DOCKETED	
Docket Number:	19-ERDD-01
Project Title:	Research Idea Exchange
TN #:	238088
Document Title:	The Leighty Foundation Comments - Consider Novel, High-density, CarFree Urban Modules for Efficient Use of Land, Material, Energy
Description:	N/A
Filer:	System
Organization:	The Leighty Foundation
Submitter Role:	Public
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Comment Received From: The Leighty Foundation
Submitted On: 6/2/2021
Docket Number: 19-ERDD-01

Consider Novel, High-density, CarFree Urban Modules for Efficient Use of Land, Material, Energy

Please anticipate now millions of internally displaced persons (IDP's) fleeing rapid sea level rise, within a few decades, in CA and USA alone: where will we put them ? What will we build for them that they, and we, can afford ? Is this our opportunity to rectify USA's post-WW2 mistake -- building our cities for cars instead of for people ? CEC should try, via a new GFO focused on this and / or similar concepts:
https://vimeo.com/373679728
" Designing â€œCarFreeâ€ Cities to Welcome Millions Fleeing Rapid Sea Level Rise, Within a Few Decades "

Many CEC and social equity objectives will be embraced by imagining and designing new mixed-density urban modules accommodating 100,000+ people, of loop toplogy based on concentric, contra-rotating fixed-guideway transit systems serving all accessibility needs for people and goods, while excluding all personal private vehicles from the "CarFree" urbanized area. CAPEX, OPEX, and land use would be greatly conserved. Many such urban "donut", "torus" shaped urban modules would necessarily be superimposed upon -- helicoptered down upon -- low-density regions of CA and USA cities, which includes most of the land areas, a "taking" of extant private property for which compensation is required: justified, in the context of the "Climate Change" emergency.

These "CarFree" loops would be built with best-practices conservation of materials and energy, water and land, attempting a "circular economy". People would walk and interact more than in today's USA urban life. Mental and physical health care savings might supply most of the needed capital. Savings in personal after-tax income required to own and operate several personal vehicles per family would service the balance of needed capital.

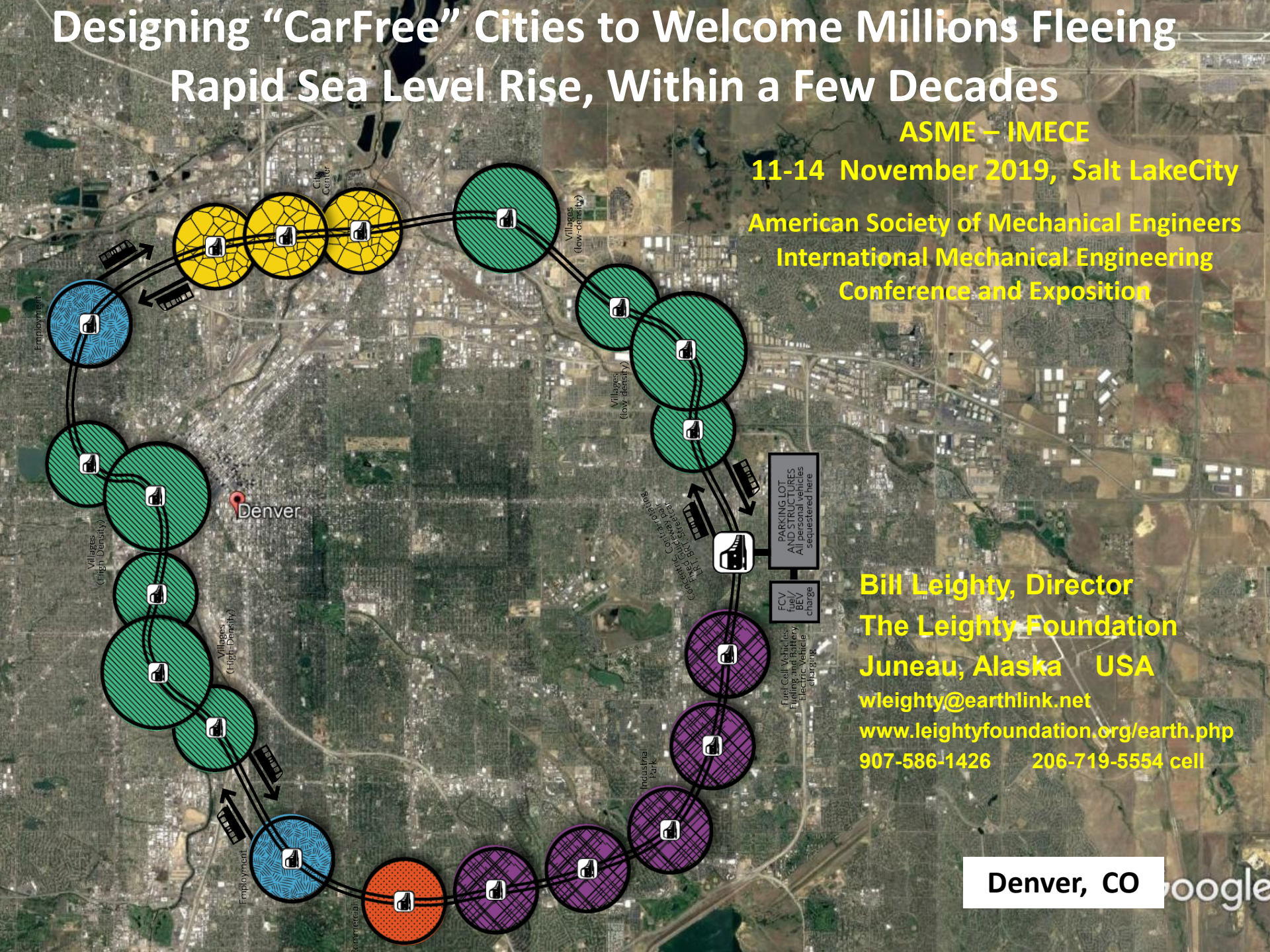
This will be a better investment than futile attempts to prevent loss of coastal property to rising seas, or dangerous attempts at geoengineering to reduce insolation upon Earth. We should now carefully consider such extraordinary responses to the unprecedented and imminent panoply of dangers self-inflicted by unrestrained anthropogenic GHG emissions, while we may still have time to act. California is probably the best place to start; CEC might lead, with EPIC or other funds.

Additional submitted attachment is included below.

Designing "CarFree" Cities to Welcome Millions Fleeing Rapid Sea Level Rise, Within a Few Decades

ASME – IMECE
11-14 November 2019, Salt LakeCity

American Society of Mechanical Engineers
International Mechanical Engineering
Conference and Exposition



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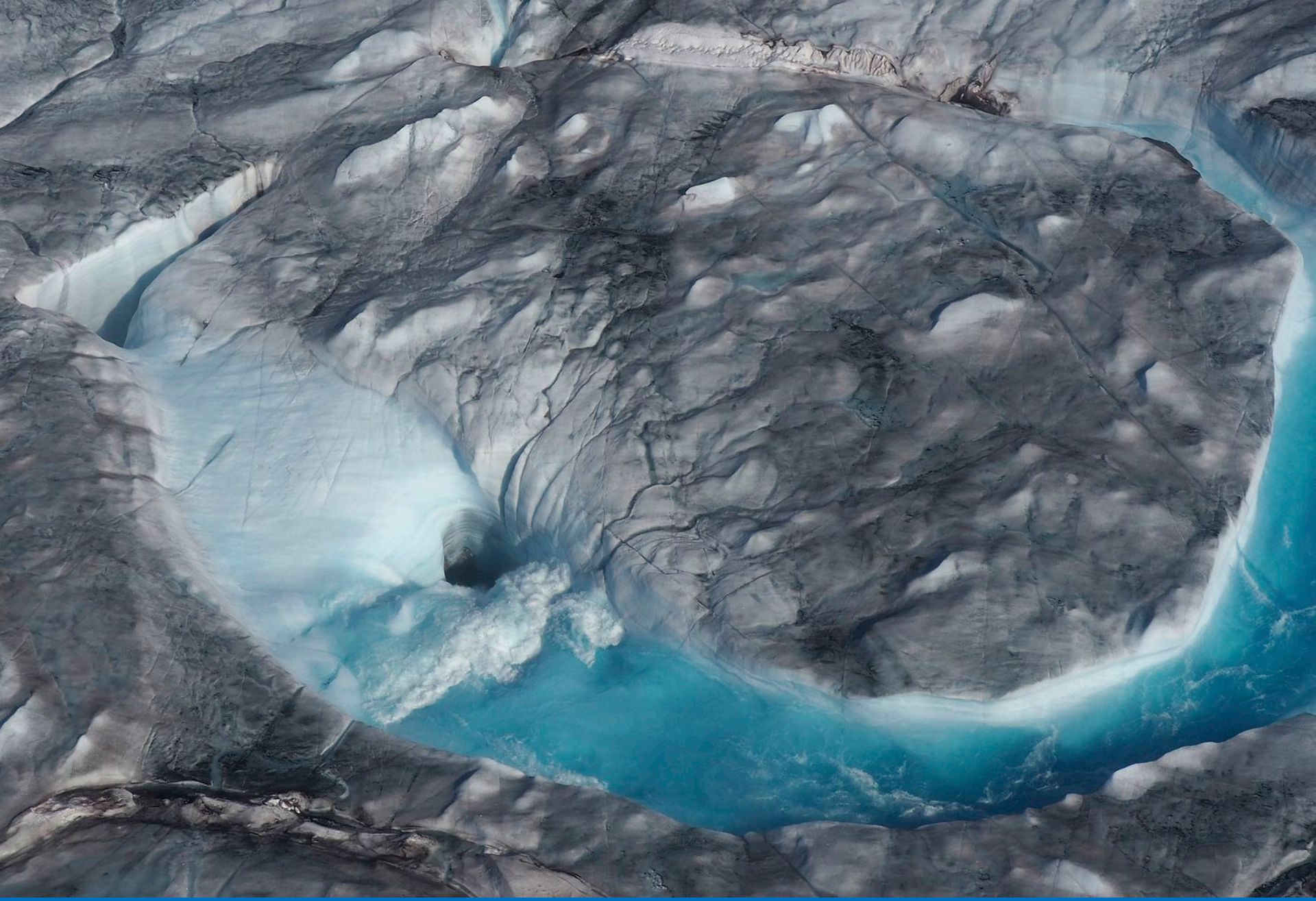
"Climate Change"

- Warming
- Severe weather
- Sea level rise
- Ocean acidification
- Species extinction
- Human conflict

Responses:

- Mitigation: cut GHG
- Adaptation
- Geoengineering

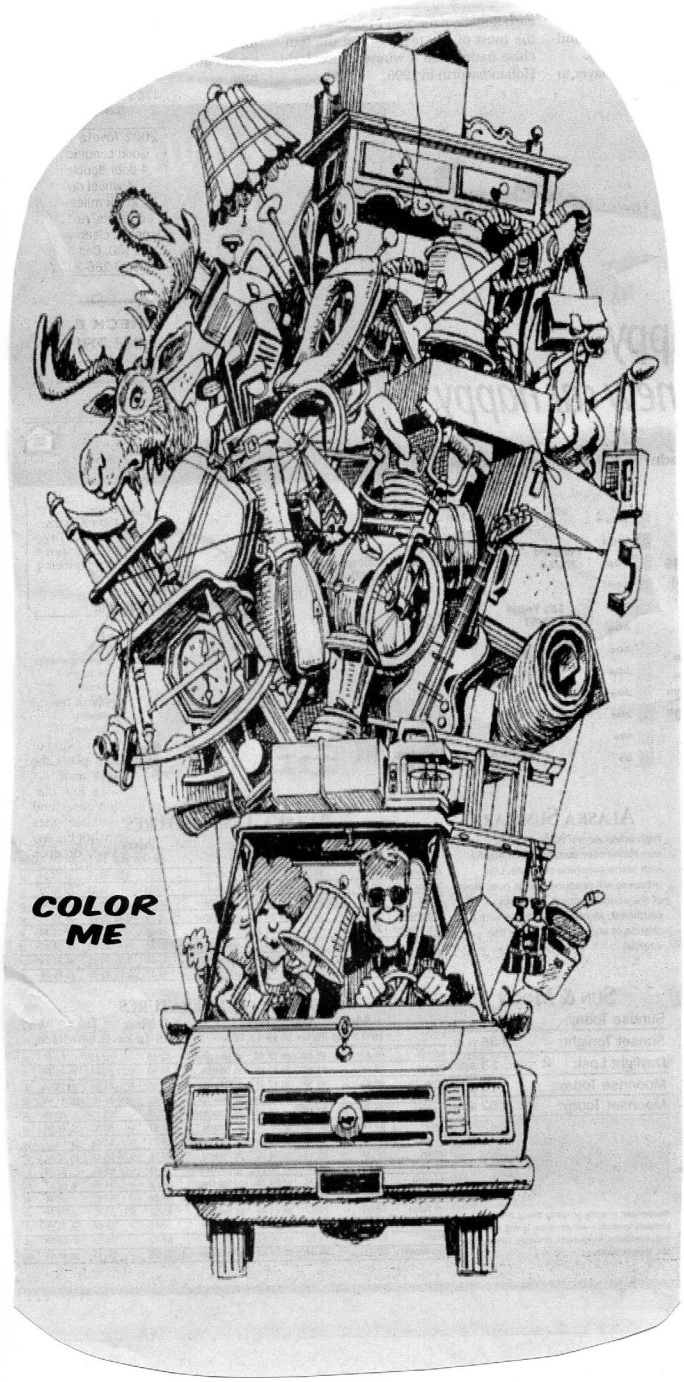


Greenland Ice Melting


Greenland Ice Melting

Antarctic tidewater glacier calving

Antarctic Ice Melting



The Next Okies

- Another tragedy:
  - New “Dust Bowl”
  - “Global Climate Change” (GCC)
  - Displaced by rapid sea level rise
- Load the SUV, drive uphill, inland
- Lost real estate equity
- Welcome them: empathy
- National, global emergency
- Where put them ?
- What build for them ? What afford ?
- Avoid sprawl

Why "Carfree, USA" ?

- "Climate Change Emergency": plan, design NOW
- Within a few decades
- Millions of Internally Displaced Persons (IDP's)
- Unfortunates. Tragedy: Dust Bowl
- Real estate equity lost; homes, jobs lost
- Migrate upland, inland

New, complete, urban "Loop Communities" upon extant USA low-density cities: "city within a city"

Helicopter down	Overlay
Drop	Inflict
Impose	Envision, design, build, operate

Who will own, operate ?

Who will live there ? IDP ghettos ?

Why "Carfree" ?

- "Climate Change Emergency": plan, design NOW
- Millions of Internally Displaced Persons (IDP's): 2100
- Real estate equity lost
- Migrating upland, inland
- Cannot afford tract home; we don't want sprawl
- How accommodate ? Where ? What build ?
- Anticipate, now: design, zone, comp plans, RFP
- "Access", not "mobility"
- Lower capex: private, public
- Lower opex: private after-tax, public
- Lower "embodied" energy, materials = lower GHG
- Recover from post-WW2 mistake:

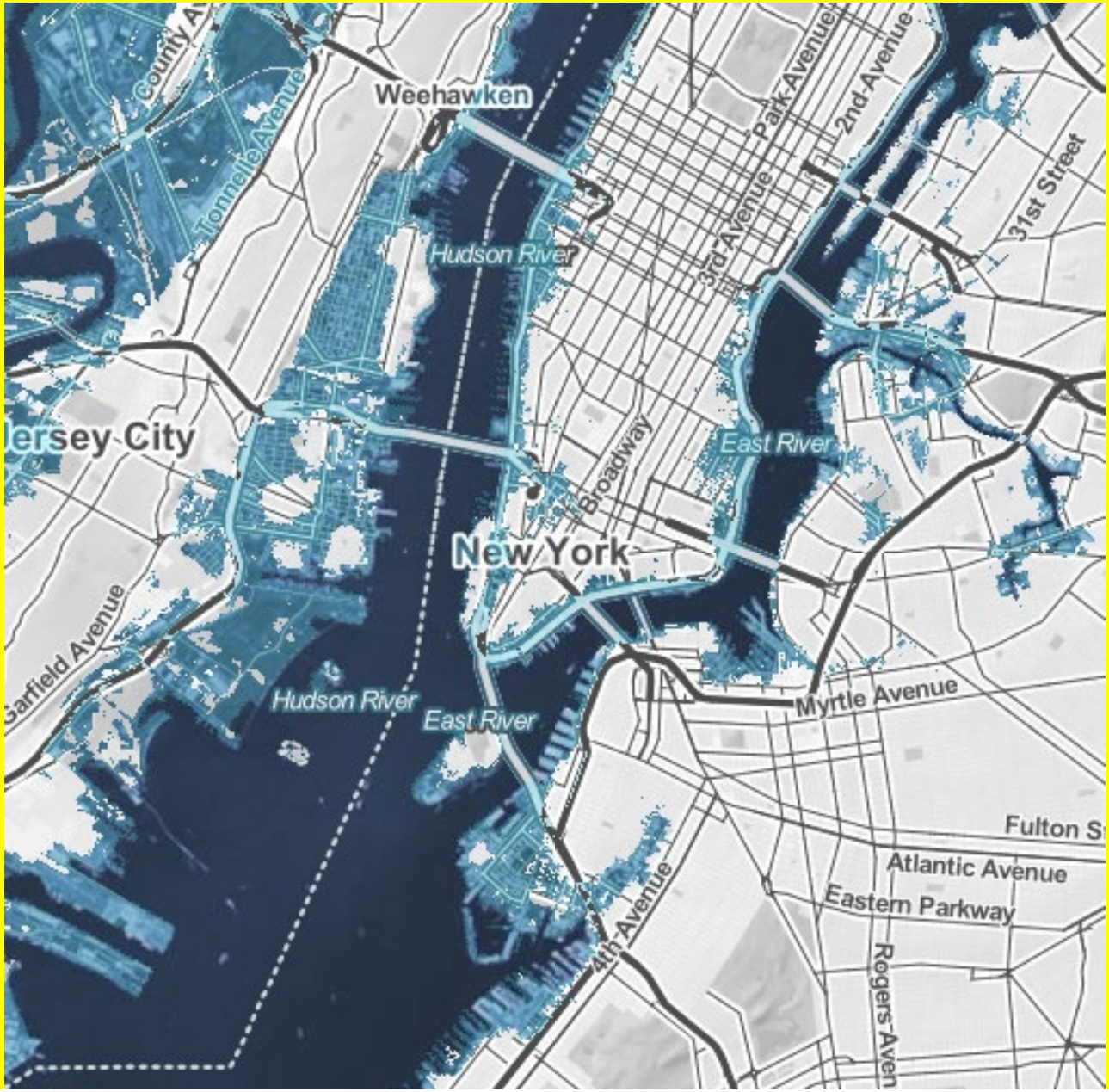
  designed for cars, not people → Opportunity

New York
Scenario 2100

Unconstrained fossil fuel combustion

Source:
Climate Central
29 Oct 2019

Source: https://choices.climatecentral.org/#12/40.7117/-74.0010?compare=scenarios&carbon-end-yr=2100&scenario-a=unchecked&scenario-b=extreme-cuts



