

Meeting Summary

ODOE and the CETI-OES Team presented on the energy pathways modeling results and key findings for the Oregon Energy Strategy, including that the Reference Scenario modeling least-cost attainment of Oregon Energy objectives presents an overall decrease in statewide energy demand but an increase in electricity demand; increased reliance on alternative clean fuels, especially in the hardest-to-decarbonize sectors; and increased reliance on renewable generation and energy storage. ODOE and the CETI-OES Team also took questions from attendees in-person and via the WebEx chat. ODOE invited members of the public to continue providing input through the public comment portal at <https://odoe.powerappsportals.us/en-US/energy-strategy/>. Meeting materials and a recording of the meeting are available on ODOE's website: <https://www.oregon.gov/energy/Data-and-Reports/Pages/Oregon-Energy-Strategy-Engagement.aspx>

In-Person Meeting Notes

Introduction

- Ben Duncan (Kearns and West) introduced the call, explained WebEx functionality, went over emergency procedures at OMSI, and spoke to the meeting's purpose as focused on providing modeling results and clarity on the modeling.
- Janine Benner (ODOE) welcomed attendees, highlighted ODOE's 50th Anniversary and clarified that the modeling results would be used to inform Oregon's Energy Strategy, but that the modeling results themselves do not constitute the Strategy.

Background on Oregon Energy Strategy:

- Edith Bayer (ODOE) provided a background on why Oregon is undertaking an Energy Strategy, explaining that a Strategy with broad ambit is necessary to address a challenge with the scope of energy transition. Edith described the present modeling results as illustrating pathways analogous to alternative routes on a road trip, with different tradeoffs, costs, and benefits; the present modeling similarly shows pathways from a common starting point to a common ending point.
- Edith presented on the starting and ending points for the Energy Strategy modeling, covering HB 2021, CPP, and EO 20-04. Edith explained that the modeling accounts for the entirety of the energy economy in Oregon and the region. The modeling explores alternative pathways by comparing multiple scenarios that provide insights on cost, resource mix, and reliance on out-of-state resources.
- Edith introduced the Alternative Scenarios examined in the modeling, including alternatives that delayed energy efficiency and building electrification; that delayed transportation electrification; that examined the impact of limited demand response technology adoption; that limited utility-scale electricity generation in Oregon; that provided for high distributed energy resources and limited transmission; and that provided for alternative flexible resources to reliance on fuels. Edith also stated the ODOE tested a few additional questions, including what if VMT goals were not realized; what if ACT MDV and HDV decarbonization targets were not met; and, what if data center load growth demand

were lower than modeled? Edith stated that ODOE used NWPCC's mid-high level forecast and that ODOE modeled a reduced version of this forecast.

- Edith described complementary analyses that ODOE will be undertaking with ODOE's technical support consultants, including a household energy wallet analysis to examine household cost impacts; an air quality impact analysis to examine public health; a jobs analysis; and a mapping effort to assist in interpreting modeling results.
- Edith explained that the modeling is not itself intended to serve as Oregon's Energy Strategy or to forecast Oregon's energy future; instead it is intended to guide near-term policymaking and discussions and to examine uncertainties in politics, technology, and economics.

Energy Strategy Modeling & Key Scenarios:

