



Enabling the New Transportation Economy

Your Gateway to the Future of Urban Air Transportation

State of Texas UAM

UAM Ecosystem's Economic Drivers:

- Vertiport Level
- Sector Level
- City Level

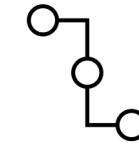
AGENDA

ABOUT

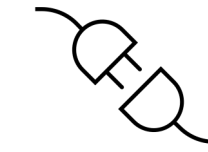
What Cities Care About?



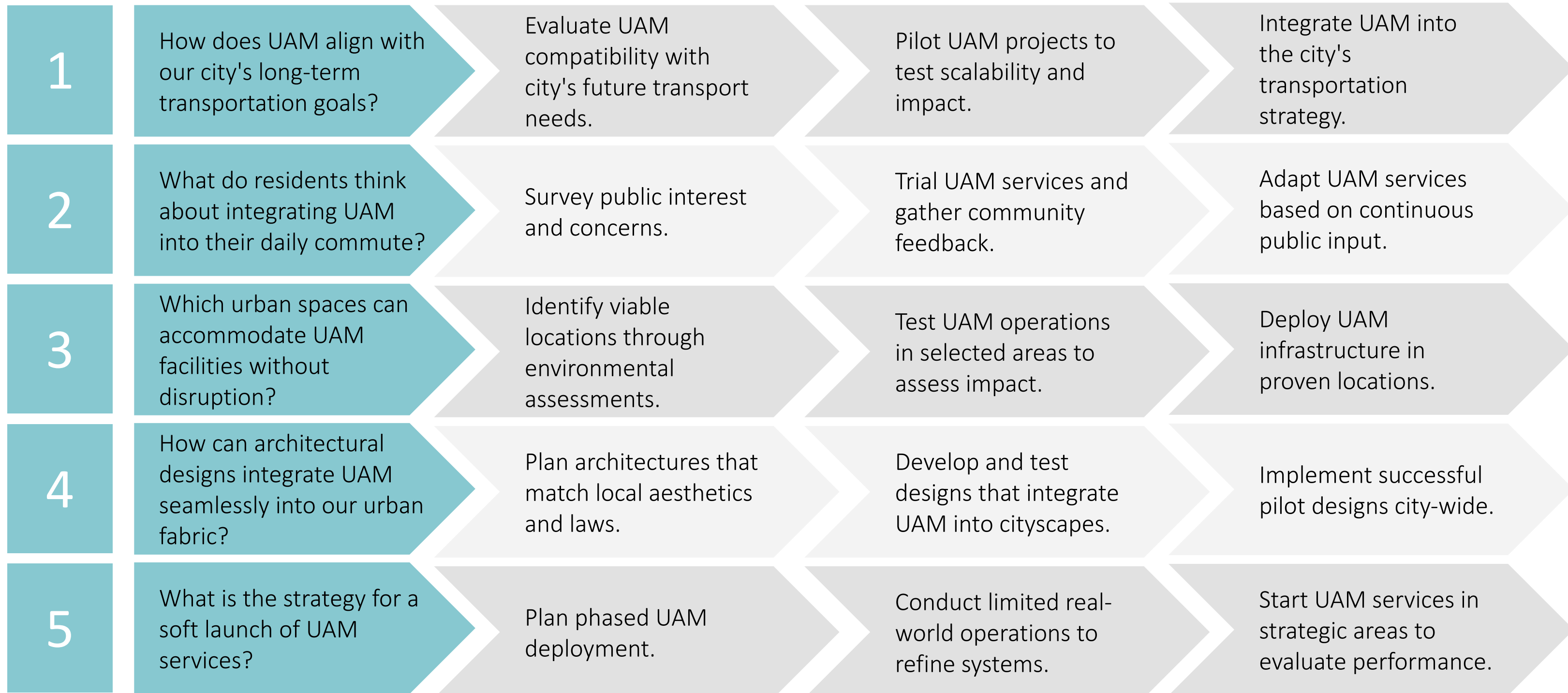
UAM Feasibility Study Process



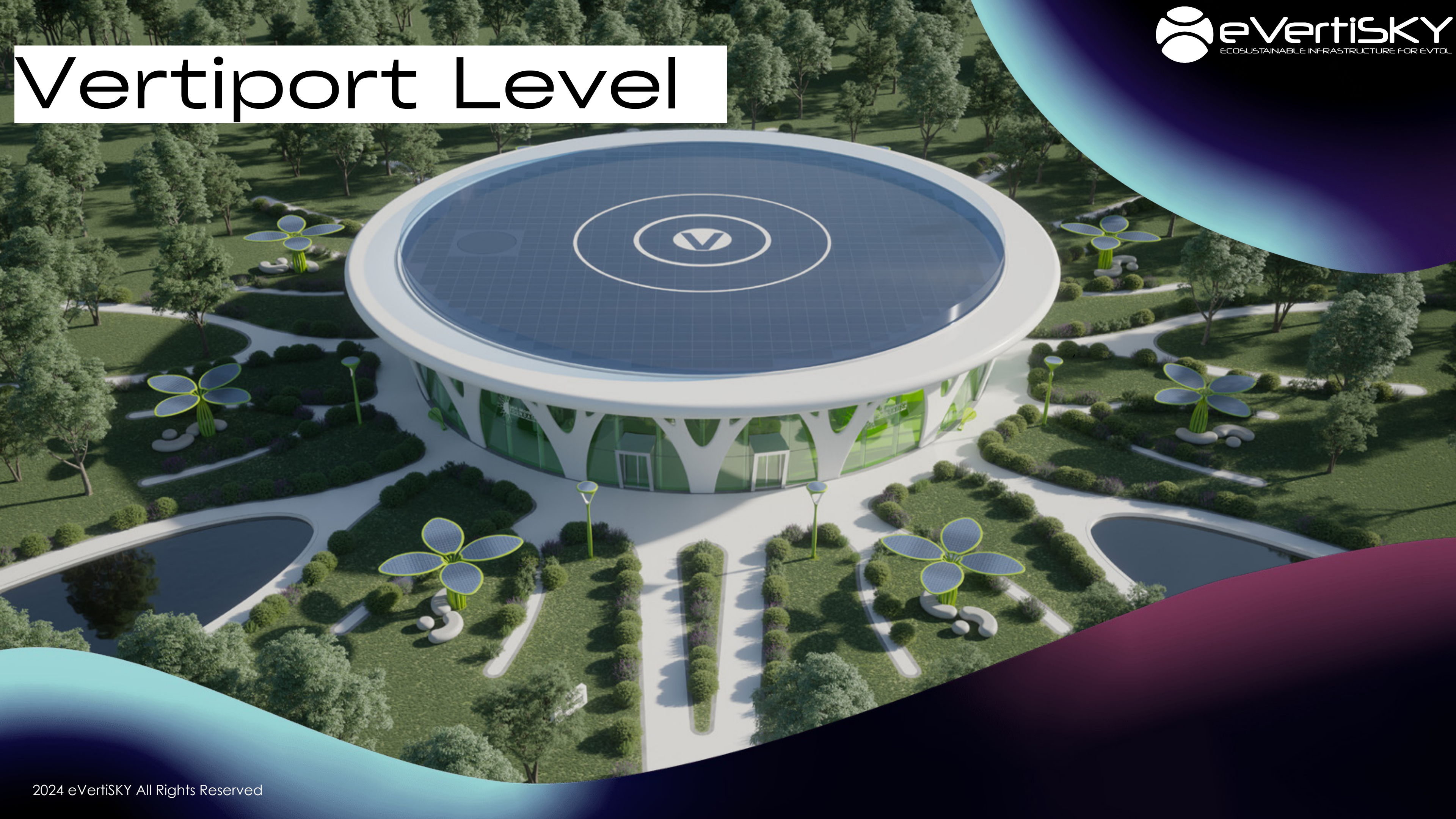
UAM Living Labs



UAM Integration

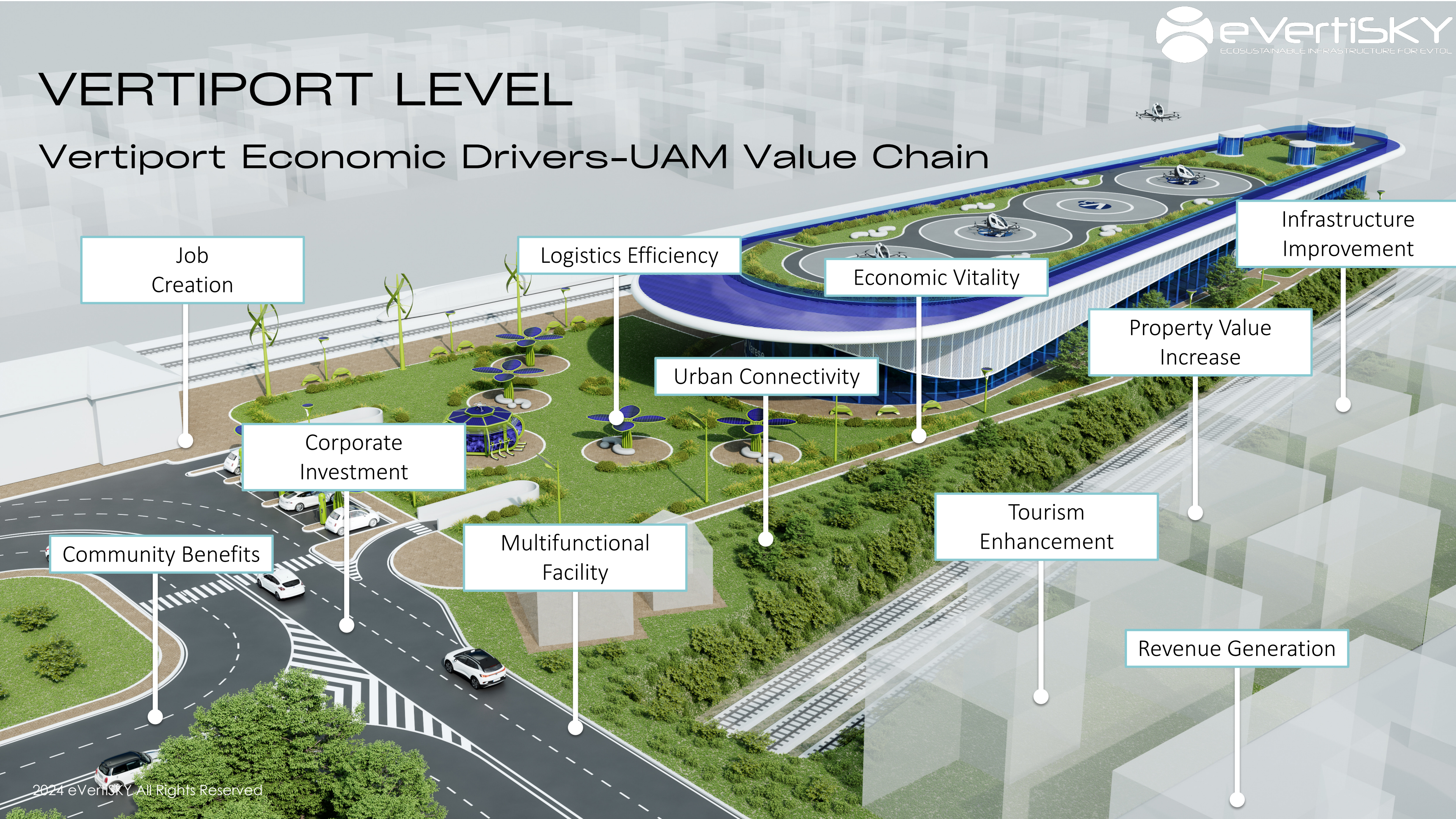


Vertiport Level



VERTIPOINT LEVEL

Vertiport Economic Drivers-UAM Value Chain



Job Creation

Logistics Efficiency

Economic Vitality

Infrastructure Improvement

Corporate Investment

Urban Connectivity

Property Value Increase

Community Benefits

Multifunctional Facility

Tourism Enhancement

Revenue Generation

VERTIPORT LEVEL

Vertiport Placement – Identification of public transit routes

Fair Park Station

Bachman Station

Ledbetter Station

Parker Road Station

Westmoreland Station



MISSISSIPPI

LEGEND

● DART

VERTIPORT LEVEL


Vertiport Placement-Proximity to major airports

DAL

DFW



LEGEND

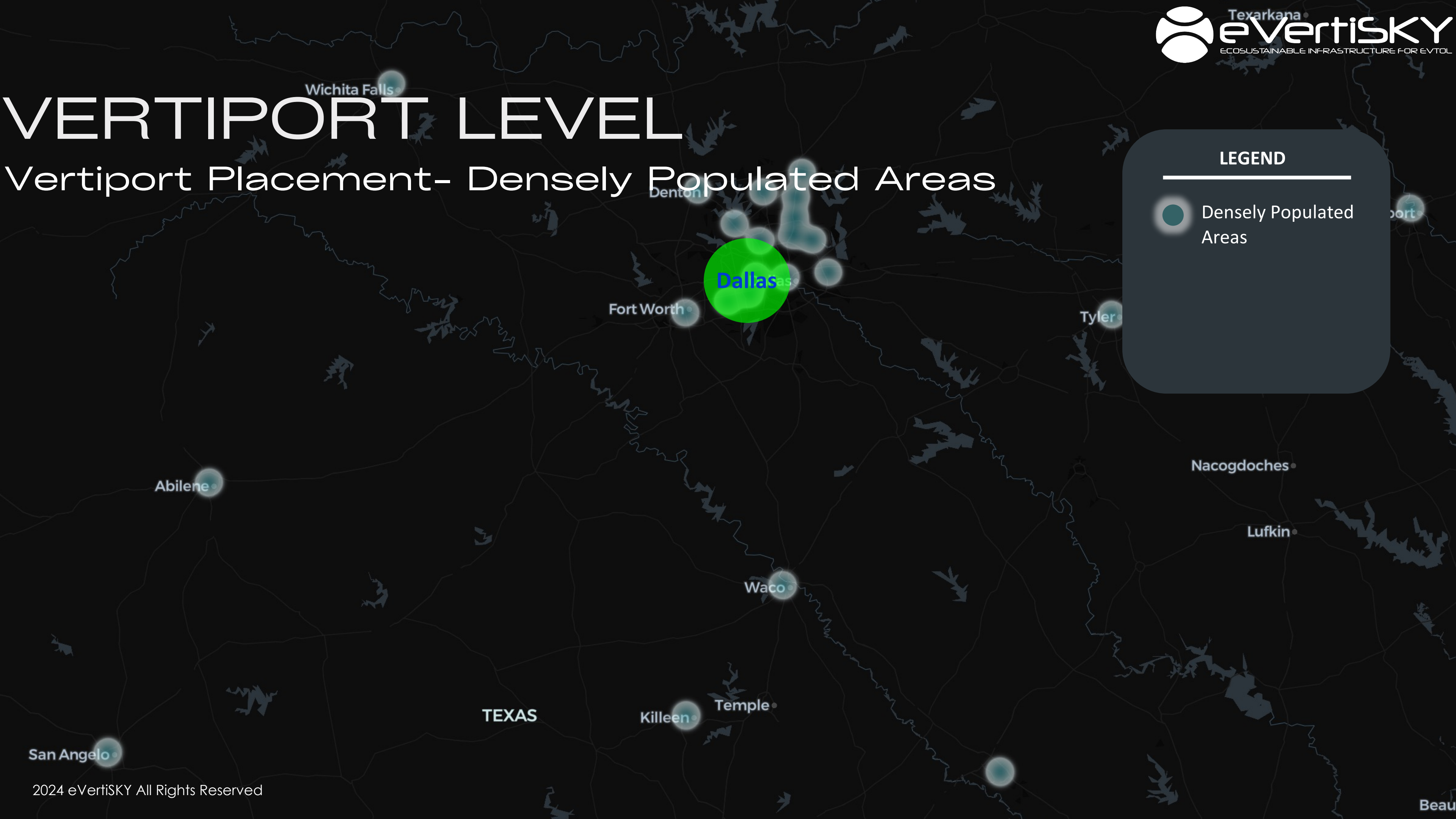
 Airports

VERTIPORT LEVEL

Vertiport Placement- Densely Populated Areas

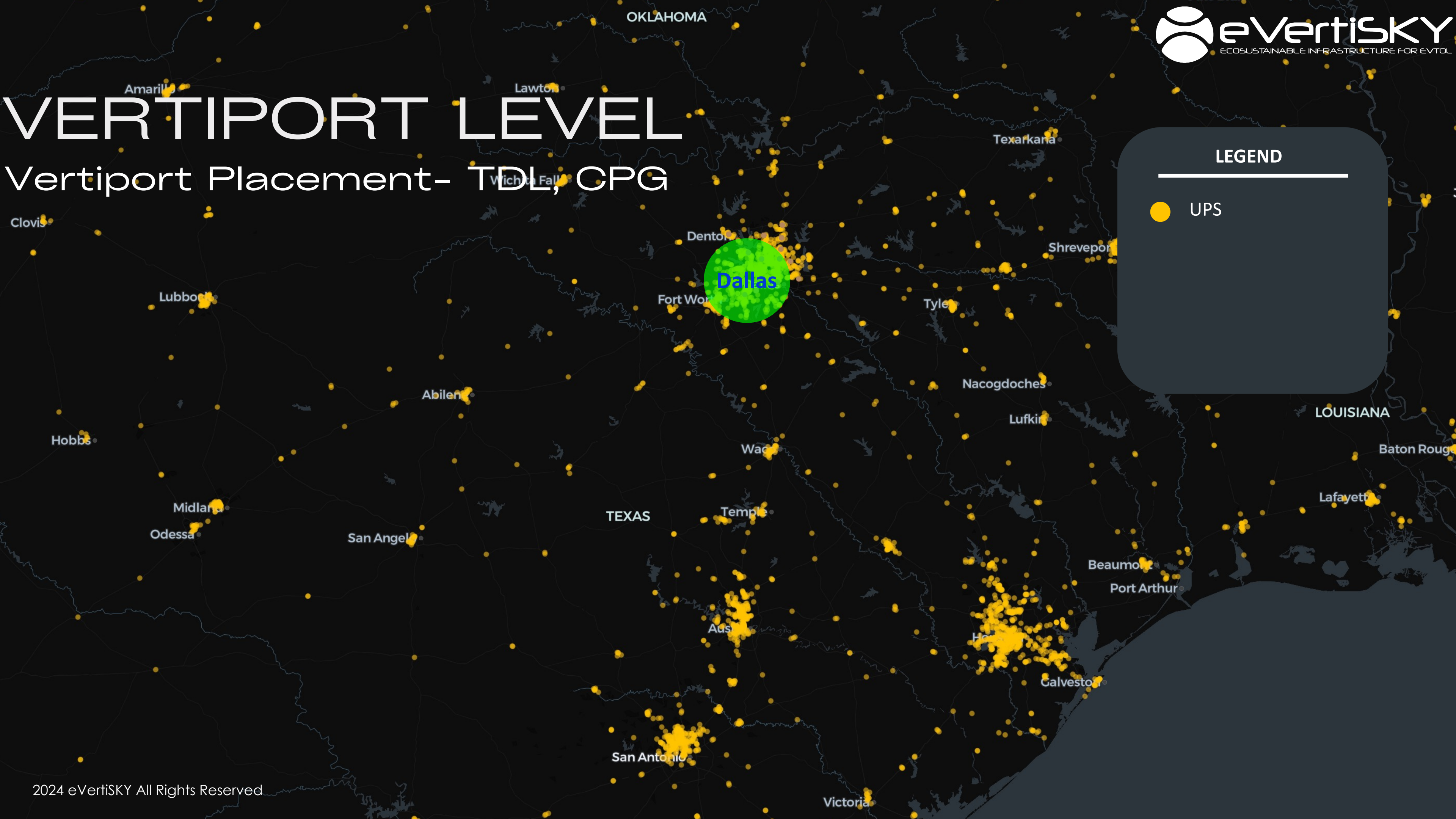
LEGEND

 Densely Populated Areas



VERTIPORT LEVEL

