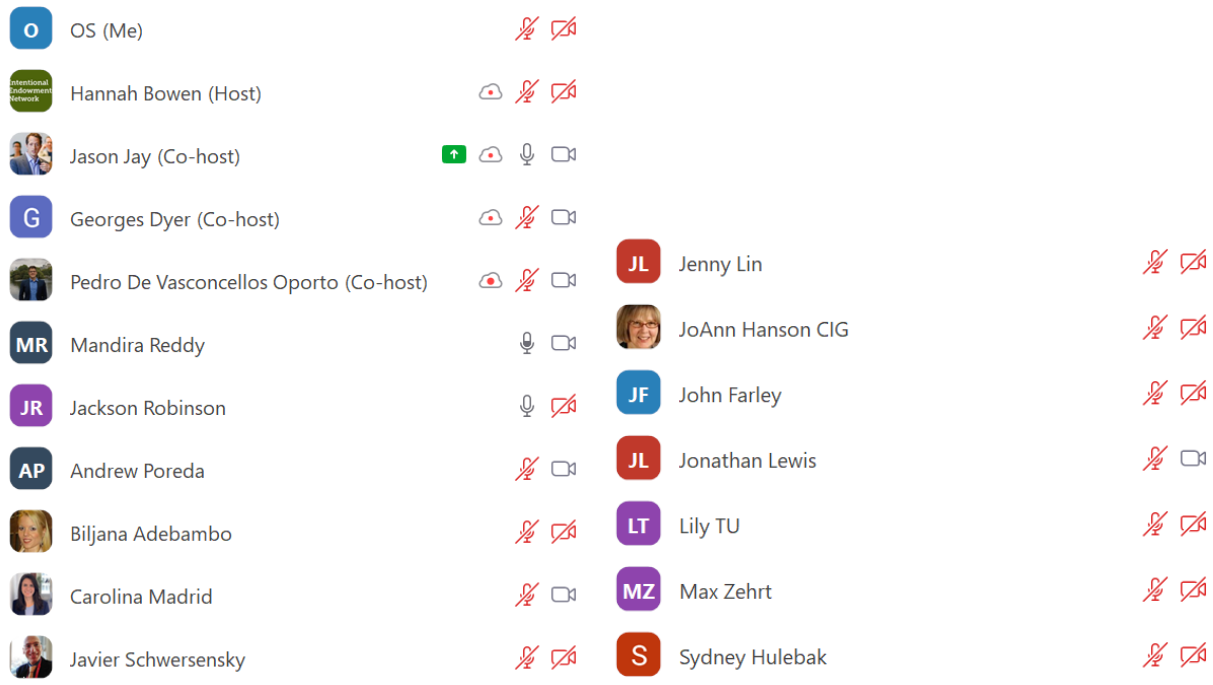
Intentional Endowments Network: En-ROADS Climate Simulator Workshop

