



Creating Connected & Resilient Communities Through Applied Stakeholder Innovation

Utility Energy Forum Keynote

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The Accelerating Rate of Technological Change

Rate of adaptation defines survival

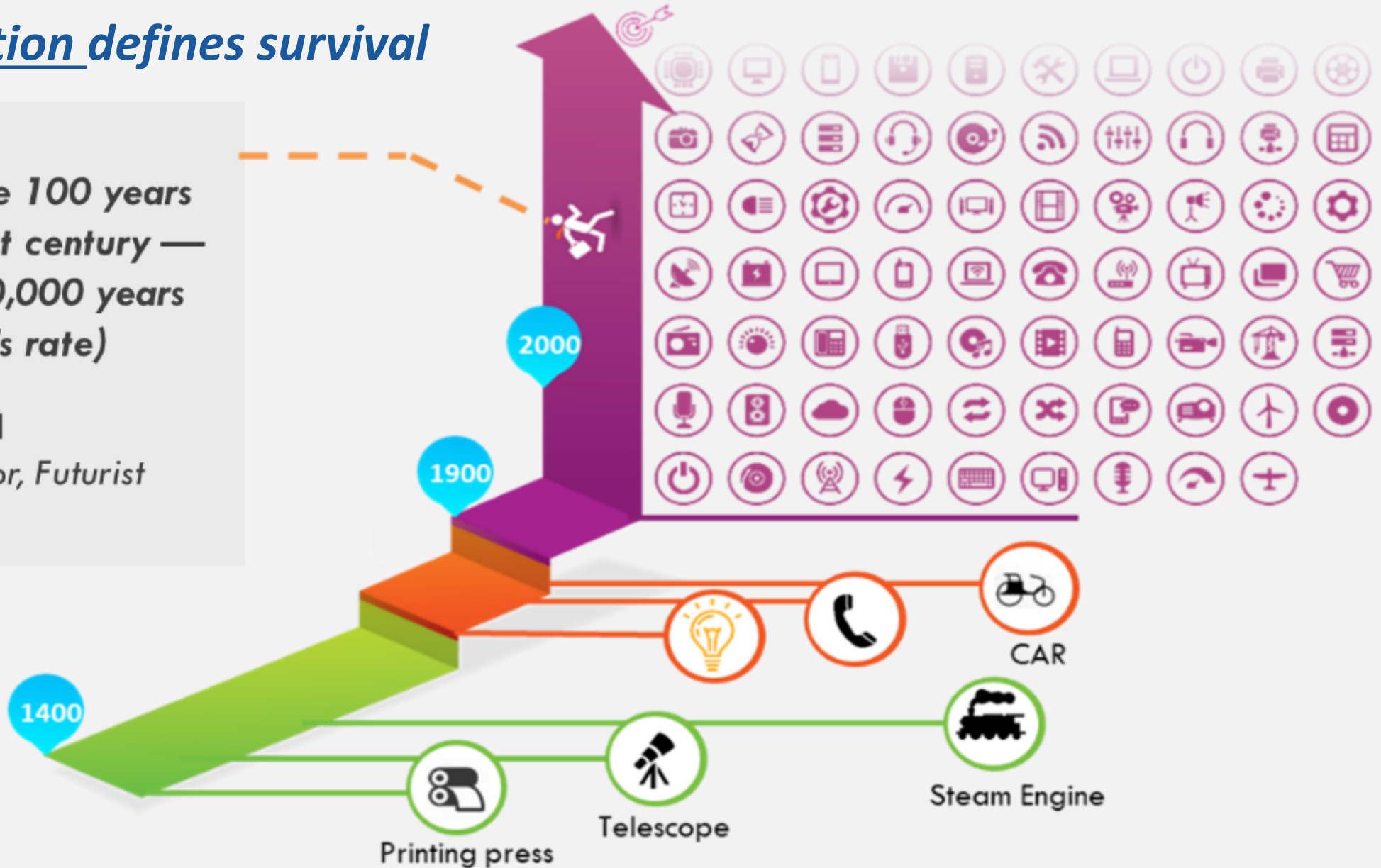
"We won't experience 100 years of progress in the 21st century — it will be more like 20,000 years of progress (at today's rate)"



Ray Kurzweil
Inventor, author, Futurist

Impact on...

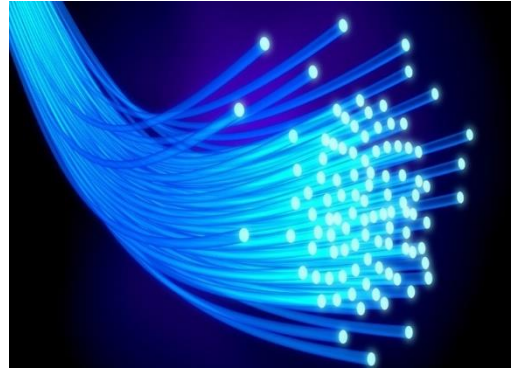
- City Planning
- Utility Systems
- Business Models



What Should You Be Thinking About Differently?



