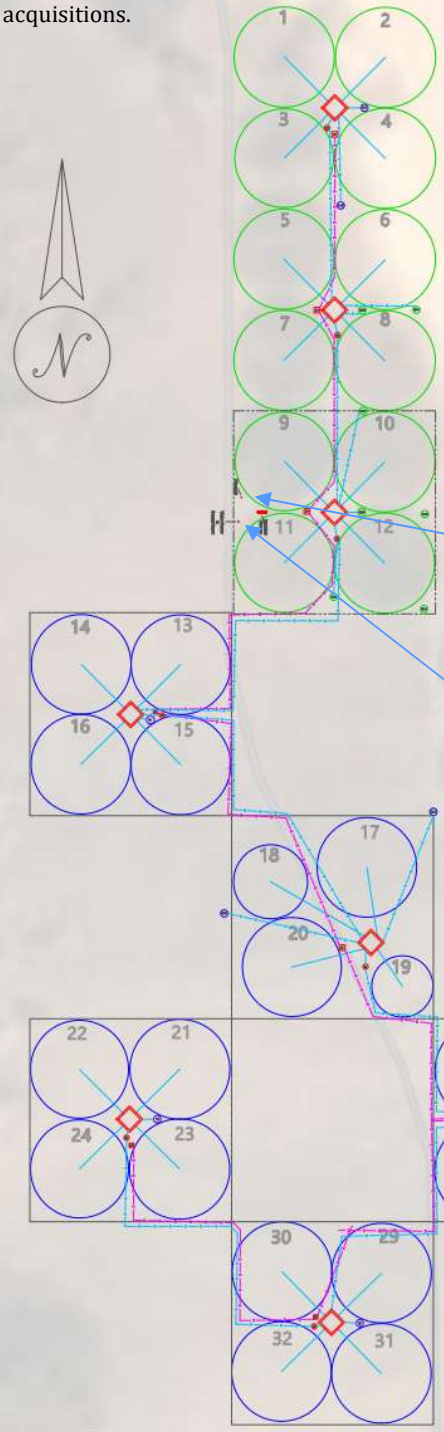
Project site on the East Side (above) and West side (below) of Stockton Hill Road.

THE PROJECT SITE

The project site northeast of Kingman, Arizona.

- 32 Center Pivot fields
- Arranged around 8 clusters
- Green fields are existing, blue fields are proposed.
- Wells not shown.
- Non-contiguous parcels will be connected through land acquisitions.

	Components	Description	Voltage	Phase	GPM
1-18	Existing Fields				
19-32	Proposed Fields				
1 A-1	Well 9-1	Well Assigned to Cluster 1			
1 A-2	Well 9-3	Well Assigned to Cluster 1			
2 A-1	Well 10-1	Well Assigned to Cluster 2			
2 A-1	Well 10-2	Well Assigned to Cluster 2			
2 A-2	Well 10-3	Well Assigned to Cluster 2			
3 A-1	Well 21-1	Well Assigned to Cluster 3			
3 A-2	Well 21-2	Well Assigned to Cluster 3			
3 A-3	Well 21-3	Well Assigned to Cluster 3			
3 A-4	Well 21-5	Well Assigned to Cluster 3			
3 A-5	Well 21-4	Well Assigned to Cluster 3			
4A	Well 20-1B	Well Assigned to Cluster 4			
5 A-1	Well 33-1	Well Assigned to Cluster 5			
5 A-2	Well 33-2	Well Assigned to Cluster 5			
6A	Well 9-1a	Well Assigned to Cluster 6			
6A	Well 9-1B	Well Assigned to Cluster 7			
7A	Well 9-1B	Well Assigned to Cluster 8			
1B	Cluster 1 Water Pump	Water Pump for Cluster 1, Existing Fields 1 - 4			
1C	Cluster 1 Switch Gear				
2B	Cluster 2 Water Pump	Water Pump for Cluster 2, Existing Fields 5 - 8			
2C	Cluster 2 Switch Gear				
3B	Cluster 3 Water Pump	Water Pump for Cluster 3, Existing Fields 9 - 12			
3C	Cluster 3 Switch Gear				
4B	Cluster 4 Water Pump	Water Pump for Cluster 4, Proposed Fields 13 - 16			
4C	Cluster 4 Switch Gear				
5B	Cluster 5 Water Pump	Water Pump for Cluster 5, Proposed Fields 17 - 20			
5C	Cluster 5 Switch Gear				
6B	Cluster 6 Water Pump	Water Pump for Cluster 6, Proposed Fields 21 - 24			
6C	Cluster 6 Switch Gear				
7B	Cluster 7 Water Pump	Water Pump for Cluster 7, Proposed Fields 25 - 28			
7C	Cluster 7 Switch Gear				
8B	Cluster 8 Water Pump	Water Pump for Cluster 8, Proposed Fields 29 - 32			
8C	Cluster 8 Switch Gear				