Meeting Notes

2021.03.17

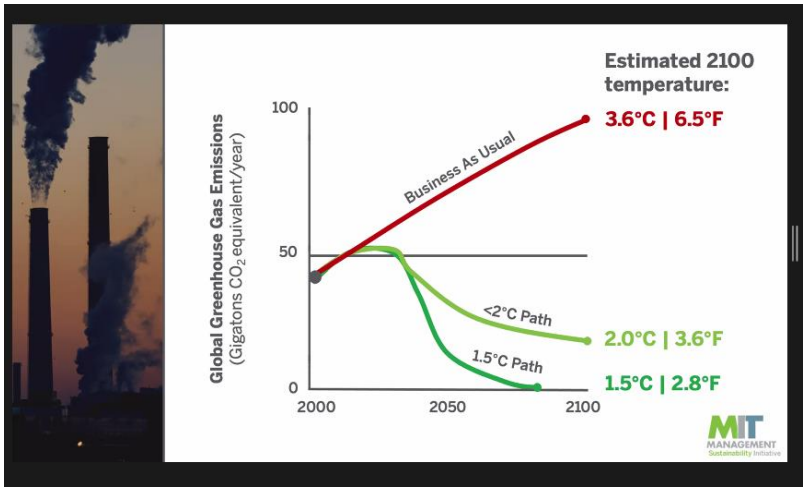
Participants



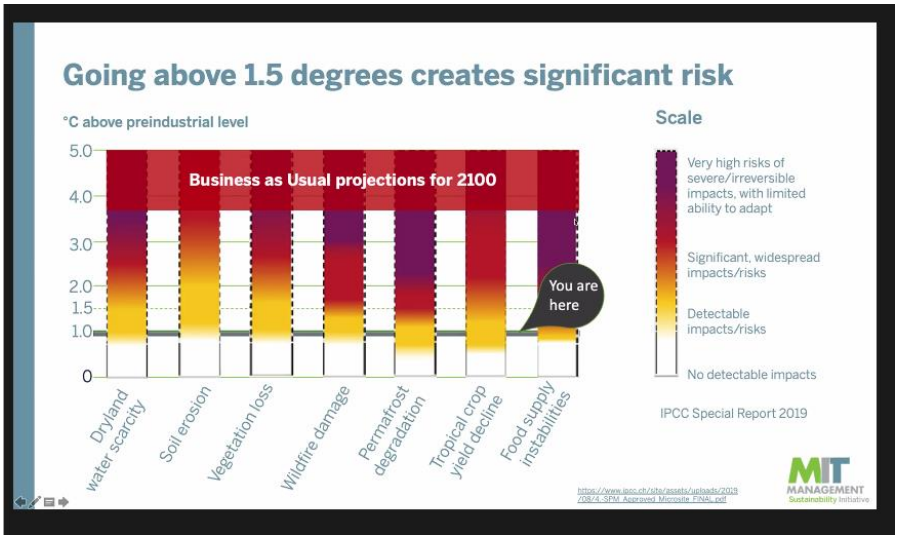
Hosts

- Jason Jay
- George Dyer

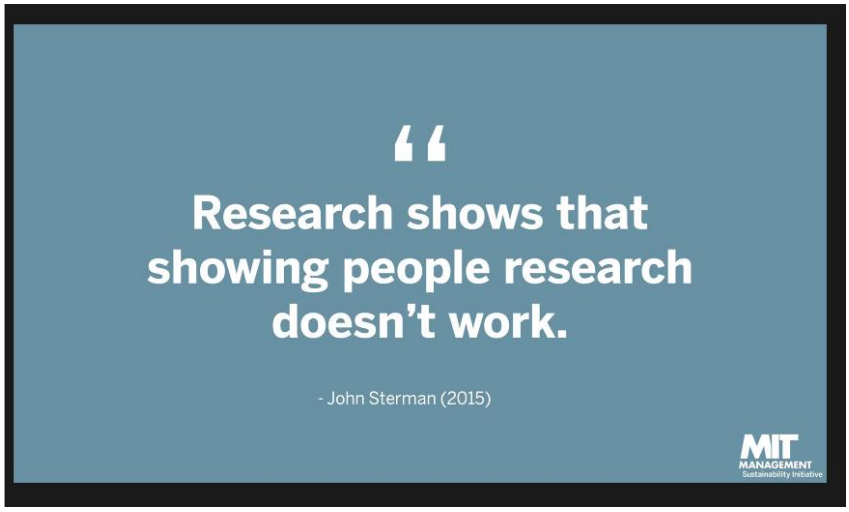
Workshop



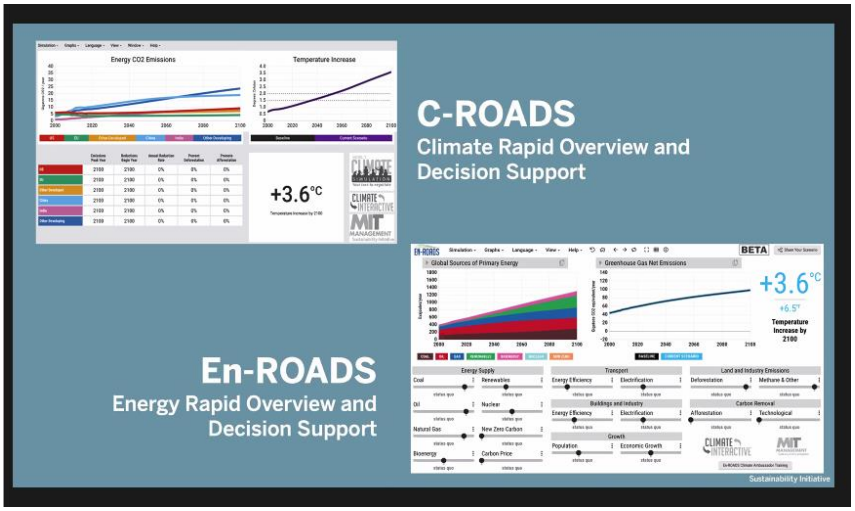
- The problem we're trying to solve is that we're currently heading for a future with 3.6 degrees of temperature rise



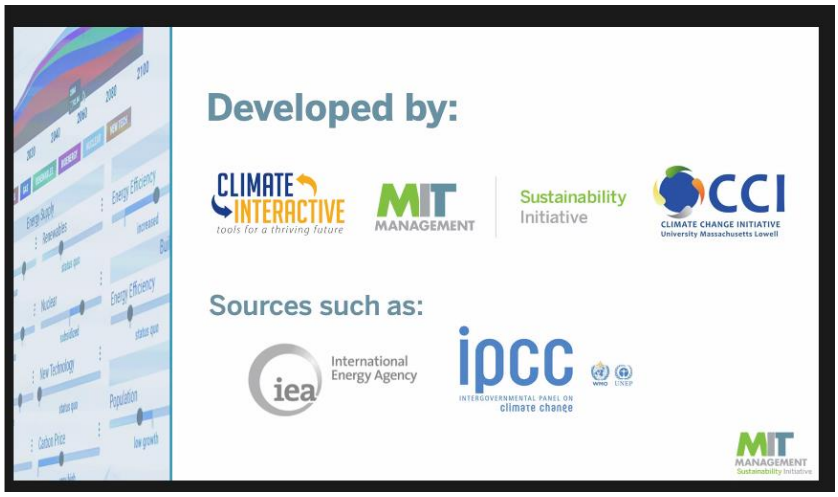
- Why is that the goal?
    - Because even in at current levels of climate change we're seeing wild fires and draughts already, and you can see that the business as usual projection puts is in the 4 to 5 degree temperature rise scenario
    - Scientists don't use words like catastrophic, but "very high risks of severe/irreversible impacts" are as close as they'll get



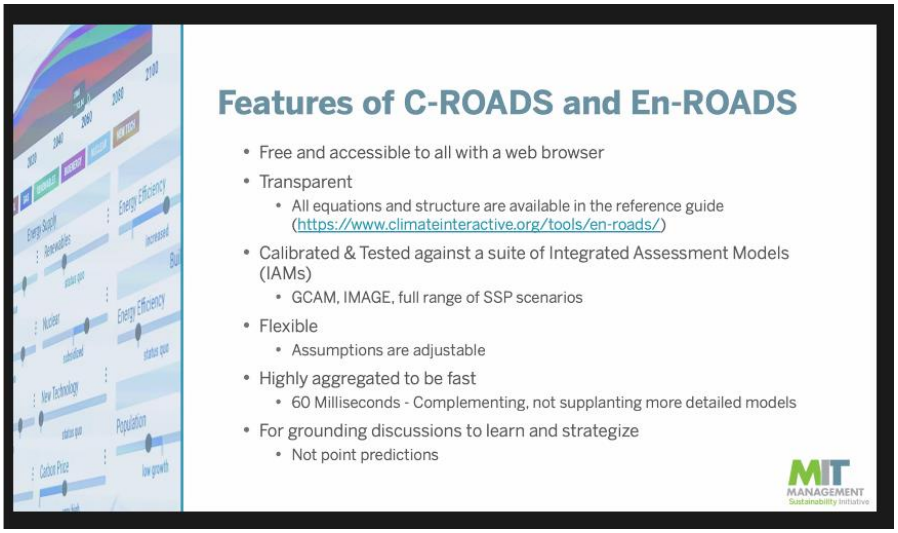
- We know that research doesn't always work, what does work is putting your hands on the tools and building your own sense of understanding, urgency, and the need for coordination



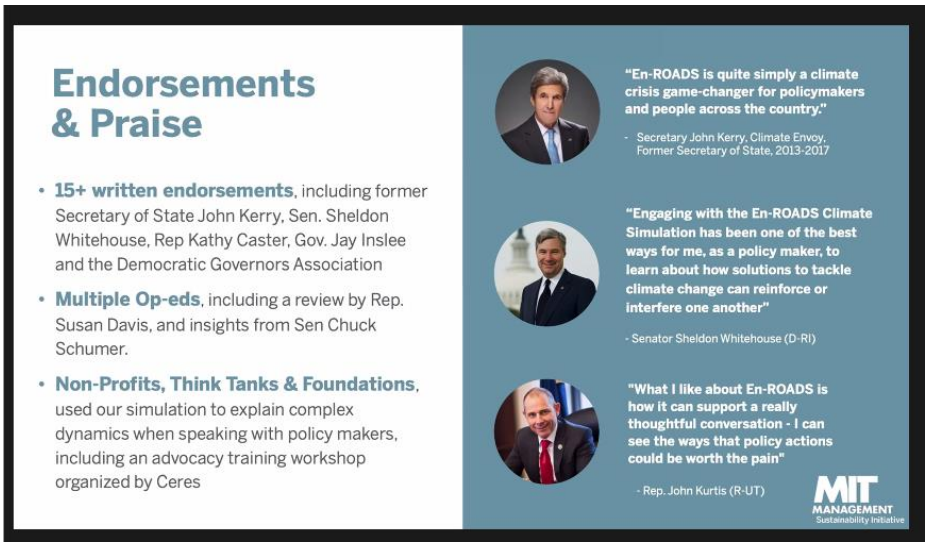
- What we do is therefore develop tools. The first is C-ROADS, this allows us to play with the emissions trajectories of different countries to see what types of commitments would be required to reach certain temperature rise scenarios
    - I'm not going to go into C-ROADS today, but the spoiler is that you can take the carbon out of the US, the EU, all developed countries, and China and still not be below a 2 degree scenario
    - Unless you handle the growth of emissions in India and other countries, we wont' be able to solve the climate problem
    - Making clear that action has to be on a global scale



