

STEM Outreach Through Scaled Physical Depiction of Construction Power Line Safety

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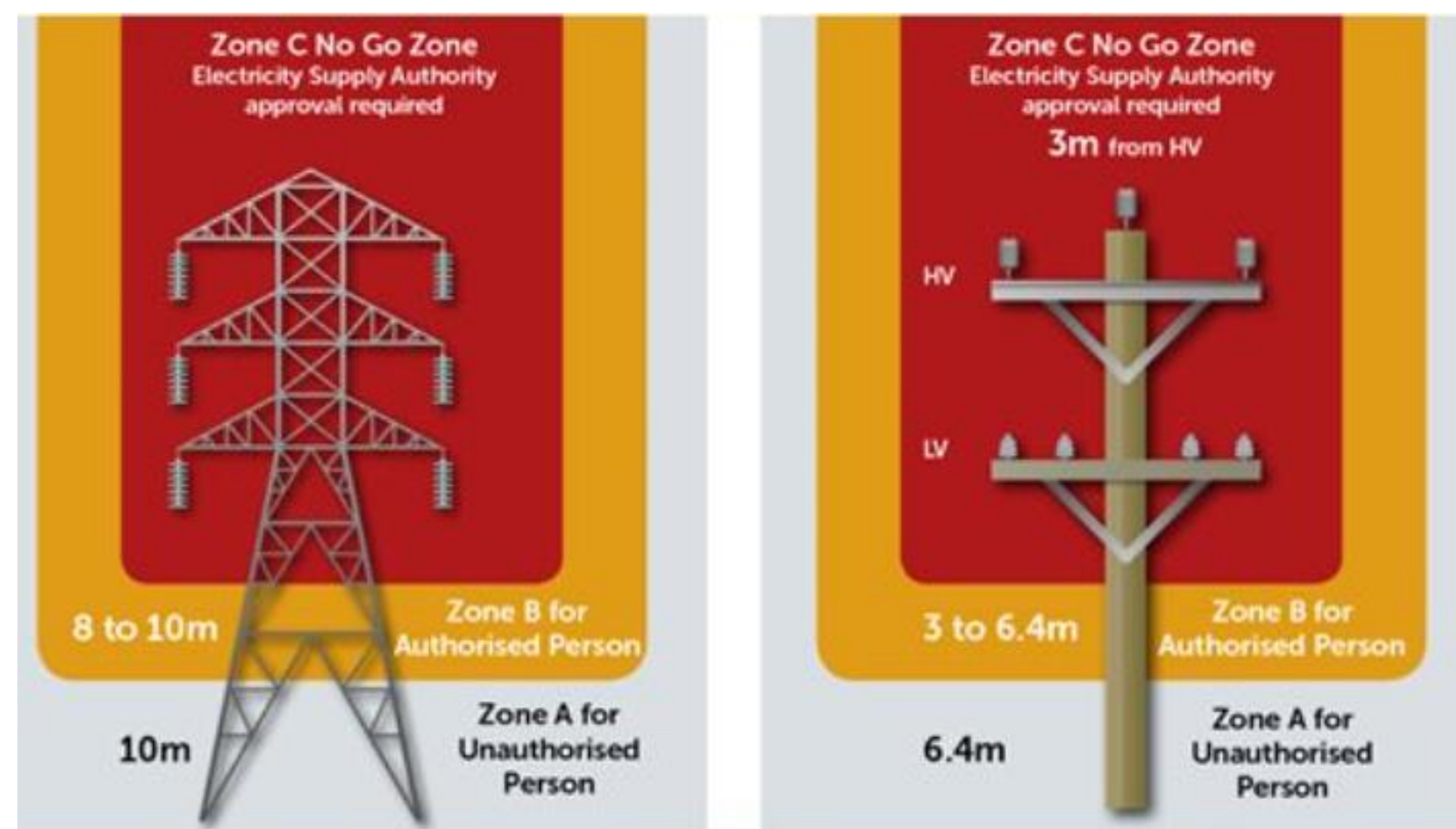


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Introduction

- High voltage transmission lines are insulated by air
- Air has a dielectric strength of 3 kV/mm
- To ensure personal safety and safe operation of transmission lines it is necessary to keep a safe working clearance to prevent unintended electrical arcs from occurring
- It is important to teach student in a fun and interactive way the safety around high voltage transmission lines
- A STEM outreach demonstration was created with a remote-controlled excavator