Micro-Grid and Electrical Storage

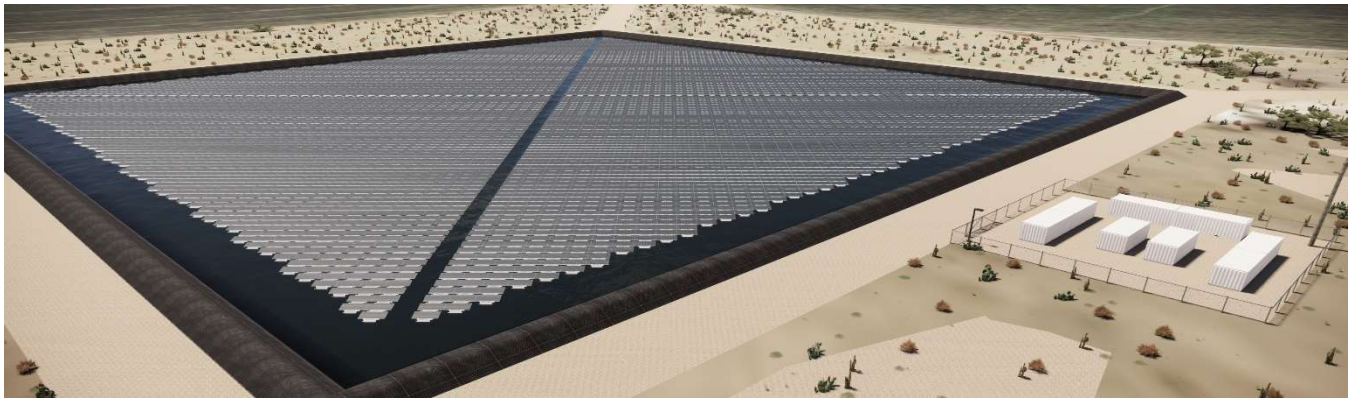
Control/Visitor Center

Legend

- Solar & Irrigation Pond
- Existing Field
- Proposed Field
- Intercluster Water Pump
- Cluster Electrical Switchgear
- Electrical Switchgear and Controls
- Existing Well
- Proposed Well

THE PROPOSED PLAN

Each Cluster of 4 Center Pivot Fields has an associated irrigation pond which stores pumped well water.