- This is a collaboration between MIT Sloan School of Management we're I'm on the faculty and we worked with climate interactive to develop the software around this, the underlying modelling draws on data sources like the IEA and IPCC – the best available science

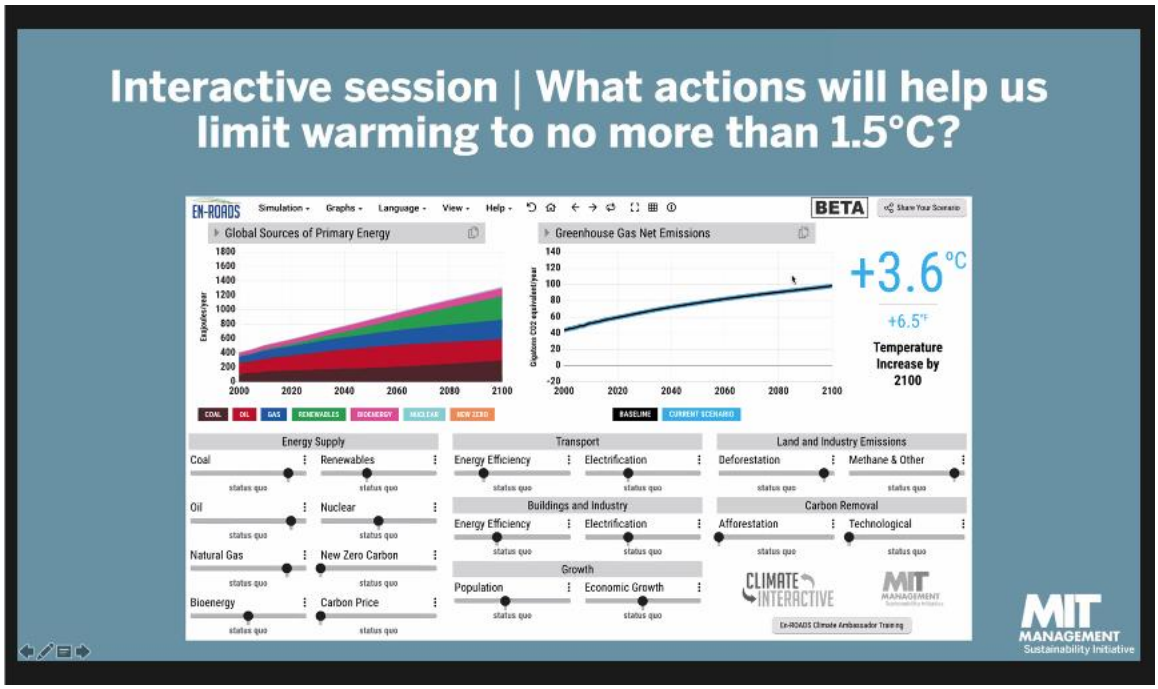


- It's free to anyone with a browser, the equations and assumptions are available, it's an open tool, it's calibrated to behave the same as super computer models that take days to run, it's much more useful for learning and strategizing because of real time feedback

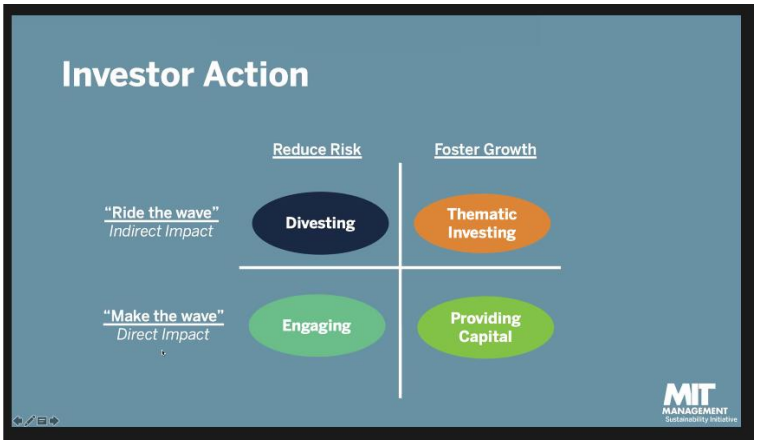


- What we do with this is go out and engage with politicians

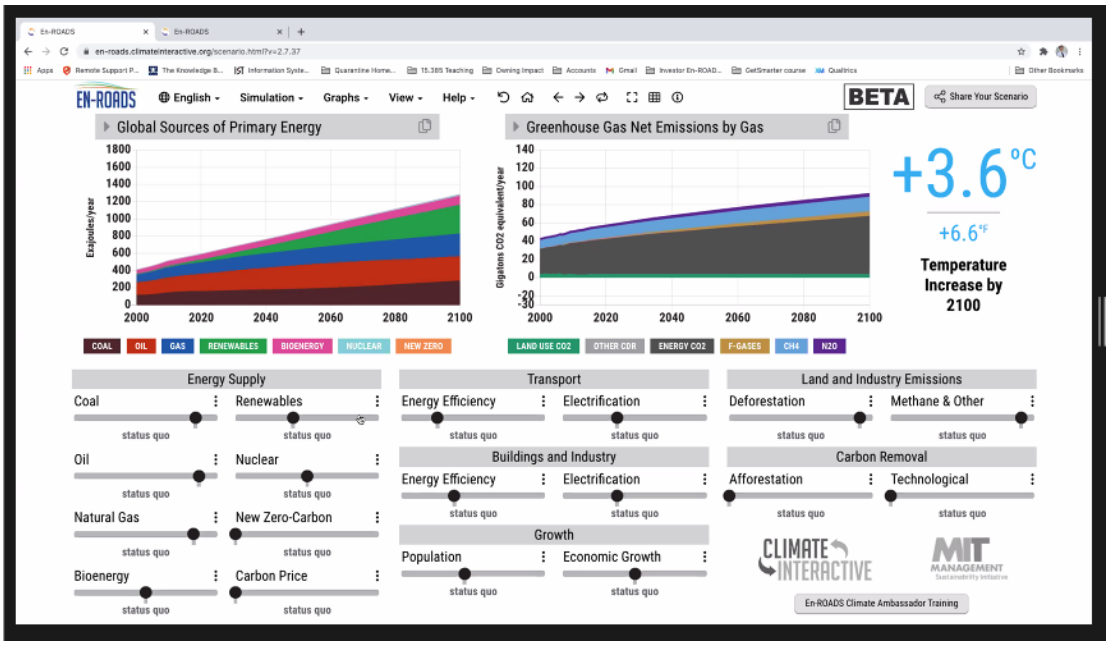
- We're also reaching out to asset owners, family offices, and the like
- We have some quotes there on how people have reacted, and that's what we hope to achieve today

