



EVALUATING THE IMPACT OF UEFA CHAMPIONS LEAGUE MATCHES ON INTERNET TRAFFIC

***WEDNESDAY INTERNET TRAFFIC DURING UEFA CL MATCHES
(as seen at MINAP and NAMEX)***

Gianluca Sironi
Special Projects
NAQUADRIA | PCIX



Internet Service Provider

Tier III Datacenter
Colocation, Cloud
Managed Services
5 ISO certifications
ACN qualification

www.naquadria.it

Internet Exchange Point

managed by Naquadria

Free membership
Free 1 / 10 / 100 Gbps port
Layer 2 PCIX-VSIX
K-root node
MS Cache, ...

www.pcix.it

Live sport streaming events

→ football live streaming events

→ UEFA Champions League live streaming events

→ UEFA CL Wednesday night live streaming events

Wednesday CL events: streaming only on Amazon Prime Video

UEFA Champions League Wed night matches observed:

- CL 2023–2024 Knockout Phase (Feb–May 2024) (8)
- CL 2024–2025 League Phase (Sep 2024 – Jan 2025) (8)
- CL 2024–2025 Knockout Phase (Feb–May 2025)



- **Italian IXPs : MIX, NAMEX, MINAP, TOP-IX, VSIX, ...**
(ordered by traffic / peer #)
- **Traffic data publicly available**
- **Data collected @ MINAP and NAMEX (IXPManager-based)**
(see <https://www.minap.it> and <https://www.namex.it>)
- **Focus on «prime time» (~ 9-11 pm) of Wed nights**
- **Analysis of traffic deviations during Wed UEFA CL matches**

Note: Amazon member @ Namex , not @ MINAP



Where we retrieve traffic data



see <https://www.ixpmanager.org/community/user-list>

IT (MINAP, NAMEX)
IE (INEX)
GB (LONAP, NCL-IX)
SE (STHIX)
DE (BCIX, DO-IX, ...)
NL (DATAIX, FRYS-IX, ...)
RO (InterLAN)
GR (GR-IX)
HR (CIX)
[...]

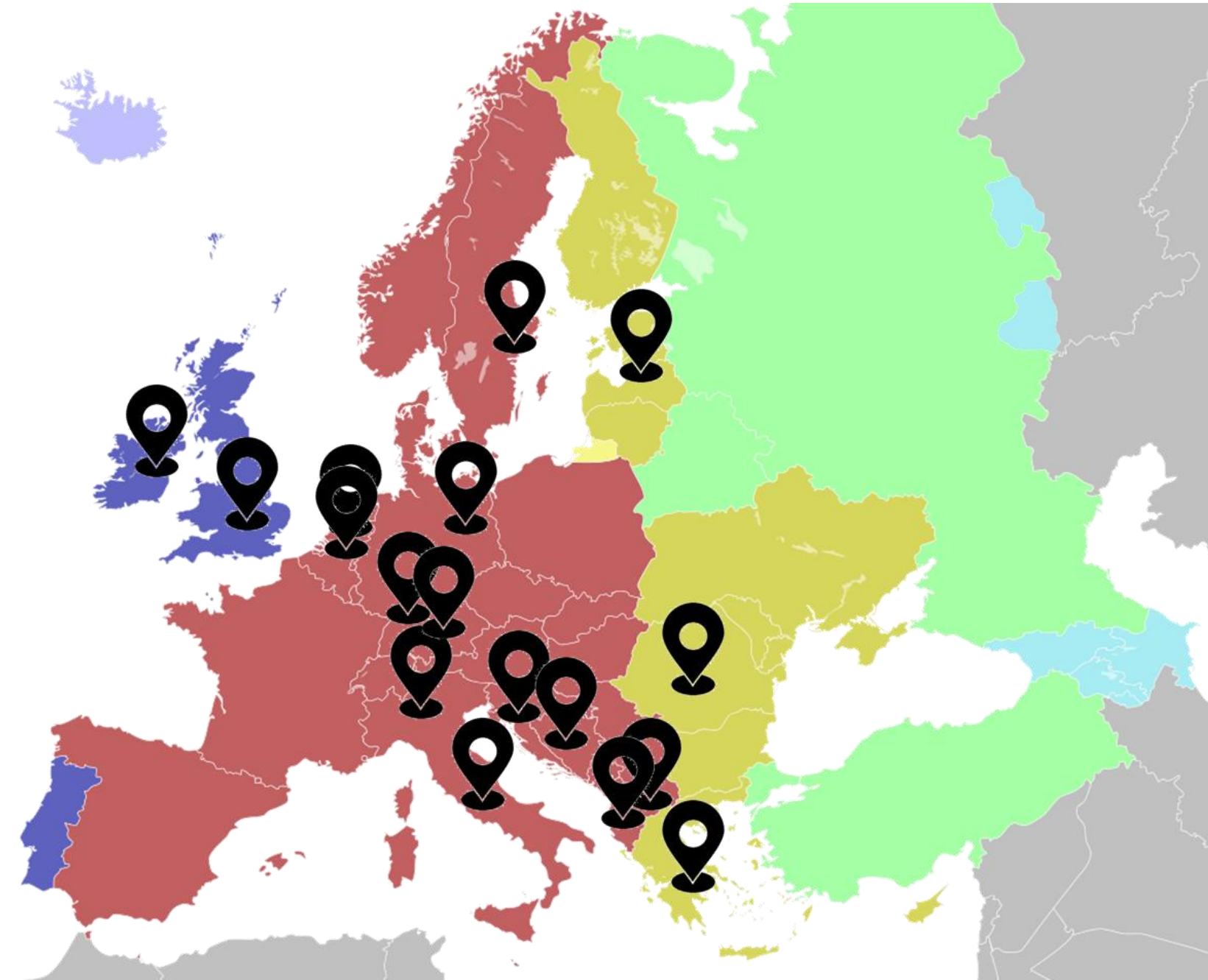


Image source: https://en.wikipedia.org/wiki/Central_European_Time#/media/File:Time_zones_of_the_Greater_Europe.svg



Which traffic data we collect



[https://ixp.example.com/grapher/{graph}\[?id=x\]\[&period=x\]\[&type=x\].....](https://ixp.example.com/grapher/{graph}[?id=x][&period=x][&type=x].....)

API access

current traffic
[bps]



```
{
  "class": "ixp",
  "urls": {
    "png": "https://www.inex.ie/ixp/grapher/ixp?period=day&type=png&category=bits",
    "log": "https://www.inex.ie/ixp/grapher/ixp?period=day&type=log&category=bits",
    "json": "https://www.inex.ie/ixp/grapher/ixp?period=day&type=json&category=bits"
  },
  "base_url": "https://www.inex.ie/ixp/grapher/ixp",
  "statistics": {
    "totalin": 15013439801606864,
    "totalout": 15013959560329200,
    "curin": 158715231920,
    "curout": 158713872624,
    "averagein": 125566129180.59367,
    "averageout": 125570476225.09074,
    "maxin": 222438012592,
    "maxout": 222348641336
  },
  "params": {
    "type": "json",
    "category": "bits",
    "period": "day",
    "protocol": "all",
    "id": 1
  }
}
```

source: <https://docs.ixpmanager.org/grapher/api/>



Which traffic data we collect / 2



ISO 8601 timestamp
Mon to Sun week

10m «sampling»
144 samples / day
1008 samples / week
~ 53k samples / year

```
▼ statistics:  
  totalin:      18553775624851200  
  totalout:     18574859820993600  
  curin:        187859791184  
  curout:       188403157184  
  averagein:    155191755652.0201  
  averageout:   155168340209.32663  
  maxin:        358128403480  
  maxout:       355973849680  
  maxinat:      "2023-09-27T19:50:00.000000Z"  
  maxoutat:     "2023-09-27T19:50:00.000000Z"  
▼ params:  
  type:         "json"  
  category:     "bits"  
  period:       "day"  
  protocol:     "all"  
  id:           1
```

e.g CSV dataset record: **YYYYMMDDThhmmssZ,187859791184,188403157184[,...]**



DATA METRICS & STATISTICS

DIMENSIONAL PARAMETERS (DAILY/WEEKLY):

min | max | 1Q | median | 3Q | 5p | 10p | 90p | 95p
range=(max-min) | AVG | STD DEV | MAD | IQR=(3Q-1Q) | ...

ADIMENSIONAL PARAMETERS (DAILY/WEEKLY):

max/min | max/AVG | CoV | ...

NORMALIZATION:

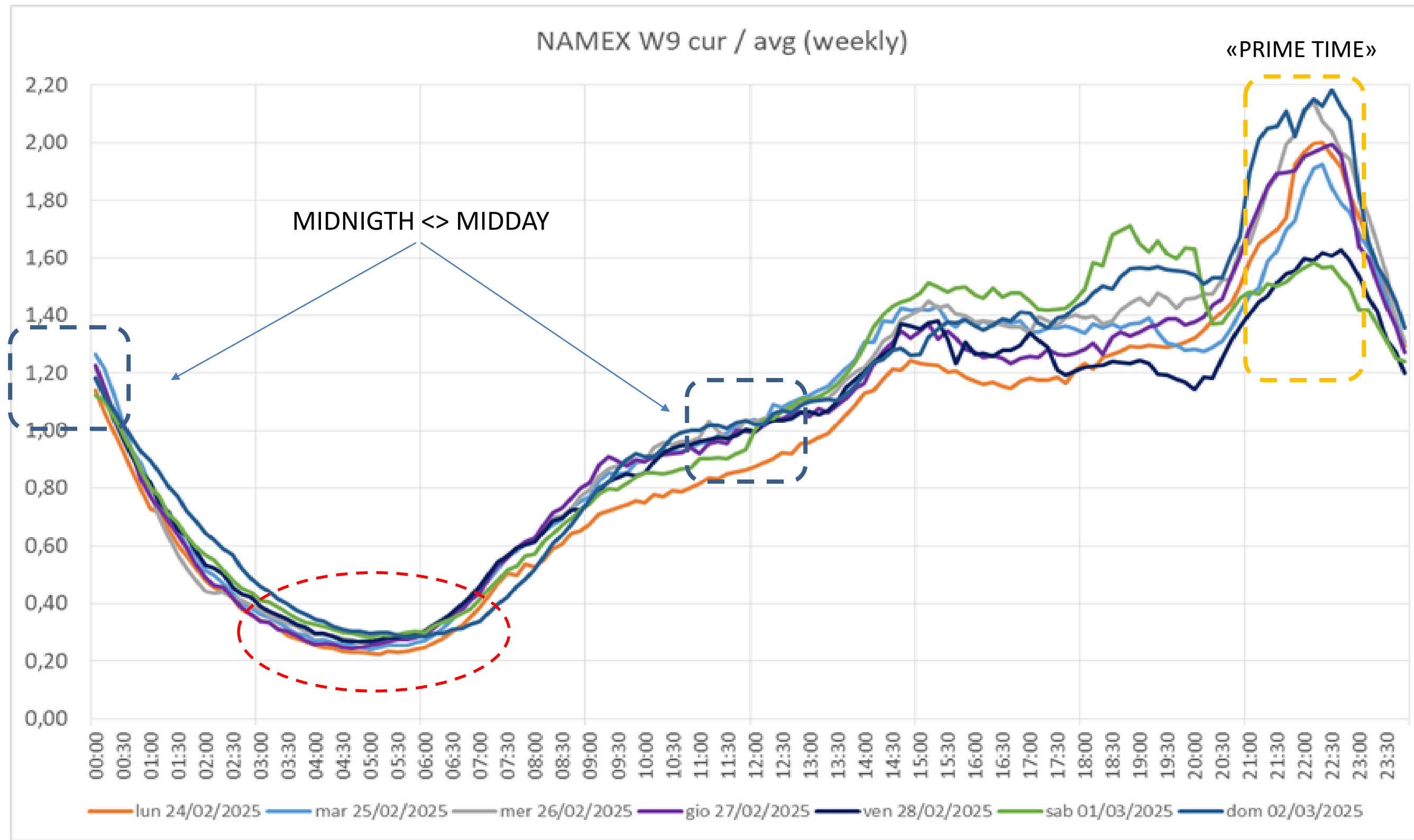
min-max normalization | mean normalization |
standardization (z-score) | modified z-score | ...

