

## [Transcript] FYI - For Your Innovation / The State Of Delivery And Nuclear Cost Declines | The Brainstorm EP 11

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Welcome to episode 11 of The Brainstorm.

We're talking delivery fees and the cost of nuclear energy, and we're joined by two great guests.

We've got Tasha Keeney and Daniel McGuire joining us later on.

Tasha, why is it so expensive for me to get food delivered now, and how do we fix this problem?

Well, yeah, you know, we're talking about this because this past quarter, but really the past six months, we've noticed, well, for the first time, companies that have their own delivery services are noticing that more consumers are opting to pick up items.

And so we saw Chipotle, Sweetgreen, saw more pickups over delivery.

Domino's partnered with a third party app, Uber, and Postmates also Uber for the first time.

They had their own delivery app for seven years now.

So that really, I think, signifies something.

And the reason that this is happening is because delivery fees are just becoming astronomical.

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So if you look at the markup that's both on the menu item price as well as on an actual fee basis and taking into account tip, other things, it's 50% on average across these apps.

So the average delivery order is something like \$30, but you can imagine if you're ordering food for a family, for instance, that 50% markup could be extremely meaningful.

So this started to happen coming out of the pandemic.

Some of it was probably inflation-driven as costs were going up in general at these restaurants. But also these apps, when they first started competing, they were not necessarily profitable on these orders.

So I think now you're seeing more of a fee grab from the third party players as well.

So I mean, why do we care about this?

I think it just goes to show us why drone and robotic delivery should make a big difference in consumers' pockets in the future.

And so, Tasha, just to confirm with you some hard numbers here.

So it's roughly 50% increase in the fees.

And the growth has slowed from, I think you said, a peak of 126%.

And that was in April 2020.

And it's decelerated.

And so year-over-year growth is all the way down to 6%.

Are those the right numbers from the brainstorm?

So 50% is the average markup of the regular.

So it would cost you 50% more to order your McDonald's through Uber than to go to McDonald's and pick it up yourself.

And that number has risen over time.

We saw growth of over 120% during the peak of the pandemic in delivery sales.

And that's now closer to 6% as of this past June.

So an extreme deceleration.

We also saw that confirmed by Instagram.

So here at Arc during our morning meeting, this morning, Andrew Kim talked about Instagram growth.

And they saw about a 5% growth every year in gross merchandise values of the same thing as growth sales.

So we're seeing that really across the board.

I mean, consumers are just rebelling against these really high fees.

But I think drones will come to the rescue.

And soon we'll love delivery again.

To what extent here is this just VC money drying up?

And it's like, you know, VCs are subsidizing unprofitable business models.

And now that's no longer the case, you know, also the comparison to Uber, right?

They recently the profitable quarter and everyone's saying, oh, look at, you know, mission accomplished

almost after years and years of subsidized rides.

You know, perhaps at sort of like the smaller competing companies, that's a thing.

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I mean, because most of these like Uber, you know, has been public for some time. So I think that it's less VC money drying up for them. It's more just that quest for profitability. And we've noticed that their take rate in eats has gone up pretty significantly over, let's say like the past few years. It used to be in the low single digit percentage points. And now I think it's in double digit percentage points. So I think, you know, it's as you're hinting at these apps have not always been profitable. They're heavily fueled by incentives. Certainly when they first started out, it was VCs that were covering those checks. And now it's been the public markets for some time. But I do think that it goes to show that, hey, look, they prove something, which is consumers want delivery and fast and convenient is really nice. And a certain price point comes with that. So I think that the robotic delivery options that we expect to be available over the next 10 years, we'll just accelerate that trend. Tasha, two questions for you. One, when you talk about the solution being drones and rolling robots, what do you think that does exactly to the price and just consumption of these types of goods? And then also, who are some of the players to watch in the space that are building the robots and drones? Yeah. You know, we've estimated in the past that drone delivery could be less than a dollar. But even if it's only a few dollars, that would still undercut today's delivery options, which actually provide a pretty nice price ceiling for these companies that are coming in. Especially when you're first starting out with delivery, it could go as low as a dollar or less, but there will be able to charge higher fees because, again, the market's actually here and proven. For robot delivery, a lot of the work that we've done has been focused on groceries in particular. So the assumption is it's like one robot per every few customers, they're grouping orders together. And then you can imagine that it costs in the low single digit dollar range. And Sam's done a lot of work on that in the past as well. So I think it's something that we're both excited about. And do you think we'll still be asked to tip these drones and robots? I don't think so. I don't think so. I don't know. I was just at the airport. At your robot. Have you seen at the airport now, the self-checkout asks for a tip?