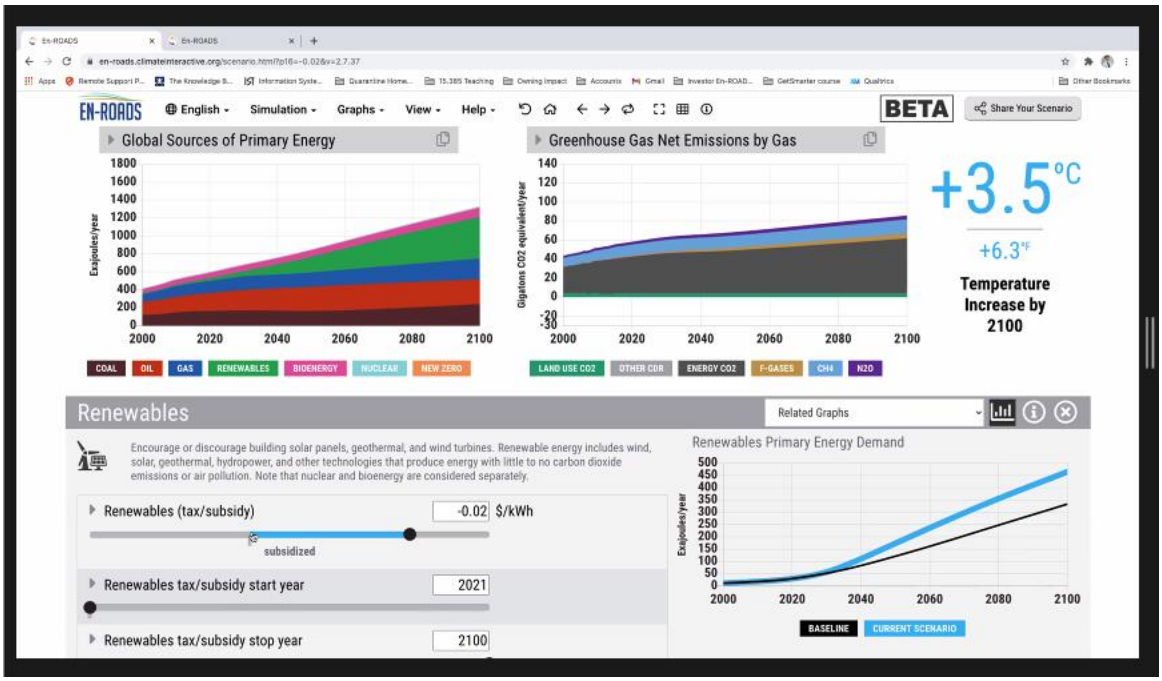


- What actions will limit us to a 1.5 degree scenario?
    - Jonathan Lewis
        - I think an important aspect is breaking it down to a tactical level
        - I'm on the call because I'm on the treasurer and chair of the endowment for the Phi Beta Capa Foundational Society
        - When I look at the tool I think it's cool to talk about this at the national level, but there's municipalities who need to be thinking about these things
        - A more micro version of this tool will help driving public conversations
    - Jason Jay
        - This is certainly not the end all tool
        - There are in fact tools for the municipal and state level
        - I would suggest everybody become trained, for free, in how to be an ambassador with this tool
        - Given that we're playing with a globally aggregated tool for today I want to hear about what will get us where we need to go
    - Mandira Reddy
        - I work with Capricorn investment group and look at it from the investor perspective
        - At the high level we're doing 2 things: investing in new technologies and the second thing is shareholder engagement in the companies we hold
        - Pushing them in the right direction, making sure energy companies increase their mix of renewable energy for example

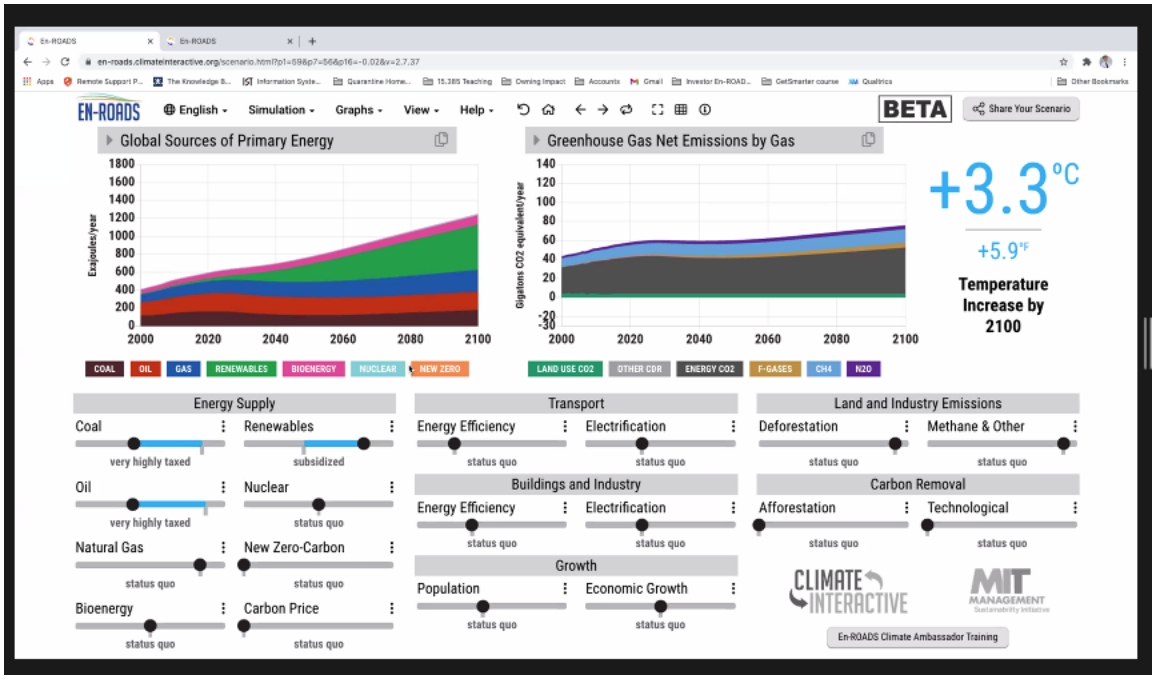


- Jason Jay
  - Let me talk about this from the investor perspective
  - Mandira what you're talking about with respect to Capricorn is providing capital and using engagement
  - Some of these make the wave, and others perform better as the wave crests
    - Investing in an electric vehicle ETF for example rides the waves and does better when there's already momentum
  - You mentioned getting renewables up, lets play with that example
  - The two slides below are the before and after, encouraging renewables is reflected in the green band expanding and you see some substitution away from coal, oil, and gas
  - The grey band of energy related CO2 emissions is smaller and we see 1/10th degree reduction

