

Enduring Connection Policy (ECP) 2.3

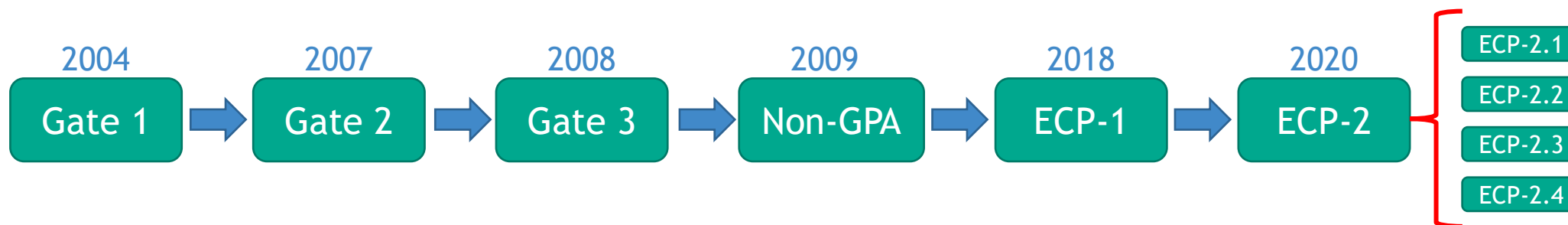
Constraints Analysis for Wind
& Solar

Area Results Overview

9th February 2023



ECP-2.3 - Background



- ECP-2.3 is the third of four batches of connection offers planned under the CRU's Enduring Connection Policy 2 for offering grid connections to new renewable generators in Ireland.
- ECP-2.1 provided 2 GW of connection offers, ECP-2.2 provided 2.7 GW of connection offers and ECP-2.3 has 3.2 GW of renewable applications, of which: 0.5 GW onshore wind, 2 GW solar and 0.7 GW battery.
- EirGrid is required to provide ECP-2.3 customers with constraints information, reported as Total Dispatch Down.
- ECP-2.3 constraints analysis has been carried out in line with the CRU decision: CRU/20/060 on ECP 2 and 12 area reports have been published .

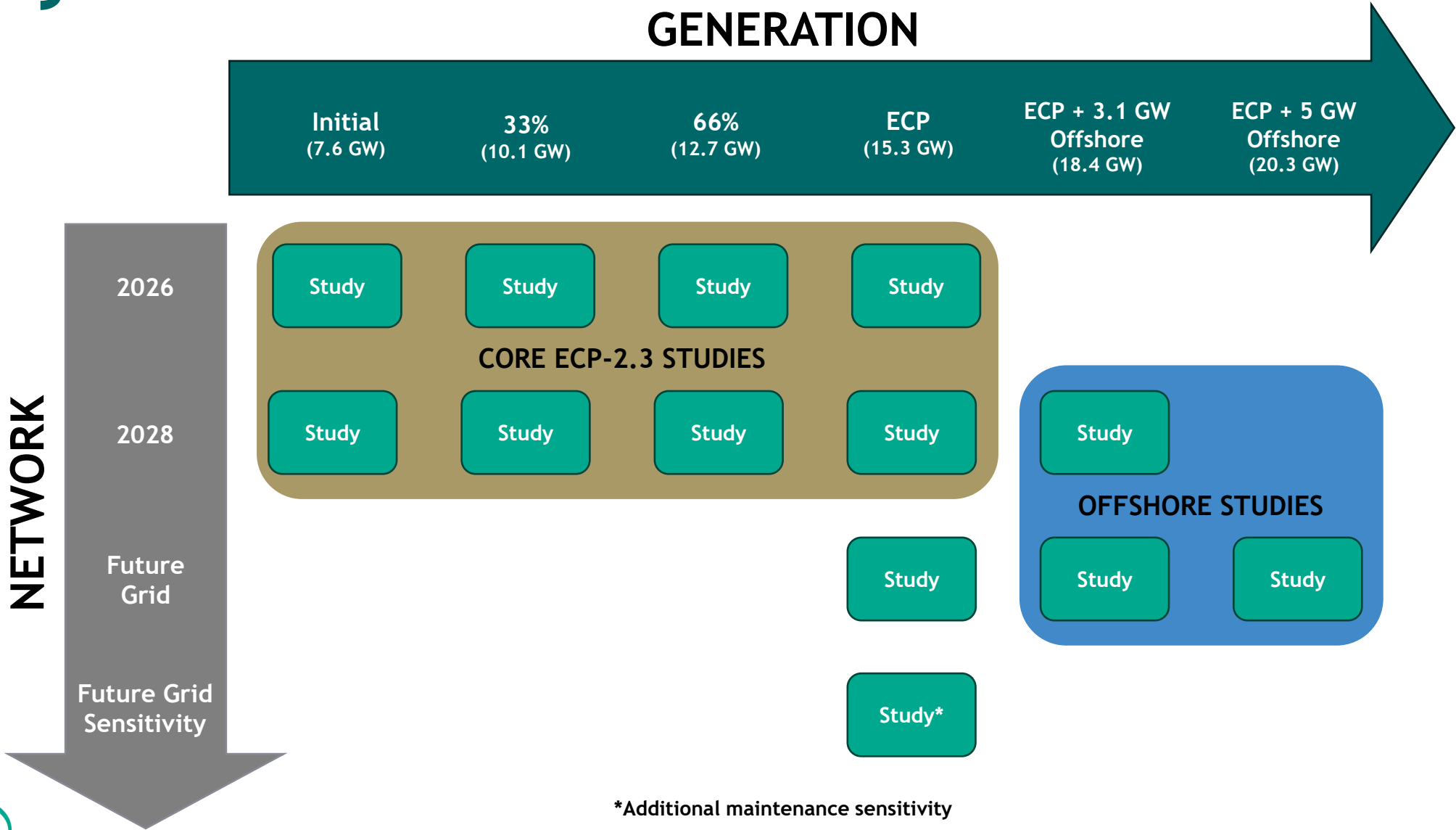
Key Metric: Total Dispatch Down

Total Dispatch Down = Surplus + Curtailment + Constraint



TDD Type and Definition	1. Surplus DD applied for energy balancing when generation exceeds demand plus interconnector export.	2. Curtailment DD applied to ensure operational limits are met.	3. Constraint DD applied to manage network constraints. This is applied to solve local transmission issues.
ECP-2.2 Approach	<ul style="list-style-type: none"> • Non-PD to reduce output on a pro-rata basis. • If surplus is unresolved by non-PD reduction, PD reduce output on a pro-rata basis. 	<ul style="list-style-type: none"> • PD and non-PD reduce output equally on a pro-rata basis. 	<ul style="list-style-type: none"> • PD and non-PD reduce output equally on a pro-rata basis within a constraint group or area.
ECP-2.3 Approach	<ul style="list-style-type: none"> • As per ECP-2.2. 	<ul style="list-style-type: none"> • As per ECP-2.2. 	Proposed according to Enduring approach from SEM-22-009: <ul style="list-style-type: none"> • Non-PD to reduce output on a pro-rata basis. • If constraint is unresolved by non-PD reduction, PD reduce output on a pro-rata basis.