Vertiport Placement- TDL, CPG

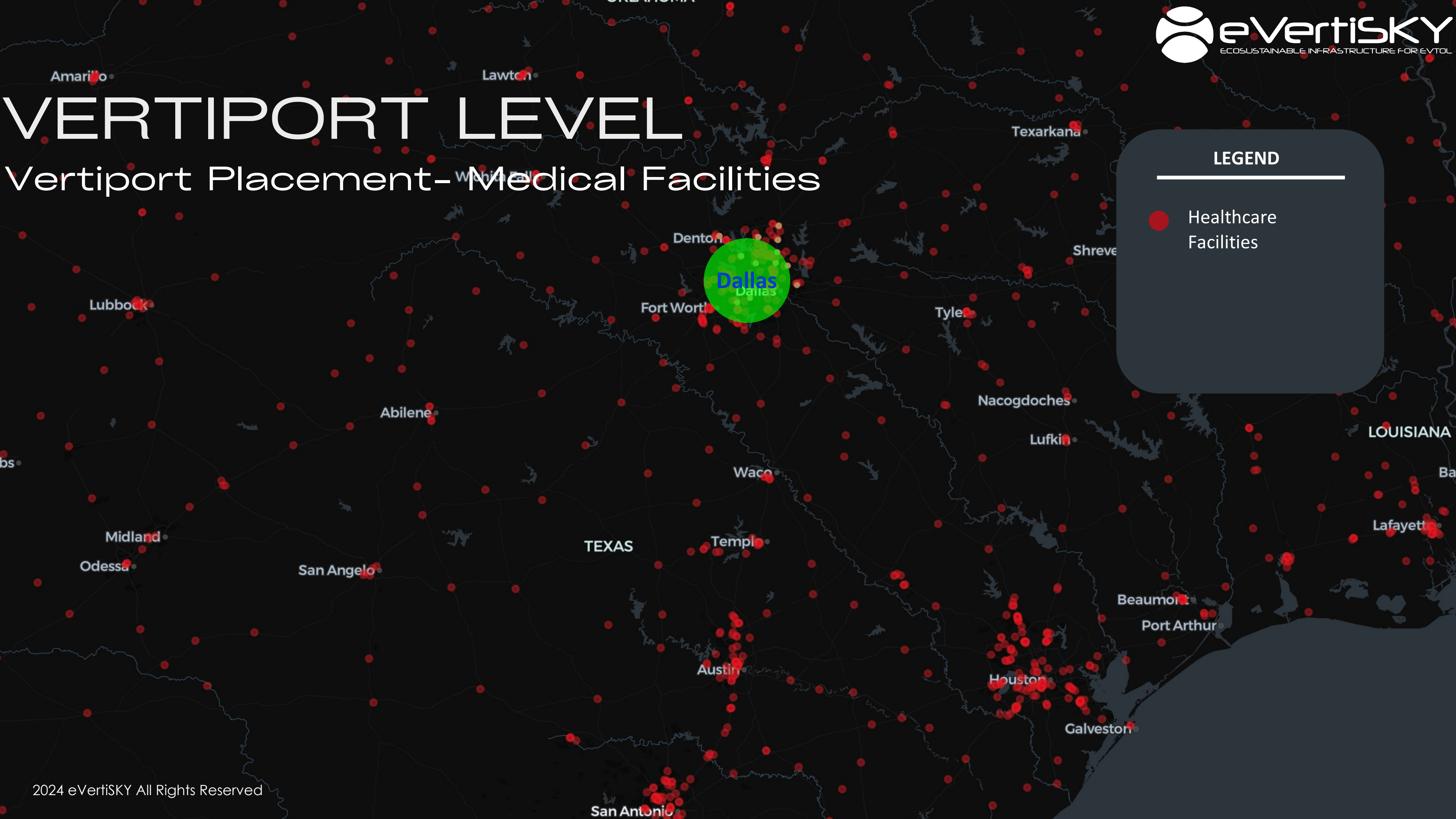


VERTIPORT LEVEL

Vertiport Placement - Medical Facilities

LEGEND

 Healthcare Facilities

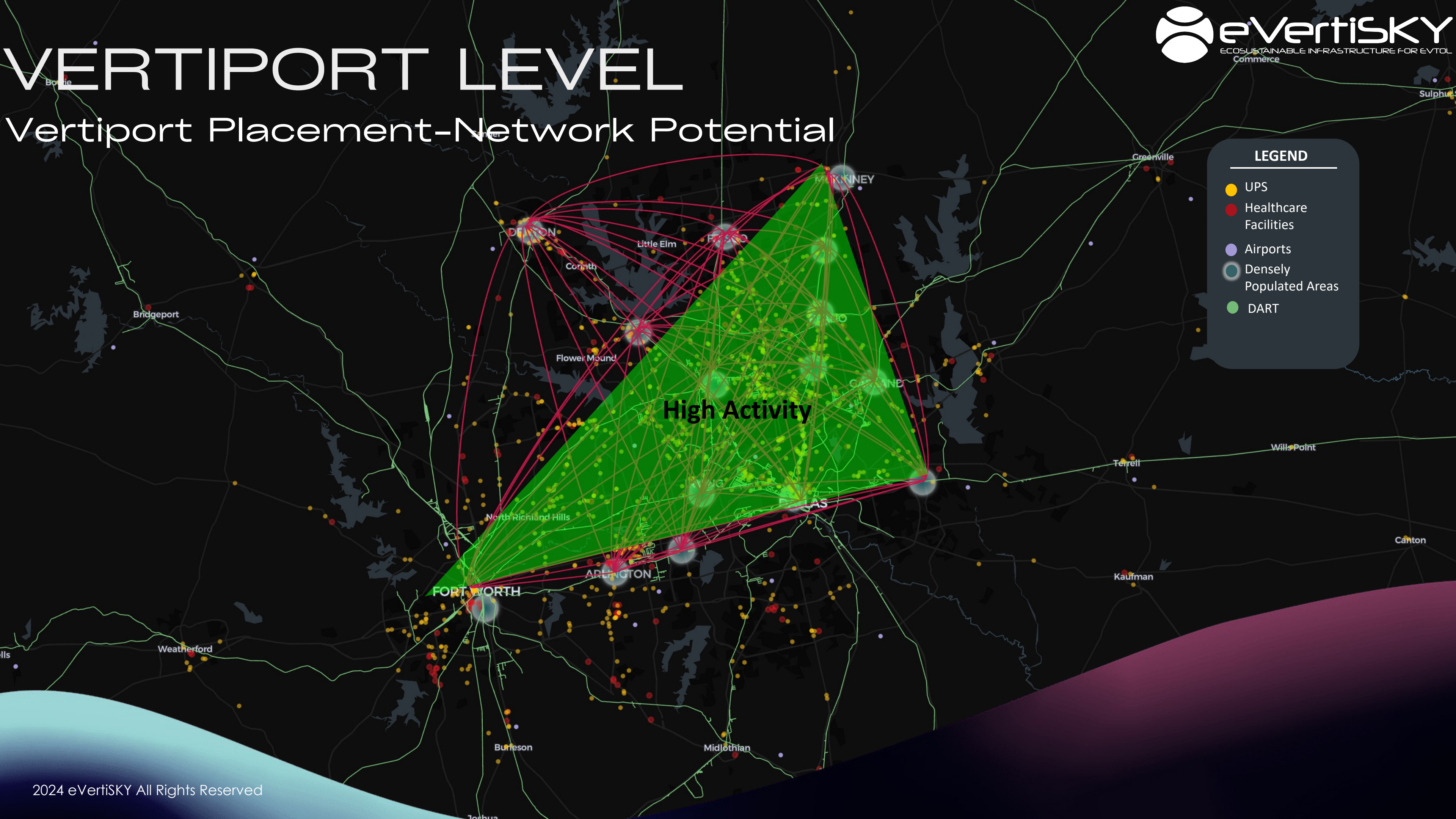


VERTIPORT LEVEL

Vertiport Placement-Network Potential

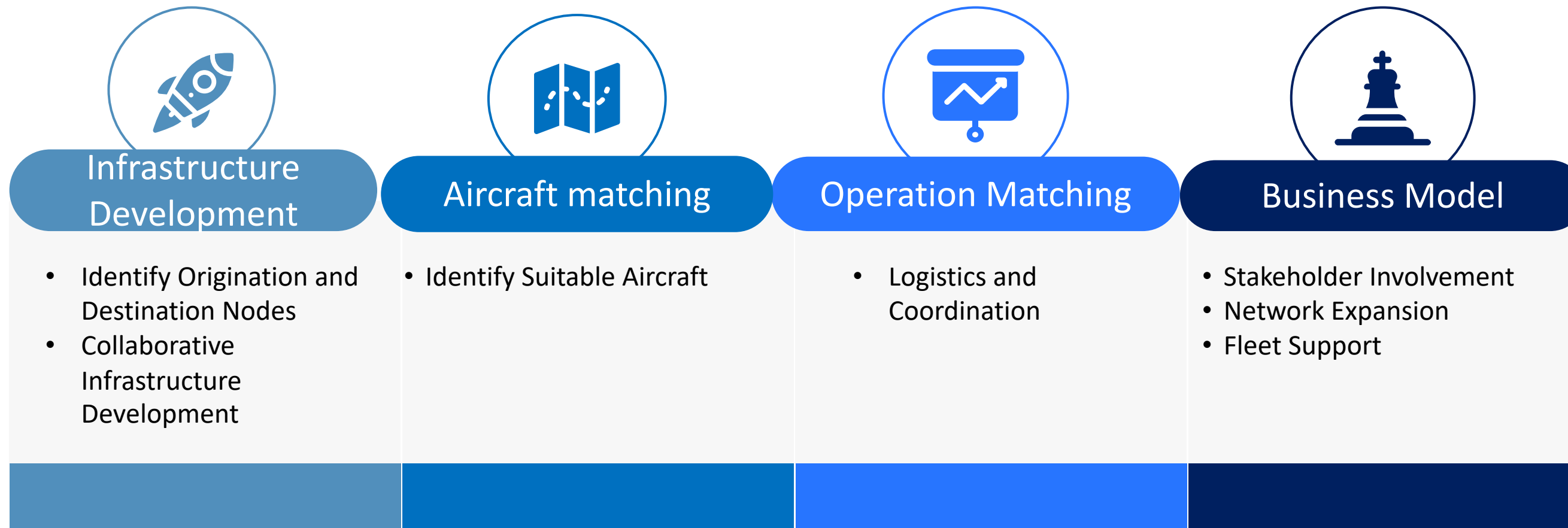
LEGEND

- UPS
- Healthcare Facilities
- Airports
- Densely Populated Areas
- DART



VERTIPORT LEVEL

Vertiport Business Model



VERTIPOINT LEVEL

Vertiport Ownership Models

Single Ownership

Cooperative

Timeshare

Mixed-Used

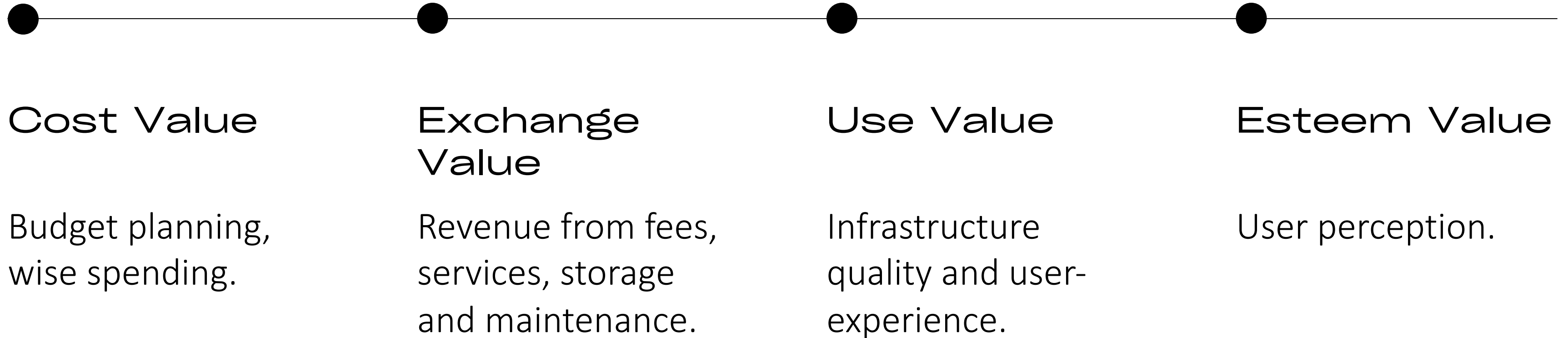
Hotel

Condominium

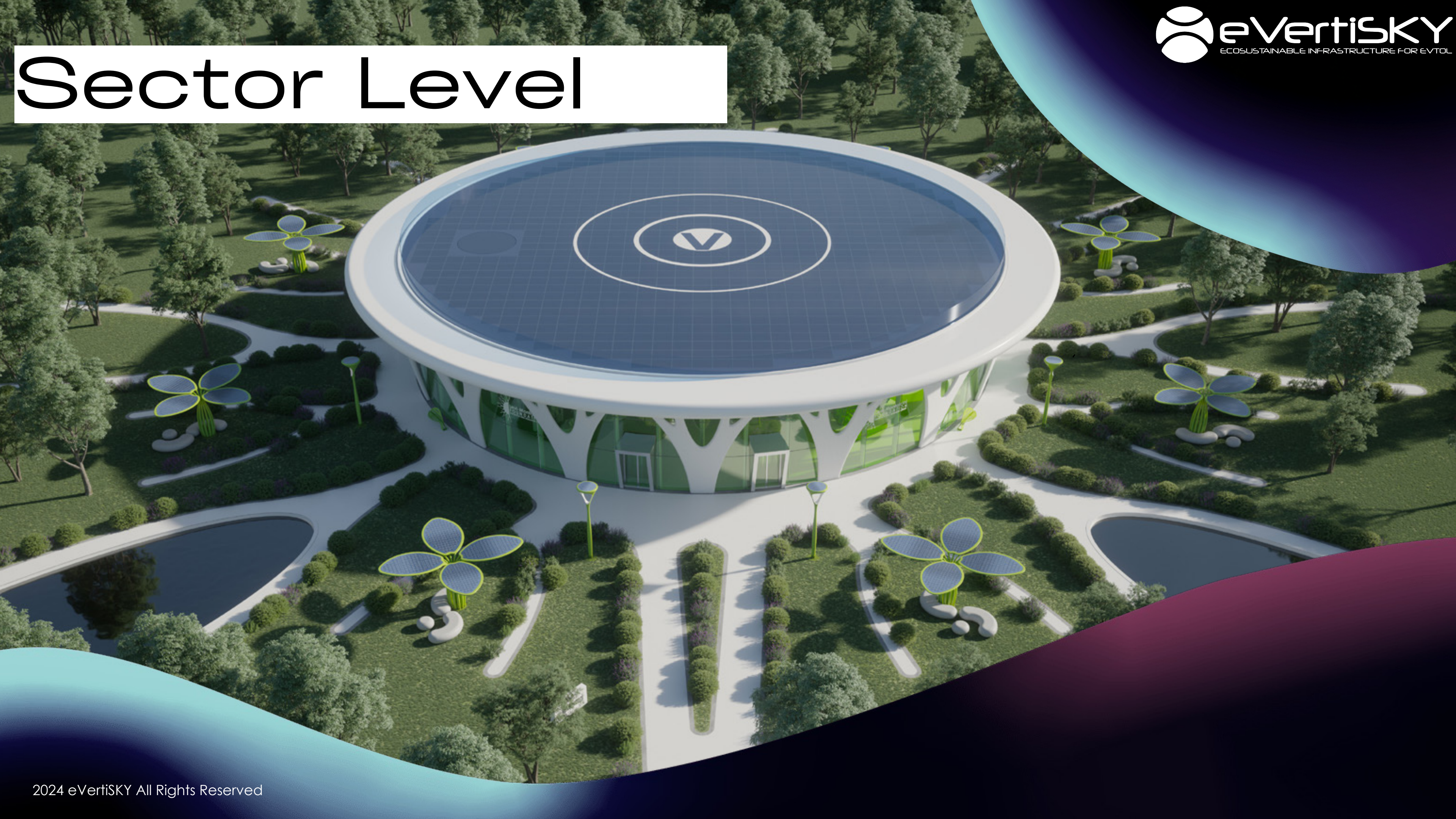
Fractional

VERTIPORT LEVEL

Vertiport Value Analysis



Sector Level



Sector Level

Economic Zone

Sector SuperBlock
(Economic Zone)

CLAA Safe and
Efficient
Operations

Sustainable
Infrastructure

DALLAS

Sector Level

City Classification

- **Prime Candidates** (good profile) UAM) for cities over 100 sq mi
- **Primary Candidates** (network profile) for UAM for cities over 200 sq mi
- **Primary Candidates** for Regional Air Mobility (RAM) for cities under 100 sq mi

Sector SuperBlock (Economic Zone)

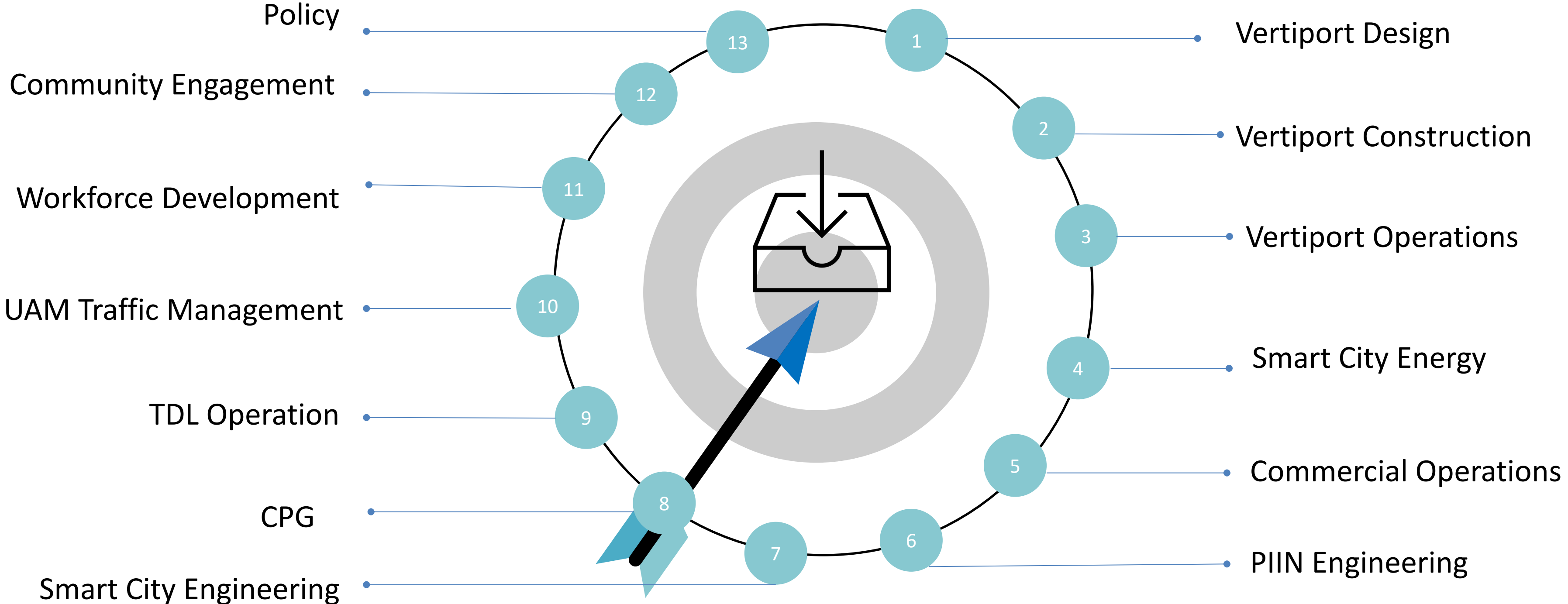
DALLAS

✓ DALLAS, TX

- Total Square Miles: 6004.4
- Category: **Primary Candidate for UAM**
- Flyable Sectors: 22.7

SECTOR Level

Job Creation



SECTOR LEVEL

UAM Transition Models

