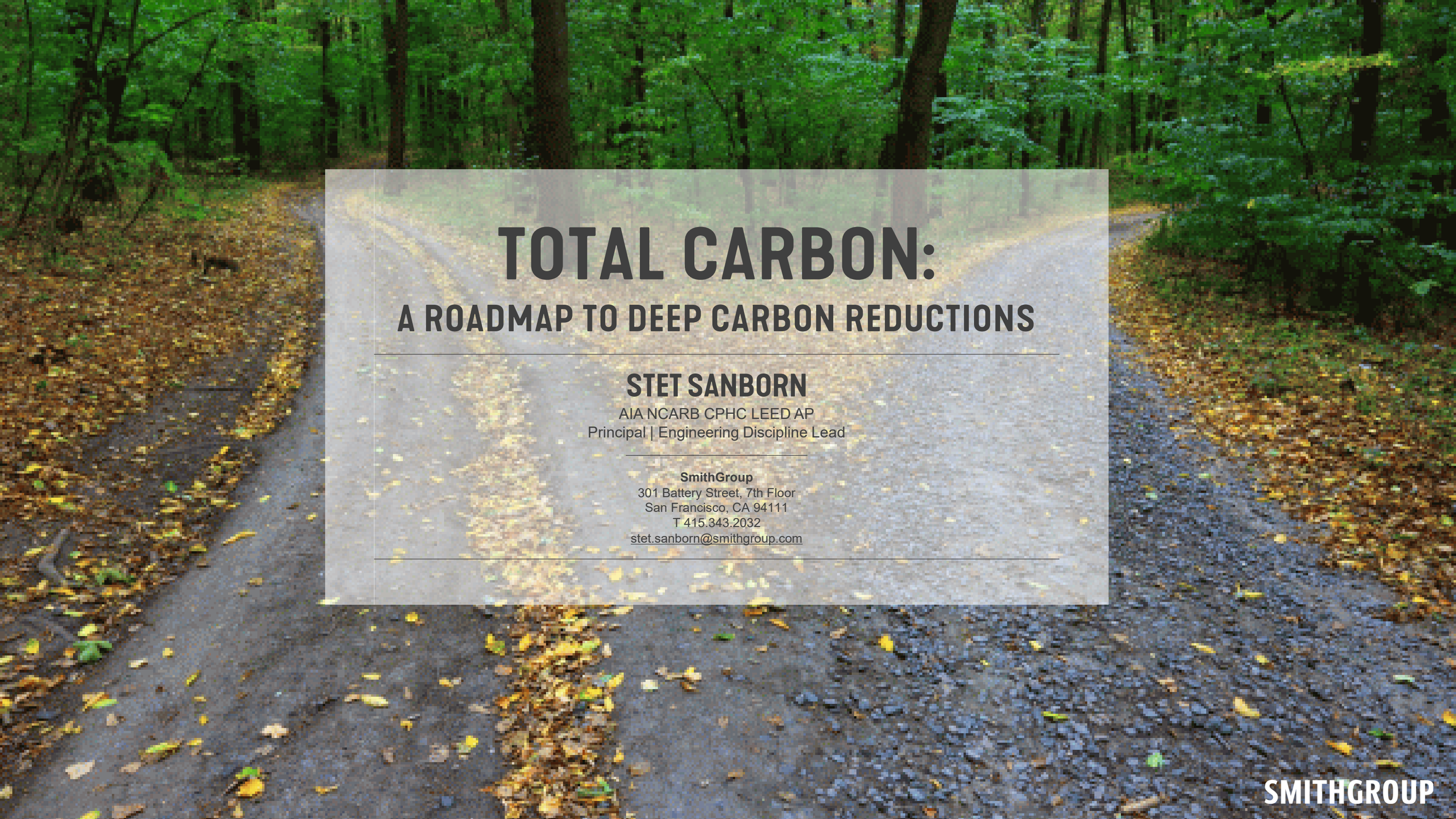

TOTAL CARBON:

A ROADMAP TO DEEP CARBON REDUCTIONS

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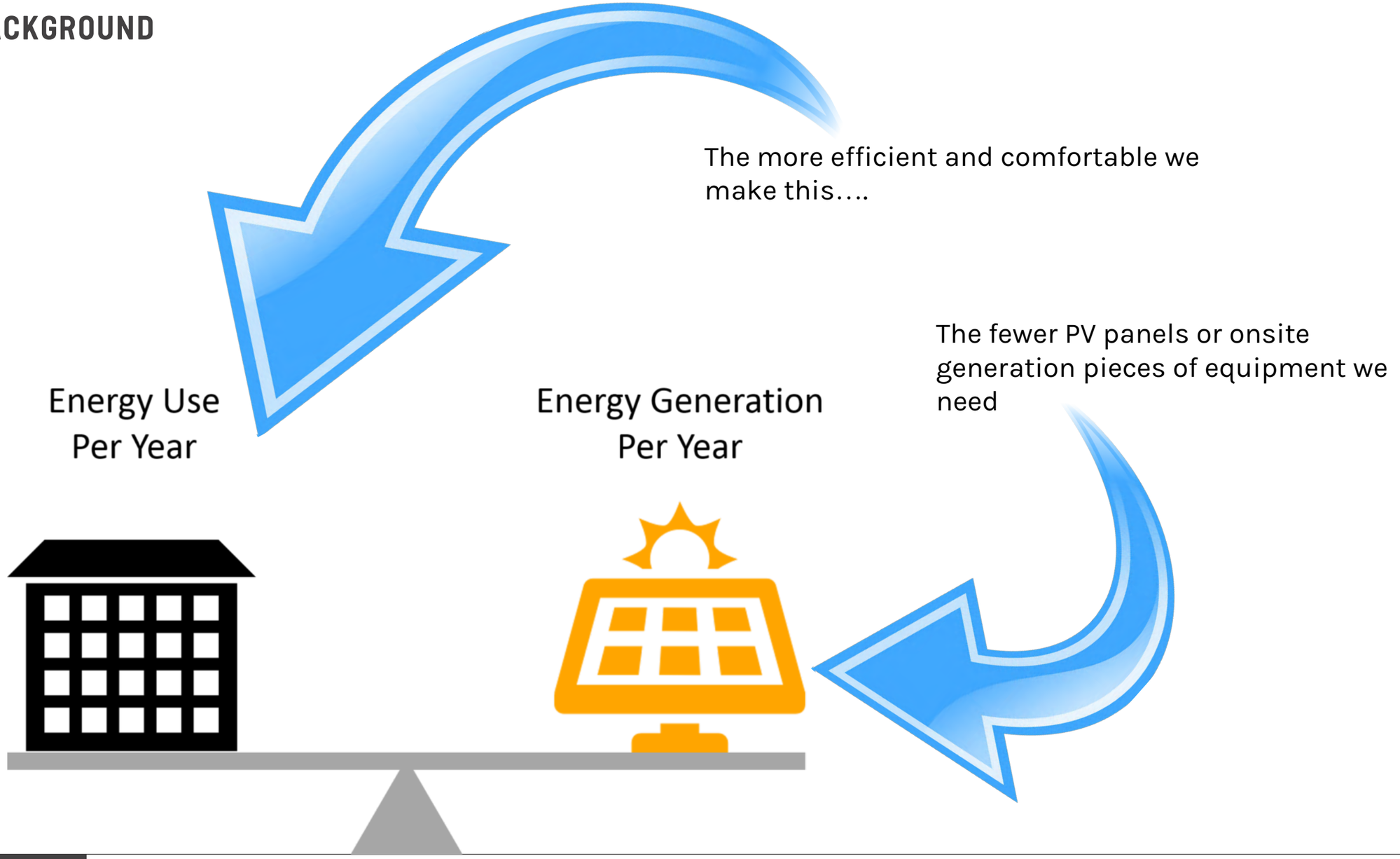
SMITHGROUP