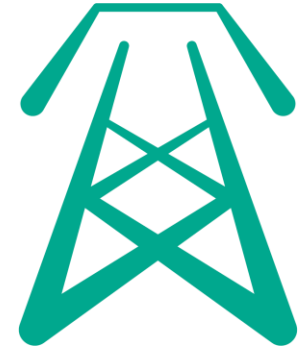
Study Scenarios



Study Assumptions

Wind, Offshore Wind and Solar Profiles

- Onshore wind profiles from the year 2020 were used.
- Each area profile is a recorded profile from a representative node in that area.
- Solar and offshore wind profiles have been obtained from an external vendor and have been synthesised from 2020 data.



Interconnectors

- 2026: Moyle, EWIC, Greenlink
- 2028: Moyle, EWIC, Greenlink, Celtic
- Future Grid: Moyle, EWIC, Greenlink, Celtic, LirIC, 2nd IE to France IC

Reinforcements

- 2026 & 2028: based upon current estimated delivery dates from latest Network Delivery Portfolio (NDP).
- Future Grid: network aligned with the SOEF 1.1 Roadmap network.



Operational Assumptions

Operational Limits (applied in Curtailment Run)	Assumption
Non-Synchronous Generation	2026 - 85% 2028 - 90% Future Grid - 95%
Operational Limit For Inertia	2026 - 20,000 MWs 2028 - 20,000 MWs Future Grid - 20,000 MWs
Minimum Sets (IE, NI)	2026 - 6 (4,2) 2028 - 4 (3,1) Future Grid - 3
Reserve	POR, SOR, TOR I, and TOR II

Network Op. Limits & Rules (applied in Constraint Run)
Line/Cable limits
N - 1
N - G
SPS



Ireland Total Dispatch Down (%)

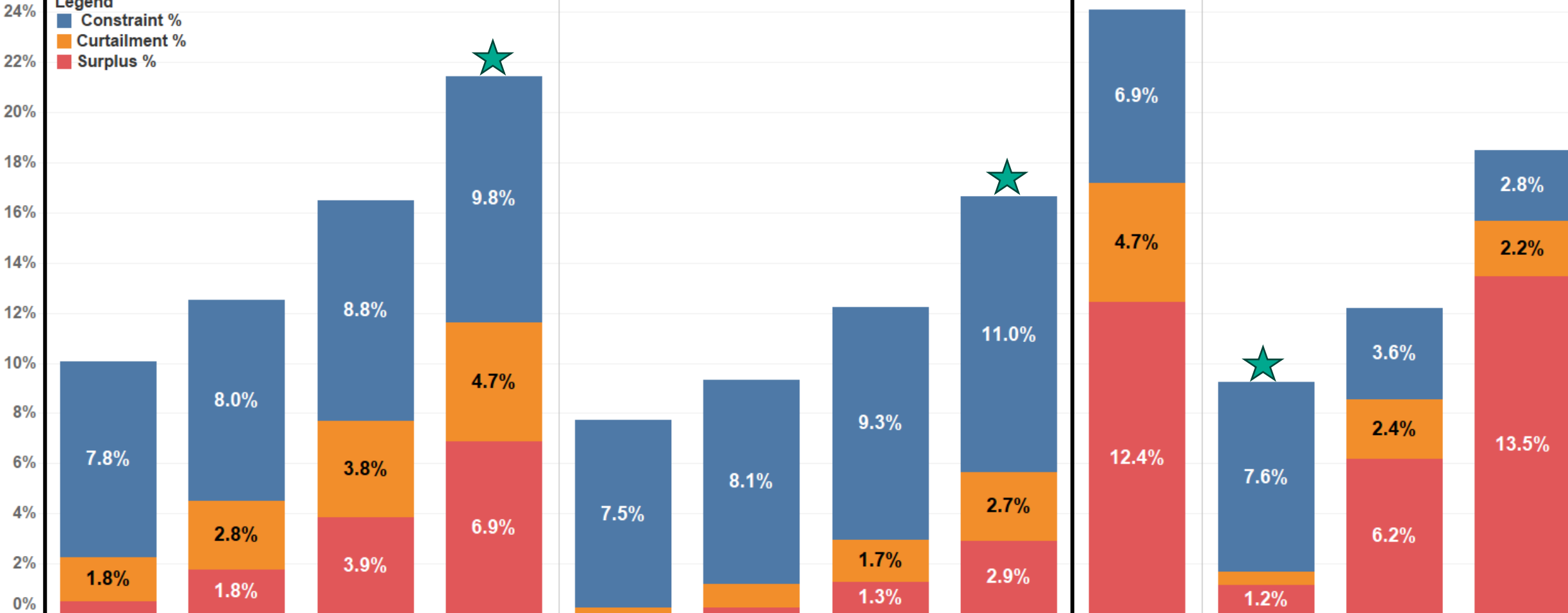
2026

2028

2030

- Legend**
- Constraint %
 - Curtailment %
 - Surplus %

Total Dispatch Down (%)



Core ECP-2.3 Scenarios

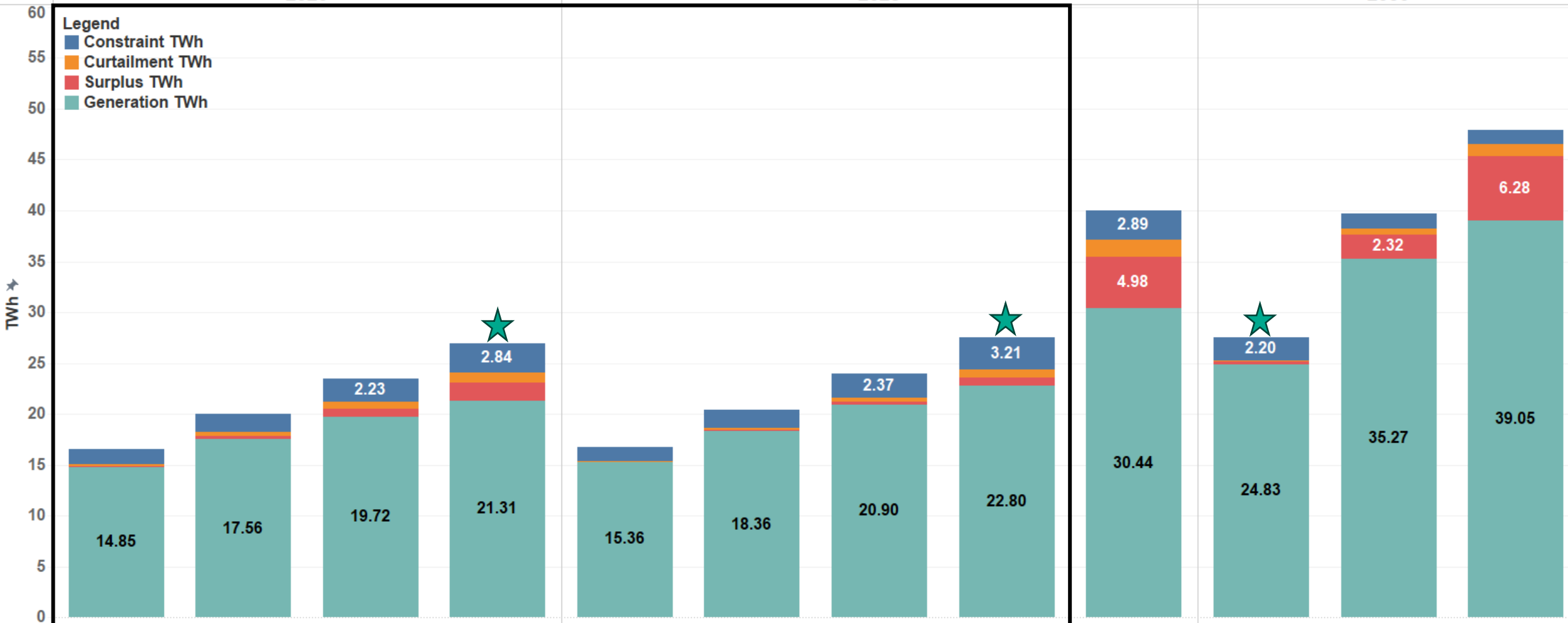
IE Total Dispatch Down and Generation (TWh) (Wind and Solar)