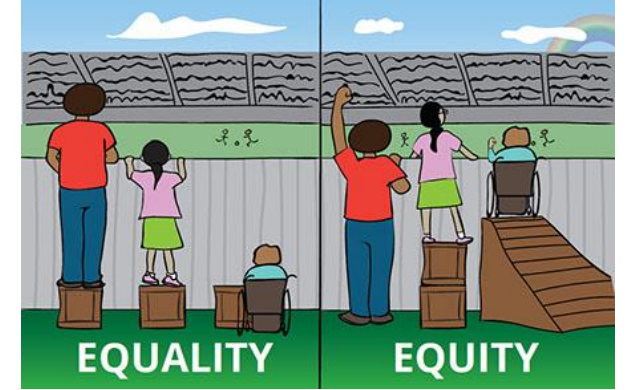
Multi-Stakeholder Planning



Comms Infrastructure



LEDs, 5G & RoW



Social Equity



Workforce Housing



Community Resiliency



Mobility & Transit

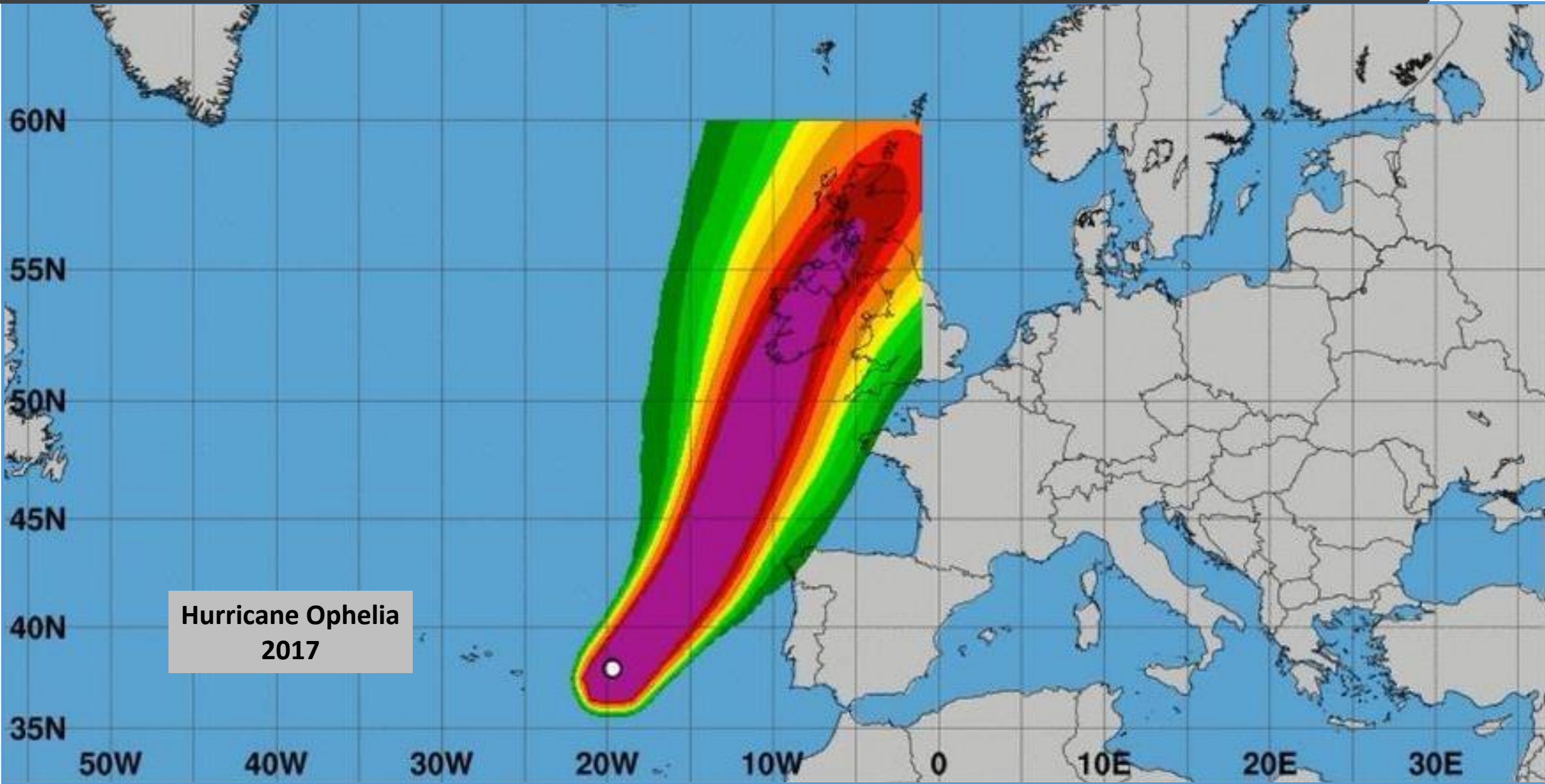


Econ Dev



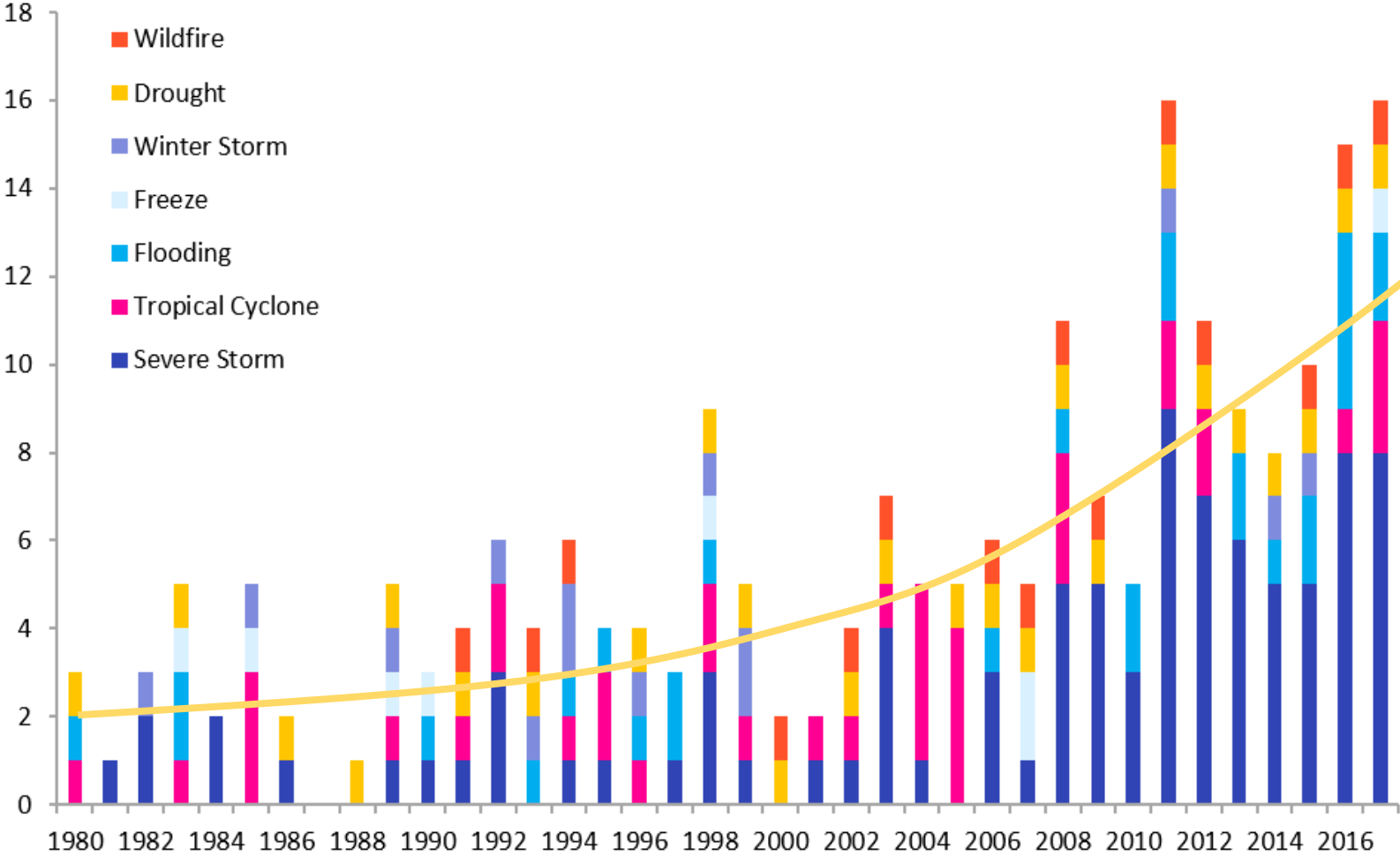
Carbon Reduction

An Unforeseen & Unpredictable Climate Future



Major Storm Trends Over 40 Years

Billion-dollar Disaster Events by Year, 1980-2017



2017: \$306B

NOAA expects these costs will increase as weather becomes more volatile.

Trend suggests ever-increasing challenges to electric system resilience in the future.

How Resilient Are Your Communities?