CORRELATION:

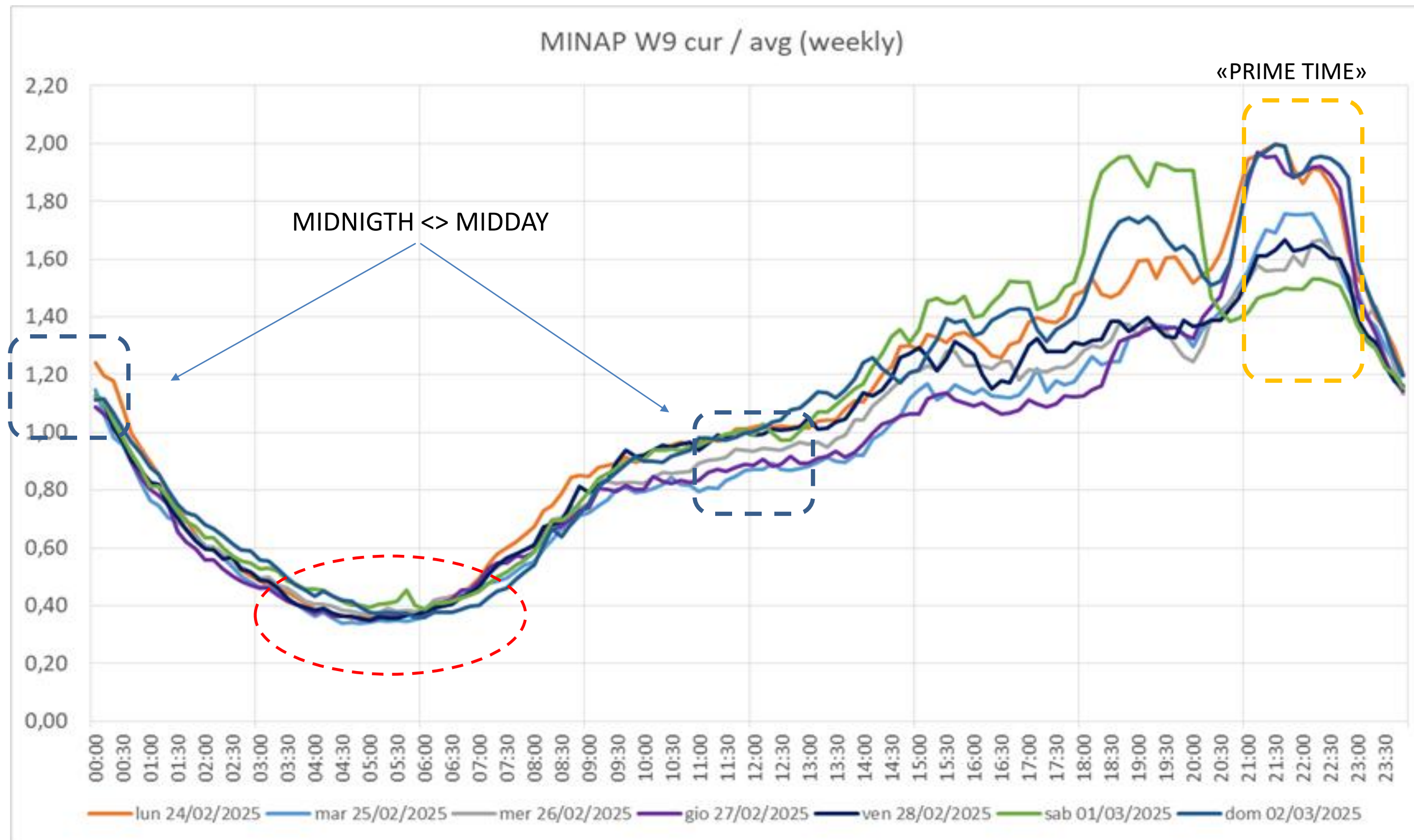
intra IXP / inter IXP correlation matrix | ...