2026

2028

2030

- Legend**
- Constraint TWh
 - Curtailement TWh
 - Surplus TWh
 - Generation TWh



Core ECP-2.3 Scenarios

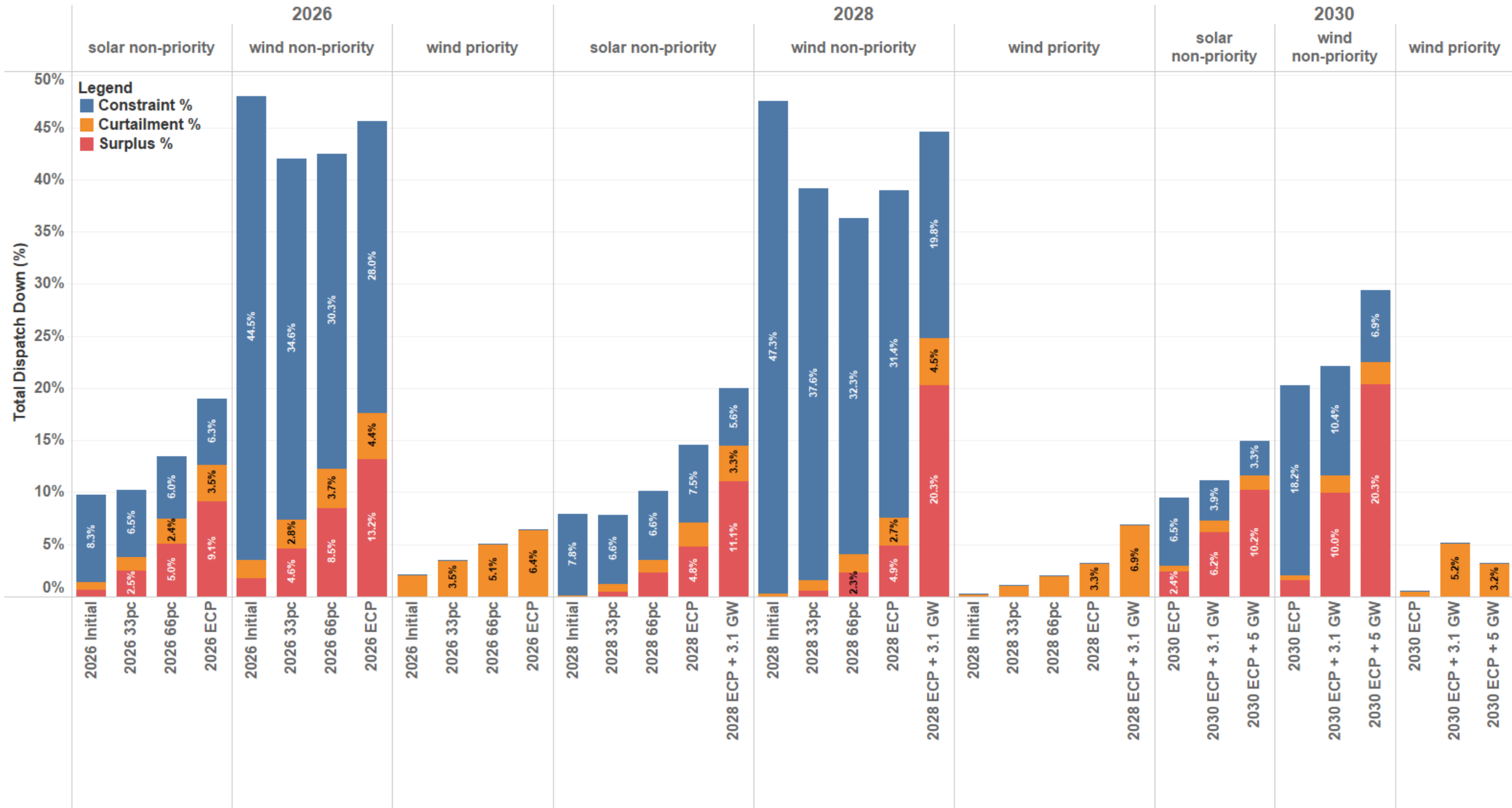
2028 ECP + 3.1 GW

2030 ECP

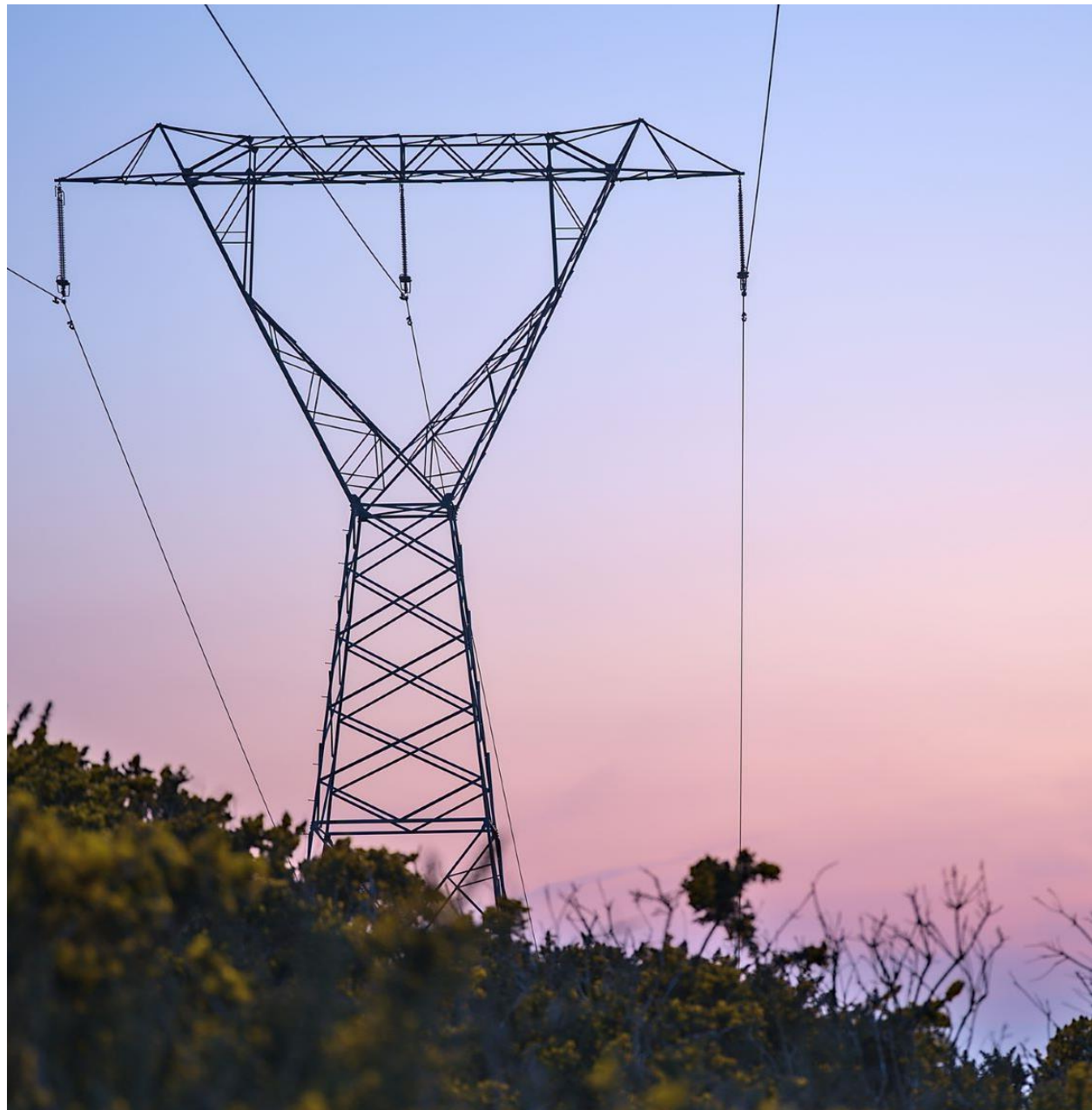
2030 ECP + 3.1 GW

2030 ECP + 5 GW

Ireland Dispatch Down by Technology (%)



Area Results



Area A, B & C

Network Year	Number of Reinforcements/Projects
2026	10
2028	5
Future Grid	13

- 2026 - 10 reinforcements
- 2028 - 5 reinforcements
- Future Grid - 13 reinforcements
- High-RES scenarios - power flow towards east.
