

First to Market

August 27, 2026

CAN SPACEX REALLY SEND COMPUTE INTO ORBIT NEXT YEAR?



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Chart of the Day

INFLATION: What is keeping Core PCE high?

Current Core PCE %YoY and Contribution to Excess Growth by Category

	(a)	(b)	(c)	(d)=(c)-(b)	(d)*(a)
	Core Personal Consumption Expenditures				
	Weight	'99-'19 20Y YoY Avg	Current YoY	YoY% Change - 20Y Avg	CTG to Delta (%)
Expenditure Category	(%)	(%)	(%)	(%)	
PCE Core	100.0	1.7	3.3	1.62	1.62
1 Recreational goods and vehicles	3.7	-5.4	8.6	13.96	0.52
2 Financial services	6.2	3.4	9.2	5.77	0.36
3 Public transportation	1.6	1.8	10.8	9.00	0.15
4 Clothing and footwear	3.0	-0.4	3.5	3.88	0.12
5 Recreational items	1.8	-1.8	3.3	5.08	0.09
17 Social services and religious services	1.3	2.0	3.0	1.00	0.01
18 Furniture and furnishings	1.6	-1.8	-0.4	1.37	0.02
19 Magazines, newspapers, and stationery	0.7	1.7	4.6	2.88	0.02
20 Recreation services	4.4	2.4	2.9	0.43	0.02
21 Household maintenance	0.7	2.9	5.4	2.46	0.02
22 Motor vehicle parts and accessories	0.7	1.8	4.1	2.27	0.02
23 Accommodations	1.1	2.3	3.4	1.08	0.01
24 New motor vehicles	2.2	0.2	0.6	0.47	0.01
25 Tools and equipment for house and garden	0.3	0.0	2.6	2.57	0.01
26 Postal and delivery services	0.1	3.8	12.3	8.59	0.01
27 Tobacco	0.6	5.5	6.7	1.21	0.01
28 Water supply and sanitation	0.8	4.4	4.7	0.28	0.00
29 Final consumption expenditures of nonprofit ir	3.2	1.2	1.2	-0.05	-0.00
30 Nursery, elementary, and secondary schools	0.4	4.6	4.0	-0.66	-0.00
31 Household supplies	1.1	-0.2	-0.8	-0.67	-0.01
32 Commercial and vocational schools	0.5	4.3	1.5	-2.75	-0.01
33 Household appliances	0.5	-0.8	-3.6	-2.76	-0.01
34 Professional and other services	1.6	3.5	2.5	-1.03	-0.02
35 Net purchases of used motor vehicles	1.1	-0.3	-1.8	-1.49	-0.02
36 Telecommunication services	1.0	-1.9	-4.6	-2.74	-0.03
37 Higher education	1.1	5.1	2.1	-3.01	-0.03
38 Pharmaceutical and other medical products	3.9	2.9	-2.9	-5.73	-0.23

Source: Fundstrat, BLS

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**Financial Services +
Recreational Goods
accounts for >55%
of excess PCE**

fundstrat

Good morning!

One of the major challenges facing contemporary data-center development stems from the heat that all of those cutting edge processors generate. All that heat needs to be dissipated quickly to keep those processors from essentially melting, and that requires a lot of water and a lot of power. In fact, cooling accounts for up to 40% of a hyperscaler's power usage (though this number is on a downtrend.)

Unintuitively, setting up data centers in the freezing cold of outer space makes the problem significantly harder, not easier. Terrestrial heat dissipation relies on simple conduction and convection: heat energy is transferred to surrounding air or water, which then transfers it to the broader environment – ultimately, the atmosphere. Those freezing temperatures in space are largely irrelevant because in the vacuum of

space, there is no receiving medium to begin that initial stage. (This is, by the way, how insulated windows and fancy water bottles work.)

So it was that when Elon Musk announced on Monday that SpaceX \$SPCX would move the launch of the first "AI1", its satellite-based data server, to 4Q 2027, with "significant scale" in 2028, my immediate question was: How did Musk and his team solve the challenge of heat dissipation?

It's important to acknowledge that Musk's announcement includes the news that AI1 will incorporate a space-optimized Nvidia Vera Rubin NVL72 system. The space version of the \$NVDA system will reportedly feature a specialized space-focused cooling system. (It will also feature a shock-absorption system to help it survive launch, aggressive redundancies, software-based self-healing, and shielding against cosmic and solar radiation, both of which can degrade semiconductors.)

Still, in the view of some scientists, it is not at all clear that Musk's team has solved the cooling problem, despite Musk's own vague and nebulous claim that "SpaceX knows how to do heat rejection in space." It's one thing to cool a Starlink satellite, but cooling a satellite that hosts a high-performance Nvidia-powered rack is another beast altogether.