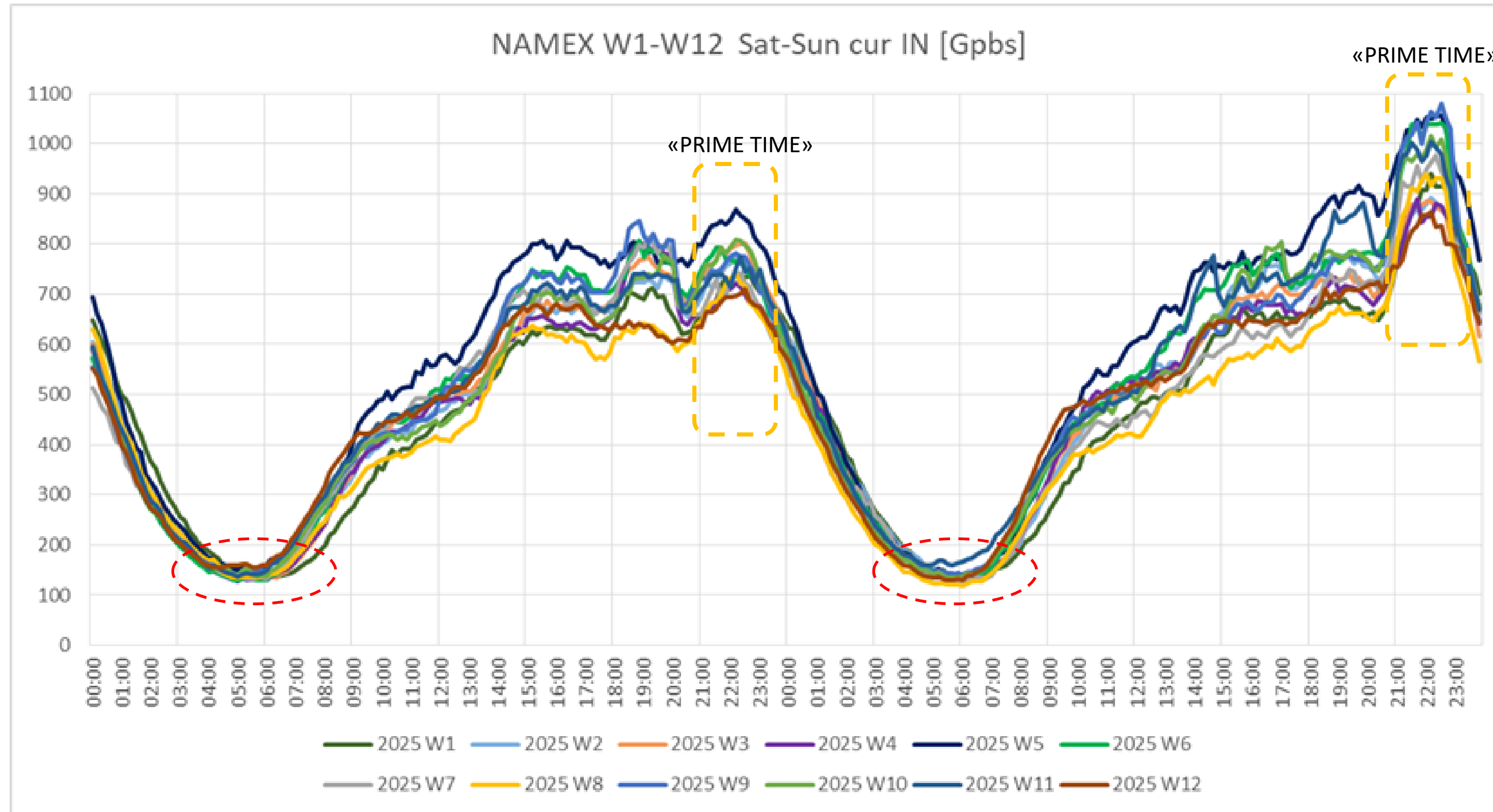
EX. 1: W9 NAMEX norm to W AVG



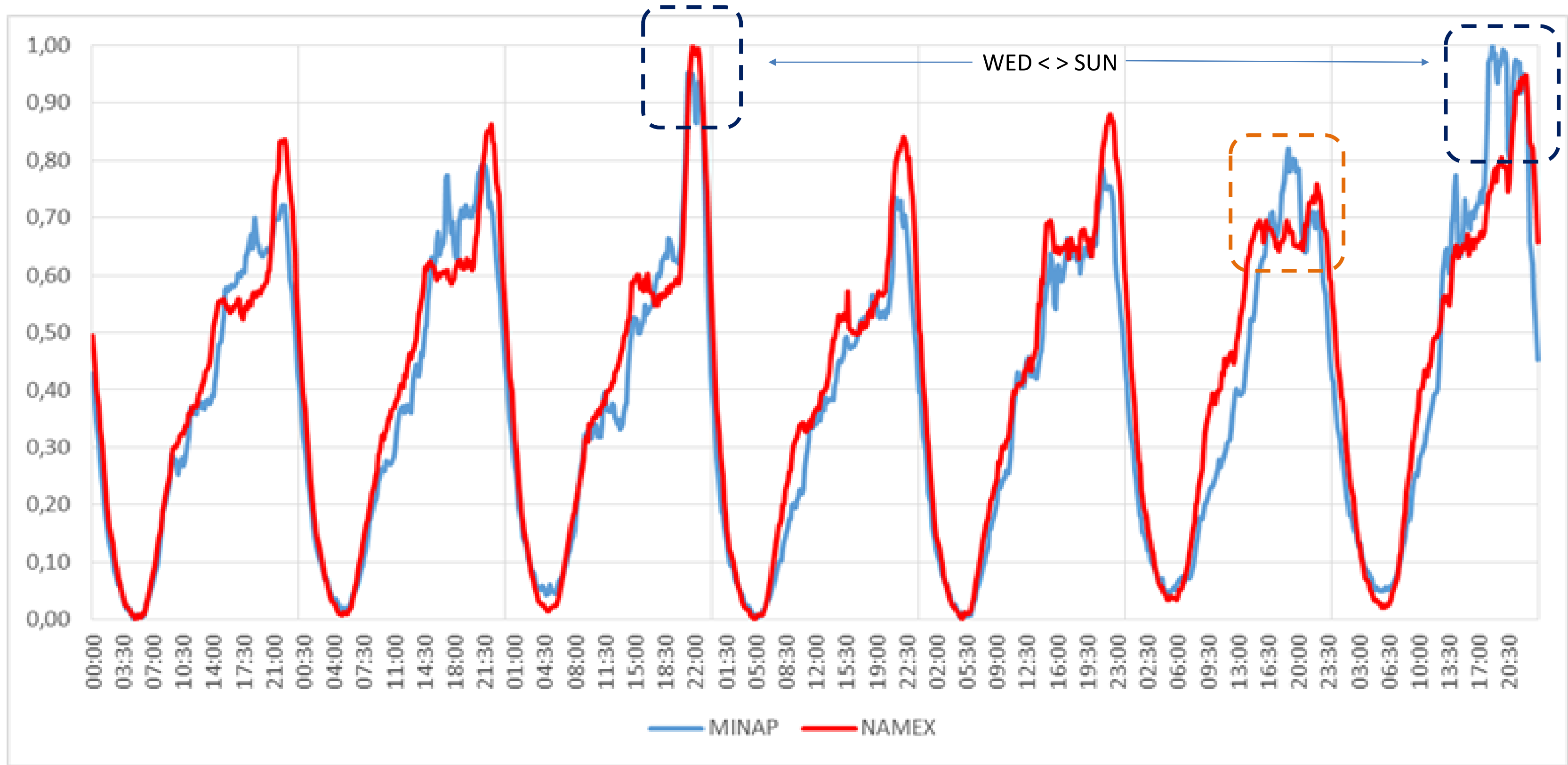
EX. 1: W9 MINAP norm to W AVG



EX. 2: NAMEX 2025 W1-W10 Sat-Sun



EX. 3: W5 2025 MIN-MAX NORM W



IXP Peers (MINAP,NAMEX)

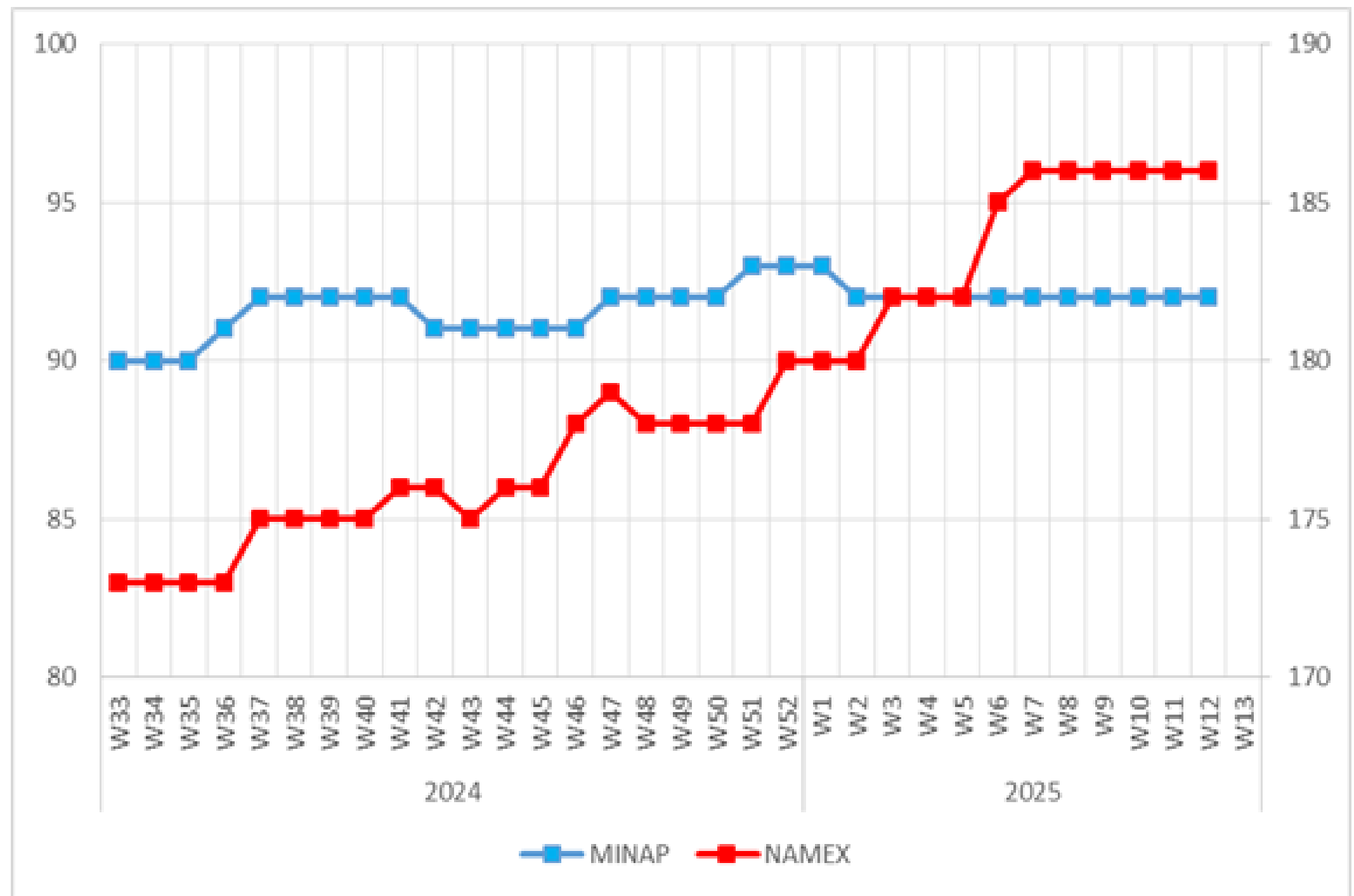
From PeeringDB
(Wed “sample”)

e.g. W9 (on Feb 26th)

```
20250226T190001Z  
IXPID,IXPName,Peers  
240,MINAP Milan,92  
121,NameX Rome,186  
48,INEX LAN1,103  
387,INEX LAN2,67  
53,LONAP,287  
[...]
```

MINAP

NAMEX



1st SET: UEFA CL 2023-2024 KP

UEFA CHAMPIONS LEAGUE 2023-2024 – KNOCKOUT PHASE (8)

W7 – Wed 14/02/2024 – Round of 16: leg 1 of 2: Lazio – Bayern

W8 – Wed 21/02/2024 – Round of 16: leg 1 of 2: Napoli – Barcelona

W10 – Wed 06/03/2024 – Round of 16: leg 2 of 2: Real Madrid – RB Leipzig

W11 – Wed 13/03/2024 – Round of 16: leg 2 of 2: Atletico Madrid – Inter

W15 – Wed 10/04/2024 – Quarter-final: leg 1 of 2 : PSG – Barcelona

W16 – Wed 17/04/2024 – Quarter-final: leg 2 of 2 : Manchester City – Real Madrid

W18 – Wed 01/05/2024 – Semi-final: leg 1 of 2 : Borussia Dortmund – PSG

W19 – Wed 08/05/2024 – Semi-final: leg 2 of 2 : Real Madrid – Bayern

No Italian teams qualified



2nd SET: UEFA CL 2024-2025 LP

UEFA CHAMPIONS LEAGUE 2024-2025 – LEAGUE PHASE (8)

W38 – Wed 18/09/2024 – Matchday 1 : Manchester City – Inter

W40 – Wed 02/10/2024 – Matchday 2 : RB Leipzig – Juventus

W43 – Wed 23/10/2024 – Matchday 3 : Young Boys – Inter

W45 – Wed 06/11/2024 – Matchday 4 : Inter – Arsenal

W48 – Wed 27/11/2024 – Matchday 5 : Aston Villa – Juventus

W50 – Wed 11/12/2024 – Matchday 6 : Juventus – Manchester City

W4 – Wed 22/01/2025 – Matchday 7 : Milan – Girona

W5 – Wed 29/01/2025 – Matchday 8 : Inter – AS Monaco



3rd SET: UEFA CL 2024-2025 KP

UEFA CHAMPIONS LEAGUE 2024-2025 – KNOCKOUT PHASE (4)

W7 – Wed 22/01/2025 – Play-offs: Leg 1 of 2 : Feyenoord – Milan

W8 – Wed 29/01/2025 – Play-offs: Leg 2 of 2 : PSV Eindhoven – Juventus

W10 – Wed 05/03/2025 – Round of 16: Leg 1 of 2 : Feyenoord – Inter (18:45)

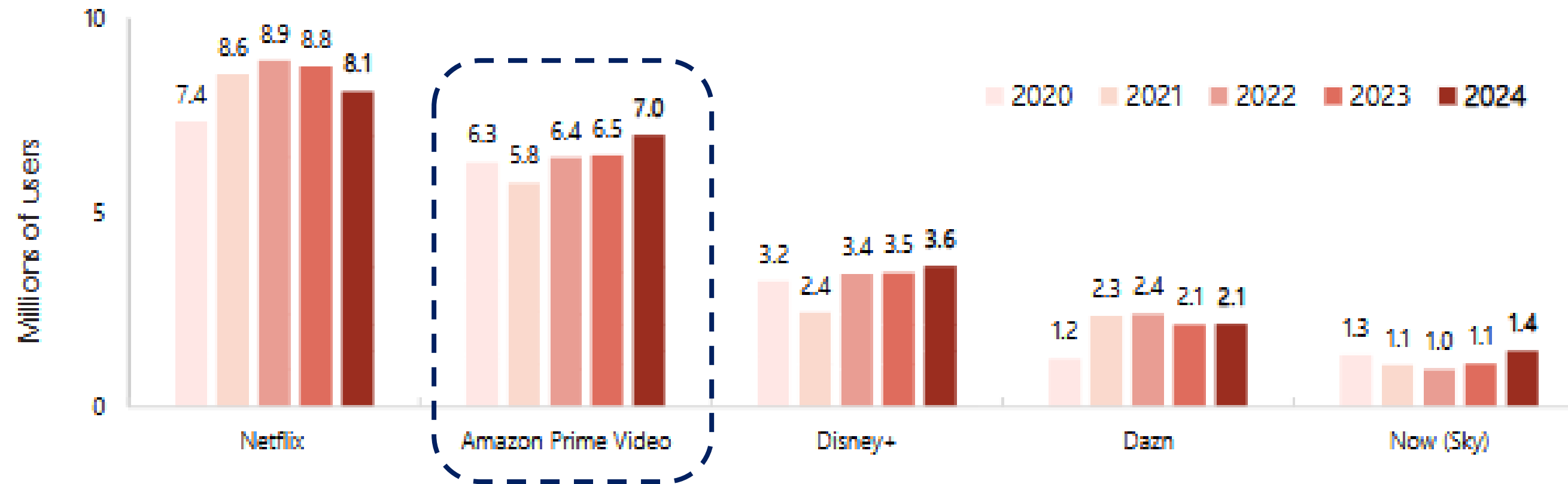
W11 – Wed 12/03/2025 – Round of 16: Leg 2 of 2 : Atletico Madrid – Real Madrid

W15 – Wed 09/04/2025 Quarter-final: Leg 1 of 2: Barcelona – Borussia Dortmund

W16 – Wed 16/04/2025 Quarter-final: Leg 1 of 2: Inter – Bayern



UNIQUE USERS OF THE MAIN PLATFORMS* (average since the beginning of the year Jan. – Sep..)



