



115/34.5KV SOLAR PLANT & SUBSTATION

sdmay25-41



BLACK & VEATCH

IOWA STATE UNIVERSITY

Department of Electrical and Computer Engineering

Client: Black & Veach

Advisor: Venkataramana Ajjarapu

Members: Andrew M Chizek, David W Ntako, Ben Palkovic,
Mohamed A Sam, Sergio Sanchez Gomez & Dallas R Wittenburg

AGENDA

- **Safety Moment**
- **Project Overview**
- **Prototype**
- **Implications and next steps**

An abstract graphic featuring two thin, dark grey lines that intersect on a light grey background. One line runs diagonally from the top-left towards the bottom-right, while the other runs from the top-right towards the bottom-left. The intersection point is located to the left of the text. The text 'SAFETY MOMENT' is written in a bold, dark blue, sans-serif font, positioned to the right of the intersection.

SAFETY MOMENT

Safety Moment – Heavy Machinery

Hazard: Heavy equipment such as cranes used in solar farm construction pose risks of crushing, injuries, accidents, and property damage if not properly operated.

Recommendations:

- **Certified and Trained Personnel:** Ensure only qualified operators handle machinery.
- **Communication System:** Establish clear communication channels for safe operations.
- **Maintain a Safe Perimeter:** Set boundaries to keep unauthorized personnel at a safe distance.
- **Situational Awareness:** Stay aware of surroundings and nearby operators.
- **Visual and Audio Cues:** Pay close attention to signals from operating machinery.
- **Personal Protective Equipment (PPE):** Verify that all required PPE is worn in and around machinery.

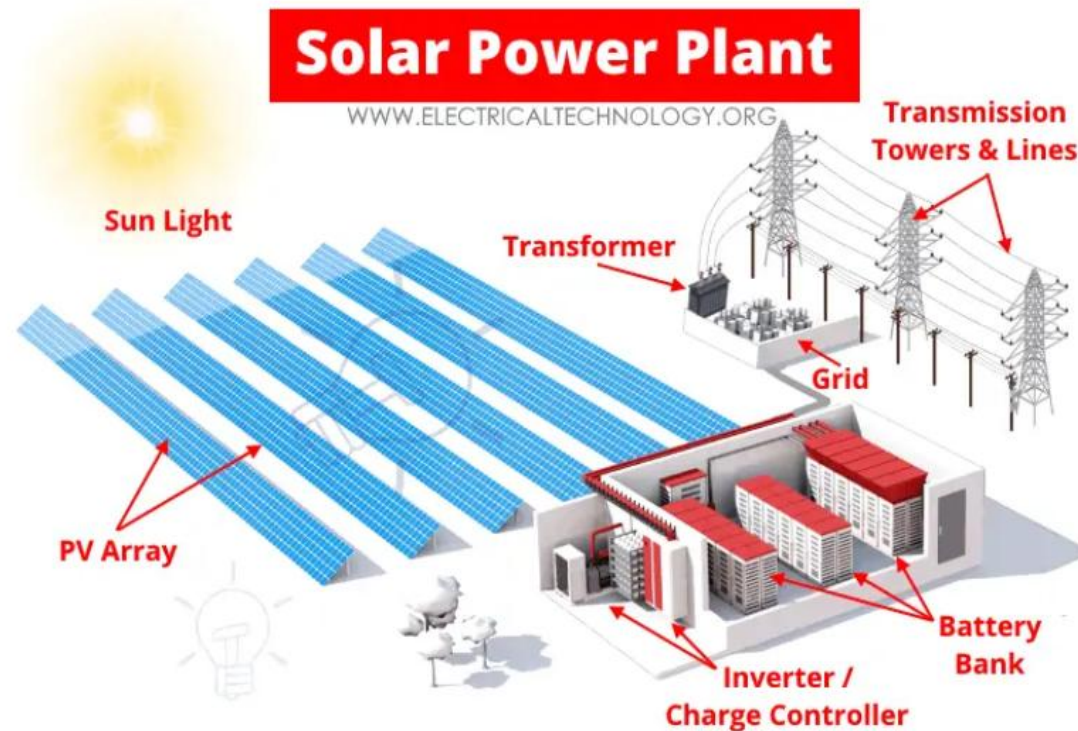


The image features a minimalist design on a light gray background. Two thin, dark gray lines intersect diagonally. One line runs from the top-left towards the bottom-right, and the other runs from the top-right towards the bottom-left. They cross each other in the upper-left quadrant of the frame. The text 'PROJECT OVERVIEW' is positioned to the right of the intersection point.