UAM Analysis: CPG Cargo Transition Model

Analysis: What is needed to reach the goal for transition to UAM?

Model: What types of operators conduct UAM CPG activity?

Specifications: What are the types of CPG supported and the limitations for each model?

Touchpoints: What are last mile offloading, inventory, and fulfillment requirement for operator and downline customer?

Shipper Operator: Owns aircraft fleet for shipping customers. Maintains network of shipping/receiving hubs/depots. Identify locations, logistics, and infrastructure. Define CPG 'drayage' model (on/off loading) and last mile model.

Brand Operator: Owns aircraft fleet for shipments own customers. Ships directly from brand distribution centers. Identify locations, logistics, and infrastructure. Define CPG 'drayage' model (on/off loading) and last mile model.

Aircraft Specifications: System Types: payload capacity, range, and speed. Service Catalogue: Optimize payload capacity to minimize the number of flights needed for deliveries within range of UAM zones.

Payload Specifications: Cargo Types: types of cargo transported & compatibility specifications. Volume Estimations: cargo volume & cubic requirements. Optimization Strategies: Match cargo types and volumes with suitable UAM aircraft to locate and maximize payload utilization.

Retail Specifications: Infrastructure: Evaluate the readiness of retailers to receive UAM deliveries, including designated fulfillment. Recommend process changes for retailers to seamlessly integrate UAM deliveries into their supply chain, minimizing delays.

Customer Specifications: Infrastructure: Outline efficient procedures that ensure the safe fulfillment: enhancing the customer experience.

Strategic Insight: Corollary Data, Operations, Logistical, Eco

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UAM Analysis: CPG Hub Aerodrome Model

Establish Business Model

Enhance Value: Assessing functionality and efficiency of the Vertiport

Use Value: Analyzing the reputation and perception of the Vertiport

Esteem Value: Identifying and quantifying costs associated with the Vertiport

Cost Value: Progress Initiatives

- Establishing Asset Classes: The vertiport development will define different asset classes, such as cargo areas, landing/parking zones, and energy/fuel infrastructure, to support efficient operations.
- Establishing Revenue Channels: The vertiport project will involve identifying beta customers and funders to establish revenue channels and ensure financial viability.
- Establishing Commercial Activity: The project will aim to secure commitments from GTM (Go-to-Market) customers to validate the market demand and establish the vertiport's commercial viability.