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It's like there's no one even around you.

It's like, I don't know what.

I think the robots are going to be asking for tips, Nick.

That's my take.

Yeah.

I'm going to guess yes as well.

It'll be an interesting social experiment, I guess, what those pressures enable.

But if you're at home and there's no one overlooking you on your smartphone, unlike at the airport, maybe you'll be less inclined to do so and you'll be able to save that money.

It's true.

And then another thing, Tasha, that you and I have discussed and seen kind of the ramifications. When we say rolling delivery robot here, there's a number of form factors that I think come to people's minds.

There's the cooler that are on wheels and go on the sidewalk or more along smaller vehicles that can share the road.

And what are your thoughts on who wins in that arena?

Yeah.

I think it's more likely that it'll be what I would call the integrated traffic robots that, as you said, share the road with vehicles.

One, you're encroaching on pedestrian space less, which I think cities will like more.

We saw with the initial rollout of the sidewalk delivery robots that those were being limited pretty severely in terms of the numbers that companies like Starship were allowed to test.

Although they've seen some more pickup recently.

But I ultimately think it'll be the integrated traffic robot.

So it'll be a little smaller than a small car, let's say, and it'll be a purpose-built vehicle.

So I think some of the ride-hailing, the autonomous ride-hailing players could start out in delivery, maybe to boost utilization rates, right?

We've heard crews plans to do that.

But over the long term, it makes much more sense for a purpose-built vehicle to do this, just from a customer.

Do you think we'll have to reimagine infrastructure?

I think of an apartment building and a rolling robot or several rolling robots trying to get up to, call it, the 17th floor.

And I think Amazon has solved some of this package delivery by inserting lockers.

Do you think apartment buildings will have to have a gated-off section where these rolling robots or drones drop off, and then that's where you actually go down to pick up?

Because getting to a specific apartment, I imagine, would be a bit of a logistical issue.

Yeah, a couple of points.

So I'd already say that getting to apartments is a logistical issue.

If you talked to anyone that's in a high-rise, sometimes just a human delivery person finding their apartment could be difficult.

But you're actually hitting an important point, which is I think that autonomous delivery

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will be extremely disruptive, not necessarily.

I think it could, forms of it could be available in dense cities.

I mean, it'll basically replace the Amazon grocery little carts that we see now here in New York City.

But it's going to be even more disruptive for people outside cities.

You can imagine someone who today, maybe there's like two restaurants that deliver to their house in the suburbs.

But with autonomous delivery, because you bring costs down, maybe it's more economic for more restaurants to make that delivery trip via an autonomous robot partner.

And as you said, in the early days, it'll likely be easier to deliver to those locations.

So I don't think that we should depend on infrastructure changes for this to roll out.

I think that might people make those changes longer term, sure.

I mean, I think those will change consumer habits completely.

We've talked about at ARC that you might not need a pantry, because if groceries are so cheap to deliver, maybe you do it four times a week versus the, you know, single time a week trip that you take now.

So I do think that we can see things change.

But right now, the companies are, you know, as they should, working to integrate with our existing systems, for so, for instance, Zipline, so they can deliver with dinner plate level accuracy in your backyard.

So you don't need like a landing pad or something for this to work.

Right.

That's really cool.

And then maybe just to wrap it up, you just mentioned Zipline.

What are the companies that you think are worth watching to see how this develops?

Yeah, you know, Zipline's a really exciting one.

The reason I think that Zipline is so exciting is because they started off in Africa, so they were able to complete, you know, hundreds of thousands of flights to date today in Rwanda.

There are more unmanned flights than manned, thanks to companies like Zipline.

And they started out in healthcare, too, which I think is smart because that's a less price sensitive area because they are so heavily dependent on things like couriers, which are, I mean, we're complaining about consumer delivery fees.

Couriers, it's like \$100 plus to get something delivered.

So that's going to be an extreme price reduction, even if you can get delivery down to like \$20.

And they're, you know, they have some key partners here in the U.S.

like Walmart, Sweetgreen, you know, that we mentioned today.