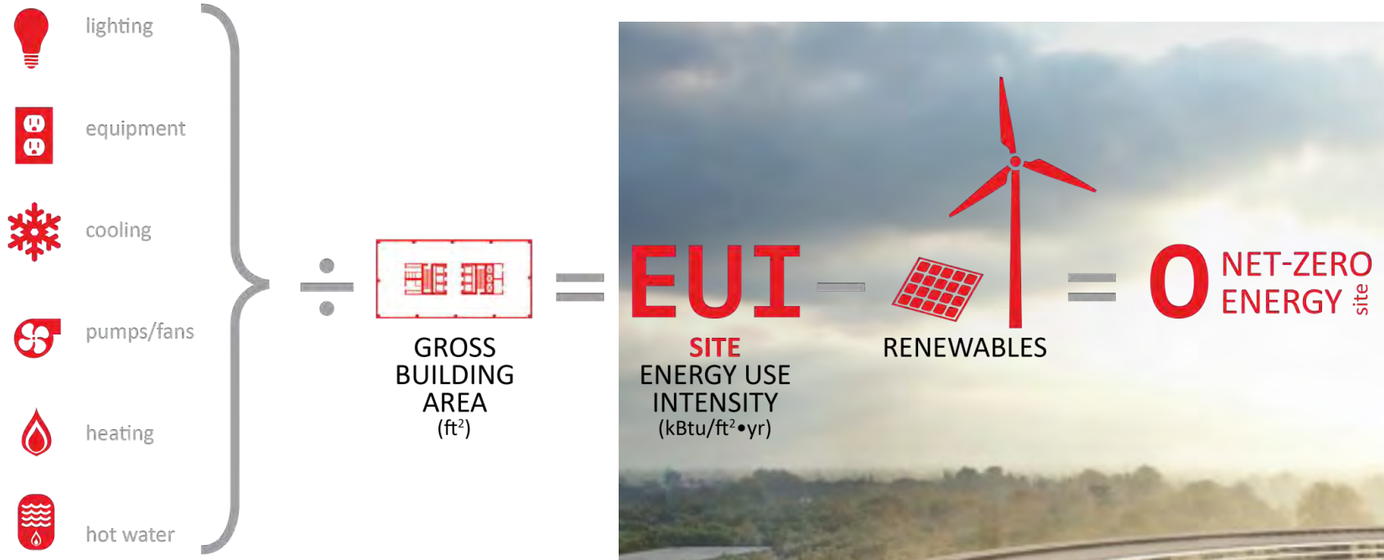
SO MUCH FOCUS ON ZNE

QUICK BACKGROUND



A RAPID MARKET SHIFT

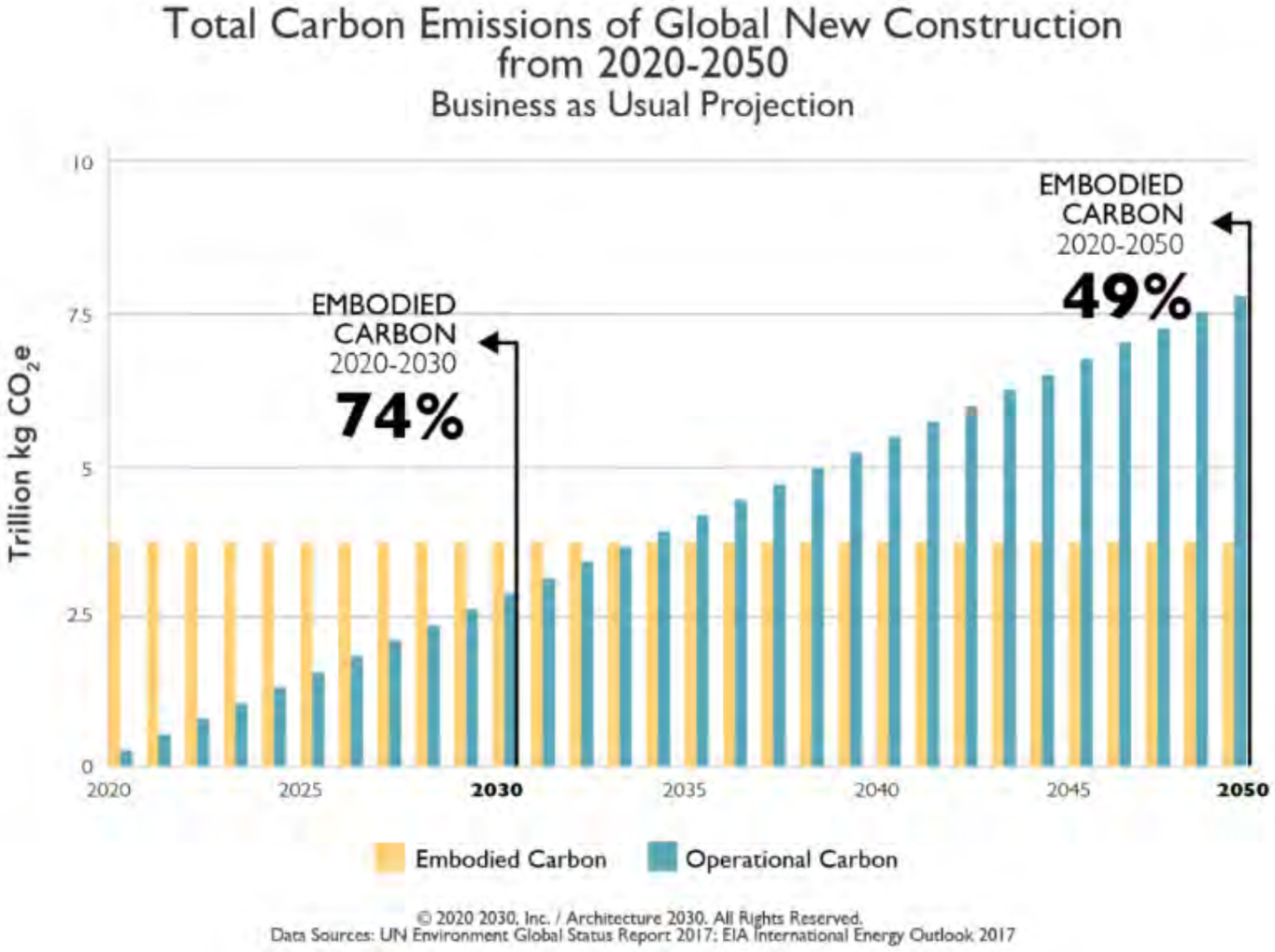
QUICK BACKGROUND



Apple Campus by Foster & Partners, Image courtesy: https://www.current-news.co.uk/blogs/what-makes-the-new-apple-campus-so-exciting

