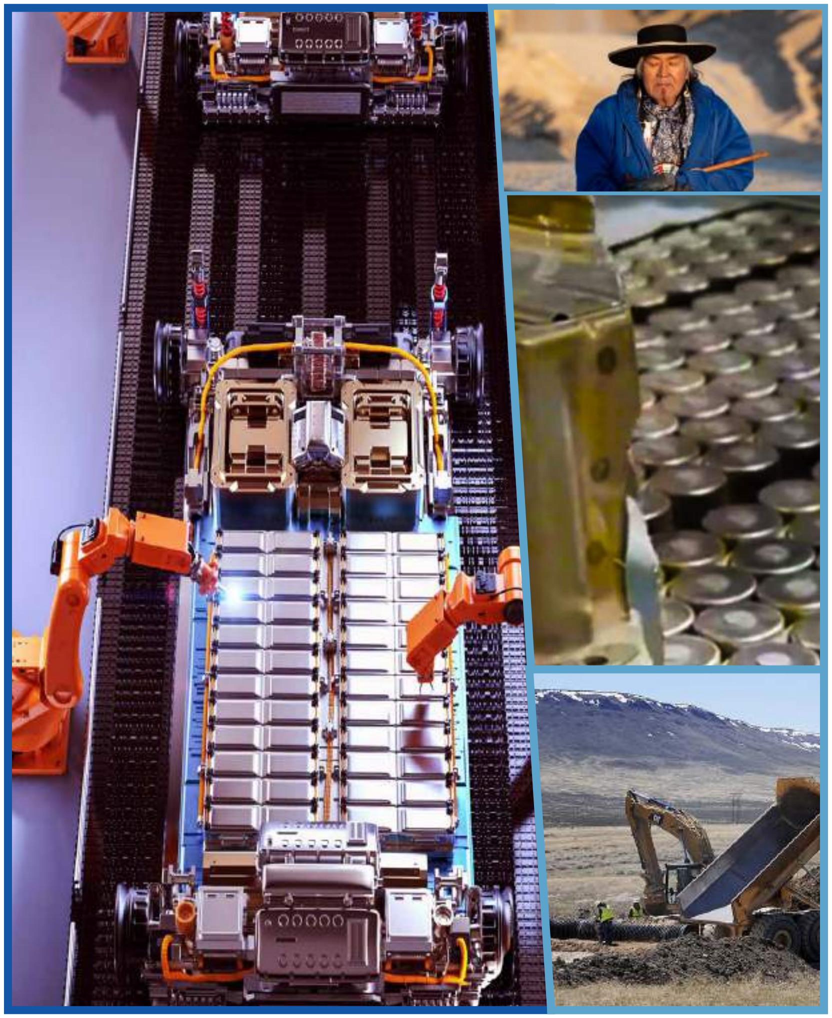
Li-loop Reversed Logistics

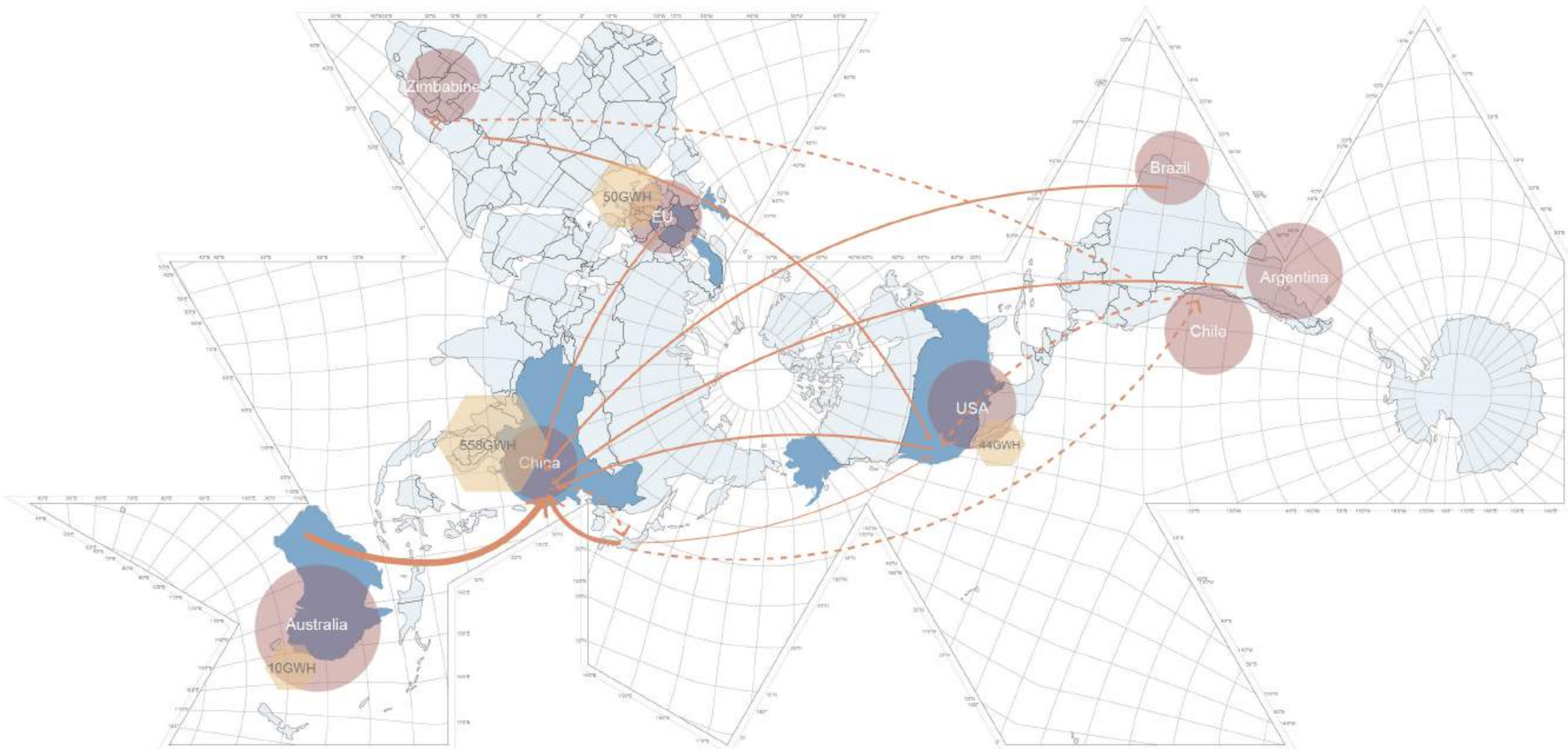
Introduction

The heralded shift towards an energy transition, often portrayed as an environmental panacea, demands an urgent and unflinching reevaluation of our entrenched policies and land-use strategies. Lithium batteries, glorified as the linchpins of this green revolution, unravel under scrutiny, exposing an unsettling paradox. The allure of electric vehicles, celebrated for their clean energy, masks a grim reality: a relentless drain on resources, significant environmental pollution, and a trail of ecological disruption. In the urban bastions of lithium battery usage, there lies an implicit complicity in a silent ecological onslaught against the hinterlands. These regions, rich in resources yet voiceless, bear the brunt of our so-called environmental advancements. What steps can we take to challenge and rectify these injustices? How do we ensure that our pursuit of sustainable energy does not become a cloak for environmental and social exploitation?