- Jeremy Hargreaves (Evolved Energy Research) provided an overview of the energy pathways modeling approach as showing the evolution of energy consumption and supply to 2050. The energy pathways modeling undertaken modeled compliance with Oregon emissions and reliability targets and reflected regional and national competition for energy resources.
- The modeling reflects Oregon's geographical constraints and competition for limited clean fuel supplies in a national energy market. The model also includes the most stringent land-use screens available from the Nature Conservancy's Power of Place – West study, restricting siting on lands with statutory or administrative protections or otherwise high conservation values.
- Key findings from the modeling include:
 - Reference Scenario represents the least-cost pathway; for example, the delayed energy efficiency and building electrification could cost around \$17 billion more and delayed transportation electrification could cost around \$14 billion more, over 25 years. Failing to reduce VMT or enact the Advanced Clean Trucks rule results in additional costs of about \$22 and \$30 billion, respectively.
 - Demand for energy decreases but electricity demand doubles over the study period.
 - A shift from fossil fuels to clean electricity and alternative fuels, along with an overall decrease in fuel consumption.
 - Heavy reliance on renewable generation, storage, and transmission expansion.
 - Fuel and clean-fuel demand remains in the hardest-to-decarbonize sectors.
- Jeremy presented on the modeled energy pathways as not reflecting an unprecedented investment in energy and as providing some reduced volatility relative to Oregon's historical dependence on imported fuel. Jeremy caveated that electrification could increase energy volatility based on resources such as lithium.
- Electricity key findings
 - The modeling indicated that a growing electricity sector would require expansion and diversification, along with investments in transmission and geographic resource diversity. This includes hydropower remaining a foundational resource, growing solar generation, doubling of onshore wind in Oregon East, enhanced geothermal being constructed by 2040, and reduced gas consumption – though additional gas reliability resources would be built in Oregon West.
 - The modeling also calls for more imported electricity; Jeremy explained that the model assumes an efficient market and means to dispatch energy, stating that initiatives like those in West Canada could provide for efficient system operations.

- The modeling calls for in-state and interstate transmission expansion, but several Alternative Scenarios impacted projected transmission buildout, with higher demand response leading to lower transmission build and alternative flexible resources leading to more transmission.
- Other scenarios had other impacts; a limited generation scenario leads to more imports and a high distributed energy resource (DER) & limited transmission scenario leads to less grid-scale solar and some imports.
- Wind and solar energy generation will result in land use impacts, with increased impacts if no clean gas electricity were selected by the model
- Fuels key findings
 - The model found less fuel used in all scenarios.
 - Aviation retains use of jet fuel that becomes clean.
 - Light duty vehicles (LDVs) and medium- and heavy-duty vehicles largely become electric.
 - Move from fossil to clean fuel in industry & agriculture with overall fuel consumption relatively constant in those sectors.
 - Commercial and residential buildings reduce reliance fuels and switch to clean energy sources, especially via electrification and heat pump reliance
 - To meet flexible generation needs, the model builds new gas capacity in Oregon West and retains substantial gas capacity in Oregon East; much of this capacity remains on standby and predominantly serves a system reliability function.
 - If we don't have this flexibility source and reduce clean gas build over time, the model builds out more grid-scale solar and electrolytically-produced hydrogen to meet flexible energy demand.
 - The model also calls for the production of ammonia to fuel maritime shipping. This ammonia would likely be produced with renewable wind power from Montana or Wyoming.
- Transportation key findings
 - Delaying electrification of trucks and the Advanced Clean Trucks rule is more costly; delay would lead to efficiency losses and need for more clean fuels.
 - Reducing VMT saves money and is one of the largest cost differences modeled – a 20% VMT reduction per capita saves \$22 billion over 25 years
 - However, modeling did not account for costs associated with rezoning or public transportation that may support VMT reductions.
- Buildings key findings
 - Delaying energy efficiency and building electrification (BE) increases fuel use and decreases electricity use.
 - Electrification and energy efficiency gains reduces per capita residential energy use
 - Increased building electrification supports more customers participating in demand response programs.
 - Increasing distributed energy resource (DER) buildout can also mitigate siting and permitting challenges by reducing need for grid-scale renewables and associated transmission
 - Heat pump adoption, appliance efficiency, and programs to reduce peak loads are key to achieving building efficiency gains.
- Overall takeaways:

- Electrification and energy efficiency are key to reducing the size of the energy demand pie.
- Fuels play a strategic role in the transition.
- All scenarios indicate a need to build infrastructure in Oregon.
- Tech and data center loads are the biggest driver of near-term electricity demand growth but there is lots of uncertainty around that load growth.