SpaceX is asserting that AI1 cooling will be handled by using an unspecified liquid coolant to carry the heat generated by the chips to a liquid-cooled radiator about 110 m² (almost 1,200 square feet). The dual-sided radiator, positioned edge side perpendicular to the sun (so that both broad sides are pointed completely away from the sun), will then dissipate the heat energy in the form of infrared light/radiation.

A radiator that size sounds rather sizeable – a one-bedroom apartment in Manhattan with that square footage would be considered comfortable, even spacious. Yet the estimated amount of heat that would be generated by a single standard (Earth-based) Nvidia-powered rack results in up to 150 kW of thermal output, and for a 110 m² radiator to dissipate it would require 1,400 W/m² of dissipation. This is a rate roughly 8.4x more efficient than a system using the same principles and concept currently running on the International Space Station.

That doesn't mean a miraculous technological leap is required, mind you – merely a significant one. Much of this efficiency gap can likely be managed through basic thermodynamics (specifically, the Stefan-Boltzmann law for those readers who like looking at equations). Basically, how much heat the radiator can dissipate rises significantly as the radiator itself gets hotter. Specifically the quantity rises with the fourth power (x^4) of its absolute temperature (Kelvin degrees, relative to absolute zero.)

Here's where SpaceX has a natural, albeit partial, advantage. The ISS radiators are limited by their need to simultaneously keep the station's internal temperature comfortable for the humans living inside, so their efficiency is capped. However, on the AI1, there will be no humans inside to complain about how scorchingly hot and uncomfortable it is. Thus, if SpaceX can run the AI1's radiator at roughly 1.7x the temperature being used on the ISS radiator, the math could theoretically work. The ISS radiator runs at 235 degrees Kelvin. Thus, the AI1's radiator would need to run at 400 degrees Kelvin – roughly 260 degrees F / 127 degrees C.

That is, however, still a big if. For this to happen, the server itself needs to run at hotter than the temperature we just listed. Traditional chips typically do not: high-performance silicon chips become prone to errors once temperatures exceed 185 degrees F (358 degrees K / 85 degrees C), and they start to physically degrade above 221 degrees F (378 degrees K / 105 degrees C). Thus, a big part of the onus rests on Nvidia to design high-performance chips to work in such elevated temperatures – an unusual design requirement for cutting-edge semiconductors. Otherwise, a much larger, heavier radiator will be required, and that would severely disrupt the economics of a space-based server.

Here's why: The current specs call for AI1 to weigh around 6 metric tons, and at best-case projected internal Starship launch rates of \$200/kg, that means the launch itself would be \$1.2 million. That weighs against the cost savings from not needing to pay an annual \$75,000 electric bill, since the satellite would be solar-powered, and the most optimistically plausible estimated useful lifespan of up to seven years before the chips start to get degraded from the heavy radiation bombardment (while also facing obsolescence). The cost/benefit analysis was thus already leaning heavily on less

quantifiable benefits, such as avoiding the increasingly hostile NIMBY attitude communities and local regulators around the world are directing at data center construction, bypassing delays in connecting to an electric grid, and removing the need to deal with state and local authorities.

Increasing the launch costs with a bigger/heavier radiator would make the cost/benefit analysis even more challenging.

That's not necessarily a bear case for SpaceX. The company still derives a healthy revenue stream from its Starlink satellite Internet service, its commercial launch services, and its government/defense contracts. Furthermore, as my colleague Hardika Singh recently explained, moonshot bets can pay off in unexpected ways, even when the company fails to achieve its primary explicit objectives. Still, the SpaceX team has a massive challenge ahead if it hopes to bring AI1 to a successful conclusion.

\$SPCX is up 1.9% this week as of Wednesday's close.

[Note: The back-of-envelope scientific analysis above was simplified significantly for a morning-coffee audience. For those with interest and about half an hour to spare, astrophysicist Scott Manley has a far more detailed discussion on his YouTube channel about this calculation, along with other challenges facing any company hoping to host servers on satellites.]

Share your thoughts

Do you think Elon Musk can meet his deadline this time and actually deliver on his promise of a satellite-based server? [Click here](#) to send us your response.

Here's what a reader commented

Q: Do you think sanctions can help stop the war?

A: The sanctions will not work in the way intended in the near term. A major part of the world wants to be free of the US Dollar. Meanwhile, alternatives for transactions are finding their way. This will only continue. On the flip side the longer the standoff continues, the more the world works toward energy independence from oil, making the Hormuz choke point irrelevant eventually.

Catch up with Fundstrat

Nvidia came in solidly with >100% revs growth on ~\$100 billion revs, just astounding. And this along with \$CRM, \$CRWD reports, should lead to a tech rally. This is consistent with our view that these were clearing events.