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San Diego

Scenario 2100
Unchecked pollution
Very difficult to predict

Source:
Climate Central
29 Oct 19

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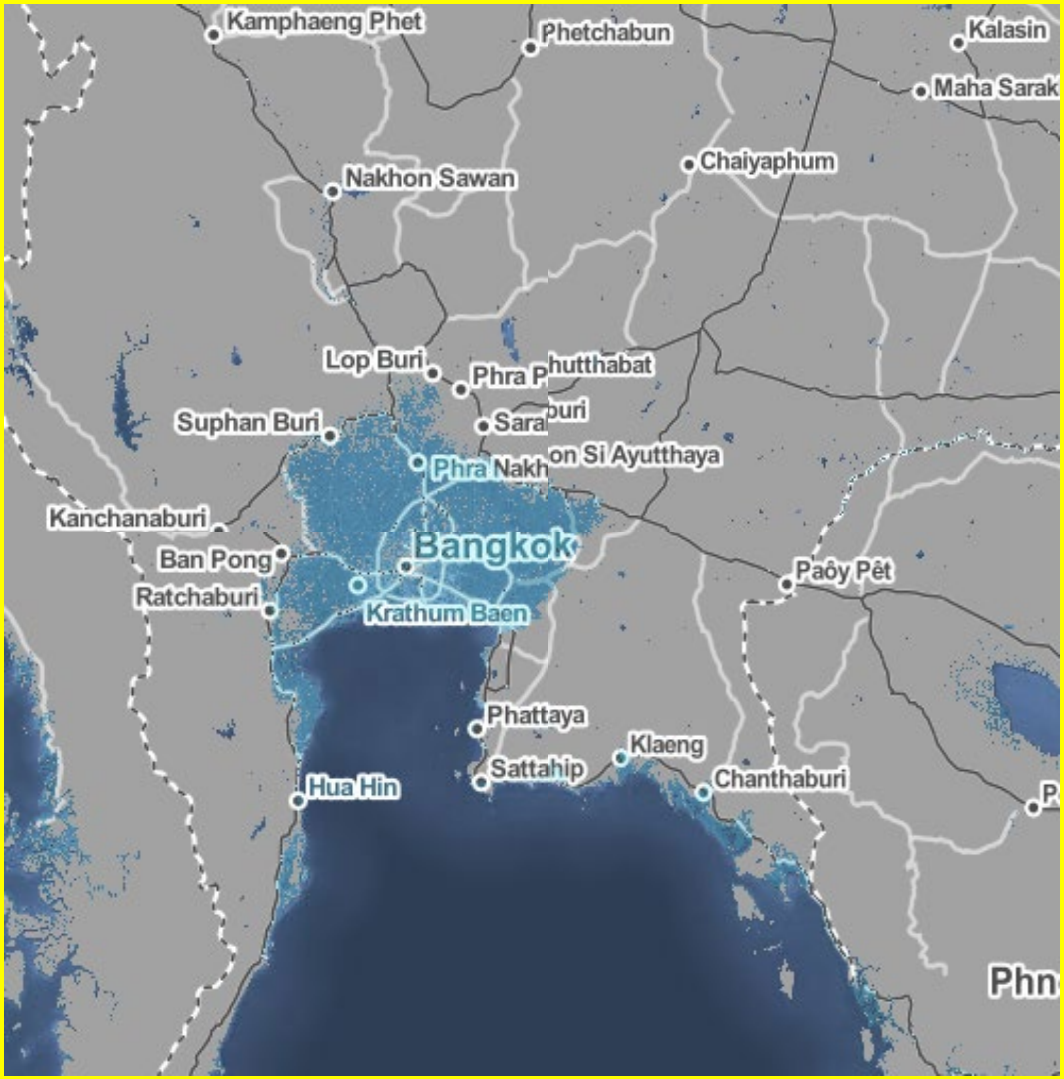


Bangkok

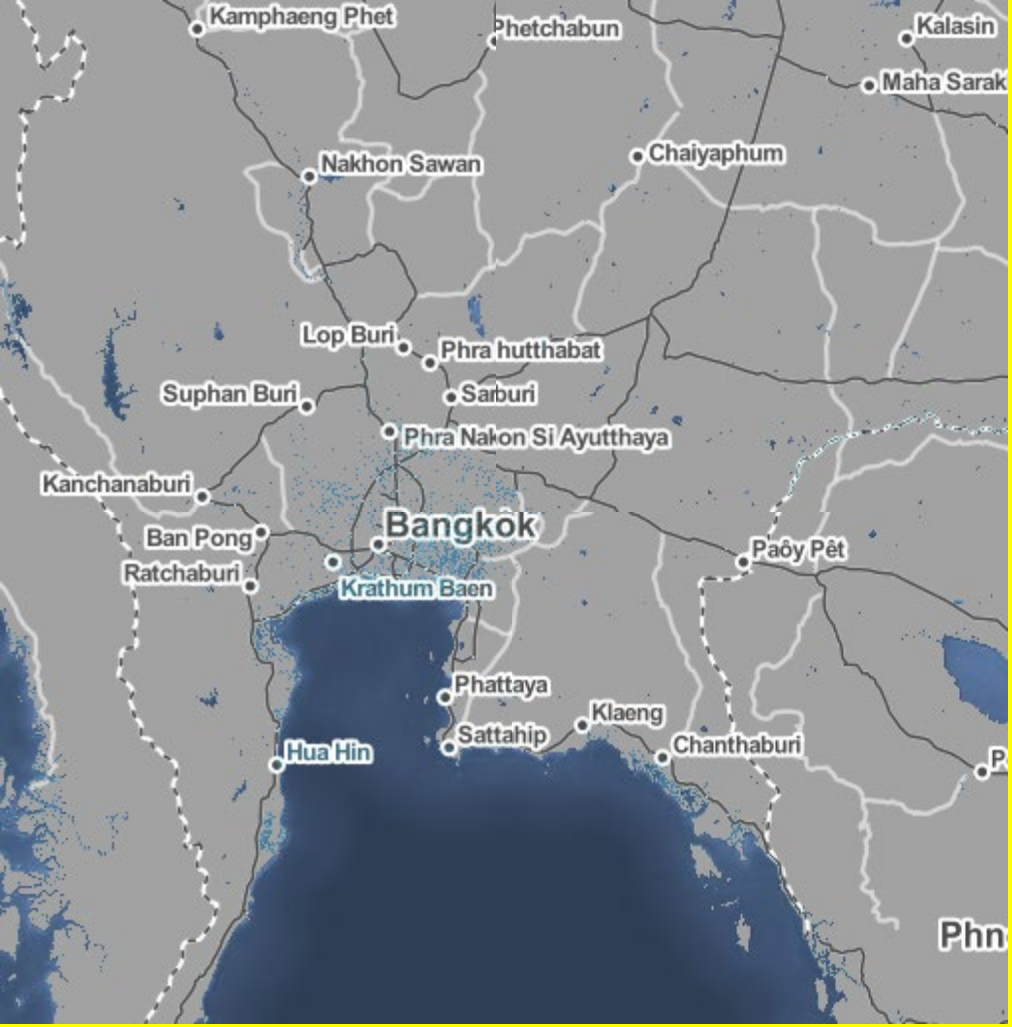
Unchecked pollution

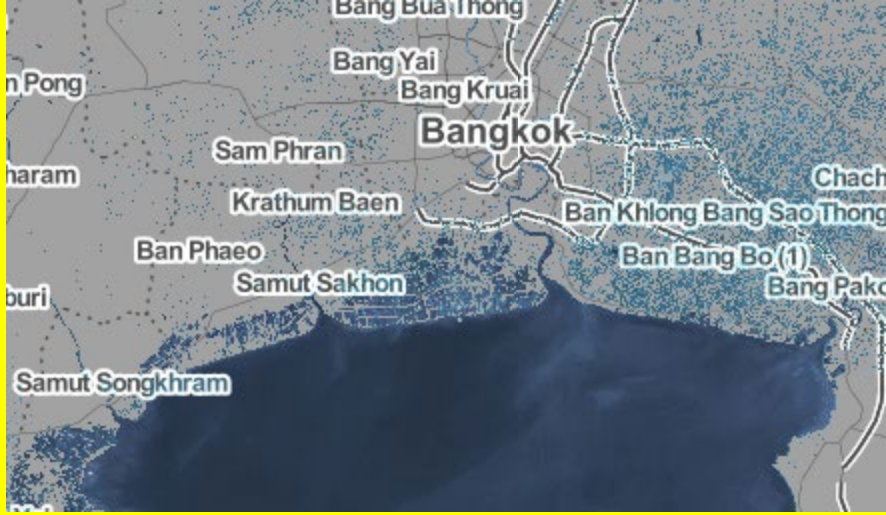
Estimated date: 2100

Very difficult to predict

Source: Climate Central

Source: https://choices.climatecentral.org/#7/15.882/100.981?compare=scenarios&carbon-end-yr=2100&scenario-a=unchecked&scenario-b=extreme-cuts





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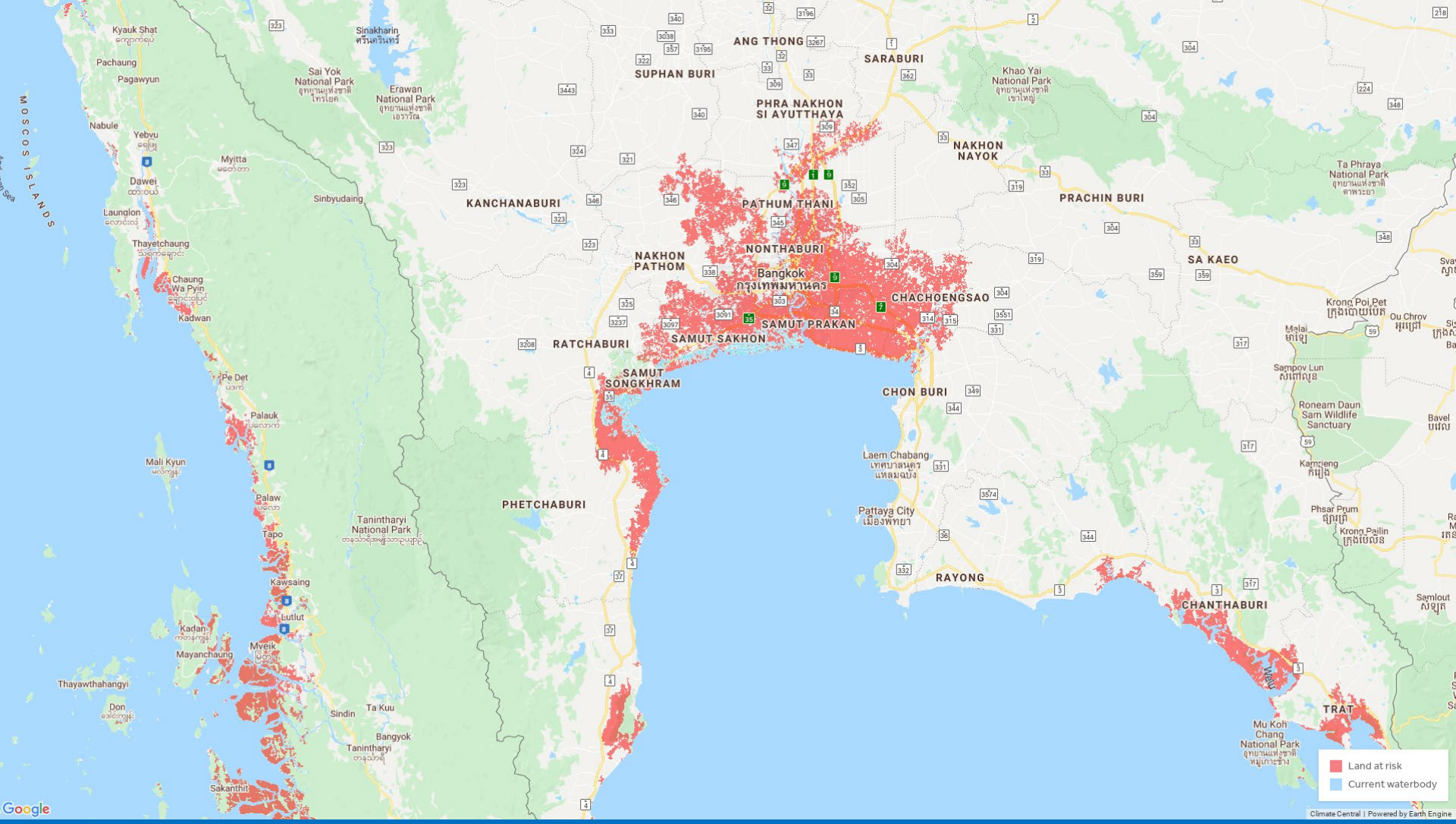


Land at risk of inundation by year 2100: Thailand

Land at risk of inundation by year 2100

3 Revolutions

Institute of Transportation Studies (ITS), UC Davis Dan Sperling, et al, 2018

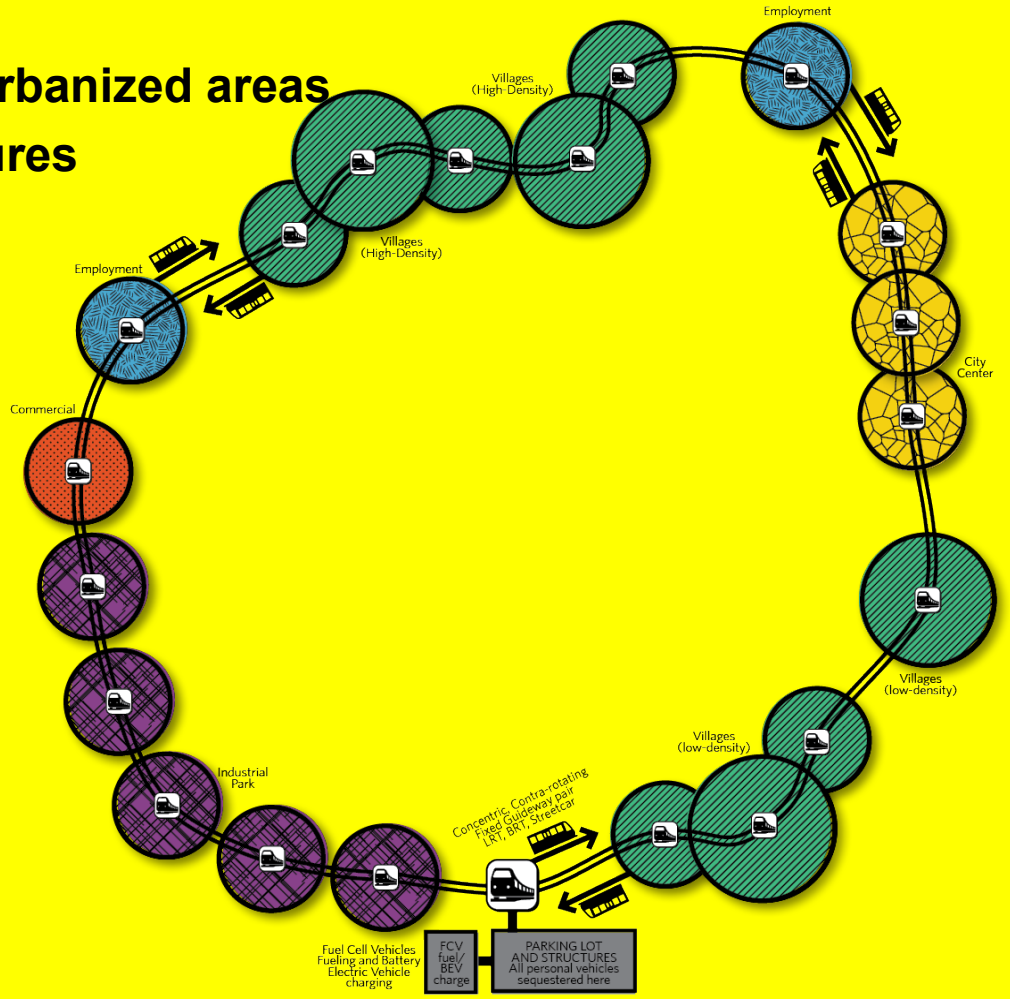
1. **Autonomous Vehicles (AV's) -- "self-driving"**
2. **Shared mobility: Transportation Network Companies (TNC)**
   - **-- Uber**
   - **-- Lyft**
3. **Electric vehicles: (all sizes)**
   - **Battery Electric (BEV)**
   - **Fuel Cell (FCV), hydrogen fueled hybrid electric**

Panacea ?

Help with sea level rise emergency ?

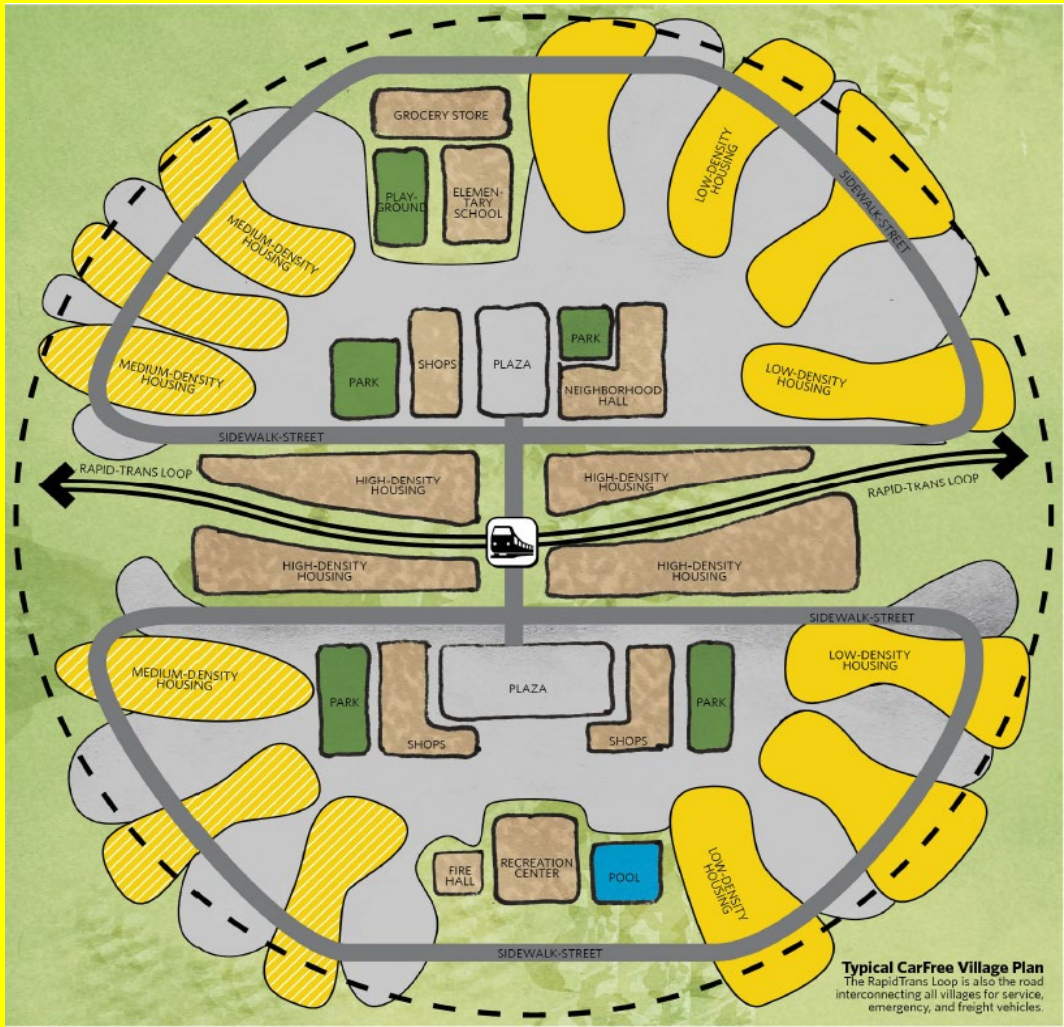
What is "Carfree, USA" ?

