



NewStreet
Research

Introducing SpectrumHub

NSR Global Spectrum Database

February 2024

1

New Product

We are delighted to launch **SpectrumHub**, our **Global Spectrum Database** in a **beta version**.

We believe this new product provides a genuinely unique insight into the state of play of the global wireless spectrum market.

2

Free Trial Period

SpectrumHub, which sits outside our regular telecoms subscription, will be available to all our clients for free during a several-month **trial period** and after that it will be put behind a **separate paywall**.

We also aim to add other valuable data sets behind this paywall soon.

3

Access

SpectrumHub consists of a Tableau interactive dashboard and is **accessible over our website**.

For clients interested in accessing the full database directly, **please contact Jose Anguis** and clients will be given a separate log-in for the platform

Contact information:

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4

Feedback & Version 2.0

During the beta phase, we would love to hear from users of the platform on feedback on product and future areas of improvement in advance of a rollout of Version 2.0.

Welcome to SpectrumHub



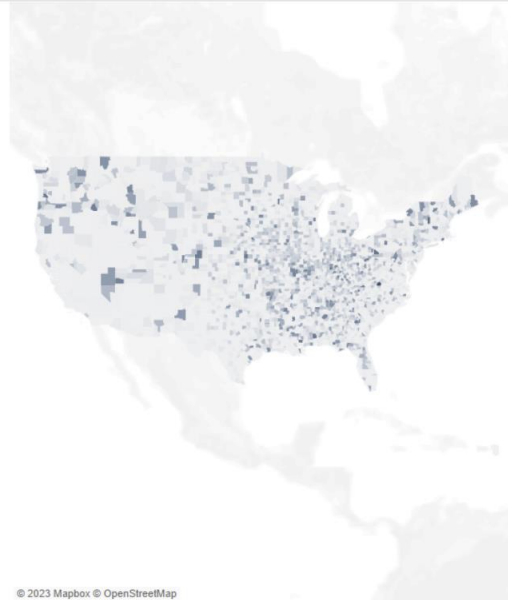
SpectrumHub
NSR Global Spectrum Database
Choose a geography to explore.