UAM Analysis: Fleet Carbon Offset

a data-driven approach to quantifying the carbon offset achieved by transitioning ground vehicle fleets to UAM, and insights and recommendations for CPG logistics companies, cities and other stakeholders

Discoveries	1. Emissions Reduction Modeling	2. Sustainability Metrics	3. Data Integration and Analysis
<ul style="list-style-type: none"> Identification of emission reduction potential based on UAM adoption. Insights into how different types of ground vehicles contribute to carbon emissions. Evaluation of the impact of delivery routes and cargo volume on emissions reduction. 	<ul style="list-style-type: none"> Quantification of greenhouse gas emissions reduction achieved through UAM adoption. Assessment of the broader sustainability impact, such as reduced air pollution and improved air quality. Evaluation of the economic and environmental benefits of a more sustainable supply chain. 	<ul style="list-style-type: none"> Identification of data correlations and patterns related to emissions reduction. Insights into the interplay between different factors affecting sustainability. Data-driven recommendations for optimizing UAM deployment strategies. 	<ul style="list-style-type: none"> Insights into the environmental and economic advantages of UAM adoption for stakeholders and decision-makers. Visual representations of emissions reduction on and sustainability metrics. Comparative data on UAM vs. ground vehicle emissions. Recommendations for policy changes and incentives to support UAM adoption.
<ul style="list-style-type: none"> Data on existing ground vehicle fleets, including vehicle types, fuel types, and emissions profiles. Geographic data for delivery routes and traffic patterns. UAM vehicle specifications and emissions characteristics. 	<ul style="list-style-type: none"> Greenhouse gas emissions data for different vehicle types and fuels. Air quality data for the regions where UAM operations are implemented. Economic data related to cost savings and revenue generation through sustainability initiatives. 	<ul style="list-style-type: none"> Integration of emissions data, geographic data, vehicle specifications, and economic data. Historical data on ground vehicle operations and emissions. Real-time data from UAM operations and emissions monitoring. 	<ul style="list-style-type: none"> Quantified reduction in carbon emissions achieved by transitioning to UAM for cargo transport. Documentation of the environmental and economic advantages of transitioning to UAM. Comprehensive models and analyses that provide a holistic view of emissions reduction and sustainability. Actionable recommendations for transitioning to UAM for cargo transport. Data-informed strategies for optimizing UAM adoption to achieve the desired carbon offset goals.

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TRANSITION MODEL

UAM Analysis: CPG Workforce Transition Model

PHASE 01	PHASE 02	PHASE 03	PHASE 04
Baseline Workforce Assessment	UAM Adoption Scenario Development	Impact Assessment and Planning	Implementation and Continuous Improvement
<ul style="list-style-type: none"> Data Collection Grouping Skill Inventory 	<ul style="list-style-type: none"> Scenario Modeling UAM Use Case Planning UAM adoption scenarios Workforce Mapping Labor Market Analysis 	<ul style="list-style-type: none"> Job Creation Analysis Skill Gap Analysis Transition Timeline Transition Forecast 	<ul style="list-style-type: none"> Transition Pilot Change Mgmt Monitoring and Evaluation Adaptation & Scalability
<p>Major Objectives</p> <p>This phase focuses on understanding the current state of the CPG workforce and the skills and roles that exist in the company/city prior to UAM.</p>	<p>Major Objectives</p> <p>In this phase, different scenarios of UAM adoption within the CPG logistics operations are developed to assess the potential changes in the workforce.</p>	<p>Major Objectives</p> <p>This phase assesses the direct and indirect impacts of UAM adoption on the CPG workforce and develops strategies for addressing these impacts.</p>	<p>Major Objectives</p> <p>This phase involves the execution of transition strategies, monitoring of progress, and ongoing adjustments to adapt to changing needs and circumstances.</p>

UAM Analysis: Commercialization Integration Model

Assessment of Existing Infrastructure: Evaluate the current state of transportation and logistics infrastructure within the city, including road networks, distribution centers, and retail facilities. Identify areas where UAM integration can optimize existing systems.

Vertiport and Hub Development: Plan and design dedicated vertiports and hubs for UAM cargo deliveries. Determine strategic locations that optimize connectivity to distribution centers, retail locations, and urban areas.

Route Planning: Develop efficient and optimized UAM delivery routes that consider factors like traffic patterns, delivery destinations, and airspace regulations. Maximize route efficiency to reduce delivery times and costs.

Integration with Last-Mile Delivery: Explore seamless integration of UAM deliveries into last-mile logistics processes. Define protocols and technologies for efficient handover of cargo from UAM vehicles to ground-based delivery personnel or automated systems.

Supply Chain Augmentation: Enhance the supply chain by integrating UAM deliveries to streamline and augment existing logistics operations. Optimize inventory management, reduce lead times, and improve overall supply chain efficiency.

Stakeholder Collaboration: Foster collaboration between cities, CPG distributors, and retailers to ensure a coordinated approach to UAM integration. Establish communication channels for sharing information and addressing challenges.

Workforce Requirements: Assess the workforce needed to support UAM integration, including pilots, ground crew, and maintenance personnel. Determine training and hiring requirements to ensure a skilled and qualified workforce.

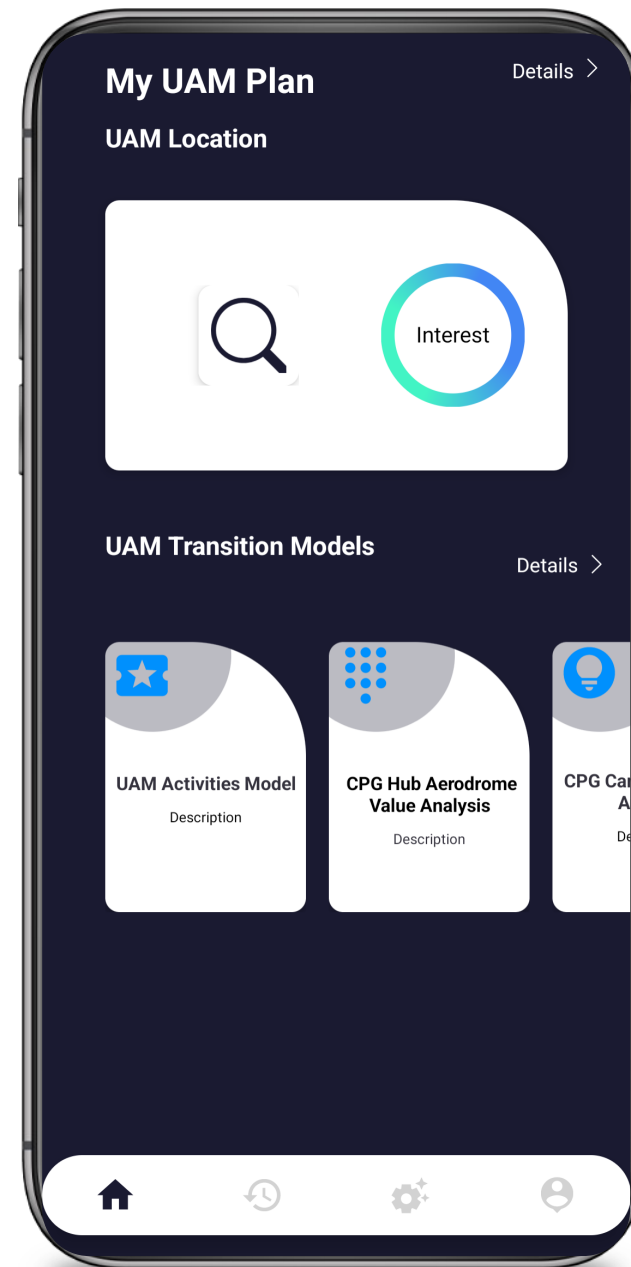
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COMPANION APPS

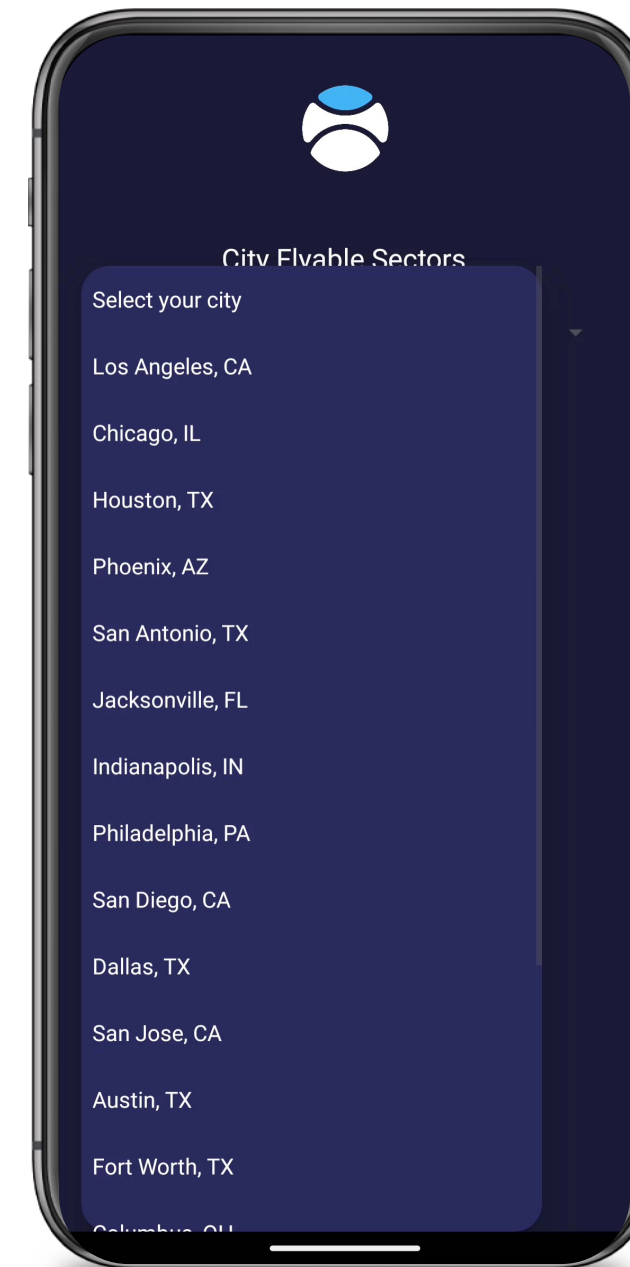
UAM Transition Models

The images/videos depict components analyzed within a specific Urban Air Mobility (UAM) Transition Model.