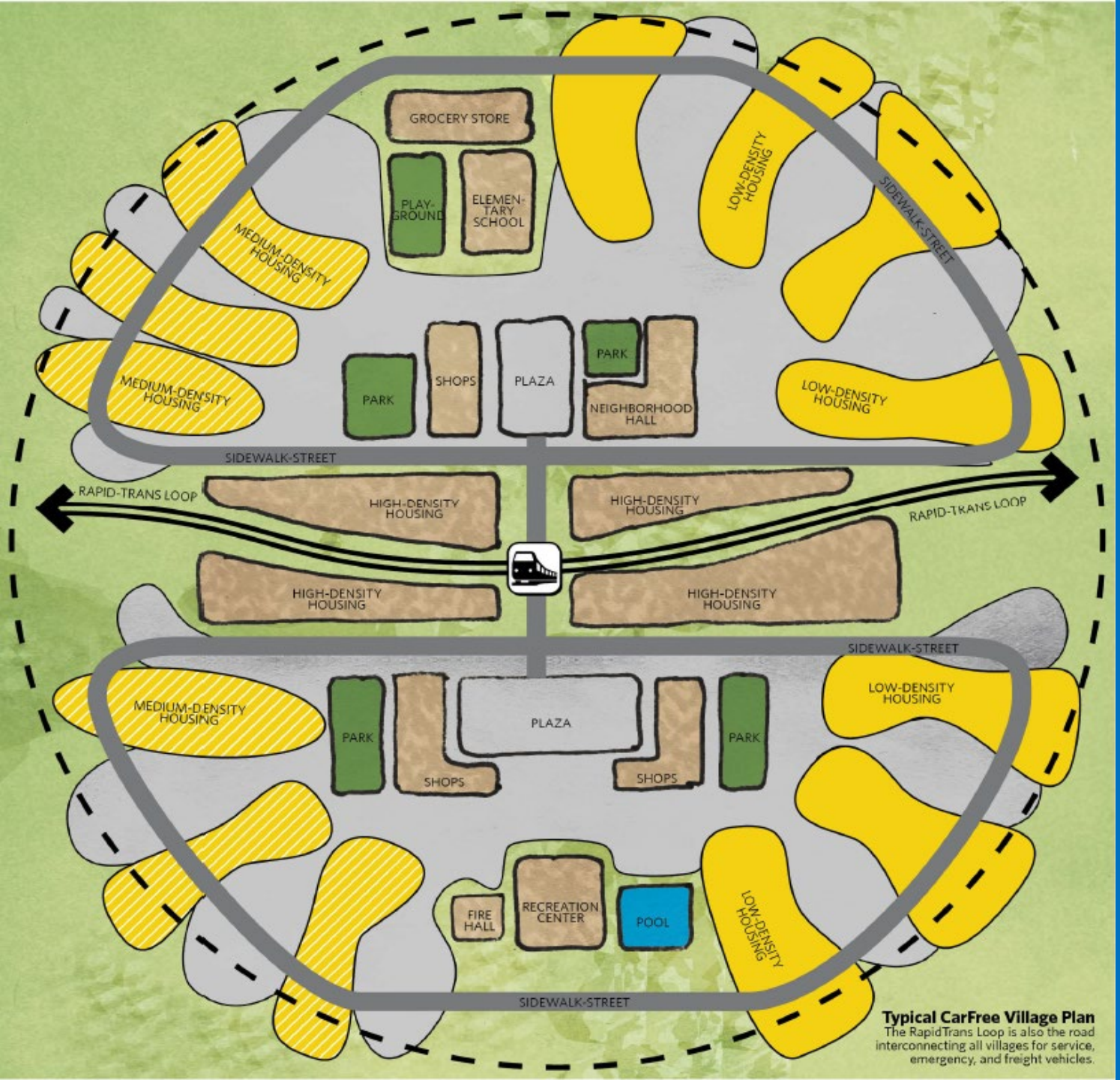
- Complete necklace of "Villages" dropped on low-density US cities
  - Complete "city within, upon, a city"
  - Diverse
  - Most services
- No: -- Personal vehicles in urbanized areas
  -- Parking lots or structures
  -- Driveways, garages
- 100,000 + people
- Density high, stress low
- Low COL (cost of living)
- New urban lifestyle
- New urban topology
- Prevent sprawl
- Personal vehicles stored



What is "Carfree, USA" ?

- **Efficiency:**
  - **Land, habitat**
  - **Energy**
  - **Materials**
  - **Time: everyone**
- **Replicate:**
  - **Many US cities**
  - **Intersect, as needed**
  - **Prevail in USA ? Beyond ?**
  - **Replace "car culture"**





"Village" node

- Typical; unique
- Transit station centric
- Build "Community"
- Dominant use varies
- Influence envelope
- Pavement
- No private LDV's
- No "parking"
- No driveways
- No garages
- TAAS
- TNC's
- More "Access"
- Less "Mobility"
- Pearls on necklace

TAAS:
Transportation
As A Service

TNC:
Transportation
Network
Company
(Uber, Lyft)

What is "Carfree" ?

- Response to national, global emergency: rapid sea level rise
- New urbanity "imposed" upon extant cities
  - Low-density regions
  - Overlay
  - Helicopter down
- "Taking" of private property
- High-density
- No private personal vehicles in urbanized areas
- Topology: loop, donut, torus
- Station-centric "village" nodes
- "Access" via contra-rotating fixed-guideway transit, stations @ 500 m
- Light rail, streetcar, hybrid:
  - Electric drive
  - On-board Hydrogen or battery energy
- Passengers, packages, mail, freight – UPS, FEDEX, other
- Paving:
  - Walk, bike
  - Service vehicles
  - Emergency vehicles

What is "Carfree" ?

- Rapid Response to national, global emergency: rapid sea level rise
- Conceptual template
- Planned community: many examples
- "Access" replaces "Mobility"
- Peripheral parking for personal vehicles

Complete necklace of "Villages" dropped on low-density US cities

- **Complete "city within, upon, a city"**
- **Diverse**
- **Most services: max "access"**

Benefits, Costs

Benefits:

- Walk, bike more: healthier, reduce all health care costs
- Lower COL (cost of living): Lower --
  - Private vehicle ownership
  - Private after-tax expense
  - Lower public capex, opex
- Reduce greenhouse gas (GHG) emissions:
  - Transportation
  - New buildings
  - Lower embodied energy
- Avoid sprawl
- Envelope influence effect: car-independence propagates outward
- Enhance human contact; community → **Happiness**

Investments:

- Taking private property: eminent domain
- Transport system: fixed guideway loops, rolling stock, stations
- Other infrastructure: utilities, village paving

Benefits, Costs

Costs:

Reward-to-Risk ratio:

Designing Carfree, USA

Very complex: start NOW

- Recruit, select host cities: reception, permitting
- Verify market: finance ?
- Topology: Transportation system loop
- Loop diameter, village diameter
- Right-of way, footprint, influence envelope
- Population target
- Schedule: urgent
- Compose RFP; RFQ. Design-Build ? Operate ?
- Finance: costs, cash flow, reward : risk
- Success motivates:
  - Car-independent living propagates beyond loop
  - Greater devotion to mitigation

Design:

New cities are rare

> Mitigation
> Geoengineering

Adaptation:
Aspects, criteria, goals:
- Local, regional
- National, continental
- Global, biosphere, Gaia
- Short, long term

Problem:
- "Climate Change"
- Sea level rise
- Emergency

Responses:
> Mitigation
> **Adaptation**
> Geoengineering
> Denial, acceptance, faith

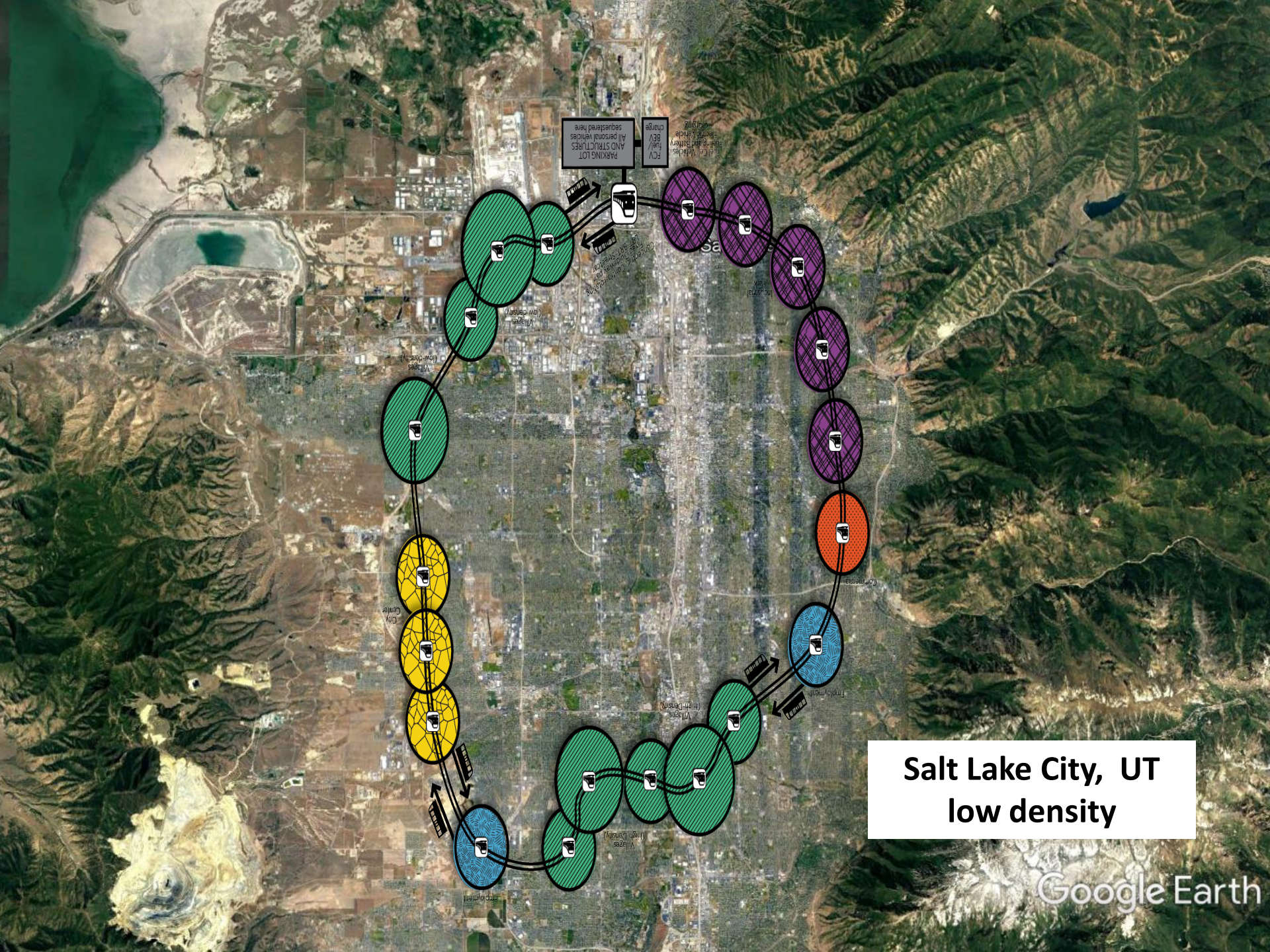
Criteria, considerations:
- Fix post-WW2 mistake: cars
- Human community
- Earth, biosphere community
- Natural capital
- Financial capital
- Land use
- Topology
- Transportation
- Climate
- Food, water
- Government
- Private sector, business
- Personal

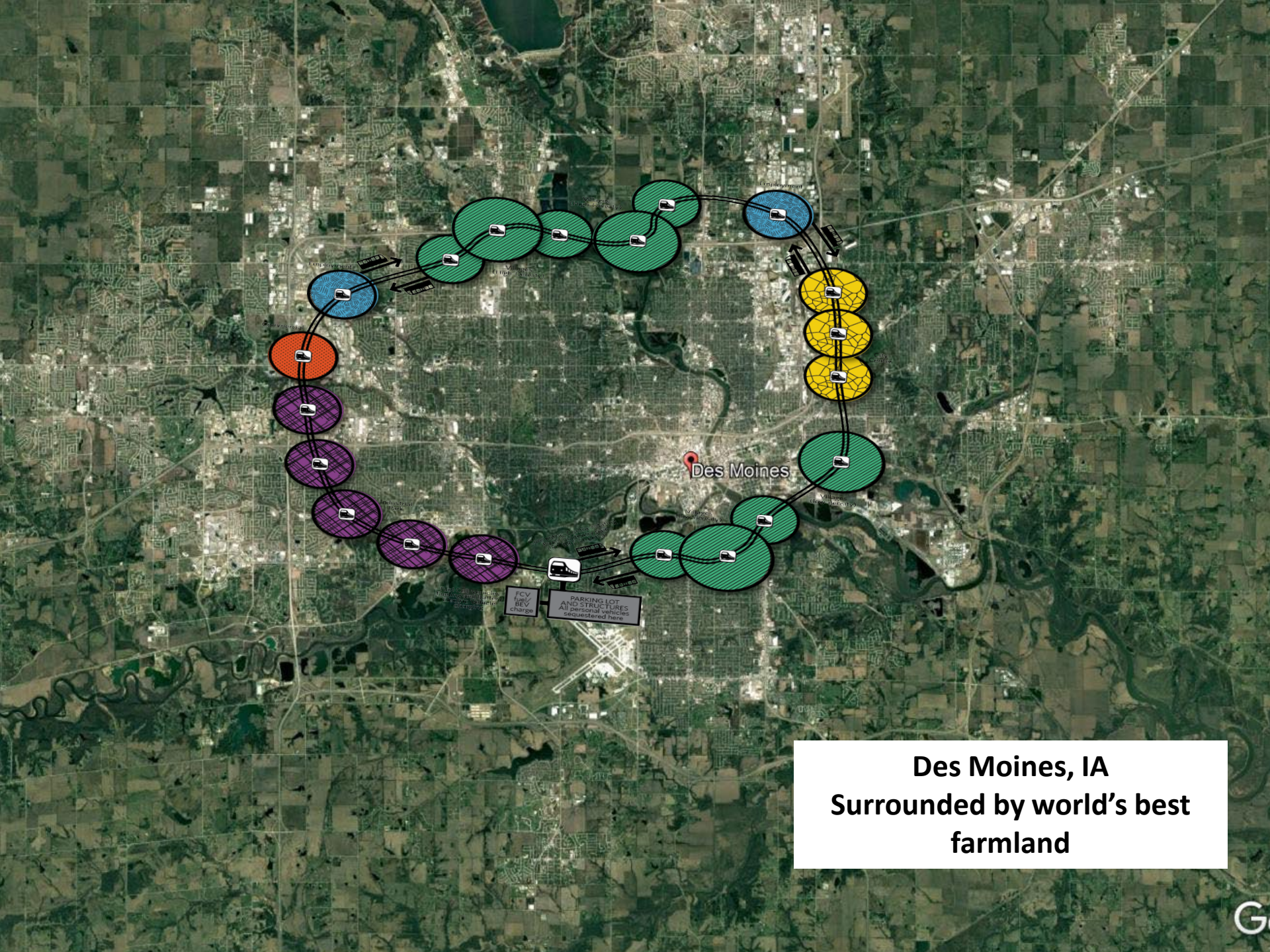
DESIGN CYCLE

Output:
RFP

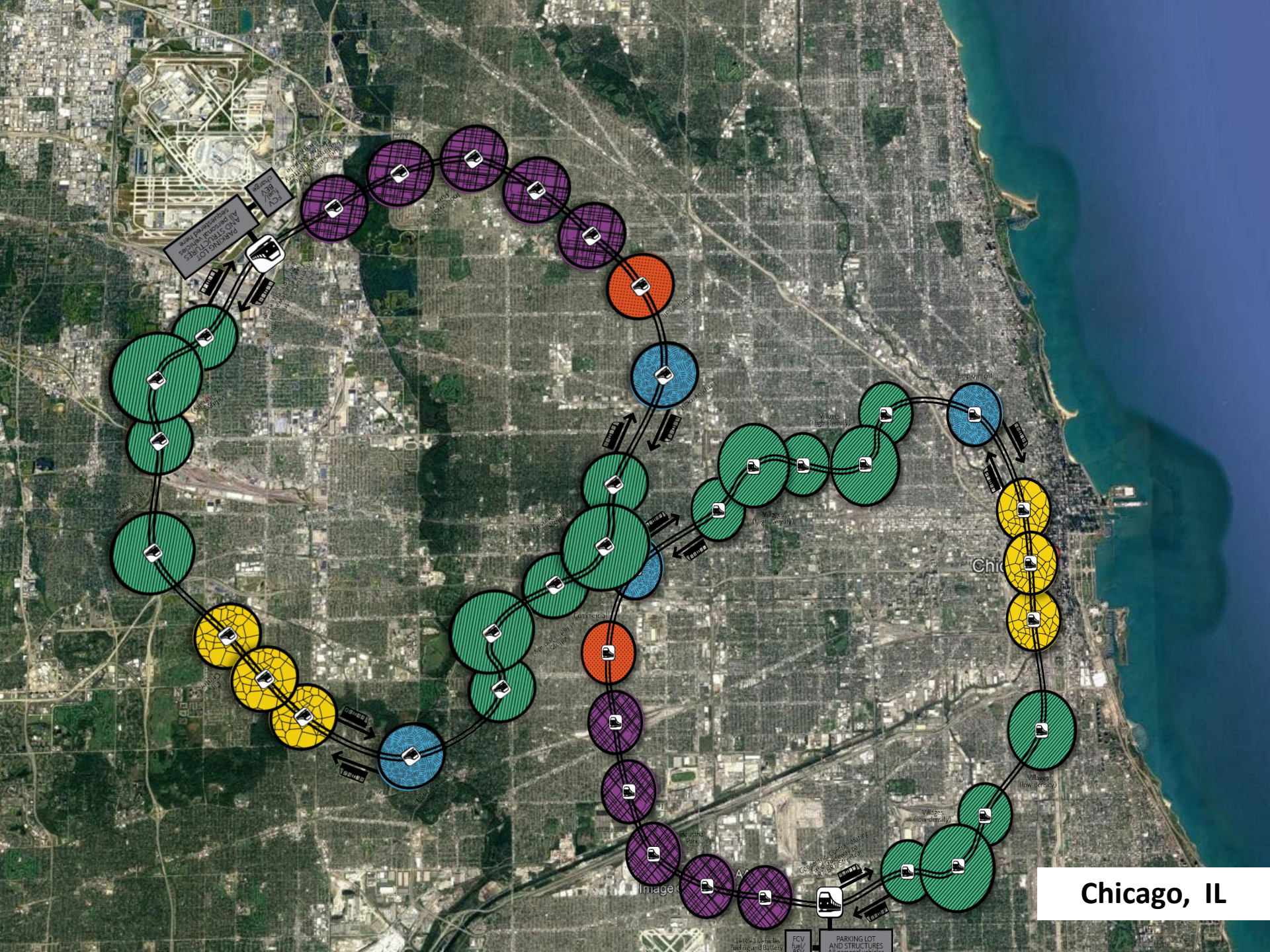
SUPERORDINATE GOALS:
TOTAL HUMAN ENTERPRISE
- Total decarbonization
- Total de-GHG
- Earth well-being
- Species survival