DECARBONIZATION

THE TIME VALUE OF CARBON



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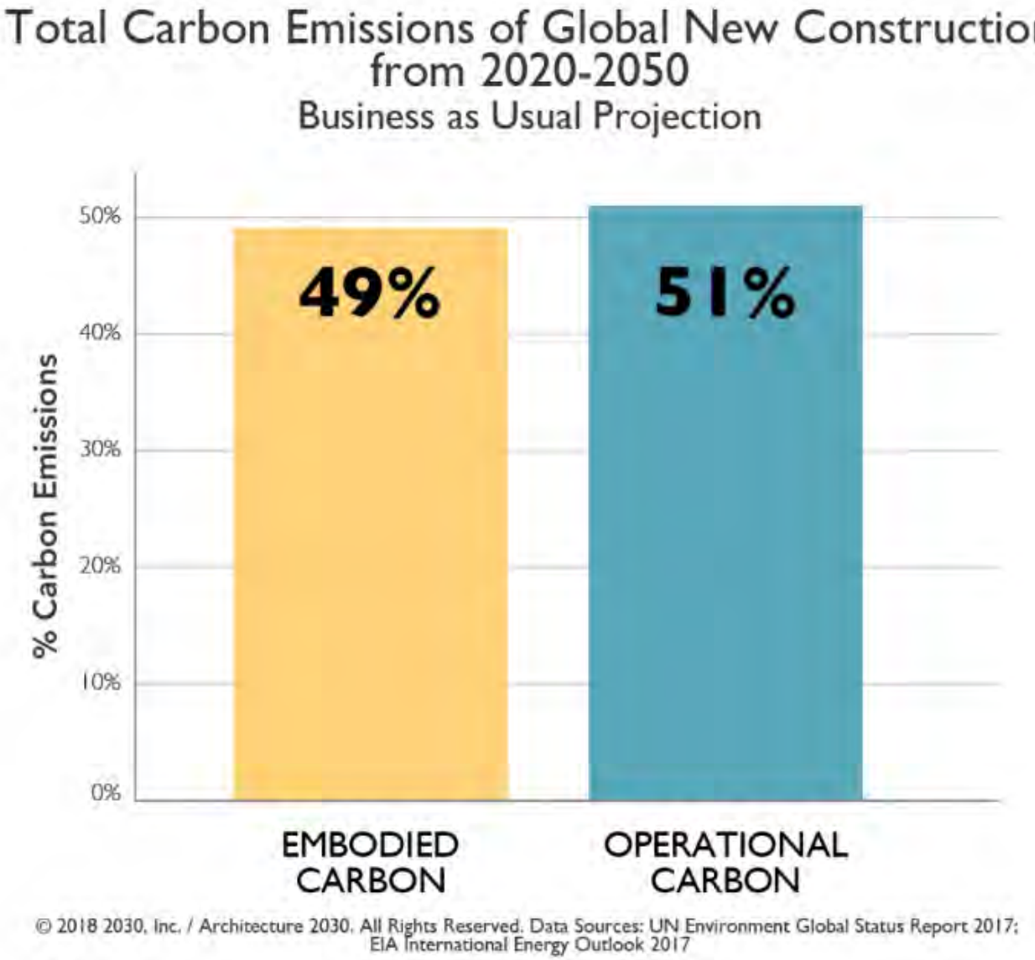
Data Sources: UN Environment Global Status Report 2017; EIA International Energy Outlook 2017



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DECARBONIZATION

STATEWIDE POLICY DRIVING RAPID CHANGE

- SB-100 (September 12, 2018)
  - Carbon Neutral Electricity by 2045

- B-55-18 (Sept. 12, 2018)
  - Executive order committing economy-wide carbon neutrality by 2045

DECARBONIZATION

LOCAL POLICY TAKING THE REIGNS

- All-Electric Codes
  - Gas Bans and Reach Codes

Decarbonization Code Comparison Matrix as of 12/05/2019

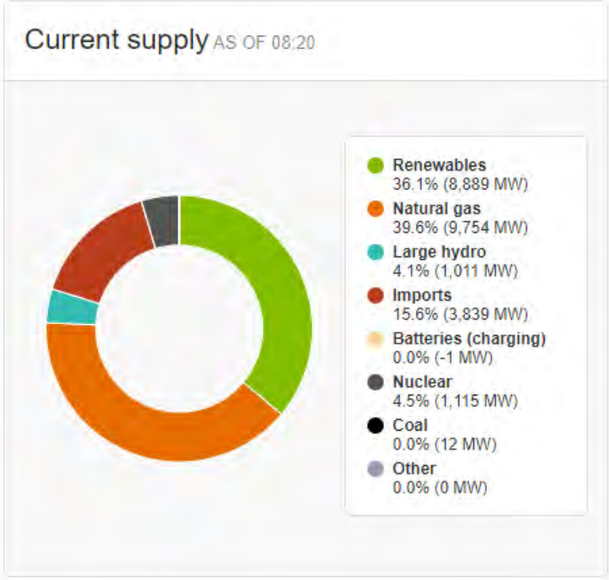
Jurisdiction	Status	Approach			Systems											Add-Ons			
		Natural Gas Infrastructure Ban	All-Electric Reach	Electric-Preferred	Whole Building	Water Heating	Space Heating	Low Rise Residential	City-Owned Properties	High Rise Residential	Hotel	Retail	Office	Restaurant	Life Sciences	Additional Solar	Electric Vehicles	Low Carbon Concrete	Natural Gas In Lieu Fee
Alameda	Approved	X			X				X										
Berkeley	Approved	A		B	X			X	X	X	X	X	X	X	X	B	X	X	
Brisbane*	Second Reading		X		X			X	X	X	X	X	X	X					
Carlsbad	Approved		X			X		X								X			
Davis	Approved			X	X			X											
Healdsburg	Second Reading		X			X	X	X	X	X	X	X	X	X	X				
Los Gatos*	Second Reading		X		X			X									X		
Marin County	Approved			X	X			X	X	X	X	X	X	X	X		X		
Menlo Park*	Approved		X			X	X	X	X	X	X	X	X	X		X	X		
Mill Valley	Approved			X	X			X		X							X		
Milpitas	Approved			X	X			X	X	X	X	X	X	X	X	X	X		
Morgan Hill	Approved	X			X			X	X	X	X	X	X	X	X				
Mountain View*	Approved		X		X			X	X	X	X	X	X	X		X	X		
Pacifica	Second Reading		X			X	X	X	X	X	X	X	X	X		X	X		
Palo Alto*	Approved		A	B	X			A	X	B	B	B	B	B	B		X		
Saratoga	Approved		X			X	X	X	X	X	X	X	X	X	X		X		
San Jose*	Approved	A		B	X			A	X	B	B	B	B	B	B	B	X		
San Luis Obispo	Second Reading			X	X			X	X	X	X	X	X	X	X	X			X
San Mateo	Approved			X	X			X					X			X	X		
Santa Monica	Approved			X	X			X	X	X	X	X	X	X	X	X			
Santa Rosa	Approved		X		X			X											
Windsor	Approved		X		X			X											