● Hello Jose Anguis
Today's Date: Tuesday, 13 February 2024

Worldwide



USA



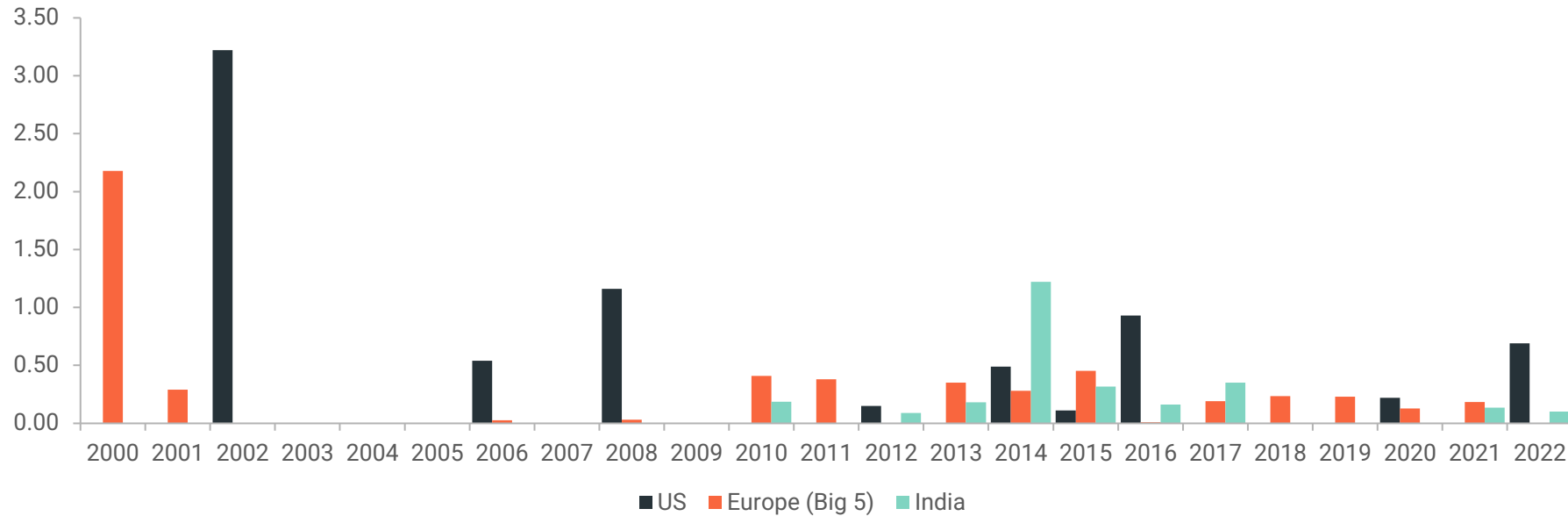
India



Spectrum auctions have come thick and fast over the past 15 years

Global spectrum auction prices paid since 2000

Price paid per MHz.pop in USD

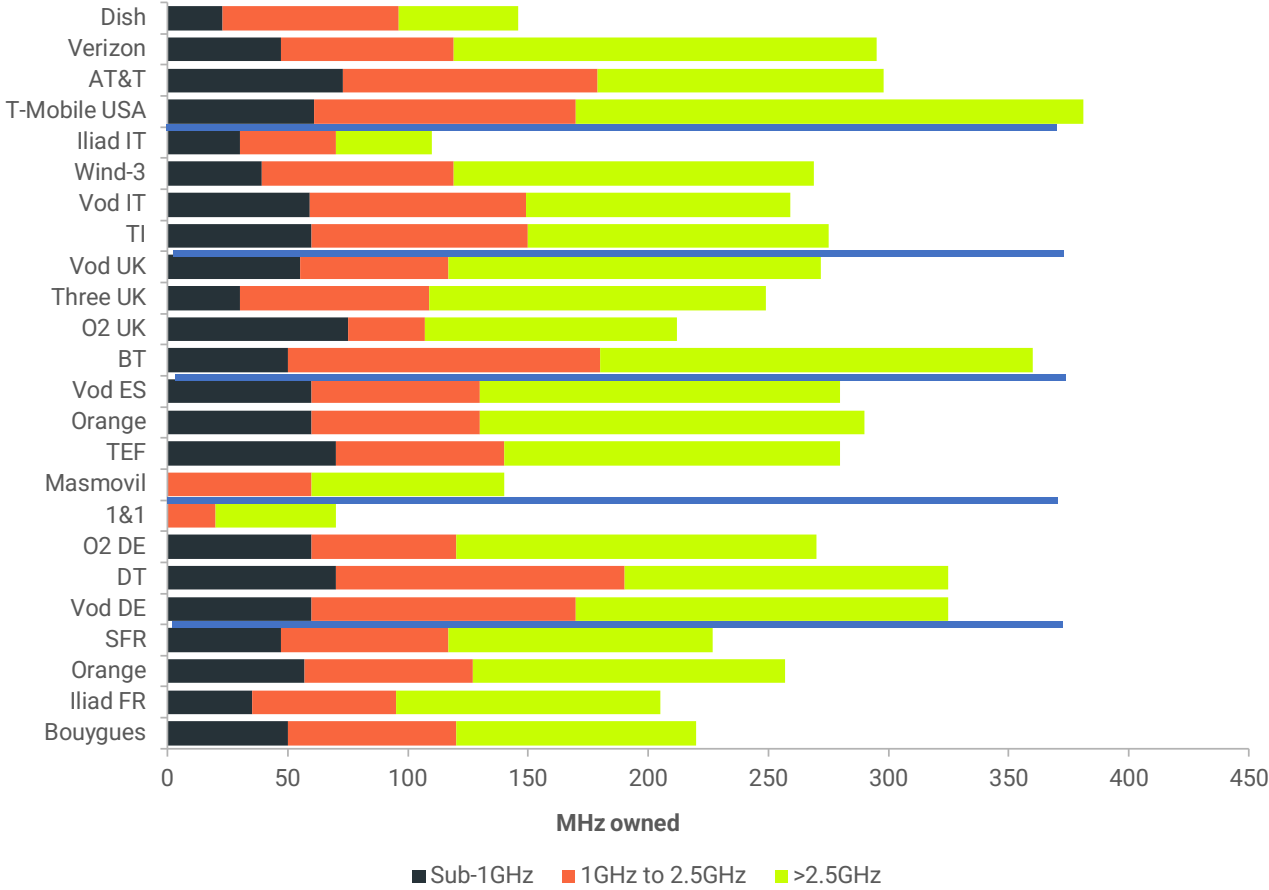


Europe vs. US Spread of Spectrum Holdings: US Far Higher than Europe

Standard deviation in holdings (MHz)	Sub-1GHz	1GHz-2.5GHz	>2.5GHz	Total
France	9	5	13	27
Germany	6	32	10	48
Spain	6	0	10	16
UK	18	41	31	91
Italy	12	6	18	35
US (now)	13	21	46	80
US (pre-C Band auction)	13	21	91	124

