115/34.5KV SOLAR PLANT & SUBSTATION

sdmay25-41

IOWA STATE UNIVERSITY
Department of Electrical and Computer Engineering

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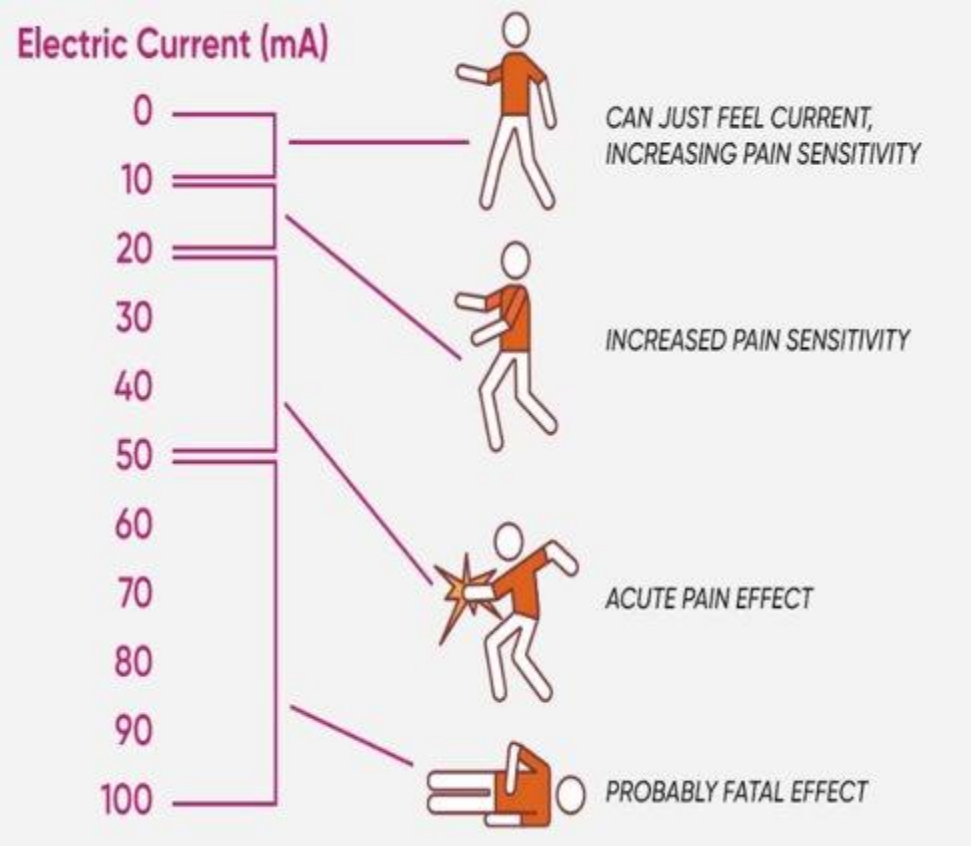
AGENDA

- **Safety Moment**
- **Project Overview**
- **IDEALS Professional responsibility**
- **Broader Context Area-Four Principles Chart**
- **Ethical Issues**
- **Important Virtue**

SAFETY MOMENT

Preventing Shock or Electrocution from Energized Conductors:



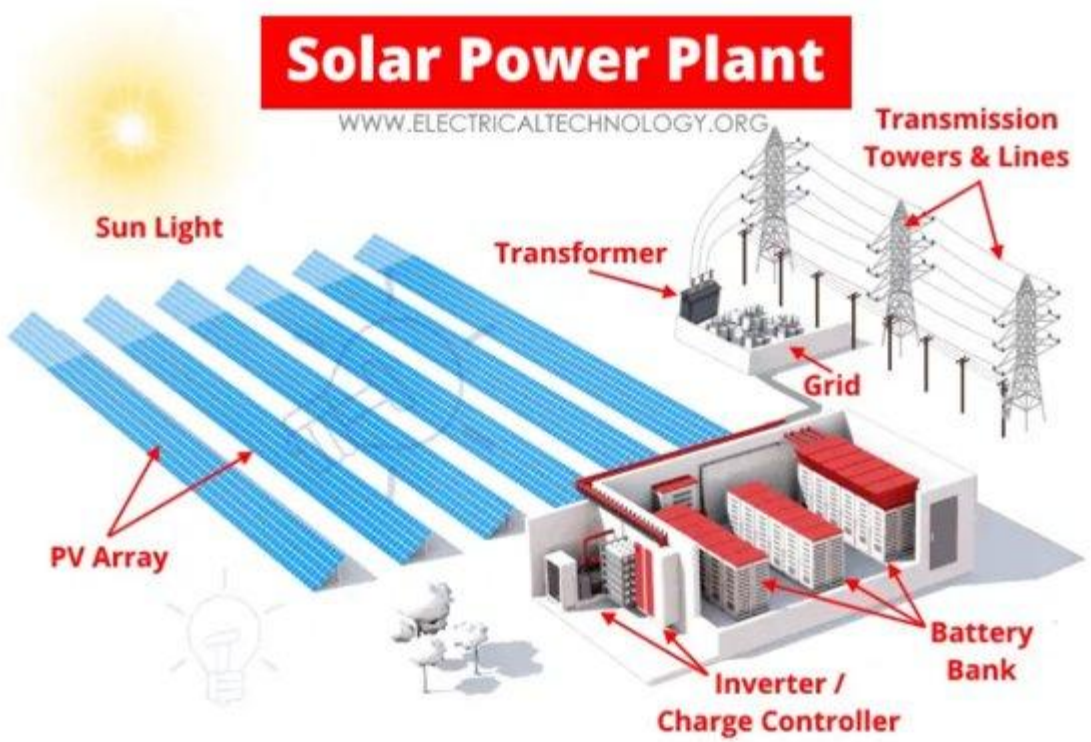
- Energized conductors in solar PV systems pose significant risks of shock or electrocution.