Q&A

Ben Duncan (Kearns and West) fielded questions from meeting attendees and the WebEx chat.

- Q: In the Working Group committee process, we talked about VMT and whether 20% VMT reduction refers to a total or per capita reduction. Which is it?
 - Jeremy: the 20% reduction is per capita
- Q: Jaisen Mody with Mitsubishi: How much potential is there for enhanced geothermal in Oregon?
 - Jeremy: Oregon geothermal potential was based on NREL estimates. In the model, we limited buildout to 25% of the technical potential, based on the uncertainty around enhanced geothermal technology; without geothermal we would have likely built out more dispersed system with clean fuels
- Q: Why is California modeled in multiple zones?
 - Jeremy: In California, we represent two zones with a transmission constraint in between NP and SP 15, and that's a binding transmission constraint in a decarbonizing world as we move forward. One of the ways we get resource diversity in the future is to share northwest wind and northeastern wind from Montana and Wyoming with the high-quality solar resource in the Southwest. Southwest being Arizona, SP in California, and so that becomes an important constraint. We've chosen to represent that in the model given the way transmission is set up between Oregon and California. We've got lines that go all the way down into SP bypassing that bottleneck, as well as the California-Oregon intertie, which has been NP, so we've got both represented in there.
- Q: David Vanthof, Climate Solutions—the chart seems to show that jet fuel is remaining consistent. It does not appear to assume a transition to sustainable aviation fuel. Is this right?
 - Jeremy: We do make that change, we just assume that it is fuel not electrification or hydrogen of the fleet. We are decarbonizing with clean aviation fuel in the future and also providing for improved efficiency.
- Q: from David Vanthof, Climate Solutions: Renewable diesel has 30% market share in OR but the graph appears not to reflect this rate
 - We aimed to include that renewable diesel rate. That fraction may come out in the wash and look smaller in the graphic because it is predominantly diesel consumption in medium and heavy-duty vehicles.
- Q: Brennan Gantner, Skip Technology—Is there any significant holes or data that you wish you could have gotten or significant sources that you wish were more supported
 - Jeremy: There are uncertainties in the future, including:
 - Near-term: load growth from data centers;
 - Long-term: solutions around hydrogen driven by 45V tax credit;

- Cost: we are building enhanced geothermal, those cost forecasts are uncertain because it is not a technology we are on the path for;
 - Transmission: the present modeling is a long-term study looking to 2050, transmission necessarily must feature because when you double the load you can't work with the current system. More studies with detailed transmission modeling would be valuable to support current modeling.
- Q: is the model original?
 - Evolved used its own, proprietary and original model but components of the model are based in similar models for cost simulation for electricity constraints. Evolved's is the only model that is economy-wide
- Q: Jason Busch, Pacific Ocean Energy Trust and Renewable Hydrogen Alliance: Offshore wind appears to be non-existent in Oregon's plans. Why is that?
 - Jeremy: We included offshore wind in the model and priced it with the cost forecast that NREL has for offshore wind. The model did not pick it up as a major investment, based largely on transmission availability and other resource availability. We could put together a scenario showing offshore wind development, but from a price perspective, we haven't seen it coming in in any great quantity in the examined Scenarios.
- Q: Jason Busch, Pacific Ocean Energy Trust and Renewable Hydrogen Alliance: Expected to hear more about reference model and the assumptions
 - Jeremy: Modeling assumptions will be published in greater detail at a future date.
- Q: David Heslam, Earth Advantage: What were the assumptions for demographic growth? Did the model account for improvements in heat pump efficiency?
 - The model accounted for Oregon population growth based on a PSU study. The model also included forecast improvements for heat pump efficiency based on weather zones.
- Q: Jess, Rogue Climate: What type of hydrogen was modeled and is capacity for new hydrogen included?
 - The modeled allowed for several types of hydrogen production, including steam methane reforming and steam methane reforming with carbon capture but, because of emissions target constraints, builds green electrolysis-produced hydrogen almost exclusively.
- Q: Claire Valentine, Oregon Citizens' Utilities Board: Can you clarify the meaning of 'cost containment' and whether that pertains to rate payer impacts or includes different payment options
 - Cost containment refers to cost impacts and difference between modeled scenarios. Costs shown roughly translate into increased cost burden for Oregonians – electricity and fuels, but the Energy Wallet analysis will provide for more in-depth ratepayer impact analysis. The model did not examine different models for how we pay for transmission.
- Q: Erin Childs, Renewable Hydrogen Alliance: How did the modeling account for electrolytic hydrogen flexibility and also where did the model produce flexibility provided by hydro storage or demand side resources?
 - Jeremy: The model assumes very flexible electrolyzers that can respond to energy availability on an hourly basis
- Q: What role does long duration energy storage play in the modeling?
 - Jeremy: Long duration storage is approaching competitive pricing, but in OR, hydro system flexibility and gas means long duration storage is less economically competitive.