Distribution of spectrum amongst major carriers

Spectrum spread is different across key markets

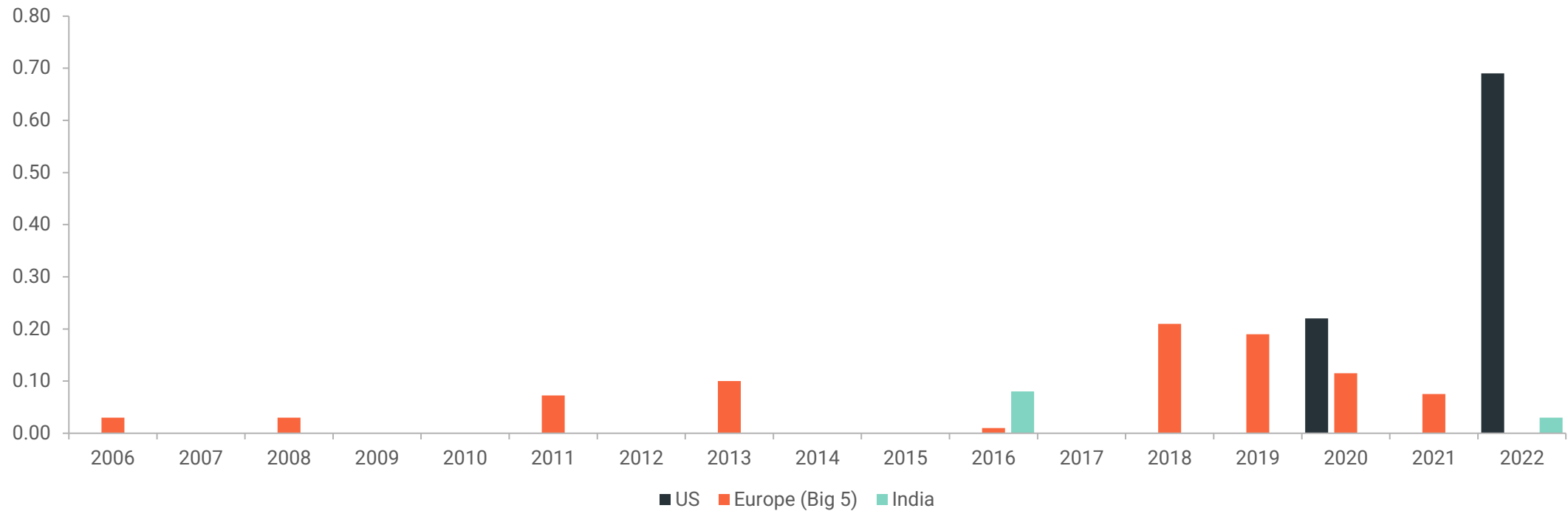


Source: New Street Research analysis

Spectrum auction prices for 2.6GHz - 4.0GHz spectrum

Spectrum Auction Prices for Mid Band - Upper Spectrum

Price paid per MHz.pop (\$)



In Europe, spectrum renewals are the bigger issue – could be €53bn over the next round

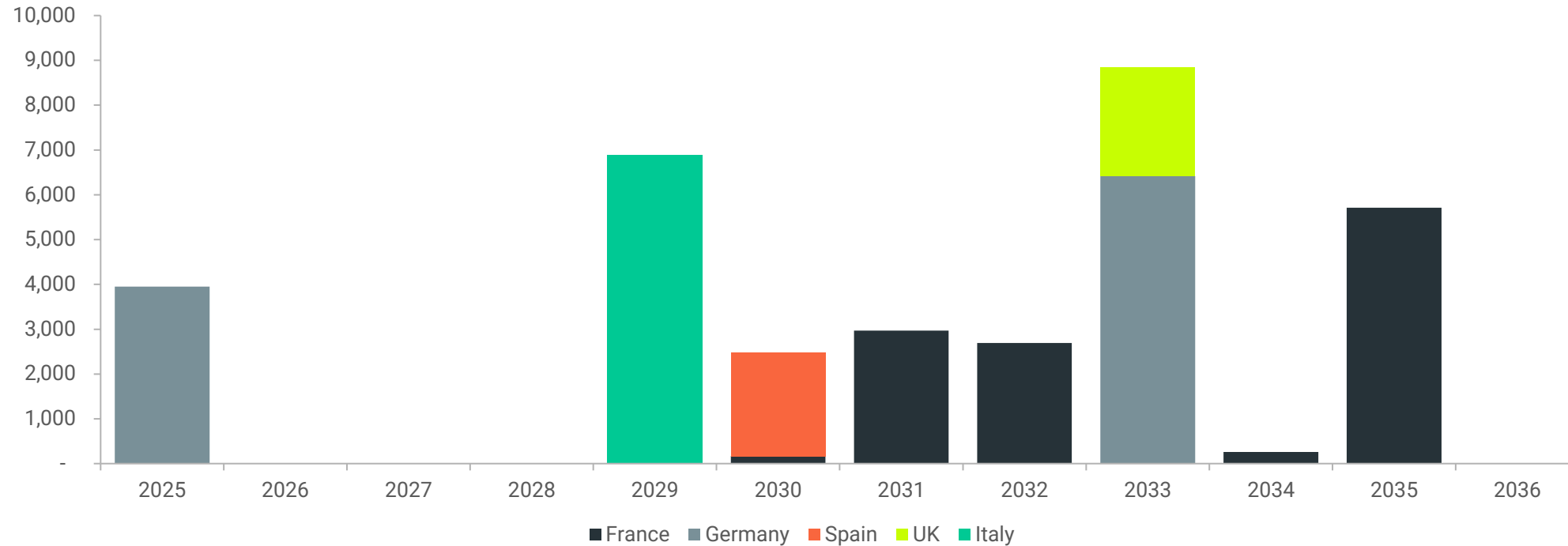
Cost to Renew: Spectrum renewals will continue to be a huge deal for operators in Europe

