

A background image showing three wind turbines on a dark hill against a bright orange sunset sky. The sun is positioned behind the central turbine, creating a silhouette effect.

Coronavirus: Opportunity for Climate Stimulus and Policy

MAY 2020

The background of the slide is a photograph of three wind turbines on a grassy hill. The scene is captured during sunset or sunrise, with a warm orange and yellow sky. The sun is positioned behind the central turbine, creating a bright glow and silhouetting the blades. The foreground shows the dark silhouette of the hillside.

Climate change is the defining challenge for future generations.

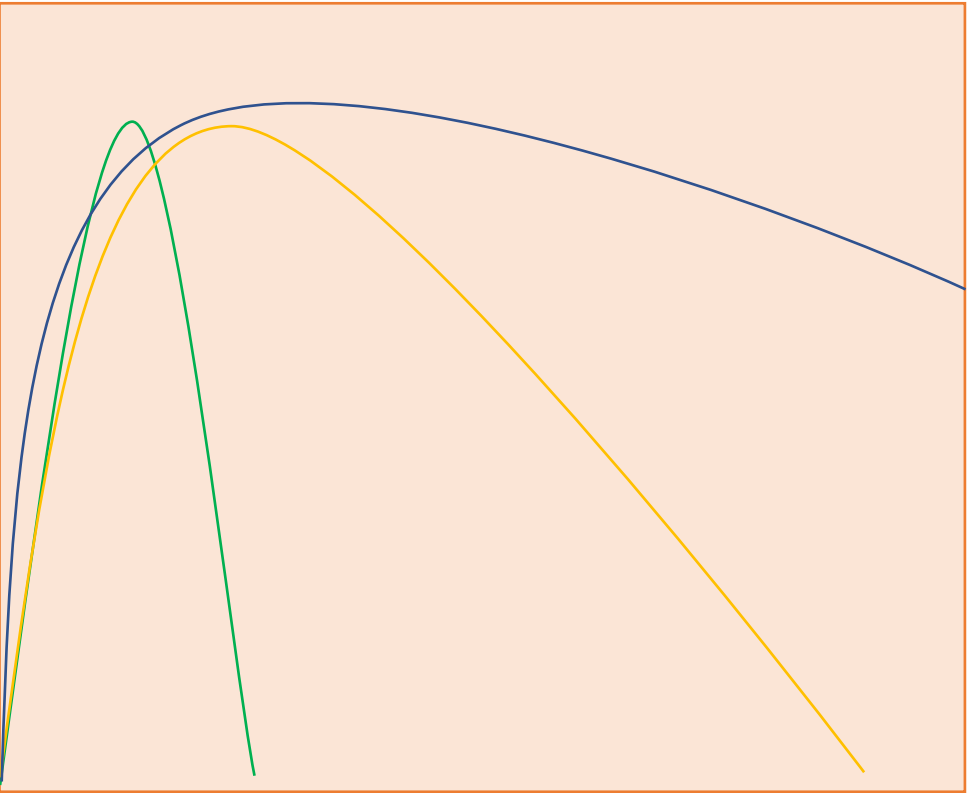
The threat it poses to economies, geopolitics and life-support will eclipse all other issues for humanity.

ORTUS CLIMATE MITIGATION is leading the transition from fossil-fuels to a low carbon economy by leveraging proven technologies to acquire and accelerate diversified renewable energy portfolios.

