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Operator: Two Barclays analysts, one hot topic, all sides explored. This is The Flip Side. The Flip Side is a podcast series featuring lively debate between two Barclays research analysts taking opposing viewpoints on timely topics of importance to economies and businesses around the globe.

Jeff Meli: Welcome to The Flip Side. I'm Jeff Meli, the Head of Research at Barclays. I'm joined today by Will Thompson from our sustainable and thematic research team. Thanks for joining me, Will.

Will Thompson: Thanks for having me, Jeff.

Jeff Meli: Today we're going to talk about the consumer's role in the energy transition away from fossil fuels. How do we get households to reduce their carbon footprint?

Will Thompson: Look, clearly, there's been a lot of focus on corporate net zero targets, but we really shouldn't lose sight of the consumer. Our cars, our homes, our plane travel, they account for about 45% of energy related emissions, roughly 20% to fuel our cars, another 20% to heat and cool our homes, nearly 5% for our airfare

Jeff Meli: And Will, I just don't think the US is on the right path to reduce those emissions. We're trying to influence behavior through a hodgepodge of subsidies and incentives. They add up to a series of half-measures that are ineffective and are slowly but surely breeding resistance to change. If we can't put a price on carbon, we should instead pick a small number of changes that are really impactful and push hard on those to make a difference.

Will Thompson: I disagree. Admittedly, this is a huge challenge and I think that's why we need a broad approach. We need to change consumer behavior on a number of fronts and simply too early to decide what will work and what won't work at this point.

Jeff Meli: It's worth giving a little context on the current US approach to climate. I'm going to use the recent Inflation Reduction Act or IRA to illustrate. It's a big bill, but it's also typical of our approach. It has dozens of provisions. It's got subsidies for a litany of climate-friendly activities. There's actually too many for me to summarize here. I'm just going to read off a sample of the list. It's got the creation of a green bank, credits for residential solar investments, incentives to purchase electric vehicles, incentives to improve home energy efficiency, incentives to improve the renewable supply of energy for home use. It's even got bonus incentives to provide that renewable energy to disadvantaged communities in an effort to improve environmental justice, which is a concept that I wasn't even familiar with before this bill. It's got incentives for climate-friendly agriculture, and again, that's just a sample.

Will Thompson: It's a lot, and this is why the IRA is considered such a game-changer. It takes aggressive action on a number of fronts and it actually seeks to avoid picking winners and losers. While innovation is starting to bend the cost curve for a number of key technologies, we still need comprehensive policies such as the IRA to help incentivize consumers to change their behavior. Even if these policies aren't perfect, I simply don't see another solution.

Jeff Meli: Well, if I was going to rely on economics to help solve this problem, Will, I would just put a price on carbon and then we can let private market innovation find the best adjustments. But what you're suggesting instead is that we should rely on policymakers to figure out which changes to subsidize and to what extent to try to get exactly the right mix of changes. I mean, look at that list I read off, who could possibly analyze all those different areas and credibly conclude that the IRA gets it right? I mean, it seems to me that this is a recipe for disaster where we're going to waste a huge amount of time, effort, and money.

Will Thompson: But Jeff, we both know that a national carbon price is simply not politically feasible in the US. So regardless of how effective it would work in theory, it seems pointless to debate that at this point.

Jeff Meli: Yeah. Well, sadly, Will, I agree with that, but I think this other approach is also deeply flawed. And I'll give you an example from California and their approach to solar panels to illustrate why I'm skeptical, California encouraged homeowners to install solar panels with a bunch of subsidies. They convinced a lot of people to make big investments, and part of that investment was that they would sell the electricity they generated back to the grid, but that had a bunch of unforeseen consequences. First of all, people were being overcompensated to provide power to the grid during the middle of the day when the sun is bright and shining, that's also when the power is least needed.

