CITY OF

PALO ALTO

SUSTAINABILITY AND CLIMATE ACTION SUMMIT

JANUARY 24TH, 2016

TODAY'S SCHEDULE

12:00	Check-in / Registration
12:30	Council Roll Call, Mayor's Welcome
12:40	Purpose, Agenda, Outcomes
12:50	Keynote: "Carbon Zero and the Grand Strategy" Colonel Mark Mykleby (USMC Ret'd)
1:15	Sustainability & Climate Action Plan: Overview and Q&A
2:15	BREAK
2:30	World Café / Small group discussions
4:30	Integrating the S/CAP and the Comprehensive Plan
4:45	Closing Remarks & Next Steps
5:00	Adjourn

Video presentation:
https://www.youtube.com/watch?v=sIWD7OQgEvM

Col. Mark "Puck" Mykleby
(USMC, Ret'd)

- Special strategic assistant to the Chairman of the Joint Chiefs of Staff.
- Co-authored "A National Strategic Narrative"
- Senior fellow at the New America Foundation where he continues his work on grand strategy and sustainability.
- Co-Director of the Strategic Innovation Lab at Case Western Reserve University.

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JANUARY 24TH, 2016

From Carbon Neutral Electricity…

From Carbon Neutral Electricity…

to Carbon Neutral Utility?

From Carbon Neutral Electricity…

to Carbon Neutral Utility?

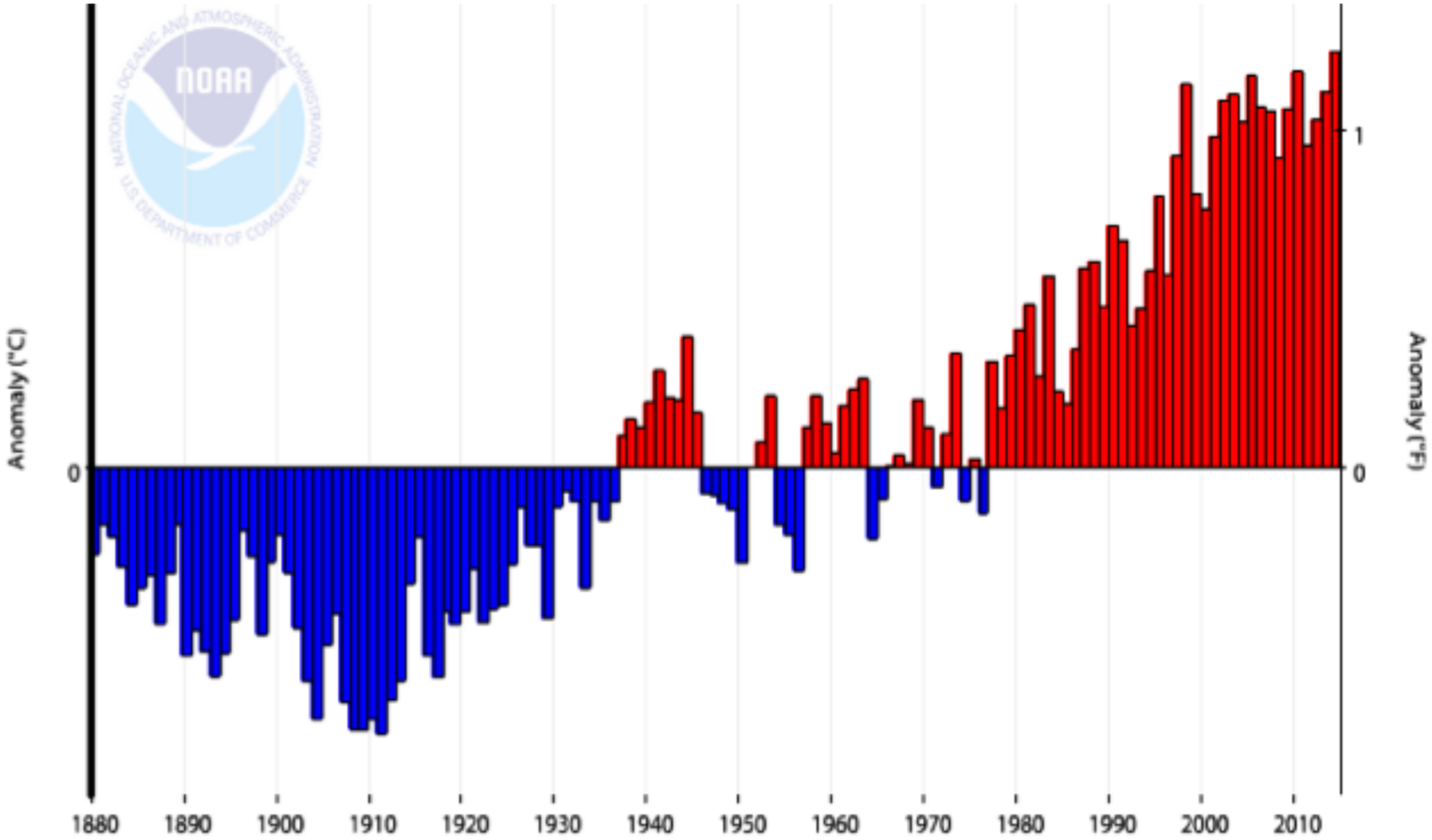
to Carbon Neutral City?

“In the story of humanity, everything is impossible until it becomes possible.”

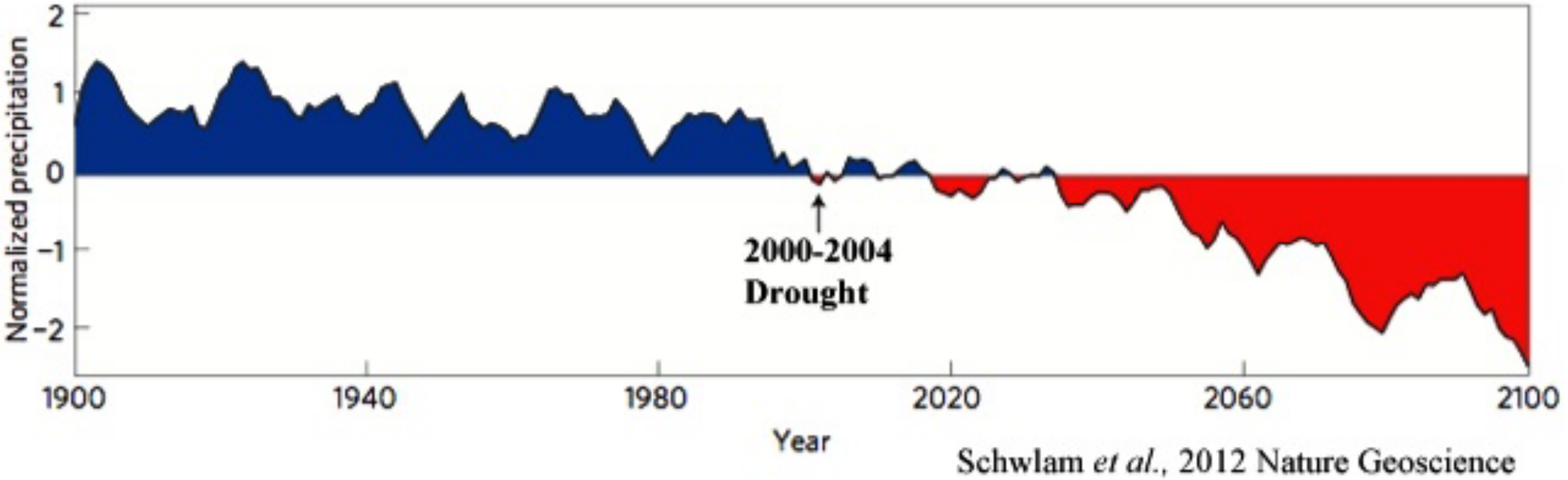
Mayor Ada Colau, Barcelona

Why are we here?

Healthier, safer, more sustainable/prosperous/resilient community.
Do our part in facing the climate challenge.
Inspire by example.

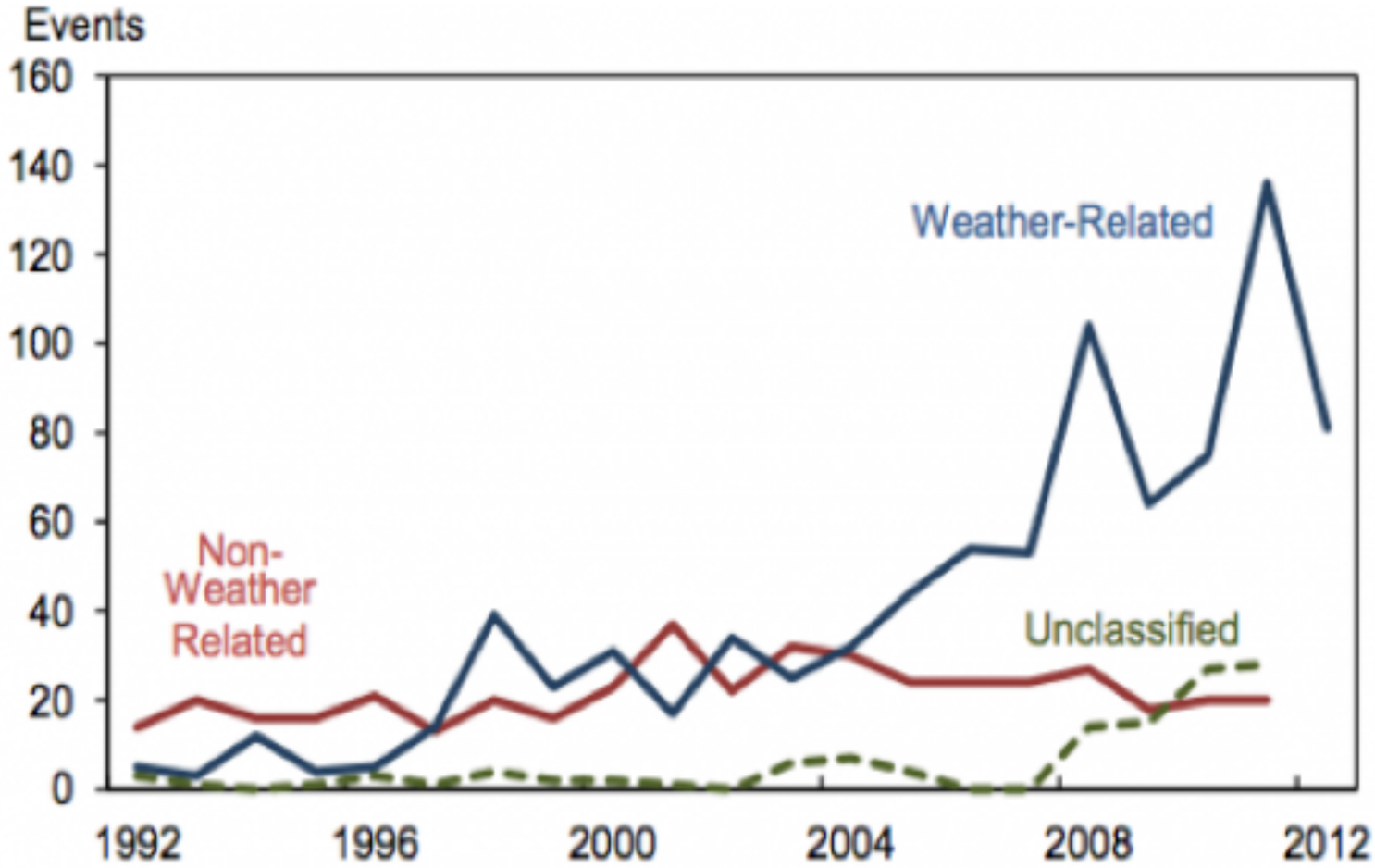

Anomaly (°C)
0
1880
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
1
0
Anomaly (°F)

Hotter.