This project re-imagining in Nevada's lithium battery supply chain aims to confront these challenges head-on. By integrating transportation and infrastructure, Li-loops proposes a sustainable system for battery leasing and recycling, creating a circular industry chain. This approach includes developmental strategies for Silver Peak Valley, the Tesla Gigafactory at TRIC, and Fallon – key nodes in the battery life-cycle. The centerpiece, a battery recycling center in Fallon, is designed not just as a facility but as a symbol of the interconnectedness between urban demand and hinterland resources. This center, with its recycling station and micro-grid, serves as a practical model for energy self-sufficiency and responsible management of the battery supply chain, reflecting a commitment to more ethical and sustainable practices in the pursuit of green energy solutions.



Background

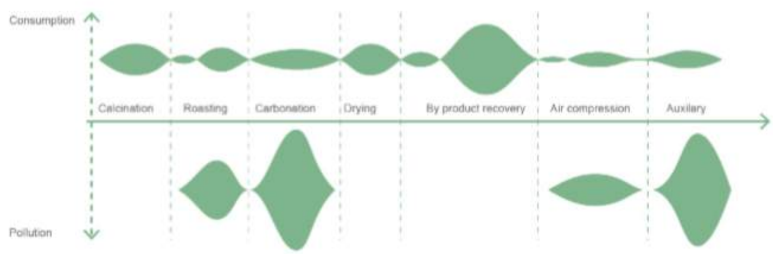


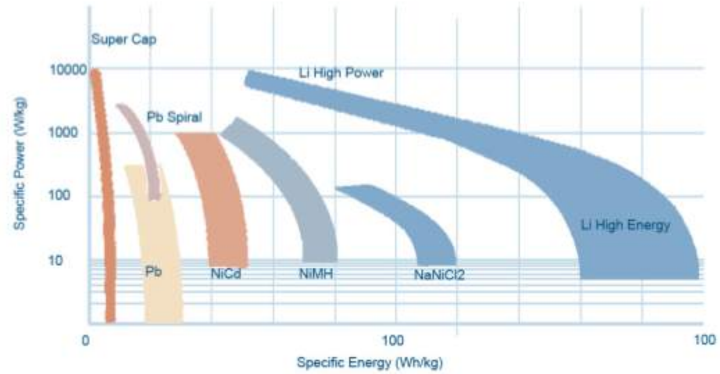
Exploring just energy transition

In this insightful project, we embark on an exploration of a fair and sustainable approach to the energy transition. Our journey begins with a critical examination of the costs and implications of the current path towards energy transition.

At the heart of our study is the lithium battery, a crucial component in the energy transition narrative. Through a comprehensive life cycle analysis, we uncover the significant carbon footprint associated with lithium batteries. This footprint stems from energy-intensive and water-consuming excavation methods, which are also mired in territorial disputes and pollution issues.

Background





Exploring just energy transition

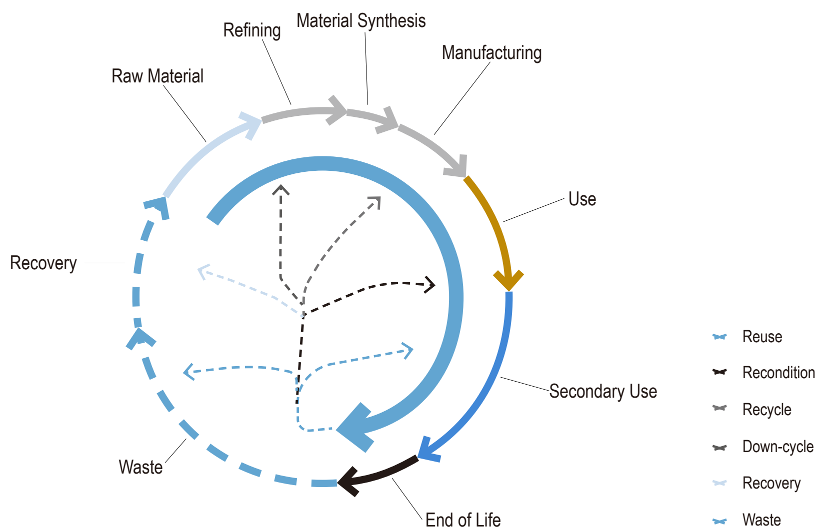
As a critical component of green energy transition, the carbon footprint of lithium batteries is heavy. Its producing process is energy heavy, water use extensive and with great pollution issues.

Lithium Battery

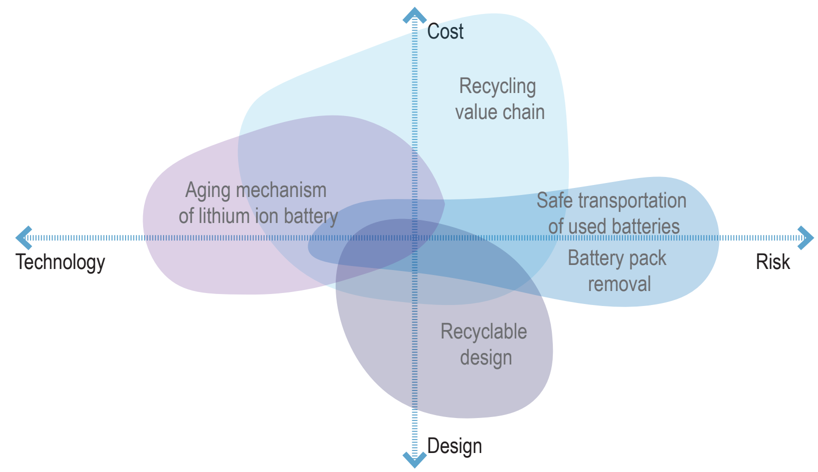
When the charging efficiency drops to 80%, the battery can no longer support such large engine. it can be re-purposed for other purposes. For example, efficiency from 80% to 60%, it EV batteries may be re-purposed for storage batteries for solar panels and wind turbines.

Background

Recycle circle



What stops recycle?