Overhead Power Line Safety



Approach distances can apply to **all**:

- Parts of a crane or mobile plant including vehicles
- Loads being moved including slings, chains, and other lifting gear
- People working at heights
 - Elevated work platform
 - Scaffolding
- Hand tools, hand control lines, equipment or other material held by a person

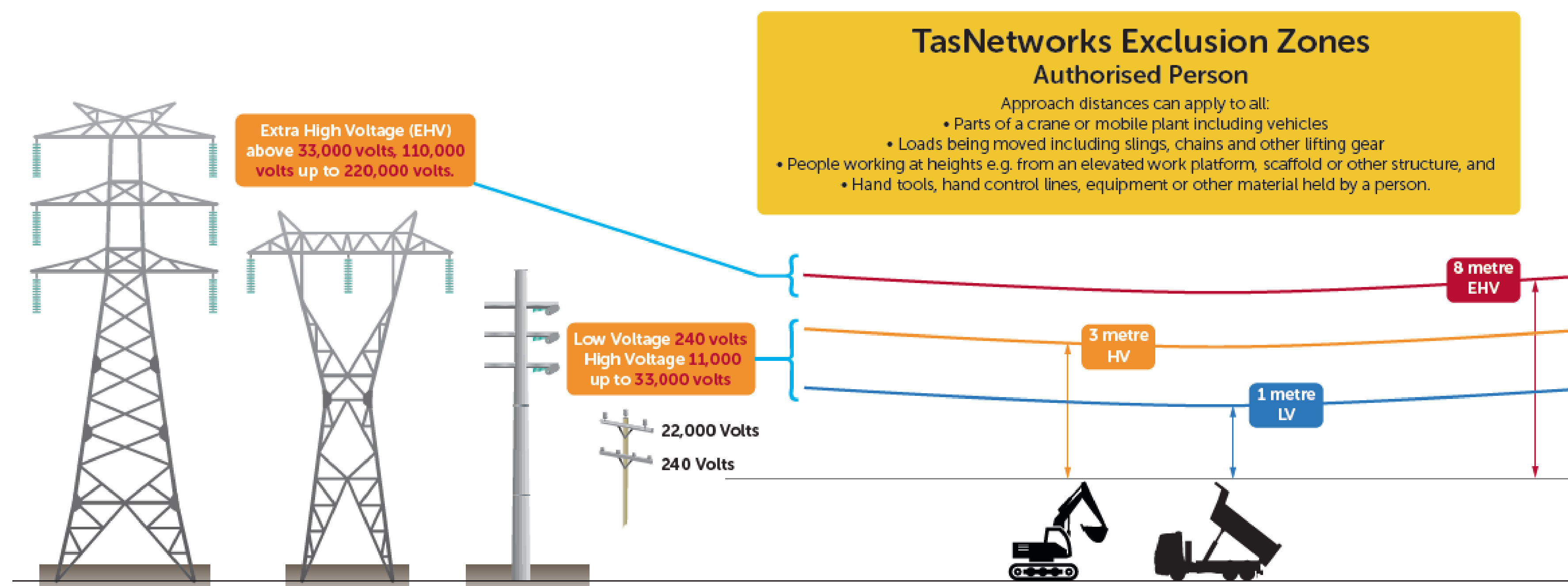
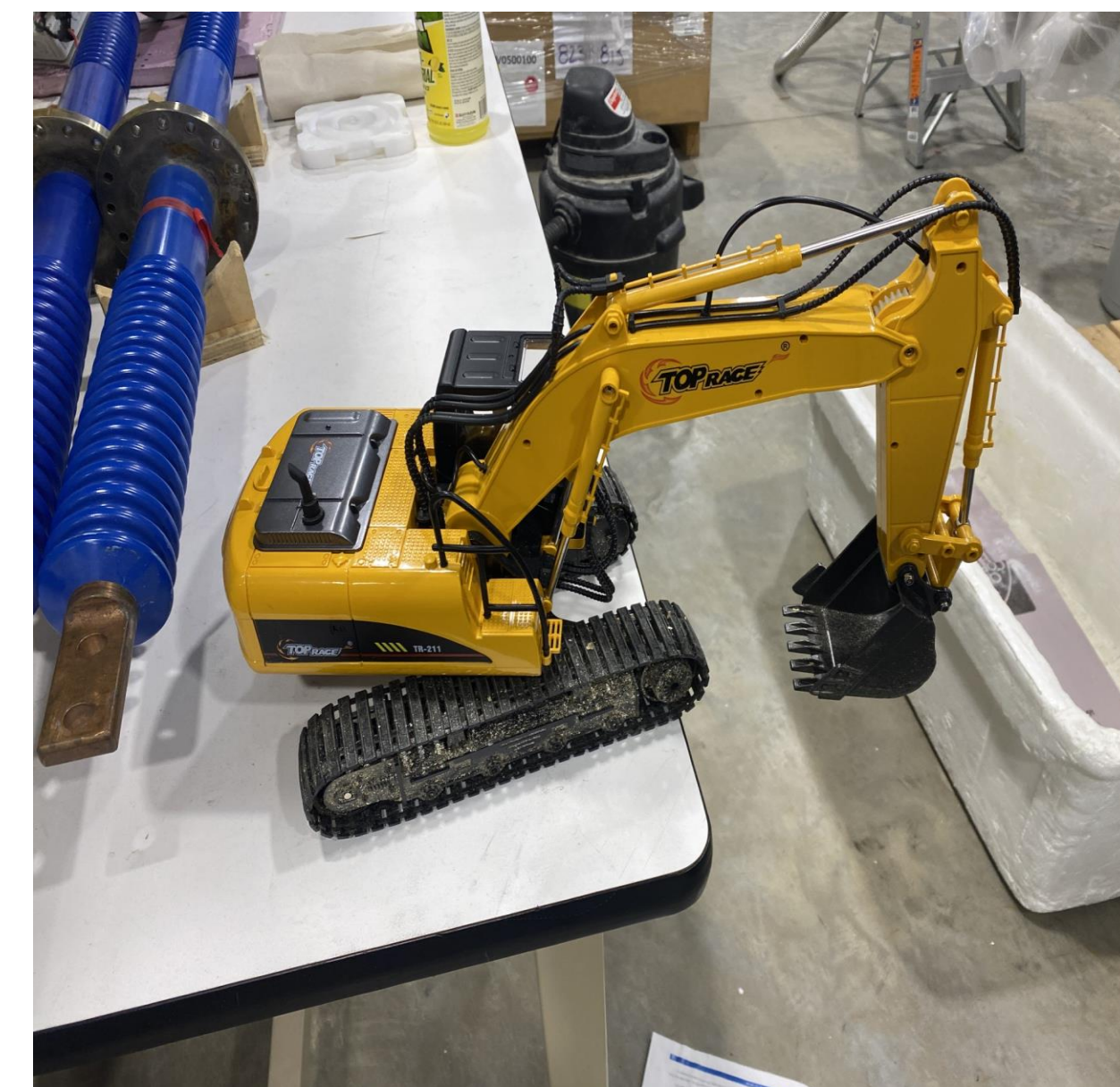
Acknowledgements