- Area A - over 1 GW wind generation
- Area B - over 1 GW wind generation
- Area C - 500 MW solar generation
- TDD reduced in Future Grid due to reinforcements.



Top 3 Contingencies Areas A, B & C

(2026 ECP (All) Scenario)

Loss of Galway_Salthill_110 causes binding on Cashla_Salthill_110_1

Loss of Cunghill_Sligo_110 causes binding on Castlebar_Cloon_110_1

Loss of Binbane_Cathleen's Fall_110 causes binding on Letterkenny_GolaghT_110_1

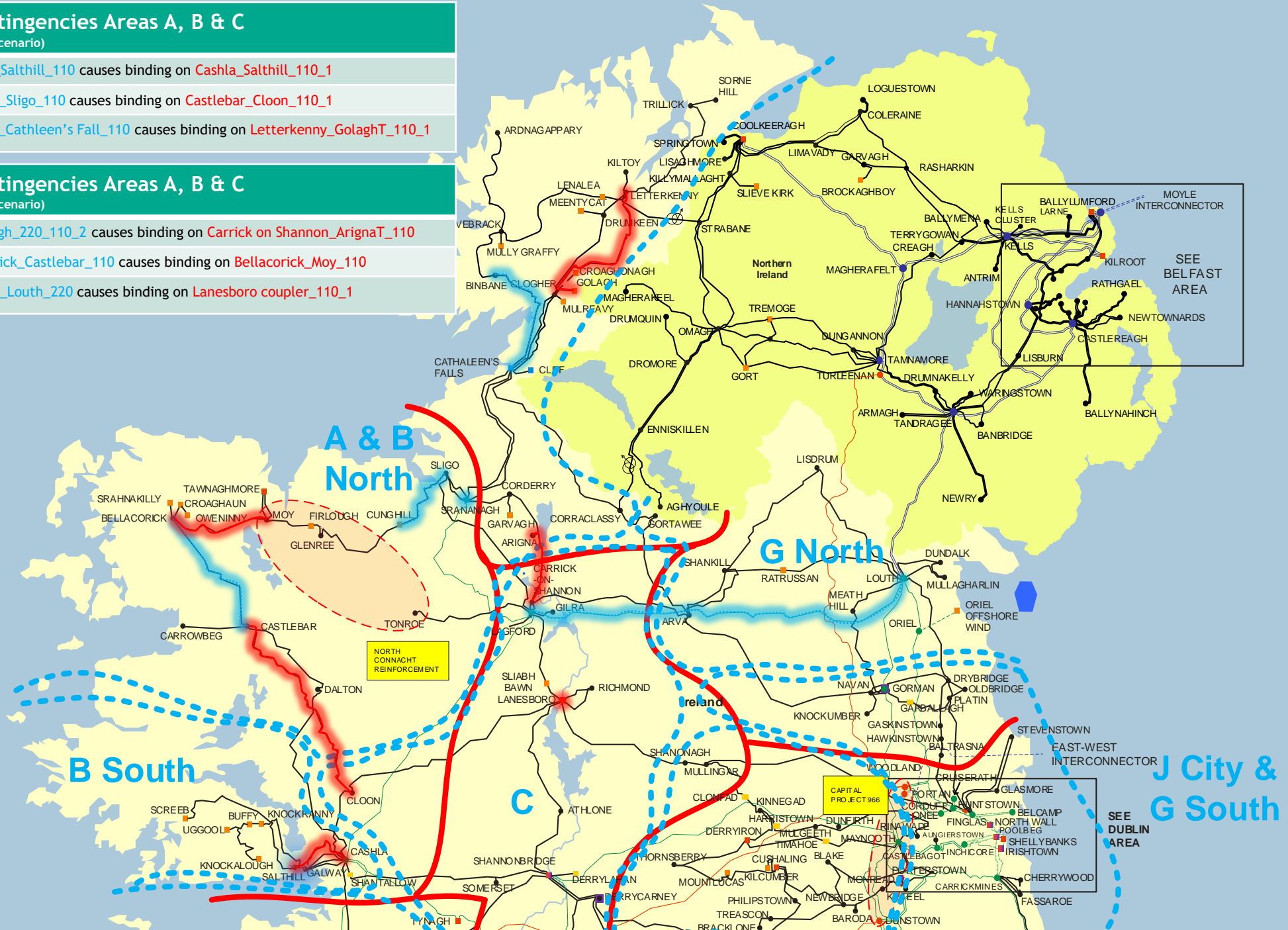
Top 3 Contingencies Areas A, B & C

(2028 ECP (All) Scenario)