CONTEXT: CORONA IMPACT AND CLIMATE CHALLENGE

CORONA ECONOMIC IMPACT

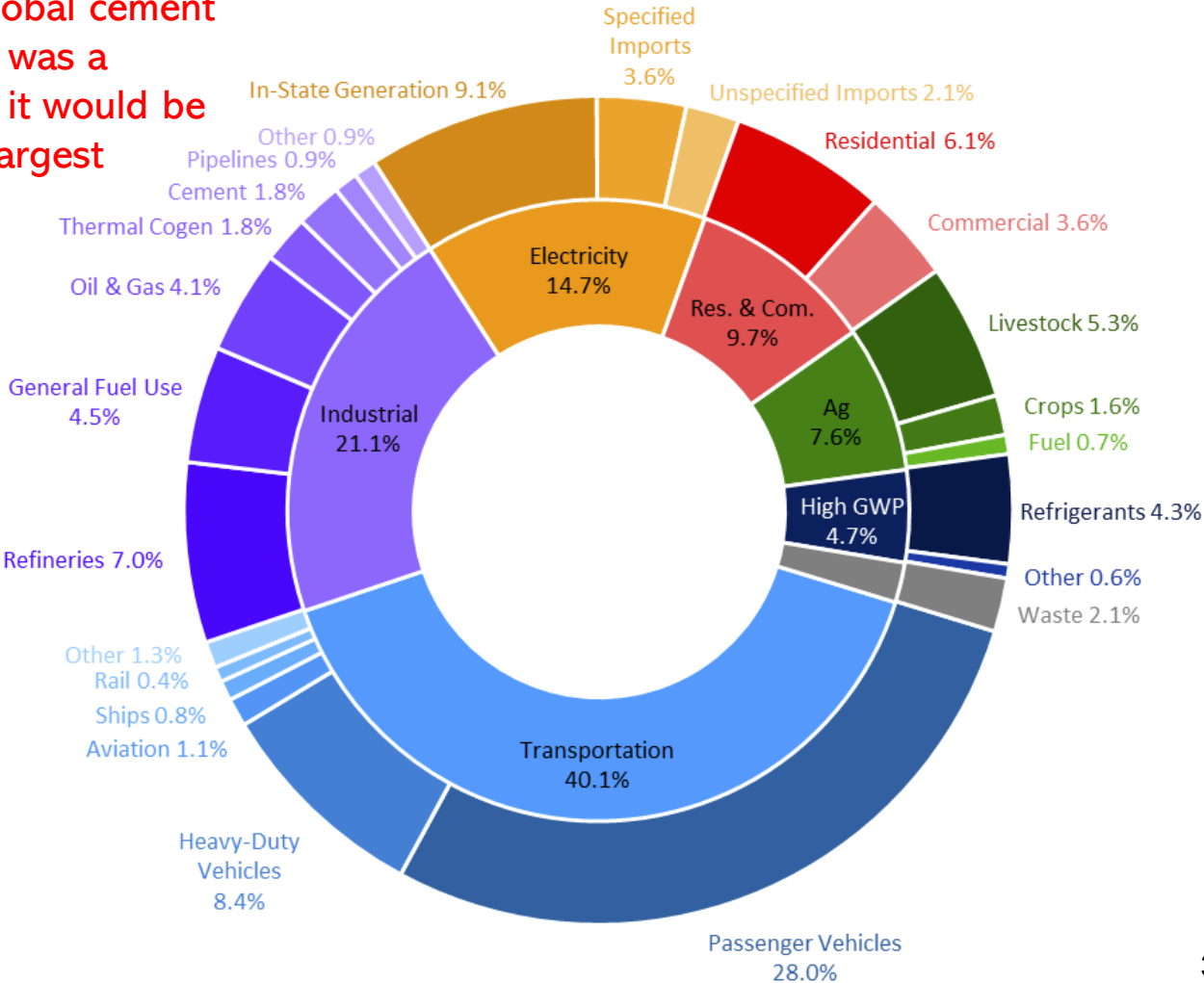
Impact



Duration

(If the global cement industry was a country, it would be the 3rd largest emitter)