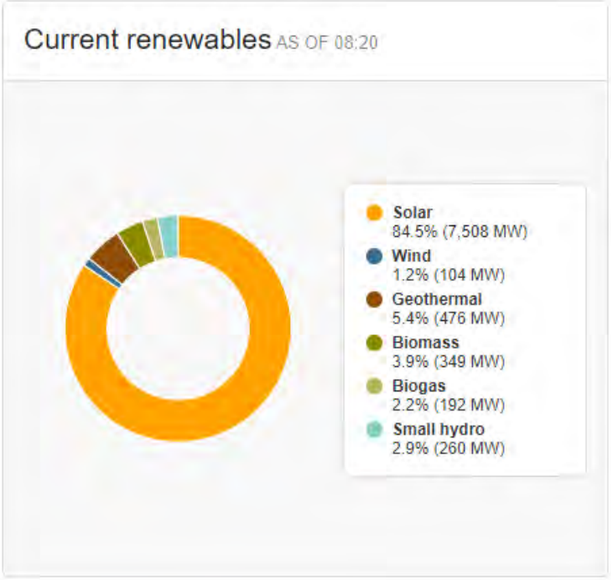
*City Council opted to go beyond staff recommendation

A and B indicate different approaches as applied to specific building types.

DECARB + ELECTRIFICATION

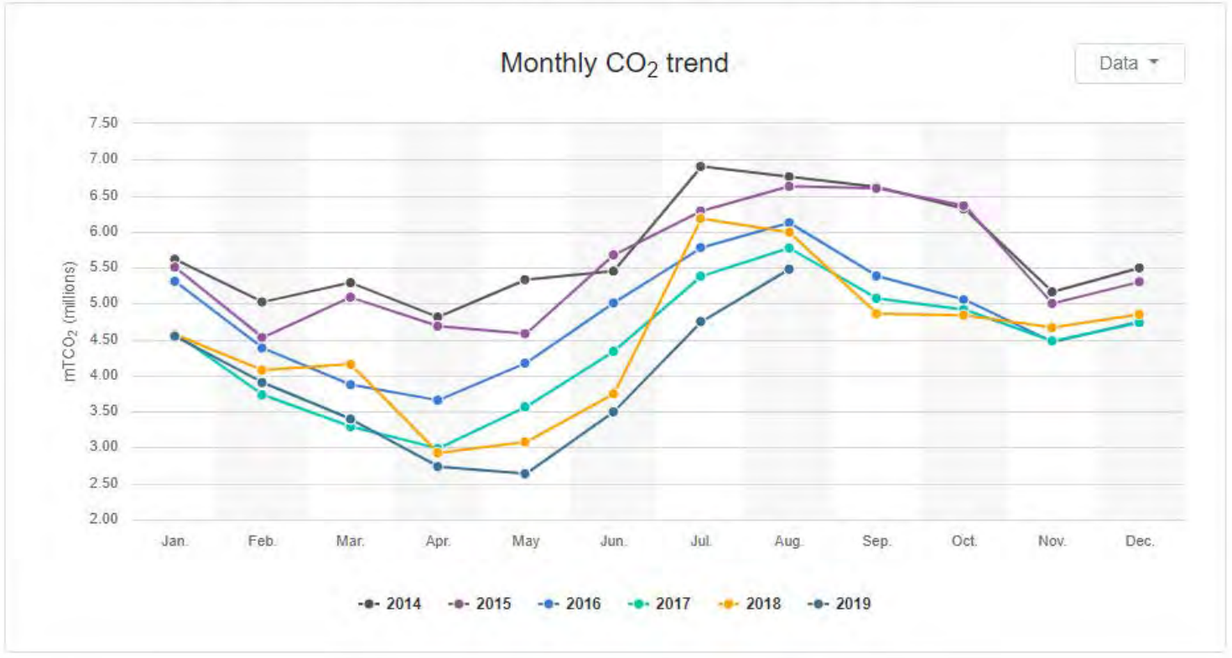
MATCH MADE IN HEAVEN IF WE'RE SMART

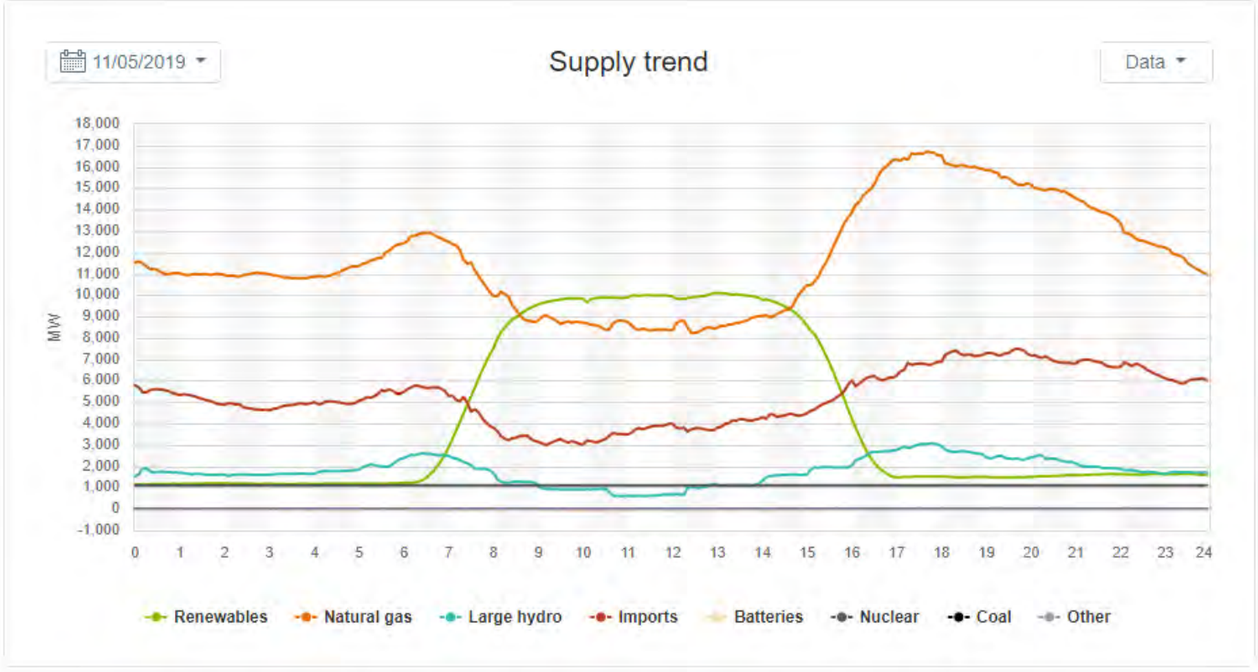




Historical CO_2 emissions (serving ISO load)

The addition of zero or very low carbon renewable resources to the grid is reducing CO_2 emissions over time.