* Note: platforms with an average time spent by users more than 7 minute are represented

Source: AGCOM (AGENZIA PER LE GARANZIE NELLE COMUNICAZIONI <https://www.agcom.it>)



https://www.agcom.it/sites/default/files/media/allegato/2024/AGCOM_Osservatorio%20n.4-2024%20english%20version_0.pdf



UEFA CL 2023–2024 metrics

TIPICAL MATCH TIMEFRAME : 9PM – 11PM (O.T. excluded)

**Introducing a new metric “prime time average” (~ 21:00 to ~ 23:00)
e.g.: NAMEX W10 to W19 (CL 2023–2024 part of KP)**

Week	95p [Gbps]	`PTA' [Gbps]	
W10	571,312	569,796	(Round of 16 – leg 2 of 2)
W11	649,821	648,477	(Round of 16 – leg 2 of 2)
W12	506,418	510,878	
W13	562,974	567,429	
W14	516,808	520,200	
W15	629,943	620,078	(Quarter-final – leg 1 of 2)
W16	654,434	646,142	(Quarter-final – leg 2 of 2)
W17	514,737	518,755	
W18	690,143	688,400	(Semi-final – leg 1 of 2)
W19	690,300	679,186	(Semi-final – leg 2 of 2)



UEFA CL 2024-2025 metrics

TIPICAL MATCH TIMEFRAME : 9PM – 11PM (O.T. excluded)

**Introducing a new metric “prime time average” (~ 21:00 to ~ 23:00)
e.g.: NAMEX W35 to W43 (CL 2024-2025 1st part of LP)**

Week	95p [Gbps]	'PTA' [Gbps]
W35	480,262	476,820
W36	459,046	464,691
W37	512,678	520,378
W38	740,499	740,179
W39	585,568	592,162
W40	698,786	699,520
W41	564,001	568,717
W42	559,916	563,758
W43	732,894	724,681
W44	649,214	659,368

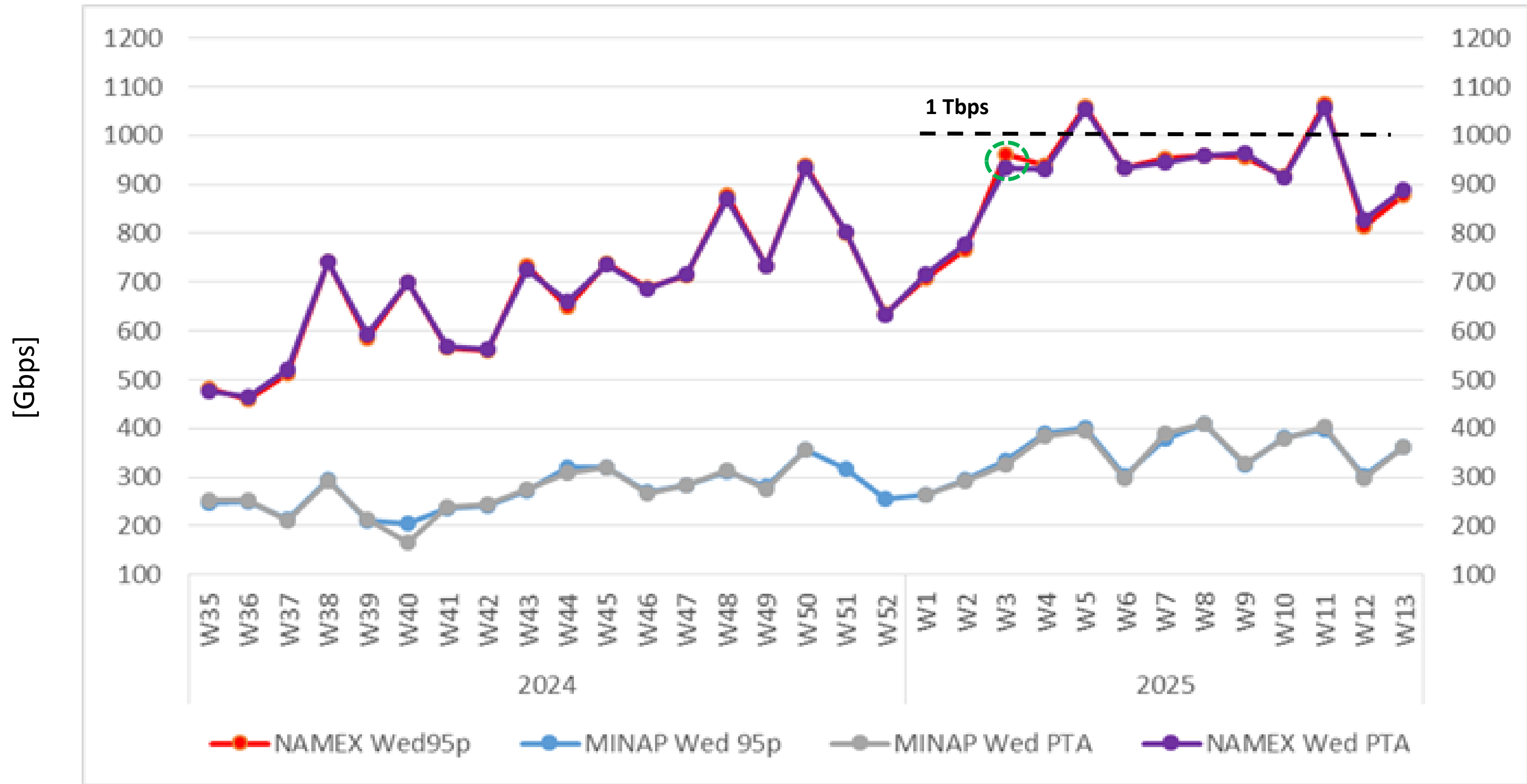
(League Phase – Matchday 1)

(League Phase – Matchday 2)

(League Phase – Matchday 3)

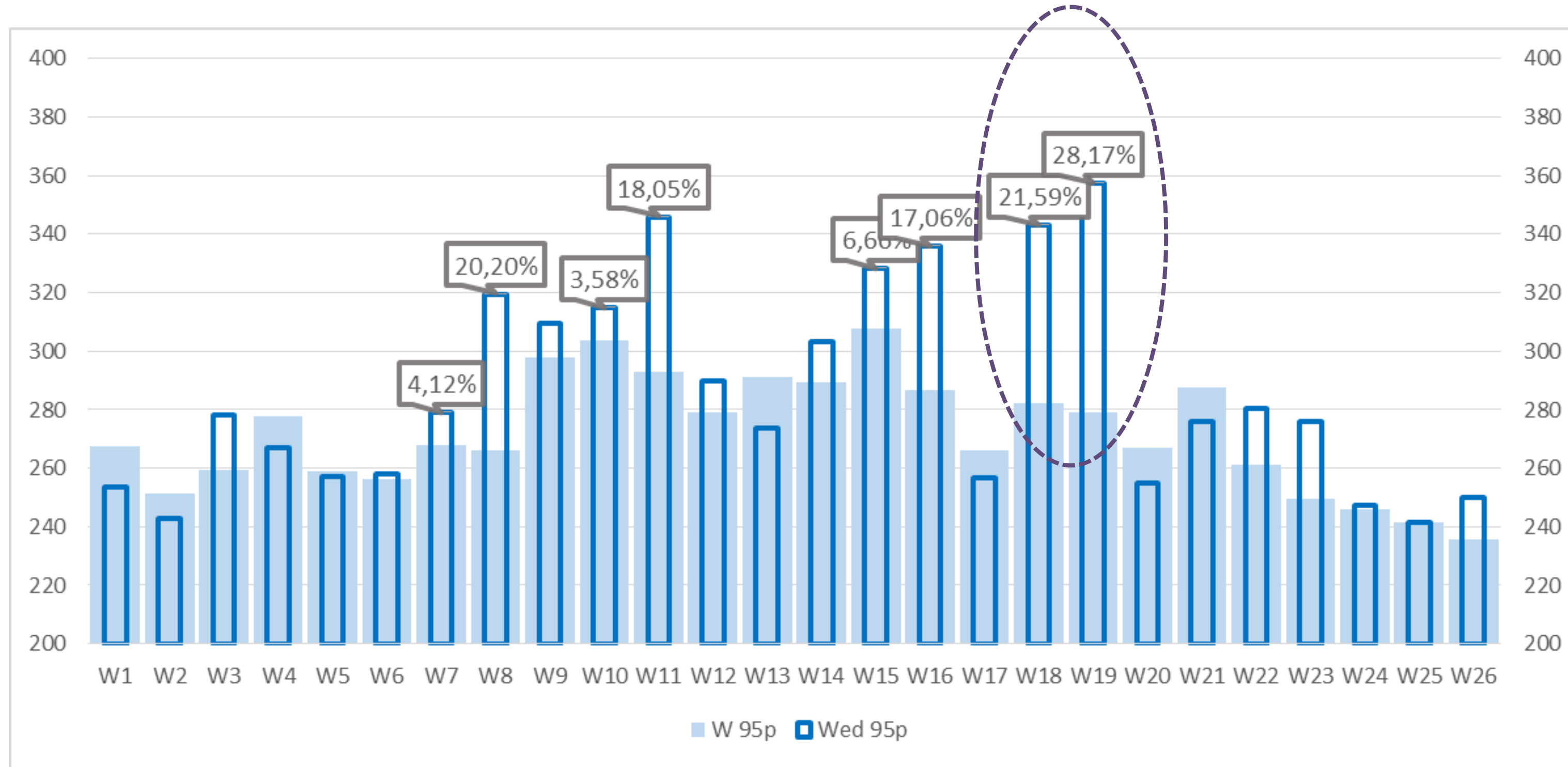


Wed 95p <> Wed “PTA”