Mexico Beach FL After Hurricane Michael 2018

Utilities Face A Shifting Competitive Landscape



Providing low carbon solutions to C&I customers



Shell Energy Inside

In November 2018 Shell launched “Shell Energy Inside” as part of Shell New Energies, the division tasked with the provision of low carbon solutions.

Partners

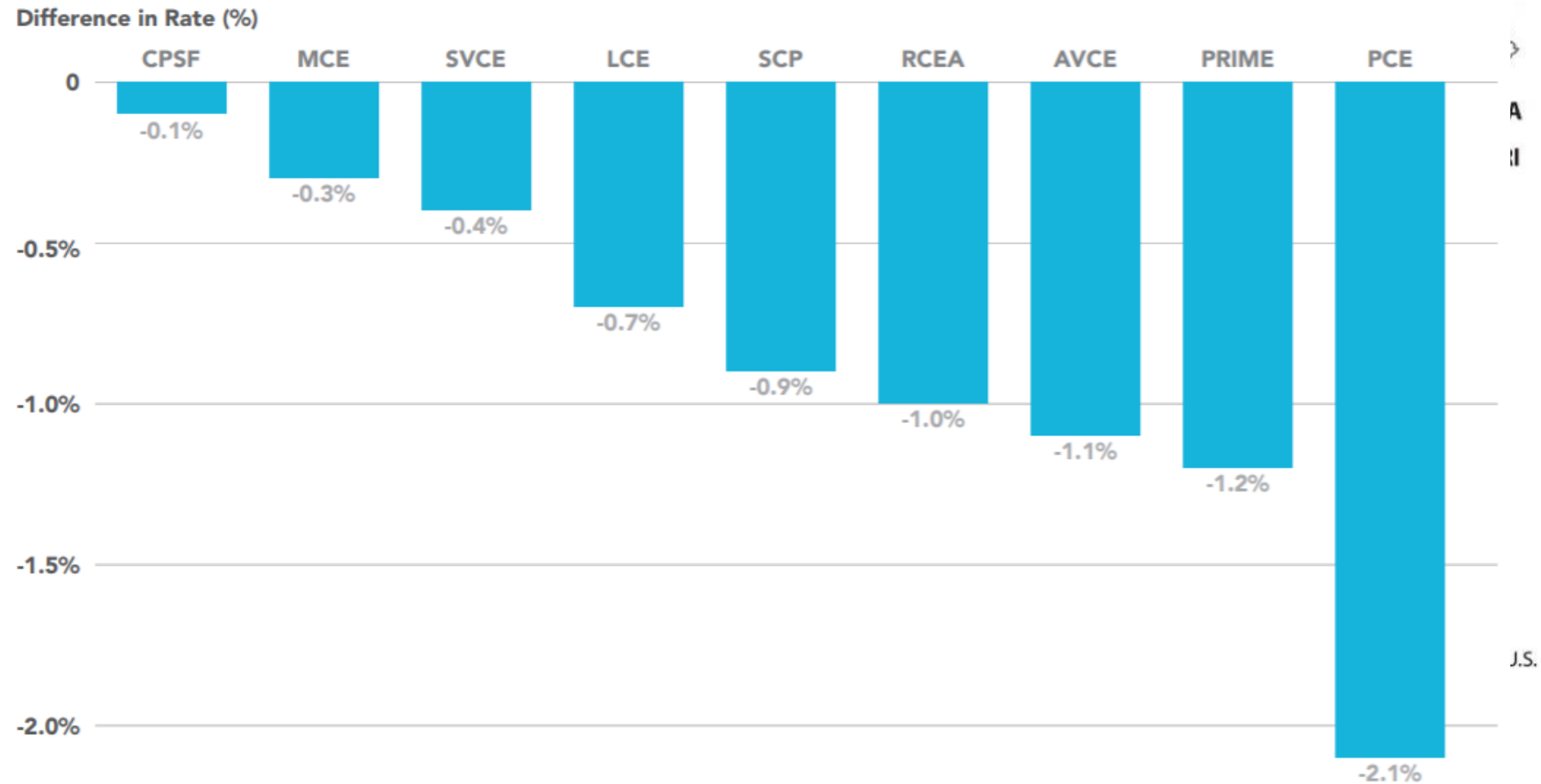
GRIDPOINT
sparkfund

The service bundles behind the meter optimization of electricity consumption via the intelligent orchestration of e.g. lighting, HVAC, back-up generation, battery energy storage, electric vehicles coupling the offering with the identification of demand response

Disintermediation: Cleaner, Faster, Cheaper

- CA CCAs expected to serve 16% of electrical load by 2020, but could be over 50% in 2020.
- CCAs could lead to achieving 2030 RPS 10 years sooner
- Every CA CCA has chosen to provide customers with more renewable energy than the competing utility and has done so at lower rates.

FIG 4 2017 CCA Rate Comparison to Affiliate IOU¹⁴





100

A CENTURY OF
APPLIED INNOVATION

A Holistic Perspective – CityNOW Value Proposition

Right of Way

- Value Asset Appropriately
- Leverage Asset Strategically
- Comprehensively Plan & Manage

Mobility

- Efficient & Equitable
- Safe & Reliable
- Accessible

Energy

- Renewable
- Resilient
- Distributed



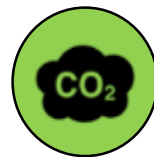
Human-Centric & Resilient: Fujisawa Sustainable Smart Town



Fujisawa Stakeholders



Gakken



-70%



-30%



+30%



+25%

Panasonic

Applied Stakeholder Innovation: Pena Station NEXT (400-Acre, P3 TOD)



\$95M in P3 Projects

1 st Statewide V2X Deployment in US	\$72M P3
1 st Commercial Microgrid in CO	\$11M P3
1 st Carbon Neutral Planning Tool in US	\$250K P3
1 st AEV for First Mile/Last Mile in US	\$250K P3
1 st Safe & Smart Streetlights in CO	\$100K P3

Living Lab for Innovation – Pena Station NEXT Phase I



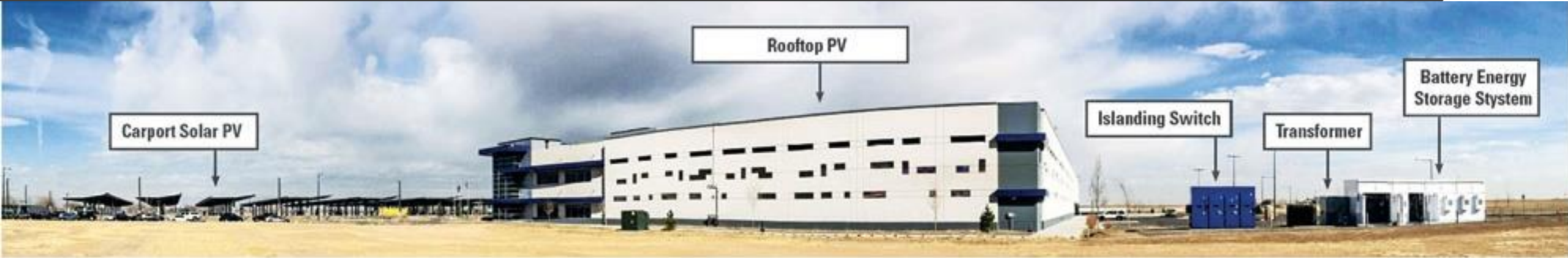
Phase I = 154 Acres



Deployed Solutions

- Portfolio Microgrid
- Community Wi-Fi
- Connected Mobility
- Autonomous Shuttle
- Networked Streetlights
- Public Safety
- Environmental Sensing
- Smart Parking