DECARB + ELECTRIFICATION

MATCH MADE IN HEAVEN IF WE'RE SMART

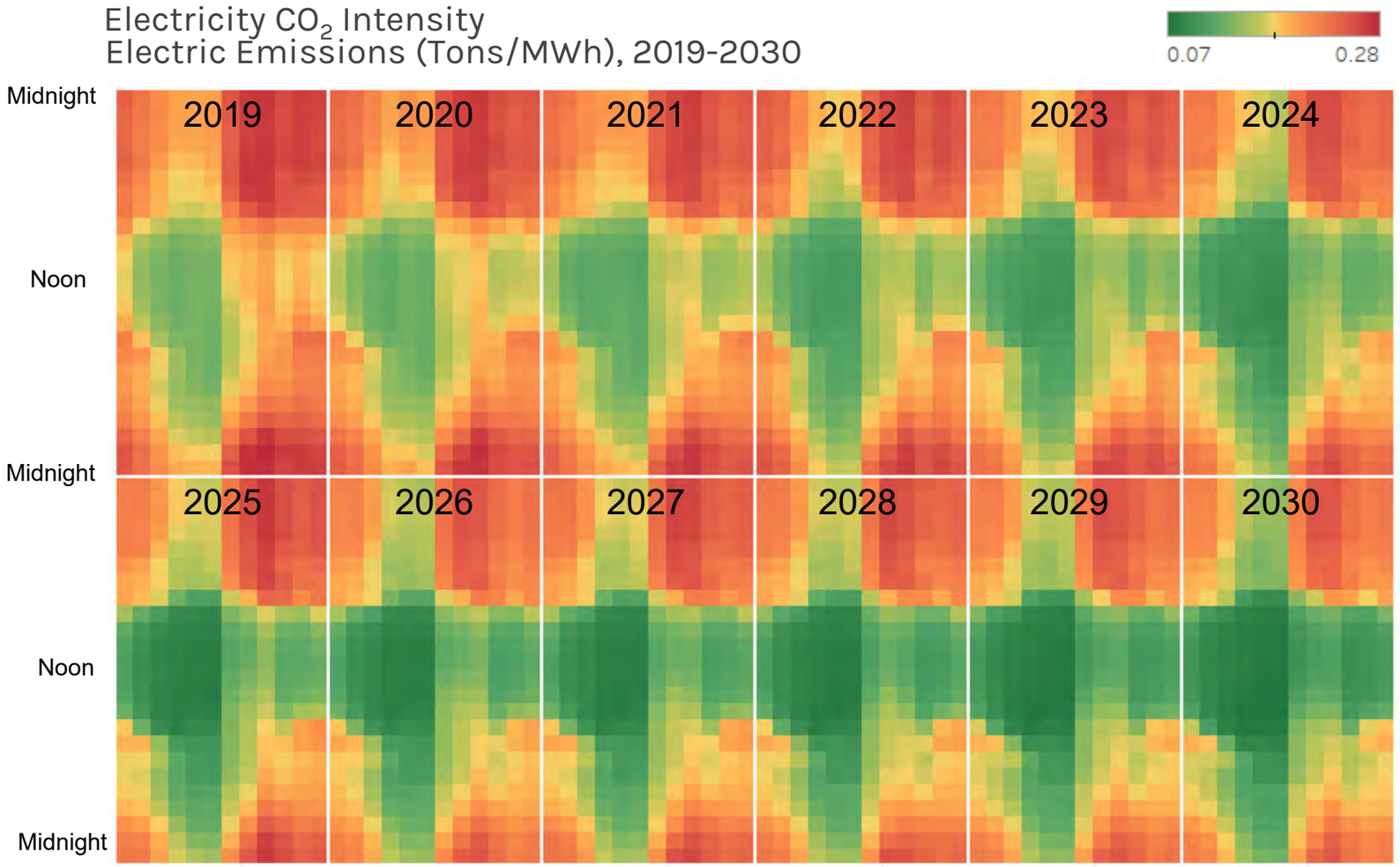


Image Courtesy Martha Brook, CEC

DECARB + ELECTRIFICATION

MATCH MADE IN HEAVEN IF WE'RE SMART

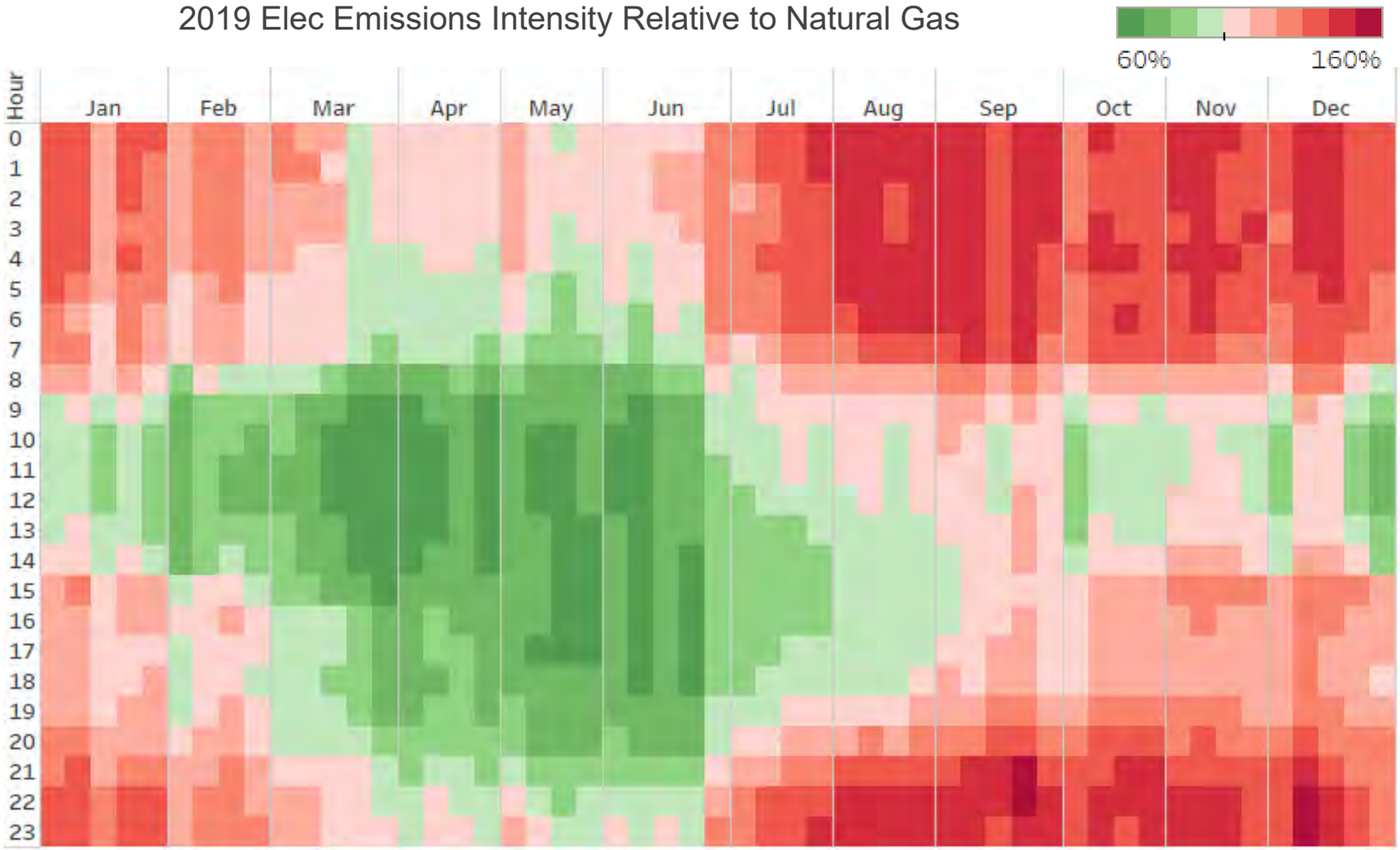


Image Courtesy Martha Brook, CEC

DECARB + ELECTRIFICATION

MATCH MADE IN HEAVEN IF WE'RE SMART

CZ 3 Water Heating - 2019 Std

2019 GHG Elec HPWH vs. Gas Tankless

1
1.60
0.40

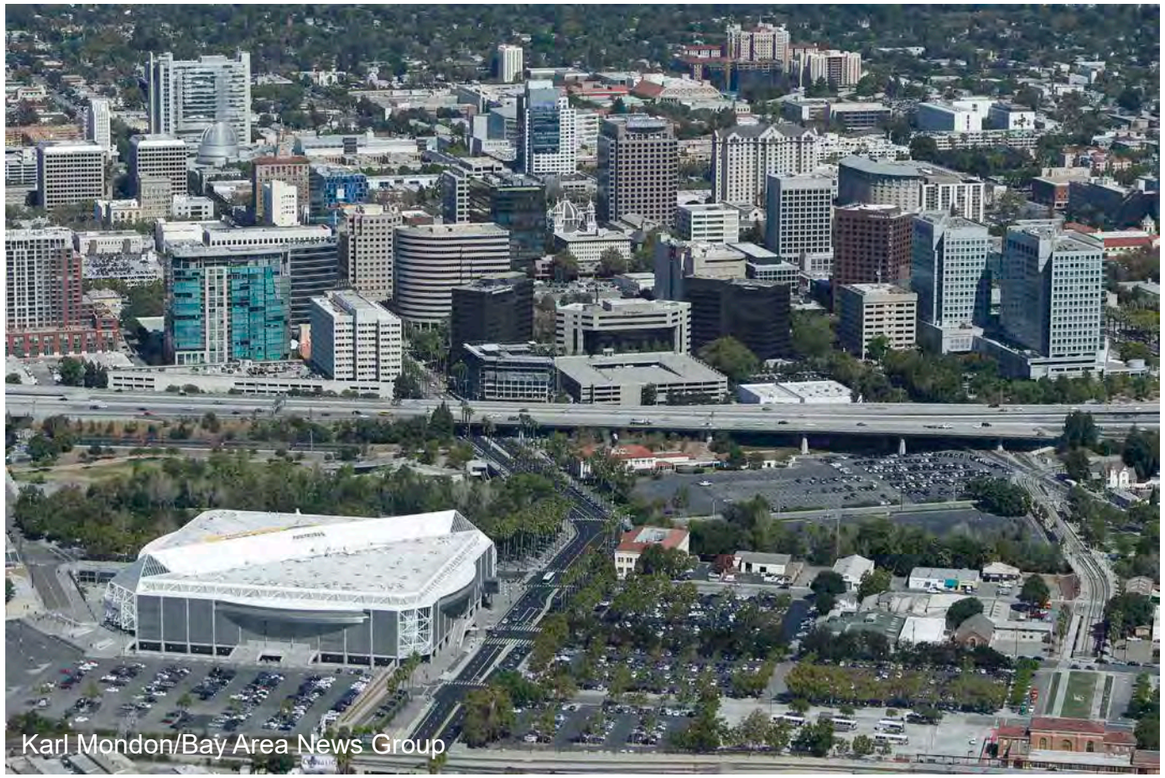
HPWH ~ 3 COP

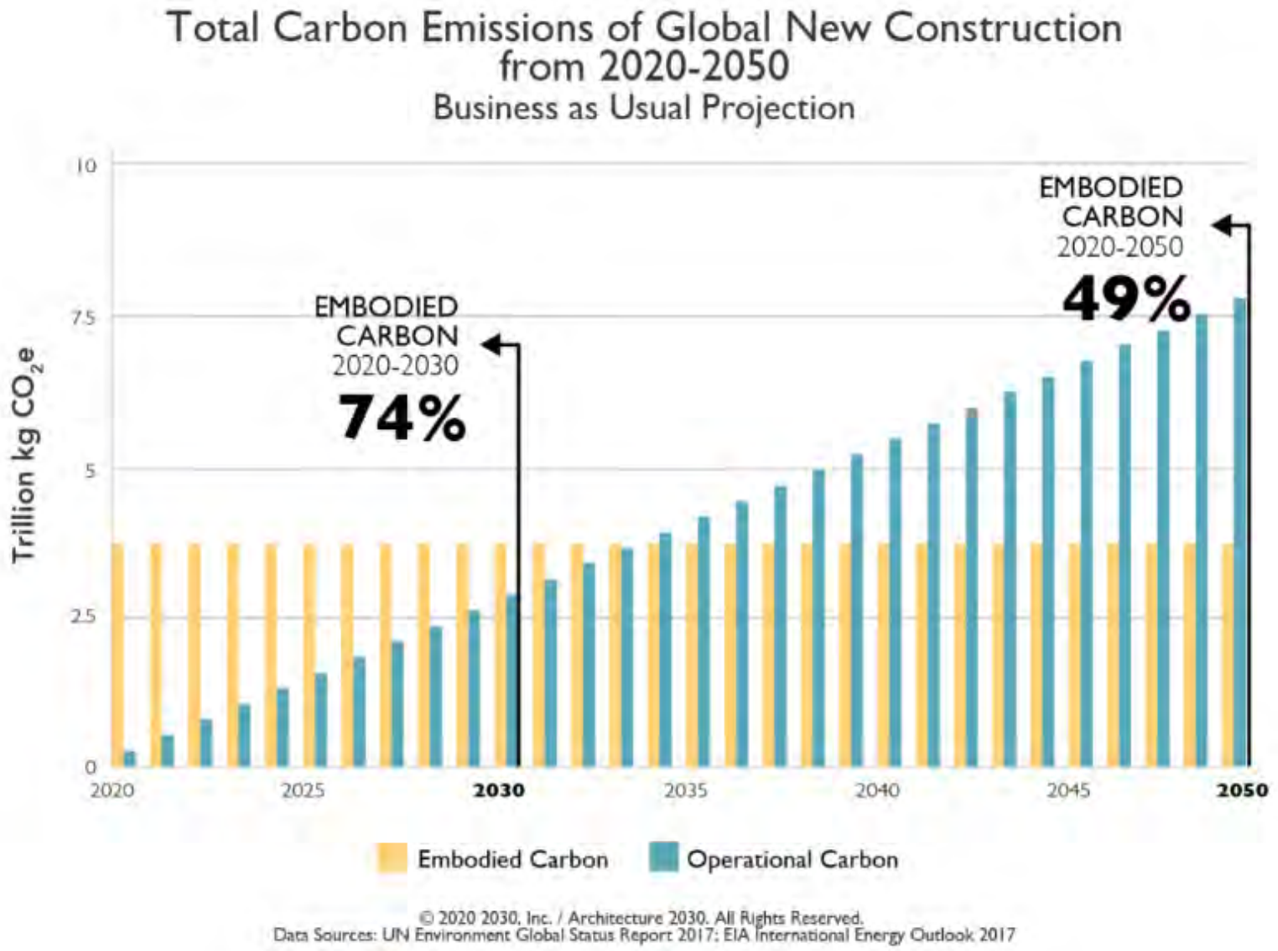
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1.1	1.6	1.4	0.5	0.4	0.2	2.5	0.5	1.3	3.2	7.5	0.4
2	4.9	1.8	0.9	0.6	0.1	1.3	0.3	1.1	1.2	0.4	2.6	2.9
3	3.8	2.1	0.3	3.2	0.3	2.0	1.0	0.6	8.5	4.3	0.1	1.8
4	6.1	6.3	0.6	0.5	0.7	0.3	0.3	0.3	0.5	0.4	1.3	1.1
5	0.6	0.4	0.5	0.7	0.3	0.3	0.3	0.3	0.0	0.5	0.8	1.4
6	1.1	0.8	0.2	0.2	0.3	0.2	0.3	0.2	0.2	0.4	0.7	1.2
7	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.4
