Lessons from COVID-19 for the Climate Emergency

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Former Science Envoy, United States Department of State

MIT Energy Conference, April 2, 2020
Resources:

Website: http://rael.berkeley.edu

Twitter: @dan_kammen
RAEL: 50 PhD graduates and counting

Rick Duke, Special Advisor to Pres. Obama on Climate Change

Assoc. Prof Tracey Osborne, Geography, U of Arizona

Asst. Prof Dan Sanchez, Extension, ESPM, UC Berkeley

Prof Charles Kirubi, Environmental Studies, Kenyatta University

Asst Prof. Gang He, Dept. Tech. & Society, Stony Brook University

Assoc. Prof. Donna Green, UNSW

Rebekah Shirley, Dir. Power for All, Strathmore University, Nairobi, Kenya

Energy Extension, Christian Casillas, U of New Mexico.

Asst. Prof Derek Lemoine, Economics, U. of Arizona.

Prof. Katie Purvis, Environmental Chemistry, The Claremont Colleges

Prof Tonio Buonosissi, Mechanical Eng., Dir. Solar Materials Lab, MIT

Assoc. Prof. Joanna Lewis, Georgetown U

Prof Arne Jacobsen, Director, Schatz Energy Lab Humboldt State U

Prof Tracey Holloway, Atmospheric Science, U Wisc. Founder, Env. Science Women’s Network

Carla Peterman, Commissioner, California Public Commission

Prof Majid Ezzati, Dir. Global Env. Health Imperial College, London & Harvard School of Public Health

Asst Prof. Deborah Sunter, Mechanical Engineering, Tufts U. & UC Berkeley Institute of Data Sciences Fellow

Assoc. Prof. Greg Nemet, U. Wisconsin, LaFollette School of Public Affairs & Nelson Institute
Critical COVID-19 Lessons for the Climate Emergency

- There is no substitute for research & development, and education
- Supply chains are vulnerable on a crowded, denuded, planet
- Tipping points happen fast
- Individual actions matter (infection & education)
- We only as resilient as the most vulnerable (Environmental Justice)
April 1 US COVID19

Total cases: 186,101

Total deaths: 3,603

COVID-19 Event Risk Assessment Planner
Assumes Incidence Homogeneity

Active circulating infections in the USA

0.0061% chance
0.061% chance
0.6% chance
5.9% chance
45% chance

Less than 1% chance of COVID-19 positive attendee at the event

Dinner party
Wedding reception
Small concert
Hockey match
March Madness Final in Atlanta

Calculation note - J.S.Weitz - jsweitz@gatech.edu - 3/8/20 - Risk is $\epsilon \approx 1 - (1 - p_r)^n$ where $p_r = I(t)/(330 \times 10^6)$ - Assumes $I = 2000$
COVID19 and Climate change
An unprecedented rise in unemployment

Unemployment to hit 20%?

Unemployment insurance claims by week in millions

Goldman Sachs 3/19/20 projection

2,250,000

Sources: US Employment and Training Administration; David Choi, Goldman Sachs
Vacancies in Scientific Leadership Positions during Three Administrations

- George W. Bush: 68 Appointed, 3 Vacant
- Barack Obama: 79 Appointed, 0 Vacant
- Donald Trump: 44 Appointed, 39 Vacant
Cumulative risks of 3°C warming

Population affected by various risks (millions of people):

- Heatwave exposure: 7,909
- Water stress: 3,920
- Risk to power production: 742
- Crop yield change: 1,817
- Habitat degradation: 1,357

Cumulative risks of 2°C warming

Population affected by various risks (millions of people)

- Heatwave exposure: 5,986
- Water stress: 3,658
- Risk to power production: 385
- Crop yield change: 362
- Habitat degradation: 680

Cumulative risks of 1.5 °C warming

Population affected by various risks (millions of people)

- Heatwave exposure: 3,960
- Water stress: 3,340
- Risk to power production: 334
- Crop yield change: 35
- Habitat degradation: 91

NDC Commitments to the Paris Accords

IPCC, 2018: 1.5 degree objective

Paris, 2015: 2 degree objective
CARBON CRUNCH

There is a mean budget of around 600 gigatonnes (Gt) of carbon dioxide left to emit before the planet warms dangerously, by more than 1.5–2°C. Stretching the budget to 800 Gt buys another 10 years, but at a greater risk of exceeding the temperature limit.

Delaying the peak by a decade gives too little time to transform the economy.

Peaking emissions now will give us 25 years to reduce emissions to zero.