- Q: David Vanthof, Climate Solutions: Was battery storage or hydro pumped storage included in the modeling?
 - Jeremy: We included battery storage but not pumped hydro. Pumped hydro should be considered in localized settings.
- Q: Mobilizing Climate Action Together: What does the reference scenario say about clean electricity percentage by 2035
 - Electricity is pretty clean by 2040, emissions target drives this because decarbonizing electricity is one of the cheapest ways of realizing decarbonization goals.
- Q: Was nuclear energy included in the model? It would be valuable to receive data on the nuclear sited outside of Oregon by the model.
 - Jeremy: We did not permit nuclear siting in Oregon, but siting was allowed in other states.
- Q: City of Portland: What is the cost of delaying the Advanced Clean Truck Rule to 2027?
 - Jeremy: We did not investigate the impact of short-term delays to the ACT.
- Q: Did the model take into account any of the new federal policies or potential changes to existing federal policies?
 - Edith: Short answer no. ODOE continues to track ongoing policy developments, which will need to be part of Phase 2 policy conversations.
 - Additionally, federal incentives aren't everything; much of the modeling results is based on cost information that is independent of federal policy.

Next Steps & Closing

- Ben Duncan (Kearns and West) thanked the attendees for their participation. Edith Bayer stated that ODOE's website lists upcoming policy working group meetings, that public forums and listening sessions will be available, and the advisory group will meet monthly. The February 12 meeting will provide for deeper methodology discussion, and the comment portal is open on ODOE's website for public input.
- Alan Zelenka (ODOE) reiterated that the modeled Reference Scenario and Alternative Scenarios meet Oregon state energy goals and that the findings show electrification and energy efficiency to be crucial for meeting Oregon energy objectives. Infrastructure development would be required across all scenarios, and tech loads remain a key driver of demand growth. <https://odoe.powerappsportals.us/en-US/energy-strategy/>.
- **Final appreciation and adjournment at 12 p.m.**

Virtual Meeting Chat

Chat is included verbatim; please forgive typos.