8	0.3	0.3	0.4	0.3	0.3	0.5	0.3	0.3	0.7	0.2	0.3	0.2
9	0.3	0.5	0.4	0.3	0.5	0.3	0.4	0.3	0.7	0.4	0.4	0.4
10	0.2	0.3	0.3	0.3	0.5	0.4	0.6	0.3	0.4	0.5	0.3	0.8
11	0.5	0.6	0.2	0.4	0.4	0.3	0.3	0.6	0.3	0.6	0.4	1.1
12	0.5	1.0	0.3	0.3	0.5	0.1	0.3	0.5	0.4	0.4	0.4	0.4
13	0.4	0.3	0.3	0.2	0.3	0.1	0.2	0.3	0.2	0.3	0.5	0.3
14	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.5	0.2
15	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.2	0.3
16	0.3	0.2	0.1	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1
17	0.3	0.4	0.1	0.5	0.1	0.2	0.1	0.2	0.1	0.1	0.2	0.2
18	0.9	0.2	0.2	0.3	0.2	0.1	0.1	0.2	0.2	0.3	0.2	0.3
19	0.7	0.3	0.3	0.3	0.2	0.1	0.3	0.1	0.2	0.4	0.3	0.3
20	0.5	0.4	1.0	0.2	0.2	0.4	0.3	0.5	0.5	0.4	0.3	0.3
21	0.6	0.5	0.3	0.2	0.2	0.6	0.3	0.8	0.5	0.2	0.5	0.7
22	0.3	0.8	0.7	0.7	0.4	0.2	0.8	0.6	0.7	0.7	0.5	0.9
23	1.1	0.3	0.8	1.6	0.5	0.7	0.9	1.3	1.2	0.9	1.4	2.9
24	0.7	0.3	1.9	0.7	1.3	0.4	0.9	3.0	0.7	1.1	0.7	1.4