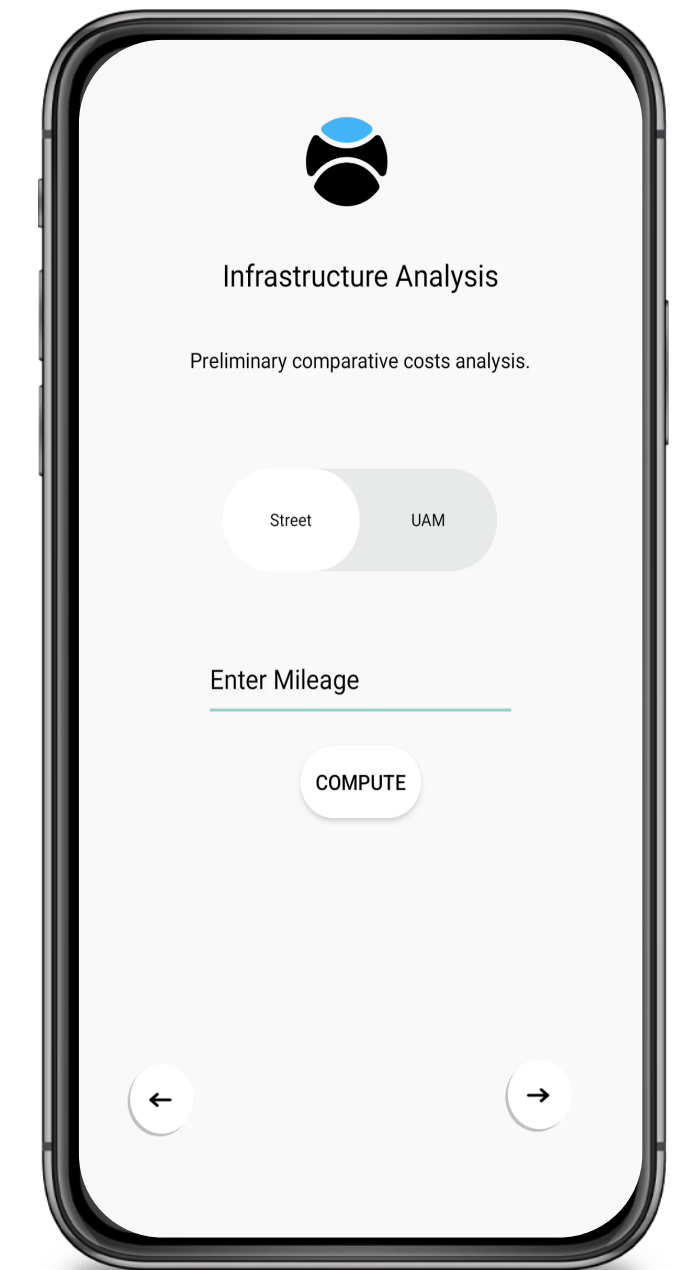
*Note: Each transition model necessitates the consideration of additional data and segments.