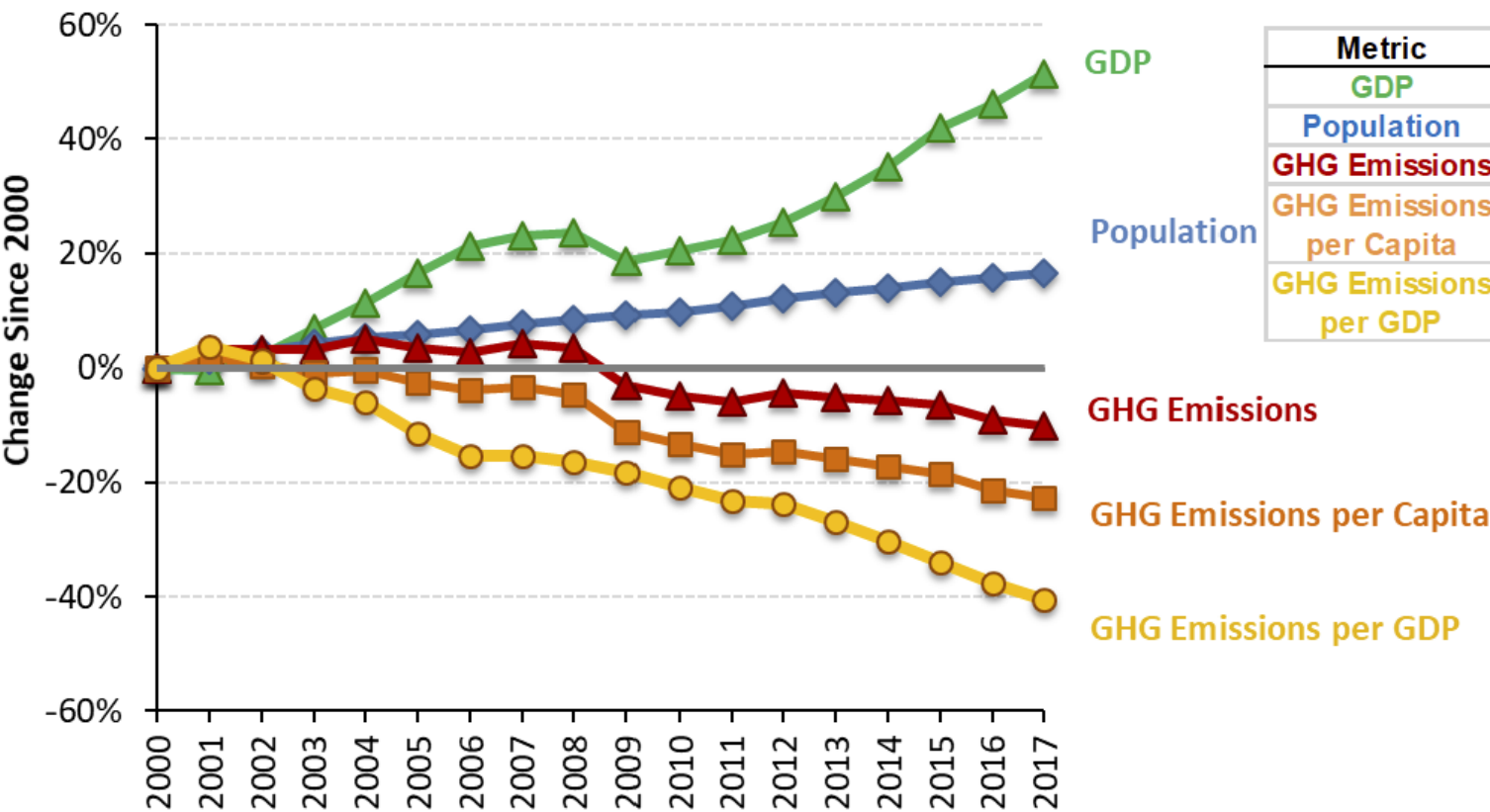
DETAILED SOURCE EMISSIONS (CA)