Applied Energy Innovation – Portfolio Microgrid



Business Model

1. Airport Invested in Canopy Steel
2. Xcel Invested in PV & BESS
3. Panasonic Invested in Rooftop PV
4. 17 Months Concept - Completion
5. 15 Separate Contracts Required



Microgrid Use Cases

1. Grid integration of solar
2. Peak demand reduction
3. Energy arbitrage
4. Frequency regulation
5. Backup service (Panasonic)

Applied Mobility Innovation: Connected Vehicle Program

Building the Internet of Roads

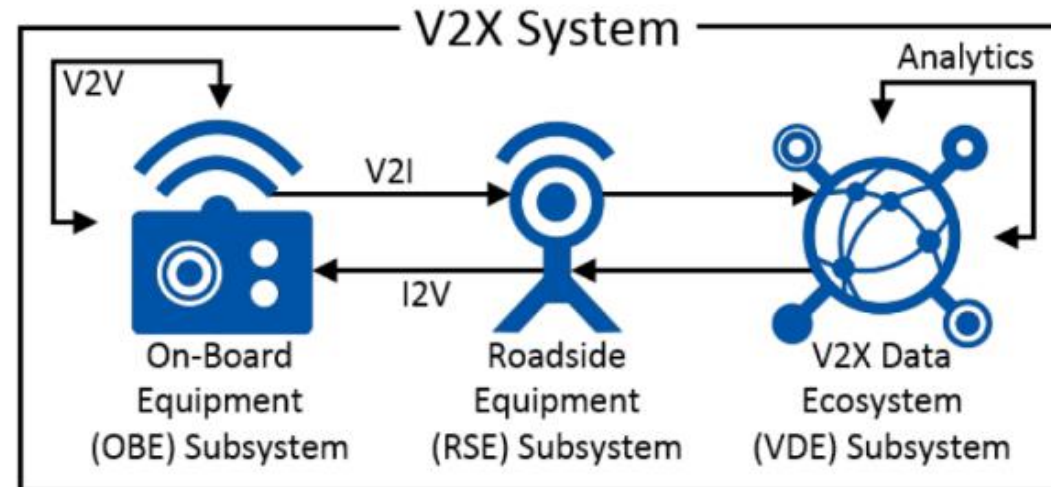
Colorado's V2X deployment program:

- ❑ U.S.'s first full-scale V2X transportation network
- ❑ Foundational platform for infrastructure
- ❑ Open & interoperable
- ❑ Available to all infrastructure owners & operators in Colorado

100M+ Connected Cars by 2022

20 Terabytes Per Hour

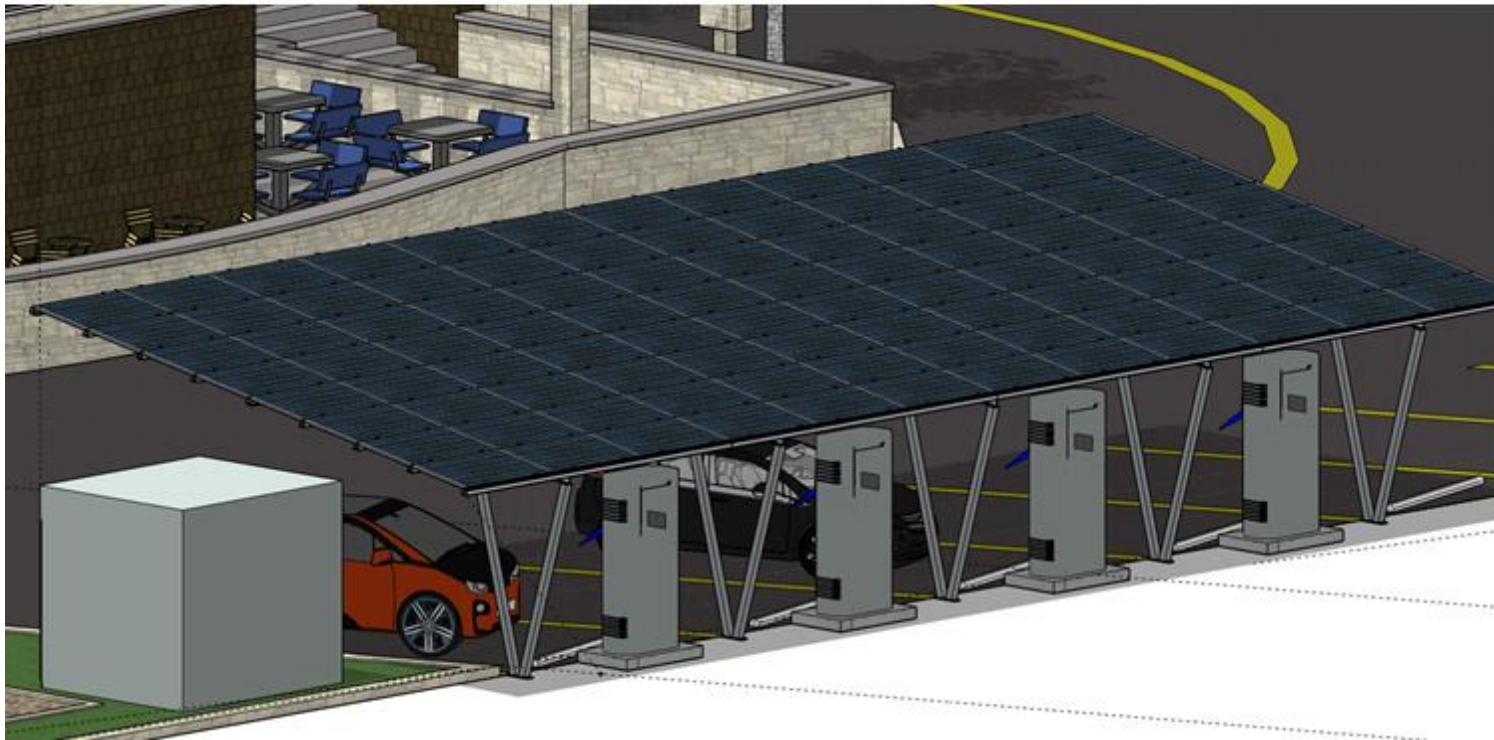
150 Petabytes Per Year



Applied Business Model Innovation: Fueling Station of the Future

Confidential Customer

- DC Fast Charging stations to serve EV customers
- Solar PV for renewable energy
- Stationary BESS for demand charge reduction & resiliency