€ bn	Cost to renew existing		Cost as multiple of		
	spectrum portfolio	Mobile EBITDA	Sector EBITDA	Mobile EBITDA	Sector EBITDA
France	11.8	6.9	14.8	1.7x	0.8x
Germany	17.0	7.6	19.0	2.2x	0.9x
Spain	13.5	4.0	7.7	3.3x	1.7x
UK	5.0	4.3	7.7	1.2x	0.6x
Italy	6.1	6.3	16.7	1.0x	0.4x
Total	53.4	29.0	65.9	1.8x	0.8x

Even if they might not be imminent, don't forget about them

Likely Renewal Spectrum Cycle for the Major 5 European Markets

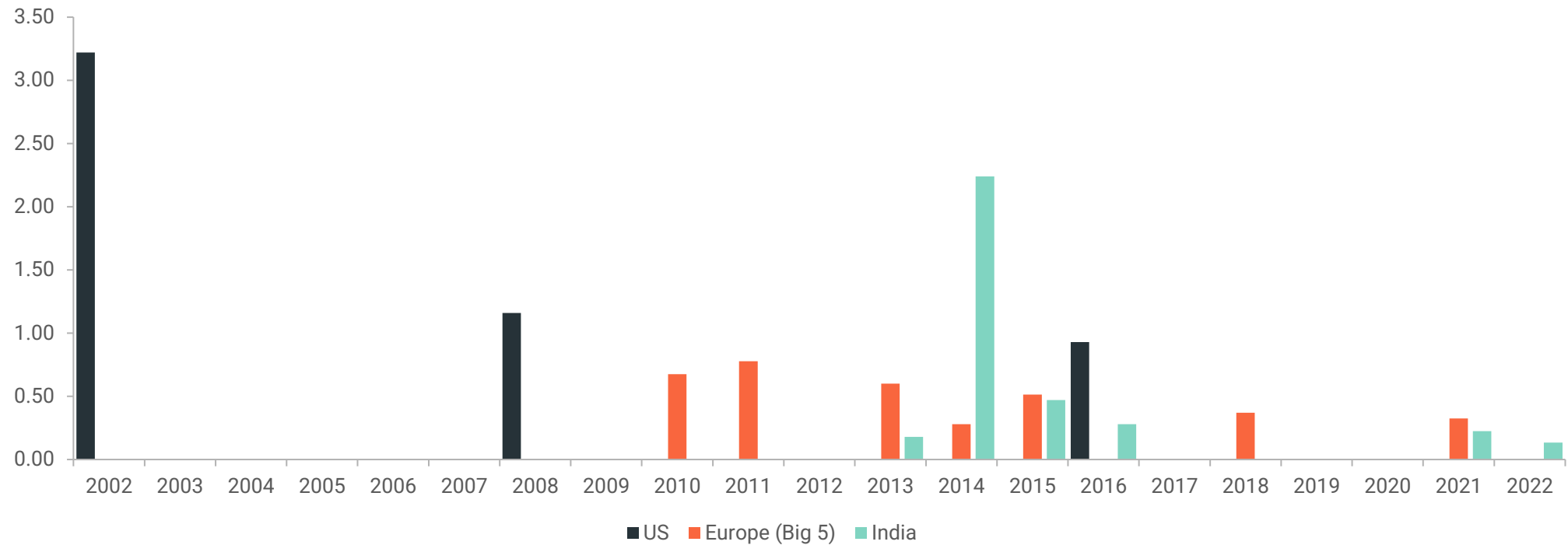
€M expected auction spend



Spectrum auction prices for sub-1GHz spectrum

Spectrum Auction Prices for Low Band Spectrum