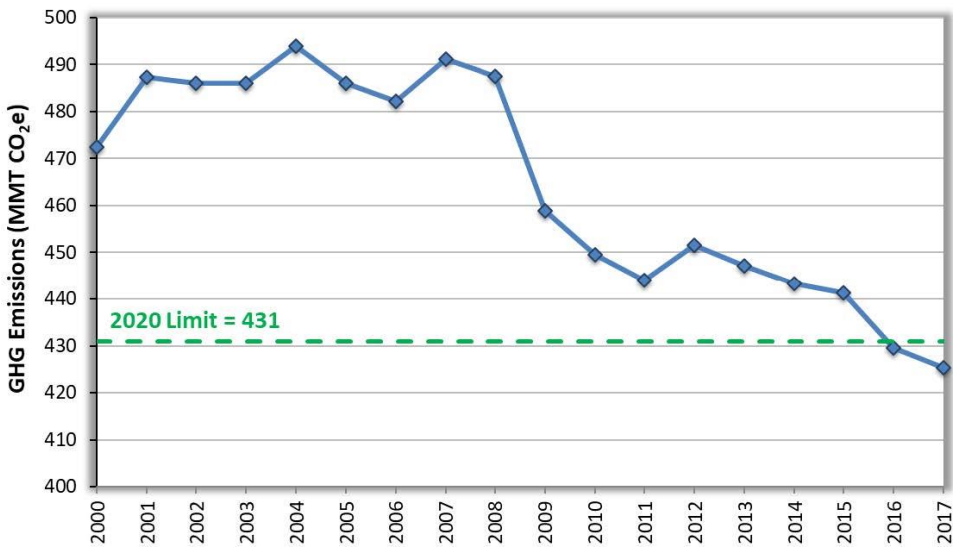
LESSONS FROM CALIFORNIA: 2000 EMISSIONS DECLINED ~10% WHILST GDP GREW BY ~50% DRIVEN BY ELECTRICITY AND TRANSPORT REDUCTIONS

CALIFORNIA IS 5TH LARGEST ECONOMY IN THE WORLD (\$3 TRILLION)

Figure 2a. Change in California GDP, Population, and GHG Emissions Since 2000



Metric	Associated 2017 Value
GDP	2.6 trillion (2012 \$)
Population	39.6 million
GHG Emissions	424.1 MMTCO ₂ e
GHG Emissions per Capita	10.7 metric tons CO ₂ e per person
GHG Emissions per GDP	164 metric tons CO ₂ e per million dollars



LESSONS FROM CALIFORNIA: PRINCIPLES TO GUIDE POLICY AND FISCAL LEVERS – GOOD ENVIRONMENTAL POLICY IS ALSO GOOD ECONOMIC POLICY

- Don't proscribe innovation
- But do set a standard which drives emissions down and allow innovation to happen
- ... And offers appropriate mechanism to encourage investment
 - Revenue stability
 - Clear set of rules
 - Support preferred through carbon market mechanism
 - Element very dirty competitors, i.e., coal generation
- ...To achieve targeted reductions within an acceptable price range

CONCEPTS FOR THE NEXT DECADE AND BEYOND

- Accelerate proven ideas ***and extend them into sectors that are still problematic***
 - ✓ Renewable energy Decarbonise electricity and electrify everything you can
 - ✓ Electricity
 - ✓ ***Daily, Weekly and Seasonal Storage***
 - ✓ ***Transport***
 - ✓ ***Residential heating***
 - ✓ Low carbon (fuel) standards
 - ✓ Decarbonise transport fuel where it cannot be electrified
 - ✓ ***Decarbonise industry emissions***
 - ✓ ***Energy efficiency and home building***
- Implement ideas to move further down the mitigation curve
 - ✓ Carbon farming
 - ✓ Capture CO2 in the ground and in building materials (and decarbonise the process)
- Embed localization lifestyle changes from Covid – i.e., work from home, travel less, consume less

RENEWABLE ENERGY IS COUNTER CYCLICAL BUT WILL INCREASINGLY DEPEND ON GOVERNMENT ACTION... WHAT NEEDS TO HAPPEN

- Governments will have every reason for renewable energy stimulus – fundamentals are very attractive in ADDITION to climate change reasons
 - Crisis resilient, energy and logistical independent
 - Non-correlated, low volatility
 - Green
 - Cheap (relatively)

Financial levers:

- Stabilise revenues for renewable projects
 - Expand Contract for Difference or other government backed PPA structures
 - Government support for Corporate PPAs
 - Accept that merchant pricing will not achieve desired outcome
- Stabilise businesses in short term via convertible notes, loans, and grants