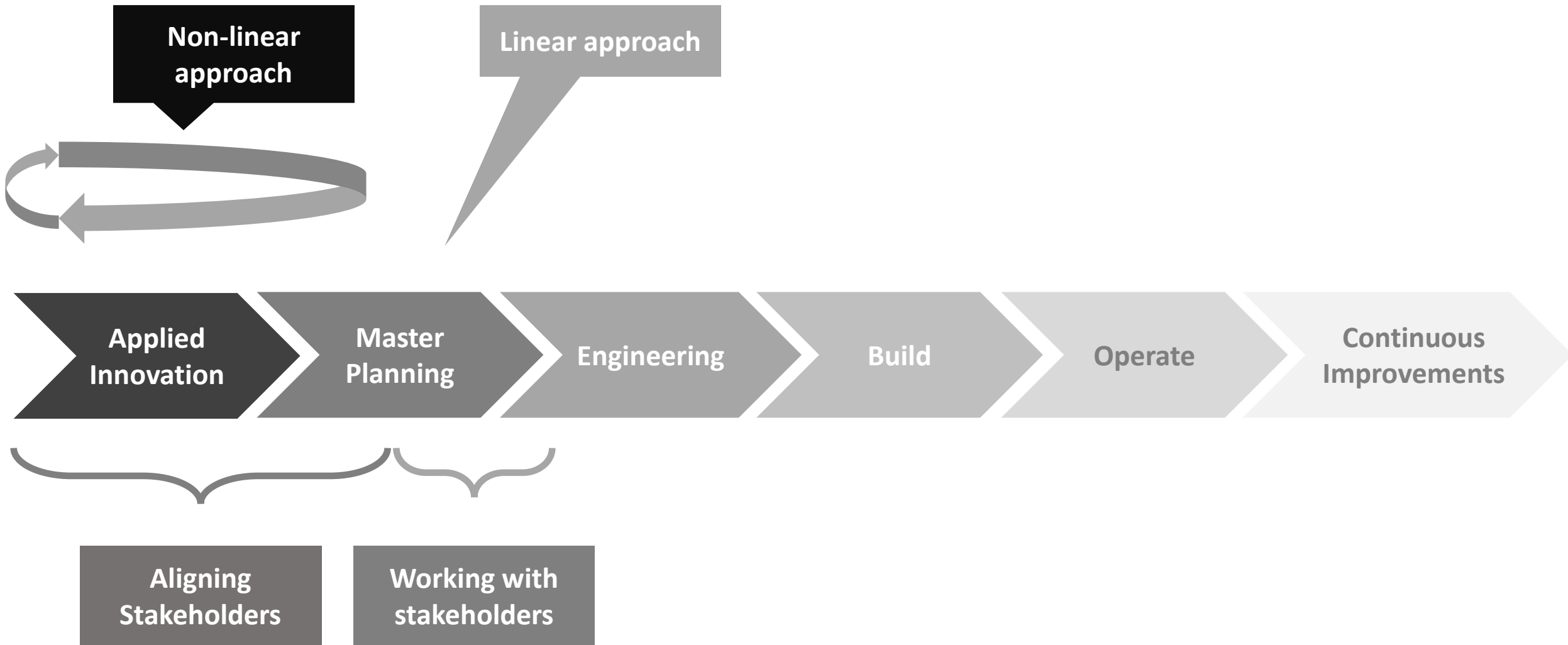
CityNOW Applied Innovation Approach

A man in a blue jacket is seen from behind, looking out over a winding road that curves through a mountainous landscape. The sky is overcast and grey, and the mountains are covered in green vegetation. The road has yellow dashed lines and leads into the distance.

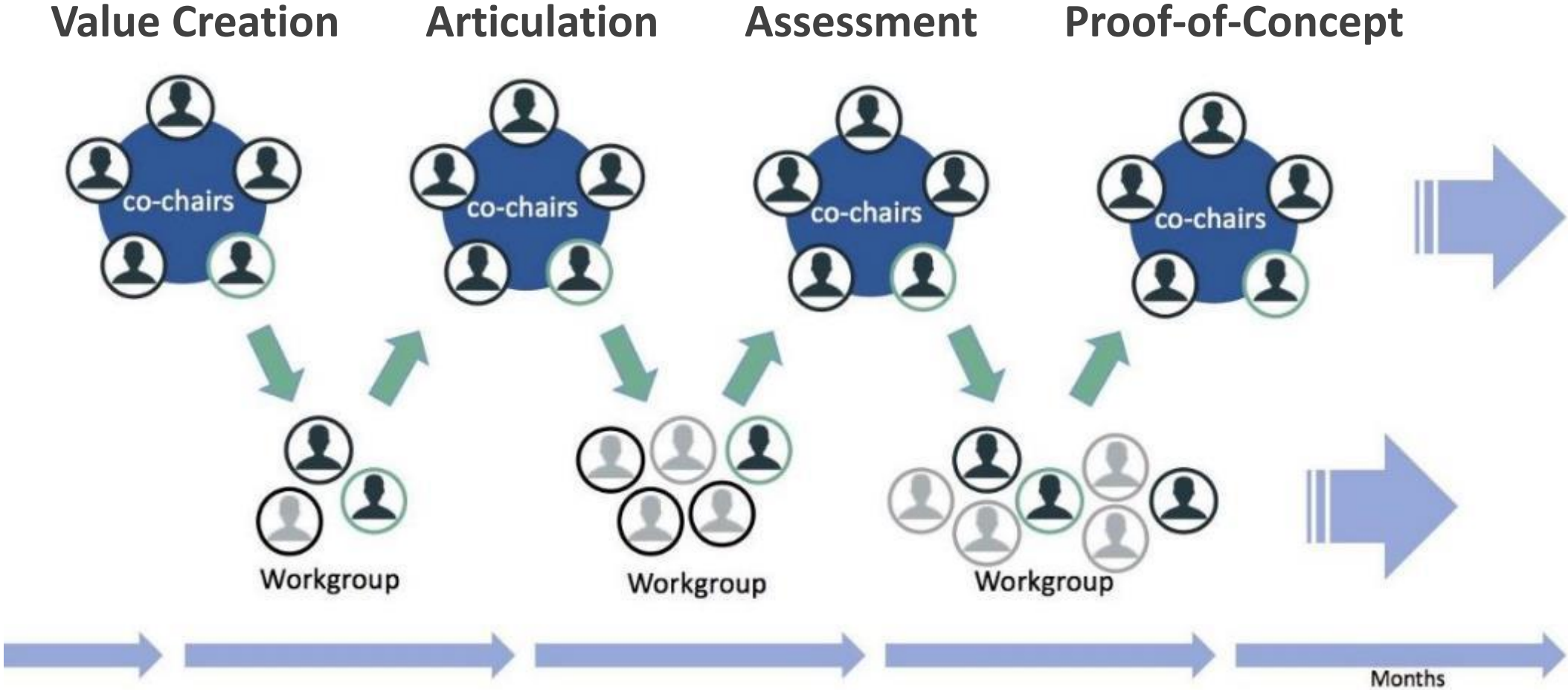
*Working together to define
the new "right way"
to accelerate outcomes
that collectively create
a better life, a better world.*