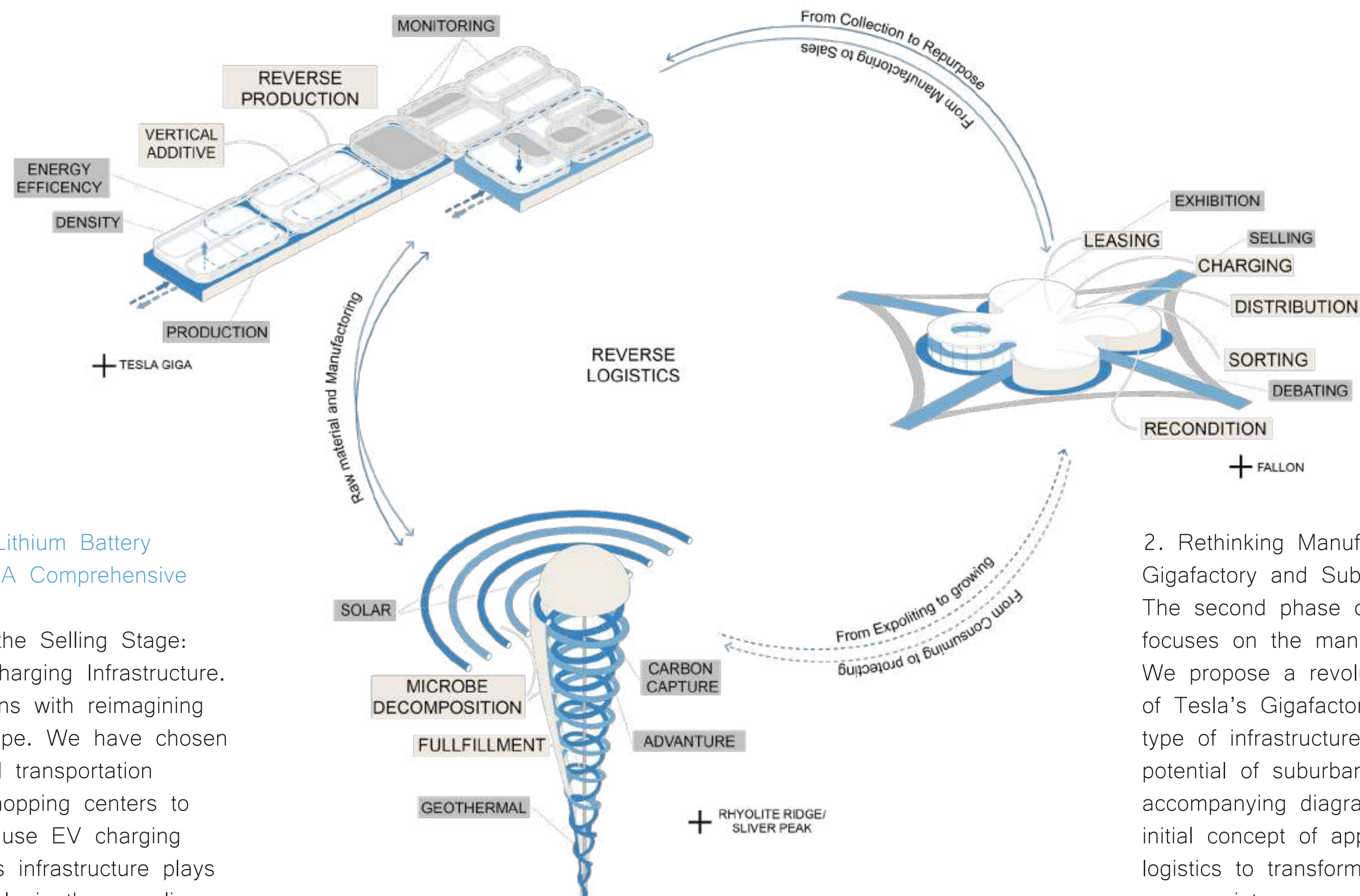
Enhancing Lithium Battery Recycling: Challenges and Solutions

Our observations indicate that recycling opportunities for lithium batteries extend beyond their end-of-life stage. Depending on the condition of the battery at its end-of-life, there are various pathways: recovery and refinement back to raw materials, reconditioning for new manufacturing processes, or repurposing for a ‘second life’ application before reaching its true end of usability. At first glance, this recycling application seems highly promising, offering an innovative approach to battery lifecycle management.

However, several factors pose challenges to this ideal scenario. The cost implications, technological limitations, risks associated with battery handling, and the initial design of the batteries can be significant deterrents for companies considering recycling. Despite these challenges, we have identified several potential solutions that align with these barriers.

Implementing supportive policies and regulations could enhance the lithium battery value chain and extend the lifespan of these batteries. Additionally, promoting safer storage and transportation practices could mitigate some of the risks involved. The modular design of electric vehicle （EV） batteries might also simplify the unpacking process

Strategy



Reimagining the Lithium Battery Recycling Chain: A Comprehensive Strategy

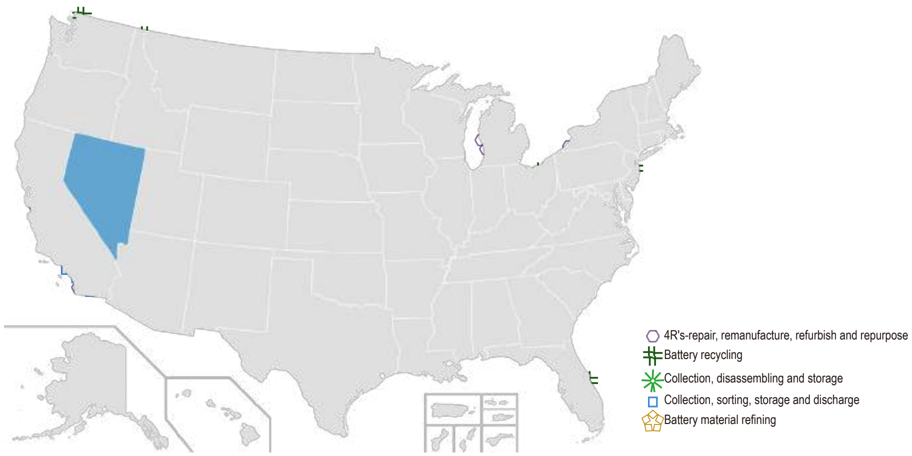
1. Innovating at the Selling Stage: Mixed-Use EV Charging Infrastructure. Our strategy begins with reimagining the selling prototype. We have chosen flyovers as typical transportation prototypes and shopping centers to develop a mixed-use EV charging infrastructure. This infrastructure plays a multi-faceted role in the recycling process, contributing to the stages of collection, sorting, and repurposing of lithium batteries. An innovative aspect of this approach is the utilization of repurposed batteries as storage units for solar panels installed on the roofs of these structures.

2. Rethinking Manufacturing: Tesla Gigafactory and Suburban Opportunities The second phase of our strategy focuses on the manufacturing phase. We propose a revolutionary rethinking of Tesla's Gigafactory as a new type of infrastructure, harnessing the potential of suburban areas. The accompanying diagram illustrates our initial concept of applying reverse logistics to transform the production process into a recycling process. We will delve deeper into this concept, discussing further plugin strategies in the upcoming sections.