Hotter. Drier.

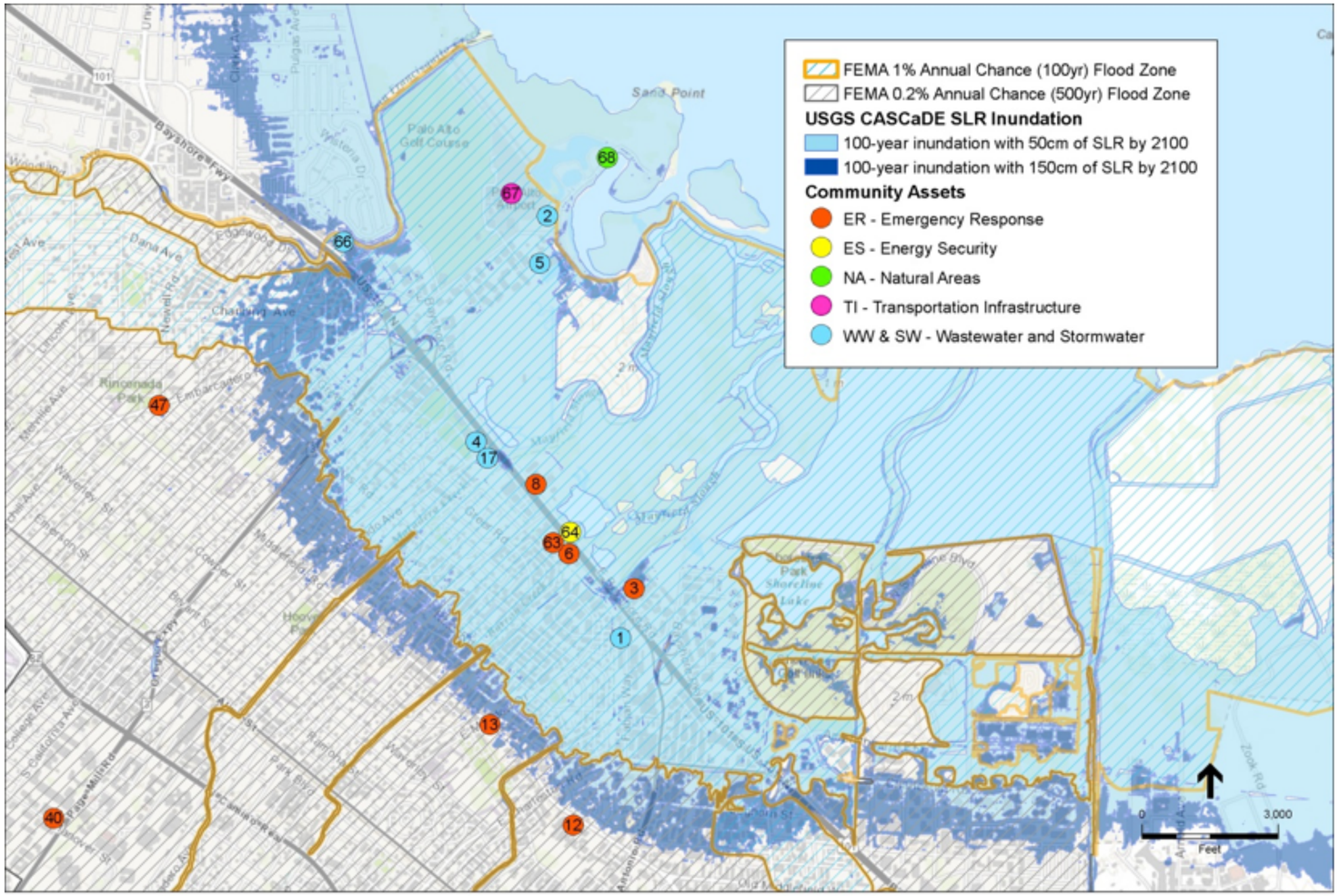
Observed Outages to Bulk Electric System (1992-2012)



Hotter. Drier. Riskier.

Source: Energy Information Administration

Sea Level Rise & Associated Flooding



SOURCE: USGS (SLR inundation), FEMA (flood zones), City of Palo Alto (City Limits, asset locations), ESRI (basemap background)

City of Palo Alto SCAP . D140455.00

Palo Alto Flood Risk and Community Assets Map

- San Francisco Bay sea level rise: 7.6 inches over the last 100 years.
- Projections:
  - 11 inches of sea level rise by 2050 (with a range of 5 to 24 inches)
  - 36 inches by 2100 (with a range of 17 to 66 inches)

COP21 Paris Agreement

- 196 countries!
- Goal: keep global temperature rise “well below” 2 degrees Celsius (ideally below 1.5 degrees) by the end of the century.
- Individual country climate plans every five years.
  The goals in these plans can only be tightened, not eased.
- Rich countries must mobilize $100bn/yr for green investments from 2020-25. Amount will be reevaluated in 2025.
- Report results to the UN every two years.
- Reevaluate the deal every five years to assess whether it lives up to its goals. (First meeting, 2023.)

What others are doing

- **80% GHG reduction by 2050**
  - State of California + Carbon Neutral Cities Alliance —17 cities, from Oslo to New York
- **“Net Zero” by 2040**
  - Cambridge MA
- **80% GHG reduction by 2030**
  - Fort Collins CO
- **Carbon neutral by 2025**
  - Copenhagen, Melbourne, University of California

We've done a lot!