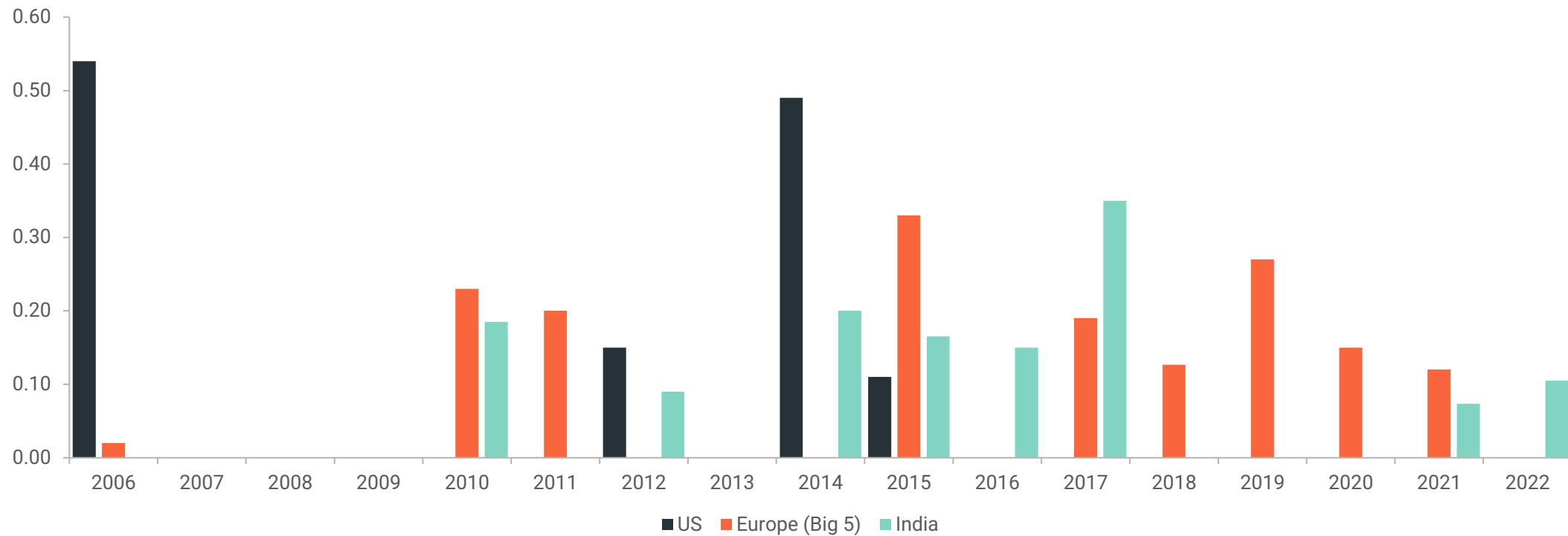
Price paid per MHz.pop (\$)



Spectrum auction prices for 1GHz – 2.5GHz spectrum

Spectrum Auction Prices for Mid Band - Lower Spectrum

Price paid per MHz.pop (\$)



Are there other spectrum bands to come? Upper-6GHz?

Potential Auction Cost if Upper-6GHz in Big-5 EU markets is Fully Auctioned

Metric	Value
Pops in Big 5 EU markets (m)	324
EU price for 3.5GHz (€ per MHz.pop)	0.16
Bandwidth of 3.5GHz band (MHz)	400
Bandwidth of 6.4-7.1GHz band (MHz)	700
Discount for upper-6GHz vs. 3.5GHz	-75%
Potential price per MHz.pop (€)	0.04
Auction cost (€bn)	9.3