Second, the people who could afford solar panels then found themselves with lots of electricity. Some of them disconnected from the grid, and that meant that the cost of maintaining the electricity grid was being shifted to people who couldn't afford solar panels or couldn't install them because they lived in rental homes or they live in multi-family homes like apartment buildings. That meant a lot of low-income families faced higher utility bills, which of course creates problems of its own. And that means California now has had to slash what they pay for that solar panel as it gets sold back to the grid. That's been very frustrating to the people who made those investments because they made the investments assuming a certain kind of power cost, and that's gone down, meaning their investments were no longer economic. It's just an example of how policymakers trying to fine-tune can misstep.

Will Thompson: I mean, no one said this would be easy, but I think it's a bit short-sighted to rule out possibilities and worry too much about the potential unintended consequences at this point. We also shouldn't discount the pace of innovation. Now, take AI, for example, just a year ago we didn't

know the potential of AI. Now, fast forward today, AI opens the door to a smart grid powered by virtual power plants that can aggregate and optimize distributed energy Resources such as EVs. AI can help identify novel materials and advance battery technologies. This would reduce our reliance on critical earthworm materials. The list goes on and I get there's a lot of uncertainty, but this uncertainty also suggests we need to take a diversified approach.

Jeff Meli: Well, AI is a really interesting example, Will. And look, I think when you look at AI, you're seeing the possibility of new insights, new technologies, new ways of utilizing our grid. When I look at AI, I see a reversal of decades of low to no electricity demand growth. I mean, we need to power all the computers for the AI and that's going to rely on the grid. That's going to be a challenge even before we start trying to change consumer behavior by getting them to electrify their homes or their cars.

Will Thompson: I do think we have to acknowledge that the next phase of the energy transition may only get harder. Up until now, consumer mission reductions have largely been driven by efficiency gains. So this is improving the miles per gallon on our cars, switching to LED lights in high efficiency appliances and furnaces. These are easy changes. They don't require any changes to how we commute or modifications to our homes, but they also don't get us off fossil fuels.

Jeff Meli: Well, on one hand, I'd say, Will, I agree with you, it's actually somewhat overlooked how successful these efficiency gains have been. I mean, US carbon emissions are down something like 20% from their peak, and that's despite the fact that our economy has been growing very robustly. And normally, you would think energy use goes up with economic growth. Most of that decline in carbon emissions is due exactly to the efficiency gains that you mentioned. However, one place I disagree, you said efficiency gains were easy and I think actually they spark some pretty serious resistance. Take the fuel economy standards for cars as an example, it's a huge political hot potato. And you can see that with the debates between the federal standards, California standards, how other states react to that can be quite a contentious issue.

Will Thompson: And I think that's my point, that the next phase of the transition will be even harder.

Consumers are being asked to switch fuels by electrifying their cars with electric vehicles or EVs, as well as electrify their homes with electric stoves and heat pumps to heat their homes. And we recently actually published a deep dive on heat pumps, but switching fuels has clearly raised the debate about the freedom of choice. Look no further than the backlash to the potential banning of gas stoves in California and New York. And this seems to show us how much of a cultural shift is needed. We also need to make aggressive action now and accept the fact that change will be slow amid early resistance.

Jeff Meli: Well, change will be slow and expensive. I thought your work on heat pumps was really instructive as an example of the costs associated with these changes. But truly, it's kind of a technology I wasn't familiar with before. I think it might be worth a quick 101 on how heat pumps work.

Will Thompson: Sure. So whereas conventional heating generates heat by burning fossil fuels or through electric radiators, heat pumps actually absorb heat from the outside. They can capture heat from the air, the ground, or even water regardless of whether it's cold outside. And by transferring heat as opposed to generating heat, heat pumps can achieve three to five times higher efficiency than conventional heating. This doesn't require magic or even novel technology. Heat pumps use essentially the same components that are in your home air conditioning system, which is actually effectively a heat pump, but just run in reverse. So in fact, most heat pumps provide heating and cooling, so they eliminate the need for having air conditioning at your home.

Jeff Meli: Yeah, it's cool technology for sure, but now let's get back to the cost side of the equation. So the average cost to buy and install a heat pump is about \$16,000, which is three to four times the cost of a conventional gas furnace and boiler. And this excludes any additional insulation costs, which is an important component because heat pumps provide lower heat supply relative to all

those conventional heating methods. Now, most buildings in the US and Europe were built before the modern-day energy codes, so it can cost thousands of additional dollars to upgrade them so that the insulation is sufficient. I've read a study that said the full cost of a heat pump for a pre-1980 single-family home in upstate New York could be as high as \$60,000.