PROJECT OVERVIEW

115/34.5kV Solar Plant & Substation

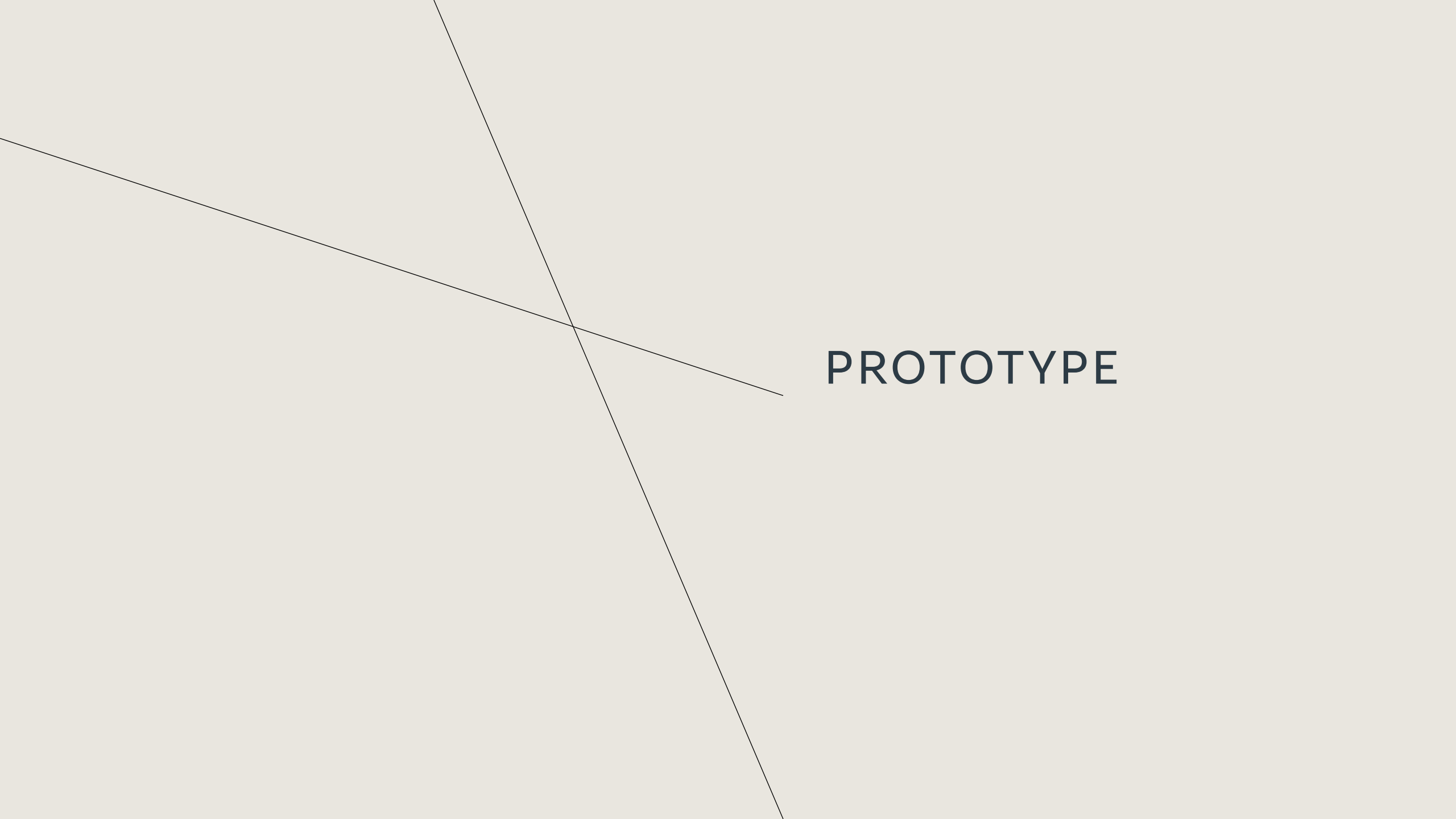
- Our project is to develop a solar plant in Luna County, NM and substation with 115 KV as the primary side of the transformer and 34.5 KV as the secondary side for end user.
- Photovoltaic (PV) Modules are used to convert solar energy into DC electricity.
- Inverters are used to convert DC to AC then connect to the low side of the transformer.