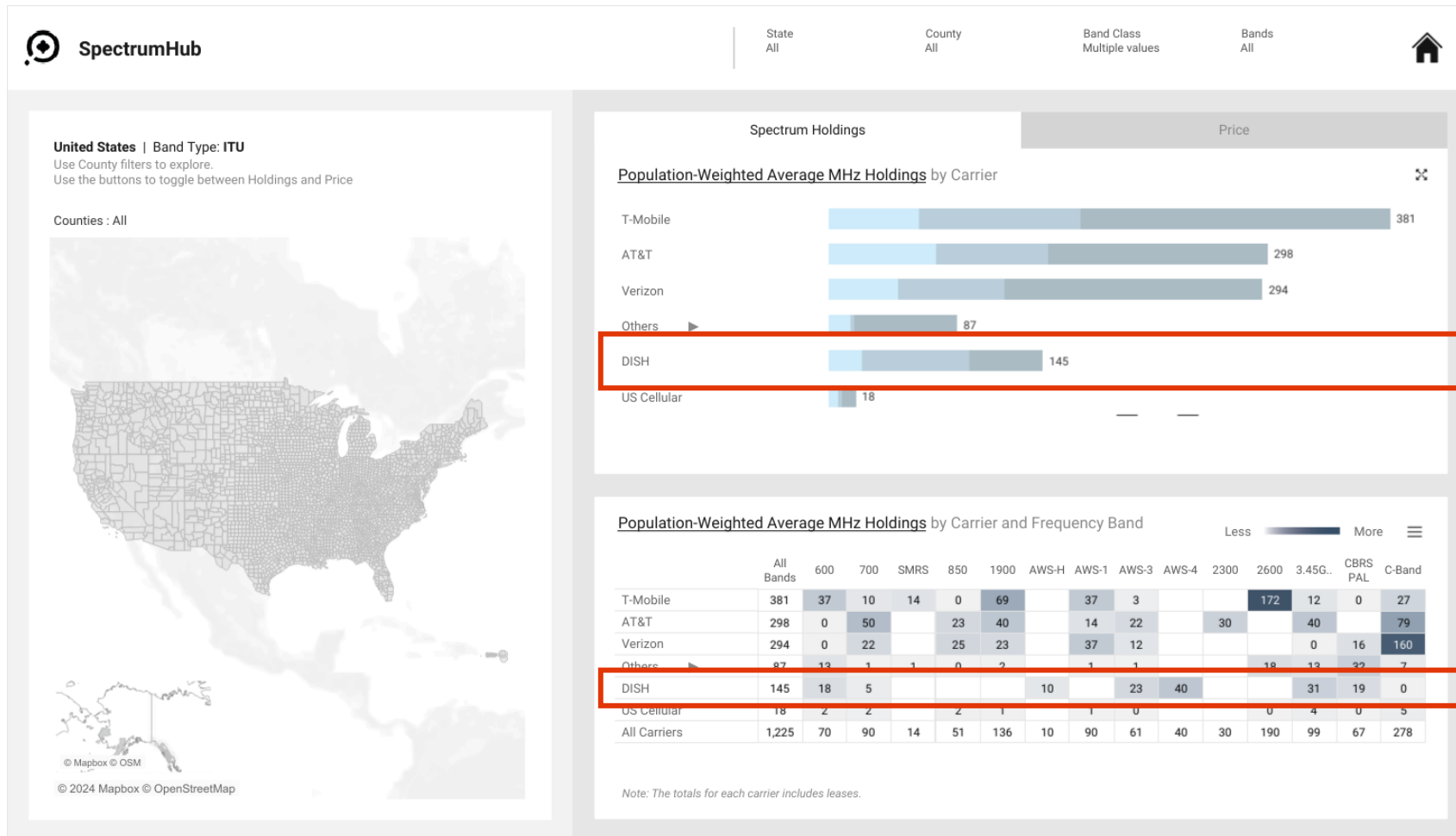


SpectrumHub: Live demonstration




SpectrumHub: DISH showcase


What spectrum does Dish own?



Who else has holdings in the AWS band?




State
All
County
All
Band Class
Mid Band - Lower
Bands
Multiple values



United States | Band Type: ITU
Use County filters to explore.
Use the buttons to toggle between Holdings and Price

Counties : All



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Spectrum Holdings
Price

Population-Weighted Average MHz Holdings by Carrier ✕

Verizon	49
AT&T	36
T-Mobile	40
DISH	23
Others ▶	1
US Cellular	1

Population-Weighted Average MHz Holdings by Carrier and Frequency Band Less More ☰

	All Bands	AWS-1	AWS-3
Verizon	49	37	12
AT&T	36	14	22
T-Mobile	40	37	3
DISH	23		23
Others ▶	1	1	1
US Cellular	1	1	0
All Carriers	152	90	61

Note: The totals for each carrier includes leases.

T-Mobile has less 600MHz in NYC than it wants, Dish has more than it needs

State New York	County New York	Band Class Low Band	Bands 600
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United States | Band Type: ITU
Use County filters to explore.
Use the buttons to toggle between Holdings and Price