2002	2005	2007
Sustainability Plan	Zero Waste	Climate Protection Plan

Environmentally Preferable Purchasing

2009

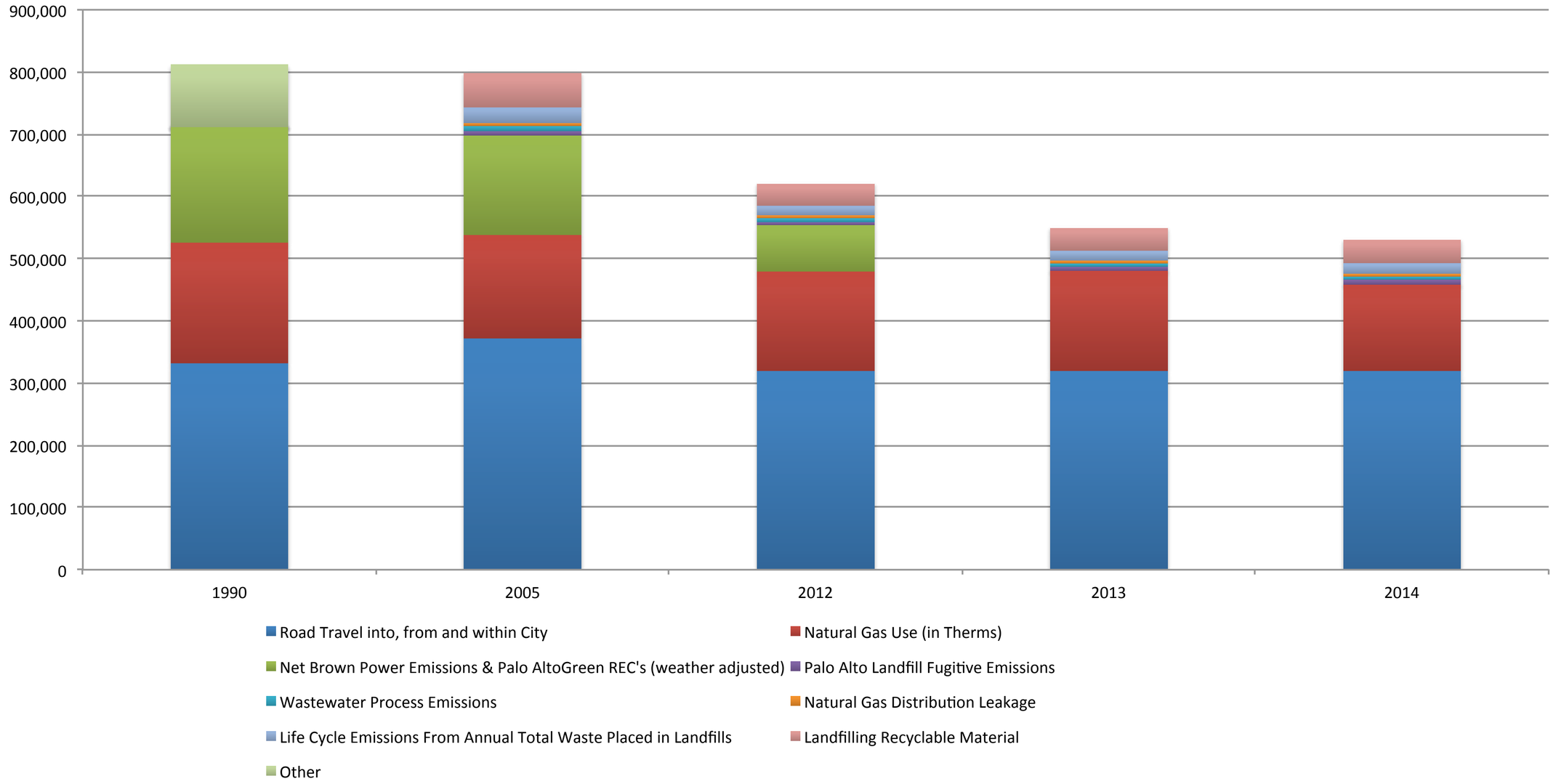
Carbon Neutral Electricity

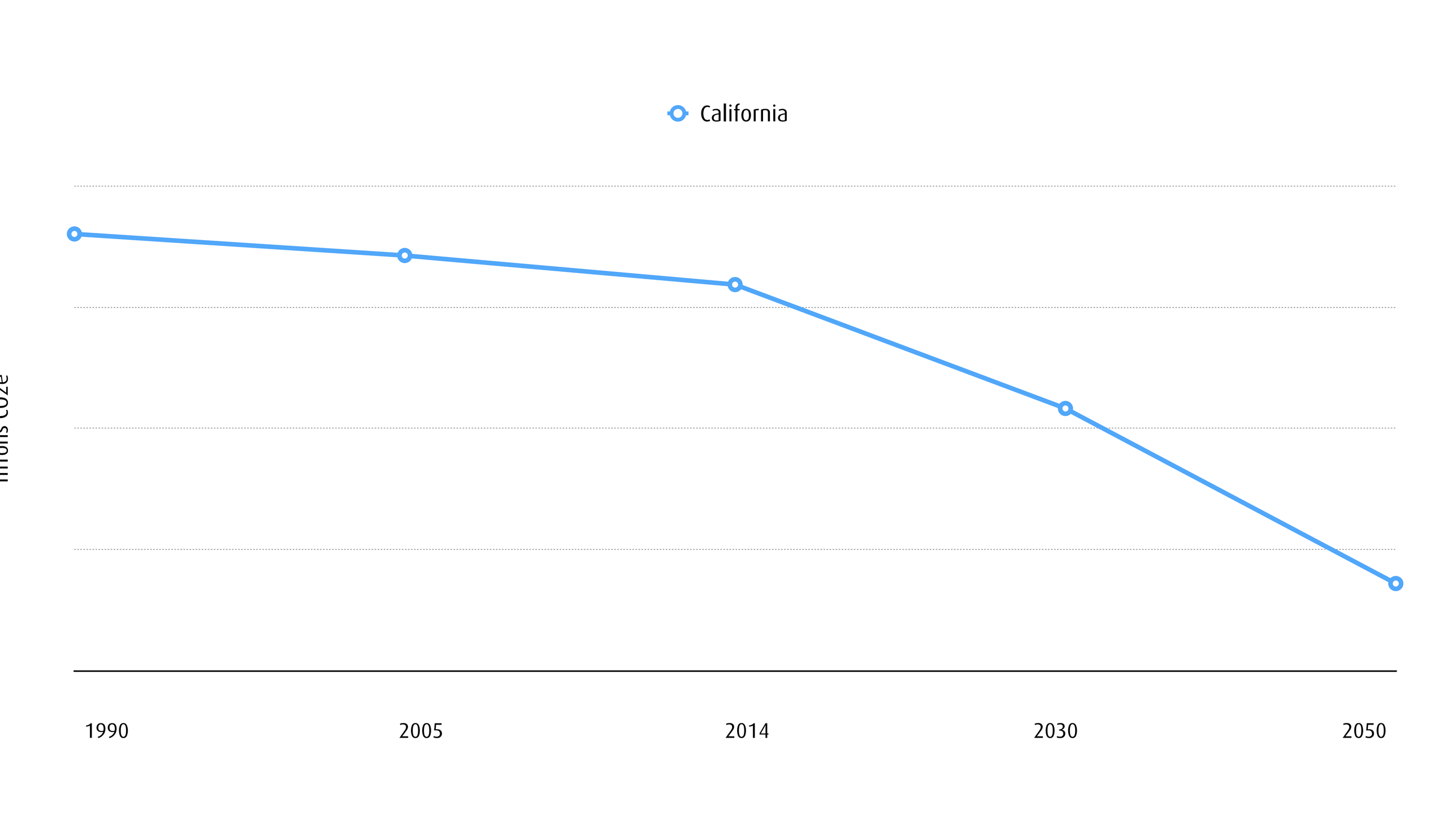
2013

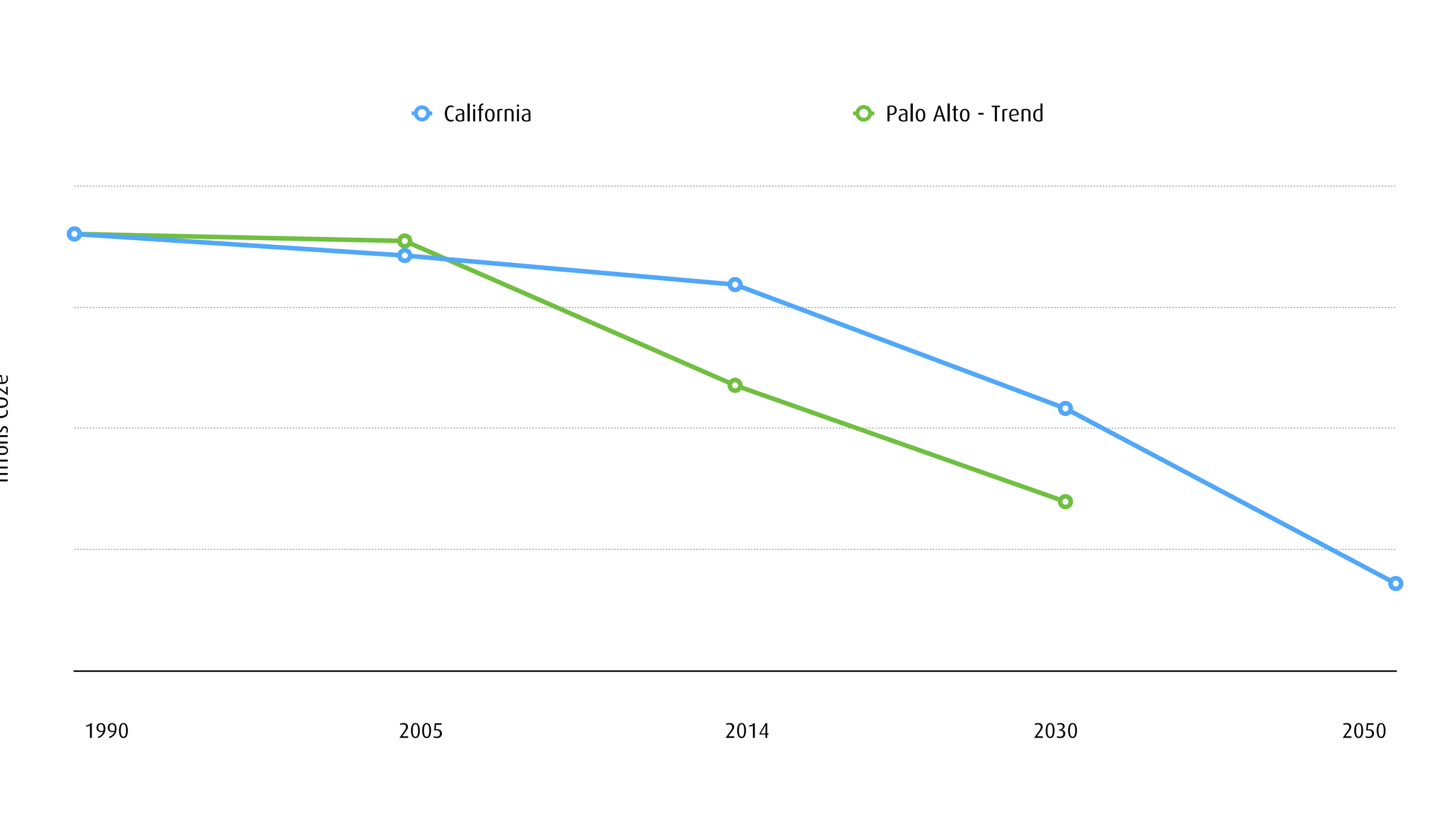
Green Building Ordinance

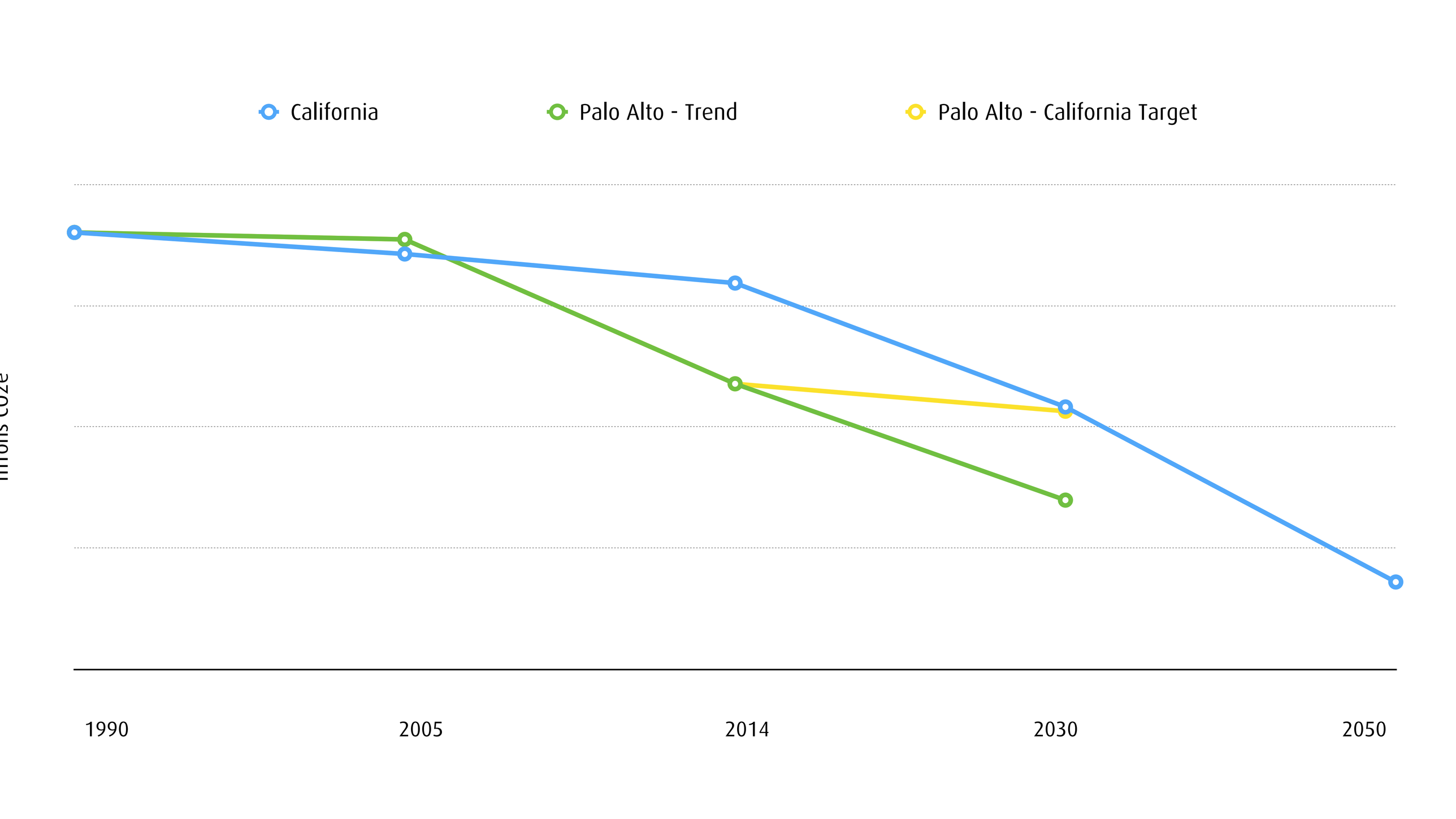
2015

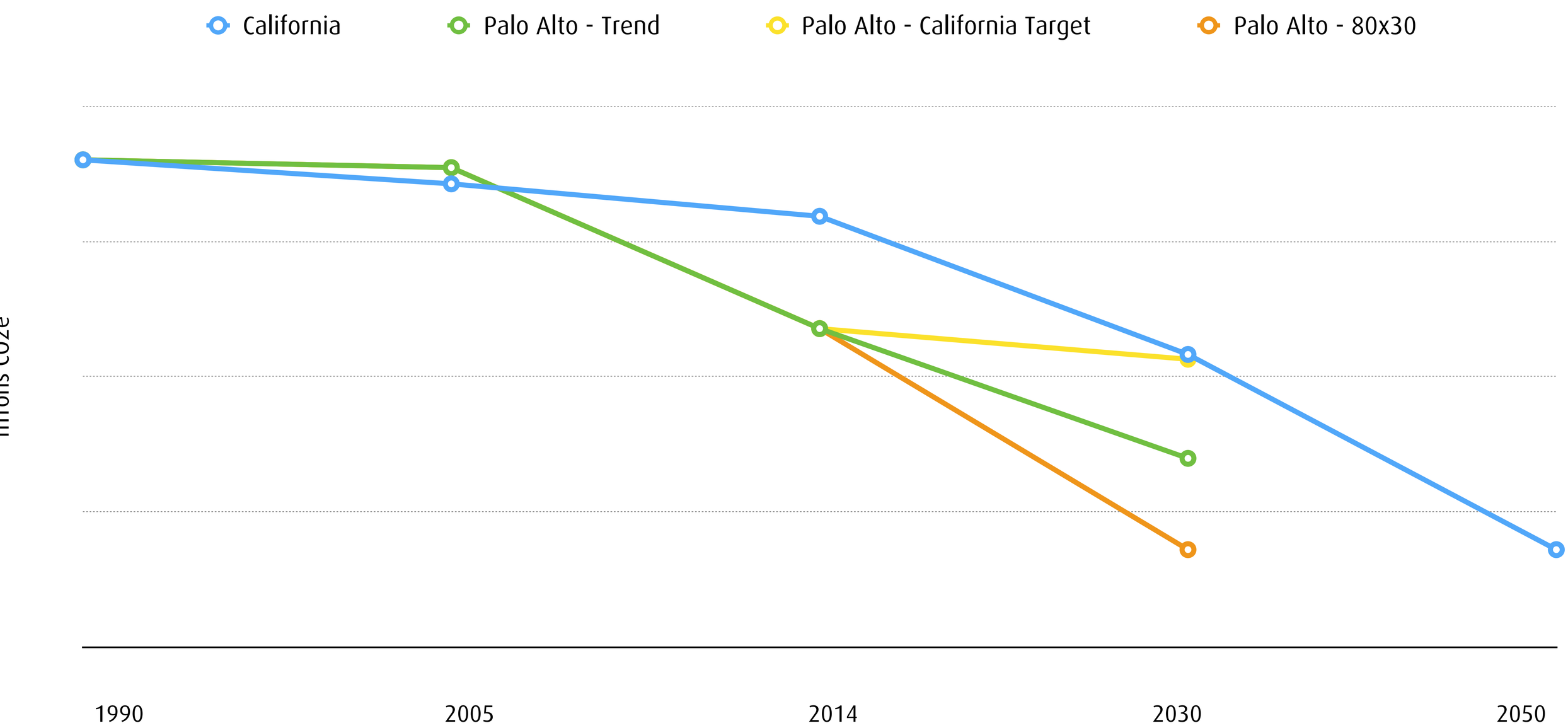
GHG Emissions Down 35% since 1990!




California
Millions CO2e
1990
2005
2014
2030
2050


California
Palo Alto - Trend
Millions CO2e
1990
2005
2014
2030
2050


California
Palo Alto - Trend
Palo Alto - California Target
Millions CO2e
1990
2005
2014
2030
2050


California
Palo Alto - Trend
Palo Alto - California Target
Palo Alto - 80x30
Millions CO2e
1990
2005
2014
2030
2050


We Can Do This. Here.
"The best way to predict your future is to create it."
- Peter Drucker

For the past year,

- Staff, consultants and 100s of Palo Altans have been developing the SCAP—understanding our impacts and risks, assessing our options.
- We examined three scenarios—with largely similar strategies, implemented at a very different pace
- **We are now recommending a course of action for the community's consideration:**
  - "Climate Neutral City"—reducing GHG emissions 80% by 2030 —20 years ahead of California's 80% goal!

Scenarios

California goals

80% x 2050

California goals—ahead of schedule!

80% x 2030

California Moonshot

100% x 2025

For your consideration

Carbon Neutral Electricity

- 2013

Carbon Neutral Utility

- 2016-2030

Carbon Neutral City

- 2030-2035

Target: 80% x 2030

What you've said

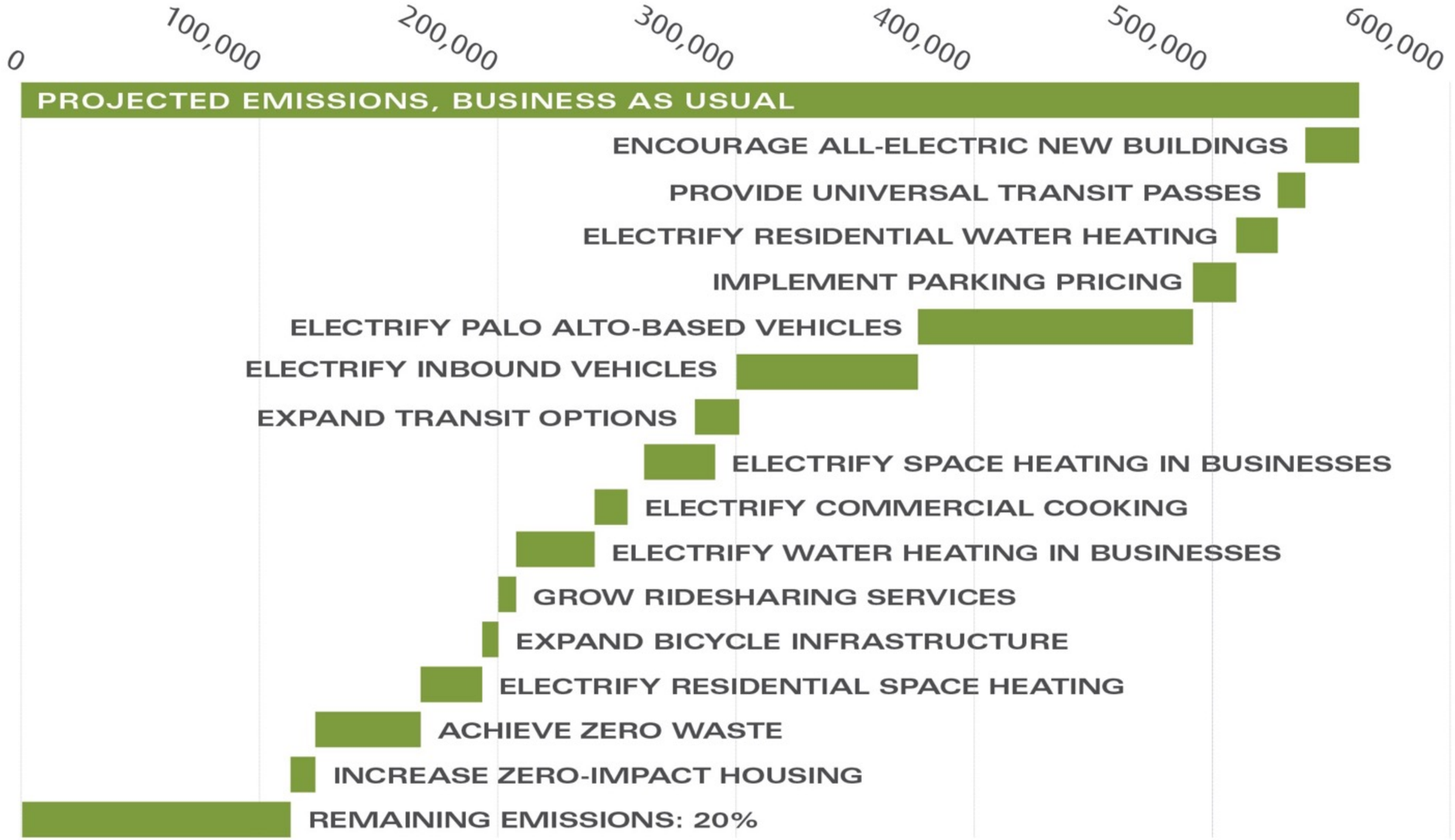
Should we be a carbon neutral city?

Yes: 79%

How much more would you pay on your energy bill to get there?