Will Thompson: And that's just only upfront costs. The other challenge with heat pumps is that they actually don't always provide lower fuel costs.

Jeff Meli: Wait, what? Because you just told me they were three times more efficient.

Will Thompson: They are, but most people heat their homes with natural gas, and in most regions of the US and Europe, electricity is three times more expensive than natural gas on a dollar per kilowatt basis. So this can completely offset the efficiency gains of the heat pumps. And given how much we need to invest in the grid to meet increasing power demand, I do worry that electricity prices may only go higher.

Jeff Meli: See, this seems like a huge hurdle to implementation for me. It's just hard to imagine that the best use of that \$60,000 is to install a heat pump. I mean, surely that household could get better bang for the buck in some other sort of change. And it really highlights to me the flaws in this approach. I mean, look, anyone who makes that decision however well intended, is simply wasting money. You could easily spend it more intelligently into greater effect.

Will Thompson: To be fair, maybe heat pumps don't make sense for everyone, but it doesn't mean they're not worth pursuing. In fact, heat pumps have outsold gas furnaces in the United States over the last several years. This is despite IRA subsidies for heat pumps still not being available yet. So the reality is in many homes, they lack access to natural gas and they still rely on expensive heating oil, propane and direct electric radiators. Maine, which isn't the most progressive state, has had very high heat pump adoption due to many Mainers being stuck on heating oil. The New York

Times just wrote a big article about this, plus heat pumps can make a lot of economic sense for new construction homes. Since heat pumps can provide both heating and cooling, they eliminate the need to install separate heating and air conditioning systems, saving costs. And that's why over 40% of new single-family homes in the United States now come with heat pumps.

Jeff Meli: Well, see that new construction point is a good one. And I do think, of course, that we need a lot of new housing supply in the country. That's something we talked about in the last episode of The Flip Side. But here's my angle though. We should focus the subsidies there. It's the most cost effective and over time it's going to achieve the greatest adoption. And then you take this carrot and stick approach by pairing it with mandates. So look at what New York State has done. They're actually the first US statewide ban on fossil fuel furnaces for most new construction, which starts in 2026. See, to me this makes sense because you're going to focus your subsidies on the part where you get the most bang for the buck and then you pair it with a mandate to force the change. Forget about that 60,000 retrofit.

Will Thompson: Yeah, unfortunately, a big challenge in converting existing homes to heat pumps is related to our human nature. Most people simply don't even think about replacing their heating system until they have a problem. When their furnace fails and they lose heat, they're going to be eager to get heat back into their home and they won't wait for a contractor to come do building upgrades and retrofits. The path of least resistance for them will be to install another gas furnace or boiler. And since boilers and gas furnaces last well over a decade, these homes could still be burning fossil fuels beyond 2040.

Jeff Meli: Well, Will, that's actually a good segue to my view because I think you've really hit on something in this challenge associated with changing fuels. But let's think why that's so challenging. The underlying reason is because it exposes the consumer to the full cost of carbon. Fossil fuels are cheap in this country because we don't charge for carbon. When you change fuels to electricity, you're forcing the consumer to internalize that cost. Now we're opting for a subsidies-

based approach to facilitating that transition. We do that because it's easier to federalize the extra spending rather than forcing the consumer to spend it directly.

Will Thompson: Yeah. But you're bearing those costs and budget deficits and consumers will still end up paying it just not directly,

Jeff Meli: Will, it's actually even more perverse than that. We're pumping carbon into the atmosphere today causing issues for future generations. And then the half-hearted attempts we make to try to address that problem are financed by their future tax payments. And then to top it off, we don't even get the subsidies right as evidenced by that earlier California example.