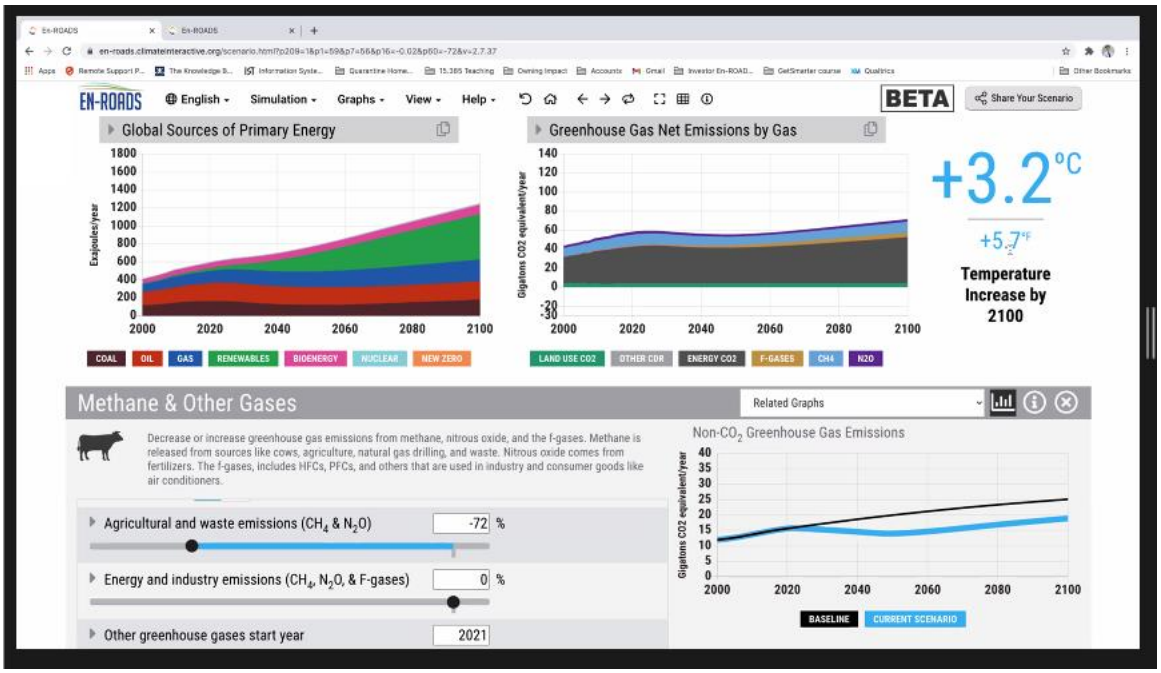




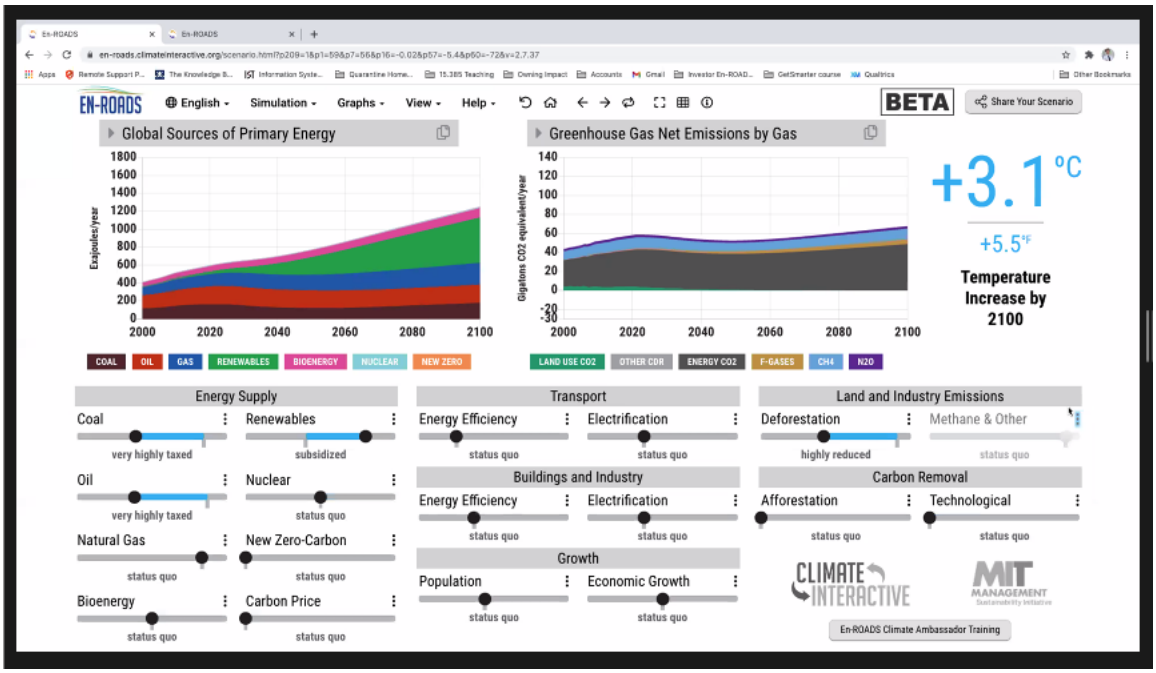
- What are some of the other things we can that we think are going to have an impact on this picture other than encouraging renewables?
    - Carolina Madrid – WindSail Capital
        - In addition to subsidizing renewables you could tax coal and oil
    - Jason Jay
        - Okay, lets add a tax on coal and oil
        - Each of those moves takes off 0.1 degrees
        - There's clearly some price elasticity, it's clearly a significant action to take