One-third: 5-10% more
One-fourth: 20% more
One-fifth: Double

Where the GHG Reductions Could Come From



The Fine Print

Completeness

- This deck presents a summary of a longer and more detailed plan. It does not include every element and detail.

Precision

- The analyses in this deck are based on assumptions and best available data. They are not definitive; assume +/-20% on all projections.

Legality

- The legal and financial implications and cost-effectiveness of the potential initiatives presented here will require detailed careful consideration and review, and are subject to Council direction.

Key Strategies

Transportation

60% of current emissions.
Traditional approaches make it worse.
Big changes looming.
How could we make it more convenient to not drive?

Energy

Pursue aggressive, integrated resource efficiency measures.
Evaluate & pursue electrification (Natural Gas = 26% of current emissions)
Develop local solar

Water

What if the “drought” is a long term shift?
How do we build resilient water supply?
How do we reduce dependence on hydro?
What would “net zero water” look like?

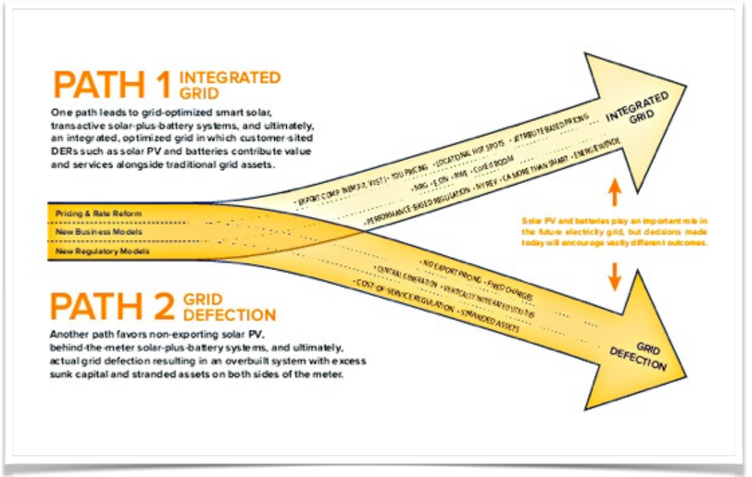
Key Strategies

Buildings

Loading Order: Efficiency first
Build Net Zero Energy (& Water?)
Accelerate retrofit/upgrade cycle
Encourage all-electric new construction

City Operations

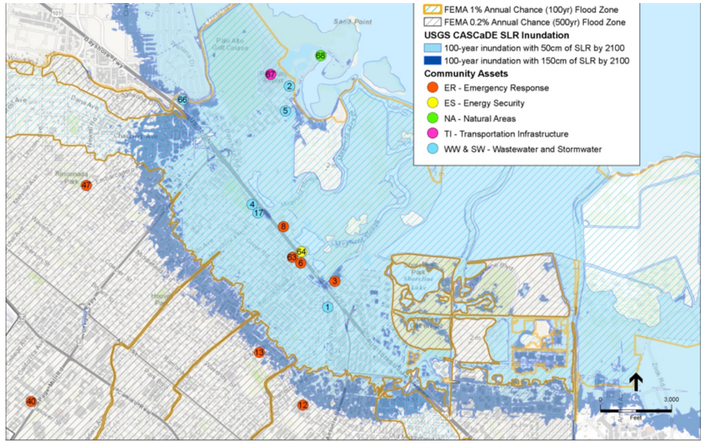
“Default to Green”
Incorporate TCO+E into operating decisions & capital budgets
Incorporate price for carbon



Utilities

From carbon neutral electricity to carbon neutral utility
Distributed generation & storage
Microgrids
What will a “utility of the future” look like—as distributed generation gets cheaper?