Will Thompson: And we've seen this with EVs. So early adoption has been led by wealthy individuals that can afford an EV and are willing to deal with some of the early inconveniences such as range anxiety and lack of charging infrastructure. But despite tightening vehicle emission standards and significant EV subsidies, EV sales have actually softened. Sales fell 11% in Europe in March and Tesla sales might be flat this year. And while some might point to higher interest rates, the simple fact is that many auto manufacturers seem to be shifting their focus to plug-in hybrids, which suggests that interest rates are not the problem. The problem is many people are not ready to switch to an EV.

Jeff Meli: I think another part of the problem is that the subsidies are trying to do too much. So the EV subsidies that you mentioned have fair wage and local labor requirements. Those raise the cost of EVs. Just as a similar example, the Treasury Secretary of the United States recently criticized China for exporting too much cheap clean tech. But if we insist on higher costs for clean tech, then the subsidies don't actually accomplish anything. Look, is this a climate catastrophe? If the answer is yes, then cheaper is better. I think the real issue here is that we're spreading our resources too thin.



You want to make real change, make a concentrated push on one or two big issues. I'm not expert enough to say what those issues should be, but let's just say hypothetically that we choose EVs, then you take all that IRA money and you use it to build a national network of charging stations. Something like what we did with the highway system in the 50s. You eliminate the constraint that you just mentioned associated with range anxiety and limited charging. Now, all of a sudden, an EV is feasible not just for a wealthy homeowner in California, but for everybody. And you mandate the transition. You do kind of like what New York State was doing around new construction. You make that window really short, at least as short as Europe. That's how you can get real change.

Will Thompson: My concern with that approach of doubling down on one part of the energy transition is that it assumes everybody is in the same position to change. And I just mentioned how many people aren't ready to switch to an EV. Your solution of building a national network of chargers ignores the fact that often the cheapest and most convenient way to charge your EV is at home. Yet many people, particularly in low-income and disadvantaged communities, don't have access to residential EV charging since they rent their homes. They live in multi-family buildings, or they don't have a personal driveway or parking garage. You're asking them to sacrifice not only time in their day but actually money because it might probably cost more for them to charge. That doesn't seem like an equitable solution for me.

Jeff Meli: Well, I think there are going to be significant adjustment costs and political costs that go along with this change. But just to be clear, there will be a cost to pay for this transition one way or another. And if we're really on the cusp of a climate catastrophe, which of course is a point of debate, then the political costs or inconveniences we're talking about are nothing compared to the alternative. And I just think that we're going to take this problem seriously. Pushing on 10 strings at once isn't going to get it done. I feel like once you build the charging stations, a lot of those concerns you gave go away and now it's a question of how much we're charging for the electricity.

We really ramp up EV production in sales, now we talk about bending the cost curve. That's when those technologies get cheaper. Pretty soon you can flip the script and then the internal combustion vehicles become the ones that are inconvenient. Maybe gas stations start closing because everyone's charging their cars instead. And you get that beat-up old pickup truck that's still burning gas off the road. I mean, look, global emissions this year are going to be the highest ever. I just really struggle to understand where this incrementalism is getting us.

Will Thompson: Look, I do think there needs to be a concentrated effort, but not necessarily on the demand side, which is what we've been focused on, but rather on the supply side. I was surprised that the electric grid was pretty much an afterthought within the IRA and even the Bipartisan Infrastructure Law. It's becoming clear to me that we need serious and sustained investment in our grid to accommodate growing electricity demand, changes in grid dynamics, and even increasing frequency and magnitude of extreme weather. Much of the energy transition is really predicated on having a green, reliable and affordable electric grid.

Jeff Meli: Well, I do think there's merit to that and I think in particular, if all the subsidies that we're spending now could instead be used to offset what would otherwise be higher electricity costs, which as you noted could actually become a hindrance to adoption of some of these new technologies. Well, for more insights about heat pump technology, the opportunities and indeed the hurdles associated with these and other changes, clients at Barclays can read our latest report, Heat Pumps: Raising the Thermostat on Heating Decarbonization available on Barclays Live.

Operator: That's all for now from this Barclays podcast. Thanks for listening and we'll catch you next time on The Flip Side. For more insights on this topic, clients can log into Barclays Live or find out more at [Barclays.com/cib](https://www.barclays.com/cib).