- This hazard occurs when current flows through the body due to:
  - Faulty wiring or equipment.
  - Improper system grounding.
  - Lack of appropriate safety measures.
  - Effects can range from burns to fatal heart failure.

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.

IDEALS PROFESSIONAL RESPONSIBILITY AREA PERFORMING WELL

IDEALS PROFESSIONAL RESPONSIBILITY

Area: Communication Honesty

- Relevance to Our Project
  - Making sure we are effectively communicating is very important to ensure our client, advisor, and team members are all on the same page. This is important not only for safety, but for functionality of our project.
- Team's Approach
  - Our team holds multiple regular weekly team meetings including meetings with our client, Black & Veatch, meetings with our faculty advisor, and team meetings.
  - Our team maintains very consistent reporting and progress updates. We also maintain a project website for clear documentation.
- Why Our Approach Upholds Ethical and Professional Responsibilities
  - Our communication practices follows the importance of truthful and accurate reporting in all professional interactions in accordance with the NSPE (National Society of Professional Engineers) Code of Ethics
  - Maintaining communication in an honest matter helps build trust and ultimately prepares our team for long-term success.

IDEALS PROFESSIONAL RESPONSIBILITY AREA PERFORMING NOT SO WELL

IDEALS PROFESSIONAL RESPONSIBILITY

Area: Financial Responsibility

- Relevance to Our Project
  - Financial responsibility is important for maintaining the project within a reasonable budget and ensuring a cost-effective solution for our client.
- Team's Approach
  - Our team updates an ongoing costs spreadsheet created using Microsoft Excel for various components of the project as well as a cost estimation tool with our client. Each and every week, we discuss costs in our meetings and modifications that may be needed.
  - Based on the weekly tasks required of us by our client, we continually update the cost estimation. It can be very difficult to find pricing for some components because they are strictly provided by commercial suppliers, making it hard to obtain a true cost.
- How We Will Change This Approach to Better Uphold Ethical and Professional Standards
  - Our group will suggest not only continuing with our weekly cost meetings, but make mention of doing in-depth cost analysis more frequently with our client in order to make sure needs are met. We will also verify all components are included by cross-referencing our AutoCAD drawings.
  - These proposed changed will not only comply with ethical standards but also build trust with our client, including any future investors and the community, by demonstrating a commitment to financial responsibility.

BROADER CONTEXT AREA-FOUR PRINCIPLES CHART

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Area	Description	Examples
Public health, safety, and welfare	This project improves the well-being of the community around the solar farm. Installing a solar farm instead of a coal power plant improves local air quality and welfare of families.	Solar panels do not emit pollutants because they operate without burning fossil fuels. Setting up the solar farm creates job opportunities.
Global, cultural, and social	The project upholds values like promoting green energy and combating climate change. A key issue is how the community feels about visible solar installations in their area.	The solar project’s design and operation respect local ethics and won’t force any of the community users to change their daily habits. It can positively impact perceptions of renewable energy and lower utility bills.
Environmental	The project boosts renewable energy use, leading to greener electricity production.	Using solar power reduces the need for oil and gas extraction, which helps protect local ecosystems and wildlife.
Economic	The project aims to reduce energy costs, making power generation more affordable for utility companies and consumers.	The design of the solar farm and substation is focused on being economically viable, aligning with the utility's goal to enhance cost-effective renewable energy options.

ONE IMPORTANT AREA - ENVIRONMENTAL IMPACT

Why It's Important:

- Our solar farm supports sustainability goals by reducing reliance on fossil fuels.
- Preserves local ecosystems, reducing air and water pollution.

Key Benefits:

- Clean Energy: Solar farm produces electricity without CO2 emissions during operation.
- Environmental Preservation: Minimal land alteration, preserving natural features of New Mexico.
- Pollution Reduction: No air pollutants or water contamination.