Loss of Srananagh_220_110_2 causes binding on Carrick on Shannon_ArignaT_110

Loss of Bellacorick_Castlebar_110 causes binding on Bellacorick_Moy_110

Loss of Flagford_Louth_220 causes binding on Lanesboro coupler_110_1



Total Dispatch Down in Area A

A, B North solar
solar non-priority

A, B North wind

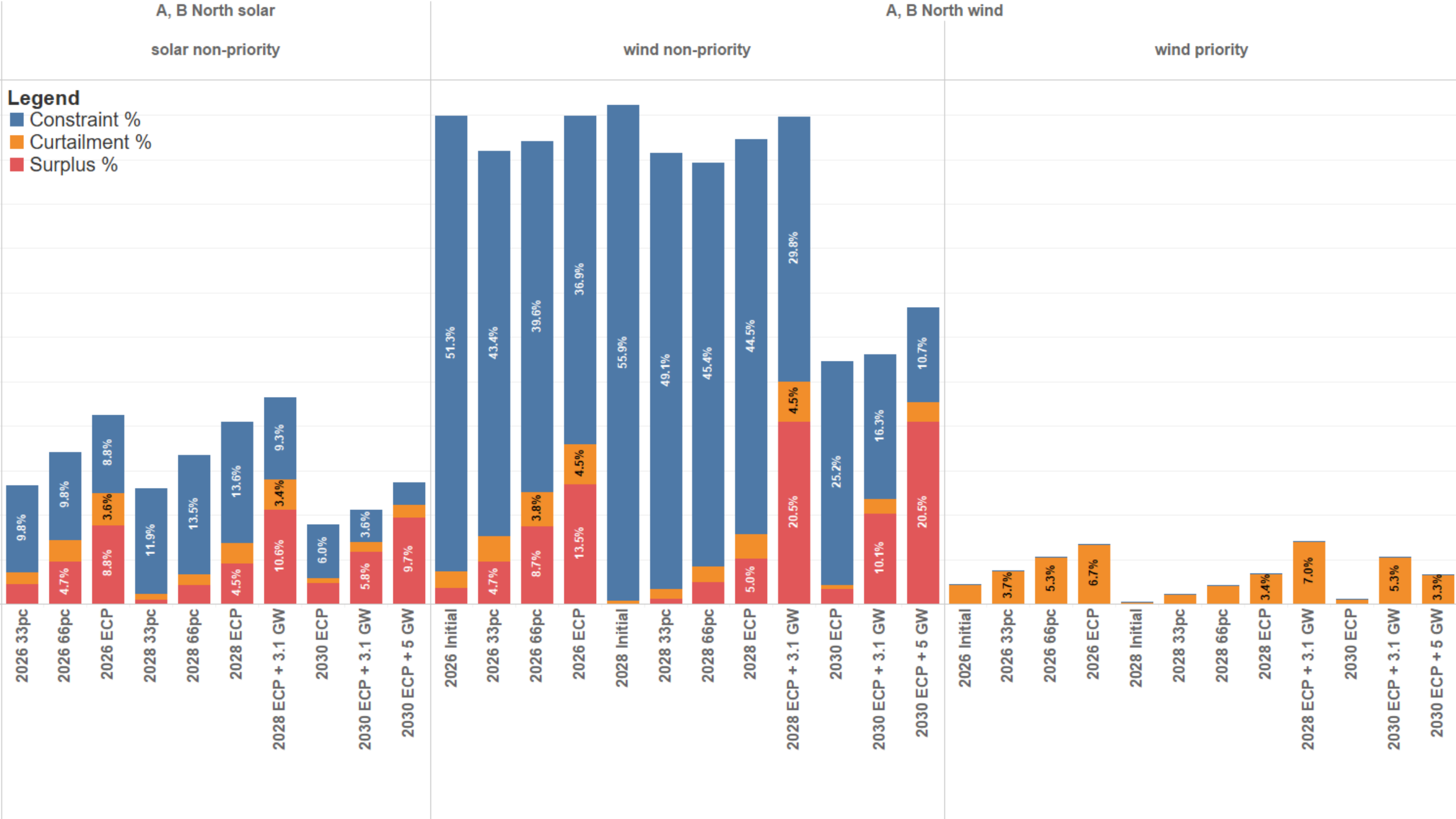
wind non-priority

wind priority

Legend

- Constraint %
- Curtailment %
- Surplus %

Total Dispatch Down (%)