Key Strategies



Adaptation/Resilience

Assess
Protect / Adapt / Retreat
Pursue “Green Infrastructure”

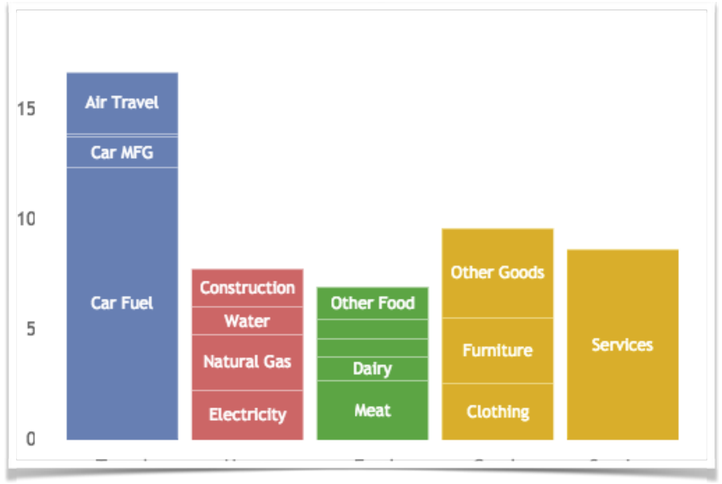
Natural Environment

Protect/Adapt/Expand canopy & parklands
Use “ecosystem functionality” layers in planning
Value & enhance the common wealth for future generations

Information Tech

Expand open data initiatives
Deploy visual performance dashboards
Accelerate smart grid & smart city development
Protect privacy

Key Strategies



Engaging Community

Services, education, incentives
Pilot neighborhood collaborations & "fitbit for sustainability" apps
Estimate/report "Scope 3" emissions

Finance

Price carbon in city operations
Appropriate 5 year budget
Consider local carbon tax
Offset **all** emissions—and invest in carbon neutral transitions

A Few Core Moves

REDUCE

- Electricity, natural gas & water use
- SOV trips
- “Waste”
- Congestion
- Stress
- Etc

SHIFT

- Fossil car > EV
- Natural gas > electricity
- Potable water > recycled water
- Laundry > landscape
- Etc

TRANSFORM

- Car ownership > MaaS
- Free parking > Feebates
- Etc

Our Focus for Today

WATER

- Reduce potable water consumption
- Update Green Building Ordinances for net zero water
- Shift landscapes to drought-tolerant plantings
- Allocate water resources to urban canopy
- Develop “green infrastructure” to capture, store and treat stormwater
- Pilot onsite wastewater treatment & purified water delivery
- Pursue recycled water production and use
- Manage groundwater

TRANSPORTATION

- Accelerate the shift to electric vehicles
- End incentives to private car use
- Ensure convenient, economical transit
- Develop Mobility as a Service in Palo Alto & the region
- Increase bicycle mode share
- Explore zero impact (including trip cap) standards for development

ELECTRIFICATION

- Pursue aggressive, integrated resource efficiency measures
- Encourage all-electric new construction
- Make Palo Alto GreenGas “opt out”
- Accelerate building retrofit cycles and equipment replacement
- Conduct periodic electrification feasibility analyses
- Monitor biogas options
- Monitor long-term viability of natural gas business

Key Actions: Mobility (AKA Transportation)

Goals: Reduce congestion. Reduce emissions. Increase convenience.

Means: Expand non-automobile mobility options. Expand transit facilities and services. Create the right incentives.

Actions:

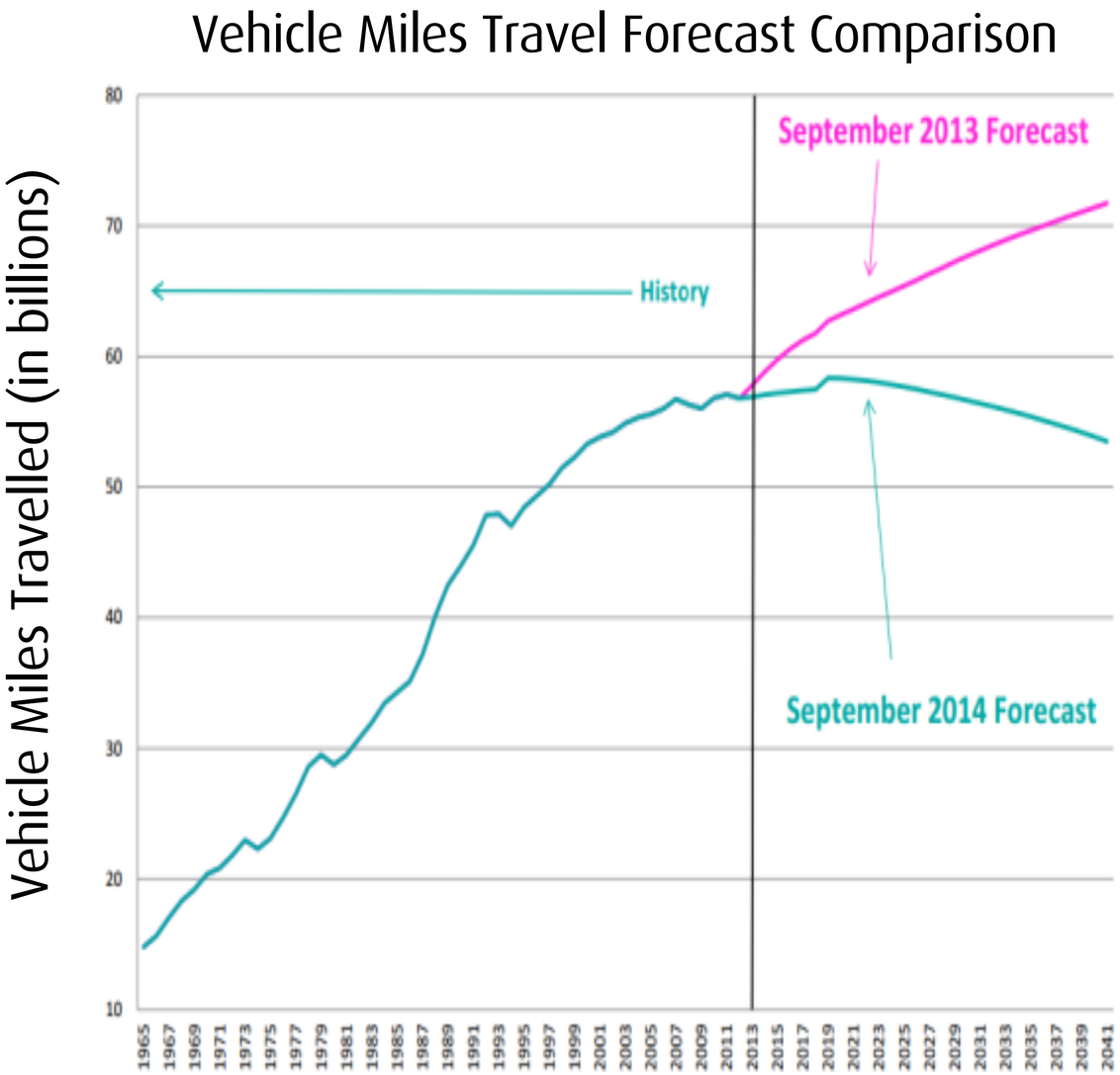
- Reduce GHG/VMT by shifting vehicle fleets (City owned, privately owned and commercially owned) from fossil-powered to electric.
- Reduce trips and vehicle miles travelled (VMT) by developing mobility services that make not driving more convenient than driving.
- Phase out automobile subsidies by charging for parking—and investing proceeds in alternatives like transit, bicycle infrastructure, ride sharing, walkable neighborhoods, etc.
- Collaborate with regional partners to advance "Mobility as a Service" (MaaS).

Benefits: Emissions. Savings. Agility. Resilience.

"How could we make it more convenient for anyone, anywhere, anytime to not have to get into a car and drive?"