We would like to thank Dr. Peter Cheetham and his research team at the Center for Advanced Power Systems (CAPS). We would also like to thank Florida State University and the Undergraduate Research Opportunity Program for providing us with this opportunity.



Methodology

- We created a diorama of a streetside construction project.
- This involved an excavator which is in close proximity to a power line.
- The excavator is remote controlled so that it can be operated from outside the diorama.
- We can raise the scooping arm up into and through the “No-Go zone”.
- The diorama includes disconnect switches to demonstrate how the power line can be safely taken out of service to enable safe operation of the excavator



- Before the conclusion of the UROP project we intend to perform and record a high voltage measurement using the excavator
- A 100 kV high voltage ac transformer will be utilized within the high voltage laboratory at the Center for Advanced Power Systems
- The metal bucket of the excavator will be set to ground potential and will be moved in close proximity of a high voltage conductor
- Based on gap distance and applied voltage an electrical arc will form between the conductor and metal bucket
- The video of this experiment will be displayed with the diorama

STEM Outreach



What I learnt from UROP

- We learnt an incredible amount throughout the course of this UROP Project. Before this project, we had zero understanding of electrical arcs and high voltage application
- We have also achieved a better understanding of project management in an official setting as well as the ins and outs of pursuing a research project

Conclusion

- Our research project has been successful in drawing interest towards the high voltage engineering lab through our display.
- This success will bring more eyes to both the school and the program itself as it will be shown in open houses at the CAPS lab and beyond.
- We have also tested and reaffirmed the standing traditions for construction near electrical systems and can continue to test new ideas to improve safety in this regard with the creation of our diorama.

References

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