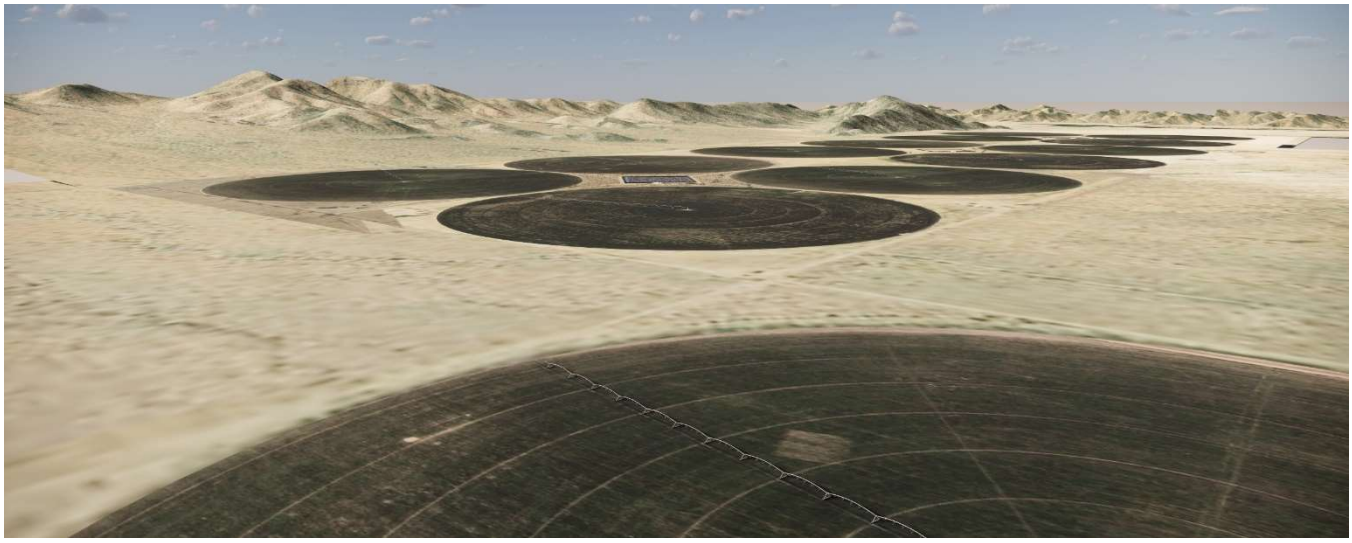
Each irrigation pond is covered with Floating Photovoltaic solar panels which power the farm & reduce evaporation.

The Floating Photovoltaic arrays (FPVs) use the sun's energy to power the wells and 'store' that energy in the ponds.

PROPOSED PLAN

Each Cluster is part of a Micro power grid, containing additional electrical storage and controls.

Clusters are interconnected to allow balancing of wells, ponds, water and power.



Edges of fields present over 1100 acres of unused land which could be placed into use for additional generation.

FEASABILITY OF THE PROJECT

The feasability of constructing this project and deriving the majority of the energy required to draw the water from the acquifer, distribute the water to the crops, and run the ancillary equipment on the farm using solar energy is excellent. We examine this in more detail below.

- **Energy Costs:** This study examined a method of using solar energy to produce the energy needed to run a commerical farm in this location. Given the remote location of this land, as well as other large land areas which could be put to use for agricultural purposes, we find that the Solar plus Storage option offers the only feasible short- and long-term energy solution. The Operational Cost of a 'Diesel Only' operation (or other fuels) at remote locations, given the uncertainty and high cost of converting diesel oil to electricity, is too high and creates untenable costs of energy as part of the crop value. In short, the farmer cannot afford to grow crops in this manner and stay competitive in the market. The Capital Cost of a grid-powered 'Electric Only' operation at remote sites like this, given the distance of the land from the existing electric grid, would require an investment of tens of millions of dollars in the running of distribution lines and upgrading of substations, which would also then be followed by traditional kilowatt-hour costs. While the 'Solar plus Storage' option also requires a sizable investment, this investment is dramatically reduced by the current tax incentives provided for renewable energy (over 50% of the cost) AND reduces the cost of energy for on-going operations. *This study finds that totally 'green 'electricity can be produced and used on the site at a lower initial cost than the alternatives, and controlled to produce power and energy at rates significantly lower than grid power for a timeframe of 30 years, with NO demand charges, and at a Capital Cost which, when combined with the less expensive real estate costs of such remote areas, will rival or surpass other traditional farming locations and allow profitable growing operations.*
- **Solar Availability:** The method of deploying Floating PhotoVoltaic (FPV) arrays on top of 6 acre irrigation ponds which are located within clusters of 4 crop circles has been designed to provide more than 100% of the energy required for operations. This location in sunny Arizona provides exceptional annual and daily solar insolation curves. There was only 1 instance in the solar data where 3 days in a row were partly cloudy, and even these days produced a good amount of solar energy. Only 7 occurances of 2 consecutive days of cloudiness in a Typical Mean Year (TMY)were found. TMY data is data used by both the US National Renewable Energy Labs (NREL) and the solar industry for predicting system performance. The data represents 20 years worth of solar insolation data taken from thousands of locations across the country. Therefore, with a minimal amount of energy storage, the use of the sun at this location can be counted on almost as well as baseload power. Annually, the site requirements and the solar insolation also match up well, since the farm uses only 15% of its maximum water load (which occurs in July) in the winter months when solar insolation declines.