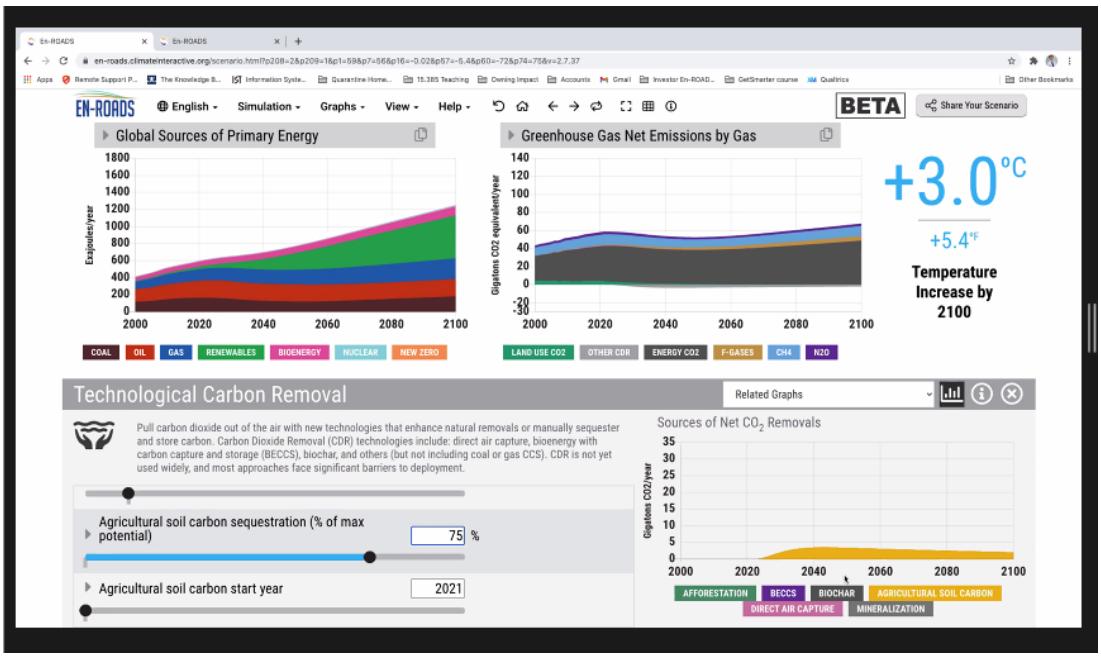
- Jonathan Lewis
    - Land agriculture and farming (changing how people eat)
- Jason Jay
    - Lets start with that, and lets get more specific in the agriculture
    - What specific changes would you like to see Jonathan?
        - Adopt less red meat, more fish, more veg based
    - Great, let's see what happens
    - One of the things that we'll do is use the tool to decrease methane emissions cows emit
    - The light blue band of methane is reducing, a modest reduction in methane is having a good effect of 0.1 degrees because it's such a strong GHG



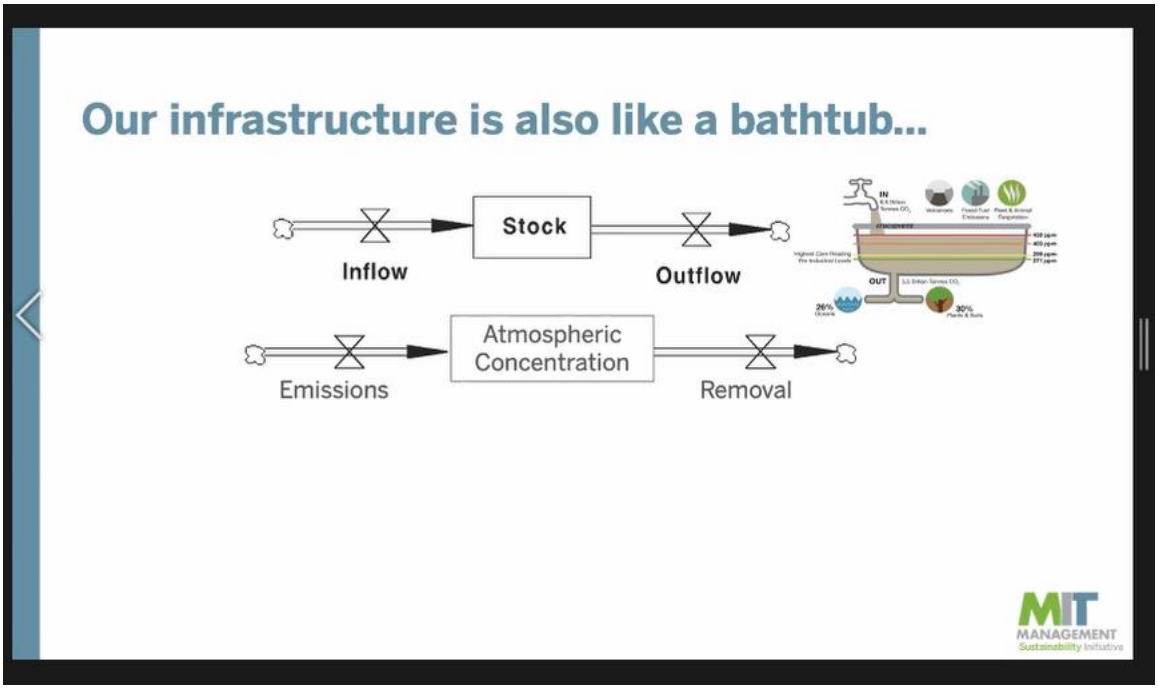
- Now there's also the land use consideration when we talk about reducing beef consumption, so I like to reduce deforestation a bit to reflect the lower pressures on forests
- We'll use the lever that allow us to slow down the rate of deforestation
- We see another 0.1 reduction



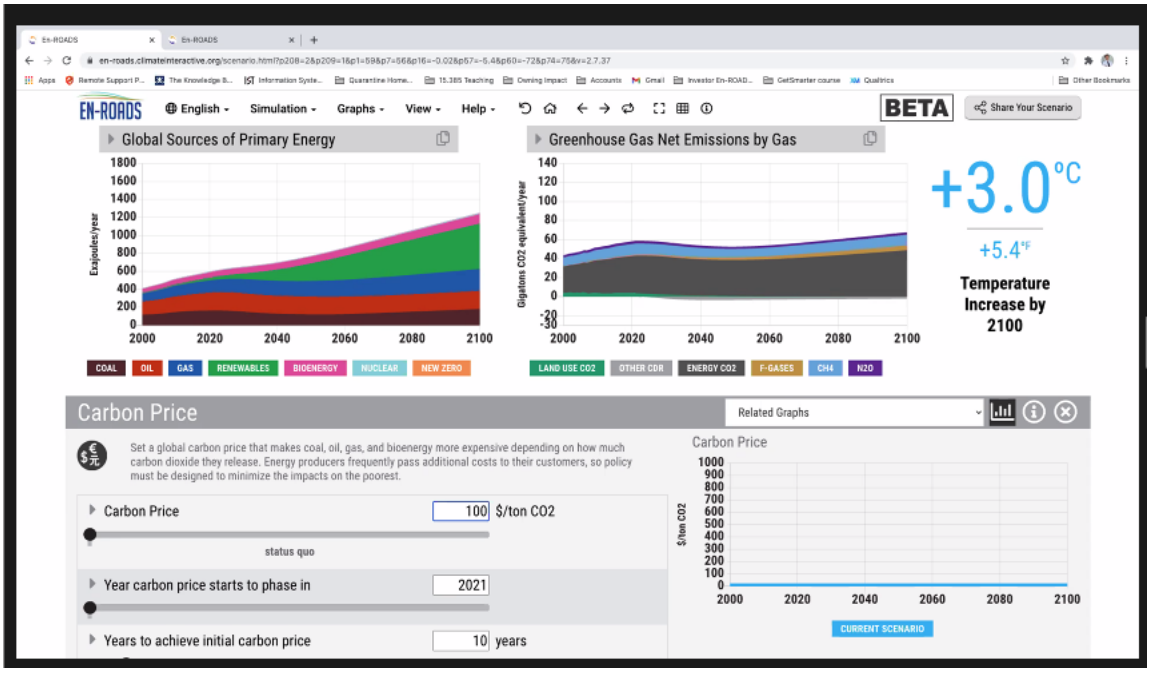
- Biljana Adebambo
  - I've recently learned how much soil can absorb CO2, so perhaps looking at agricultural practice changes like moving away from single crops
- Jason Jay
  - Under technological carbon removal we have a lot of different tools that include BECCS, direct air capture (pulling CO2 out of the sky), enhanced mineralization, and what you're talking about is agricultural soil carbon sequestration
  - Lets give that a try and do an ambition global plan of regenerative agriculture practices which achieves a 75% change in carbon sequestration