Total Dispatch Down in Area B

A, B North solar

solar non-priority

A, B North wind

wind non-priority

wind priority

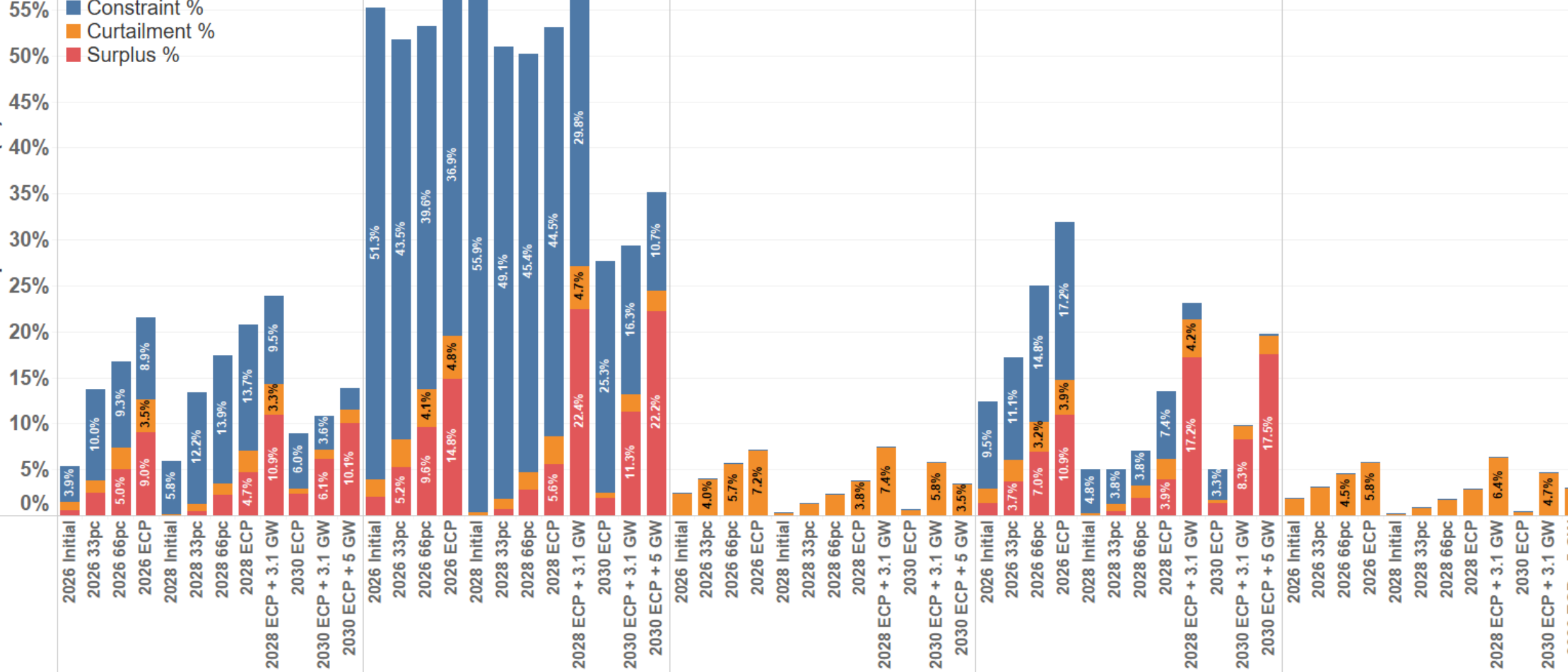
B South wind

wind non-priority

wind priority

Legend

- Constraint %
- Curtailment %
- Surplus %



Total Dispatch Down in Area C

C solar

solar non-priority

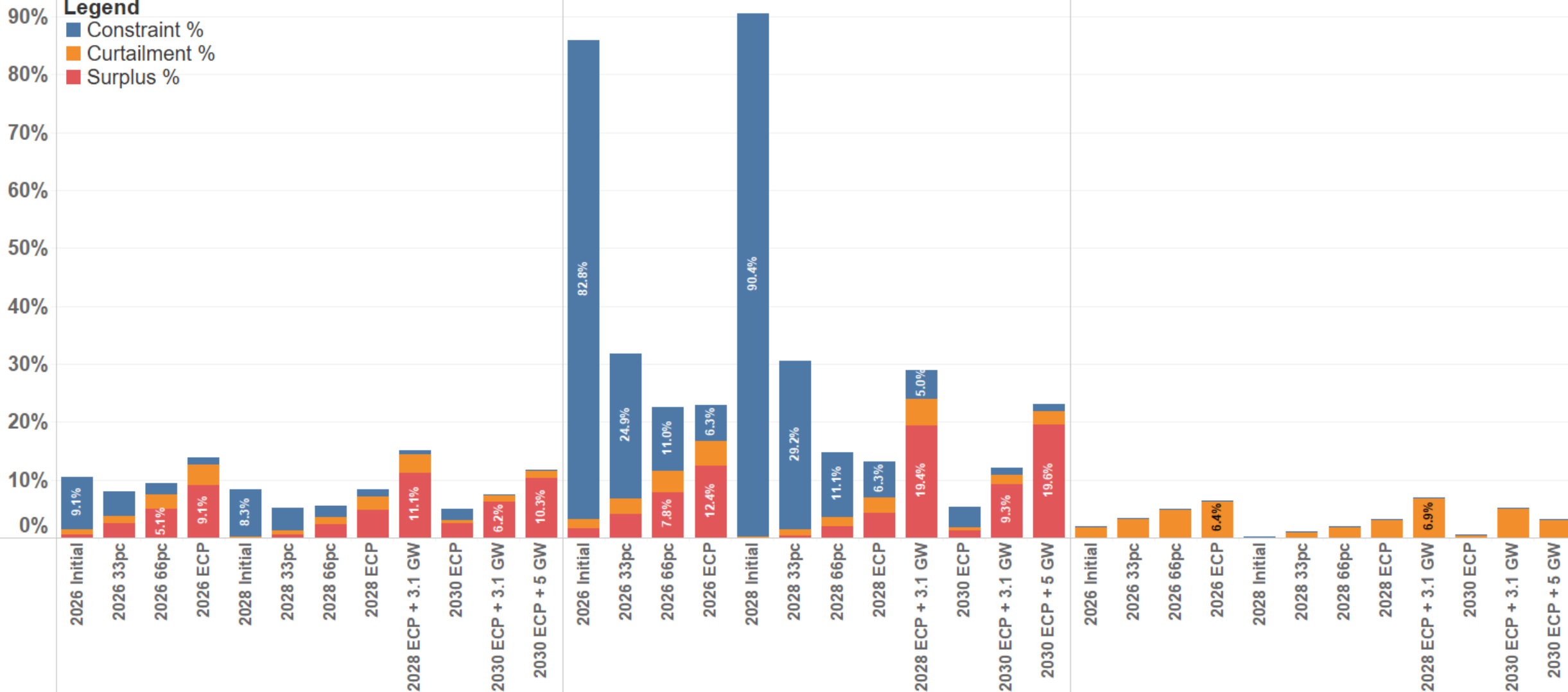
C wind

wind non-priority

wind priority

Total Dispatch Down (%)