Project Information

Because of increasing utility renewable energy requirements, Iowa State University has been involved in the development of a 115/34.5kV Distribution Substation and a 60 MW Solar Plant. Our team will manage the whole design process, from the solar layout, electrical layout through all associated construction deliverables. The reliability and safety of the substation will be ensured with critical calculations such as load-flow analysis, short-circuit studies, system protection, and grounding. Our team will then develop an original tool that will be utilized for the optimization of elements of conceptual design. In this process, creative problem-solving is encouraged. Black & Veatch will give the conceptual design information and standards that shall guide our team throughout the project.

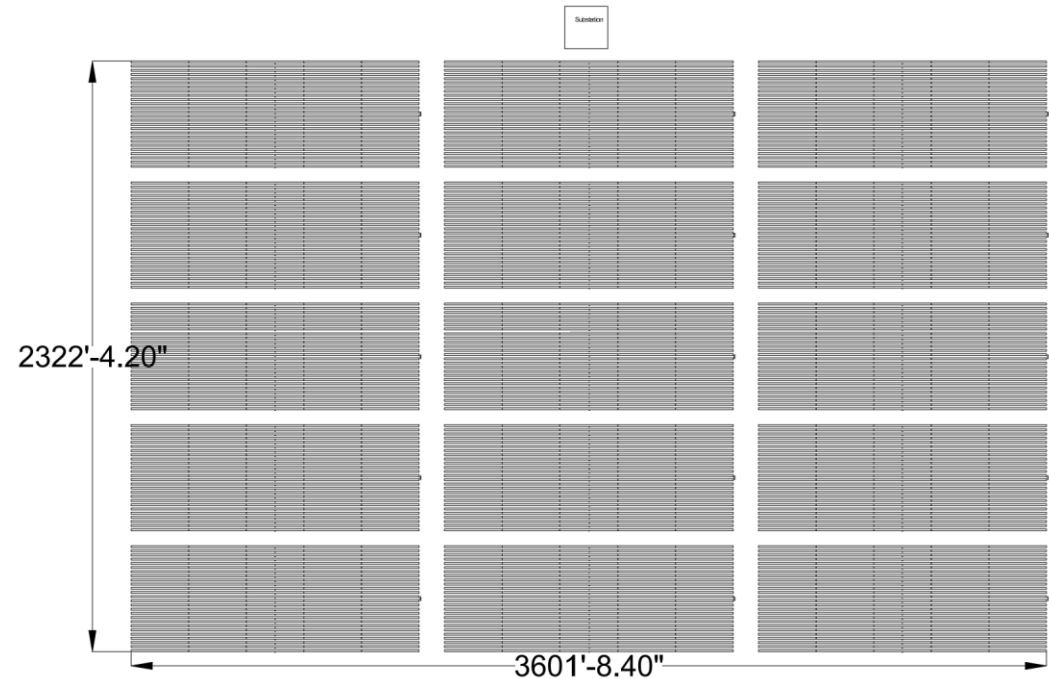


An abstract graphic on a light gray background. Two thin, dark gray lines intersect. One line is nearly horizontal, sloping slightly downwards from left to right. The other line is steeply diagonal, sloping downwards from top-left to bottom-right. The intersection point is located to the left of the word 'PROTOTYPE'.