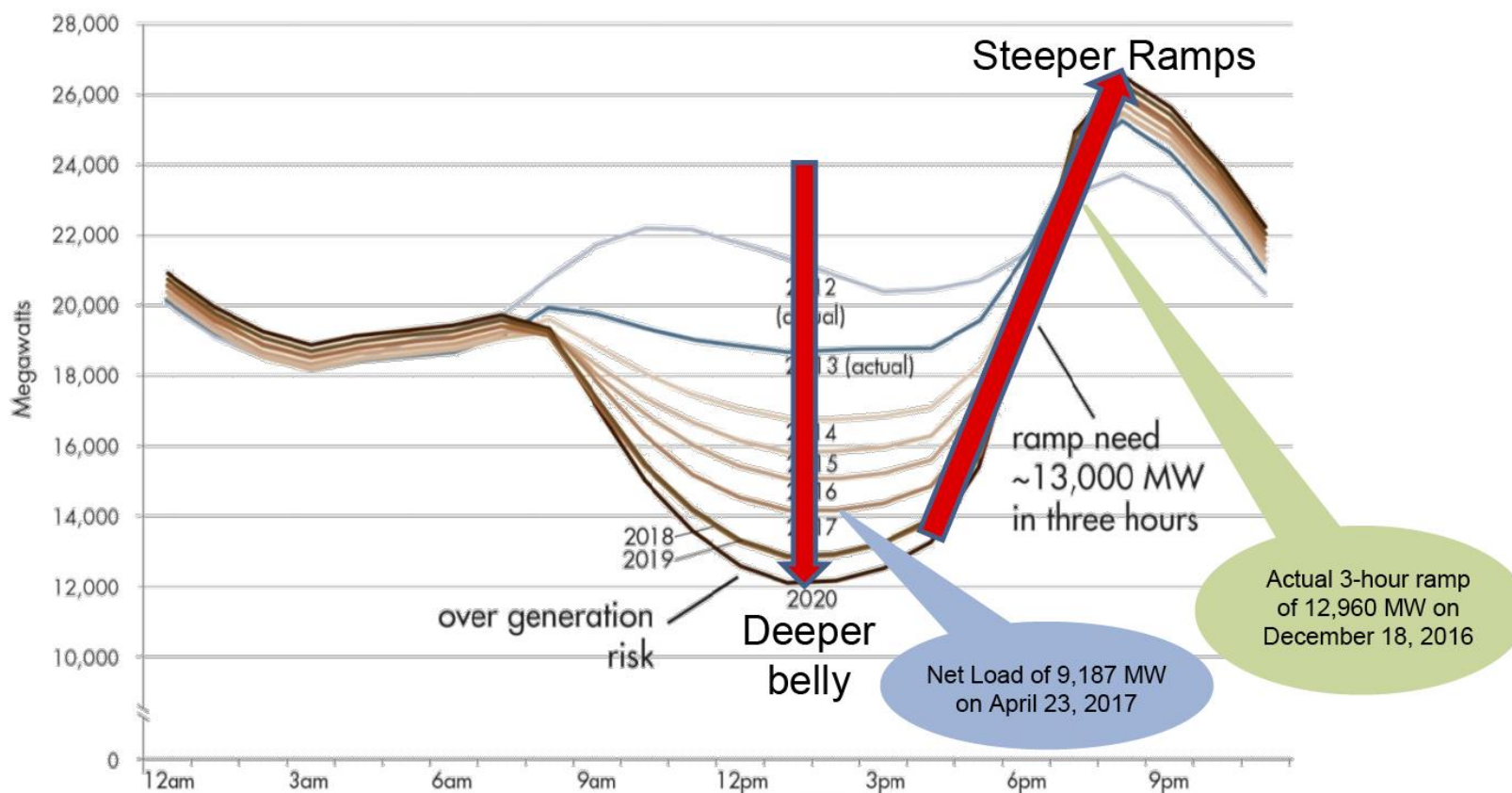
Policy levers

- Aggressive goal setting to reach 1.5C required levels of emissions
- Expedited planning and permitting
- Expedited interconnection
- Pressure by phasing out coal (not just investment but existing plants)
- Carbon tax and LCFS

DAY, WEEKLY, AND EVEN SEASONAL STORAGE FURTHER UNLOCKS ELECTRIFICATION AND IMPACT OF RENEWABLES

CALIFORNIA DUCK CURVE, COMING SOON...