9:59 AM	from Jessica Reichers to everyone:	Hello, Everyone! I am Jessica Reichers, the Technology & Policy Manager at the Oregon Department of Energy. I will be monitoring the chat for questions and sharing those with Ben, our moderator.
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10:00 AM	from Jessica Reichers to everyone:	If questions come up during the presentation, feel free to put them in the chat here. We will hold questions until the end, but I will be capturing what is written here for the Q&A portion of this presentation.
10:06 AM	from Phil Barnhart to everyone:	Will this meeting be saved so that it can be watched later?
10:07 AM	from Jessica Reichers to everyone:	Hi, Phil. Yes, the meeting will be recorded and posted on our website.
10:07 AM	from Jessica Reichers to everyone:	The Oregon Energy Strategy website is located here: https://www.oregon.gov/energy/Data-and-Reports/Pages/Energy-Strategy.aspx
10:08 AM	from Jessica Reichers to everyone:	On the webpage you can sign up for email notifications, see meeting recordings, and meeting materials. We keep the webpage updated regularly.
10:25 AM	from Tracy Farwell to everyone:	Re: AI. Just be aware that the data feedstock for AI software includes mass fiction. So "Artificial" means fictional. Why pay extra for fictional "intelligence"? Think about it.
10:26 AM	from Jessica Reichers to everyone:	Thank you for your comment, Tracy.
10:27 AM	from Tracy Farwell to everyone:	Hey just a thought <:-))
10:28 AM	from Linda Lu to everyone:	Can anyone in the webinar see the presentation?
10:29 AM	from Brian Murphy to everyone:	No I'm not seeing it either
10:29 AM	from Greer Klepacki CEP to everyone:	Me neither
10:29 AM	from Ryan Bottem PGP to everyone:	Also cannot see the presentation.
10:29 AM	from Jessica Reichers to everyone:	Hi, all - we are working on getting this up for you.
10:29 AM	from Josh Price, ODOE to everyone:	I'm have a few problems getting the presentation up on webex
10:30 AM	from Linda Lu to everyone:	Okay thanks for the update
10:30 AM	from Tracy Farwell to everyone:	About the Cascadia seismic wild card. Seems like your selected scenarios are an adequate proxy. Nice work.
10:30 AM	from Jessica Reichers to everyone:	Thanks, Tracy. We always appreciate positive feedback!
10:31 AM	from Andy Lanier to everyone:	If you are sharing slides, the virtual participants are not seeing them.
10:31 AM	from Linda Lu to everyone:	If there's a sharable link, we can also just follow along on our own
10:32 AM	from Jessica Reichers to everyone:	Hi All, we are working to have another person display the presentation. Stay tuned. It will be posted on our webpage later as well.

10:32 AM	from Jess, Rogue Climate she/they to everyone:	Thank you!
10:32 AM	from Jessica Reichers to everyone:	Thank you for your patience. The presentation should be displaying for you now.
10:32 AM	from Tracy Farwell to everyone:	OK. Slides came back.
10:41 AM	from Tracy Farwell to everyone:	Recently discovered that WA is concerned about its single high pressure liquid fuels pipeline feeding demand in WA and OR. Proposed a single above-ground second one added. Not happening. So Cascadia event will quickly advance transition to electricity grid for transportation. Sooner electrification will cut a lotta grief, post disaster. (you're welcome).
10:41 AM	from Jessica Reichers to everyone:	Thanks, Tracy.
10:45 AM	from Dave Vanthof to everyone:	The chart seems to show jet fuel remaining consistent. Does not appear to assume a transition to SAF? Why are you not assuming you can shift to another kind of fuel?
10:46 AM	from Jessica Reichers to everyone:	Thanks for the question, Dave. We will add it to the question queue for the Q&A section.
10:46 AM	from Tracy Farwell to everyone:	Suggests that electrified transport is same as insuring a stable economy. Authentic intelligence, not artificial, not fiction. Question is, how to skip the feverish software marketing that gaslights anyone with a brain.
10:47 AM	from Jessica Reichers to everyone:	Thanks for your comment, Tracy.
10:49 AM	from Greg Lamberg to everyone:	we will no longer be buying oil from overseas under president Trump. Oil wil be domestic. Drill Baby Drill!
10:50 AM	from Jessica Reichers to everyone:	Thanks for your comment, Greg.
10:55 AM	from Dave Vanthof to everyone:	My understanding is that renewable diesel already has a 30% market share in Oregon compared to diesel.It looks like the graph shows much lower percentage today
10:55 AM	from Tracy Farwell to everyone:	D!B!D! is a reality. So is cheaper energy without cost of commodity fuel handling infrastructure and forever maintenance. BTW. Just sayin"
10:55 AM	from Jessica Reichers to everyone:	Thanks, Dave. I will add that question to our Q&A list.
10:59 AM	from Greg Lamberg to everyone:	Gas will have to increase between now and 2040 until SMR's are commercial. This graph is a fantasy!!
11:01 AM	from Jessica Reichers to everyone:	Thanks for you comment, Greg.
11:01 AM	from Tracy Farwell to everyone:	Investing in Oregon low cost energy. https://www.newsunenergy.net/