*Data from The Global Carbon Project.
R&D in Materials Science for Storage

Data sources:

Overnight Energy costs (current)
Regional Greenhouse Gas Initiative
CA & Quebec
Social Cost of Carbon ($50)
Electric Vehicle Data Science: China and New York City (w/Gordon Bauer)
Data science for fleet management:
Dr Cheng Zheng, CEO, Aspiring Citizens Cleantech (ACC), Chengdu, China
& Gordon Bauer & Daniel Kammen (ERG, UC Berkeley)

100% EV taxi fleet in Shenzhen, China (25,000+ vehicles)
24 month fleet conversion
Electricity for All: Issues, Challenges, and Solutions for Energy-Disadvantaged Communities

Kibera Town Center, Nairobi: Women’s Resource Center
Solar microgrid franchise model leverages community energy

- Largest slum in Africa
- Minimal infrastructure
- Unmet energy demand
- Leverage Women’s resource center (600 users/day)
- Women’s resource center opens 2017
- Community training center
- Hub of franchise model for community micro-grid
In one year a youth movement on climate went from

From this

To this

Four million people
September 20 – 27: a week of action
Expectations locally to globally
ANDREW DICKSON
Secretary of the Assembly

Re: Berkeley Division Memorial Resolution on Fossil Fuel Divestment Ballot Results

Dear Secretary Dickson,

The Berkeley Division held an electronic vote in accordance with Senate Bylaws 90 and 95 on the proposed Memorial to the Regents on fossil fuel divestment. The ballot was open from June 6-27, 2019. The certified results of the ballot are as follows:

- Total ballots cast: 423
- "Yes" votes: 339
- "No" votes: 84
- Invalid ballots: 0

Please contact me or Berkeley Division Associate Director Sumei Quiggle if there are any questions concerning this ballot.

Sincerely,

David Milnes
Chair, Committee on Rules and Elections and Secretary, Berkeley Division of the Academic Senate

Cc: Barbara Spackman, Chair, Berkeley Division of the Academic Senate
Jocelyn Sturla Banaria, Executive Director, Berkeley Division of the Academic Senate
Hilary Baxter, Executive Director, UC Academic Senate
California Energy Goals: Aggressive & Evolving

2013: 20%
2020: 33%
2030: 60%

California Senate Bill 100: 100% clean energy by 2045 and 2030 standard now 60% (without nuclear or large hydro)
California Energy Efficiency Policy Drives Innovation

Residential New Construction

• All new residential construction in California will be zero net energy by 2020.
All new commercial construction in California will be zero net energy by 2030.

Leverage opportunities from emerging technologies initiatives, incentive programs, and local initiatives targeting commercial building/property developers.
Learning from our Missteps:
Climate and Environmental Justice
Evolving California Climate Laws

Assembly Bill 32
Return to 1990 emission levels by 2020

Senate Bill 100:
100% green energy in 2045

Senate Bill 32:
Cap & Trade carbon market
And 35% or more of revenues for marginalized communities

Solar Mandate & EV Mandate:
1 million solar roofs & EVs by 2020

Justice component a work in progress...
Environmental Justice

- Lack of EV access where the health benefits are highest
- CA Green New Deal: Dedicated seed fund of $3.5 billion/yr for disadvantaged areas
- CA SB50 (housing access at transit hubs): bill failed 2x

Opinion

Why Housing Policy Is Climate Policy

In California, where home prices are pushing people farther from their jobs, rising traffic is creating more pollution.

By Scott Wiener and Daniel Kammen
Senator Wiener is the chairman of the California Senate’s Housing Committee. Dr. Kammen is a professor of energy at the University of California, Berkeley.

March 25, 2019
EcoBlock Vision: A Multi-Customer Microgrid Solution
https://ecoblock.berkeley.edu

Electrical system combines DER

- Communal rooftop solar PV
- Communal energy storage system (flywheel and/or battery)
- Intelligent loads and electric demand response
- Shared Electric vehicle (EV) charging
- Smart controls in a direct-current (DC) microgrid infrastructure

behind a single interconnection with the utility, PG&E
Solar Is Not Just for the Rich

Is US residential solar just for the rich?