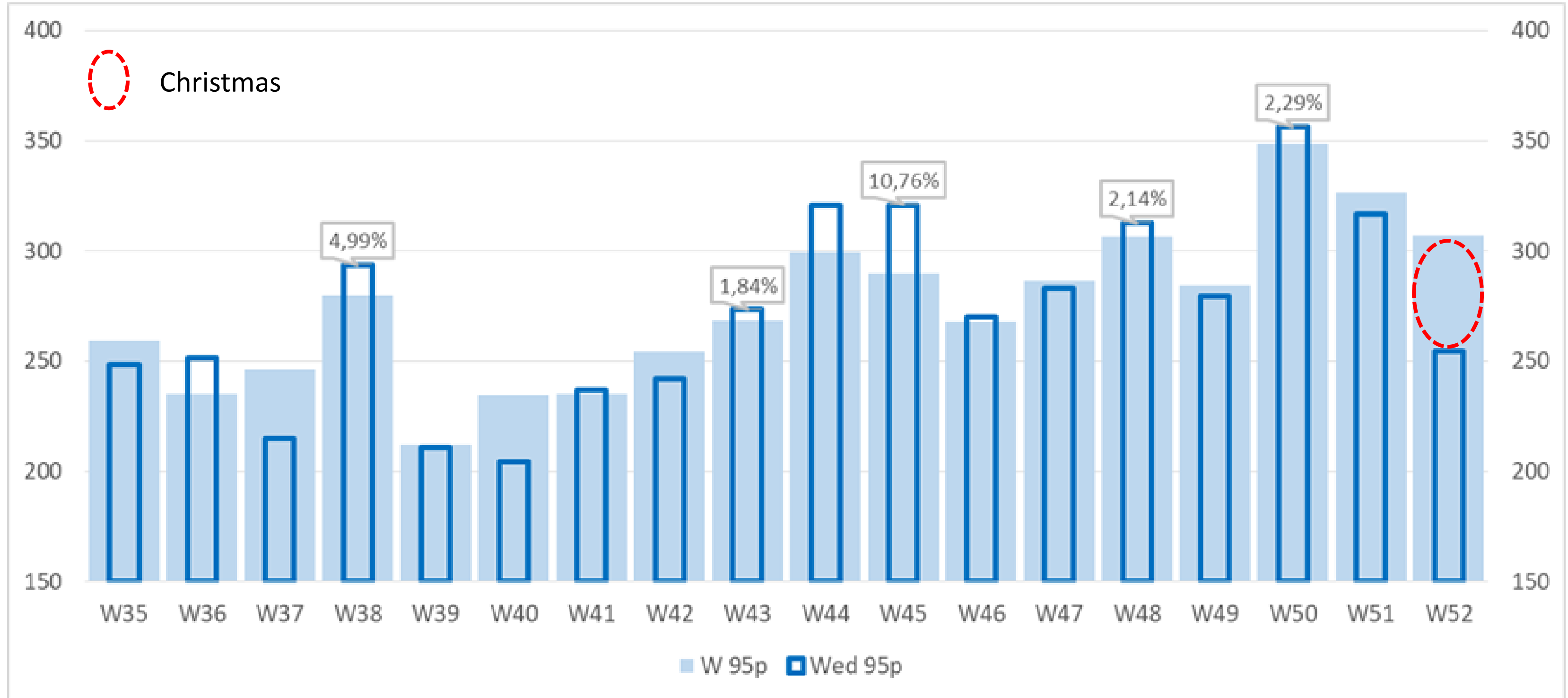
MINAP CL 2023-2024 KP (1H2024)

UEFA CL 2023-2024 Knockout Phase [Gbps]



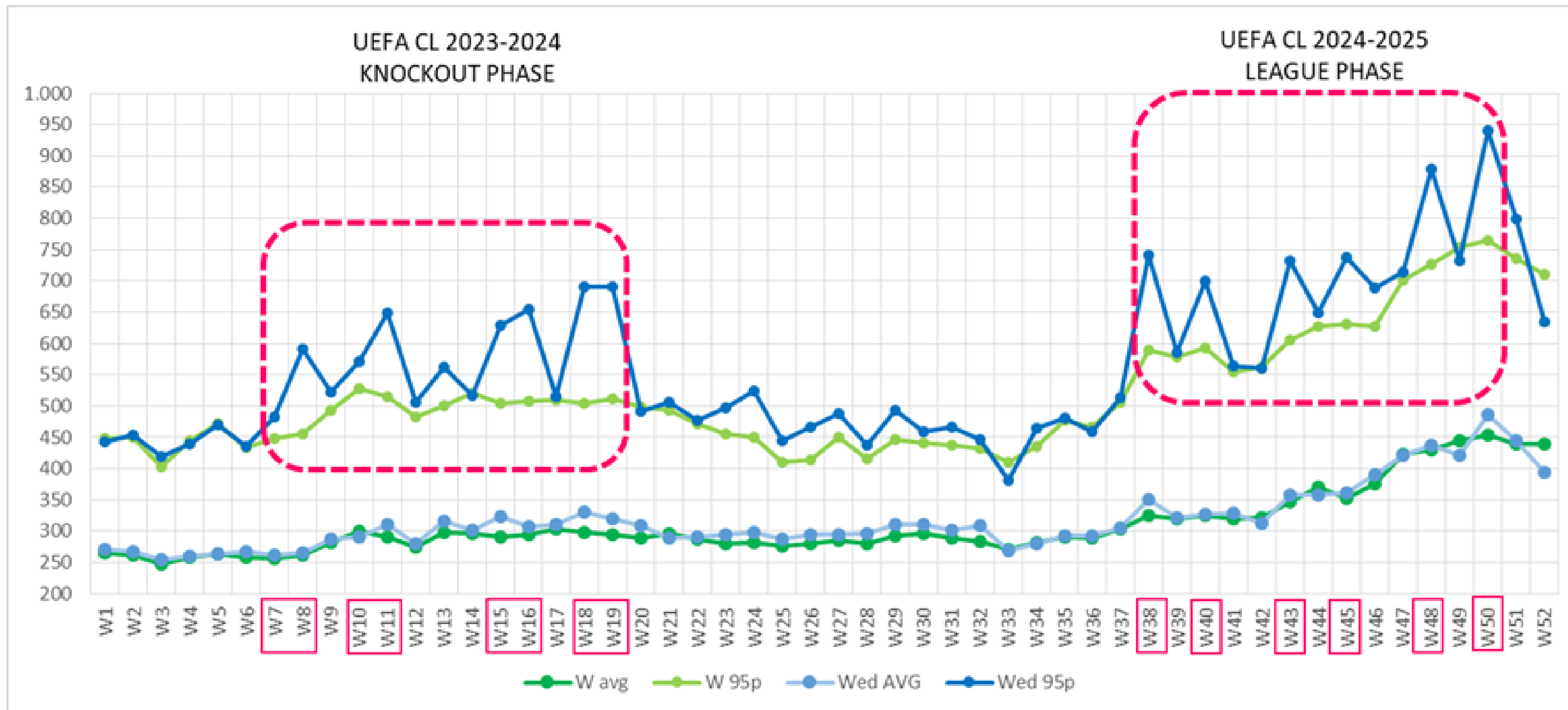
MINAP CL 2024-2025 LP (2H2024)

UEFA CL 2024-2025 League Phase [Gbps]



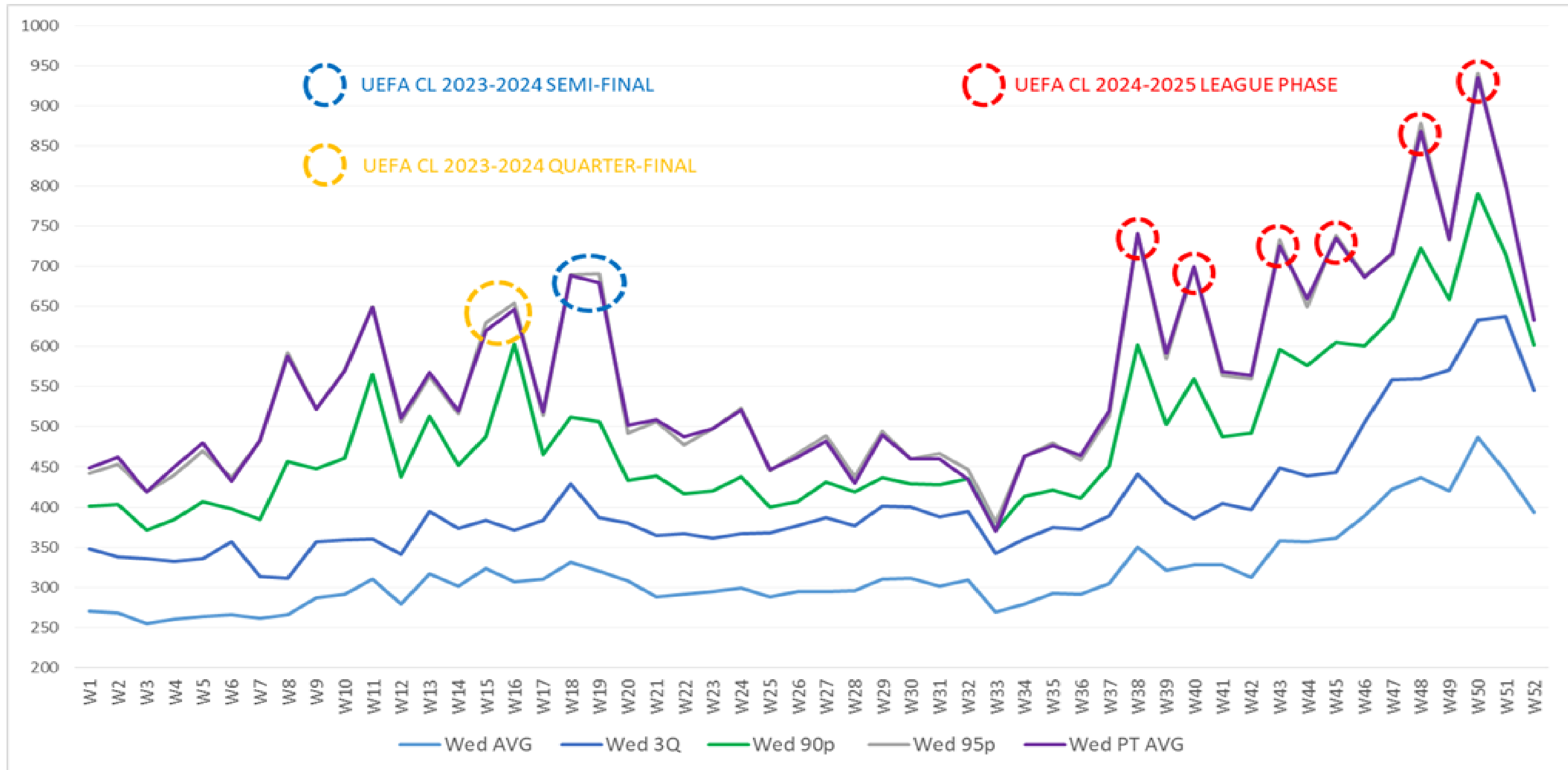
NAMEX 2024 WEEK<>WED TRAFFIC

UEFA CL 2023-2024 KP | UEFA CL 2024-2025 LP [Gbps]