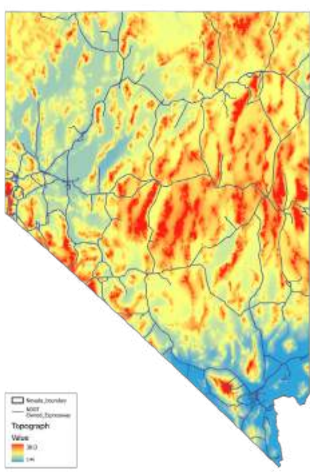
3. Microorganism-Assisted Lithium Extraction: A Sustainable Landscape Approach

Location

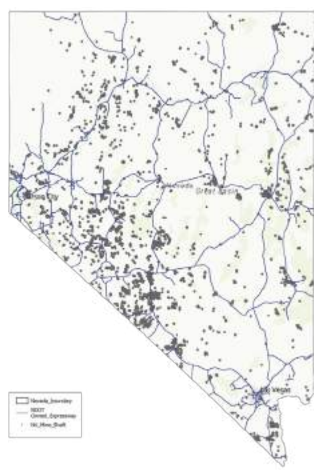
Lithium battery End of Life in the USA



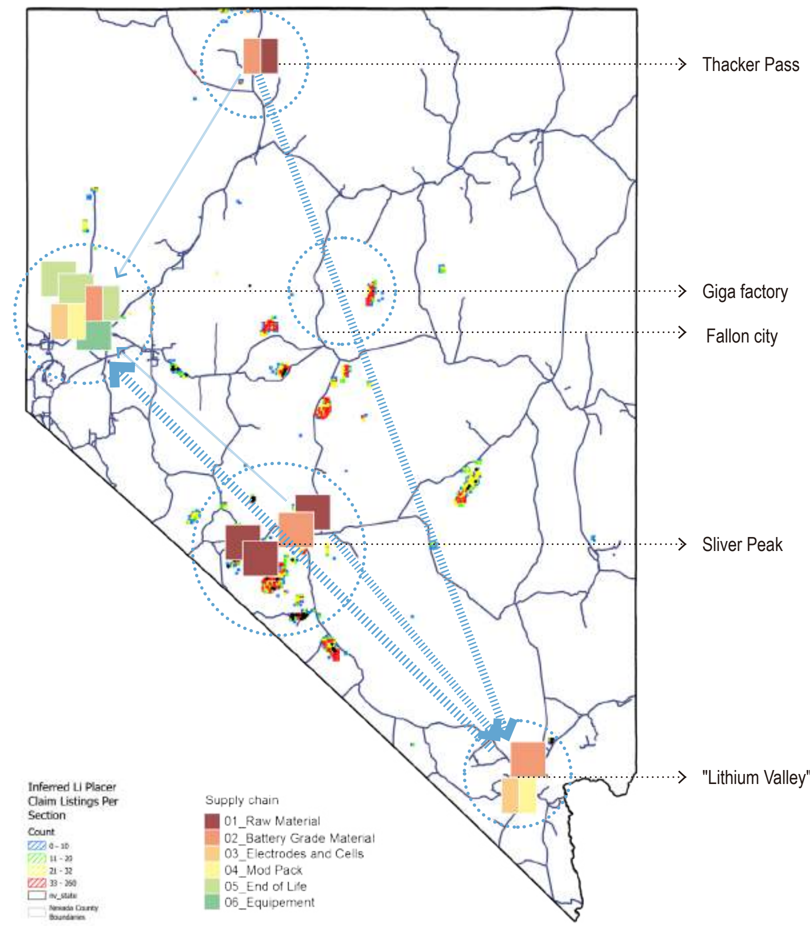
Topography and Transportation



Mines and Transportation



Lithium supply chain and Transportation

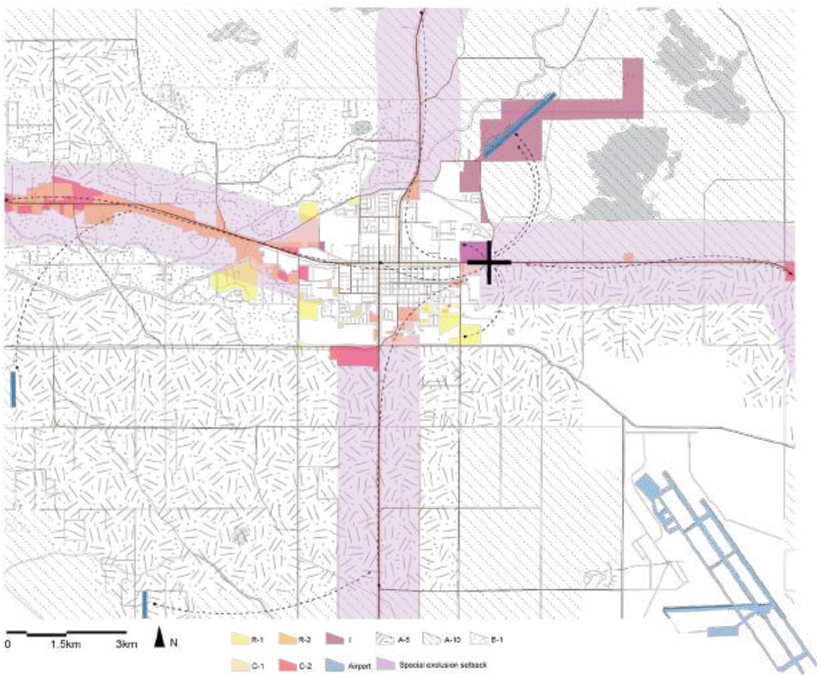


Lithium Battery Recycling Project: Focusing on Nevada

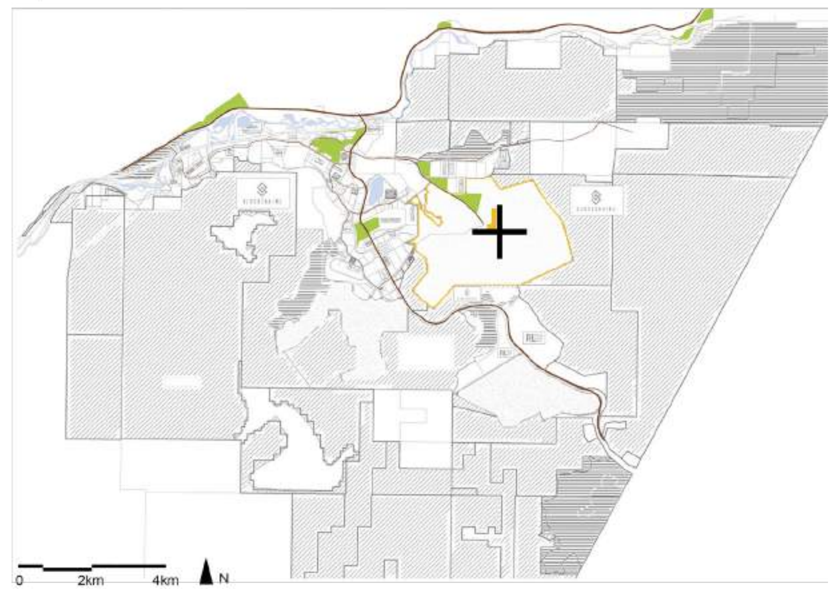
Nevada has been strategically selected as the regional focus for our lithium battery recycling initiative. This choice is underpinned by a detailed analysis of the distribution of lithium battery end-of-life facilities across the United States. While Nevada boasts a comprehensive cycle encompassing excavation to manufacturing of lithium batteries, it falls short in end-of-life processing capabilities. The state currently lacks adequate facilities for essential tasks such as battery collection, sorting, storage, discharging, and refining.This deficiency hinders the maintenance of a circular flow of lithium within the state, necessitating the transport of lithium batteries to other states for recycling and processing.

