City Electrification Challenge and Fellowship Milestones

During the Future City Fellowship, your team will act as consultants to your partner city, informing its electrification strategy and incorporating technical standards from Underwriters Laboratories Research Institute's Standards Academy. Your team has six months to research, design, and iterate on a proposal to advance electrification for your client. You will need to accommodate client interests, government policies, technical constraints, and social needs to electrify your city safely, sustainably, and equitably. In a final consultant pitch, you will share your proposal and its impact over the next 30 years.

Challenge Statement

Propose a plan for the electrification of your city to keep citizens healthy and safe. In your plan, you will need to set targets to meet demand at three 10-year intervals, stay within budget, and address various concerns about electrification solutions, such as

1. **Ensuring technical feasibility** in electrical energy production, transmission, storage, and distribution for the specific city's needs while "greening" the energy supply chain via electrification.
2. **Satisfying safety concerns** by adhering to ULSE safety standards, choosing at least two to highlight as significant in your plan, and proposing one new safety standard, along with the tests that will demonstrate certification to safe limits.
3. **Prioritizing environmental sustainability and resilience** to help your city stay livable and strong. You may use ULSE standards to make this argument as well.
4. **Demonstrating economic viability** for your plan using the specific city's actual budget and funding streams, and/or suggesting opportunities to ensure meeting fiscal needs over the entire term of your plan.
5. **Addressing societal and stakeholder impacts, including equity issues** in the production, transmission, storage, and distribution of electrical energy. Your pitch should both explain why you believe the plan is adoptable and how it will benefit the community.

Your Client

Your city partners are your clients. City partners can include representatives from government agencies, such as energy regulators and city councils. You will work with city partners to learn about local electrical demand and use, the city's energy goals, and any codes and regulations, including safety standards, that they must adhere to.

Just like any consultant, you will need to understand your client's needs and receive their feedback as you work. You will have three formal touchpoints with the city to gather information and receive feedback. These are your project Milestones: **a client interview, sharing your narrowed challenge for feedback, and a final consulting pitch.** Additional informal contact with your client is optional, subject to availability.

Other stakeholders and residents are a valuable source of information and feedback. You should identify key stakeholders impacted and influenced by electrification to inform your thinking. Consider engaging additional stakeholders as needed, including utility companies, local community residents, businesses, institutions, environmental organizations, and technology providers. It is up to you to contact and engage these additional partners.

Future City Fellowship Milestones

The Fellowship is broken into three phases, each with a terminal milestone. Milestones, required meetings, and evaluation surveys must be completed to receive Fellowship stipends.

Phase 1: Understand the Problem and Narrow Your Focus

Electrification is a broad topic. In the first phase of the Fellowship, you should learn about your client and narrow the broad goal of electrification to a specific challenge or focus area that your client agrees with. Research your client's existing electrical systems and goals, and consider possible systems that your team can tackle before and after you interview your client. By the end of this Milestone, you will share and defend the direction you're taking with DiscoverE. For this phase of the project, we suggest your team:

A. Construct a city profile including:
    - Current population & population growth projections
    - Climate & environmental conditions
    - Current electrification status, i.e., what percentage of energy currently comes from renewable sources? Are there existing electrification plans?
    - Major economic sectors. What are the city's primary industries? Will your electrification plan affect these sectors?
B. Establish a baseline for electrical use and electrification efforts. Research current electrical generation and demand within the city, including trends for demand, e.g., peak use times and the biggest consumers. Research the current electrification systems in place and any electrification plans the city has to wean itself off fossil fuel dependency.
C. Use the ULRI Standards Academy to understand the significance of standards in the engineered world, and to learn about ULSE safety and sustainability standards related to

electrification. How do these technical standards interact with current regulations? How can they be leveraged to demonstrate the safety and sustainability in an electrified city?