  Each of the 8 clusters of 4 fields (32 CP fields in total) will utilize a 1.8MW DC Floating Photovoltaic array. Initial design estimates projected slightly larger 2.3MW arrays, but with the development of the Digital Model for the site, this was modified by the use of a smaller array which can actually track the sun over the course of the day from 120° to 240° azimuth through the use of a motorized cable system. This recent change allows us to lower the CapEx of the project somewhat, and increase the size of the Battery Energy Storage System (BESS) in order to optimize performance. The benefit of the tracking system is a slightly 'flattened' daily solar radiation (insolation) curve, with a lower peak and broader shoulders. This allows us to place more of the farm loads 'under the solar curve' while not stranding a lot of peak production.

- **Water as Storage:** The use of the irrigation ponds provides energy storage by allowing the well pumps to do the 'heavy lifting' of bringing well water to the surface (over 2/3 of the overall energy requirements)during the majority of the solar day and provides for cloudy weather or use of the water during the shoulders of the solar curve. The use of FPVs on top of the ponds not only eliminates the need to put arrays on what could be productive and costly farm land, but also lowers the evaporation of the ponds while simulaneousy increasing the efficiency of the solar panels by providin some cooling. It also allows the solar arrays to be periodically cleaned using an automatic spinkler system if desired, increasing production via reduced soiling factors on the panels. A Battery Electric Storage System (BESS), provides storage for the remaining electric loads (pumps, pivot motors, etc).
- **Land Use Factors:** We find no obstacles to the use of the land. The site was previously used as a center-pivot farm, but failed financially after the all-diesel approach it was using was found to be uneconomical. Previous wells are already in place and have operational experience and a few new wells are planned. The recharge rate of the wells is good and will support the intended operations. Due to the sites remote location, Permitting discussions have been held and any permits required appear to be easily obtained. No airports are within 5 miles of the site, so glare and reflectance from the solar arrays is not expected to be an issue.
- **Capital Finance:** Given the low cost of energy which contributes to a profitable farming operation, the experience of the ownership team as long-time commercial farmers, and the tax advantages currently enjoyed by renewable energy equipment owners, it is believed that the Capital Raise for this project should be successful. The additional sales of supplemental fuel to outside 'off-takers' if desired might also help derisk the financing of the energy systems.
- **Construction Factors:** We find no adverse factors which should hinder construction of the project. All equipment being considered for use is in commercial operation elsewhere and is time-tested. All equipment is available within a 6-9 month window, with the battery system and FPV floation system being the two longest lead items. Of the work being done on site, the current buyer has a previous history of building profitable farms, and has teams that can actually do most of the EPC work, including excavation, piping and wiring. Some elements of the microgrid will require the use of professional electrical contractors. The FPV manufacturer and dealer have agreed that the EPC installation team can install the FPV systems after being taught during the installation of the first pond.