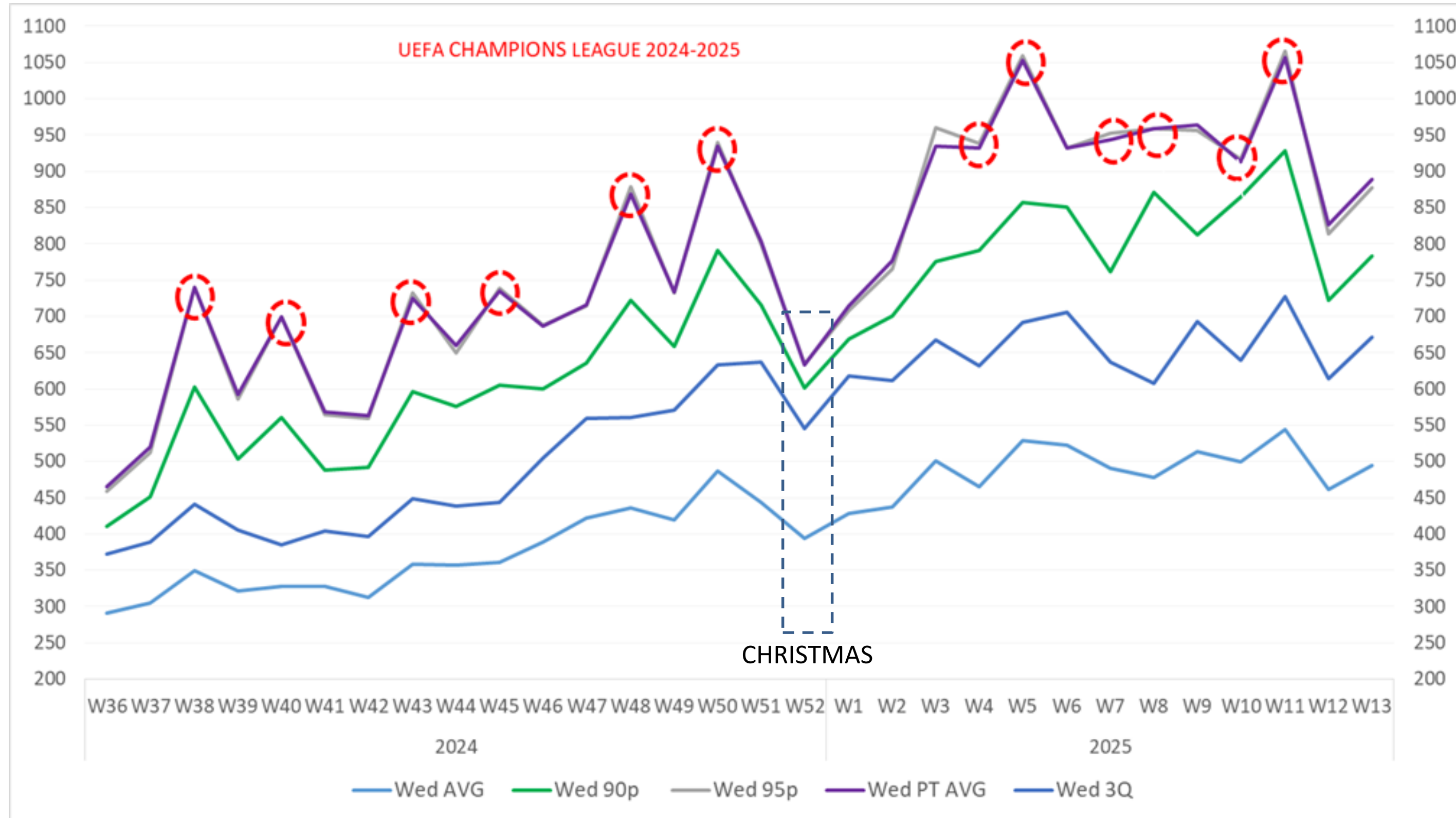
NAMEX 2024 WED TRAFFIC

UEFA CL 2023-2024 KP | UEFA CL 2024-2025 LP [Gbps]



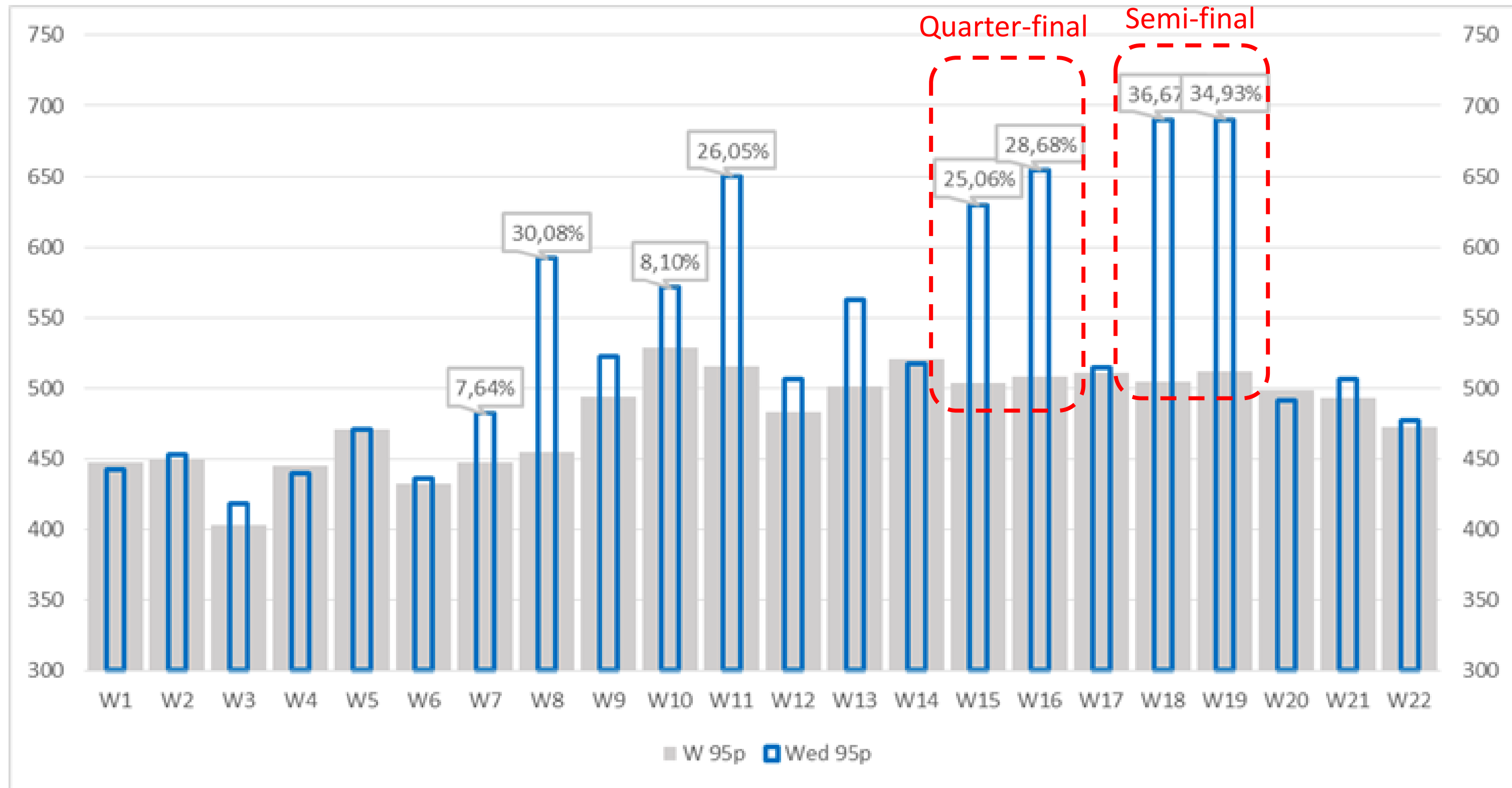
NAMEX CL 2024-2025 WED TRAFFIC

UEFA CL 2024-2025 LP / KP [Gbps]



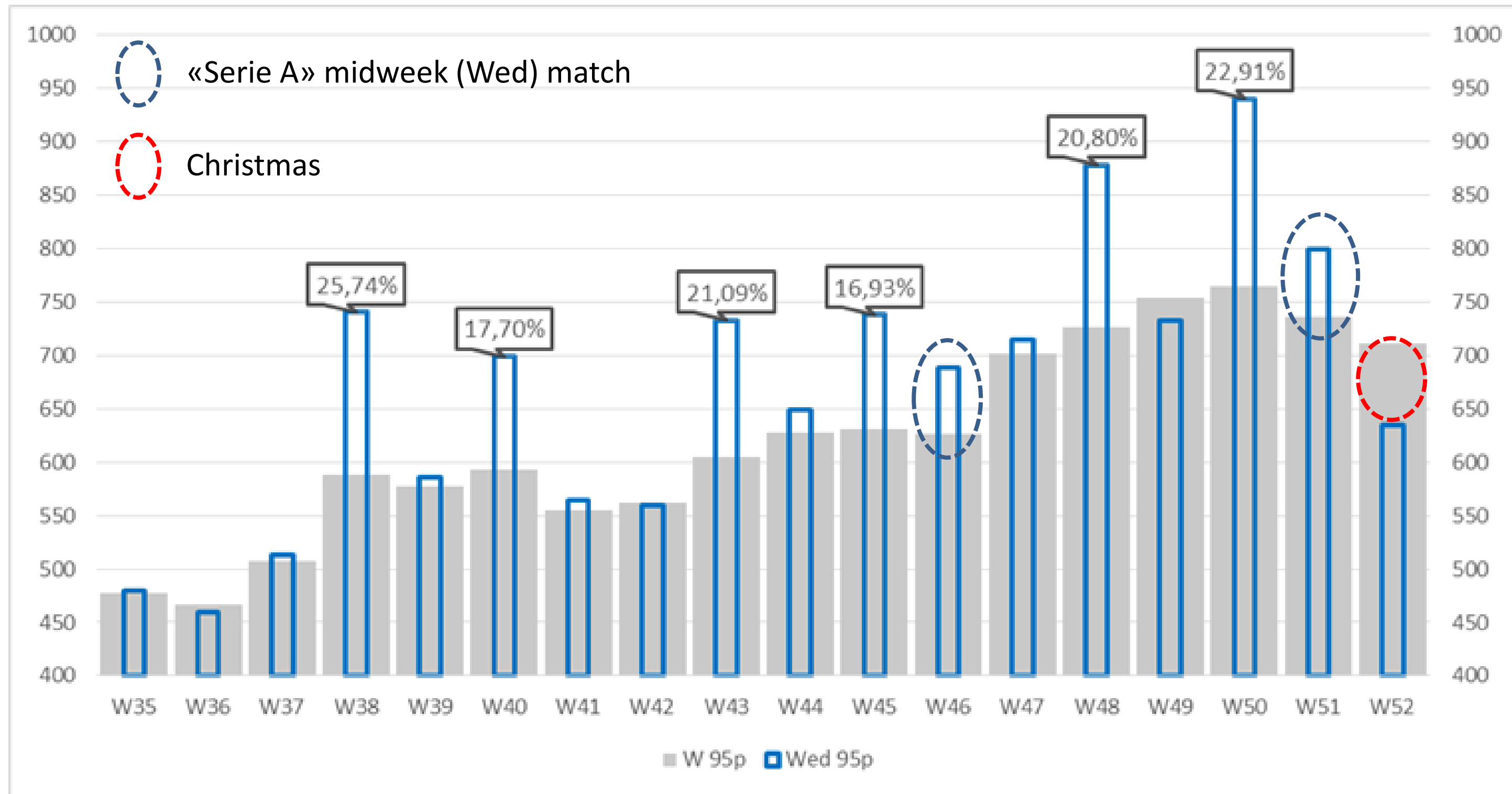
NAMEX 2024 95p W <> Wed / 1

UEFA CL 2023-2024 KP – Feb-May 2024 [Gbps]