Technical

\$NVDA's post-earnings fade might not materialize this year given \$NVDA's strong 2028 revenue guidance, which might technically drive the stock back to new all-time highs.

Crypto

I previously laid out the case that the market has likely made its lows and that the broader macro regime is beginning to turn more favorable for crypto. Yesterday's data and price action did little to change that view. Accordingly, we added another 5% of risk across the model portfolios yesterday, taking cash down to 35%.

News We're Following

Breaking News

- US stock futures climb as Nvidia's outlook lifts tech sector BBG

Markets and economy

- Warsh steps into spotlight after Bessent's bond move HILL
- Fed Lisa Cook turns mortgage allegations back on Trump and his Cabinet CNBC
- US merchandise-trade deficit widens to largest since March 2025 BBG

Business

- Nvidia reports blowout quarter, says demand for AI chips is getting even hotter WSJ
- After Meta landmark settlement with state AGs, legal headaches remain CNBC
- Chinese state oil giant CNOOC sees potential for US-China energy cooperation REU
- A breakthrough pancreatic cancer drug marks a new era for treatment BBG

Politics/U.S.

- Khalid Sheikh Mohammed: Trial date set for alleged 9/11 mastermind BBC
- College sports meltdown fuels push on Capitol Hill SEM
- Republicans divided over pre-election stimulus push as economy slows HILL

Overseas

- Iceland holds knife-edge referendum on EU - and it could be decided on fish BBC
- CIA chief's surprise Moscow trip was to warn Russia not to attack NATO WSJ
- Glacier collapse may have triggered deadly Nepal flash flood, experts say REU

Of Interest

- Yayoi Kusama, whose art evoked hallucinatory wonder, dies at 97 WAPO
- Diego Maradona's 'Hand of God' football from 1986 World Cup win over England sells for £2.5m BBC

Overnight

S&P Futures	+38 ▲ point(s) (+0.49% ▲)
overnight range:	+17 ▲ to +51 ▲ point(s)

APAC

Nikkei	-0.20% ▼
Topix	+0.15% ▲

China SHCOMP	+1.13% ▲
Hang Seng	-0.34% ▼
Korea	+1.53% ▲
Singapore	-0.65% ▼
Australia	-0.98% ▼
India	-0.27% ▼
Taiwan	+0.31% ▲

Europe

Stoxx 50	-0.15% ▼
Stoxx 600	-0.33% ▼
FTSE 100	-0.59% ▼
DAX	+0.26% ▲
CAC 40	-0.89% ▼
Italy	-0.44% ▼
IBEX	-0.33% ▼
Canada	-0.39% ▼
Mexico	-0.15% ▼
Brazil	+0.01% ▲

FX

Dollar Index (DXY)	+0.08% ▲ to 99.240
EUR/USD	-0.06% ▼ to 1.1644
GBP/USD	-0.12% ▼ to 1.3578
USD/JPY	-0.09% ▼ to 159.46

USD/CNY	+0.02% ▲ to 6.7208
USD/CNH	+0.02% ▲ to 6.7211
USD/CHF	-0.05% ▼ to 0.8058
USD/CAD	-0.04% ▼ to 1.3883
AUD/USD	+0.08% ▲ to 0.7176

UST Term Structure

2Y-3M Spread widened	1.4bps to 43.8bps
10Y-2Y Spread widened	0.5bps to 43.8bps
30Y-10Y Spread narrowed	-0.1bps ▼ to 51.9bps

USD HY OaS

All Sectors	-12.7bps ▼ to 296bps
All Sectors ex-Energy	-3.4bps ▼ 294bps
Cons Disc	+3.6bps ▲ to 509bps
Indu	-5.2bps ▼ to 234bps
Tech	-2.8bps ▼ to 198bps
Comm Svcs	-2.2bps ▼ to 289bps
Materials	-5.1bps ▼ to 264bps
Energy	-3.6bps ▼ to 269bps
Fin Snr	-1.9bps ▼ to 185bps
Fin Sub	-2.1bps ▼ to 281bps
Cons Staples	-2.6bps ▼ to 458bps
Healthcare	-3.6bps ▼ to 312bps
Utes	-2.4bps ▼ to 208bps *

DATE			TIME	DESCRIPTION	ESTIMATE	LAST
8/28	10:00 AM	Aug F UMich 1yr Inf Exp			4.4	4.3
8/28	10:00 AM	Aug F UMich Sentiment			51	51
9/1	9:45 AM	Aug F S&P Manu PMI			n/a	53.2
9/1	10:00 AM	Jul JOLTS			7300	7359
9/2	10:00 AM	Jul F Durable Gds Orders			n/a	1.1

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