In summary, there appears to be no reason that this project cannot be built.

PROJECT TIMELINE

In this section we look at the highlights for the schedule of the project.

Contract Effective Date – June 25th, 2022

Stage 1 - FEED Document Complete

Stage 2 - Final Microgrid Electric and Civil Designs (if Go-Ahead given) – Oct/Nov 2022

Long lead items:

Floating Array, panels and floats – 9-10 months from deposit
Batteries - 9 months from deposit
Controls and SCADA – 4 months from deposit
Ponds and Liners – Spring 2023

Stage 3 – Construction Nov '22 – Nov '23

Stage 4 – Commercial Operations – Dec '23

CONCLUSIONS

This project evaluation supports the following conclusions.

1. The FEED document and Digital Model predict that the project site can be improved with a self-generation system comprised of solar arrays and supplemental generation behind a Microgrid architecture, and that energy can be produced at a price comparative to grid pricing at other locations.
2. A Digital Model was used to determine the sizes of the major components to consist of 8 'clusters' of 4 center pivot fields each, with each cluster containing 1.8MW of floating solar photovoltaics on an irrigation pond of 7 acres, 8.5' deep, and a microgrid containing 7.8MW/15.3mW-hrs of Lithium Ion batteries as a Battery Energy Storage System (BESS). The model analyzes annual performance by integrating the farm's loads, solar input, pond levels and BESS Storage in 35,040 - 15 minute time intervals across the year.
3. The original hypothesis of needing 5 days of storage for both pond and electrical energy has been adjusted to 3 days. During the Typical Mean Year data supplied for the solar insolation, only 1 period over the year experienced more than 3 days of extended cloudiness, and even then more than 45% of the solar insolation was produced. There were approximatly 7 instances of 2 days of extended cloudiness. This indicates a low level of 'exceedance' for 'brownouts' in the solar generation. Since the farm's overall well capacity rate is greater than the application rate on the field, in an emergecy the well pumps can keep up with the demand even with no pond storage and the pumps are running on backup electrical storage. The new pond storage has been set at 3 days, and the electrical (battery) storage has been set at 3 days.
4. The Pond size has been established. On-site test wells indicate virtually unlimited digging depth. The pond needs to be 7 acres to accomodate the 1.8MW FPV, plus some extra space around the edges to allow the array to track the sun. A pond of 550' per side and 8.5' deep (working depth) produces a pond of 7 acres and provides 3 days of usable storage for the well water.
5. The economics of the project look good. The Digital Model shows that energy can be provided at the site at competitive prives of just $.095/kWhr from year 1, while being off both the electric grid and using no supplemental fuel. The Solar arrangement can be achieved at a Capital Expenditure (with Tax Credits included) competitive with what it would cost to run electric distribution lines to the site. The operating cost of the solar plus storage solution is also much less costly than costly standalone diesel or CNG operations.
6. Even with the solar plus storage energy supply at the site there is an abundance of 'spare land' available on the farm. This land can be further used to generate profits from additional solar arrays which could be used to feed an Anhydrous Ammonia plant, for instance, which would provide even more profits for the owner/operators. The production of NH3 as a supplemental fuel can be a profit center of its own by producing both fertilizer (and can be used as a fuel stock) for other local farms.
7. During the Front End Design process there were no apparent 'project stoppers' that appeared in the addition of the renewble energy system.

CALAWAY FARMS – RED LAKE, AZ
RENEWABLE ENERGY UTILITY ISLANDS

DETAILS OF THE PROJECT DESIGN

This part of the report contains detailed information about the project and the calculations required to construction the utility islands. Information in this section is considered highly confidential and proprietary and is covered by one or more Non-distribution agreements and copyrights. Reprinting or redistribution of this information in any form to persons outside of Associated Energy Developers, LLC, Solar Integrated Roofinf Corporation, or Calaway Farms is expressly forbidden without written permission from Associated Energy Developers, LLC.