One of the companies that's sort of feeling this delivery pinch.

So I think they have a lot of things, exciting things ahead of them.

I would also keep an eye on Wing, which is Google's drone delivery project.

They're a little bit behind Zipline in the number of deliveries, but still in the hundreds of thousands partnered with Postmates.

They've done a lot of things out in Australia.

You know, sadly, Amazon Prime Air, I think, has kind of fallen behind competitors.

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And then on the robot delivery side, you know, companies like Neuro have done some pilots.

We're kind of waiting to see how those work out.

You know, Sam, you and I have talked to some of the public companies that have tested out those projects.

I'm clear to be seen, you know, if whether or not that particular, you know, those particular projects will make it.

But I would expect to see, you know, other companies enter this space.

Great. Tasha, thank you so much for joining us.

All right. Now we're joined by Daniel McGuire, and we're talking nuclear energy.

But more than that, we're talking application of rights law.

Nick, I feel like everyone who's listening probably has some association between rights law and arc and the research we do.

But at the risk of being repetitive, I'll just give a very high level.

I'll just give a very high level.

Rights law is, you know, tied to Moore's law.

Moore's law is actually a derivation of rights law.

And rights law says that for every cumulative doubling of production, you get a fixed percent cost decline.

And this is important in doing research and projecting technologies out in the future, because you can predict and forecast when you'll cross over a tipping point in demand that could unlock, you know, this outsized potential.

And, you know, we've done this with varying technologies, and now Daniel's done it for nuclear energy, but it's not as clear a picture with nuclear.

So, Daniel, we've got this chart up here.

Can you kind of walk us through what's going on?

Yeah, sure.

Thanks, Sam.

And thanks, Nick, as well, for having me on.

Before, maybe I look at the chart just to step back quickly as why to nuclear.

So over the past couple of years, there's been increased emphasis on solar and wind, but the big problem with there is intermittency.

So that means the sun always isn't shining and it's not always windy for the wind farms.

So there's an issue in terms of reliability.

So nuclear is a great solution to this because it can run 24 seven as a carbon free source of power.

So to look at this chart that's up now, what we've done here is look at on the X axis, the cumulative of power deployed.

So this is in megawatts and on the Y axis is overnight construction costs.

So what overnight construction costs is it's the cost of building a nuclear plant as if it occurred overnight.

So taking out account of buildup interest for delayed plants.

So what's interesting about the US is initially there is a clean kind of cost decline curve and there's a nice trend of the dots going forward.

And for clarity, what each dot on this chart is, it represents a plant connected to the US grid in

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chronological order from left to right.

And as highlighted in the chart, there is a significant uptick in around 1974.

And what's interesting about 1974 is this is when the US Energy Reorganization Act was introduced. This act introduced the separated the body into the Nuclear Regulatory Commission and the Energy Research and Development Administration, which later formed with other bodies to become the what's known as today the Department of Energy.

Interestingly, this uptick kind of illustrates the impact that regulation can have on costs.

And what we are currently in the process of doing is looking at, well, had this regulatory change not occurred,

what would the cost decline have been post change?

And that's kind of where we're at now.

It's like I said, it's a work in progress.

But I would like to highlight too, there are other factors and not just this regulatory change.

So nuclear has been known over the years for its disasters.

You have the Three Mile Island Accident in 1979, Chernobyl in 1986 and more recently Fukushima in 2011.

So there are external factors, but we think this chart is kind of just a high level way of illustrating how regulation can impact nuclear.

And so, Daniel, I see one of the lowest points at this inflection.

It looks like maybe it was \$1,000 overnight capital costs per megawatt deployed.

And then I see this black dot all the way at the very end.

What is that black dot represent?

Yeah, so the kind of the tipping point is 1974 to around \$2,200.

The black point represents the Vogtel plant, which was actually brought online a couple of weeks ago.

That is roughly around \$8,000, so roughly four time increase in costs.

And I'd like to clarify as well, all of these costs are in 2023 inflated levels.

So comparing apples with apples.

So it seems like the regulatory burden here and protesting as well has really impacted the costs here.

And just, you know, Rough Ball Park, I know still work in progress.

How much money has been spent, you know, fighting these battles

that could have otherwise been used to keep driving costs down?

What's kind of that delta there as far as money lost because of what's going on?

