IOWA STATE UNIVERSITY
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4910 Lightning Talk: Contextualization

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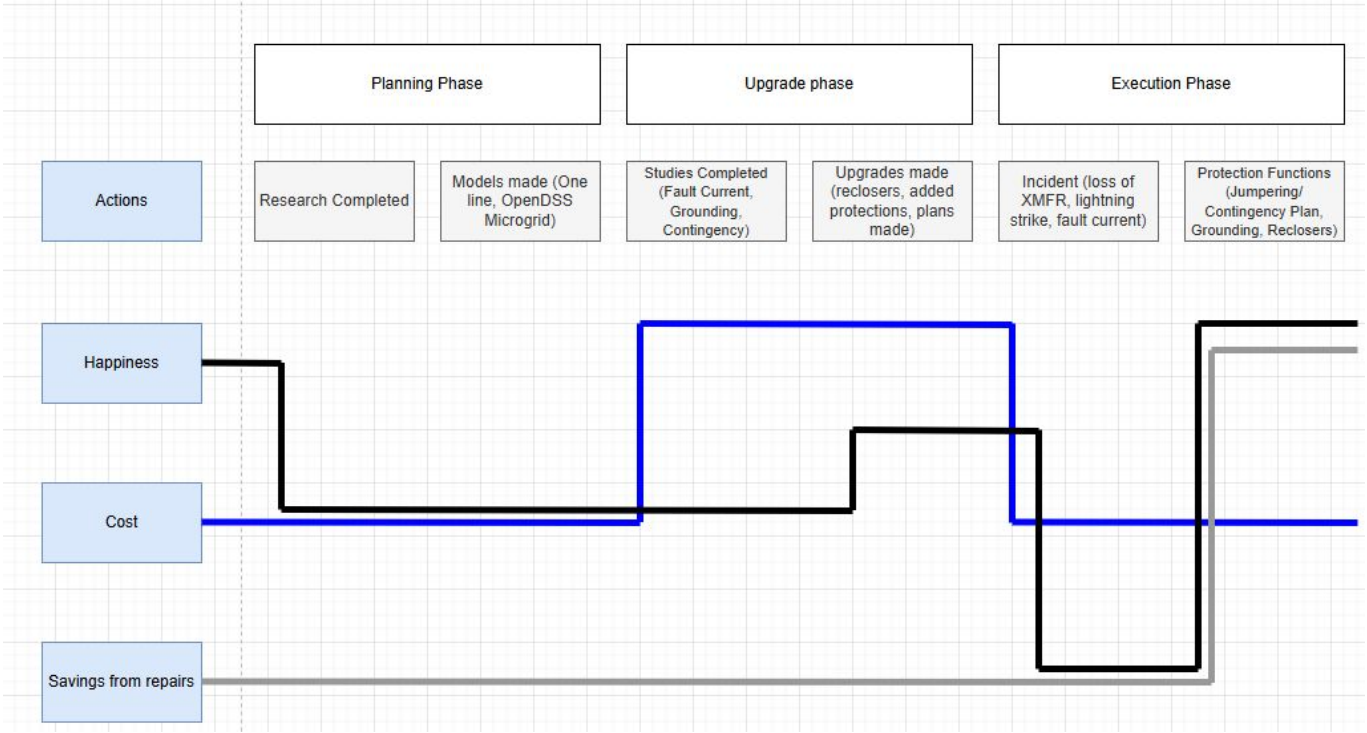
Project Overview

- Client: Burns and McDonnell
- User: ISU Utilities and customers
- Goals:
  - Model and analyze the ISU Microgrid
  - Increase reliability for end users
  - Design upgrades for both transmission and distribution power systems
  - Create future plans for load growth and increase of renewable energy

Artifacts: Journey Maps



Artifacts: Pros/Cons Table

Distribution Software Choice:

Option	Cost (40%)	Previous Knowledge (30%)	Ease of Use (20%)	GIS (10%)	Total Score
CYME	2	5	4	5	3.6
ETAP	3	4	3	0	3.0
OpenDSS	5	3	3	4	3.9
PSS/E	4	1	3	3	3.0
SKM	1	1	4	0	1.5

Artifacts: Pros/Cons Table

Substation Material Choice:

Option	Cost (Weight: 30%)	Energy Efficiency (Weight: 30%)	Lifespan (Weight: 20%)	Maintenance (Weight: 10%)	Environmental Impact Weight: 10%)	Total Score
Vented/Flooded Lead Acid	4	2	5	3	3	3.7
Sealed Maintenance-Free (VRLA)	5	3	4	4	3	4.3
Nickel-Cadmium (Ni-Cd)	3	4	5	3	4	4.0
Lithium-Ion	2	5	4	4	5	4.0

Artifacts: Technical Complexity

Internal Complexity:

- Detailed design of transmission line components
- Protection and Coordination of components will provide complexity

External Complexity:

- Model representation of the microgrid in OpenDSS
- One-Line Diagram of Substation Plan

Human Aspects

- Microgrid improvements help provide more reliable power
- Contingency plans provide worst-case scenario steps of action for power loss
- Substation anticipated growth factors help transmission needs stay relevant
- Renewable considerations help the Earth reduce “dirtier” generation

Economic Aspects

- Upfront cost a drawback of microgrid and substation upgrades
- Equipment and materials chosen will be cost-effective, but there remains a certain fixed cost associated with any improvements
- Long-term benefits of storage and reliability will provide value exceeding the upgrade cost

Technical Aspects

- Complexity showcased through detailed design of technical systems

Conclusion

- Challenges with cost-benefit choices, design assumptions
- Human aspects and increased reliability will repay any costs in the long-term
- Technical Requirements satisfied through internal device choices and models created via industry software