Gil Friend

Transportation is Changing



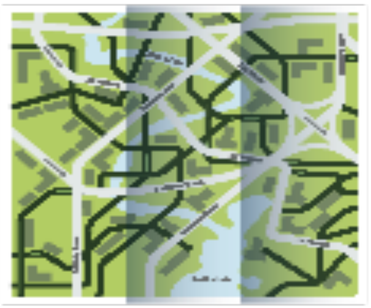
Mobility of the Future

01. MOBILITY AS A SERVICE

on-demand, multimodal, tech-enabled

02. MOBILITY-FRIENDLY CITIES

walkable, bikeable, transit-friendly



03. THE RIGHT VEHICLE FOR THE JOB

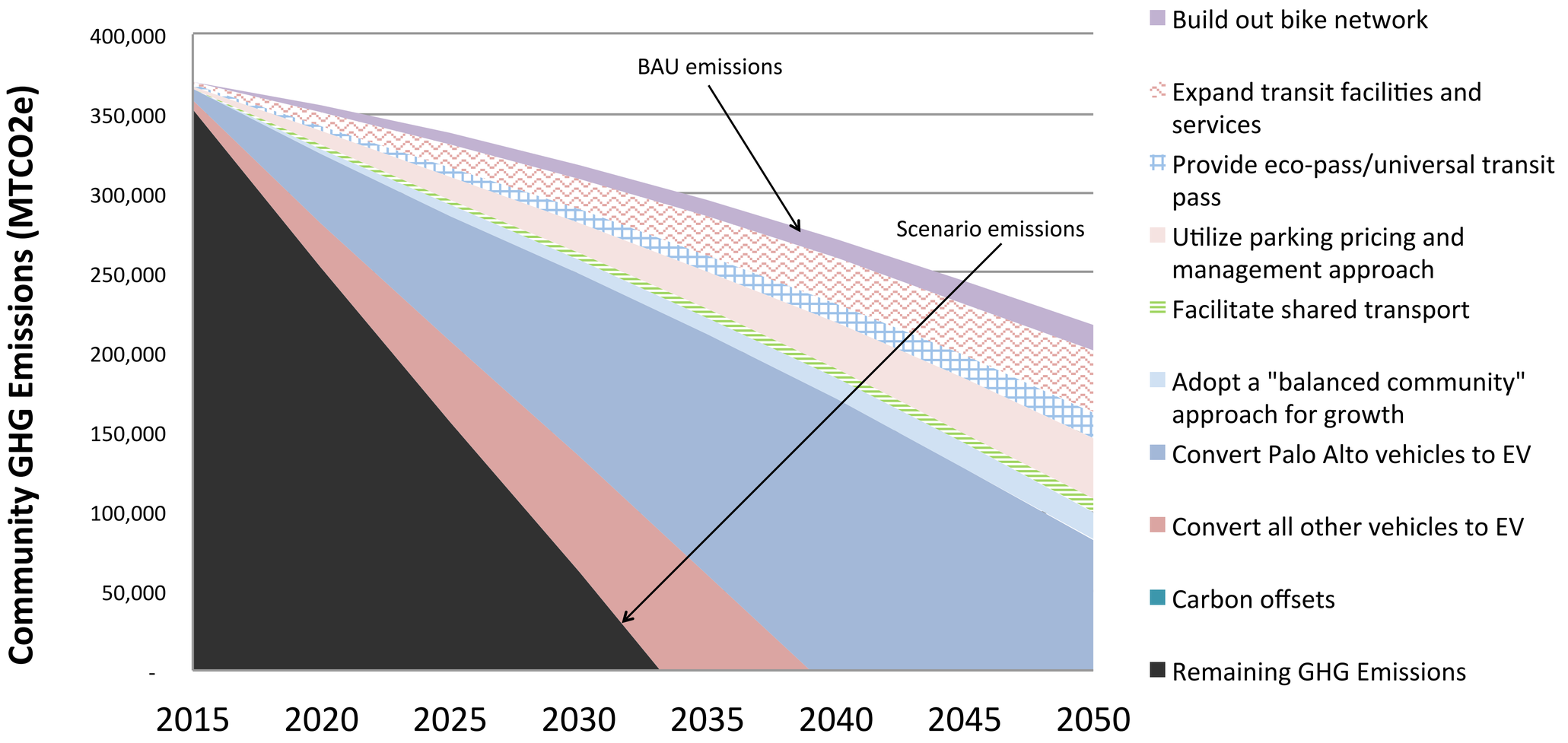
efficient, electric, right-sized

04. SELF-DRIVING

driverless, connected

Source: Rocky Mountain Institute

Transportation: 80x30



Transportation: 80x30

Strategy	Selected? (Yes/No)	Assumptions	Implementation Level	Annual Adoption Rate
Build out bike network	Yes	Build 21 miles of new protected bike lanes, expand bikeshare programs, provide bike amenities near transit hubs and key destination points.	40%	2.7%
Expand transit facilities and services	Yes	Expand transit ridership by 60% and support bus rapid transit and advocate for major upgrades to reliability, frequency, and capacity of Caltrain service.	60%	4.0%
Facilitate shared transport	Yes	Facilitate and support dynamic ridesharing, Transportation Network Companiesand casual carpool through designated curbspaces	60%	4.0%
Provide eco-pass/universal transit pass	Yes	Expanded Universal Transit Pass (UTP) - Caltrain GoPass, SamTrans Way2GoPass, and VTA Ecopass, for all residents and employees by 2030	100%	6.7%

Transportation: 80x30

Strategy	Selected? (Yes/No)	Assumptions	Implementation Level	Annual Adoption Rate
Utilize parking pricing and management approach	Yes	Have 50% of employment sites institute parking pricing, parking cash-out, feebates, as well as full cost pricing of residential parking (unbundling or eliminating minimum parking requirements)	50%	3.3%
Adopt a "balanced community" approach for growth	Yes	Target jobs-housing balance of 3.1 with growth in specific areas of 5,000 new housing units by above business as usual	15%	1.0%
Convert Palo Alto vehicles to EV	Yes	Incentives, rebates and programs to encourage electric vehicle adoption by Palo Alto residents; 90% of vehicles electric	90%	6.0%
Convert all other vehicles to EV	Yes	Offer charging stations, and other incentives for inbound driver to choose EVs; 60% of vehicles owned by non-Palo Alto people are EVs	60%	4.0%
Carbon offsets	No	Purchase carbon offsets	0%	

Key Actions: Energy

Goals: Eliminate emissions. Reduce costs. Increase comfort, reliability and resilience.

Means: Efficiency. Renewables. Electrification. PPAs+distributed generation & storage. Smart Grid. Green building program. Pricing carbon. New financing and business models.

Actions:

Set energy & carbon performance standards for new buildings + renovations. Accelerate retrofits, including electrification.

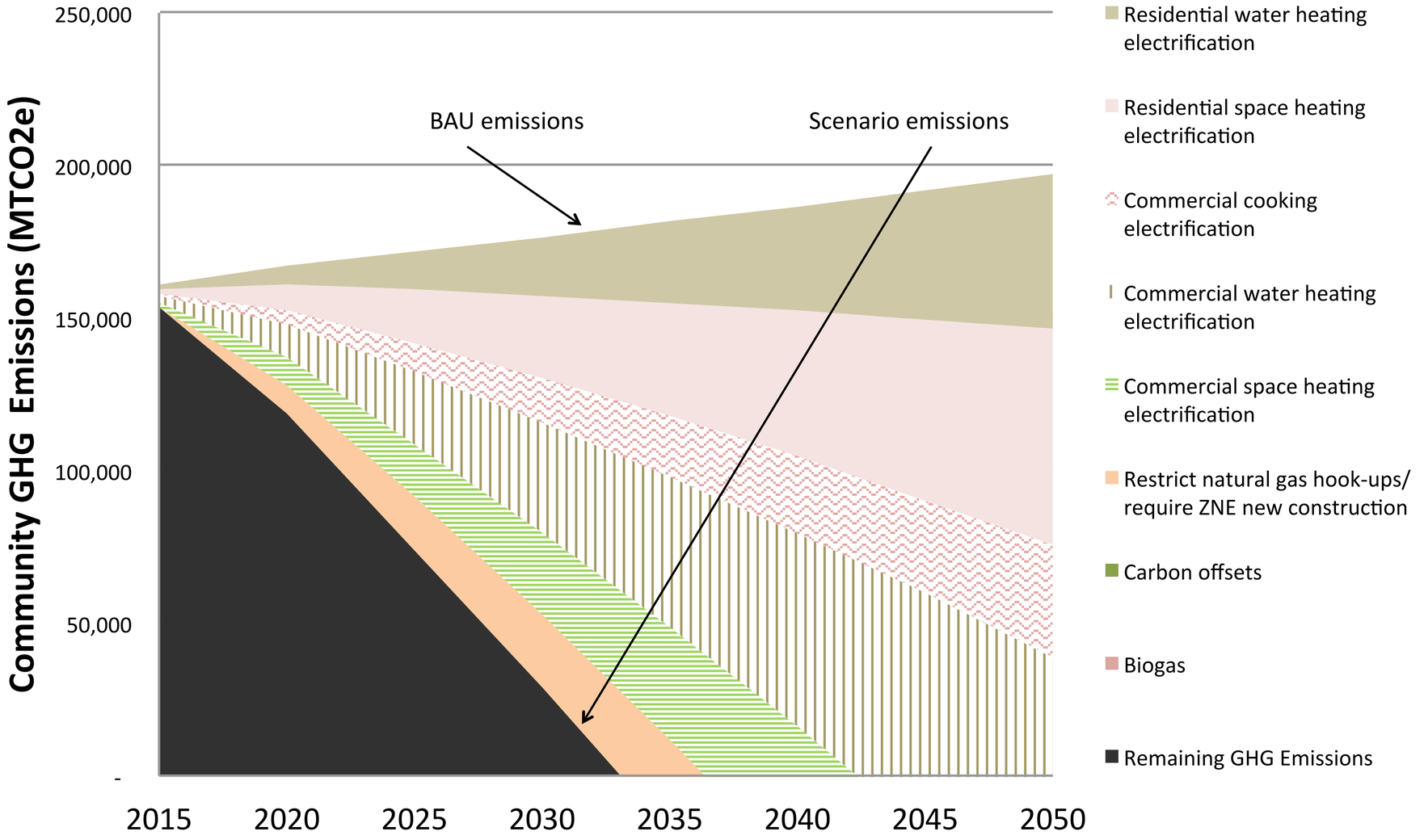
- Raise efficiency & RPS goals; market integrated service offerings; 10% challenge.
- Evaluate and pursue electrification options
- Develop contingency plans to maintain carbon neutral electricity in face of potential reduced dependence on hydroelectric power.
- Explore microgrid and district energy strategies in key districts.
- Proactively explore “utility of the future” strategies to use disruption to our advantage.

Benefits: Emissions. Savings. Agility. Resilience.

“People don’t want natural gas and electricity. They want hot showers and cold beer.”

Amory Lovins

Natural Gas 80x30



Natural Gas 80x30

Strategies	Selected? (Yes/No)	Implementation Level	Annual Adoption Rate
Residential water heating electrification	Yes	100%	7%
Residential space heating electrification	Yes	70%	5%
Commercial water heating electrification	Yes	85%	6%
Commercial space heating electrification	Yes	85%	6%
Commercial cooking electrification	Yes	50%	3%
Restrict natural gas hook-ups/ require ZNE new construction	Yes	100%	100%
Carbon offsets	No	0%	100%
Biogas	No	0%	0%

What will happen when…

- Solar energy is cheaper than fossil energy?
- EVs are less expensive than internal combustion?
- Batteries are cheap enough for effective storage?
- It’s more convenient not to drive than to drive?

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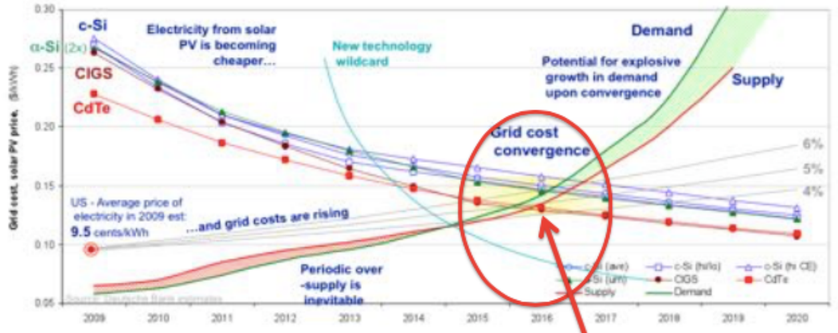
DB: Grid Parity in 80% Global Markets by 2017



- Solar at/below grid parity in **100's of markets** globally TODAY.
- *Deutsche Bank*: **Solar Below Grid Parity** in
  - 47 states in the US by 2016
  - Up to **80% of Global markets by 2017**