Yeah, that's a really good question.

So as I mentioned, if you were kind of to follow the trend line and continue it on post 1974, at the rate of progress, at the rate of cost decline that was occurring in the U.S.

alone, this would imply roughly \$345 billion wasted, quote unquote.

So that is the difference between what the cost of plants post 1974 cost versus what they could have cost had the cost decline continued to occur.

So it's quite interesting in that regard.

Do you think that, and I'll ask this question to both of you because I know you've both spent time

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looking at this space, do you think that there's a renewed interest in nuclear?

And I know this is more fission or this is fission.

Now you have fusion making waves and you're hearing a lot of news.

Is that part of the reason there's this renewed interest in the space?

Yeah, maybe I can go first Sam and then you can add on.

So I definitely think so.

And even from a regulatory perspective too.

So there is this new advanced reactor development program, so a or DP, which is set up by the Department of Energy and they're encouraging a new form of nuclear energy.

Well, it is nuclear fission, but in a smaller form called small modular reactors.

And for context, this wasn't available back in the day where the chart was illustrating the 50s, 60s, 70s.

A lot of it is to do with this new fuel called trisulfide fuel, which brings a contamination on the fuel level at a pebble level, as opposed to having the requirement of large construction buildings to contaminate or to contain a potential leakage and comes with that is a lot more cost efficient methods of building these plants in terms of time.

But yes, I'm interested to know what your thoughts on that.

Well, yeah, I just say, you know, the small modular reactors have definitely garnered interest.

One of them came out, I think via SPAC.

There are a number out there, private companies as well.

I think countries are looking at it as well.

You have prices that went crazy with, you know, the commodity spike with the war in Ukraine and Russia.

So all of these kind of led people to rethink and say, okay, you know, what does our energy base look like?

And, you know, if you look at that chart, nuclear is now four times more expensive than it was.

Really, there shouldn't be a reason for that.

You know, it is a technology cost should continue to decline.

So clearly there are outside factors at play.

And if governments can get on board with this and clear the path for this, I think, you know, we've seen that it can be done safely and it can be done cost-effectively to be a key part of the energy future.

And just to add to that point as well, as in why now?

So the International Energy Agency, they explicitly state that nuclear is going to be a foundation for achieving net zero carbon 2050 target.

So I guess that's kind of lit a spark under countries and they're starting to reevaluate why nuclear is should be part of the solution going forward.

And I know this is a separate topic and probably another full topic that we should discuss at some point, but fusion, what are your thoughts on that?

I've seen a lot about it in the news, but curious, is the progress that's



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being portrayed true or are we still very far away from that reality?

I think we still have some time, even with the small modular reactors, you know, the plants that are coming online or plan to come online are end of this decade. And those are kind of first buildouts.

So, you know, I think it is exciting.

You know, there's just, I think, another paper that came out.

The there's like net positive energy, but it was it's not really counting the full energy spectrum, right?

It's like a lot of energy to set it up.

And then you do the experiment, you get a small net positive.

So I think we still have we still have time here.

Got it. Yeah.

All right, Daniel, thank you.

We look forward to seeing where this research leads.

And we'll probably have you back on when you wrap it up.

Yeah, great.

Thanks for having me, guys.

And I'm going forward.

I'll be posting a lot of charts on Twitter and stuff.

So if anyone wants to follow me at D.

McGuire arc to stay up to date with it.

Nice. Nice. Good plug.

Good.

A worth a word.

Yeah.

A worthwhile to someone asked, actually.

One of the YouTube comments.

So there's your there you go.

There's your answer.

There you have it.

All right, Nick, any anything going on?

Any questions we want to answer from last week?

I didn't see many.

I guess maybe the code code word at the end is not working.

So if people have other thoughts or just want to send us questions without a code word, please feel free.

We we do enjoy getting them.

We do enjoy answering them.

And hopefully we can continue that.

But yeah, and our video last week, we got flagged because I think we were talking about climate and YouTube.

YouTube flagged us because climate is controversial.

Maybe not a good idea to call out YouTube for flagging us.

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All right.

Video will now probably get flagged.

YouTube is great.

YouTube's great.

Exactly. All right.

I think we'll wrap there before we do any more harm to our to our show.

But thank you, everyone, as always, for listening in.

And that that's our show next week.

See you next week.