D. Interview your city clients to help define a narrow problem that you will address **(Client Meeting #1)**. Be prepared to ask well-informed questions to get the information that you need. What is the city already doing, and what information can they provide? Ask them where you can find local or representational data.
E. Choose the narrow electrification-related problem or system that your team will design to improve. A criterion for narrowing your focus is your client's needs and goals, the goals of this project, and what you've learned about electrification and safety/sustainability standards thus far.
F. **MILESTONE 1:** Meet with DiscoverE at the end of this phase to briefly outline your narrowed challenge, describe your goals, share any pertinent safety or sustainability standards, and identify key focus areas for your team's design work. Like all engineering design, you may need to revisit and revise your challenge, goals, and options as you work. See the Phase 1 Rubric.
G. Phase 1 Optional Resources:
    - Project Management 101
    - Being a Good Consultant
    - Questions to Research and Consider
    - Client Electrification Analysis
    - Additional stakeholder analysis and interview. Contact other stakeholders and learn about their needs, costs, and concerns (optional but helpful).

Phase 2: Solution Design, Testing, and Modeling

Once you have decided on the narrowed focus area you plan to improve, meet again with your client **(Client meeting #2)** to explain to them the location you have chosen and why. Then, work to brainstorm possible solutions to develop and model. Play out the impacts of each of your favorite ideas over the next 10, 20, and 30 years. By the end of this phase, you should identify your best solution idea, choosing the best solution after you have some data, not based on first instincts.

A. Meet again with your client **(Client meeting #2)**. Present your narrowed problem focus and justify why you've chosen to move forward with it using data and analysis. Work with your client to brainstorm some solution ideas and gather their feedback on any initial ideas.

B. As a team, brainstorm a range of ideas, then identify two or more possible solutions that you think would best fit the needs you identified.
C. Compare possible solutions. Use any modeling that helps quantify or qualify the strength of your ideas (Excel, GIS, R, SPSS, etc). Consider standards that would affect the safety and sustainability of your ideas, and analyze which safety, sustainability, and quality-of-life measures are in place and which may be needed. Consider stakeholders' interests and gather information to inform your solution choices. Outline possible budget needs and revenue sources for the potential solutions.
D. Choose your best solution idea and prepare to justify your choice:
    a. Model the expected outcomes of at least two aspects of your electrification plan in 10, 20, and 30-year timelines to demonstrate your plan's efficacy and outcomes. For example, how will your planned changes contribute to your city's 10, 20, and 30-year sustainability or resilience goals? Collect data on the key metrics that you can use to evaluate the success of your design (e.g., energy savings, cost reduction, reduction of CO_2 emissions).
    b. Choose ULSE safety and sustainability standards that you will adhere to to ensure your solution is feasible, safe, and sustainable.
    c. Conduct a risk management analysis to identify potential risks that could derail your electrification plan and propose mitigation strategies. See the Phase 2 Rubric.
E. **MILESTONE 2:** Meet with DiscoverE and the other Fellowship Teams to share your plan and the data or inferences you are using to justify its impact over 10, 20, and 30 years. DiscoverE may bring in additional partners, as needed, to provide feedback.

Milestone 3: Creating and Polishing a Final Consulting Pitch

Create and rehearse a consulting pitch to share your recommendations with city stakeholders, including city and industry partners and experts **(Client meeting #3)**. See the Phase 3 Rubric. Your pitch should also make sense to anyone "off the street," so please include:

A. Opening slides to set the tone, provide some background, and illustrate the reasons for increasing electrification in your city. This baseline should include the existing safety and sustainability standards relevant to this issue.
B. Problem definition slides that describe the problem in terms of the gaps that you are trying to meet, including any safety standards that are missing. Describe projected monetary costs, or impacts on human safety, environmental sustainability, or any other issues that could arise without an intervention, over the next three decades.

C. Provide a standards analysis, including how ULSE safety and sustainability standards impact this issue and potential solutions.
D. Present your solution to meet the city's needs in terms of the narrow challenge you defined. Describe how ULSE standards that are integrated into your proposal ensure safe and sustainable electrification.
E. Justify your pitch with a value proposition and a cost-benefit analysis compared to the projections without your intervention. Identify increases in human safety and environmental sustainability based on data from your model compared to what would happen if the city did not implement your plan in 10, 20, and 30 years from now. Include a brief analysis of stakeholder interests and potential impact on your plan.
F. Present the pitch to DiscoverE before presenting to your city clients.
G. Phase 3 Optional Resources:
    a. Client pitch template slide deck
    b. Client pitch example slide deck