Designing Car-free Cities to Welcome Millions Fleeing Rapid Sea Level Rise

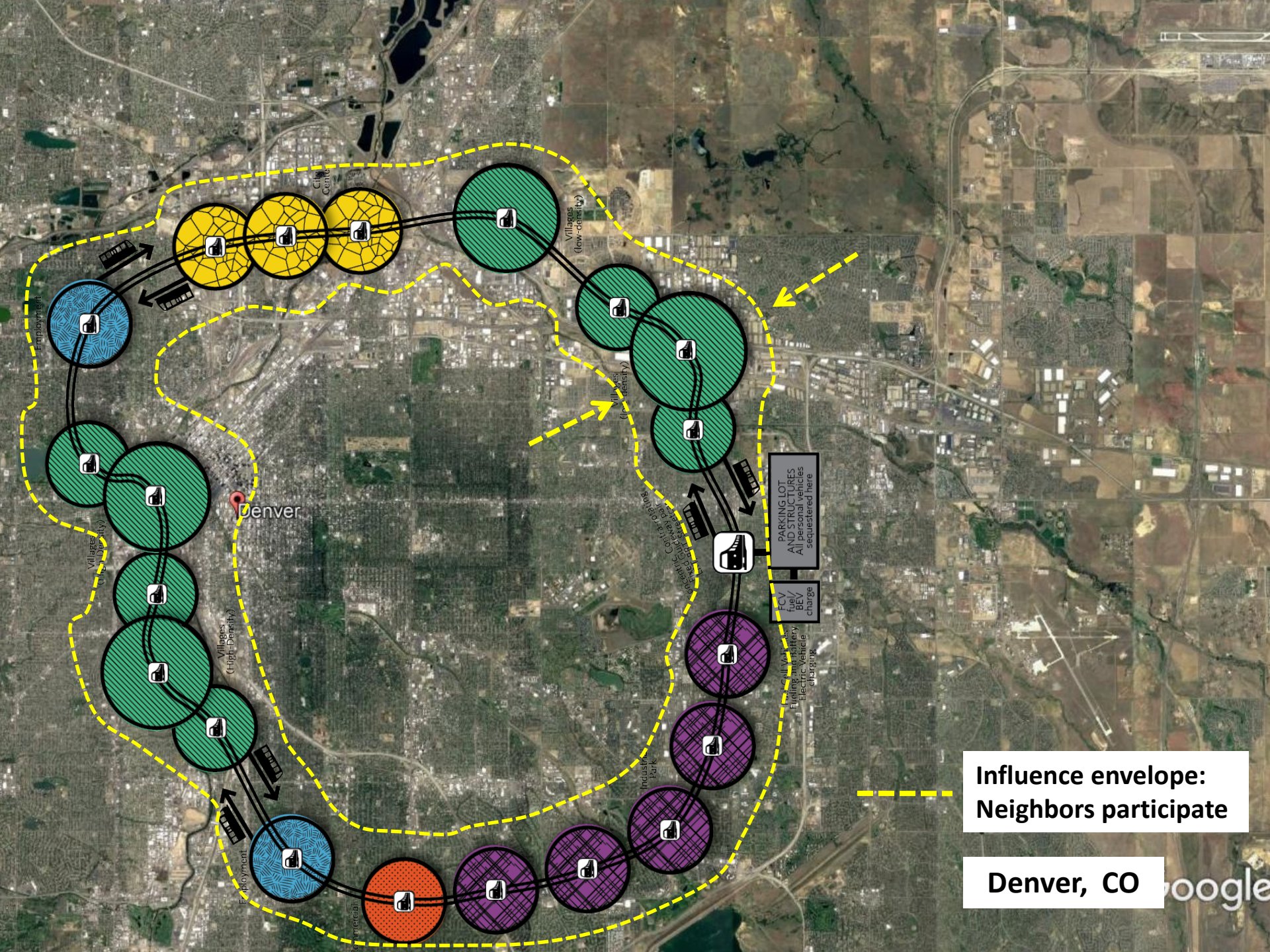

Salt Lake City, UT
low density
Google Earth

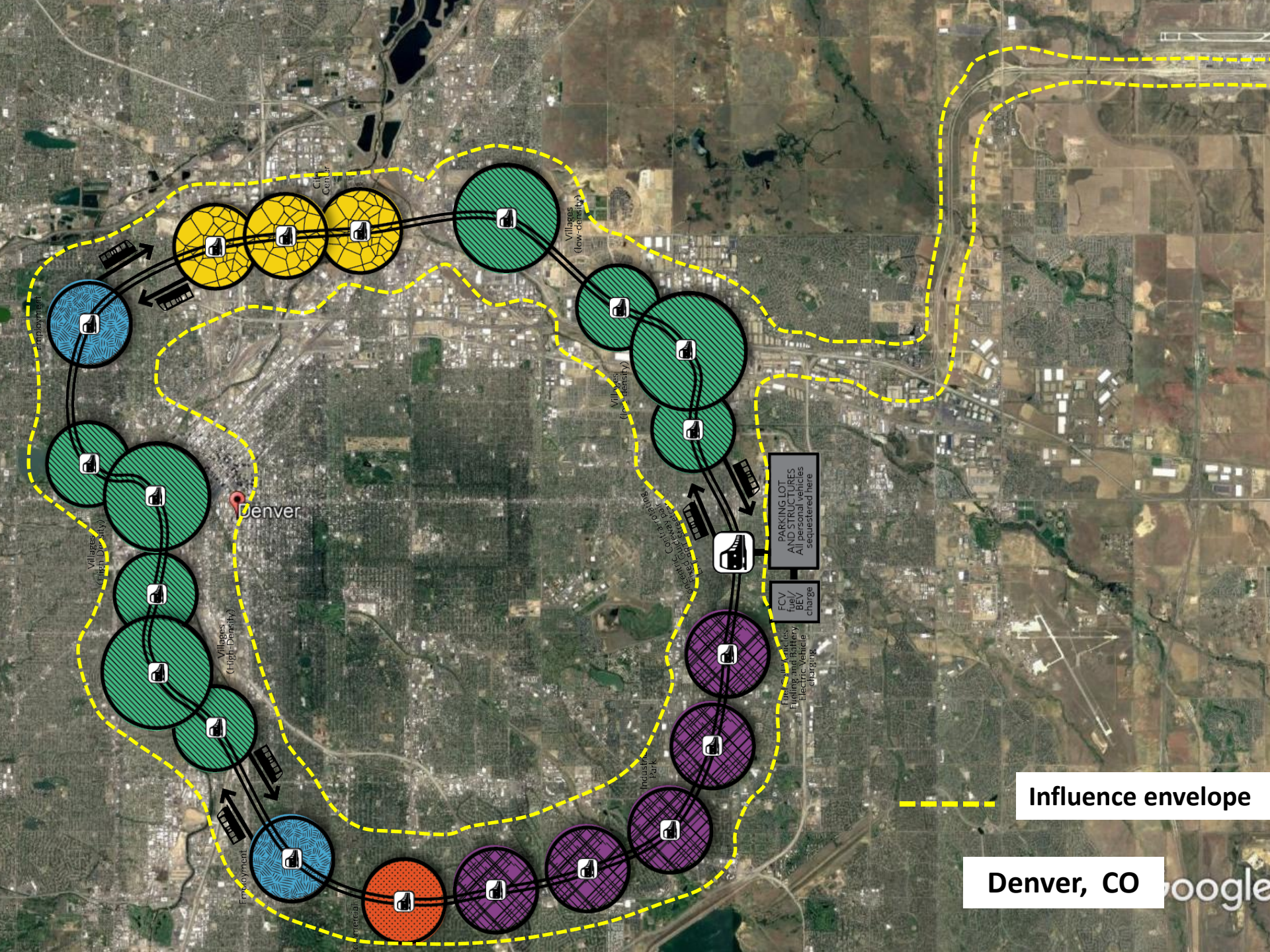


Des Moines, IA
Surrounded by world's best farmland


PARKING LOT AND STRUCTURES
PARKING LOT AND STRUCTURES
Chicago, IL

Employment
City Center
Villages (low-density)
Villages (low-density)
Denver
Villages (High Density)
Villages (High Density)
Employment
Commercial
Industrial Park
Fuel Cell Vehicles: Fueling and Battery Electric Vehicle charging
PARKING LOT AND STRUCTURES All personal vehicles sequestered here
FCV fuel/ BEV charge
Denver, CO


City Center
Villages (low-density)
Employment
Villages (low-density)
Denver
Villages (High Density)
Villages (High Density)
Employment
Industrial Park
PARKING LOT AND STRUCTURES All personal vehicles sequestered here
FCV fuel/ BEV charge
Influence envelope: Neighbors participate
Denver, CO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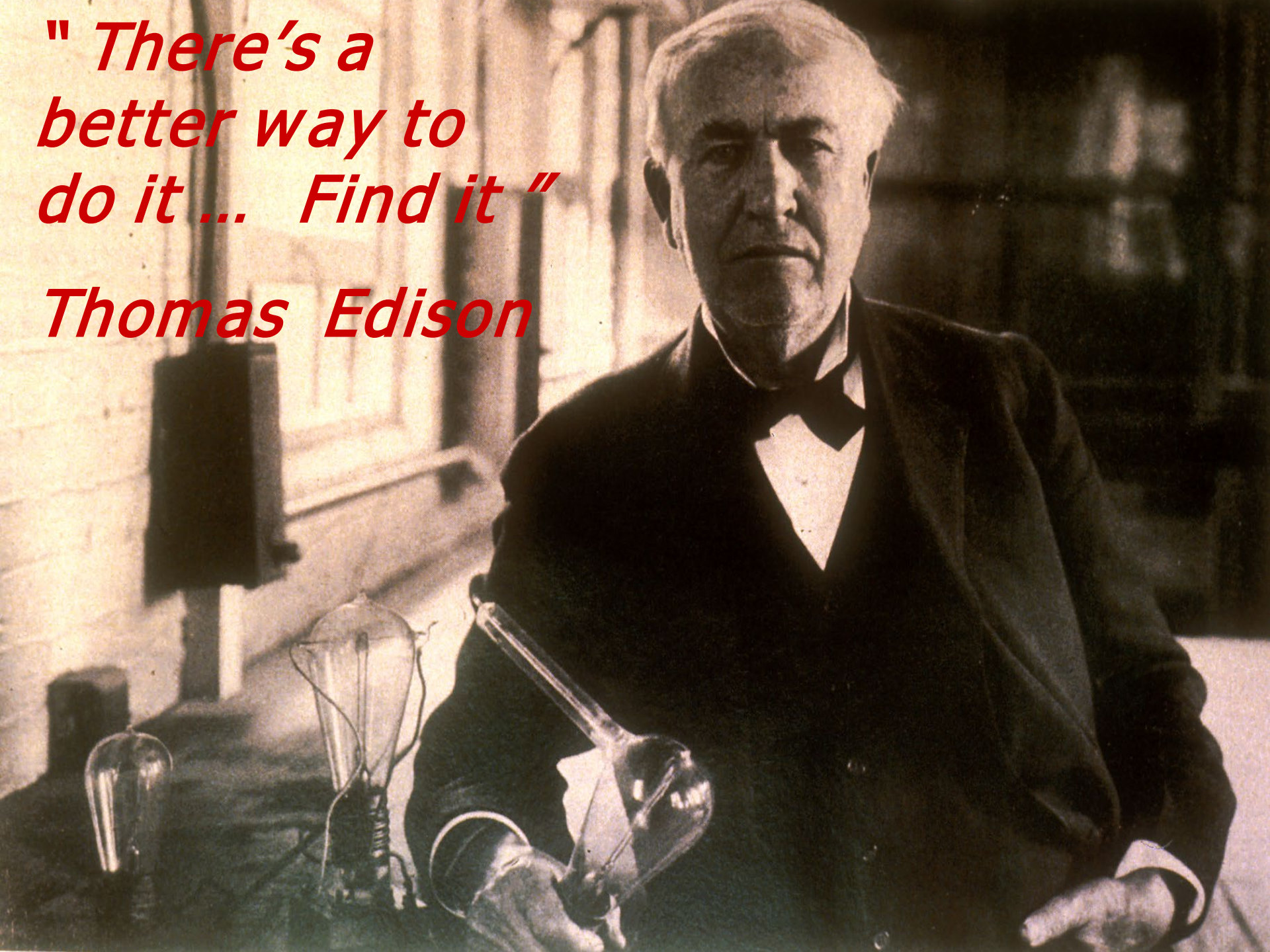
Denver, CO

"Climate Change"

- Warming
- Severe weather
- Sea level rise
- Ocean acidification
- Species extinction
- Human conflict

Responses:

- Mitigation: cut GHG
- Adaptation
- Geoengineering

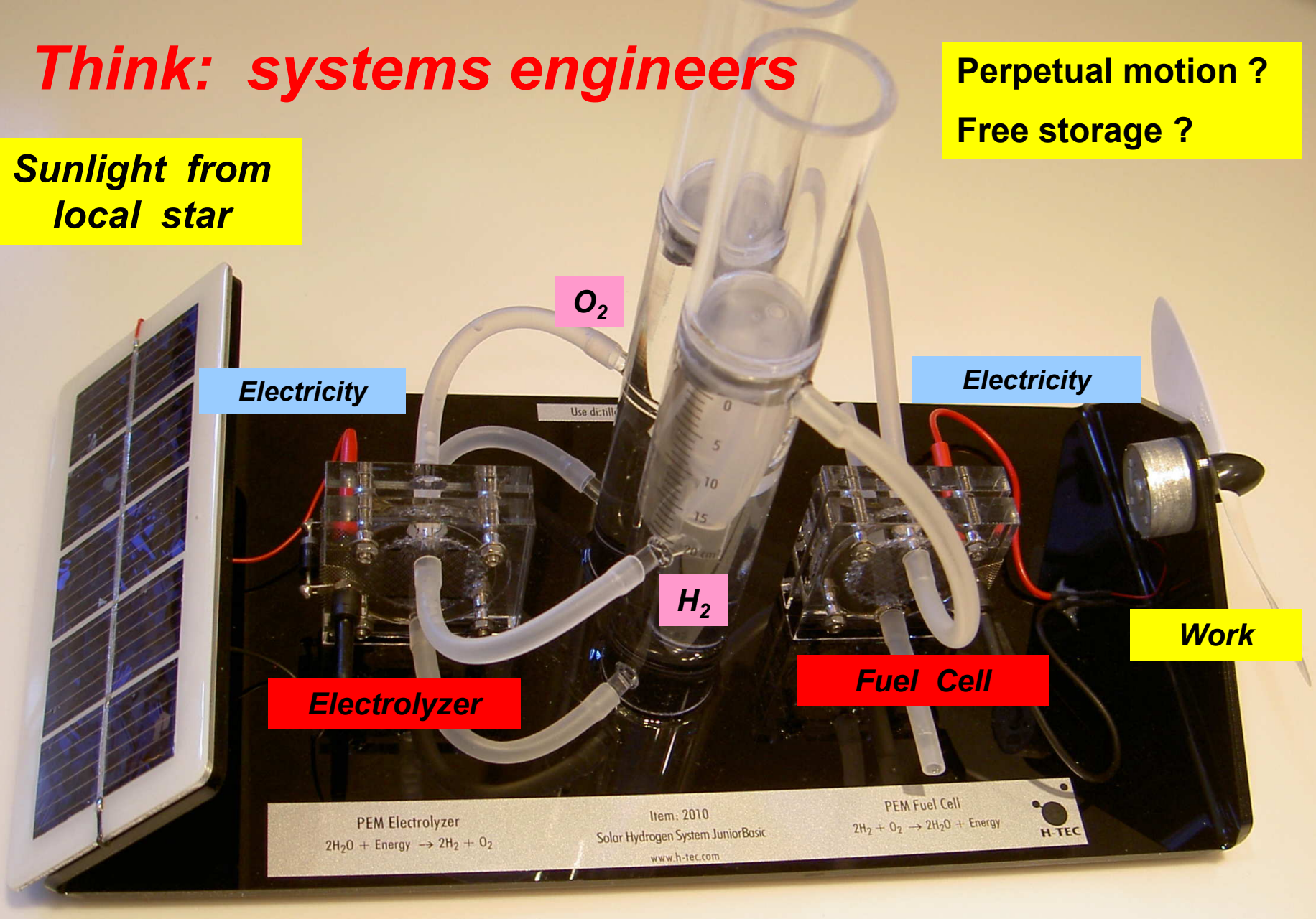

" There's a
better way to
do it ... Find it "
Thomas Edison

Think: systems engineers

Perpetual motion ?

Free storage ?

Sunlight from local star



Solar Hydrogen Energy System

Transform Entire Human Enterprise

- **Our responsibility, obligation**
- **“Climate Change” emergency**
- **All human activity**
- **Near-total de-carbonization (CO_2)**
- **Near-total de-GHG-emission**
- **Enormous business opportunity**

FOCUS: Transform world’s largest industry

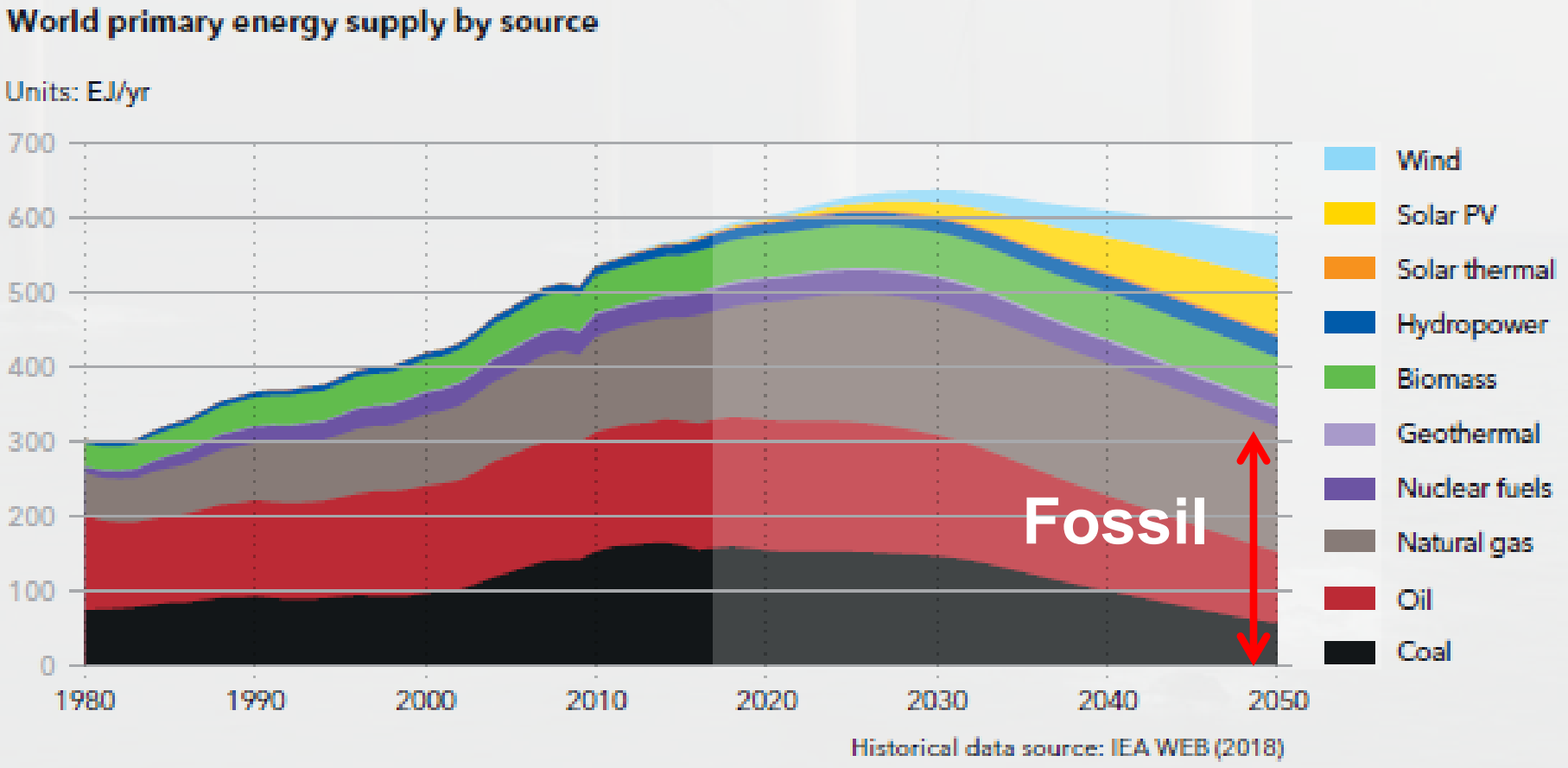
Energy: Greatest Humanitarian Gift

- **Gaia, species, systems, peoples**
- **Global energy system: achieves all --**
  - **Benign**
  - **Relatively safe**
  - **Inexhaustible**
  - **Affordable: competitive**
  - **Preserve natural capital: Earth**
  - **Firm and dispatchable**
  - **Storage inherently free**
  - **Resilient, robust: acts of God and man**
  - **Cyberattack resistant**
  - **Unobtrusive infrastructure**
  - **Equitable: no monopoly**
  - **Distributed, autonomous**
  - **Ubiquitous on Earth**