Typical Spring Day

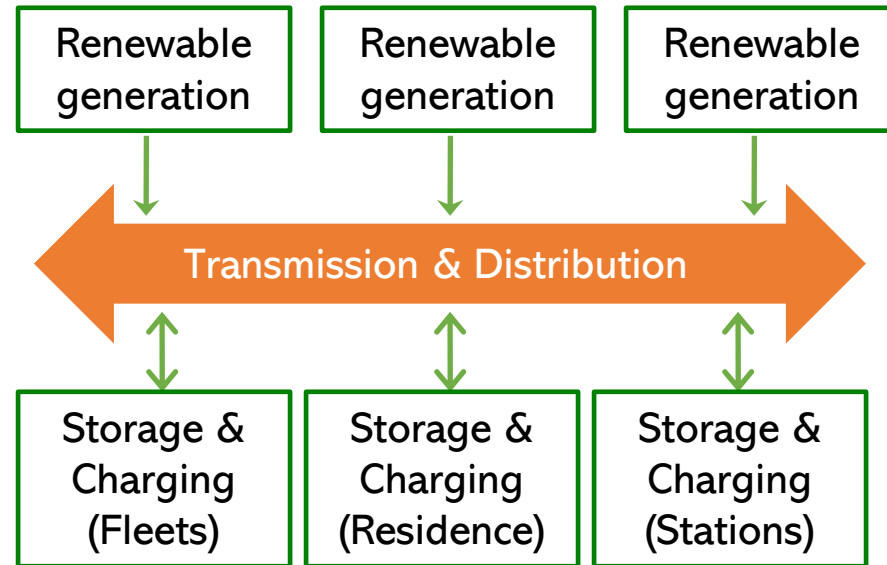


- Rooftop solar drops daytime demand
- Late afternoon requires fast ramp of non-solar resources
- Solutions: storage, shift demand, grid integration
- Solutions: Hydrogen, compressed air, pumped hydro

CAN A SEPARATE MARKET FOR RENEWABLE ELECTRICITY FOR TRANSPORT BE LESS EXPENSIVE THAN PETROL THROUGH POLICY DESIGN?

PROPOSITION

- Could be sold like cell phone minutes
- Priced below gasoline
- Eligible for LCFS credits
- Direct customer access – just like gasoline market
- Need to address:
 - “Demand charges”
 - Timing of delivery



Gas: \$0.15/mile @ \$3.78/gallon, 25 mpg
: \$0.06/mile @ \$2.70/gallon, 45 mpg

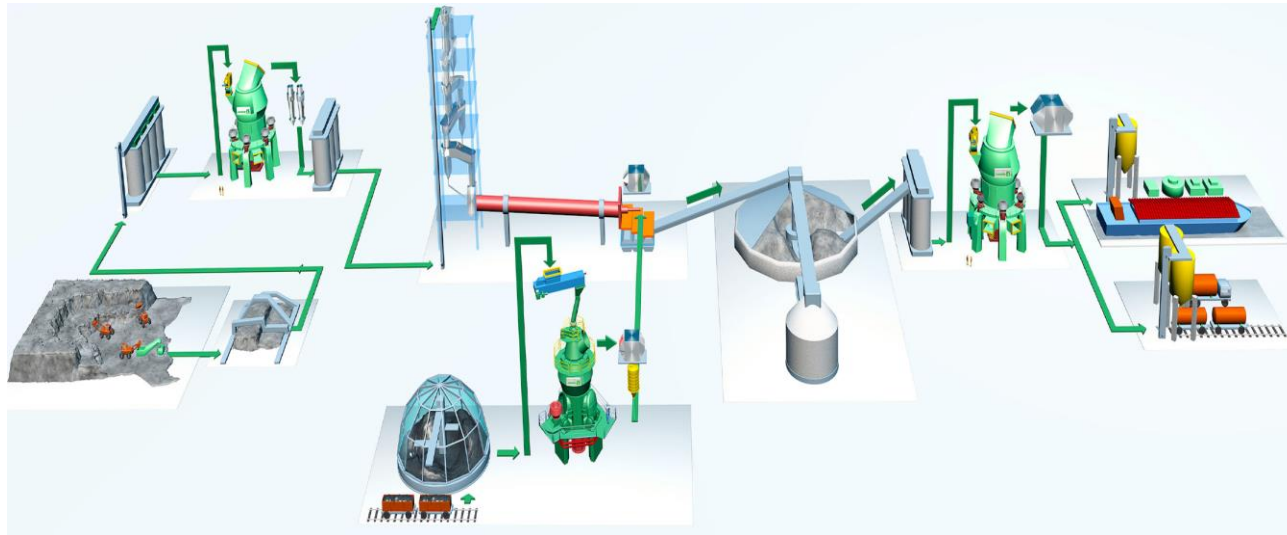
Electricity: \$0.043/mile @ \$.15/kWh, 3.5 m/kWh