Clean Disruption- Copyright © 2001-2016 by Tony Seba

Source: Deutsche Bank

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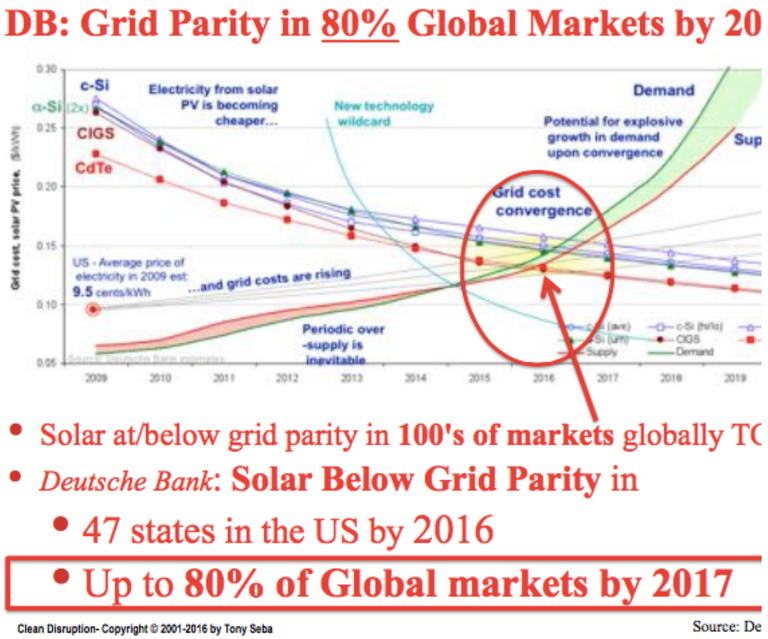

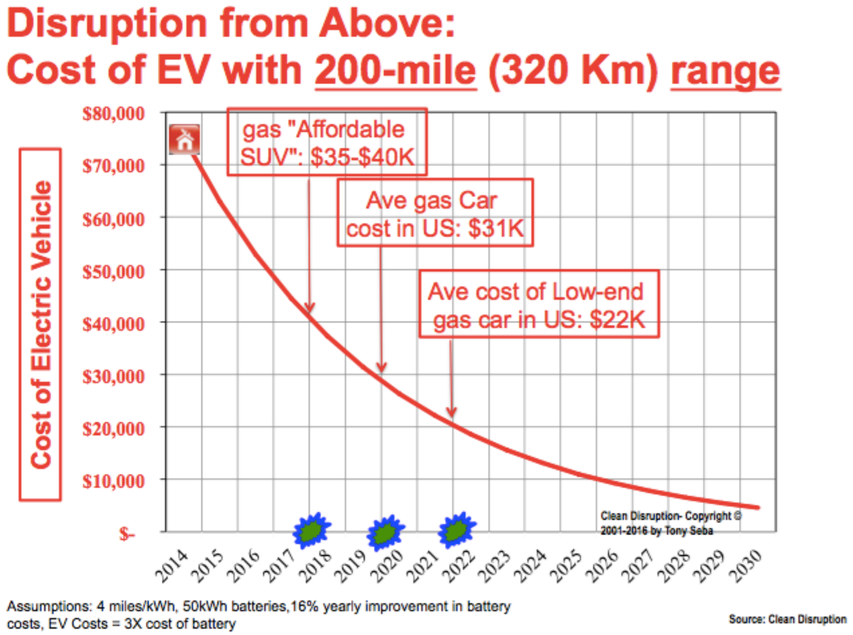

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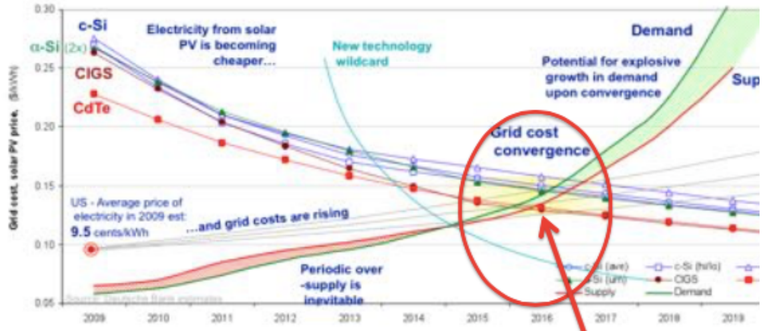
DB: Grid Parity in 80% Global Markets by 20



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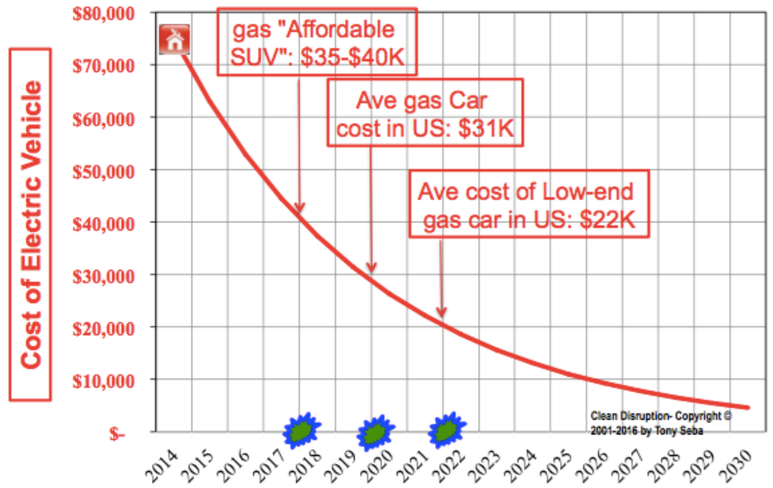
  - Up to **80% of Global markets by 2017**

Clean Disruption- Copyright © 2001-2016 by Tony Seba

Source: De

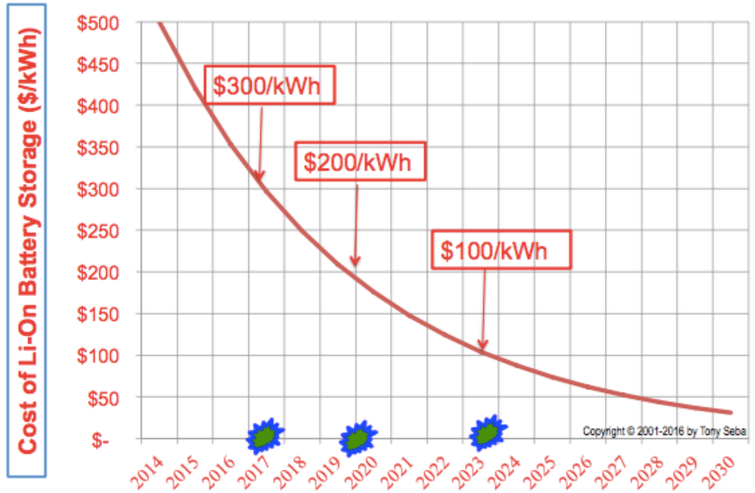
Disruption from Above:
Cost of EV with 200-mile (320 Km) range



Assumptions: 4 miles/kWh, 50kWh batteries,16% yearly improvement in battery costs, EV Costs = 3X cost of battery