11:02 AM	from Greg Lamberg to everyone:	You're welcome. As a 35 year energy expert who recently moved to Oregon, this is dissapointing. This is just not realistic and will be VERY expensive.
11:04 AM	from Tracy Farwell to everyone:	Great tutorial on SMR technology. https://better-energy-llc.com/the-nuclear-conundrum-2023/
11:06 AM	from Greg Lamberg to everyone:	SMR's will be the future in a decarbonized grid. They are at least 10 years out and unfortunately nuclear is illegal in Oregon.
11:07 AM	from Jessica Reichers to everyone:	NREL = National Renewable Energy Laboratory
11:08 AM	from Greg Lamberg to everyone:	Solar in Oregon is a Joke! Less than 18% availability. Requires a massive overbuild and tons of batteries ala California, where residential rates are already above \$.50 and rapidly heading to \$1.00. Looks like OR is trying to be CA, for which the consequences will be dire. This is very dissapointing...
11:10 AM	from Tracy Farwell to everyone:	Please consider the cost of fuel. What fuel costs \$0.0 per gal.
11:11 AM	from Linda Lu to everyone:	I wonder what asumptions the model made about rooftop solar adoption, in terms of costs and capacity compared to utility-scale solar. If the strategy already recommends upgrading and expanding transmisision, investing in distributed solar seems like going hands in hands.
11:11 AM	from Jessica Reichers to everyone:	Thanks, Linda. I will add your question to our Q&A queue.
11:12 AM	from Jess, Rogue Climate she/they to everyone:	For Q+A - What is ODOE's definition of "clean gas," and does this mean that OR will plan to build and use peaker plants?
11:13 AM	from Ryan Bottem PGP to everyone:	Jessica, thanks for moderating the chat. Wondering if I can submit some questions for the Q&A.
11:13 AM	from Ryan Bottem PGP to everyone:	-What does the "Phase 2- Policy Development" look like- timeline, process, stakeholders, who is engaged/has a seat at the table?
11:14 AM	from Jessica Reichers to everyone:	Thanks, Ryan. I will add your questions to the queue. I will add that we will do a deeper dive on key takeaways from the scenarios in the policy working groups we will facilitating in February.
11:14 AM	from Jess, Rogue Climate she/they to everyone:	For Q+A - what type of hydrogen is being considered in this model, and is the increased need for renewable generation to produce hydrogen a part of the model in terms of generation capacity needs?
11:14 AM	from Ryan Bottem PGP to everyone:	Thanks, Jessica -- Will tune in to the workinggroup meeting.
11:15 AM	from Jessica Reichers to everyone:	https://www.oregon.gov/energy/Data-and-Reports/Pages/Energy-Strategy.aspx