Location

+ FALLON



+ TAHOE RENO INDUSTRIAL CENTER (TRI)



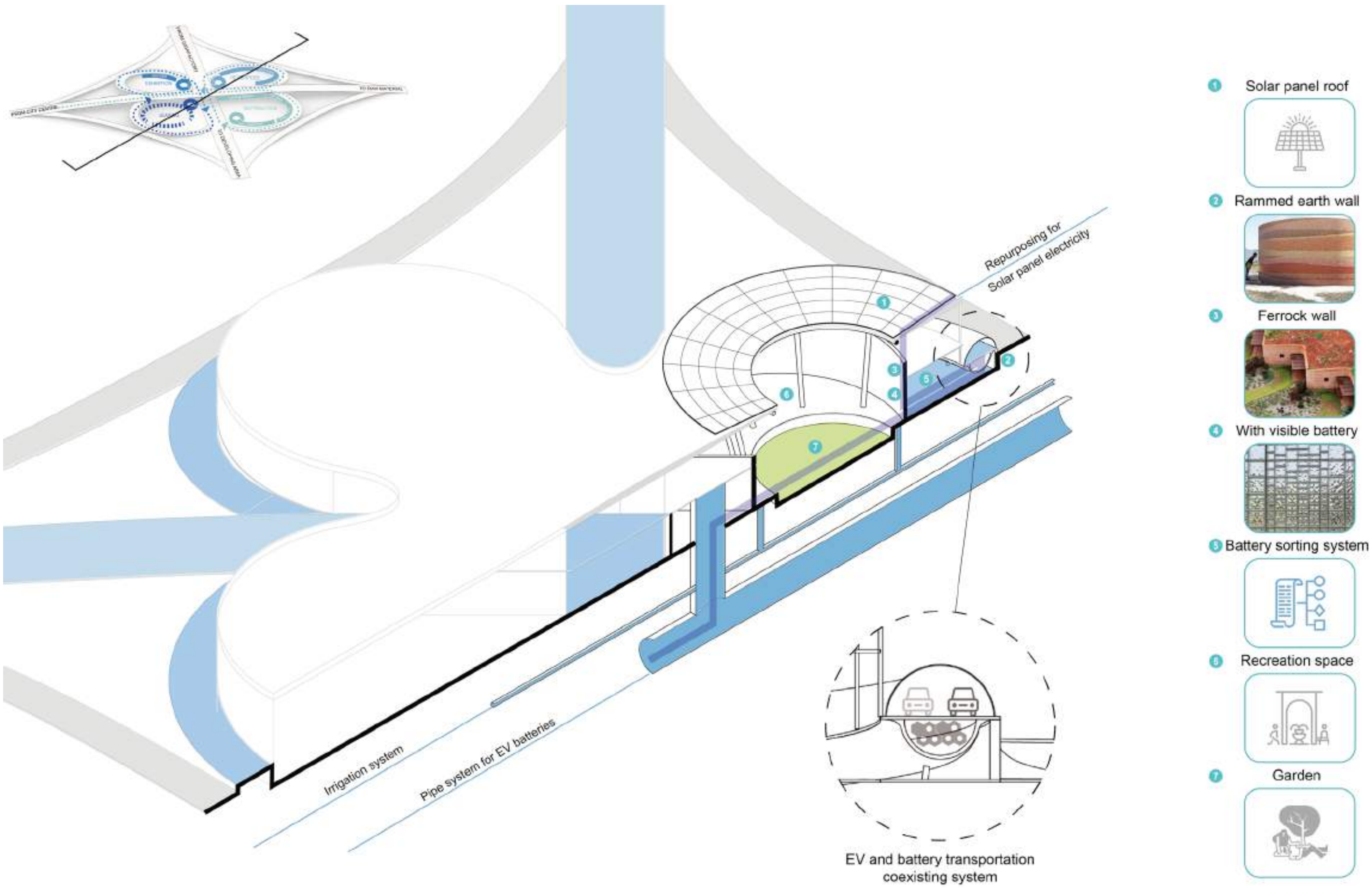
Fallon's Strategic Location for EV Charging Infrastructure

This site, positioned within the developing belt, offers several strategic advantages. Its proximity to factories ensures easy access to the manufacturing hubs, while its location near residential and commercial areas facilitates direct engagement with consumers.
Looking towards the future, this prototype in Fallon serves as a model for broader application. The goal is to replicate this approach at key intersections where EV charging demands are high, thereby integrating recycling and charging infrastructure seamlessly into urban landscapes.

Manufacturing Session: Focusing on the Tesla Gigafactory and Animal Engagement

As we move to the final part of our discussion, we turn our attention to the manufacturing session, which is centered around the Tesla Gigafactory. In this phase, our design approach incorporates a unique element: animal engagement. This aspect aims to integrate wildlife and natural ecosystems into the manufacturing process, fostering a harmonious coexistence between industrial development and the natural environment.