Panasonic

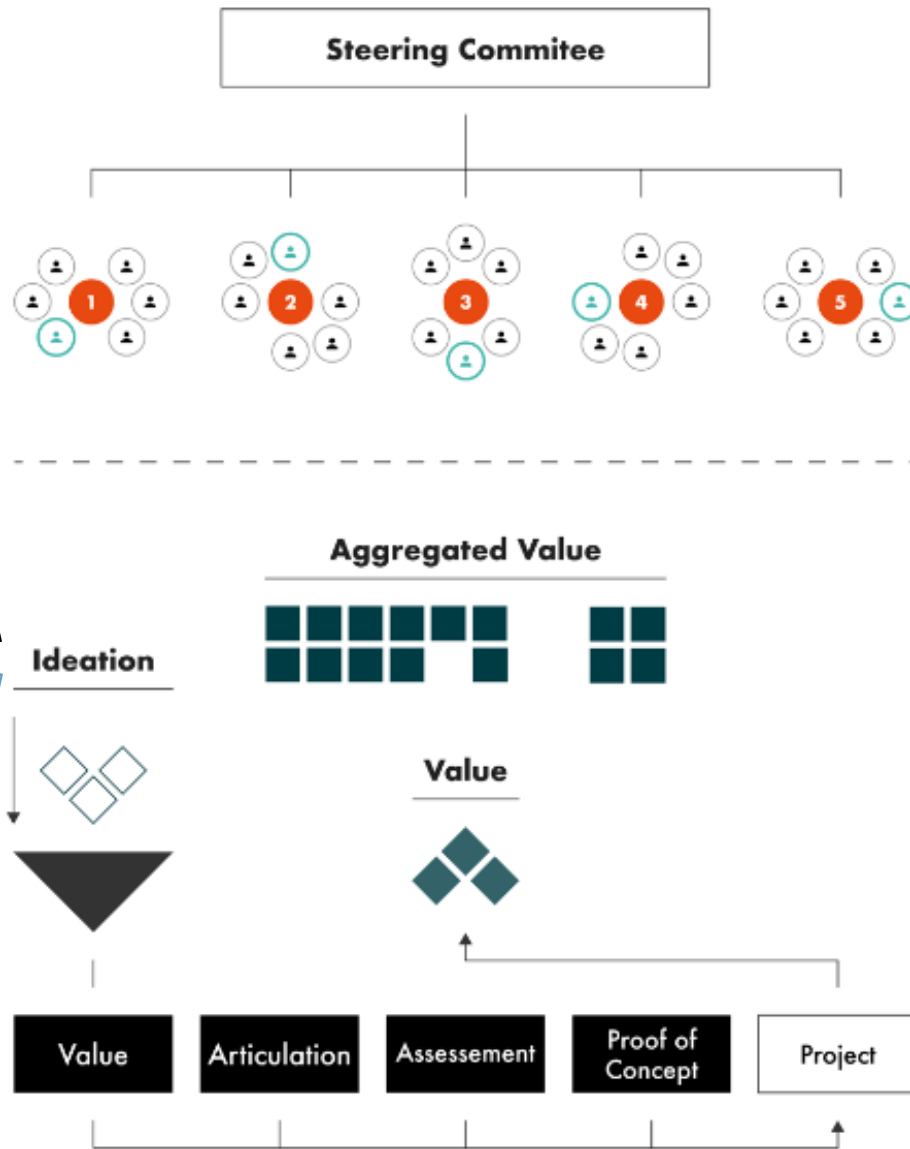
A Non-Linear Process To Achieve Transformational Outcomes



A Lightweight Process That Empowers Decision Makers



Enabling Long-Term, Multi-Stakeholder Value Creation

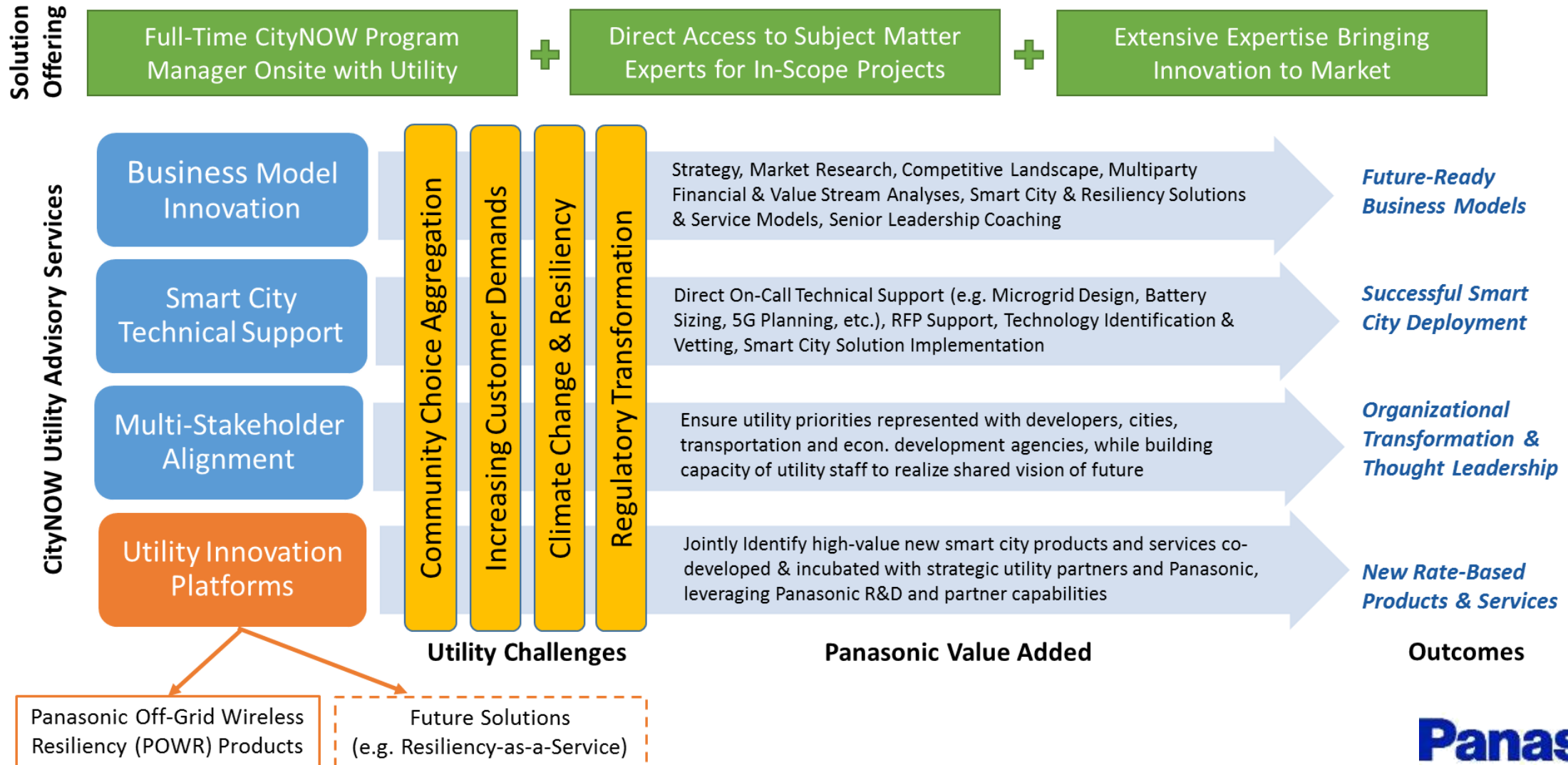


Combined Value Creation

- Ideas continuously enter a continuously evolving process
- Process supports ambitions ranging from business-as-usual to disruptive
- The combined value creation process truly drives long-term transformation

CityNOW Utility Innovation Framework

CityNOW Utility Innovation & Advisory Services accelerate the development and deployment of innovative smart city strategies and solutions that will be successful today and support an evolving regulatory structure.