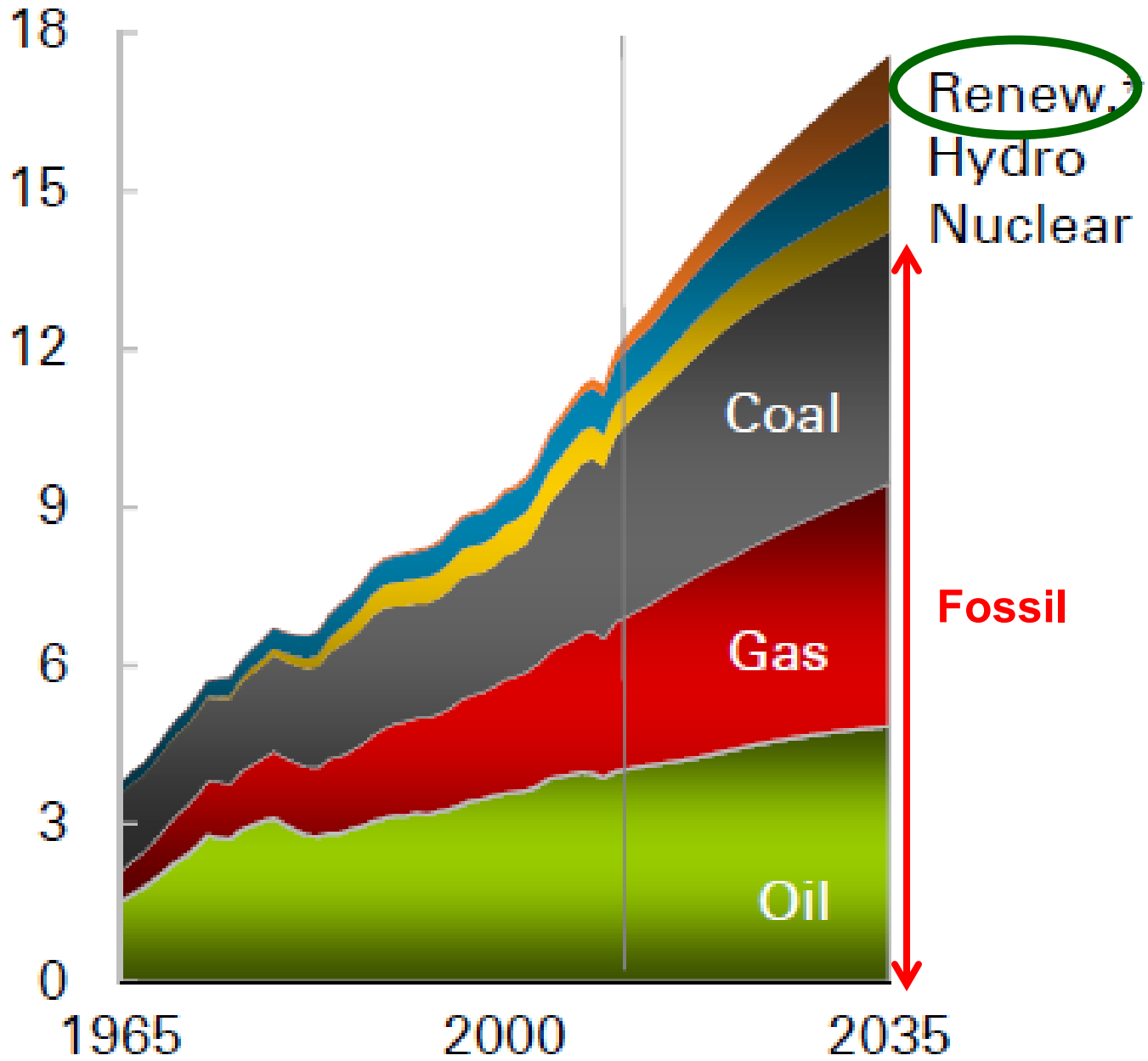
Transform Entire Human Enterprise

- **Humanitarian: prevent climate catastrophe**
- **Beyond energy, transport, electricity**
- **All human activity: "enterprise"**
- **Transform world's largest industry:**
  - **Quickly**
  - **Prudently**
  - **Profitably**

IEA: International Energy Agency, 2018



- Peak energy ~ 2030 640 EJ =
- Efficiency up
- Fossil fuels: 81 % → 56 % 2050



World Primary Energy Consumption

BP
Energy
Outlook
To 2035

January ‘14

World Energy Outlook 2019

International Energy Agency (IEA) www.iea.org / weo

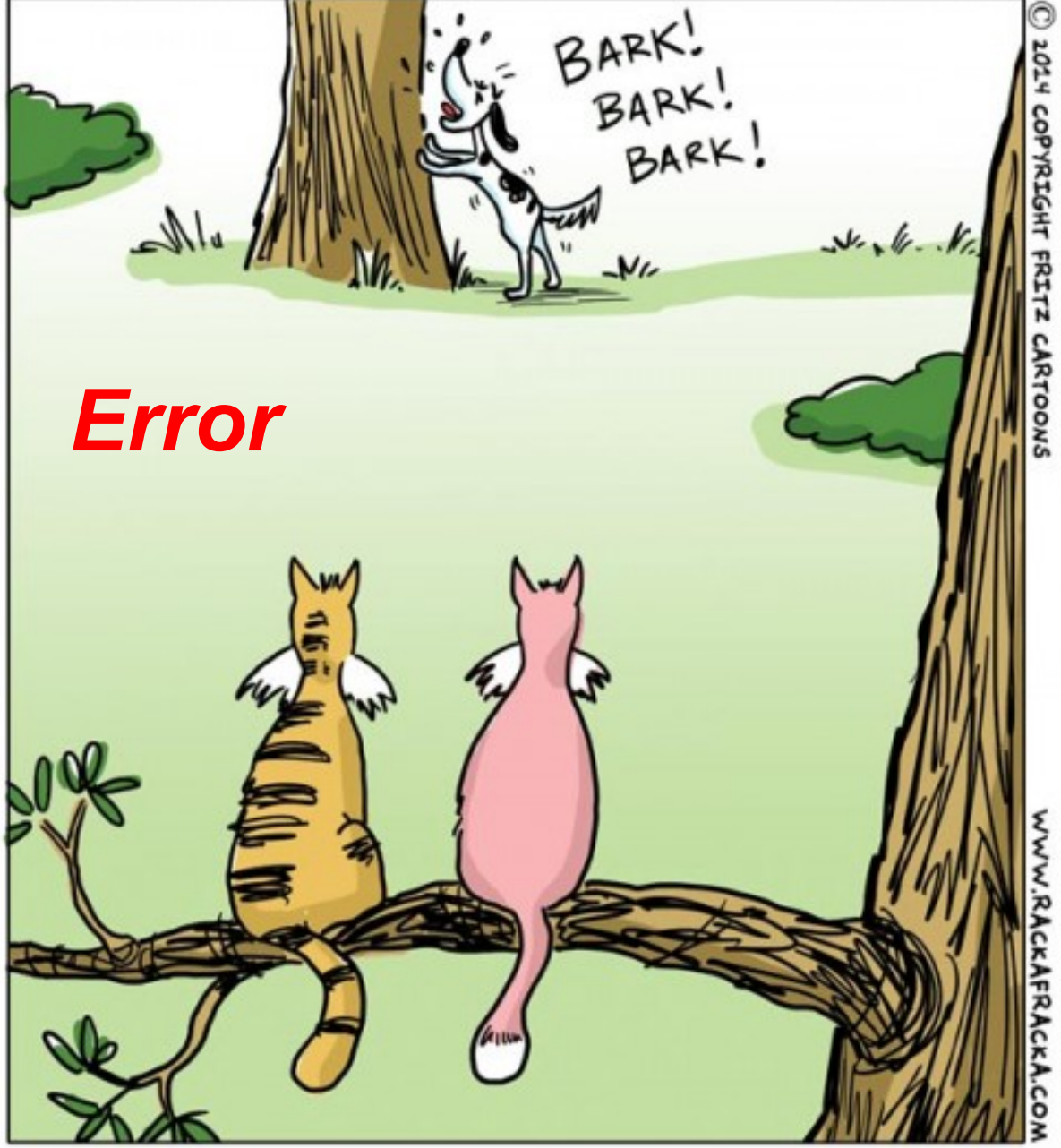
- **Dr. Fatih Birol, IEA Executive Director:**
  - **" … crystal clarity … there is no single or simple solution to transforming global energy systems."**
  - **"Without new policies in place, the world will miss its climate goals by a very large margin."**
- **Tomorrow's energy supply drivers:**
  - **Shale revolution**
  - **LNG (liquefied natural gas)**
  - **Falling costs of renewables**
  - **Digital technologies**
- **What is the world pathway to meet global climate targets and other sustainable energy goals?**
- **Africa: affect global trends ?**
  - **What energy choices**
  - **Rise of consumers**
- **Offshore wind: How large ?**
- **Could world's gas grids deliver low-carbon energy?**

Transform World's Largest Industry

Complete energy systems:

- Renewable energy (RE)
- CO2-emission-free (CEF)
- Multiple sources
- Variable generation (VG): Time-varying output
- Integrated, synergistic
- Electrochemical or Carnot ?
- Move, store, as electricity or as water-split Hydrogen ?
  - Electrochemical: " electrolyzer " proven
  - Photochemical: catalyst
  - Biochemical: photosynthesis
  - Thermochemical: High-T solar, nuclear
- Lower Dispensed Cost: Wind-source Hydrogen Fuel

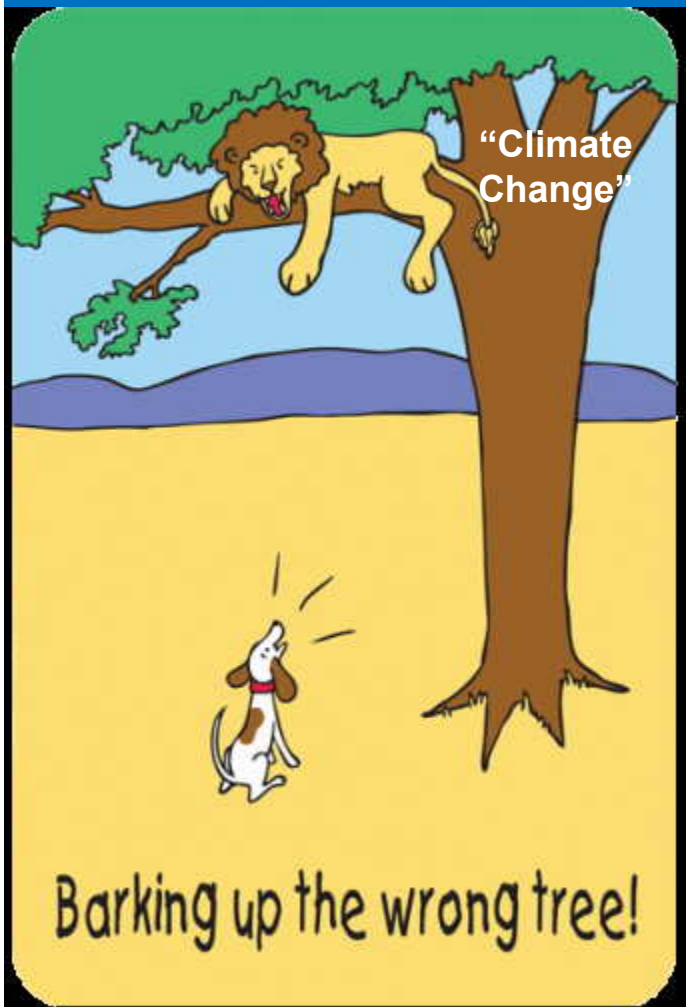
Entirely via electricity systems ?



BUSTER WAS CAUGHT BARKING UP THE WRONG TREE AGAIN.

Danger:

All eggs in electricity basket ?



“Grid”

Technically, Economically Suboptimal ?

Obsolete ?

Opportunity cost to persist ?

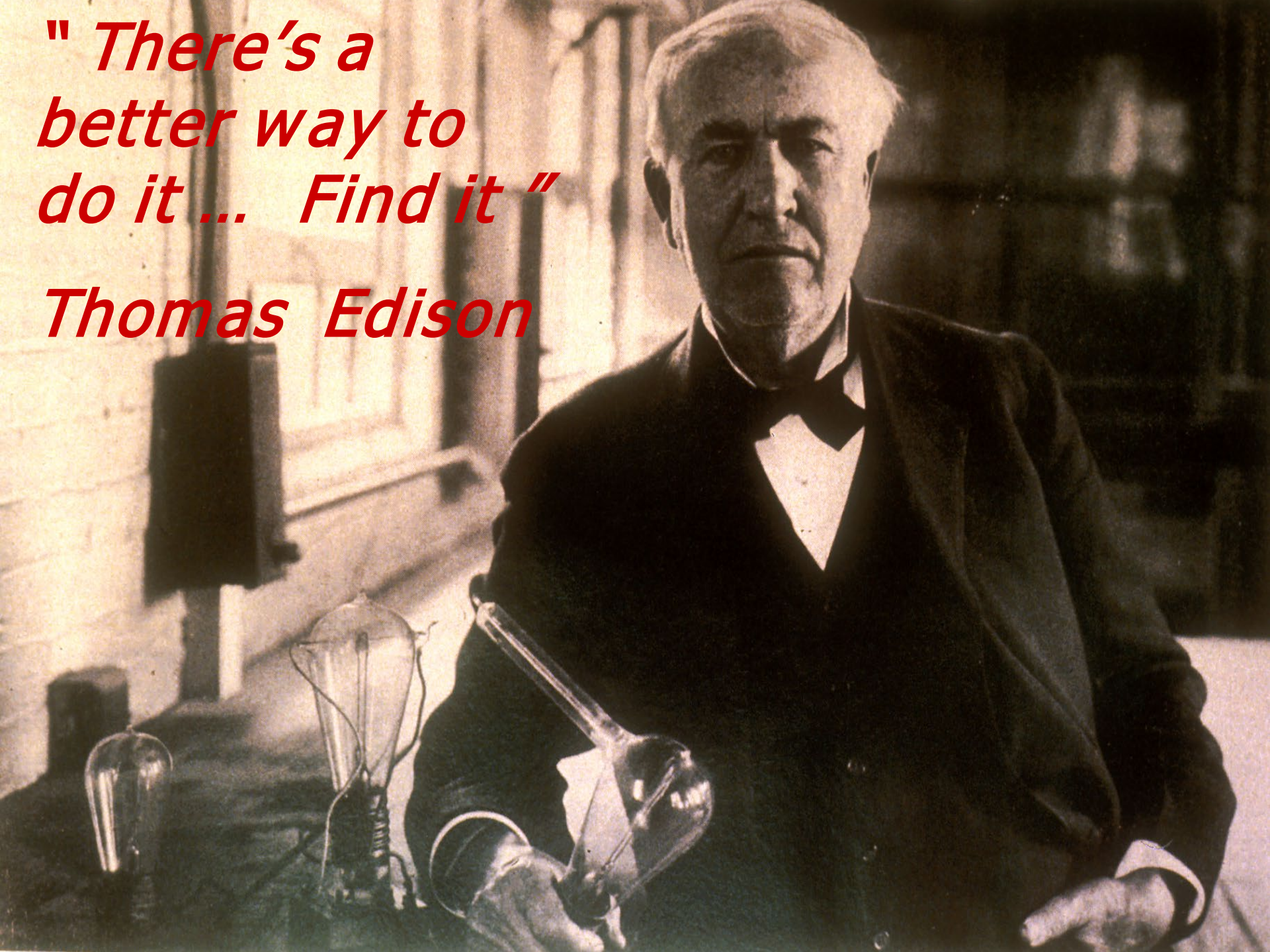
Mitigation: USA, Global, Local

Don't give up

- Quickly reduce, then zero, ALL anthropogenic greenhouse gas (GHG) emissions
- Transform the world's largest industry from ~ 85% fossil to ~ 100% renewable, CO_2-emission-free energy sources, as quickly as we prudently and profitably can
- Run the world on renewables
- Resist "adaptation" and "geoengineering"

1. **Complete, integrated, optimized, CO_2-emission-free energy systems based on C-free fuels – Hydrogen (H_2) and Anhydrous Ammonia (NH_3) – via pipelines**

2. **Deep (6 - 10 km), hot dry rock (HDR) geothermal via Electro Pulse Boring (EPB), to go deep enough, cheap enough, almost anywhere on Earth**


" There's a
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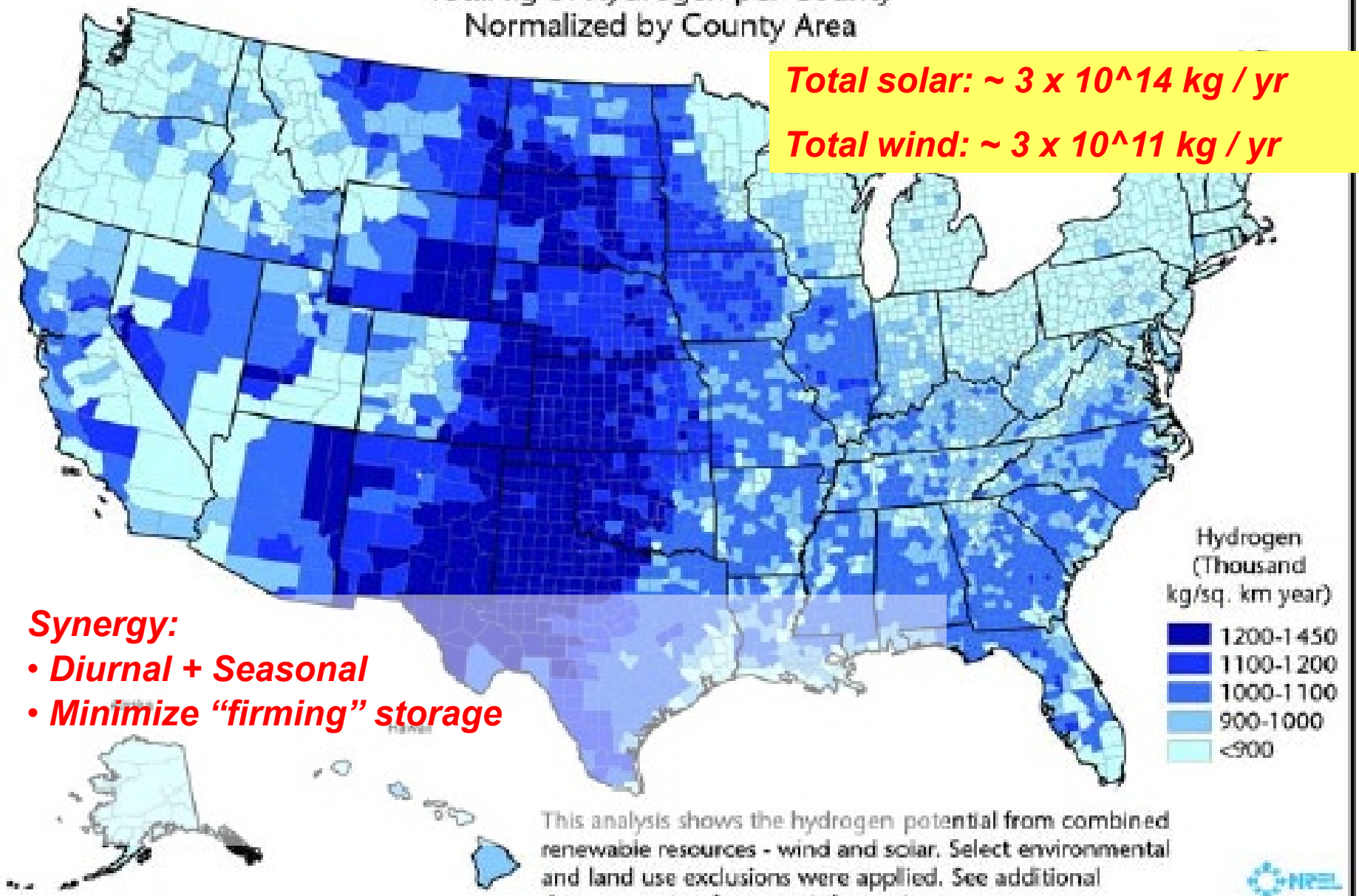
The Great Plains Wind Resource

Figure 3

Hydrogen Potential from Solar and Wind Resources

Total kg of Hydrogen per County
Normalized by County Area



Total solar: ~ 3 x 10^14 kg / yr

Total wind: ~ 3 x 10^11 kg / yr

Synergy:

- ***Diurnal + Seasonal***
- ***Minimize "firming" storage***

This analysis shows the hydrogen potential from combined renewable resources - wind and solar. Select environmental and land use exclusions were applied. See additional documentation for more information.