Counties: New York

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Spectrum Holdings Price

Population-Weighted Average MHz Holdings by Carrier ✕

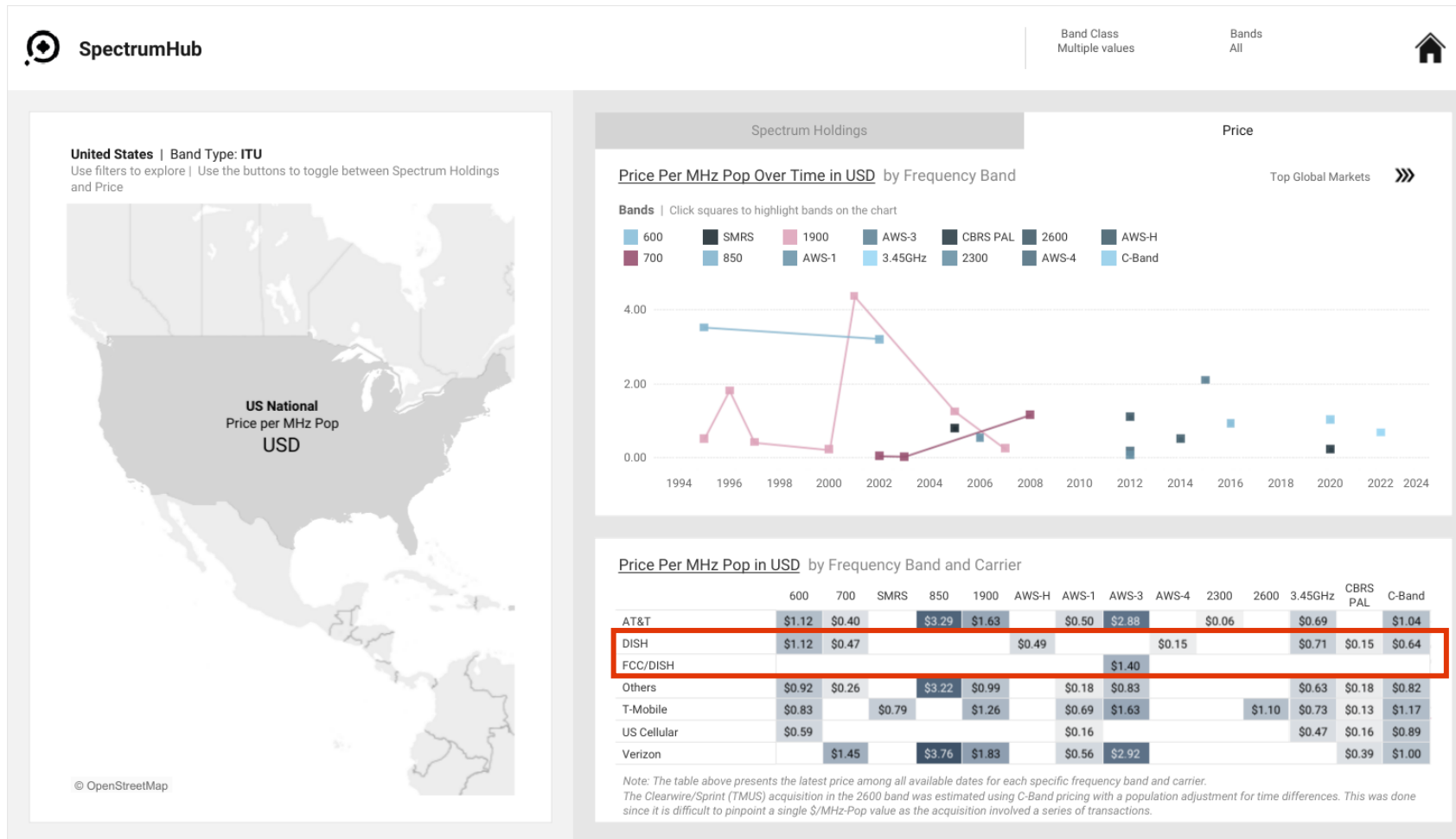
DISH	<div style="background-color: #add8e6; height: 15px; width: 100%;"></div>	40
T-Mobile	<div style="background-color: #add8e6; height: 15px; width: 90%;"></div>	30

Population-Weighted Average MHz Holdings by Carrier and Frequency Band Less More ☰

	All Bands		600
DISH	40		40
T-Mobile	30		30
All Carriers	70		70

Note: The totals for each carrier includes leases.

What did DISH pay for their spectrum?