Applied Utility Innovation – PGE Smart City Strategy

Smart Streetlights

With energy-efficient LEDs and features such as dynamic dimming and sensors, smart streetlights enhance public safety by brightening when illumination is needed and save energy by dimming when it's not. When combined with sensors, they're also critical for monitoring and managing pedestrian and for electric mobility options. From pedestrian and cyclist detection to traffic signal timing to parking and traffic management, the result: safer streets, less congestion, smarter communities.



Onsite and Offsite Solar Energy

Rooftop, carport, and other onsite solar PV—complemented by additional offsite solar farms—supply clean, cost-effective, local renewable energy. This supports achieving the city's ambitious climate targets and powers the Corridor with the green energy stacks in high demand from today's progressive companies, homeowners, and renters. The result: gain a competitive "green real estate" advantage and help the city meet its renewable energy goals.




Autonomous Electric Shuttles

The finesse of driving a taxi and it doesn't involve a driver at all. Self-driving, zero-emissions electric shuttles help solve the last-mile mobility challenge and make transit alternatives to transit hubs such as Union Station and within the Broadway Corridor development. The result: meeting a critical need for the elderly, disabled, income that make a major struggle, and other circumstances often making taking an driving just don't make sense.




Broadway Corridor Redevelopment Energy and Mobility Strategy for PGE

Submitted by CityNOW
March 19, 2018

Parasceki CityNOW
4074 N. Parasceki Way, Denver, Colorado 80218
www.ParascekiCityNow.com



Smart Streetlight Roadmap for PGE

Submitted by CityNOW
April 25, 2018

Parasceki CityNOW
4074 N. Parasceki Way, Denver, Colorado 80218
www.ParascekiCityNow.com

Smart Grid

With a wide suite of distributed energy resources (smart thermostats, building energy management systems, batteries, etc.) allow dynamic balancing of energy needs across build-out blocks, and the entire Corridor. The result: automatically adjusting and efficiently using the right energy, at the right place, at the right time.



Smart Grid



Battery Energy Storage and Microgrids

With customer-led and shared community batteries help to stabilize the electricity grid, effectively integrate their renewable energy into the grid, and provide critical backup power during emergencies if the broader grid experiences a disruption. This result: resilient, local power systems that enhance public safety and provide important hubs for the community.



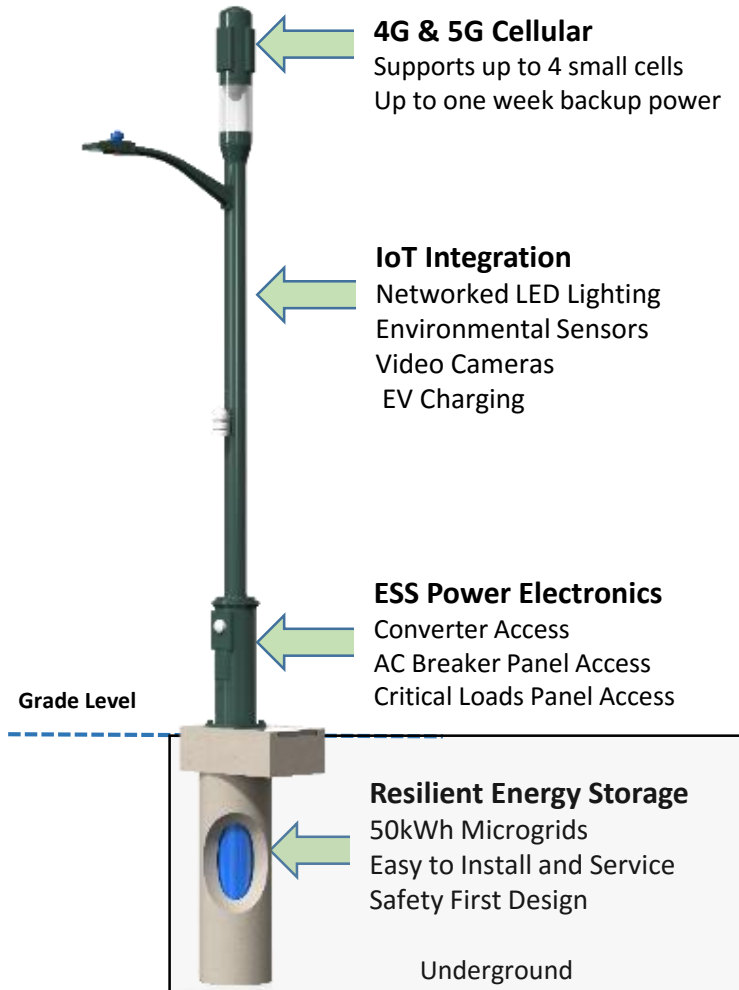
Community Resiliency Center

A state-of-the-art network operations center (NOC) serves as the "brain" for the smart, sustainable, secure—coordinating energy resources, transportation, and mobility planning, public safety monitoring, and serving as a guide customer hub in the event of an emergency.




Applied City Innovation – Underground Storage in RoW

Use LED upgrades to strategically manage the Right of Way & harden community infrastructure



- Smart streetlights vs ‘safe & smart streets’
- The value of a ‘dig once’ policy
- Open trench = lay more conduit & fiber
- Strategy for
 - attracting & siting 5G small cells
 - attracting & siting IoT vendors
 - community resiliency (e.g., traffic signals, LEDs, 5G)
 - leveraging all city assets (e.g., electrification of mobility)
 - driving economic development / innovation clusters
 - leveraging public-private financing