Transition Models

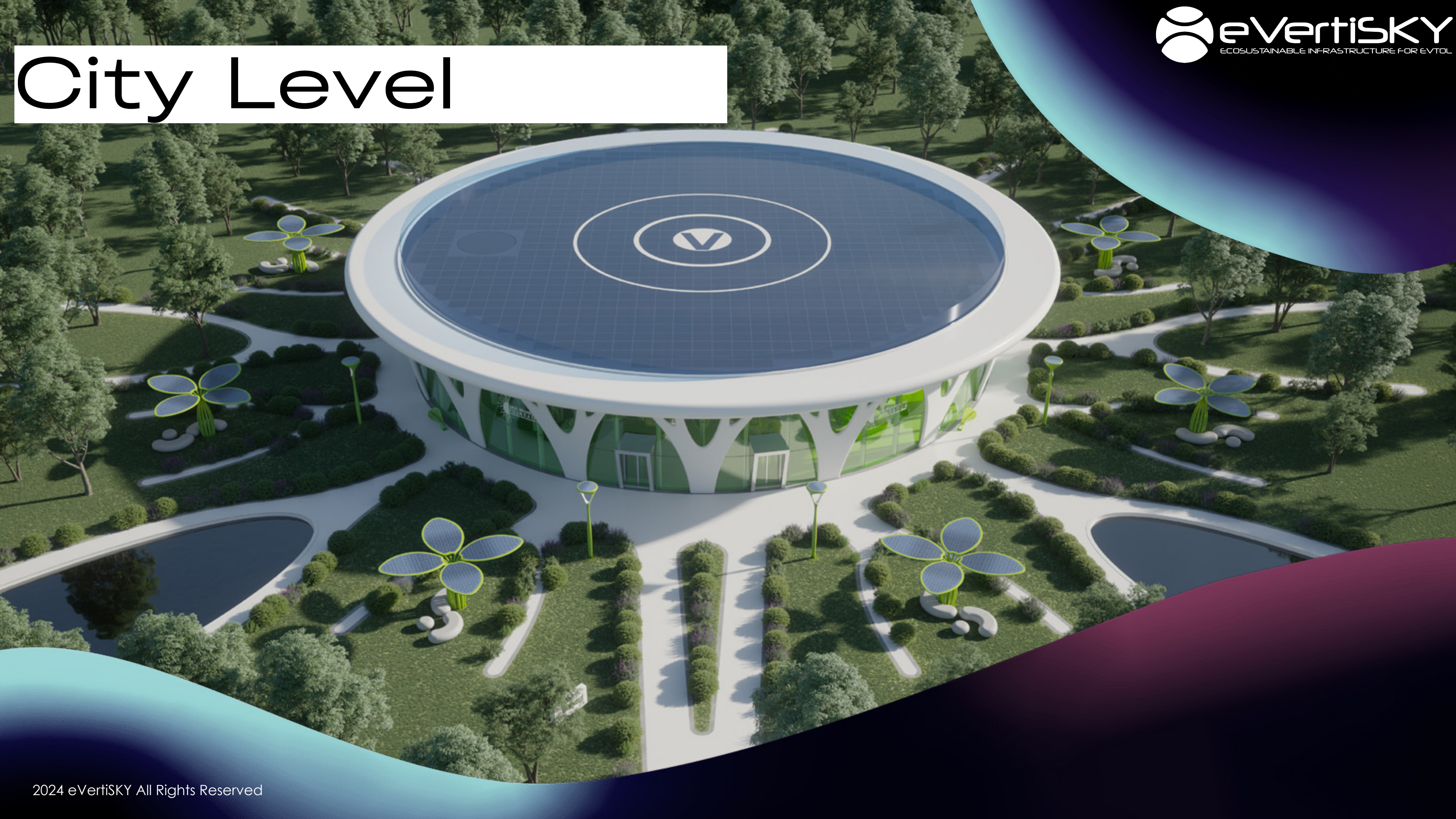


City Classification



Infrastructure Analysis

City Level



CITY LEVEL

Vertiport Network

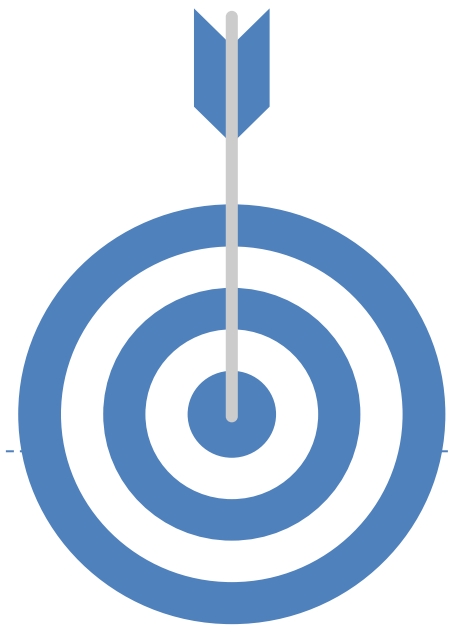
High Traffic Activity

Route Value

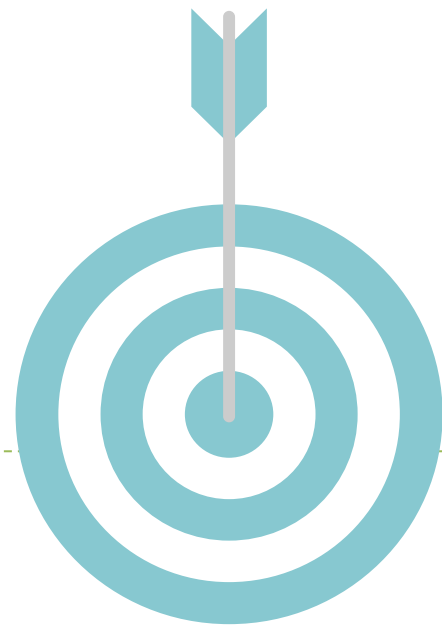


CITY LEVEL

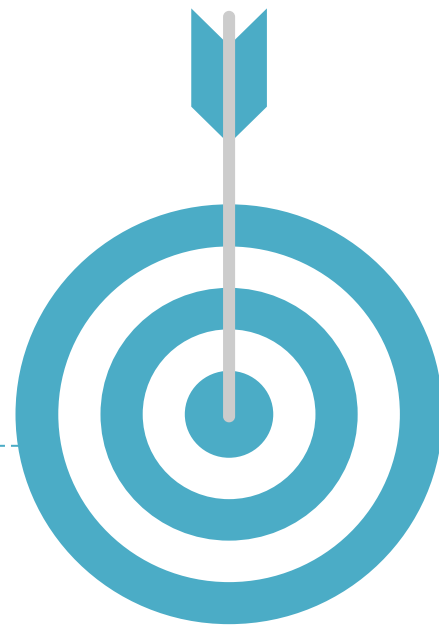
City Command & Control



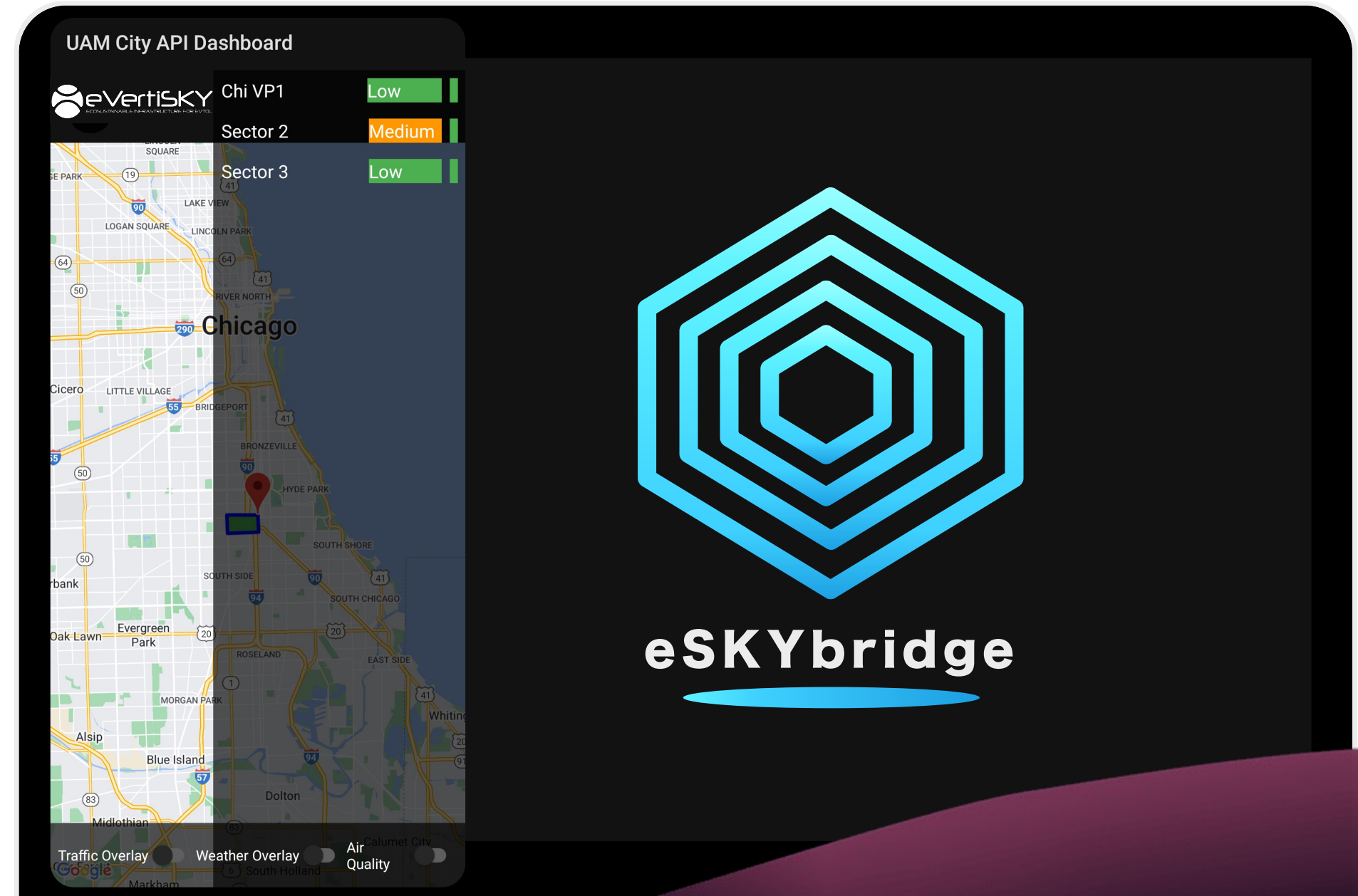
eSkyBridge CityAPI
Dashboard



Expose Citywide
UAM Ground and
Airspace Asset



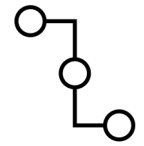
Route Use and
Land Fee Billing



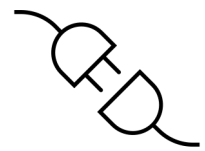
What Cities Care About?



UAM Feasibility Study
Process



UAM
Living Labs



UAM
Integration

THANK YOU!



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Enabling the New Transportation Economy

Your Gateway to the Future of Urban Air Transportation
State of Texas UAM

ELECTRIFICATION OF GENERAL AVIATION FLEET



North Central Texas
Council of Governments

Dr. Stephen P. Mattingly
Nithisha Reddy Gudipati
Mino Aji
Ma Anjelika Pineda

UTA  THE UNIVERSITY OF TEXAS
AT ARLINGTON

STUDY GOALS

- Requirements for electrification
- Lifecycle Cost
- Cost Benefit Analyses
- Introduction of survey

CHECKLIST FOR ELECTRIFICATION

1. Electric aircraft: Electric motors, Reliability, Flying time, Efficiency of power distribution, Battery (energy density and power density), Design life
2. Operational needs: Schedule, Turnaround time
3. Charging infrastructure: Battery, Charging capacity, Charging time, Cost, Usage, Design life

...CONTINUATION

4. Grid capacity and Power requirements: Power capacity, Increased load from electrification, Possibilities of grid upgrade
5. Alternate energy resources: Solar Photovoltaic, Battery storage, Integrating distributed energy resources
6. Regulatory framework: Airworthiness standards: aircraft engines (14 CFR Part 33)
7. Financial considerations

FOSSIL FUEL AIRCRAFT EMISSIONS

EMISSIONS

- CO₂ and water vapor
- Nitrogen oxides (NO_x)
- Unburned hydrocarbons
- Carbon monoxide (CO)
- Sulphur oxides
- Traces of hydroxyl family and nitrogen compounds
- Small amounts of soot particles

HEALTH IMPACTS

- Morbidity
- Mortality
- Cancers
- Acute Exposure Mortality
- Acute Respiratory Symptoms Days
- Adult Chronic Bronchitis
- Asthma

HEALTH IMPACT FACTOR

- Cost of health damage due to air pollutant emissions
- \$ Conversion factors from a 2016 study (Alrafea et al., 2016)

CO	NO ₂	PM _{2.5}	SO ₂
0.64	73.85	83.36	24.50

- 2016 to 2023 health care inflation rate: 22%

AlRafea, Kamal, Ali Elkamel, and Sabah A. Abdul-Wahab. "Cost-analysis of health impacts associated with emissions from combined cycle power plant." *Journal of cleaner production* 139 (2016): 1408-1424.

FOSSIL FUEL EMISSIONS

Table 3-2. Experimental data for use in validation. The size of the color bars is proportional to the magnitude of the emissions burden for HC (orange), CO (pink), NO_x (green) and tPMm (blue).

Engine	Full Tests	HC Avg		CO Avg		NO _x Avg		tPMm Avg		
		g/LTO	% at 95% Conf	g/LTO	% at 95% Conf	g/LTO	% at 95% Conf	g/LTO	% at 95% Conf	
Full Engine										
General Electric CF34-3A1		1	292		7315		1278		7.04	
Engine Family										
	Count									
Lycoming O-320	16	258	38%	4083	47%	32	246%	0.90	120%	
Lycoming IO-360	4	598	116%	4387	47%	44	434%	2.04	358%	
Lycoming O-360	6	406	95%	4924	58%	16	220%	1.68	186%	
Lycoming IO-520	1	968		6960		13		1.95		
TCM O-470	1	391		3441		11		1.02		
Lycoming O-540	3	747	236%	6457	108%	21	32%	3.06	444%	
Lycoming IO-540	4	795	115%	8483	96%	39	212%	3.33	230%	
Horse Power Family										
diverse Prop-200hp	35	346	112%	4056	51%	26	255%	1.27	169%	
diverse Prop-300hp	10	753	95%	7078	79%	27	171%	2.83	188%	
diverse Prop-160hp	25	275	75%	3841	52%	25	256%	1.00	123%	

Tara I. Yacovitch; Zhenhong Yu; Scott C. Herndon; Rick Miake-Lye, Exhaust Emissions from In-Use General Aviation Aircraft, TRB's Airport Cooperative Research Program (ACRP) Research Report 164, National Academies of Sciences, Engineering, and Medicine

ELECTRIC AIRCRAFT

- Emerging research and development
- Manufacturers: Airbus, Boeing, Pipistrel, Lilium, Joby Aviation, Eviation Aircraft, Electra Aero, Beta Technologies
- First electric aircraft: Pipistrel Alpha electro 2-seater
- Velis Electro by Pipistrel is certified to use in 30 countries
- Pricing: \$140,000

Charging Infrastructure

- Similar to electric vehicle charging infrastructure.
- Requires higher power outputs and fast charging
- High power demand
- High-power chargers capable of delivering a large amount of electricity in a short period are crucial.
- Advanced cooling systems
- Manufacturers: **Green motion & Pipistrel, Beta Technologies, Chargepoint, Boeing, Siemens**

BENEFIT

- Reduced emissions: CO, NO₂, PM_{2.5}
- Fossil fuel cost
- Lower maintenance costs

COST

- Electric Aircraft cost
- Infrastructure investments
- Electricity costs

- All costs and benefits are annualized based on interest rates

LIMITATIONS AND ASSUMPTIONS

- Factors like fuel flowage fees, land leases, hanger rentals are not considered in this study.
 - Aircraft based costs like maintenance costs and yearly depreciation are also not considered.
 - Installation of charging infrastructure depends on airport layout plan and supporting electrical work. The cost associated with installation is airport dependent.
 - Charging equipment cost is \$200k/charger
 - Fossil Fuel cost is \$5.40/gallon²
 - Fuel costs are calculated assuming one flight hour per one takeoff and landing^{1,2}
 - Electrical charging costs are \$5 for one hour of flight time³
-
1. Aircraft cost calculator (ACC); <https://www.aircraftcostcalculator.com/AircraftOperatingCosts>
 2. Planephd data model; <https://planephd.com/wizard/manufacturers/>
 3. Windy app blog: Meet the main electric planes companies; <https://windy.app/blog/electric-planes-companies.html>

ELECTRIFICATION SCENARIOS

Flight schools

- Only flight school aircraft converted to electric

- All operations are electric
- 50% of operations are electric
- 25% of operations are electric
- 10% of operations are electric

Entire Airport

- All aircraft based at airport converted to electric

- All operations are electric
- 90% of operations are electric
- 80% of operations are electric
- 65% of operations are electric

BENEFIT COST ANALYSIS

$$B/C = \frac{(Health\ Impact\ cost + fuel\ cost)}{(electrification\ cost + infrastructure\ cost + electricity\ cost)}$$

Benefit-Cost Ratios for Electrification of Flight schools

Airport	100% flight school electrification		50% flight school electrification		25% flight school electrification		10% flight school electrification	
	min	max	min	max	min	max	min	max
Arlington Municipal (GKY)	7.96	8.44	7.52	8.44	6.38	7.82	5.24	8.44
Grand Prairie Municipal (GPM)	9.44	9.48	9.40	9.48	9.33	9.48	9.77	10.16
Fort Worth Spinks (FWS)	6.84	7.89	5.97	7.78	4.99	8.19	2.96	6.99
Fort Worth Meacham	7.46	7.63	6.74	7.04	5.66	6.09	3.83	4.33
Fort Worth Alliance (Perot Field)	3.90	4.14	3.78	4.28	3.39	4.28	2.70	4.57
Addison	8.49	8.49	8.49	8.49	9.02	9.02	9.61	9.61
Dallas Executive	6.41	6.72	5.93	6.48	4.66	5.39	3.22	4.19
Denton Enterprise	6.63	6.92	5.81	6.26	4.55	5.14	2.95	3.62
Lancaster Regional	1.29	1.29	1.27	1.27	1.23	1.23	1.04	1.04
McKinney National	8.75	8.75	8.75	8.75	8.75	8.75	7.96	7.96
Mesquite Metro	7.15	7.16	7.14	7.16	7.11	7.16	7.54	7.68
Bridgeport Municipal	1.30	1.30	1.49	1.49	1.09	1.09	0.61	0.61
Caddo Mills Municipal	4.16	4.16	3.41	3.41	3.17	3.17	0.94	0.94
Cleburne Regional	5.21	5.21	4.27	4.27	3.14	3.14	1.50	1.50
Decatur Municipal	1.28	1.28	1.21	1.21	1.08	1.08	0.61	0.61
Gainesville Municipal	5.20	5.20	4.97	4.97	3.24	3.24	1.59	1.59
Granbury Regional	4.99	4.99	3.91	3.91	2.57	2.57	1.17	1.17
Mid-Way Regional	4.97	4.97	4.62	4.62	4.52	4.52	2.57	2.57
Mineral Wells	7.21	8.52	6.84	9.65	4.41	7.06	2.14	3.91
North Texas Regional	8.78	9.88	8.18	10.31	8.36	14.44	6.64	8.68
Rockwall Municipal	6.34	7.10	5.60	6.90	4.53	6.53	2.36	3.91
Terrell Municipal	6.92	6.92	6.09	6.09	4.91	4.91	2.51	2.51
Aero Country	2.51	2.51	1.39	1.39	0.73	0.73	0.30	0.30
Bourland Field	7.36	7.36	7.85	7.85	5.41	5.41	2.80	2.80
Hicks Airfield	7.03	7.03	6.32	6.32	5.27	5.27	3.62	3.62
Northwest Regional	10.62	10.62	9.17	9.17	7.21	7.21	3.60	3.60
Parker County	9.01	9.01	8.17	8.17	7.59	7.59	4.15	4.15
Sycamore Strip	0.76	0.76	0.39	0.39	0.20	0.20	0.08	0.08