Scenario

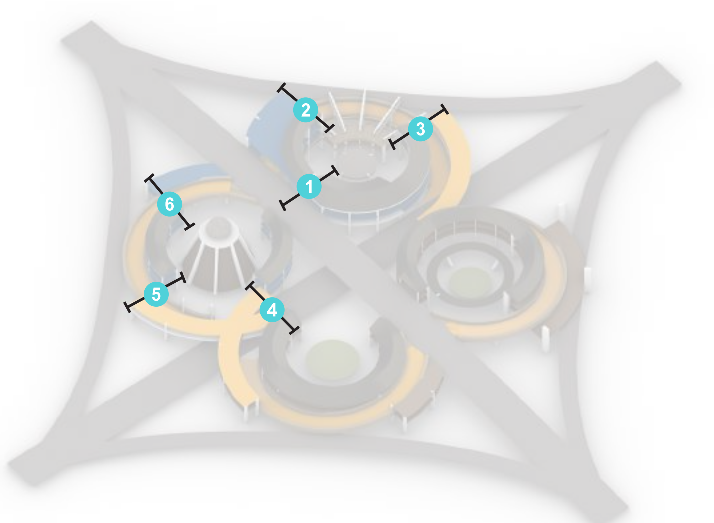


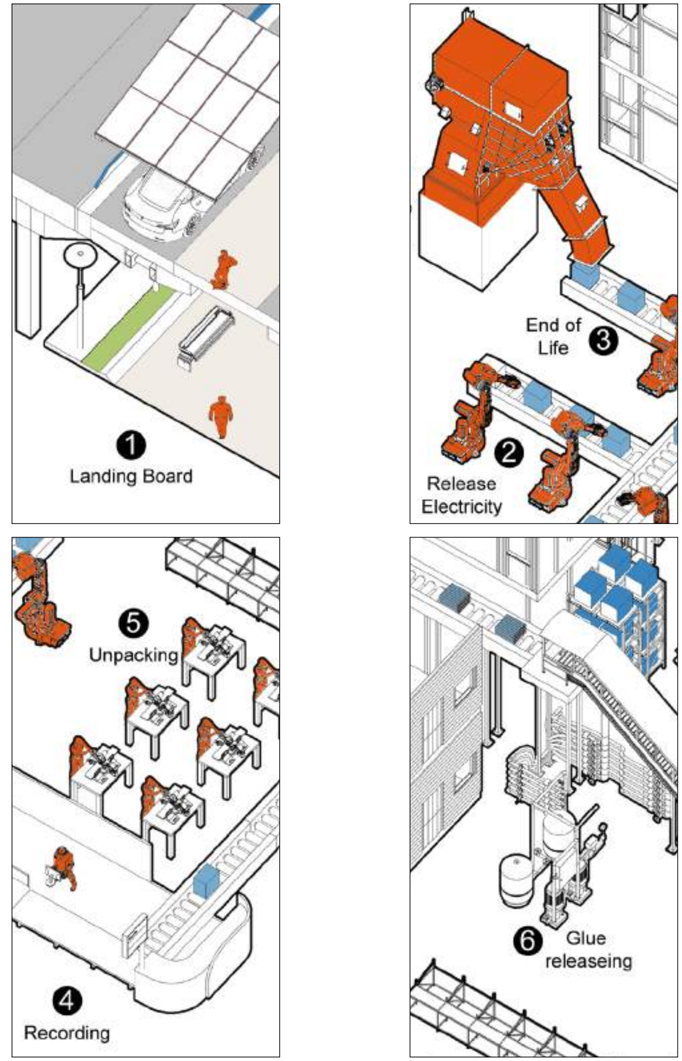
Flyover Prototype: A Key Element in Efficient Logistics for Battery Recycling

The choice of the flyover prototype is anchored in its robust connection to logistics and inherent efficiency. This strategic selection is pivotal in streamlining the recycling process for lithium batteries.

Illustrated in the accompanying diagram is the comprehensive flow involving an electric vehicle (EV) and its recycled battery set. The process encompasses several key stages: distribution, repurposing, repacking, and leasing. This sequence demonstrates a highly efficient and circular approach to battery usage and recycling, leveraging the unique advantages of the flyover infrastructure.

Scenario



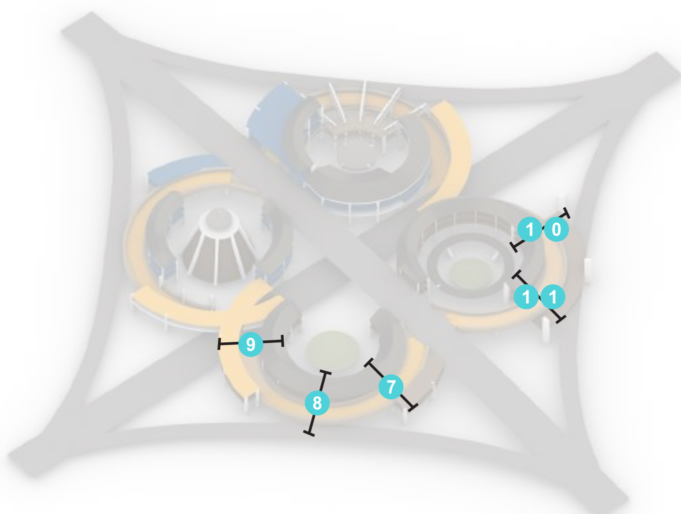


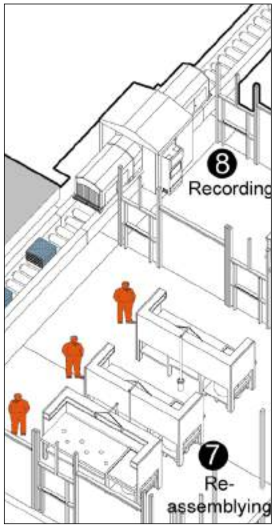
Recycling process:

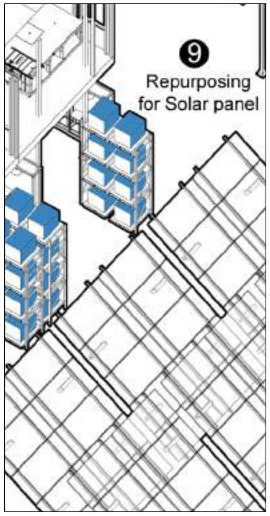
The visitors are to explore the whole facility along with the EV battery recycle process. The whole process is divdied into 8 parts. Two of each are allocated to one of the circular space.

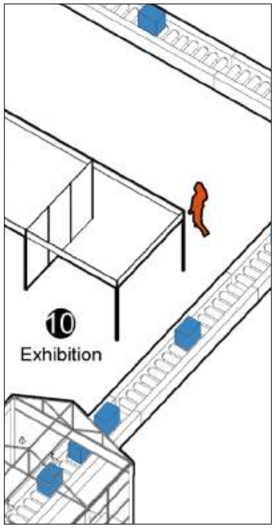
This process highlighted the actor of labor in the future. People are more engaged in monitoring than manufacturing. Robots and manufacturing chain is the key of recycling. Modular cells of batteries are more encouraged to contribute to a ease approach of this process.