By Danielle Ota
Apr 21, 2017 11:15 AM BST 0

Solar Subsidies Take Money From the Poor to Help the Rich
Large Racial disparity in solar – even at same income

Solar Installations by Racial Composition in Identified Tracts

Percentage of Census Tracts with installed PV on Buildings

<table>
<thead>
<tr>
<th>Racial Composition</th>
<th>Existing Installations</th>
<th>No Installations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>53%</td>
<td>47%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>76%</td>
<td>24%</td>
</tr>
<tr>
<td>Asian</td>
<td>83%</td>
<td>17%</td>
</tr>
<tr>
<td>White</td>
<td>79%</td>
<td>21%</td>
</tr>
</tbody>
</table>
The Green Stimulus

https://medium.com/@green_stimulus_now/a-green-stimulus-to-rebuild-our-economy-1e7030a1d9ee

Author team:

https://medium.com/@green_stimulus_now/a-green-stimulus-to-rebuild-our-economy-1e7030a1d9ee

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http://coolclimate.berkeley.edu/maps
Household GHG emissions in New York Metro Region

Energy

Transportation

Consumption

Total
## Carbon Footprint Summary (tons CO2e / year)

<table>
<thead>
<tr>
<th>Category</th>
<th>Emissions (tons CO2e/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation</td>
<td>14</td>
</tr>
<tr>
<td>Housing</td>
<td>2</td>
</tr>
<tr>
<td>Food</td>
<td>6</td>
</tr>
<tr>
<td>Goods</td>
<td>7</td>
</tr>
<tr>
<td>Services</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>36</strong></td>
</tr>
</tbody>
</table>

### Climate Action Plan Summary

- **My Current Footprint**: 41 tons CO2e/year (100%)
- **Pledged Reductions**: 5 tons CO2e/year (12%)
- **Offsets**: 0 tons CO2e/year (0%)

### Financial Impact

- **My New Footprint**: 36 tons CO2e/year (90%)
- **Financial Savings per Year**: $2223
- **10 Year Net Savings**: $20321

### Actions and Savings

<table>
<thead>
<tr>
<th>Action</th>
<th>Emissions Reduced (tons CO2e/year)</th>
<th>Savings per Year</th>
<th>10 Year Net Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buy a More Efficient Vehicle</td>
<td>1.86</td>
<td>$500</td>
<td>$3000</td>
</tr>
<tr>
<td>Telecommute to Work</td>
<td>1.07</td>
<td>$528</td>
<td>$5280</td>
</tr>
<tr>
<td>Ride my Bike</td>
<td>0.58</td>
<td>$156</td>
<td>$1560</td>
</tr>
<tr>
<td>Take Public Transportation</td>
<td>0.47</td>
<td>$156</td>
<td>$1560</td>
</tr>
<tr>
<td>Practice Eco-Driving</td>
<td>0.93</td>
<td>$249</td>
<td>$2490</td>
</tr>
<tr>
<td>Maintain my Vehicle</td>
<td>0.71</td>
<td>$190</td>
<td>$1900</td>
</tr>
<tr>
<td>Reduce Air Travel</td>
<td>0.45</td>
<td>$100</td>
<td>$1000</td>
</tr>
<tr>
<td>Offset Remaining Transportation Footprint</td>
<td>13.07</td>
<td>-$261</td>
<td>-$2610</td>
</tr>
<tr>
<td>Switch to CFLs</td>
<td>0.18</td>
<td>$63</td>
<td>$721</td>
</tr>
<tr>
<td>Turn Down Thermostat in Winter</td>
<td>0.52</td>
<td>$95</td>
<td>$950</td>
</tr>
<tr>
<td>Turn up Thermostat in Summer</td>
<td>0.15</td>
<td>$54</td>
<td>$540</td>
</tr>
<tr>
<td>Choose an Energy Star Refrigerator</td>
<td>0.05</td>
<td>$17</td>
<td>$140</td>
</tr>
<tr>
<td>Dry your Clothes on the Line</td>
<td>0.22</td>
<td>$75</td>
<td>$750</td>
</tr>
<tr>
<td>Purchase Green Electricity</td>
<td>0.05</td>
<td>$17</td>
<td>$140</td>
</tr>
<tr>
<td><strong>Total Emissions Reduced</strong></td>
<td>15.26</td>
<td>-$278</td>
<td>-$2780</td>
</tr>
</tbody>
</table>
The Green Energy Economy

Global energy savings accelerated (haltingly) after 2010

Annual changes in global primary energy intensity, 1981–2018p

-5.2% China -3.9% China -2.9% China
-1.3% EU -1.1% EU -1.6% EU
-2.9% US -2.2% US -0.8% US

Average annual change 1981–2010

Average annual change 2011–18p

IEA’s 2016 2°C warming CO₂ scenario called for 2.6%/y energy intensity drop to 2030

IEA’s 2018 2°C warming CO₂ scenario calls for 3.2%/y energy intensity drop to 2040

Figure 2 from “Recalibrating climate prospects”
Lovins, Ürge-Vorsatz, Mundaca, Kammen & Glassman

doi:10.1088/1748-9326/ab55ab
Thank you

- Twitter: @dan_kammen
- http://rael.berkeley.edu