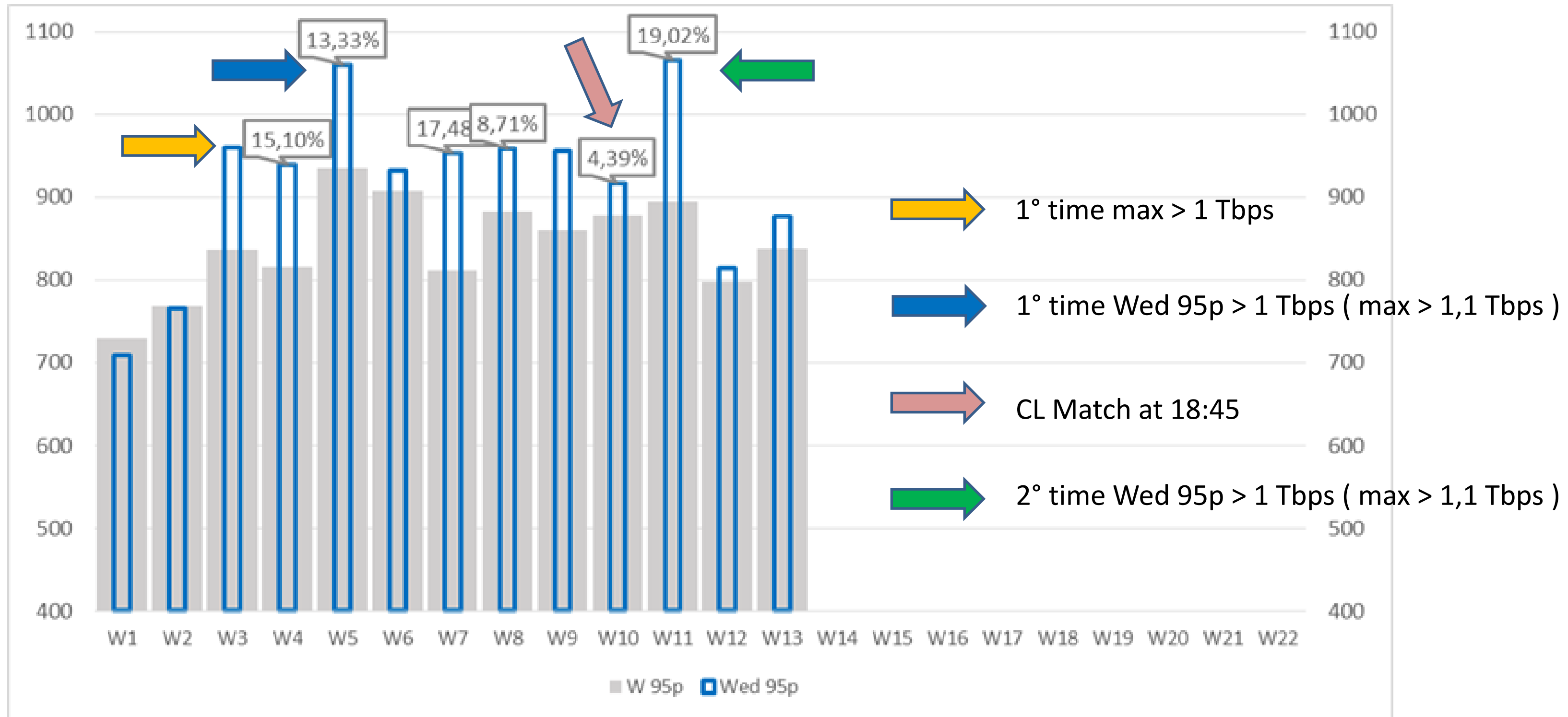
NAMEX 2024 95p W <> Wed / 2

UEFA CL 2024-2025 LP – Sep-Dec 2024 [Gbps]



NAMEX 2025 95p W <> Wed

UEFA CL 2024-2025 LP KP – Jan-Mar 2025 [Gbps]



NAMEX 2024 ALL-TIME PEAKS

All-time 2024 traffic peak progression [W,UTC time,bps]

W11,"2024-03-13T21:05:00.000000Z",696265840024

W16,"2024-04-17T21:00:00.000000Z",702198482352

W18,"2024-05-01T20:20:00.000000Z",737218269208

W38,"2024-09-18T20:05:00.000000Z",781041256560

W48,"2024-11-25T21:10:00.000000Z",800043455256 (Monday)

W48,"2024-11-27T21:00:00.000000Z",905423312552

W50,"2024-12-11T21:10:00.000000Z",968262734872

6 on 7 2024 traffic peaks on Wednesday night during CL matches

Note on W19 (NAMEX):

"2024-05-08T20:25:00.000000Z",733350129168

W19 → 2024 peak traffic night @ MINAP (and also @ MIX)



NAMEX 2025 ALL-TIME PEAKS

All-time 2025 traffic peak progression [W,UTC time,bps]

W3,"2025-01-15T20:35:00.000000Z",1001505431128

W5,"2025-01-29T20:40:00.000000Z",1122739909736

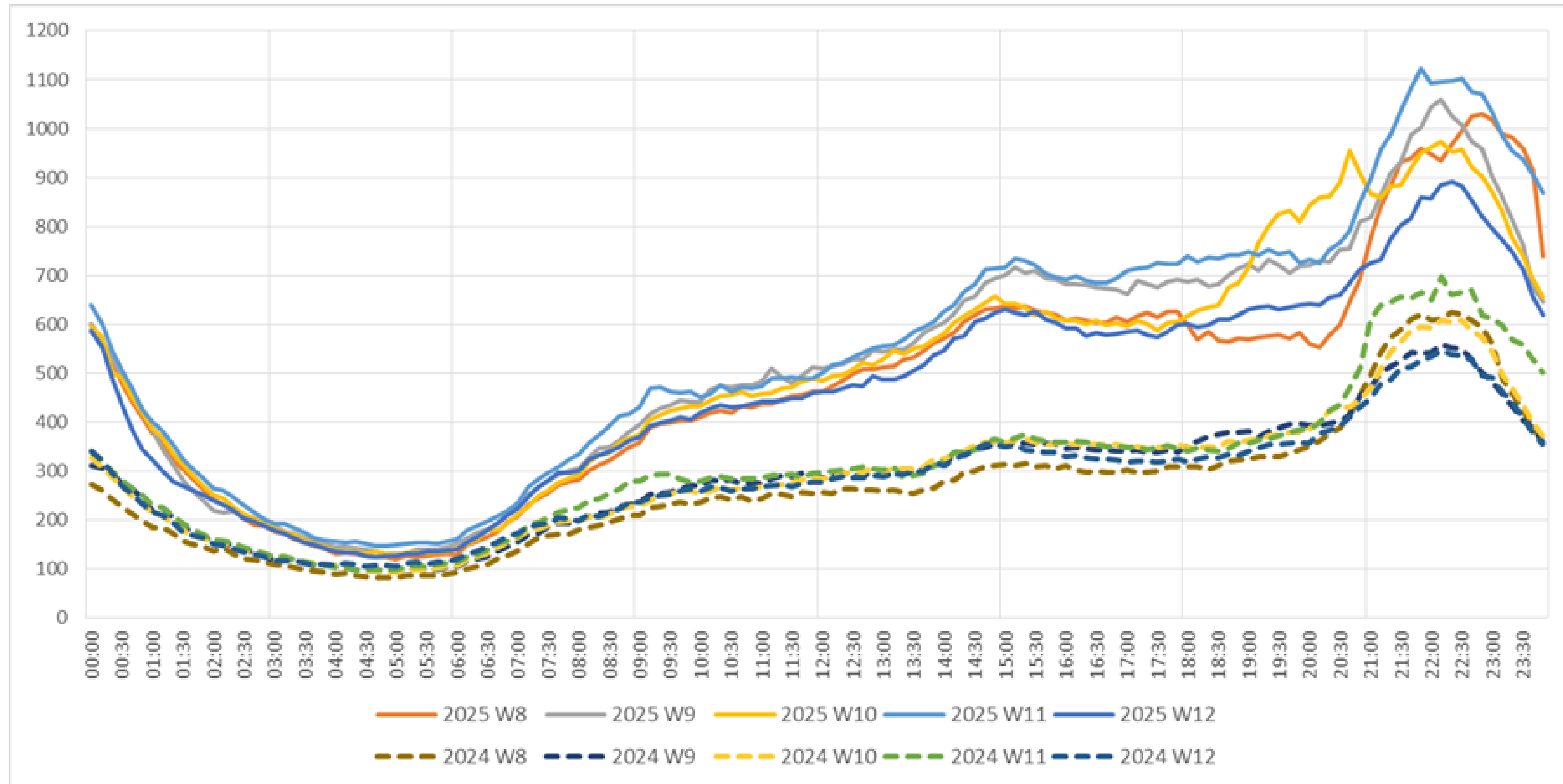
(... and counting)

2025 days with traffic peaks > 1 Tbps:

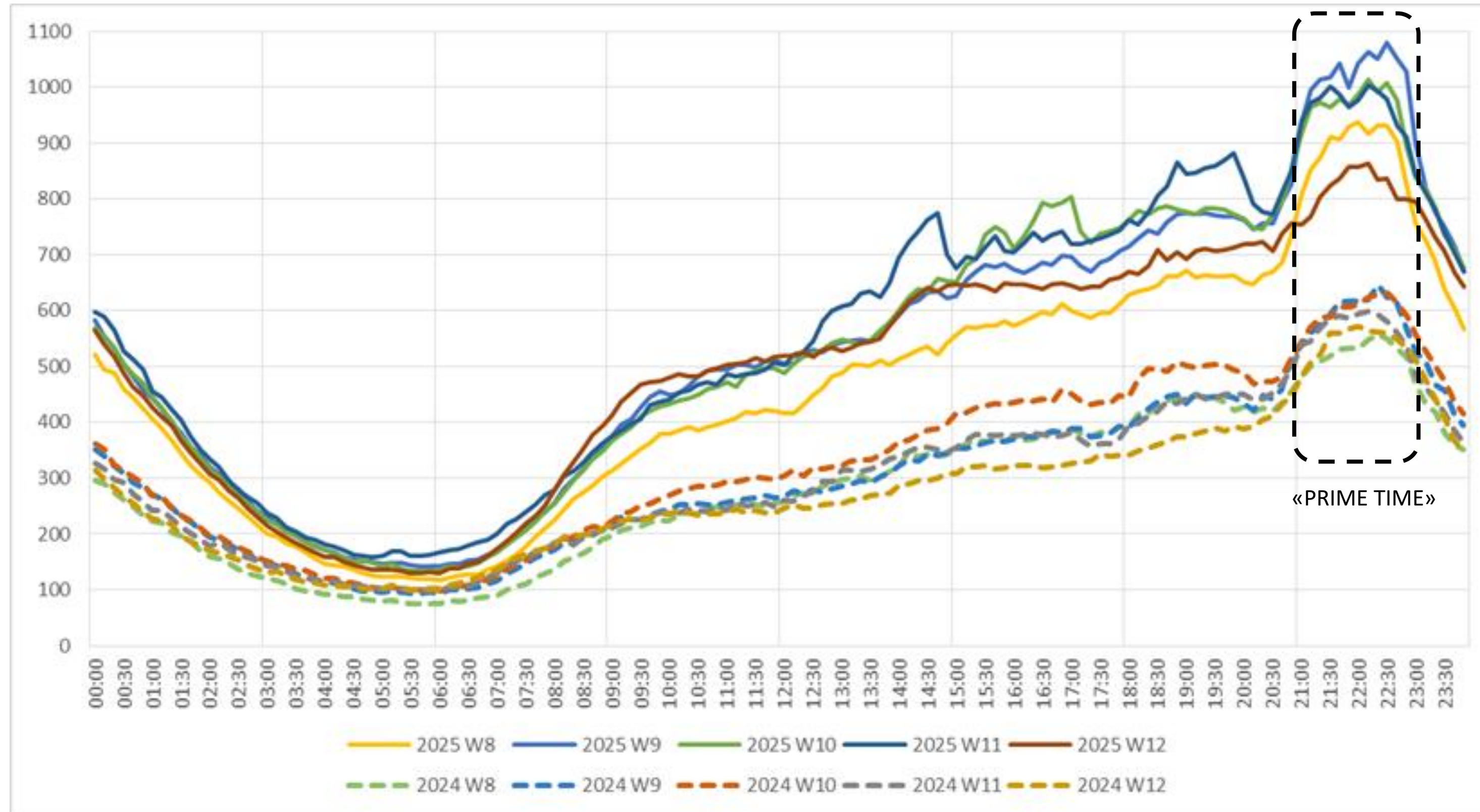
2025-01-15 (Wed)	2025-02-19 (Wed)	2025-03-12 (Wed)
2025-01-29 (Wed)	2025-02-26 (Wed)	2025-03-16 (Sun)
2025-02-02 (Sun)	2025-03-02 (Sun)	
2025-02-03 (Mon)	2025-03-03 (Mon)	
2025-02-10 (Mon)	2025-03-09 (Sun)	



NAMEX Y2Y Wed (W8-W12)



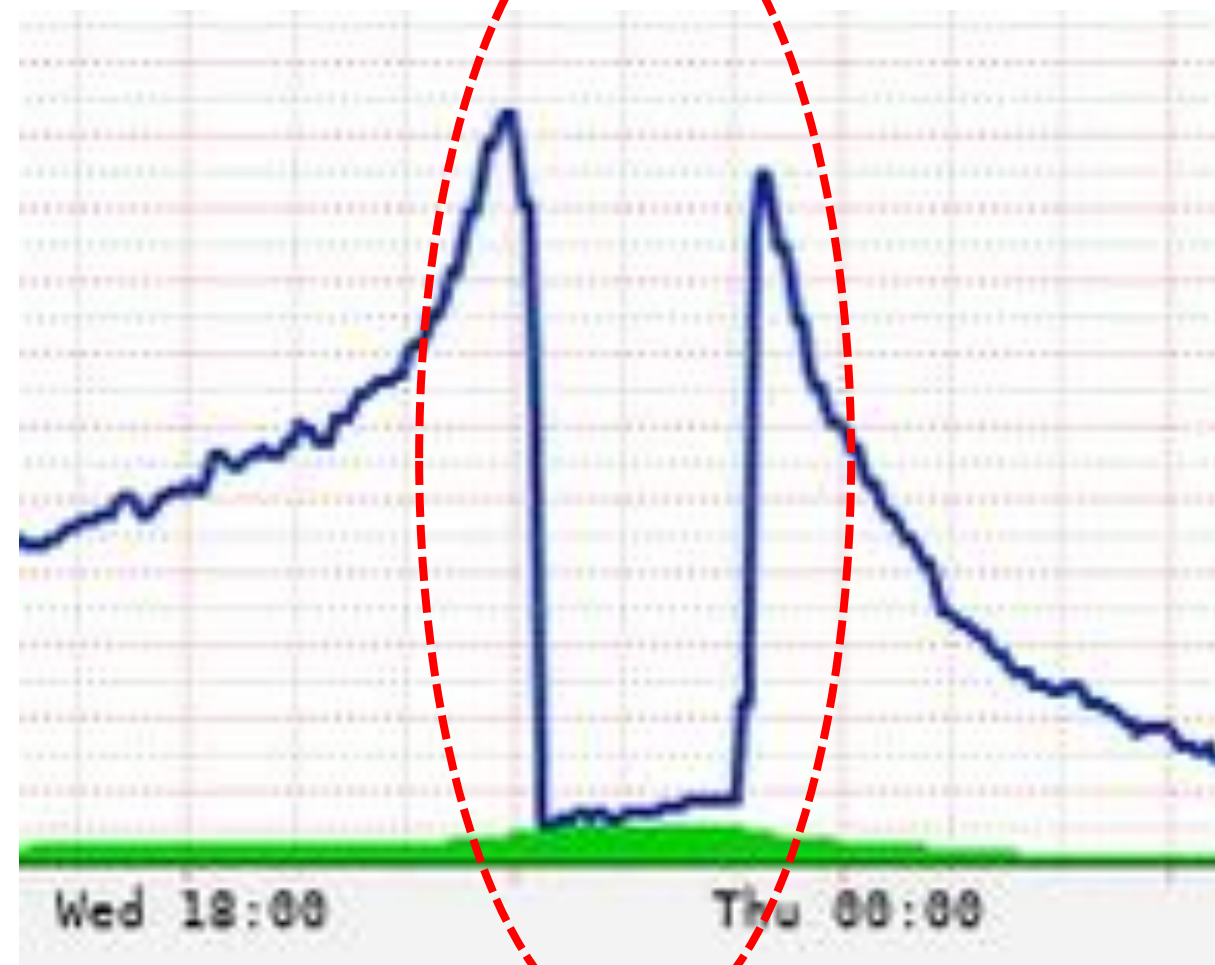
NAMEX Y2Y Sun (W8-W12)



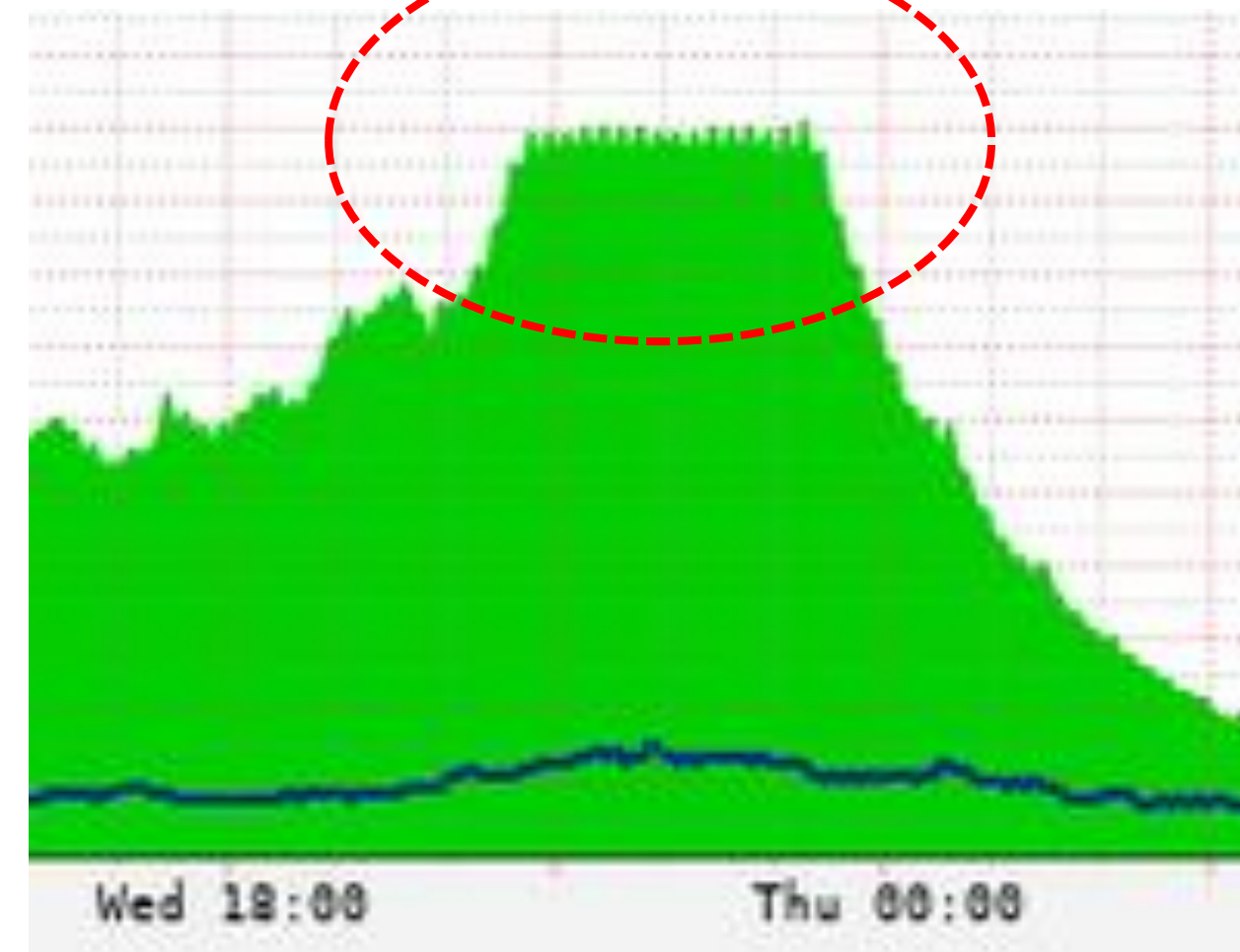
THINGS TO AVOID ?

A couple of “issues” faced during CL matches (@ MINAP)

CDN ROUTING POLICY ?



ISP - AVOID MAINTENANCE ?



SOME NOTES AND CONCLUSIONS

- **Wednesdays (and Sundays) are the days with most traffic**
- **Traffic humps/peaks are almost always related to live football streaming**
- **Metric “PTA” seems consistent with 95th percentile (W.I.P)**
- **NAMEX “all-time” peaks almost always on Wed nights (most of them are UEFA CL Wed nights)**
- **CL edition 2023–2024 (quarter–final and semi–final) :
NAMEX deviations (Wed 95p <> Week 95p) ~ 25% to ~ 35% up**
- **CL edition 2024–2025 League Phase (2024 matchdays):
NAMEX deviations (Wed 95p <> Week 95p) ~ 17% to ~ 25% up**



QUESTIONS?

COMMENTS? SUGGESTIONS?



**THANK YOU
FOR YOUR ATTENTION**

Gianluca Sironi NAQUADRIA | PCIX