Applied Innovation - Community Resiliency Pavilion



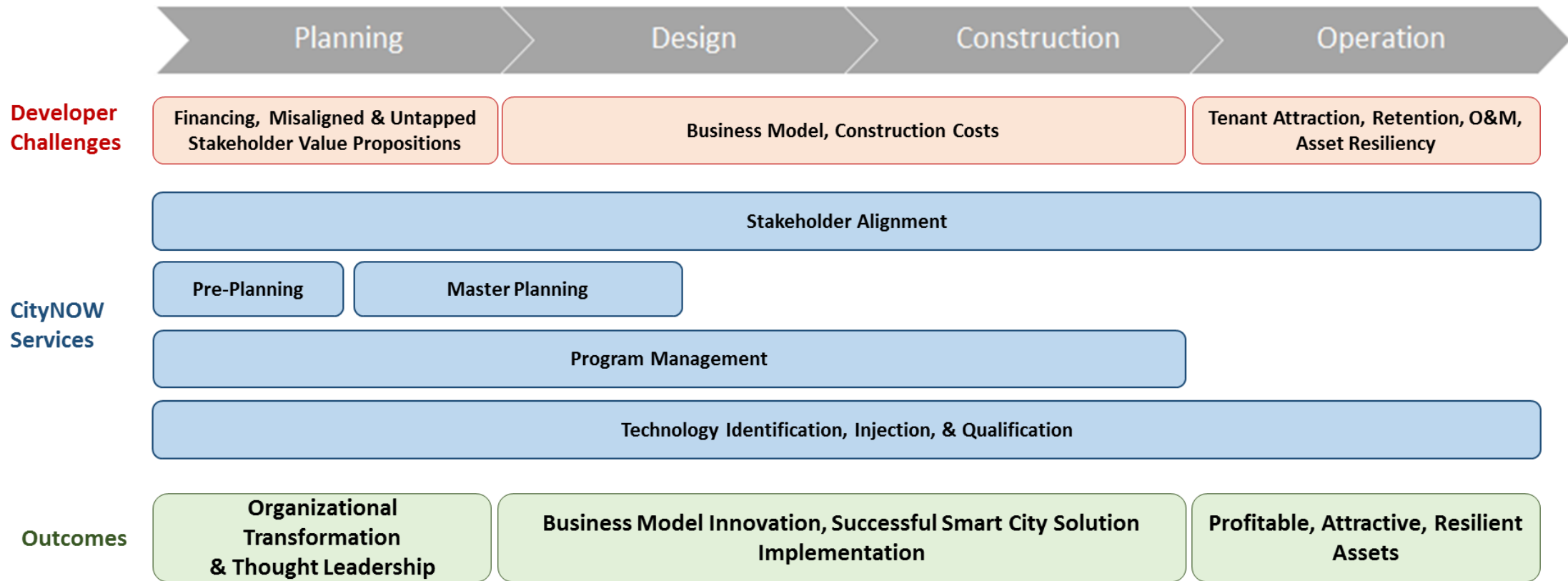
CONCEPTUAL
VIEWS ONLY

POWR Pavilion

- Utility-focused business model (utility grid services, rate-based, & a PR win)
- 50kWh battery + 12kW solar PV canopy + durable seating + A/C & USB device charging
- Provides social equity & multi-day resiliency when needed (1K to 10K+ 'charge-hours' per day)
- Designed to blend aesthetically into typical park & common area settings

Creating Transformational Communities with Developers

Our stakeholder alignment process enables the development of innovative smart city strategies that enhance the profitability, attractiveness, and resiliency of real estate assets.



Applied Stakeholder Innovation - Immersive Smart City Showcase



Commercial Business District

City Hall

Sports &
Entertainment
District

320 sq. ft.
Micro-Unit

CAFE

KM
Museum

Mobility
District

GATE 2

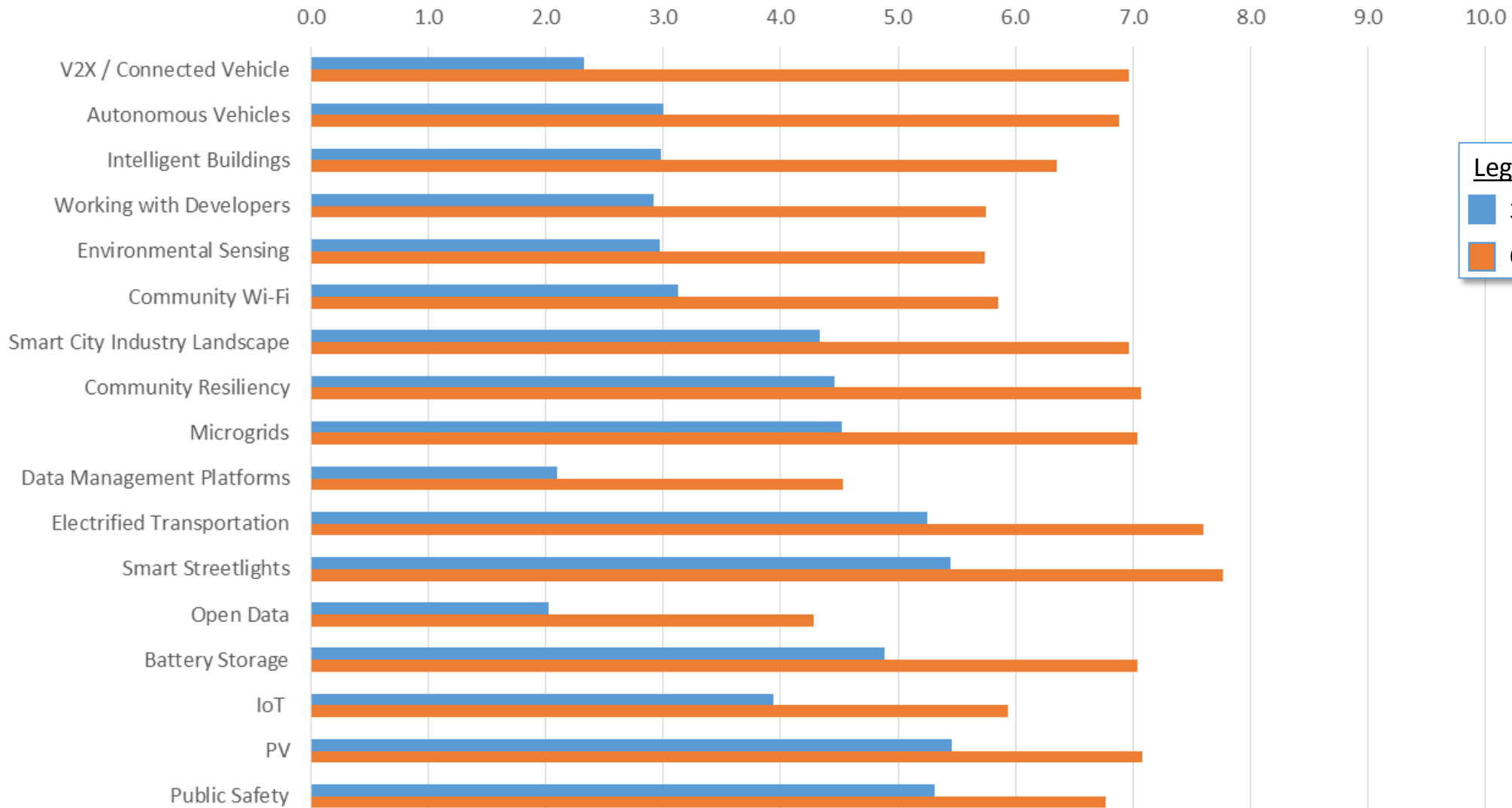
Smart
Streets

City & Utility Right of Way

Panasonic

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Smart City Training Results by Impact



Legend

- 3.9 Pre-Course
- 6.5 Post-Course

Creating a Better Life, A Better World

Thank You

Panasonic