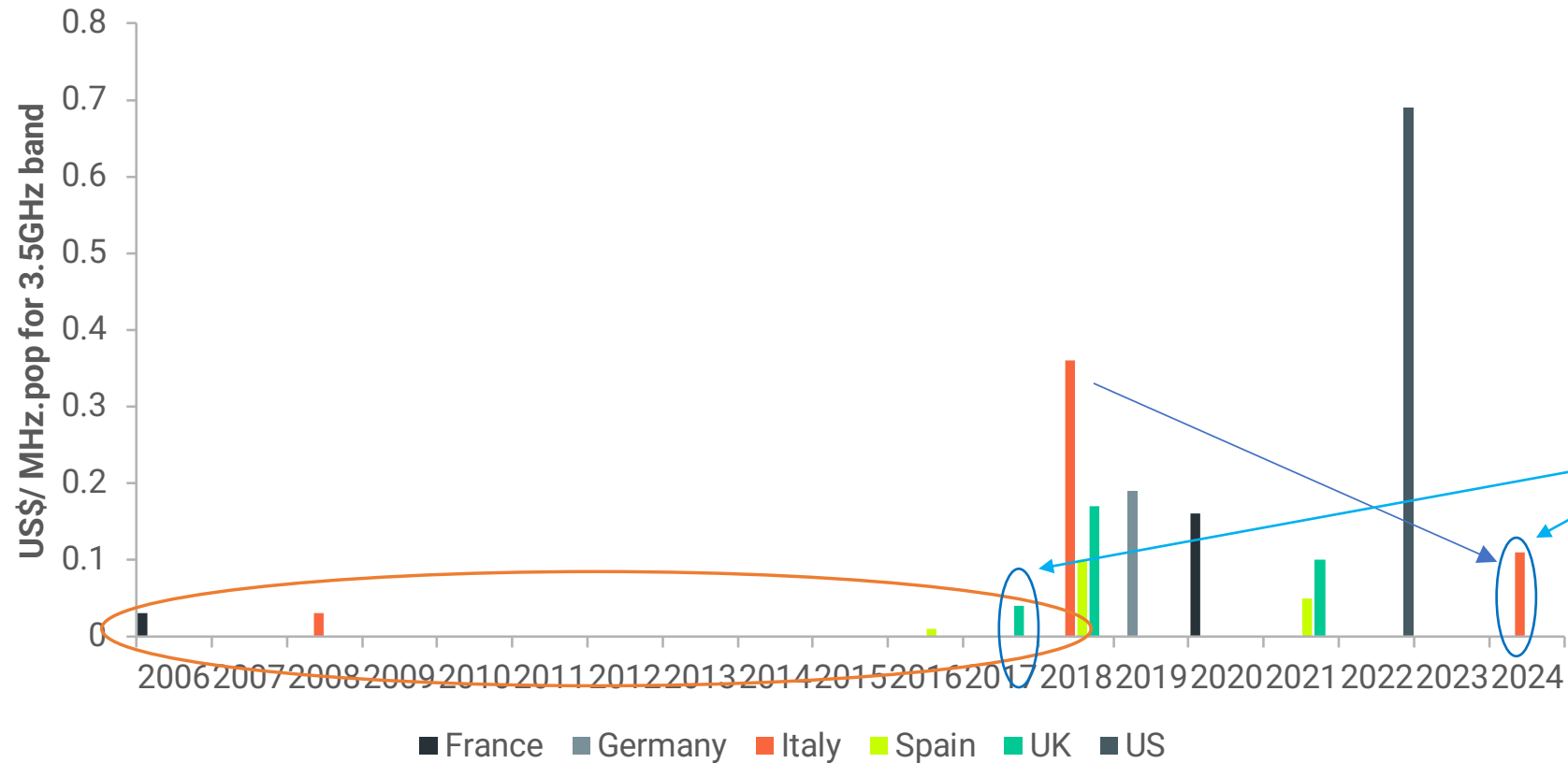


Recent and upcoming EU spectrum transactions

Upcoming German spectrum auction is still an unknown

Price paid per MHz.pop (€)	700	800	900	1500	1800	2100	2600	3500
Vod	0.2	0.74	0.25	0.1	0.29	0.25	0.02	0.15
DT	0.21	0.71	0.22	0.1	0.31	0.26	0.02	0.18
O2D	0.2	0.74	0.24	0	0.29	0.23	0.02	0.18
1&1	0	0	0	0	0	0.21	0	0.18
Spectrum owned MHz								
Vod	20	20	20	20	50	40	65	90
DT	20	20	30	20	60	40	45	90
O2D	20	20	20	0	40	20	80	70
1&1	0	0	0	0	0	20	0	50
Price for next renewal (€m)								
Vod	332	1,228	415	166	1,204	830	108	1,121
DT	349	1,179	548	166	1,544	863	75	1,345
O2D	332	1,228	398	0	963	382	133	1,046
1&1	0	0	0	0	0	349	0	747
Date of renewal								
Vod	2033	2025	2033	2033	2033	2040	2025	2040
DT	2033	2025	2033	2033	2033	2040	2025	2040
O2D	2033	2025	2033	0	2033	2040	2025	2040
1&1	2033	2025	2033	0	0	2040	2025	2040
Total (€m)	1,013	3,635	1,361	332	3,710	2,424	315	4,258

The story of 3.5GHz licences in developed markets



Hutchison buying 3.5GHz well – from PCCW in the UK and last week from OpNet In Italy

For full access to **SpectrumHub (Beta Version)**,
please contact Jose Anguis

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