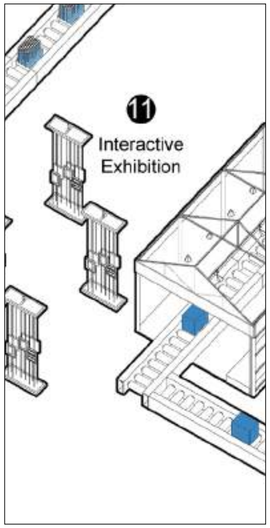
Scenario









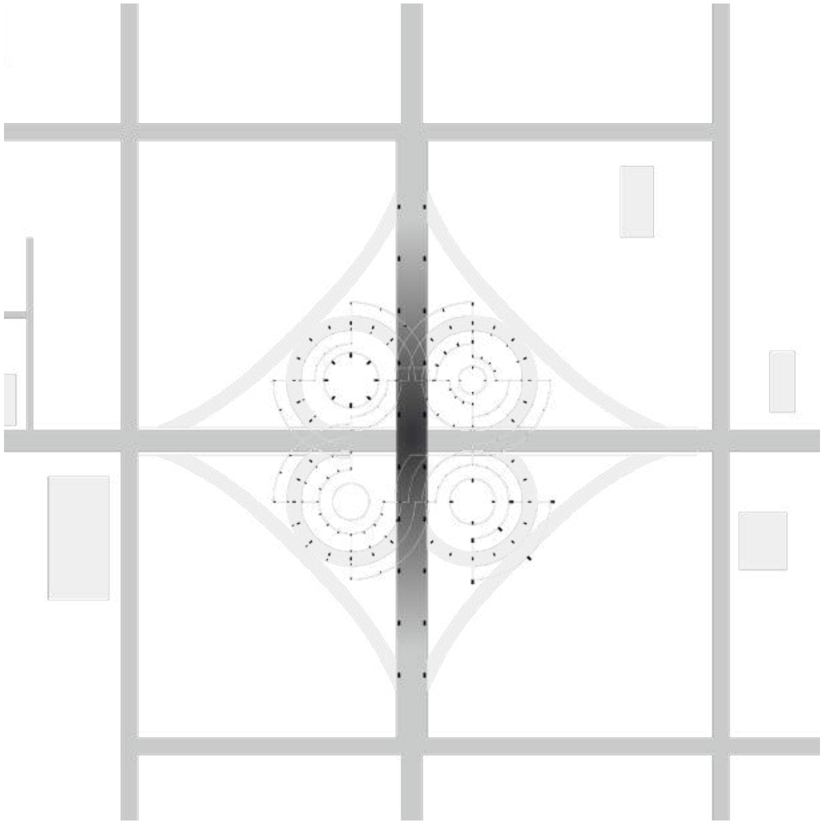


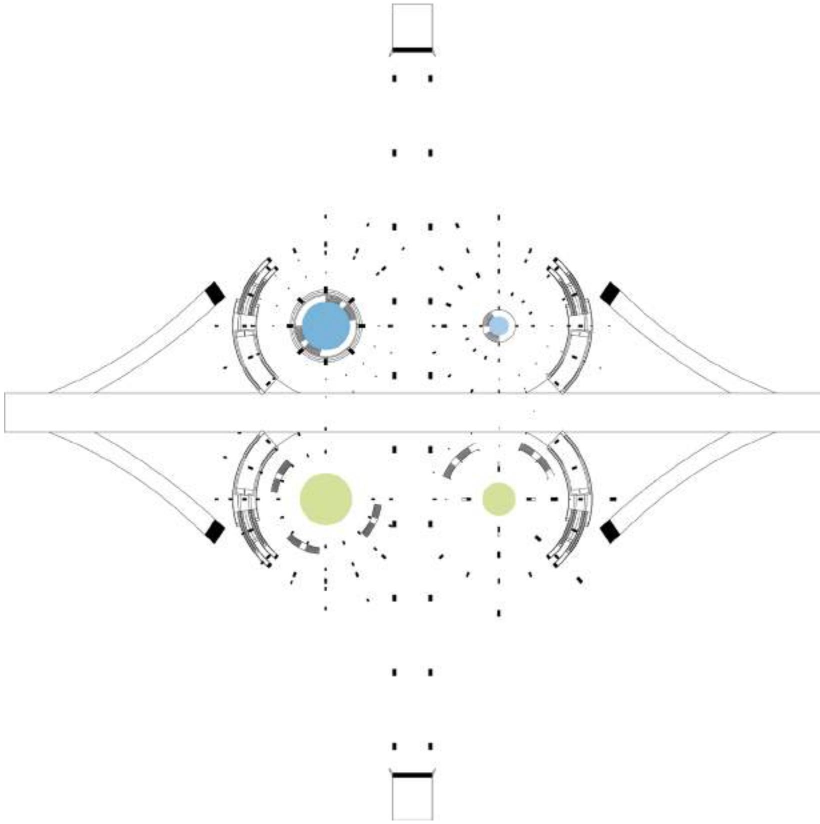
Recycling process:

In the following stages, the battery is to be checked for its condition. If it reaches its end of life, it will be collected and disposed. If it is proper for reconditioning, it will be send to be unpack and release glues.

The process is monitored with batteries recorded with its unique bar code. Once it is reconditioned, it is sent to storage space for solar panels. Visitors are encouraged to engage into the exhibition.