Image Courtesy Martha Brook, CEC

EMBODIED CARBON AND THE EXISTING CITY

THE CARBON WE'RE ALREADY SUFFERING FROM





Electrification

CARBON CALL TO ACTION

NEW BUILDINGS WILL NOT REDUCE OUR TOTAL EMISSIONS

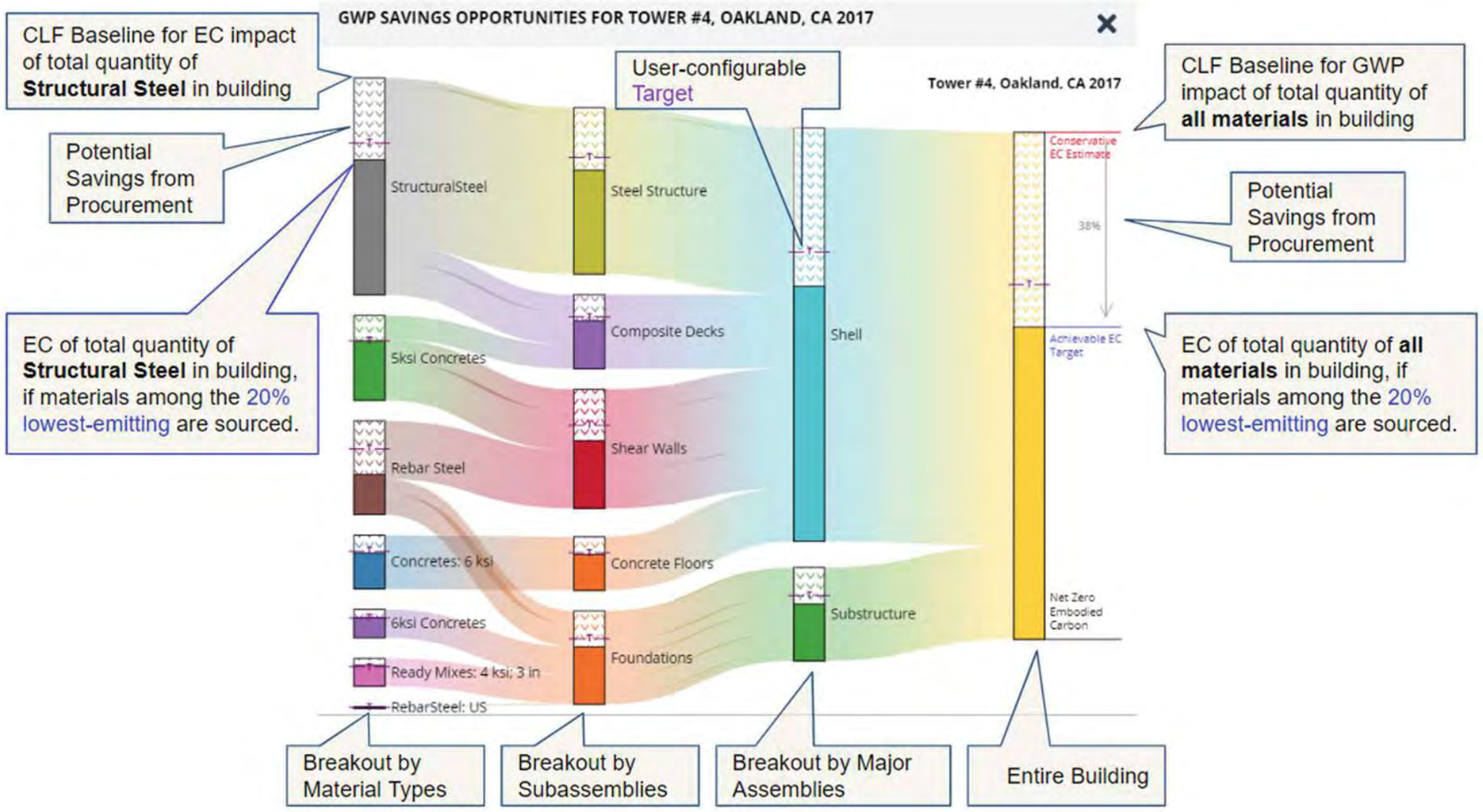


Image Courtesy ENR

ZNE RETROFITS

ALL-ELECTRIC: ZERO NET ENERGY RETROFIT. DPR CONSTRUCTION; SACRAMENTO OFFICE

BEFORE / AFTER

ALL NATURAL LIGHT: SOLATUBES AND ENLARGED GLAZING

EXIT

NATURAL VENTILATION

MASS TIMBER

CARBON ESTIMATOR

RESULTS

Volume of wood products used:
70 cubic meters (2,432 cubic feet)