REQUIREMENTS

- Ability to wheel power from Generation to Charging
- Instead of demand charges, require storage and demand management to optimize grid
- Capital costs a function of
 - Utilization
 - Charging speed
 - Degree of flexibility
 - Additional costs for transmission and distribution, storage and charging
- Eligible for some kind of LCFS?

INDUSTRIAL EMISSIONS HAVE FORMED A PARTICULAR CHALLENGE – FOR EXAMPLE, IF CEMENT WERE A COUNTRY IT WOULD BE 3RD LARGEST EMITTER IN THE WORLD

CEMENT PROCESS



CEMENT EMISSIONS COULD BE REDUCED BY 30-40% WITHIN A SHORT PERIOD TIME BASED ON TOP OF THE LINE, AVAILABLE TECHNOLOGY (FROM BOTTOM QUARTILE):

- Upgrade to top of the line plants and save on fuel and electricity (heat capture and reuse)
- Reduce clinker to cement ratio
- CCS
- CO₂ in curing
- Novel cement formulation
- Substitute municipal waste and/or waste biomass for coal or other fossil fuel

WITHIN THE EUROPEAN UNION THROUGH THE COMMON AGRICULTURE POLICY, MECHANISMS ALREADY EXIST FOR CARBON FARMING (BASIC PAYMENT)