Spacial Arrangement





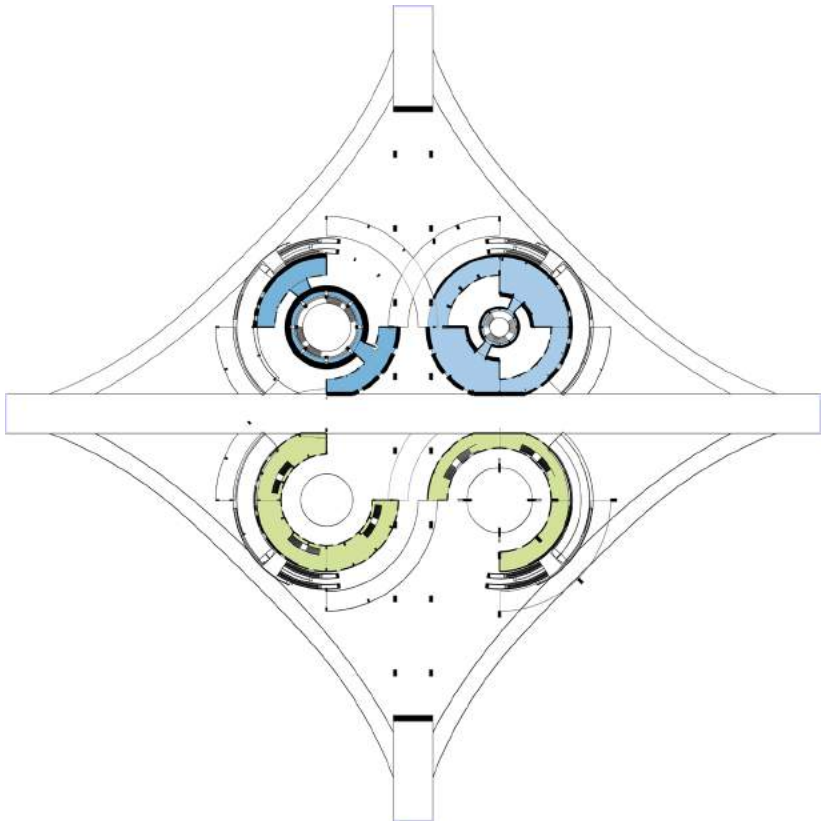
Site Plan

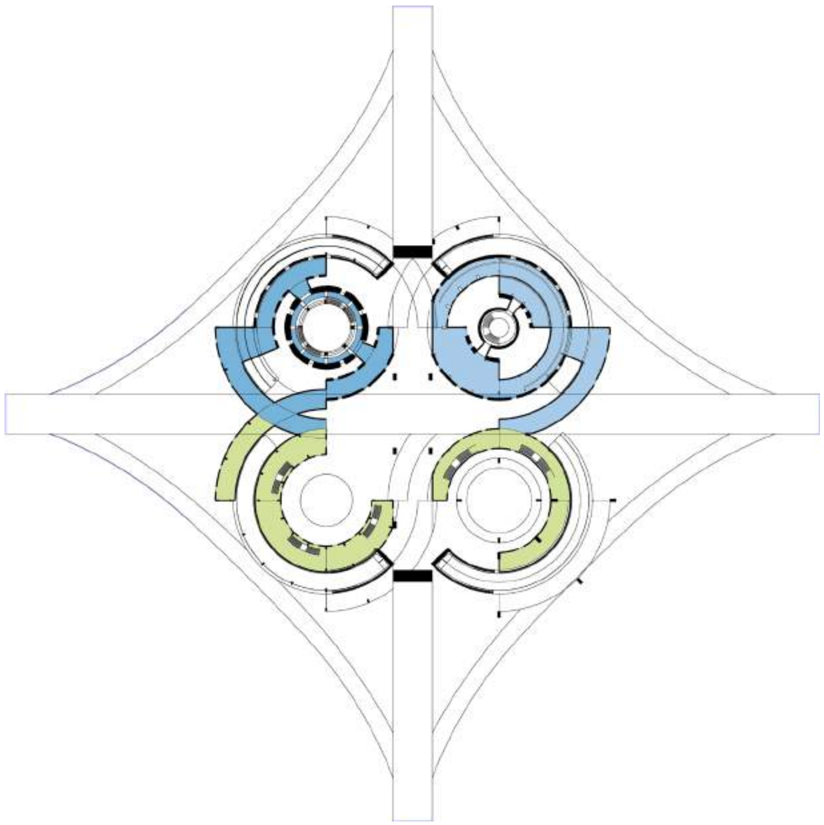
Columns are arranged on this site plan to show the flexibility of the spacial arrangement. Different size of the columns indicate different span and various function. Funtionally, it promotes a free flow of those four circular spaces.

Ground Plan

Four core spaces are designed to be the centre of each of the circular space. It functions from gathering used battery to re-purpose the battery for solar panels, to green and exhibition areas.

Spacial Arrangement





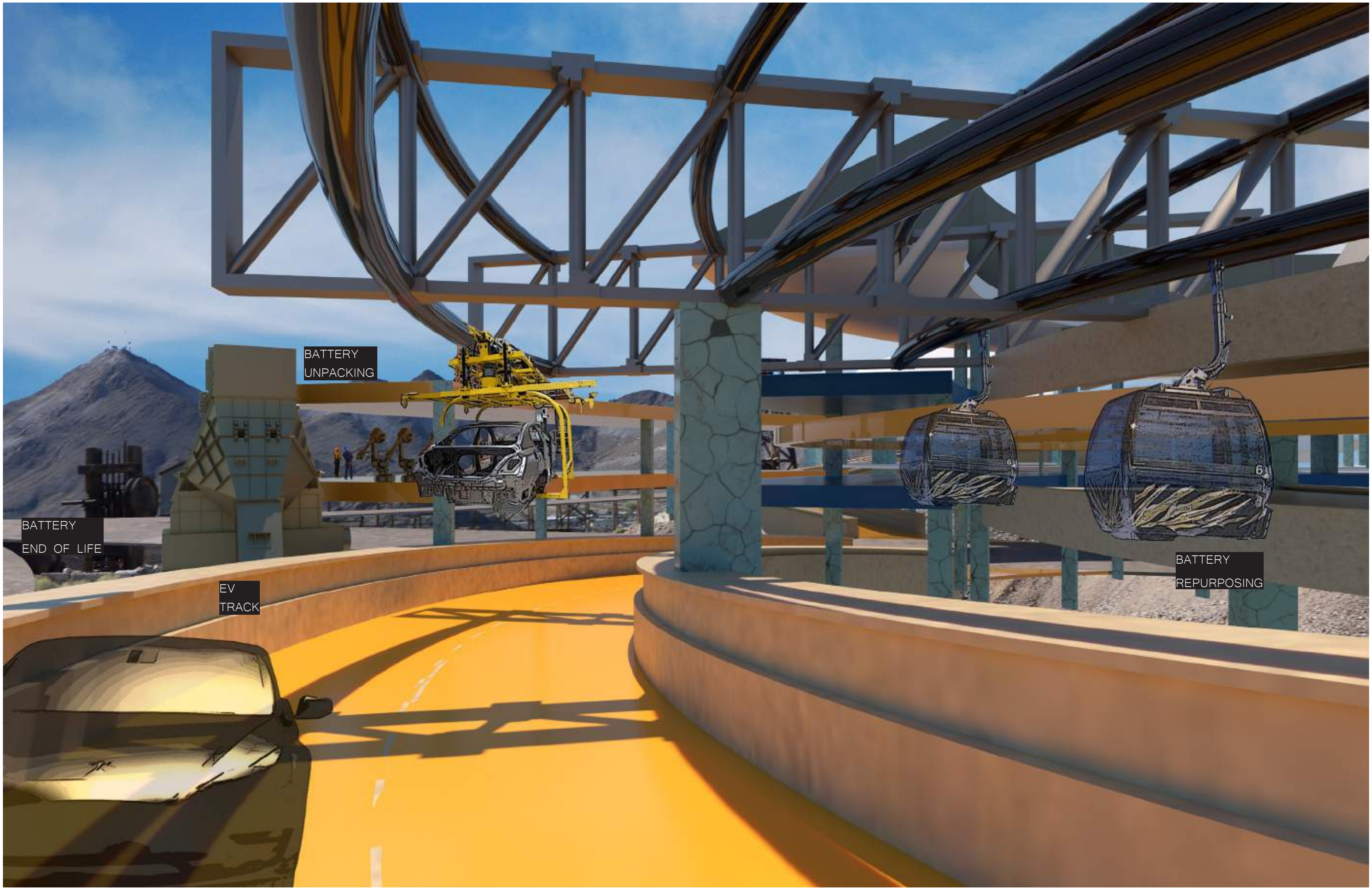
Mid Level Plan

The middle level is linked to the upper layer of the flyover. EV batteries will be processed through those areas along the electricity car, transported on the track.

Upper Level Plan

The upper level is designed for the drivers, pedestrains and visitors. Through the bridges, the four parts of the facilities are linked together to have a full experence of exploration.

Scene


BATTERY
UNPACKING
BATTERY
END OF LIFE
EV
TRACK
BATTERY
REPURPOSING

Scene