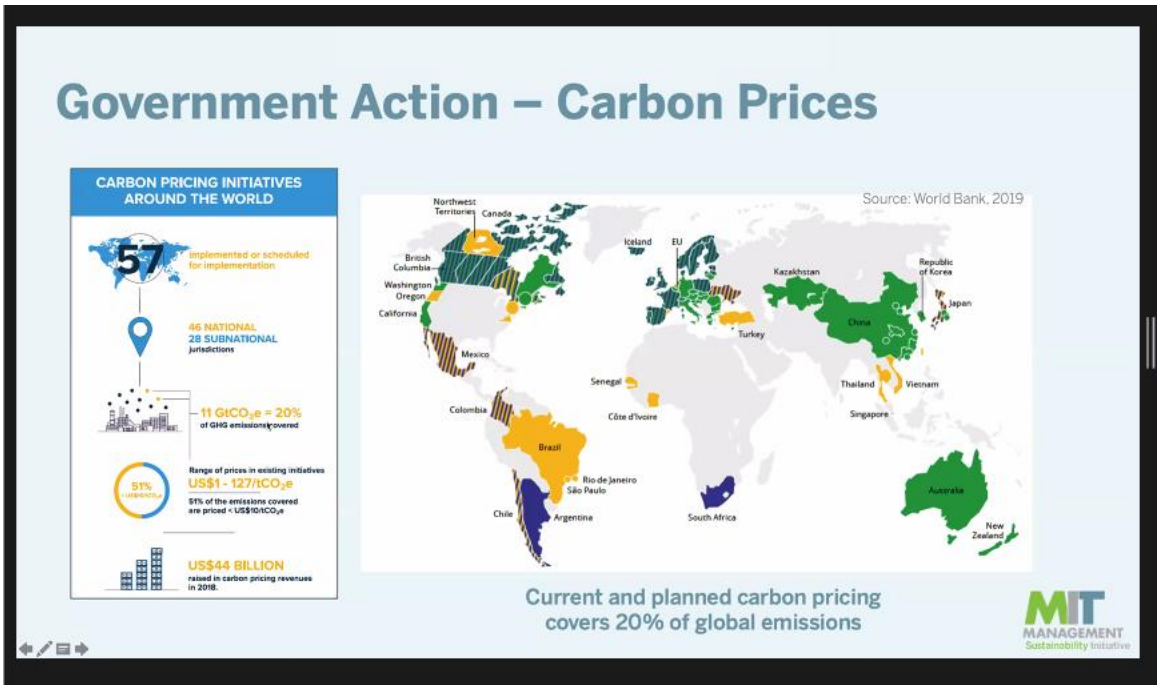
        - That was worth another 0.1 degree, how does that compares to your expectations?
            - It's quite a bit lower than I expected compared to the amount of carbon dioxide expected to be removed
        - It's a significant amount of carbon, it's a gigaton scale solution
        - What you see in the chart below is that there's saturation and the amount absorbed over time plateaus



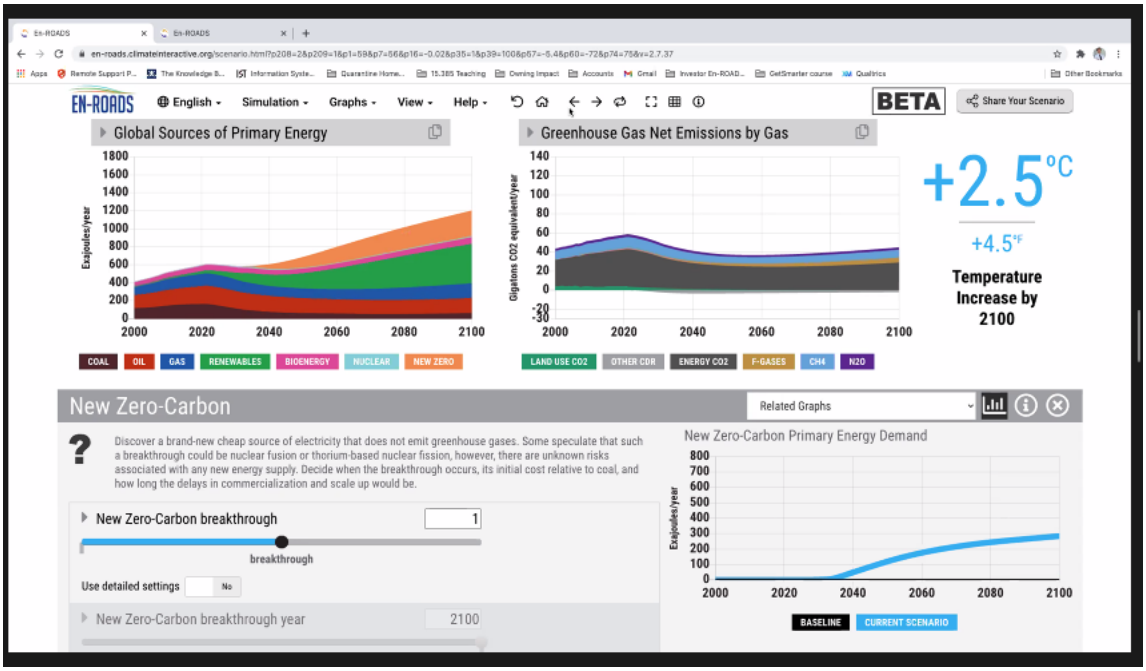
- One of the things that's important to understand – an intuition we're trying to build – is about stocks and flows and what we call the bathtub dynamics
    - The atmosphere is like a bathtub, when removals are equal to emissions the concentration is flat, when removals exceed emissions the sink is going to empty out, and that's what we need to do for concentrations to go down and that's just not going to happen with 10x the emissions from the energy sector as we're capturing
    - It's a piece of the puzzle, but we need to add more
- Let's look at carbon pricing
    - The idea behind a carbon price is to create a price for using the atmosphere and internalize the externalities
    - There's a lot of variables we can play with in terms of time to ramp up for the carbon price
    - Many people don't know how to calibrate the size of a carbon tax to real economy prices
        - 100 dollar tax on carbon adds about 90 cents per gallon price increase on gasoline
    - Let's play with the 100 dollar tax idea, and do it with a 10 year ramp-up