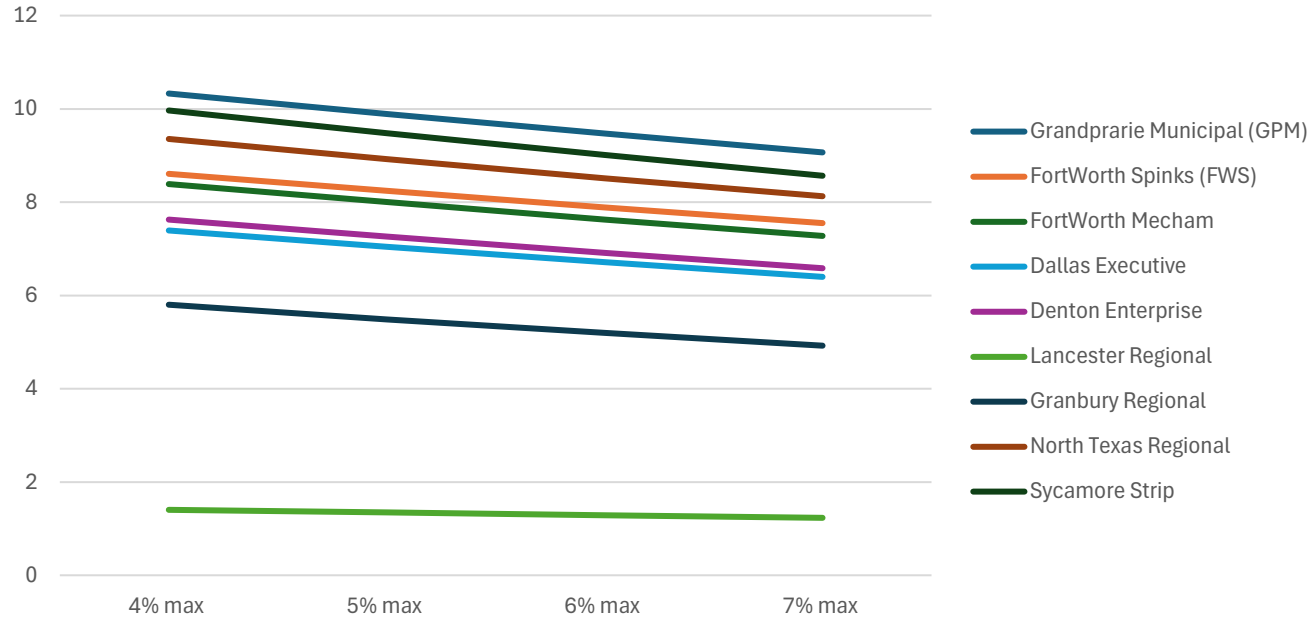
Airport	100% entire airport electrification		90% entire airport electrification		80% entire airport electrification		65% entire airport electrification	
	min	max	min	max	min	max	min	max
Arlington Municipal (GKY)	4.00	8.44	3.78	8.44	3.53	8.44	2.82	8.93
Grand Prairie Municipal (GPM)	8.62	9.48	8.86	9.77	8.62	9.72	8.43	10.06
Fort Worth Spinks (FWS)	2.44	6.71	2.44	6.59	2.08	6.45	1.56	6.21
Fort Worth Meacham	2.40	2.84	2.40	2.64	2.04	2.44	1.50	1.83
Fort Worth Alliance (Perot Field)	3.77	4.14	3.85	4.24	3.74	4.21	3.58	4.25
Addison	8.49	8.49	8.66	8.66	8.56	8.56	8.99	8.99
Dallas Executive	1.40	2.07	1.40	1.92	1.16	1.76	0.85	1.32
Denton Enterprise	2.49	3.11	2.49	2.91	2.12	2.69	1.60	2.09
Lancaster Regional	1.30	1.30	1.32	1.32	1.33	1.33	1.64	1.64
McKinney National	8.75	8.75	8.61	8.61	8.69	8.69	9.24	9.24
Mesquite Metro	6.92	7.16	6.87	7.11	7.03	7.35	7.17	7.67
Bridgeport Municipal	1.30	1.30	1.47	1.47	1.40	1.40	1.88	1.88
Caddo Mills Municipal	1.42	1.42	1.50	1.38	1.25	1.25	0.91	0.91
Cleburne Regional	1.16	1.16	1.17	1.07	0.97	0.97	0.69	0.69
Decatur Municipal	1.33	1.33	1.28	1.28	1.36	1.36	1.64	1.64
Gainesville Municipal	1.15	1.15	1.14	1.05	0.97	0.97	0.72	0.72
Granbury Regional	2.25	2.25	2.28	2.12	1.92	1.92	1.47	1.47
Mid-Way Regional	1.52	1.52	1.53	1.42	1.28	1.28	0.98	0.98
Mineral Wells	1.85	6.19	1.90	6.50	1.57	6.06	1.15	5.61
North Texas Regional	4.88	9.07	4.89	9.11	4.40	9.16	3.54	9.23
Rockwall Municipal	2.52	5.34	2.49	5.03	2.18	5.08	1.67	4.57
Terrell Municipal	2.22	2.22	2.26	2.09	1.89	1.89	1.39	1.39
Aero Country	0.14	0.14	0.14	0.13	0.12	0.12	0.08	0.08
Bourland Field	2.63	2.63	2.73	2.54	2.30	2.30	1.76	1.76
Hicks Airfield	1.41	1.41	1.41	1.29	1.17	1.17	0.85	0.85
Northwest Regional	0.82	0.82	0.82	0.74	0.66	0.66	0.50	0.50
Parker County	4.49	4.49	4.56	4.29	3.92	3.92	3.09	3.09
Sycamore Strip	0.19	0.19	0.19	0.17	0.15	0.15	0.11	0.11

Benefit-Cost Ratios for Electrification of Entire airport

Airport	100% entire airport electrification	90% entire airport electrification	80% entire airport electrification	65% entire airport electrification
Arlington Municipal (GKY)	1.29	1.18	1.06	0.75
Grand Prairie Municipal (GPM)	1.20	1.10	0.99	0.70
Fort Worth Spinks (FWS)	0.90	0.82	0.74	0.52
Fort Worth Meacham	1.41	1.29	1.17	0.83
Fort Worth Alliance (Perot Field)	3.43	3.43	3.33	3.05
Addison	0.63	0.57	0.51	0.36
Dallas Executive	0.70	0.64	0.57	0.41
Denton Enterprise	1.23	1.13	1.02	0.73
Lancaster Regional	1.29	1.30	1.32	1.61
McKinney National	1.94	1.78	1.62	1.17
Mesquite Metro	1.34	1.22	1.11	0.81
Bridgeport Municipal	1.22	1.36	1.29	1.64
Caddo Mills Municipal	0.95	0.90	0.81	0.58
Cleburne Regional	0.70	0.64	0.58	0.40
Decatur Municipal	1.33	1.28	1.36	1.64
Gainesville Municipal	0.63	0.57	0.52	0.37
Granbury Regional	1.26	1.16	1.04	0.76
Mid-Way Regional	0.98	0.91	0.81	0.60
Mineral Wells	0.88	0.81	0.72	0.51
North Texas Regional	1.53	1.40	1.27	0.90
Rockwall Municipal	1.43	1.30	1.19	0.87
Terrell Municipal	1.15	1.06	0.95	0.67
Aero Country	0.03	0.02	0.02	0.01
Bourland Field	0.57	0.52	0.47	0.33
Hicks Airfield	0.66	0.60	0.54	0.38
Northwest Regional	0.27	0.25	0.22	0.17
Parker County	1.96	1.81	1.63	1.17
Sycamore Strip	0.11	0.10	0.09	0.06

**Benefit-Cost Ratios
for Replacement of
fossil fuel aircraft
with electric aircraft
at full price**

SENSITIVITY ANALYSIS



Benefit-Cost analysis for electrification of flight schools at different interest rates

KEY FINDINGS

- Even if only 10% of total operations are with electric powered aircraft, converting the flight school aircraft fleets appears promising at most airports
- With 100% of the flight operations electrified
 - Average BCA for converting the flight school fleets in the NCTCOG region is around 6 to 6.2.
 - Average BCA for converting all aircraft in the NCTCOG region is around 2.92 to 3.34.
 - Regional BCA reduces to 1.11 when all fossil fuel aircraft are replaced with electric aircraft at full price.
 - This reduces to 0.78 when only 65% of flight operations are electric aircraft.
- Sensitivity analysis of the BCA at different interest rates shows that the B/C ratios decrease an increase in interest rates.
- Aero country and Sycamore strip are the only airports with $B/C < 1$ even at 4% rates.

SURVEY INTRODUCTION

- Awareness and Perception: Technology and development
- Purchase Intent: cost, charging time, safety, flying time, availability of models
- Incentives and Motivation: tax credits, direct rebates, environmental concerns
- Usage Patterns: type of trips, flying time
- Knowledge level: understanding the technology, evolving market
- Comparative Perception: reliability, overall value, maintenance, operation
- Factors influencing purchase: initial cost, battery range, resale value
- Decision Triggers: Test drives, demo
- Barriers to Adoption: single charge flying time, batteries & its degradation, infrastructure concerns
- Transition from Gasoline: gas & electricity price

FUTURE RESEARCH

- Launching the survey with IRB approval.
- Additional sensitivity analysis can be performed with respect to fuel costs and charging infrastructure installations.
- Contacting each airport in NCTCOG region to gather fleet specifications and operations data (by aircraft/engine type)

QUESTIONS?

THANK YOU!