- Legend**
- Constraint %
 - Curtailment %
 - Surplus %

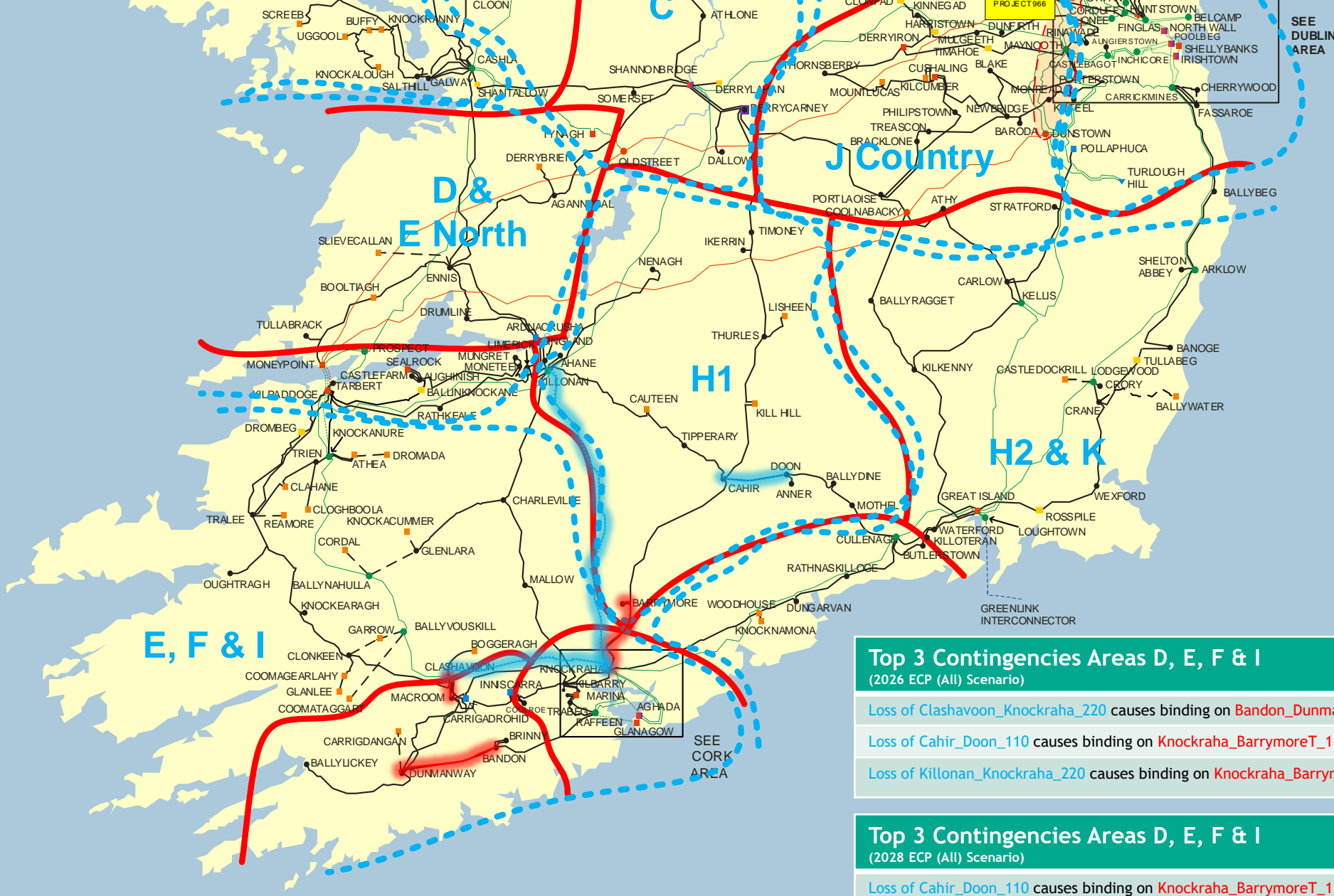


Area D, E, F & I

Year	Project Name	Area
2026	Moneypoint Synchronous Condenser: connection	E
2026	New 400 - 220 kV Transformer for Moneypoint Sub-Station	E
2026	New Ballyvouskill 220 - 110 kV Transformer	E
2026	Prospect Tarbert 220 kV: cable replacement project	E
2028	Bandon - Dunmanway 110 kV: uprate	F
2028	Bandon - Raffeen 110 kV: uprate	F
2028	Cross Shannon 400 kV Cable: project	E
2028	Moneypoint 400 kV Series Capacitor	E
Future Grid	Bandon - Dunmanway 110 kV: uprate	F
Future Grid	Drumline - Ennis 110 kV: DLR	D
Future Grid	Knockraha - Cahir 110 kV: uprate	I

- 2026 - 3 reinforcements & 1 Sync Comp.
- 2028 - 4 reinforcements.
- Future Grid - 3 reinforcements.





Top 3 Contingencies Areas D, E, F & I
(2026 ECP (All) Scenario)

- Loss of Clashavoon_Knockraha_220 causes binding on Bandon_Dunmanway_110_1
- Loss of Cahir_Doon_110 causes binding on Knockraha_BarrymoreT_110_1
- Loss of Killonan_Knockraha_220 causes binding on Knockraha_BarrymoreT_110_1

Top 3 Contingencies Areas D, E, F & I
(2028 ECP (All) Scenario)

- Loss of Cahir_Doon_110 causes binding on Knockraha_BarrymoreT_110_1
- Loss of Killonan_Knockraha_220 causes binding on Knockraha_BarrymoreT_110_1
- Loss of Clashavoon_Knockraha_220 causes binding on Clashavoon_Macroom_110_1