Zion, IL
Near Zion nuclear plant, Oct 02

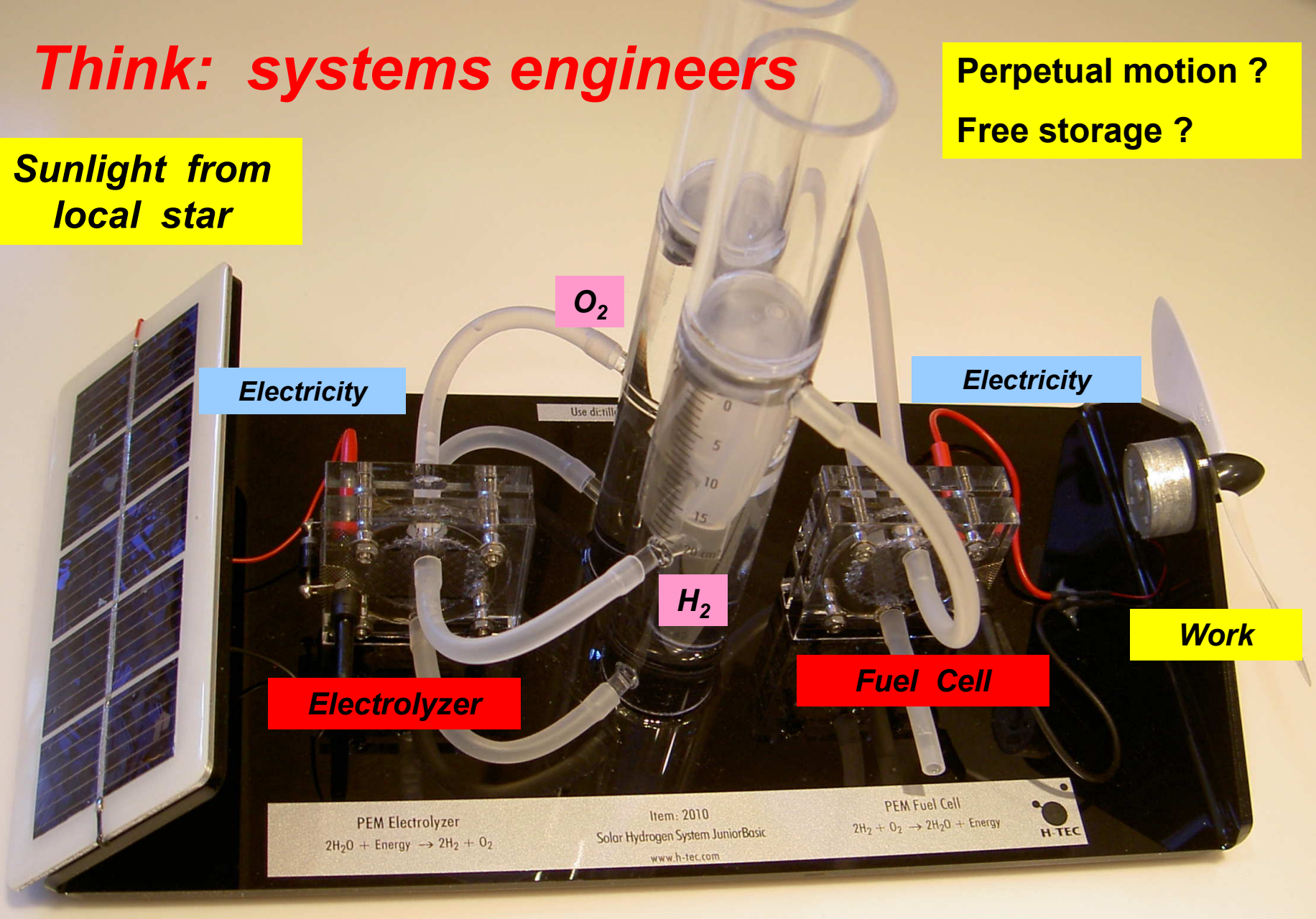
Vulnerable to acts of God and man

Think: systems engineers

Perpetual motion ?

Free storage ?

Sunlight from local star



Solar Hydrogen Energy System

Transform World's Largest Industry

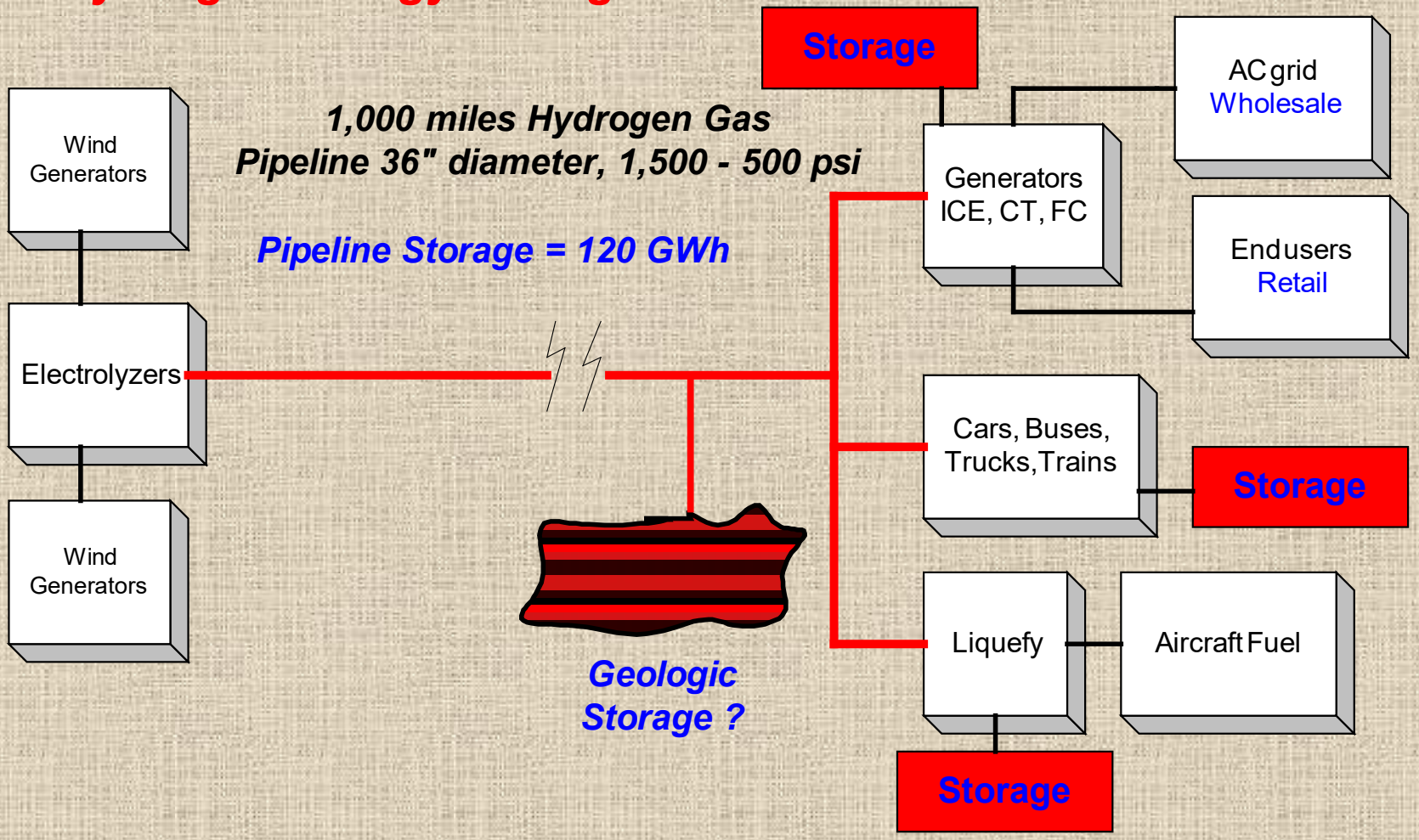
Hypothesis:

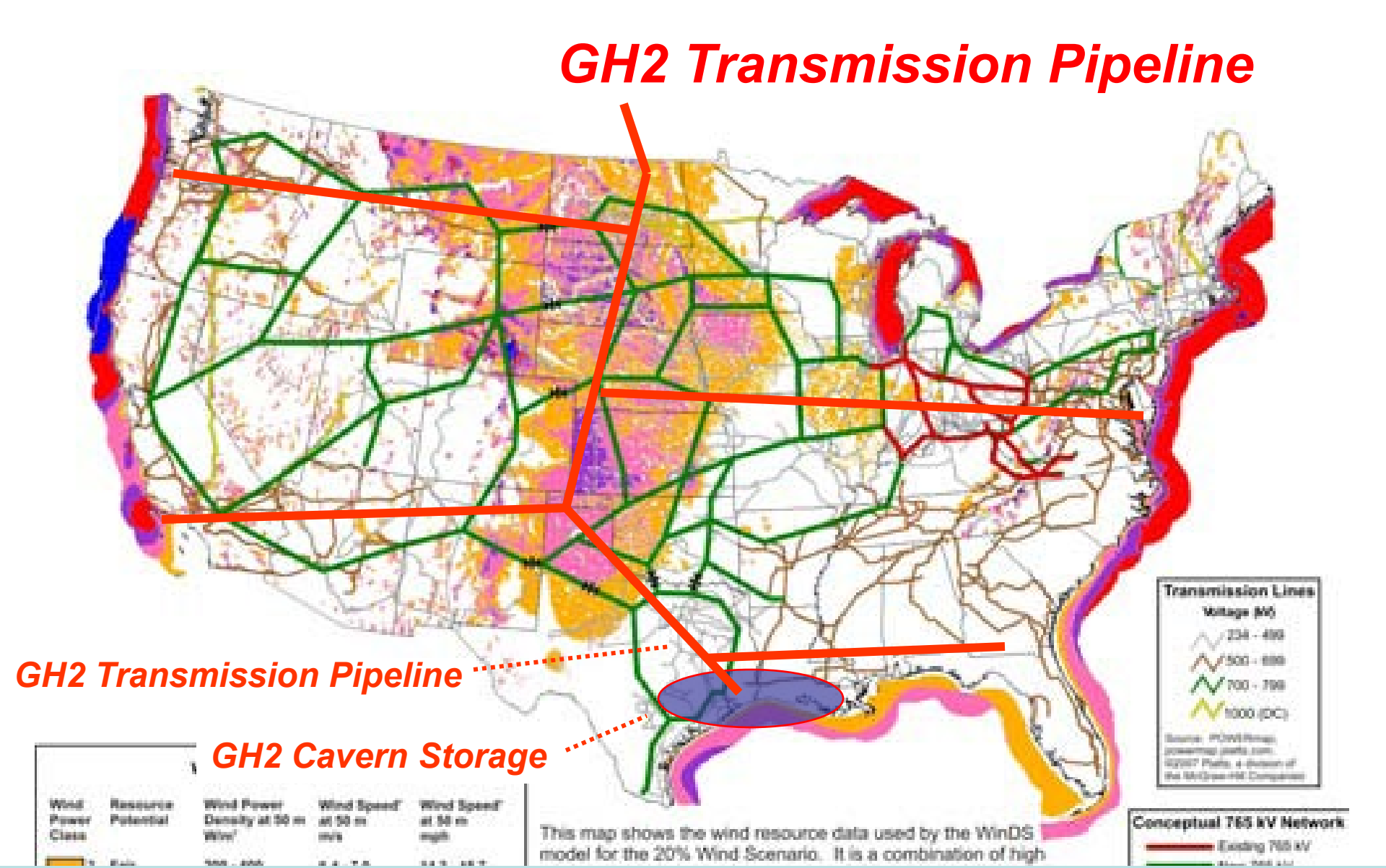
- **Limit elec to "first & last km, m" of energy system**
- **C-free fuels between: pipelines, low-cost storage**

How to know ? Who will model, study, propose ?

- **Urgent !**
- **Prevent opportunity costs: wasted capital → Grid invest**
- **Collaborative + funding**
- **Optimum mix, strategy**