Source: Clean Disruption

Projected Cost of Li-On Battery $/kWh

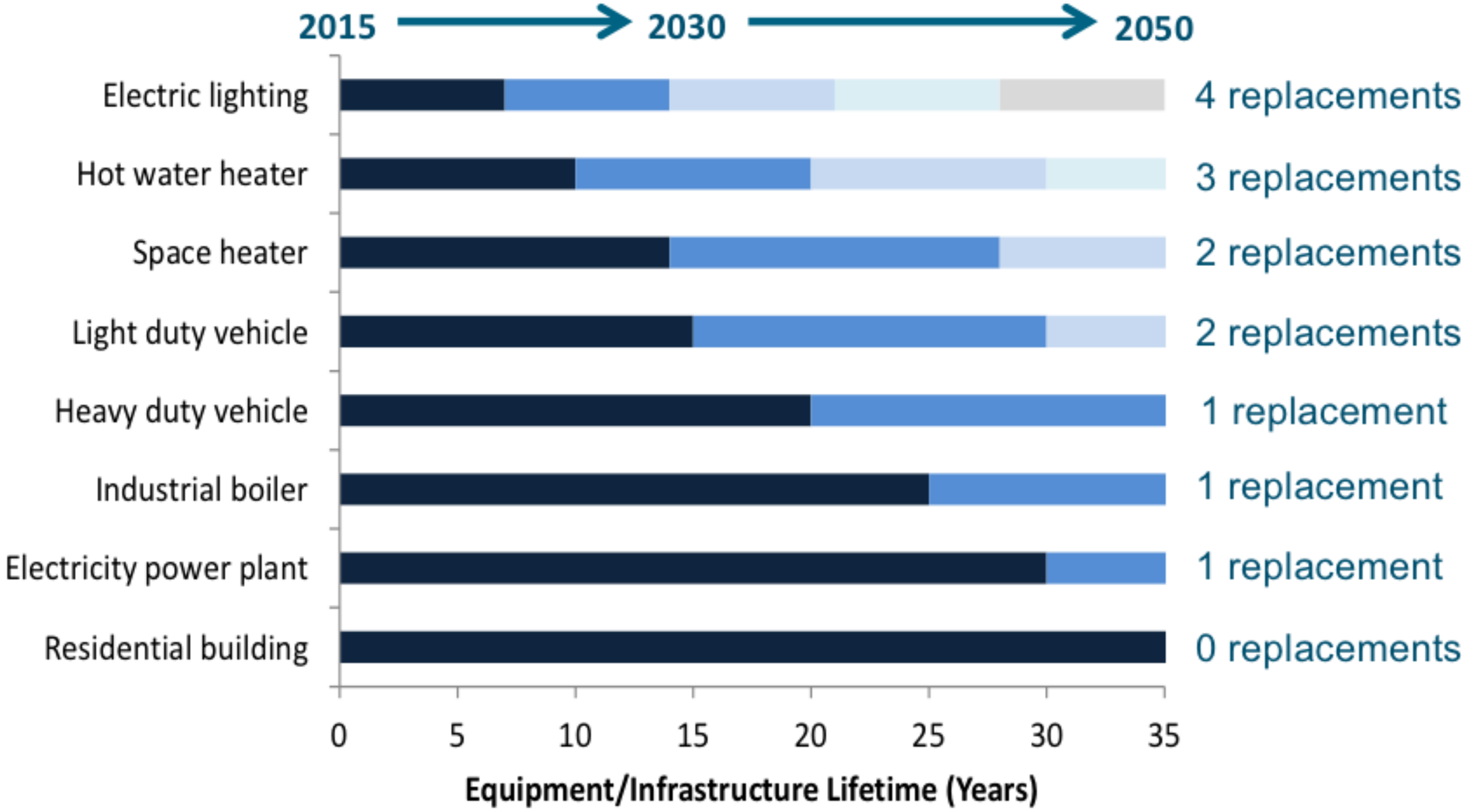


Assumptions: **16%/year cost improvement**

Clean Disruption- Copyright © 2001-2016 by Tony Seba

Source: Clean Disruption

Leverage & Acceleration

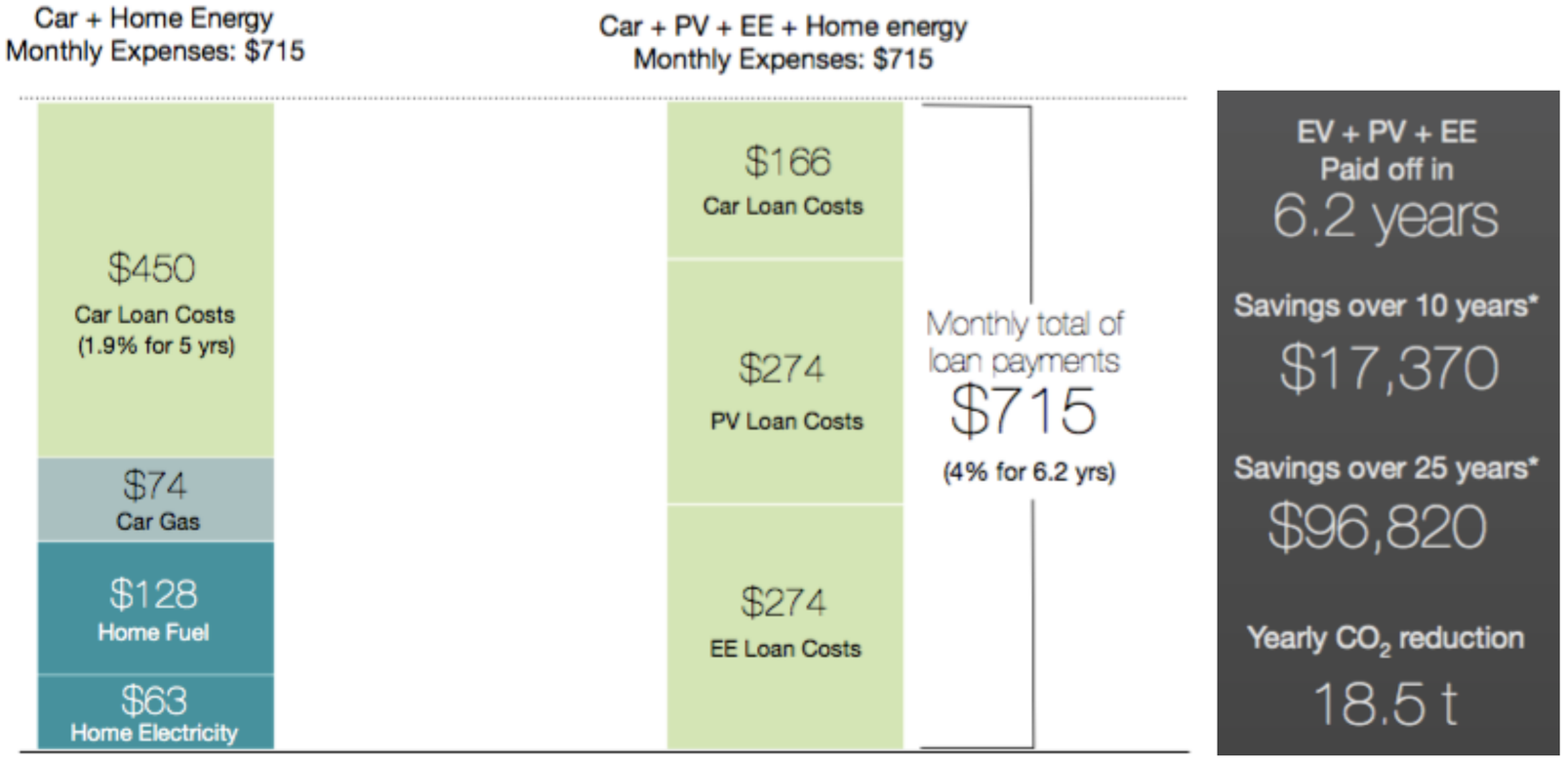


A Possible Acceleration Model

Integrated utility service offering + predictive analytics + on-bill financing (an example from Denver)

Thinking of buying a Subaru Outback?

Instead, consider a Nissan Leaf (EV) + Solar (PV) + Energy Efficiency (EE)



EV + PV + EE
Paid off in
6.2 years

Savings over 10 years*
$17,370

Savings over 25 years*
$96,820

Yearly CO_2 reduction
18.5 t

Approximate Loan Costs

Car Monthly Fuel Cost

Home Monthly Energy Costs

Key Actions: Water

Goals: Safe and reliable water supply for possible "new normal" of less (and less reliable) precipitation.

Means: Efficiency: Reduce potable water consumption. Supplement existing supplies: Recycled water. Green infrastructure for local storm water capture and storage. Onsite wastewater treatment.

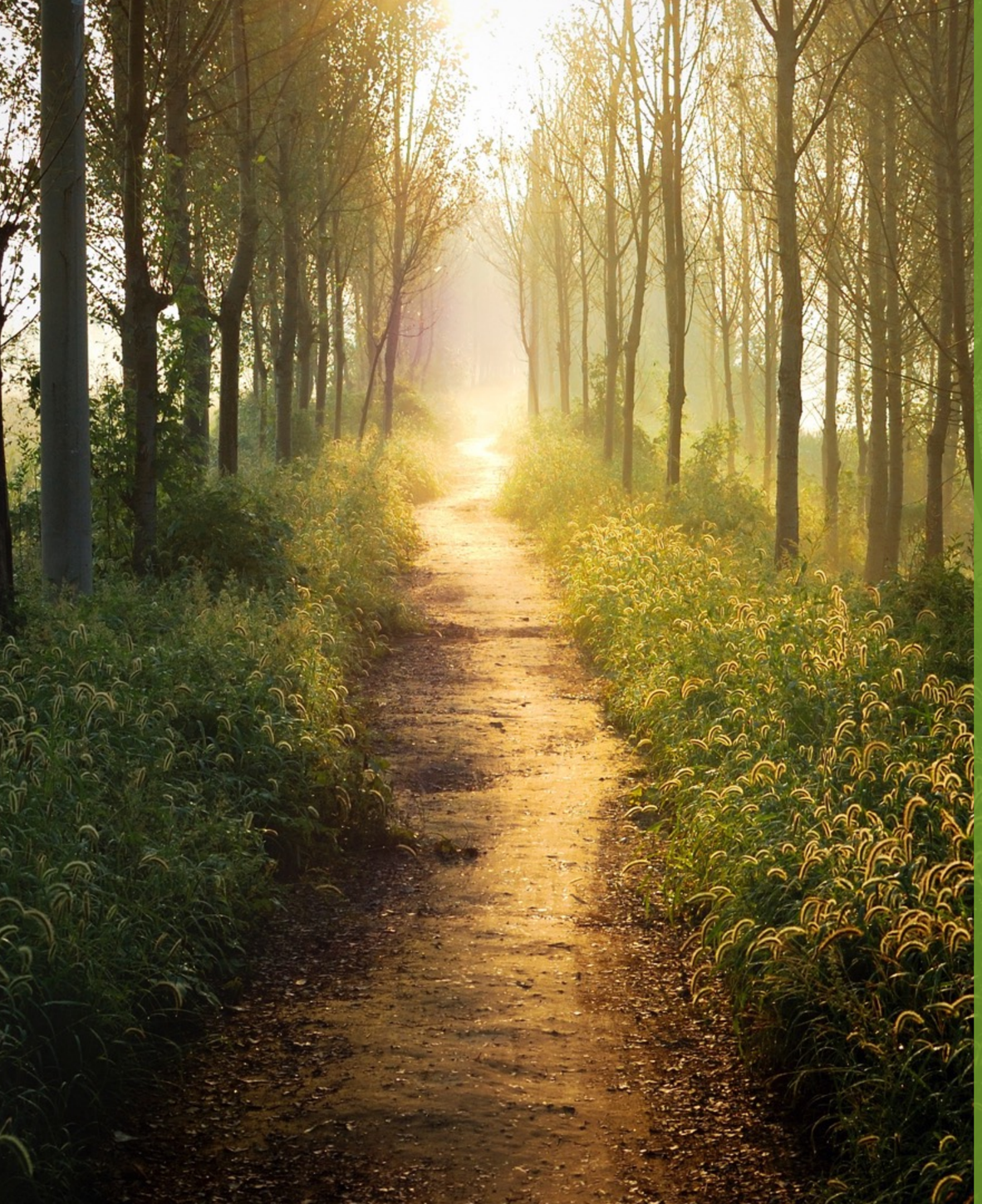
Actions:

- Develop long-term efficiency goals, and aggressively market toward them
- Incorporate net zero water standards in future Green Building Ordinances
- Evolve Palo Alto landscapes to adapt to changing precipitation trends, and allocate water resources to protect our urban canopy
- Develop and incent local water capture and storage, from household to social scale
- Pilot and evaluate onsite wastewater treatment technologies
- Pursue recycled water production and use

Benefits: Resilience. Savings. Natural environment….

"How will we conserve, capture & recycle water—to survive a possible 'multi-decadal mega-drought'—on ambient rainfall?"

Phil Bobel



“We need a clear, aligned, shared path to the future we choose.”

Jim Keene

Timeline

2016

Voluntary program development and pilot programs

- Electric heat pump technologies
- EV charging infrastructure plan
- Advocate for transit improvements
- Mobility as a Service

2017

Launch voluntary programs and electric rates

- Retail electric rate for all-electric and TOU for EV charging
- Utility connection/permitting fees
- Incentivize transit-oriented development and feebate programs

2018

Develop new ordinances

- Assess zero net energy codes ahead of Title 24 2019.
- Incentivize or require new development to provide transit passes

2019

Implement programs

- Implement zero net energy codes.
- Full portfolio of electrification programs
- Assess GHG emissions progress and update S/CAP

Exceed state targets

- 40% emissions reduction
- Achieve 90% diversion of waste
- Exceed state mandates for zero net energy new homes

Carbon Neutral Utility

- Most homes have electric water and space heating
- Accelerated Caltrain modernization
- Unbundled parking costs

Carbon Neutral City by 2030

- 90% of Palo Alto vehicles are EVs
- 100% of residents and employees have transit passes.
- All new construction achieves zero net energy

2020 2025 2030

Moving powerfully in uncertain times

Moving powerfully in uncertain times

Strong directional goals

Clear principles & criteria

Flexible platforms

Rapid, agile prototyping

Timely, transparent performance tracking

Summary

- Carbon neutral—or “net positive”—city.
- Drive radical resource efficiency
- Make it more convenient not to drive
- Accelerate building stock upgrades
- Shift from natural gas to all-electric systems where feasible
- Embed sustainability
- Build resilience
- Reducing subsidies, pricing carbon and channel local & external investment

Call to Action

- **Set a goal**—climate neutral by 2030?—and challenge staff and community to meet it with 10% year-on-year improvements
- **Adopt SCAP** as a framing strategy
  - Establish guiding principles and decision criteria
  - Direct staff to develop specific, cost effective implementation plans
  - Revisit and recalibrate every 5 years
- **Take key enabling actions**
- **Fund next phase** of design & implementation
  - Appropriate five year funding, subject to specific allocation & authorization

Questions For Today

What works?

Questions For Today

What works?

What's missing?

Questions For Today

What works?

What's missing?

What speed?

Questions For Today

What works?

What's missing?

What speed?

What opportunities?

Questions For Today

What works?

What's missing?

What speed?

What opportunities?

What concerns?

Questions For Today

What works?

What's missing?

What speed?

What opportunities?

What concerns?

What might be possible?

“Pursue something so important that even if you fail, the world is better off with you having tried.”

Tim O’Reilly

THE Comprehensive Plan Update & the S/CAP

Palo Alto's Comprehensive Plan Update and the Sustainability and Climate Action Plan are being prepared in parallel and will both address issues related to sustainability.