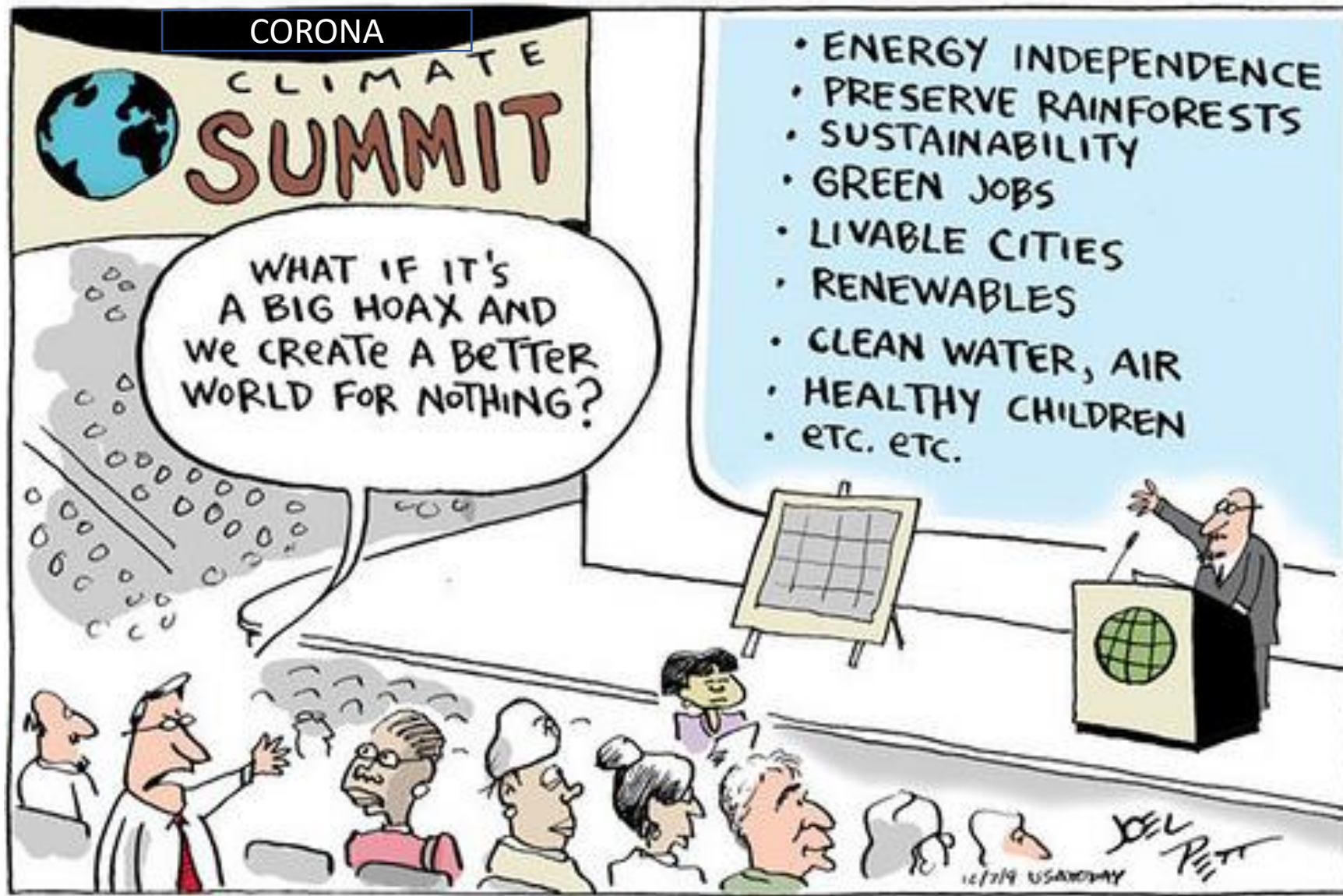
CARBON FARMING

- Take carbon out of atmosphere and store it in soil
 - France: Increase carbon by .4% per year
 - Add compost, no-till, cover crops, no pesticides, no fossil fertilizer
 - Managed pasture after one-time application of compost
- Current California Efforts
 - Target of 15-20 MMT by 2030
 - California invested \$180M on four “climate-smart” agriculture initiatives since 2014
- Research
 - Cameron et. al. “ambitious scenario” could reduce 147 MMT by 2030
 - Johan Six et. al. conservation tillage, reduced synthetic fertilizer, cover crops on 25% of irrigated cropland reduces 15-20 MMT

CARBON CAPTURE

- Building Materials
 - Keep forests standing
 - Use forest thinnings (cross laminated timber)
 - And sources such as bamboo
 - 1.3 hectares = 1 Home that sequesters 20 tons CO₂E, grows back in 3 – 5 years
 - Up to 4 tons CO₂E/year in operational savings
- Two sources – Concentrated and Atmospheric
 - Concentrated (100 – 300x more than atmospheric)
 - Capture from exhaust flue
 - Atmospheric
 - Blow air over substrate that binds to CO₂. Absorb into solid material
- Treat as waste – sequester in underground formations or convert to something of value? Advanced Materials, Polymers & bioplastics, Fuels & chemicals, Concrete & building materials
- Federal tax credit (45Q) \$35/ton

CORONA





ORTUS

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Anna has been engaged in the renewable energy, infrastructure, and venture stage companies since 1998 and has built, invested, developed and sold companies and infrastructure projects. A highly experienced energy professional, she has held senior positions at Shell International for over 10 years where she led numerous deals in renewables and energy technology. She is a Co-Founder of Project 2030.

Prior to Shell, Anna was the co-founder of Tellurian biodiesel, a leading biodiesel company which was sold to REG in 2008. She also collaborated with Fran Pavley and E2 to create AB32 and negotiate the Low Carbon Fuel Standard. Anna is a co-founder of the Clean Tech Open, the world's largest cleantech competition. She also worked at Booz Allen and Hamilton and Wells Fargo & Company.

Anna is a Board Member of Eelpower, a UK based energy storage company and Milamber Ventures, an edtech company. Anna holds an A.B. degree from Harvard College and an MBA from MIT Sloan School of Management