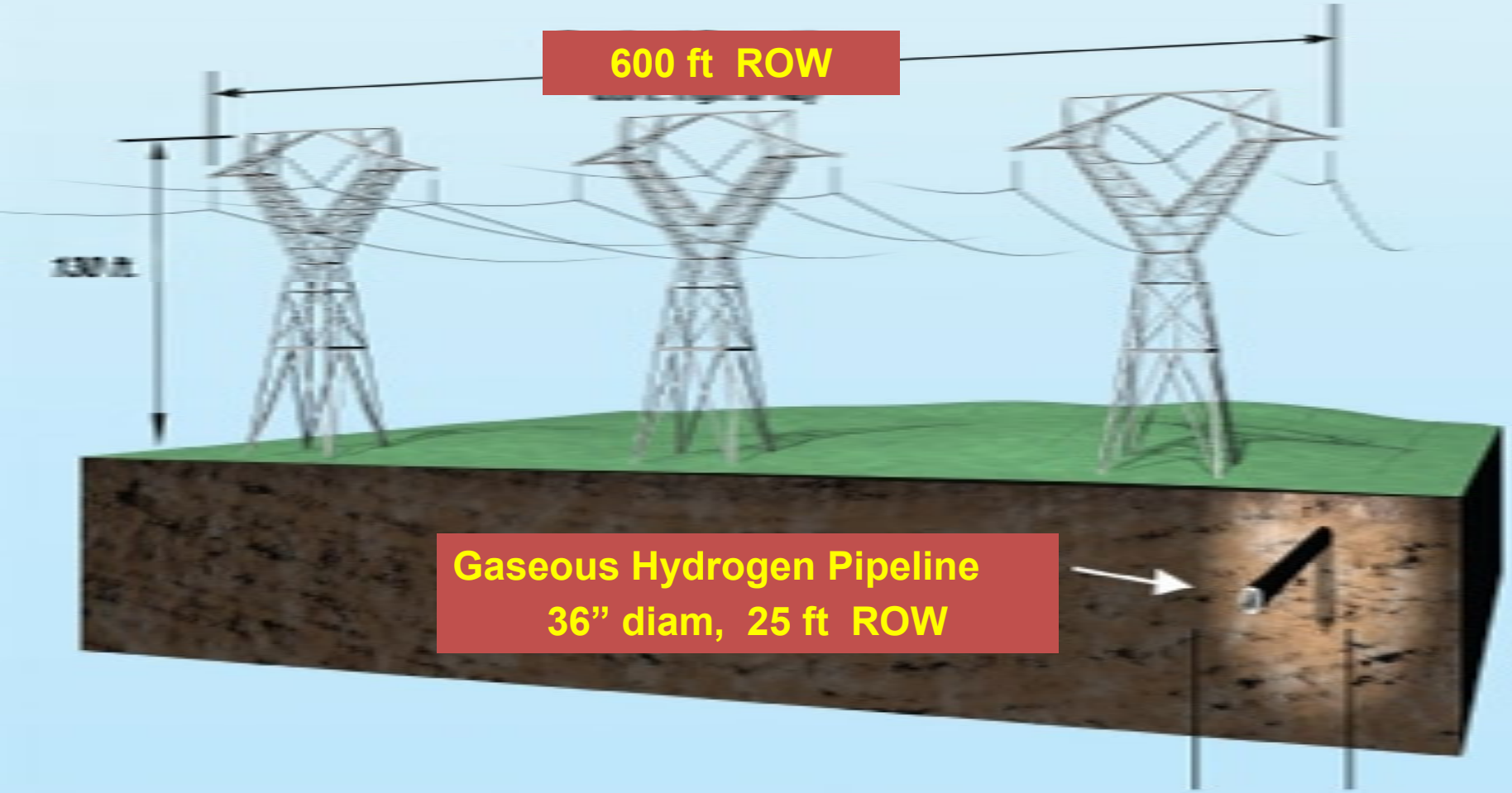
Hydrogen Energy Storage





Wind Potential ~ 10,000 GW

12 Great Plains states



Out of Sight, Out of Harm’s Way

8,000 MW alternatives: HVAC vs Hydrogen Pipeline

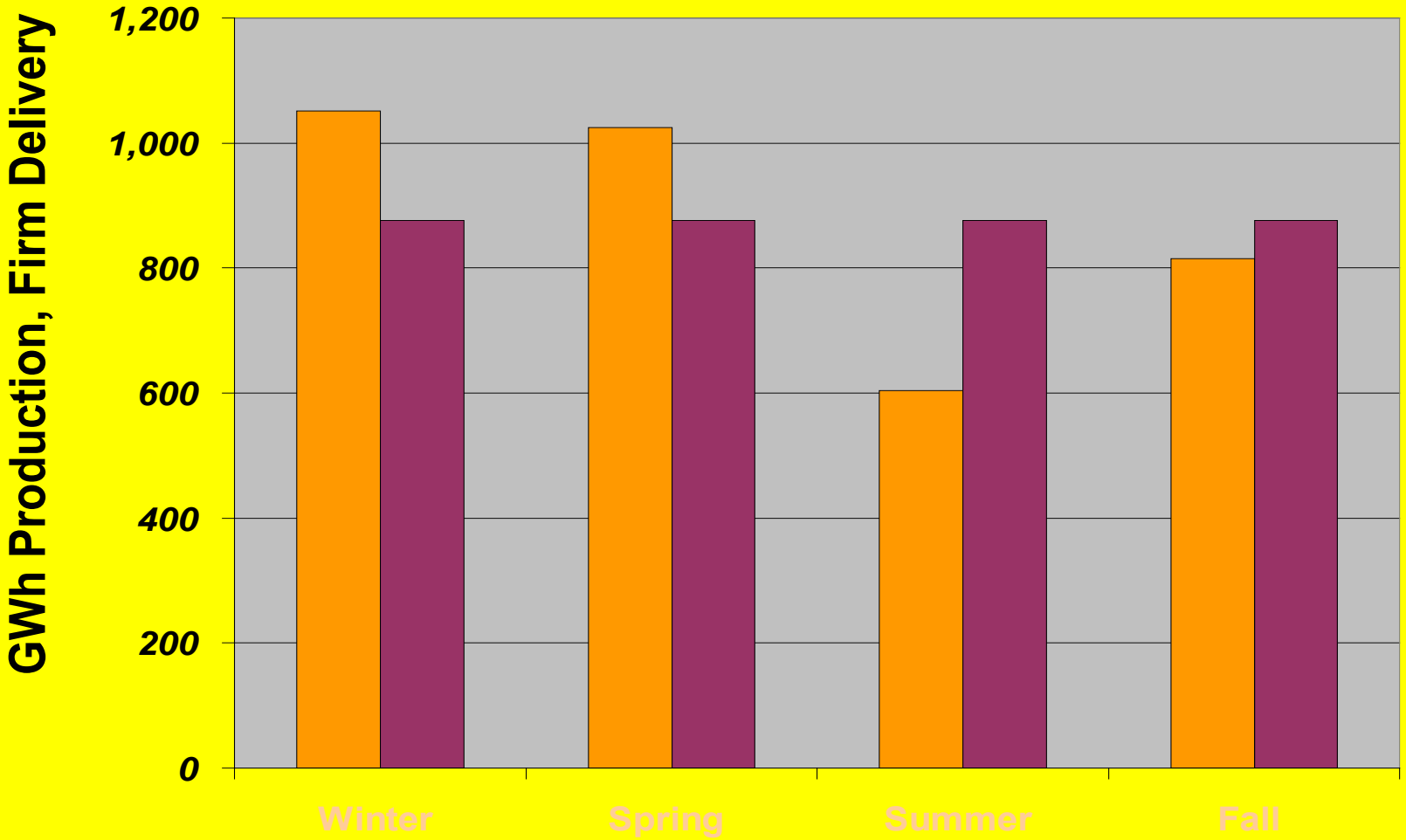
Wind Seasonality, Northern Great Plains

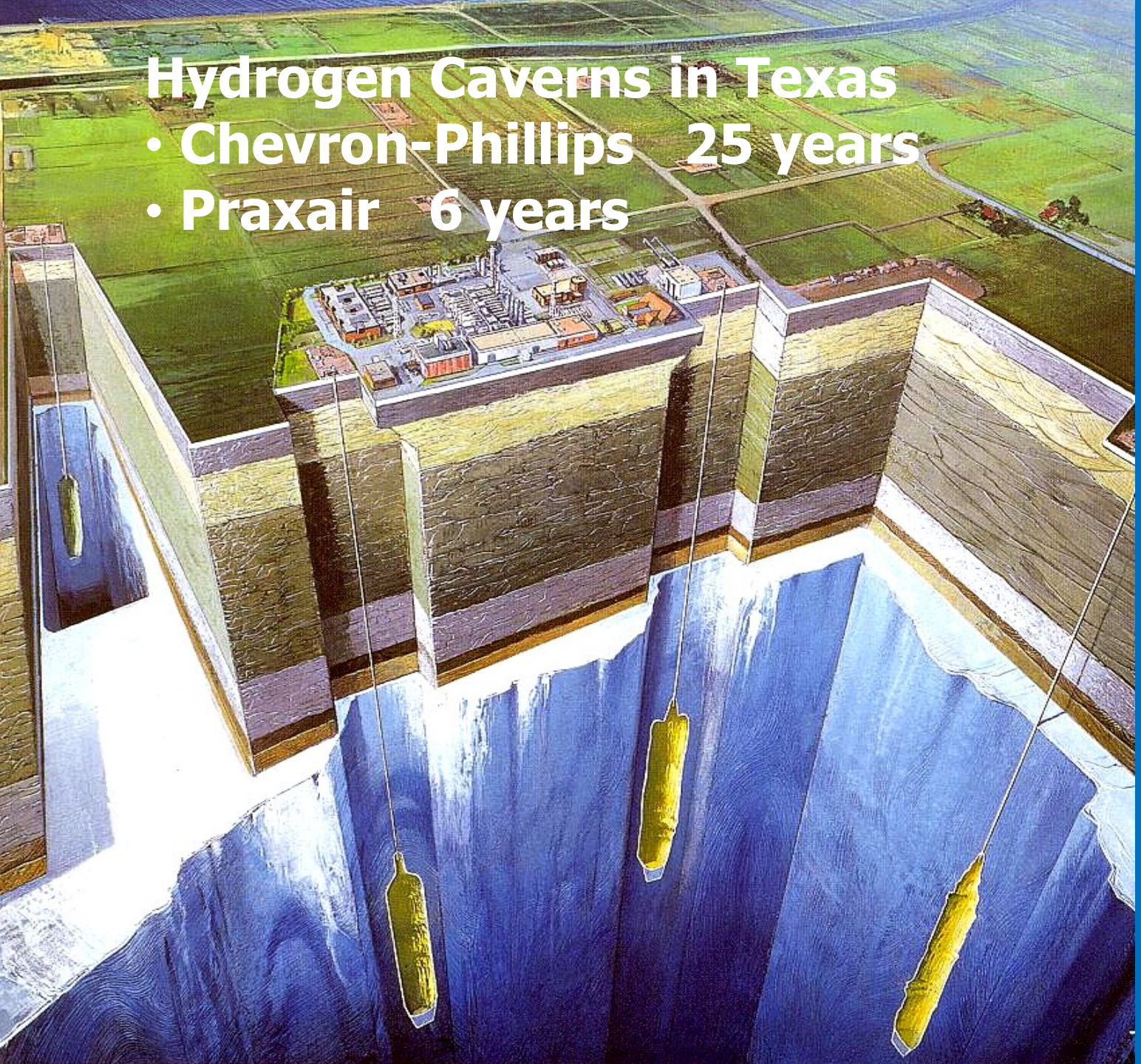
1,000 MW windplant: AEP = 3,500 GWh / yr

"Firm" goal = 875 GWh / season

Storage: 320 GWh per 1,000 MW wind

Source: NREL, D. Elliott





Domal Salt Storage Caverns

Each:

90 GWh

$ 15 million capex

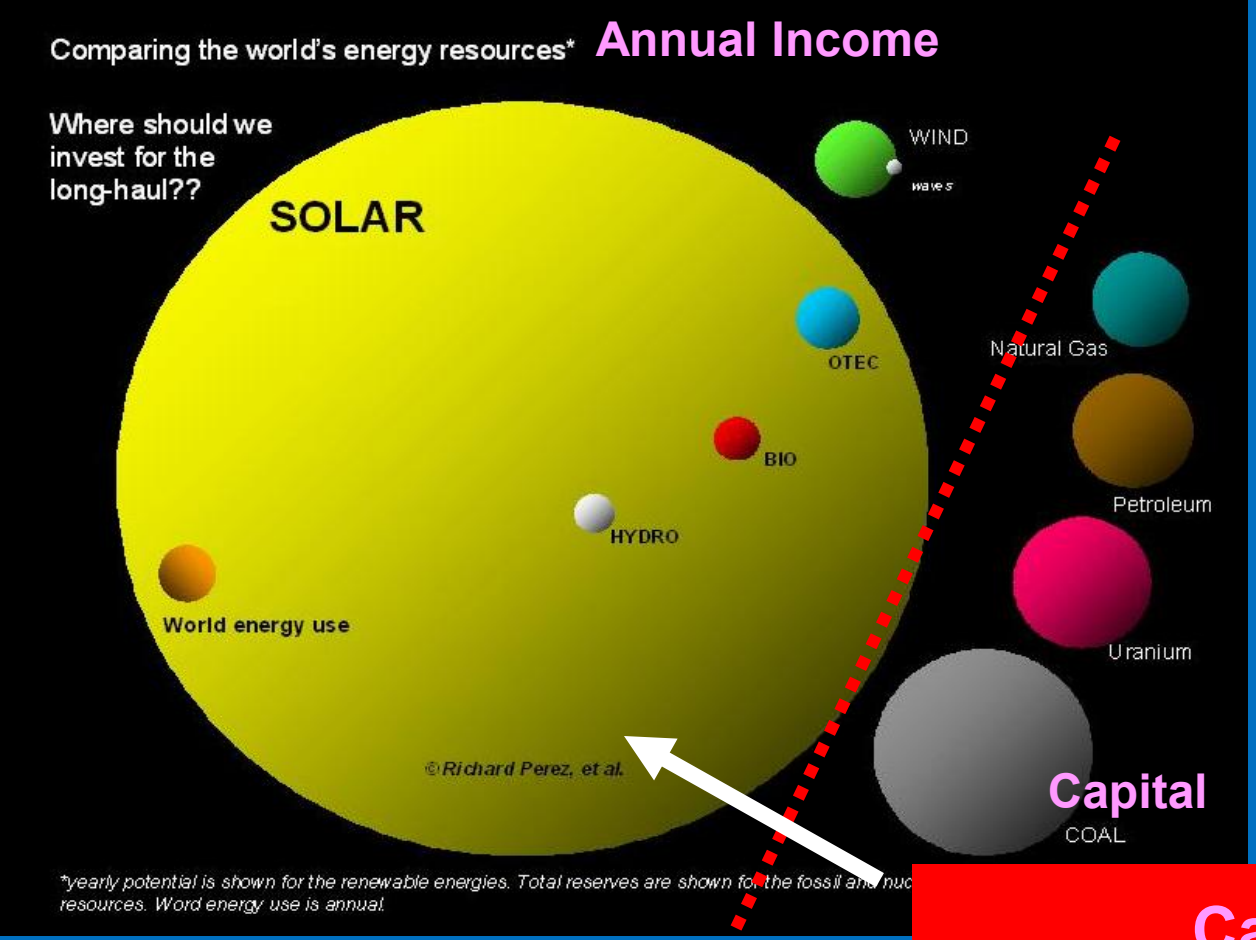
$ 0.20 / kWh

Li-Ion battery production (Bloomberg)

Global total 2017 = 103 GWh / year

Global total 2021 = 278 GWh / year

- **Hydrogen: 1 salt cavern @ $ 15-20 million = 90 GWh**
- **Ammonia: 1 liquid tank @ $ 15-20 million = 200 GWh**



Capital: ROI

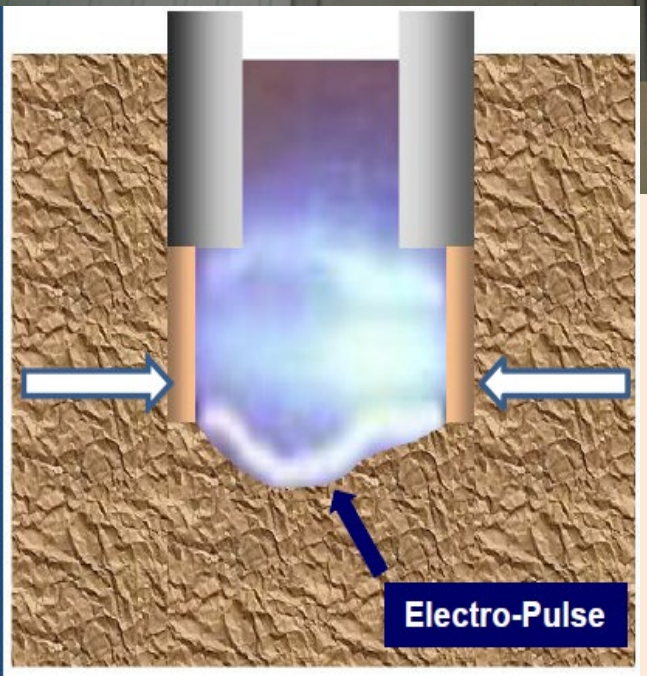
Deep (6-10 km)

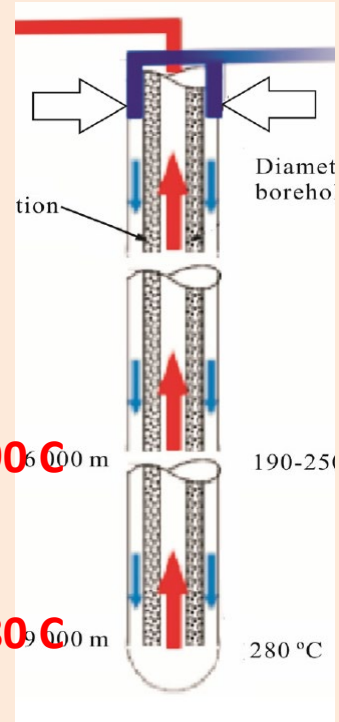
Hot Dry Rock (HDR)

Geothermal

Electro Pulse Boring

- Deep geothermal heat: 240 C @ 8 km
- Electricity + DHS heat, anywhere
- Low-cost rock breaking in tension
- "Deep enough, cheap enough"
- No rotary abrasive drilling; drill rig ?
- Goal: $ 150 / m, 50 cm diam, 5-10 km
- Hose return cuttings to surface
- Casing only through topsoil, aquifers





6,000 m 190 C

9,000 m 280 C

Thermosiphon:
Greatly reduced pumping cost.
No fracking at depth.

“ Americans can be counted on to always do the right thing –

but only after they have tried everything else ”

Winston Churchill

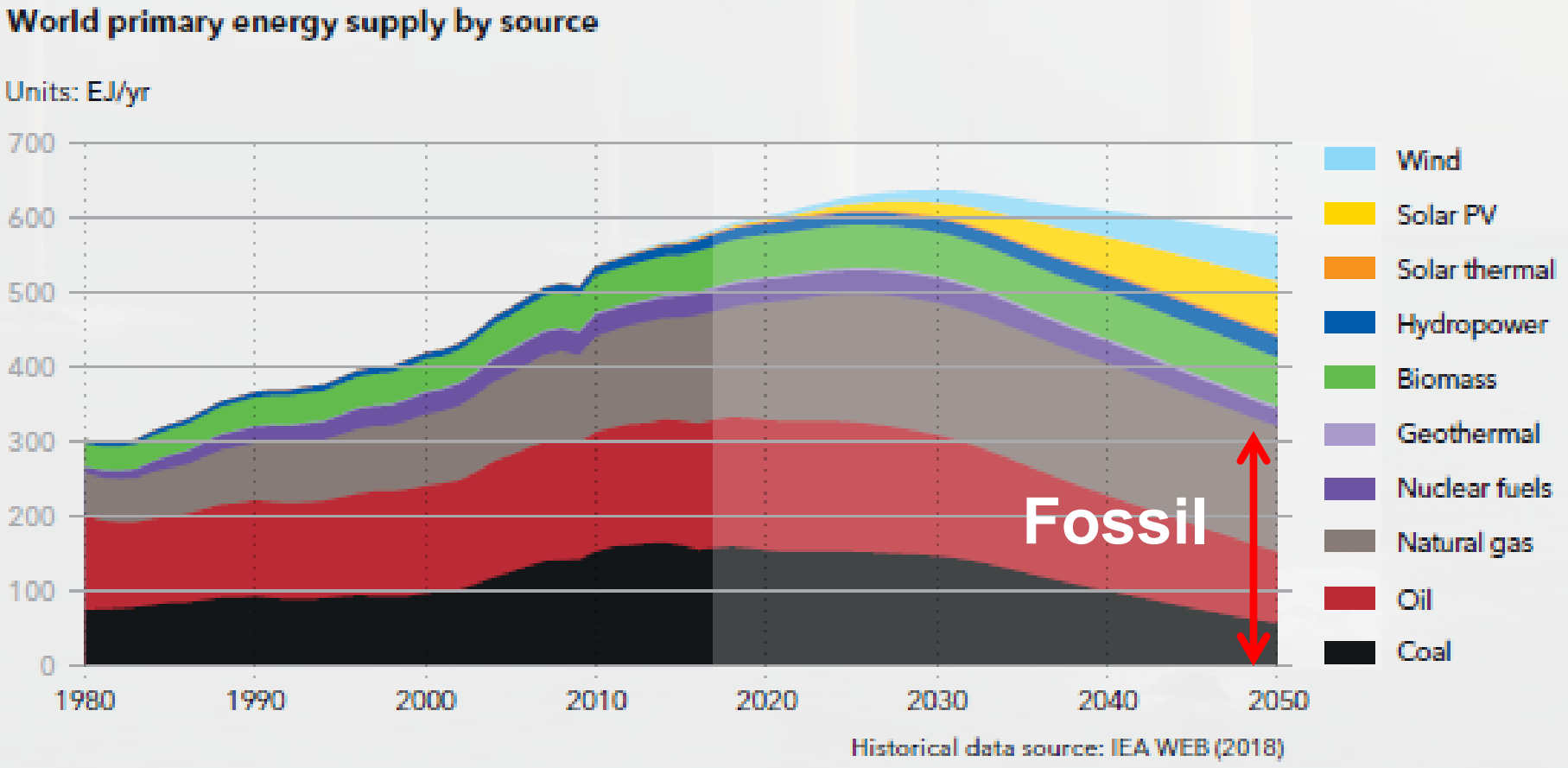
The dog caught the car.

Dan Reicher

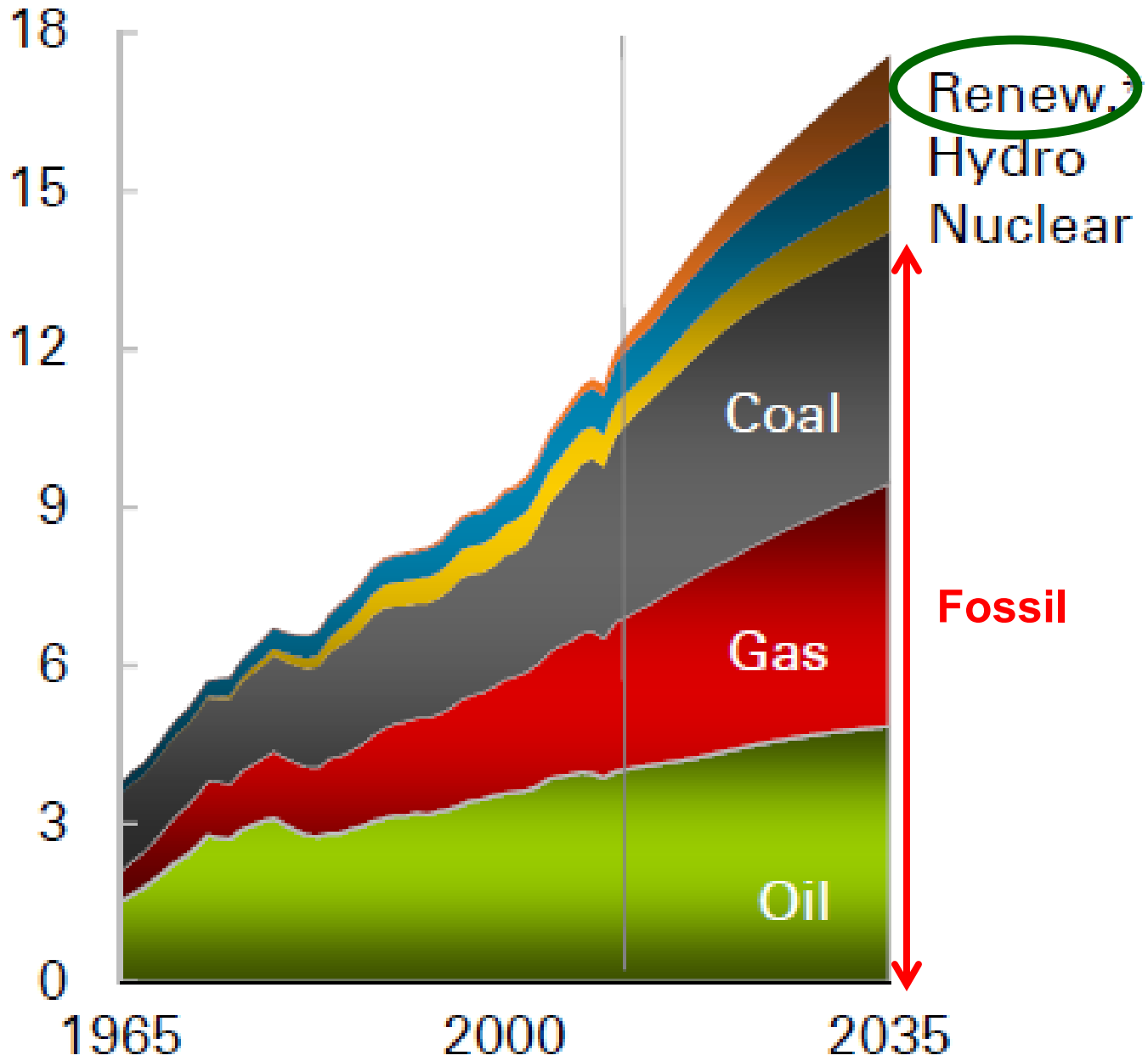
Far more Ambitious:

- Unacceptable scenarios: better, faster
- Renewables industry
- Beyond electricity systems
- Transportation + CHP fuels
- Hydrogen + ammonia fuels
- Run the World on Renewables
- ~ 100 % GHG-emission-free energy
- ~ 100 % GHG-emission-free enterprise

IEA: International Energy Agency, 2018



- Peak energy ~ 2030 640 EJ =
- Efficiency up
- Fossil fuels: 81 % → 56 % 2050



World Primary Energy Consumption

BP
Energy
Outlook
To 2035

January ‘14

"Climate Change"

- Warming
- Severe weather
- Sea level rise
- Ocean acidification
- Species extinction
- Human conflict

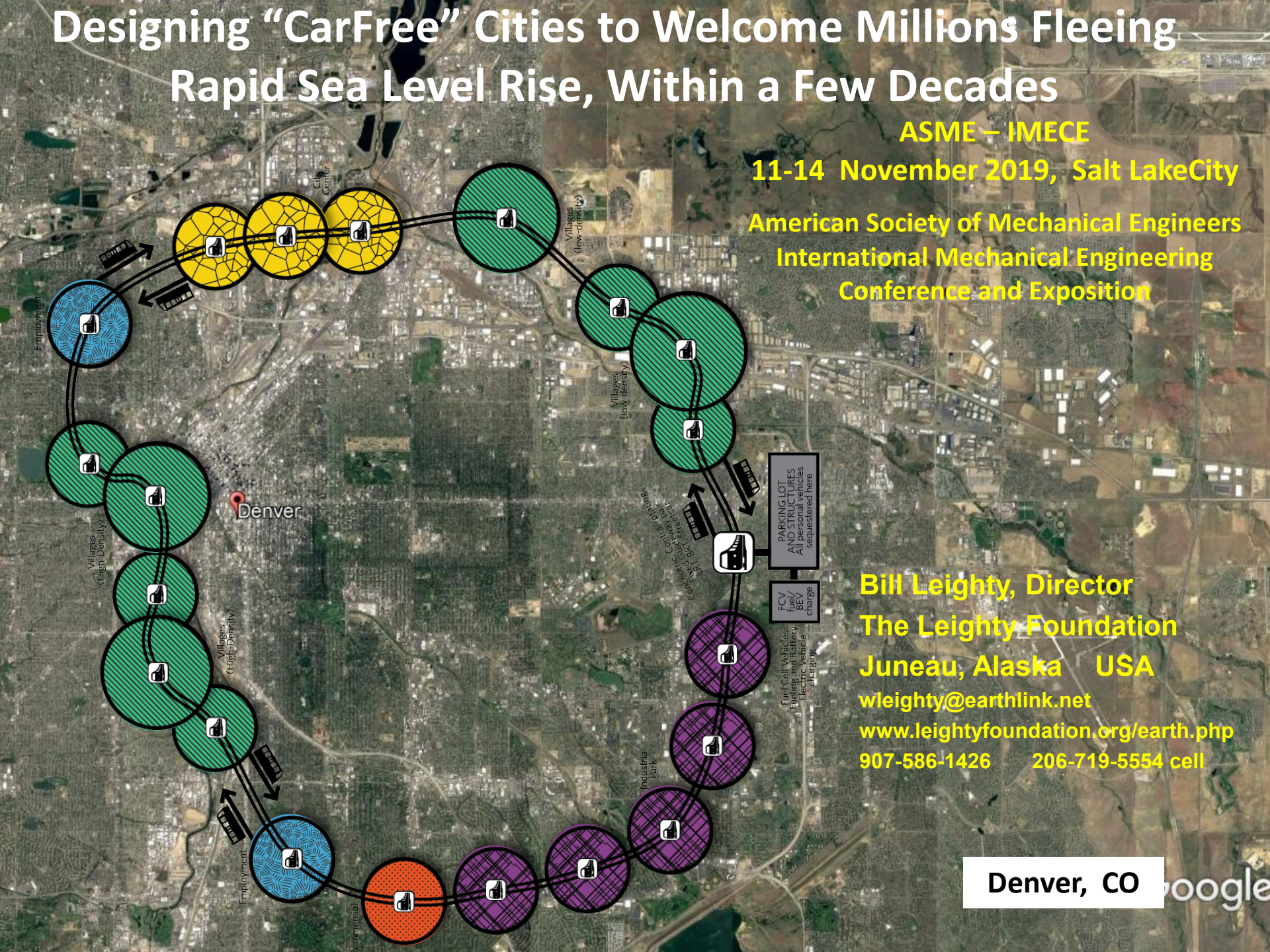
Responses:

- Mitigation: cut GHG
- Adaptation
- Geoengineering

Designing "CarFree" Cities to Welcome Millions Fleeing Rapid Sea Level Rise, Within a Few Decades

ASME – IMECE
11-14 November 2019, Salt LakeCity

American Society of Mechanical Engineers
International Mechanical Engineering
Conference and Exposition



Bill Leighty, Director
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Juneau, Alaska USA
wleighty@earthlink.net
www.leightyfoundation.org/earth.php
907-586-1426 206-719-5554 cell

END 14 Nov 19 presentation at
ASME – IMECE , Salt Lake City

Following slides are supplemental.
See more presentations, posters, videos at:
www.leightyfoundation.org/earth.php

REFERENCES

- http://www.carfree.com/
  - "Carfree Cities" J.H. Crawford's first book
  - "Carfree Design Manual" J.H. Crawford's second book
- The Water Will Come, Jeff Goodell, 2017. Little, Brown. ISBN 978-0-316-26024-4
- http://carfreealliance.org/ (empty)
- http://www.carfree.com/book/index.html
- http://www.carfree.com/cdm/index.html
- http://www.carfree.com/ven/ "Venice: Europe's largest carfree city"
- https://vimeo.com/146997345 "Recovering from Disruption" video
- https://vimeo.com/57560911 "The Carfree District in Quebec City" video
- Climate Central https://www.climatecentral.org/
- National Academies
- AAAS, Science Magazine
- MIT Technology Review, "Climate Issue"
- World Energy Outlook 2019, International Energy Agency (IEA) https://webstore.iea.org/world-energy-outlook-2019

Addendum - A

This is a conceptual template for quickly installing high-density urbanization:

- Completely free of personal vehicles and their infrastructure
- As an integral loop -- donut, half-torus -- the only efficient topology for transit-only urbs
- "Helicopter down" upon low-density regions of extant cities, including brownfields
- Tangential and intersecting to accommodate more IDP's, and others attracted by CarFree lifestyle
- Population determines density and diameter: 100,000 or more, 3 km or more
- Long-term thinking guides and inspires short-term planning, to escape perpetual over-automobility

Addendum - B

Rationale:

- Rapid sea level rise will be a global emergency: will humanity survive ? Where and how ?
- Rapid response to rapid sea level rise: we must accommodate millions fleeing low-lying coasts.
- "Taking" private property for CarFree loops will be justified, and must be compensated.
- Plan and invest now: mature this conceptual CarFree template.
- Design first for Accessibility; then for Mobility. Good urban design minimizes need for mobility.
- Transportation trends are now toward shared, driverless, electric; CarFree is the ultimate
- Optimizes Transportation As A Service (TAAS)
- Design for people, not for cars
- Design for minimum Earth impact, smallest human footprint, closed-cycle services
- Goals: conservation of land, energy, materials, residents' time
- Lower Cost Of Living (COL); improve health, reduce health care cost -- walk & interact more
- Safer for young people: walk and bike everywhere

Addendum - C

Enabling design features:

- Contra-rotating, concentric, transit loops
- Fixed-guideway system (FGS) transit: Bus Rapid Transit (BRT), Light Rail Transit (LRT), streetcar
- Full-featured, community-center transit stations about every 500 m
- A train each way, every 5 min
- Integral, autonomous loop, donut, half-torus: the only transit-efficient design
- The FGS carries people, packages, freight, mail
- Continuous paving for all service vehicles, Transportation Network Companies (Uber, Lyft, et al)
- Peripheral parking lot(s) or structure(s) sequester the few for personal LDV's, plus rental cars
- "Cars" are centrally sequestered, fueled, charged, guarded, always available
- Low public infrastructure capex, opex
- Reduce private capex, opex

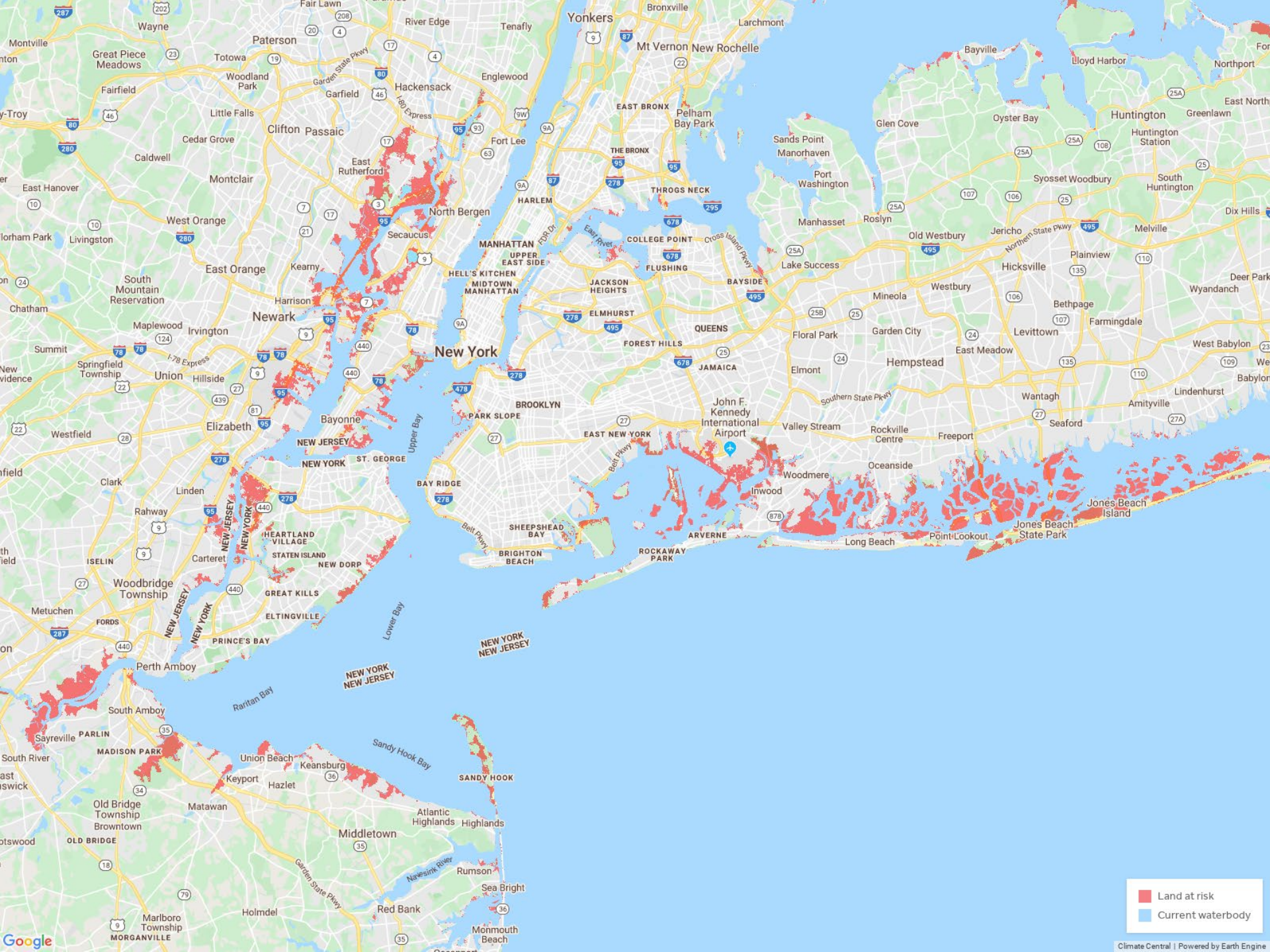
Addendum - D

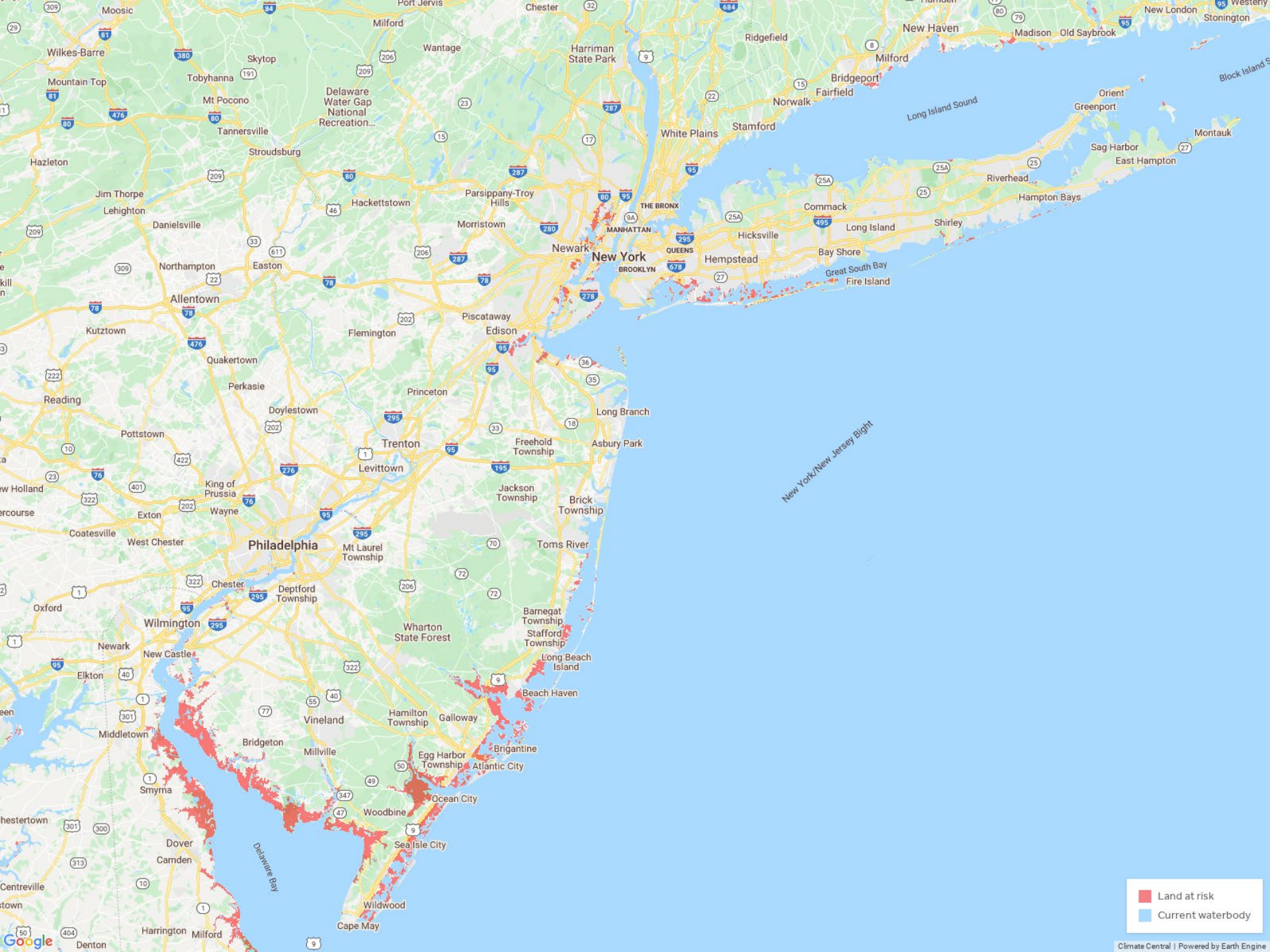
All activities are within walking distance of a transit station, a community center serving two, contra-rotating, concentric, fixed-guideway transit systems carrying people, packages, mail, and freight -- the heart of each roughly symmetrical neighborhood, community -- a pearl on the necklace.

No highway-capable personal vehicles (cars, SUV's, vans, pickups), of any propulsion energy, are allowed in the urbanized area.

These morphable "Villages" -- design and purpose, style and theme architecture, and layout and density -- may vary greatly. With the integral "donut" , the community can fit any situation, geography, topology, as overlaid on a real city: Density x Diameter determines Population.

See J.A. Crawford's CarFree City graphics, books, and videos at: www.carfree.com


Land at risk
Current waterbody
Google
Climate Central | Powered by Earth Engine


Land at risk
Current waterbody
Climate Central | Powered by Earth Engine
Google
New York
Philadelphia
Newark
Trenton
Atlantic City
Long Island Sound
New York/New Jersey Bight
Delaware Bay
Delaware Water Gap National Recreation...
Harriman State Park
Wharton State Forest
THE BRONX
MANHATTAN
BROOKLYN
QUEENS

IPCC Special Report 15

7 October 2018

- 1.5° C limit, or else … tipping ?
- *likely* reach 1.5°C between 2030 and 2052 at current rate
- ~ 2050 achieve net-zero global anthropogenic CO_2

- DNV-GL "Energy Transition Outlook 2019"
  - Technology ready; policy not
  - Not fast enough

Notes - A:

1. J.W. Crawford, author: Joel Crawford <carfreecrawford[@]gmail.com> (edit @) www.carfree.com
   A large, eclectic website to explore. Two books may still be available:
   a. Carfree Cities
   b. Carfree Design Manual
2. Urgent: national, global emergency within a few decades. Sense of urgency, emergency absent. Disruption, collapse (Diamond)

3. Topologies, transportation systems
4. Health effects: walk more, improves health, reduce health care aggregate cost, pay for transport infrastructure as ROI
5. Accessibility, not mobility
6. Post WW2 mistake: design for cars, not for people; still propagating; stop digging hole deeper: Denver sprawl
7. IDP's: how many, when. What are needs ? Capabilities ? Where put them ?
8. Strategies:
   Avoid more sprawl
   Protect land; world's best farmland
   Minimize embodied energy + operating energy
   Density(ies). HongKong ? Singapore
   Carfree: need not own one; ops and presence not allowed
   Big savings in after-tax car ownership ~= $ 7,000 / yr
   TAAS, TNC's, "3 revolutions" Sperling
   hydrogen: energy systems, trains, LRT, streetcar
   Build human community; encounters; commons
9. Design features:
   Proximity; access
   village, neighborhood, center, industrial park, cluster plan: Tokyo rail stations, other
   Jane Jacobs: eyes on the street
   safety, quiet
   "design with nature", landscape architecture
   Flowchart, block diagram

Notes – B:

10. Goals:
    a. Physical health
    b. Mental health
    c. Happiness, well-being: epidemic of sadness
    d. Save health care cost; walk more; healthier people; pay for public amenities

11. Photos: Carfree cities, city centers
12. Costs: infrastructure capex
    - Public
    - Private

Costs: infrastructure opex
    - Public
    - Private

13. Cash flow modeling: B&W graphic: private enterprise “new city”