U.S. and Canadian forests grow this much wood in:
12 seconds

Carbon stored in the wood:
55 metric tons of carbon dioxide

Avoided greenhouse gas emissions:
115 metric tons of carbon dioxide

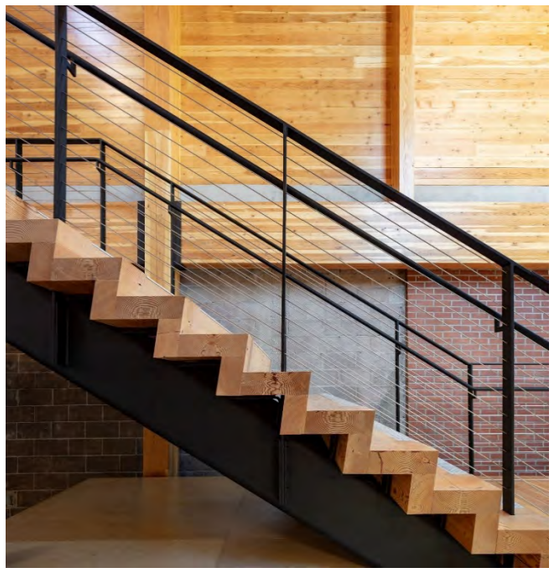
Total potential carbon benefit:
170 metric tons of carbon dioxide

EQUIVALENT TO...

33 cars off the road for a year

Energy to operate 14 homes for a year

*Source: WoodWorks Wood Products Council



MORE THAN JUST CARBON SAVINGS

BIOPHILIA AND WOOD

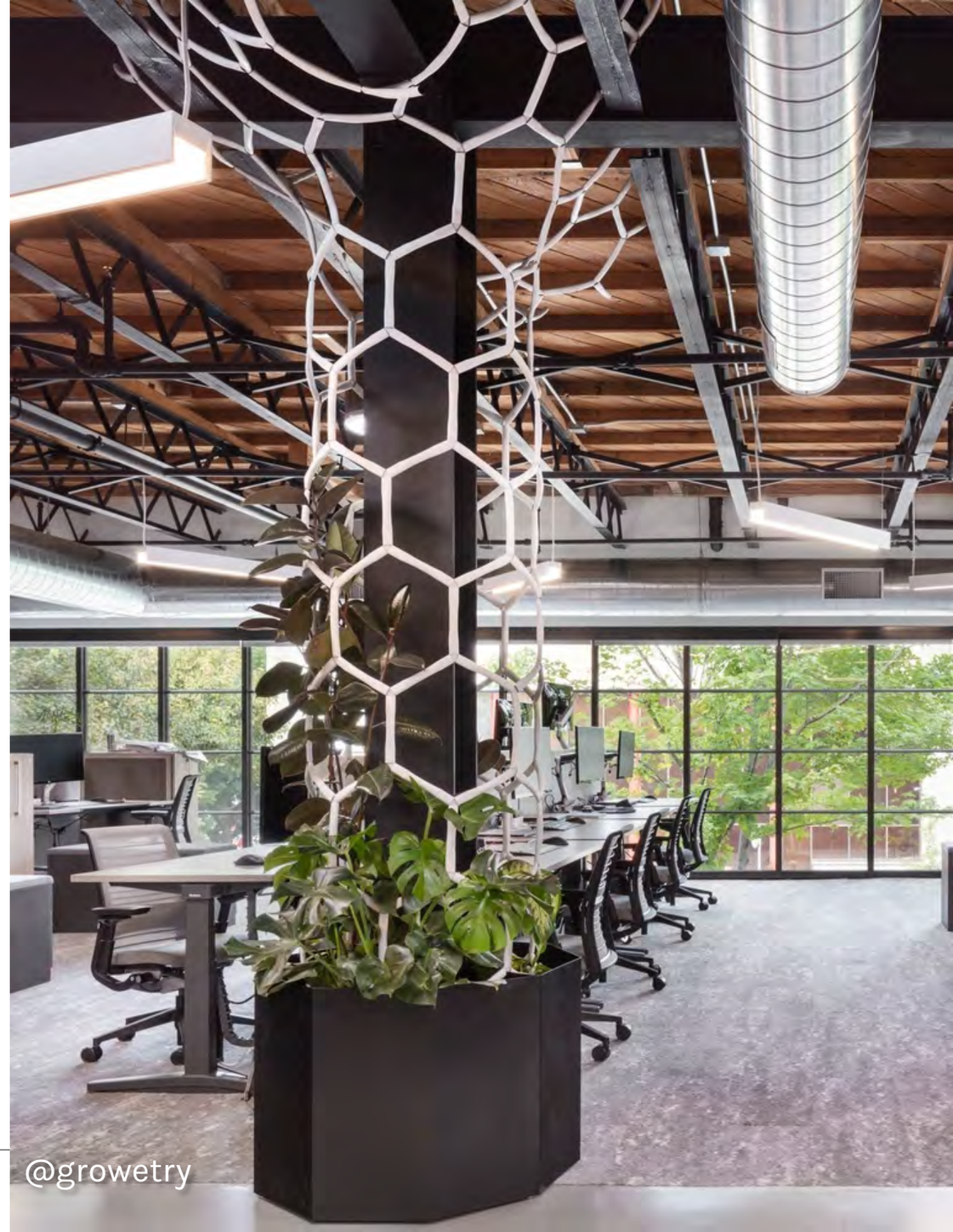
THE SEED BANK

WOOD AND RESILIENT DESIGN

@miridaelandscapes
@micahcrandallbear
@markfoster
@growetry
@chad_davies

CARBON AS INSPIRATION

@miridaelandscapes
@growetry
@thomasramey



@growetry

CHOOSE YOUR OWN CARBON ADVENTURE

Is my Project a
Retrofit, Renovation or
Adaptive Reuse?

CHOOSE YOUR OWN CARBON ADVENTURE

Is my Project a Retrofit, Renovation or Adaptive Reuse?

No — Yes

CHOOSE YOUR OWN CARBON ADVENTURE

Is my Project a Retrofit, Renovation or Adaptive Reuse?

No

Advocate for a new site

Yes

Can you retrofit to ZNE on site?

CHOOSE YOUR OWN CARBON ADVENTURE

Is my Project a Retrofit, Renovation or Adaptive Reuse?

- No → Advocate for a new site
- Yes → Can you retrofit to ZNE on site?
  - No
  - Yes

CHOOSE YOUR OWN CARBON ADVENTURE

Is my Project a Retrofit, Renovation or Adaptive Reuse?

- No → Advocate for a new site
- Yes → Can you retrofit to ZNE on site?
  - No
  - Yes → Excellent!!; Use low embodied materials, offset your new total and you win!!

CHOOSE YOUR OWN CARBON ADVENTURE

Is my Project a Retrofit, Renovation or Adaptive Reuse?

- No
  - Advocate for a new site
- Yes
  - Can you retrofit to ZNE on site?
    - No
      - Boo. At least make it all-electric and use low embodied materials and you're still a winner
    - Yes
      - Excellent!!; Use low embodied materials, offset your new total and you win!!

ZNE RETROFITS:

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