- That move got us 0.5 degrees, every other move got us 0.1. Why is this such a powerful lever?
- Is there an elasticity of demand and substitution effect consideration in this?
  - He explained in detail in terms of energy demand dynamics and energy use, using graphs showing what the oil and coal tax are doing to the price of those energy sources, also accounting for behavioural shifts as a result of those prices changes, these simultaneous effects are all accounted for and the answer is yes
  - Some people have concerns about the economic effects of a carbon price, you'll notice we did increase the cost of energy, but if you're worried about the economic disruption you can spread that over 20 years instead of 10, which looses us 0.1 of a degree in terms of reduction but allows us to absorb those impacts
  - The assumption on the current price of carbon in the model is 0 because that's close to the real average effective carbon price, which is not because carbon pricing doesn't exist

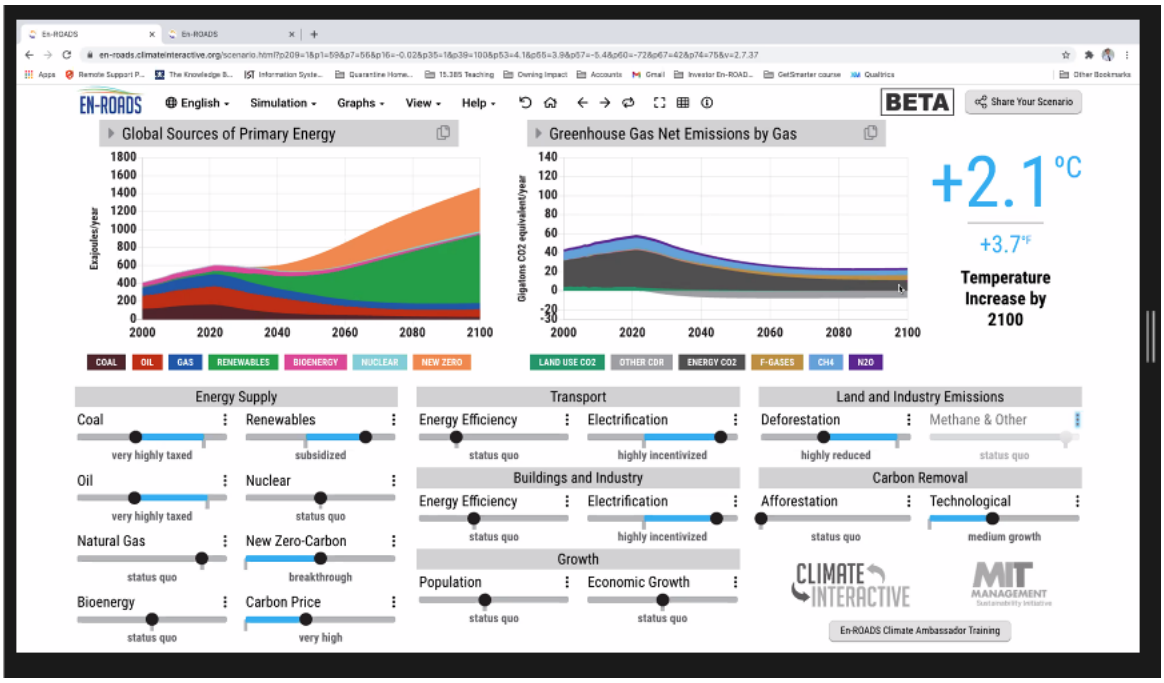


  - When we're only covering 20% of emissions with carbon pricing, and those prices are so low, on average basis the number is not significant
  - It may be if you're playing with this tool you want to adjust the base case on carbon pricing
- Other ideas for what we can add? We've made major progress to get to 2.5
  - New zero carbon and green hydrogen
  - These are technologies like nuclear fusion – tech that emits 0 carbon and it gets to be cheaper than coal quite quickly
  - We can play with a breakthrough and then a huge breakthrough, and we can pick the time frame, lets say 2030



- You see a new orange band of energy appear
- But look at what's going on with emissions and temperature, we have essentially no change, why is that?
    - Energy consumption is still increasing (population, global economy growth, ect.) but there's another phenomenon, what's decreasing as a result of the increase in orange?
        - Renewables
    - When we put fusion on the board it's just substituting for solar, wind, hydro, and geothermal
    - If we didn't have increases in renewables and only brought in clean fusion then we would see a difference, but only 0.1 degree
    - It's often a smaller change than people anticipate, we actually used this tool to communicate to Bill Gates – who said if we get fusion on the table the problem will be solved – that that isn't the case
    - If you look at Breakthrough Energy Ventures and Gates' other approaches you'll see a much more portfolio based approach
- Energy storage cost problem
    - It's a great point, if you look at Google's strategy for going to 100% clean energy they're doing fancy stuff like moving load shift for computation to places where there is wind and sun
    - The micro level considerations of grid storage are complex and are not modelled in this
    - As a simplified approach, we say when we have renewables in this model they are being deployed with enough storage to replicate base line
    - A breakthrough cost reduction in storage does ramp up renewables a little faster

- I want us to get a few more ideas to get across the finish line to 2 degrees, I want people to see 1) that it's possible and 2) see what it takes
    - Electrification of transportation and buildings
        - We did take a dent out of oil through those taxes, but if we electrify transport in the current picture that will help us to reduce oil consumption in a way we haven't done and shift energy supply
        - It's worth about 0.1 degree
        - Electrification of buildings and industry is worth quite a bit – 0.2 degrees.
        - Air source heat pumps, induction stoves, and work away from natural gas
    - Further BECCS
        - Before we only did soil based sequestration, let's look at technological approaches which will create a nice band of negative



    - Industrial methane is something we haven't really looked at
    - We haven't touched population and economic growth
        - There's a question about whether this draconian
        - There are highly ethical ways to look at population control, girls and women's empowerment is a big one
- With the suggestions you've made we've reached a 2 degree scenario, I'd like to invite you all to contemplate what this mean in the real world
    - My response is that we can clearly see what's possible
    - Even if we pull nuclear fusion off the board, we're still in a 2 degree future without any magical technological wand
    - This involves political will on our part as investors and citizens
    - I encourage you to pick up where we left off, I'm going to copy and paste into the chat a link to the simulation, and our particular scenario from today

        - https://en-roads.climateinteractive.org/scenario.html?p209=1&p1=59&p7=56&p16=-0.02&p35=1&p39=100&p53=4.1&p55=3.9&p57=-5.4&p60=-72&p63=-0.9444&p67=42&p74=75&v=2.7.37
- We're seeing very significant movement in the investor world to take on these actions of engagement, providing capital, thematic investing, and so on
- There are coalitions forming around net zero, groups working on shareholder engagement to drive decarbonization
- Through this we see what's possible through a coordinated portfolio approach

– END –