11:15 AM	from Dave Vanthof to everyone:	I don't see battery or pump storage anywhere. Does the modeling assume only clean gas or hydrogen and that storage is too expensive?
11:16 AM	from Jessica Reichers to everyone:	Also, we have not yet published the working group member list, because we are still finalizing members. However, it will be published on that webpage once it is final.
11:16 AM	from Jessica Reichers to everyone:	Hi, Jess - are you asking if the hydrogen is clean or not?
11:17 AM	from Jess, Rogue Climate she/they to everyone:	Yes - and the specific definition of clean hydrogen ODOE is working from
11:19 AM	from Jessica Reichers to everyone:	Hi, Dave, Will add your question to the Q&A list.
11:20 AM	from Ann Vileisis to everyone:	Super basic question: when you say "our costs" --can you explain who is the our?
11:20 AM	from Jessica Reichers to everyone:	Thanks, Jess. I will add your question to the queue.
11:21 AM	from Jess, Rogue Climate she/they to everyone:	Thank you!
11:21 AM	from Tracy Farwell to everyone:	Interesting. Excess solar collection at mid-day stored as generated H2, used after dark. No CO2.
11:21 AM	from Sidney Villanueva - Blue Skies Law to everyone:	Are these slides posted somewhere?
11:22 AM	from Jessica Reichers to everyone:	https://www.oregon.gov/energy/Data-and-Reports/Pages/Energy-Strategy.aspx
11:23 AM	from Jessica Reichers to everyone:	Hi, Sidney. We will publiush the slides later today or Monday. You can see them in the webpage link I pasted above.
11:26 AM	from Jessica Reichers to everyone:	Hi, Ryan - Jeremy is covering the key takeaways right now!
11:30 AM	from Jessica Reichers to everyone:	We will be going to questions for folks here in the room, but I will be providing your questions in a littl ebit.
11:30 AM	from Ryan Bottem PGP to everyone:	Jessica, feel free to strike my first Q on key takeaways, thank you.
11:33 AM	from Tracy Farwell to everyone:	Petrostates are geoengineering a not-happy future. Thankfully Oregon is not a petrostate (no carbon fuels production). ODOE is busying itself with geoengineered energy solutions to the carbon-driven geoengineering problem. Costs money to do the right thing. Again, nice work.
11:34 AM	from John Plaza to everyone:	It would be interesting to see some analysis of determining highest and best use cases for biogas (RNG) as inputs for liquid fuels such as SAF. IE, is using RNG for electricity production less beneficial to the state/region over using it as feedstock for the production of transportation fuels in hard to decarbonize sectors such as aviation/heavy trucking.

11:38 AM	from Michael Freels to everyone:	Thank you for the feedback, John. We should discuss this more in the Low Carbon Fuels Policy Working Group.
11:40 AM	from Sidney Villanueva - Blue Skies Law to everyone:	Have you considered how new federal policies (which could impact renewable development and/or BPA's ability to develop transmission) might impact these results?
11:45 AM	from Michael Freels to everyone:	Thank you for the question Sidney, I have added it to the list.
11:46 AM	from Rakesh Aneja to everyone:	Thank you for the analysis and presentation. I have a question: Can the model separate results for medium- and heavy-duty vehicles from the overall transportation analysis?
11:47 AM	from Tracy Farwell to everyone:	@Villanueva Correct. Policy maneuvers can intercept timely non-emitting solutions for whatever reasons, if any. In a free economy (if we gonna have one) it favors low cost energy that is free from the sun and you don't need to dig it up or fight about it. Unless I missed somethin'
11:47 AM	from Mike Jung to everyone:	Clean hydrogen can be produced through methane pyrolysis. Carbon is captured as a solid and sequestered in asphalt, and the process uses no electricity for process energy, avoiding the need for new infrastructure. Is methane pyrolysis considered in this model?
11:50 AM	from Michael Freels to everyone:	I have added your questions to the list. Thank you
11:55 AM	from Tracy Farwell to everyone:	OK to consider CH4. Also consider that the infrastructure for CH4 (natural gas) production and handling actually leaks like there's no tomorrow (CH4 is 80x worse than CO2) and there's currently no way to recover it.
11:56 AM	from Michael Freels to everyone:	Thank you for your comment, Tracy.
11:58 AM	from Tracy Farwell to everyone:	Right. Start of a discussion, not the end. Also, thanks for honoring science and math.
11:59 AM	from Jessica Reichers to everyone:	https://odoe.powerappsportals.us/en-US/energy-strategy/
12:00 PM	from Jessica Reichers to everyone:	Thatnks, Tracy. Appreciate you tuning in.
12:03 PM	from Jessica Reichers to everyone:	Have a great day. Thank you!