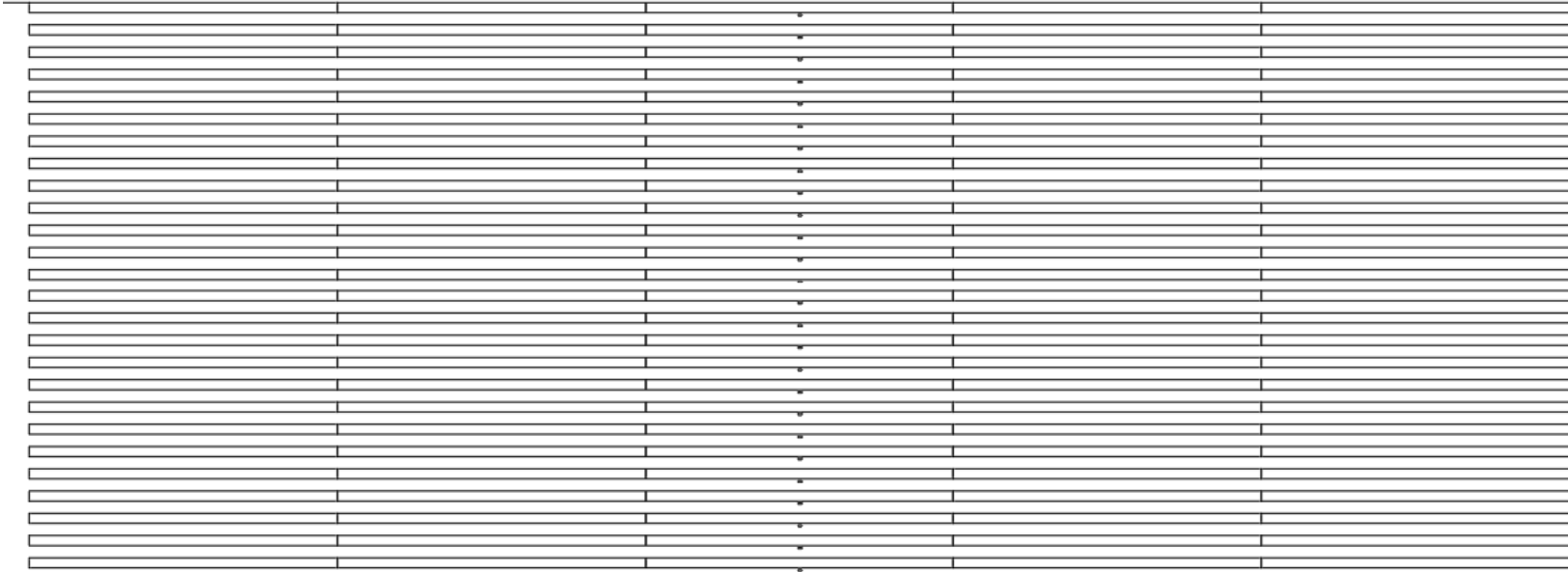
PROTOTYPE

SOLAR ARRAY PROTOTYPE

- First array prototype helped us figure out where certain items like the combiner boxes and inverters should be placed, we decided the components should be more central
- The first prototype helped understand the connection between our research and an actual design
- This is based on the distance between components and the voltage drop created by this



SECOND ITERATION



- Using what we found from our first iteration, we moved the inverters and combiner boxes to a better location
- The combiner boxes are centralized on the row and the inverter is more central on the array

An abstract graphic featuring two thin, dark grey lines that intersect on a light grey background. One line is oriented diagonally from the top-left towards the bottom-right, while the other is more horizontal, sloping slightly downwards from left to right. The intersection point is located in the upper-left quadrant of the image. To the right of this intersection, the word "IMPLICATIONS" is written in a bold, dark blue, sans-serif typeface.

IMPLICATIONS

IMPLICATIONS



- We will use what we learned from our original prototypes to develop an optimized array that fits in the plot of land we selected.



THANK YOU

Andrew Chizek

David Ntako

Ben Palkovic

Mohamed Sam

Sergio Sanchez Gomez

Dallas Wittenburg

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