ETHICAL ISSUES

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Some potential ethical issues related to our project include:

- Land Use: Potential disruption of local ecosystems due to the large size of solar farm and amount of land needed.
- Economic Effects on Local Communities: Changes in job markets due to shifting from traditional to renewable energy sources, potentially impacting local economies.
- Waste Management: Challenges in responsibly recycling or disposing of solar panels at the end of their lifecycle.

IMPORTANT VIRTUE

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Virtue: Integrity - Integrity ensures that every decision and action taken in the project aligns with ethical standards and promotes trust.

How Our Team Demonstrates Integrity:

- Clear Communication: Regularly update our client, advisor, and members of our team with accurate information about project progress and any challenges.
- Compliance with Regulations: Strict adherence to all environmental, building, and safety regulations without taking shortcuts, ensuring all aspects of the project meet legal and ethical standards.

BLACK & VEATCH

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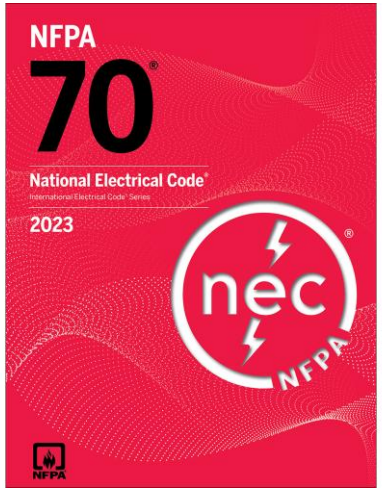

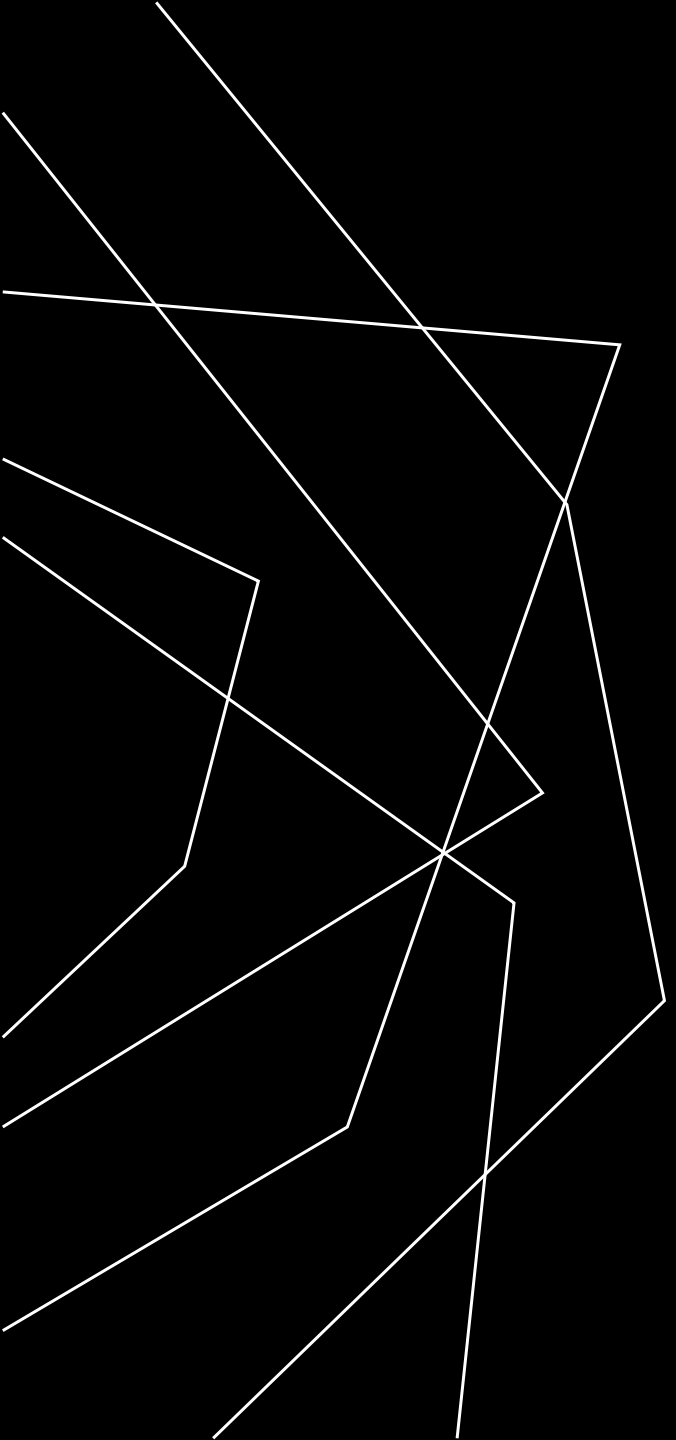

THANK YOU

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