Total Dispatch Down in Area D

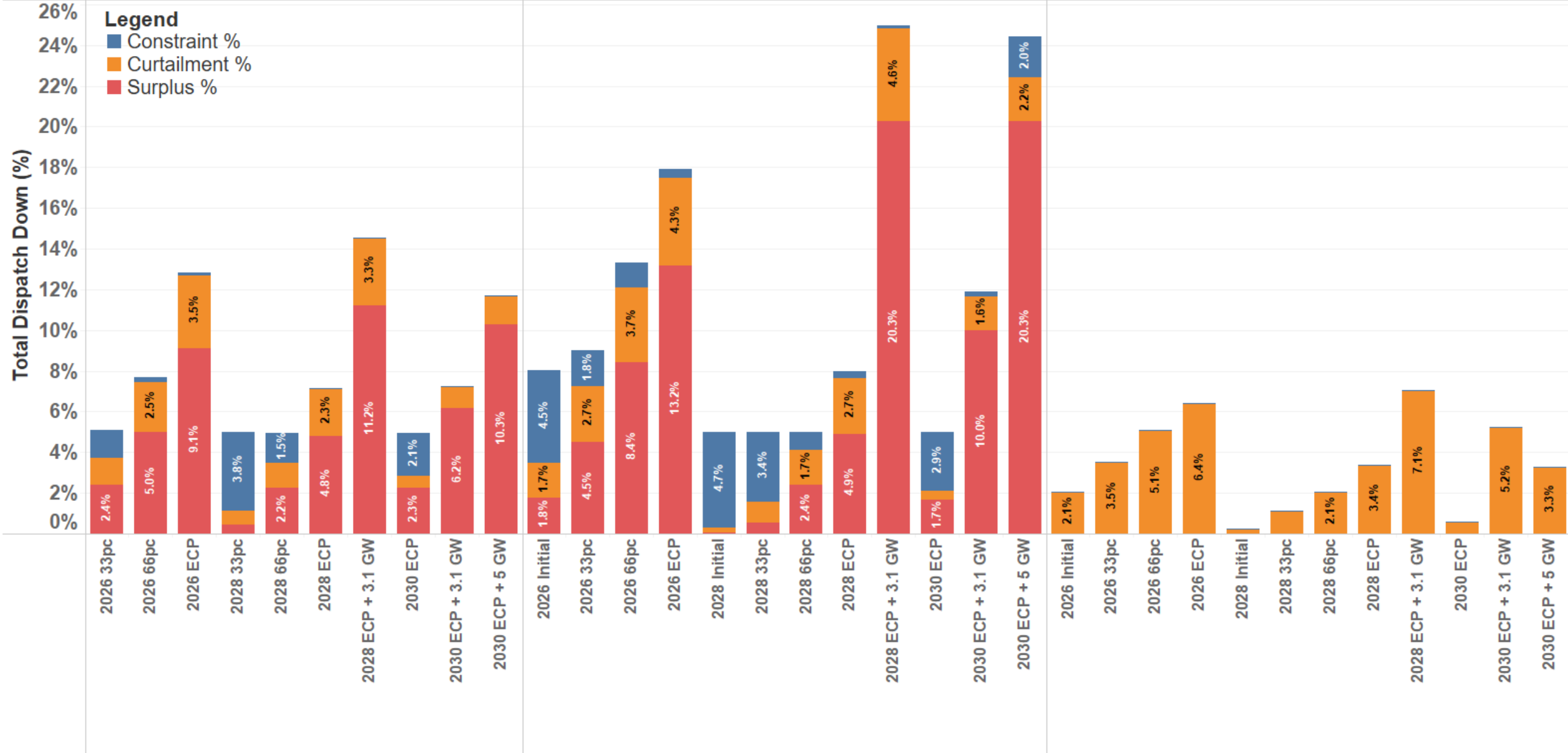
D and E North solar

solar non-priority

D and E North wind

wind non-priority

wind priority



Total Dispatch Down in Area E

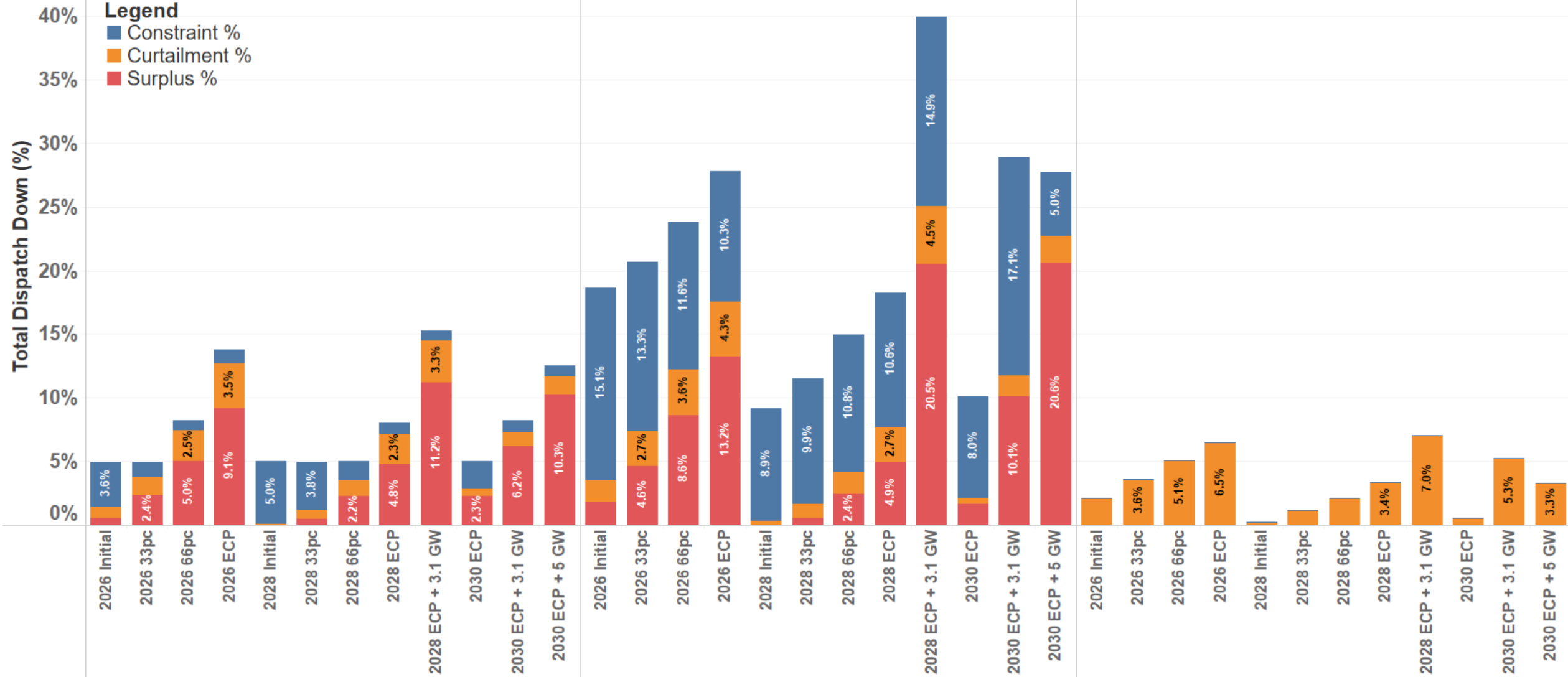
E,F & I solar

solar non-priority

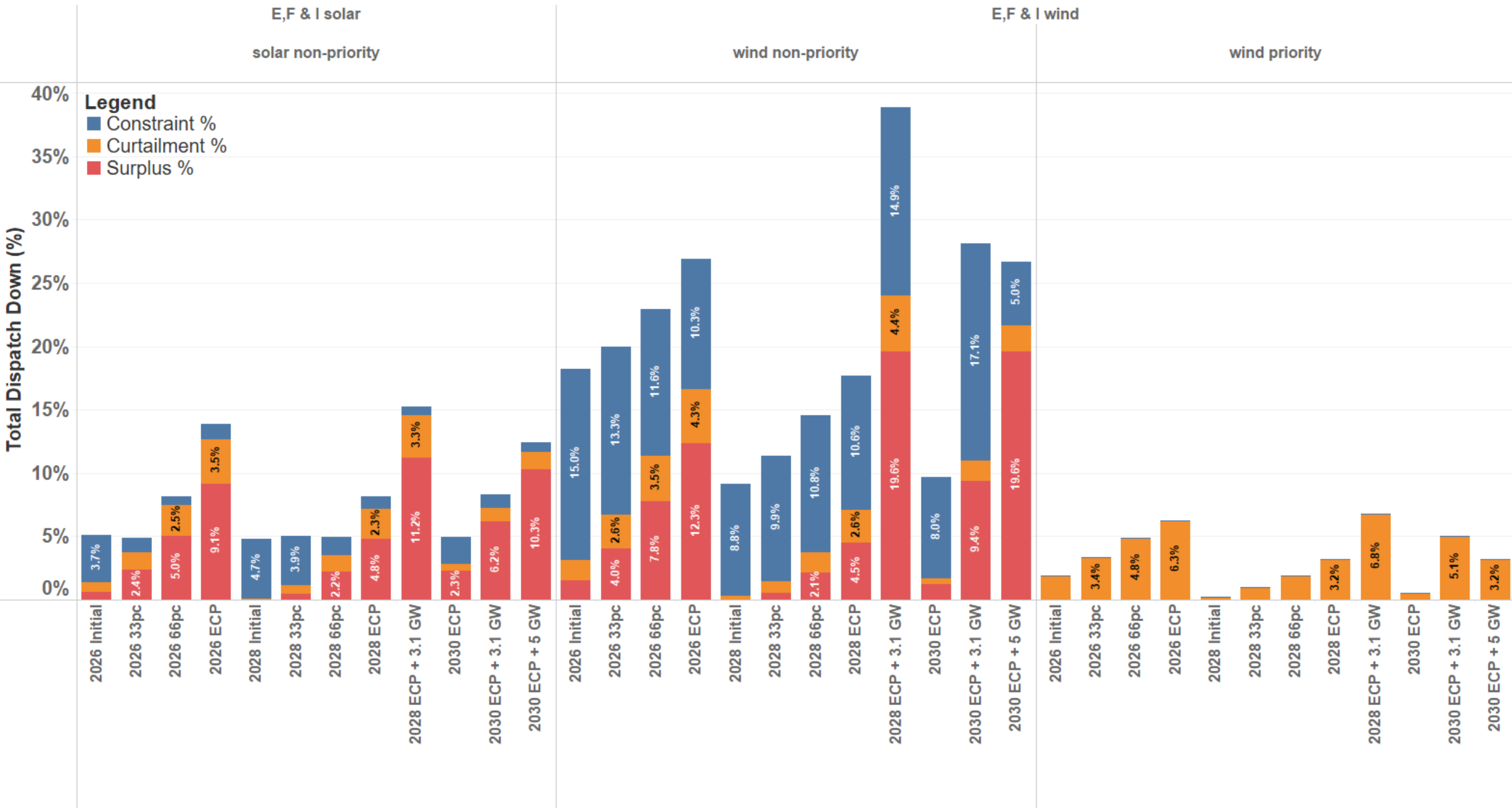
E,F & I wind

wind non-priority

wind priority



Total Dispatch Down in Area F

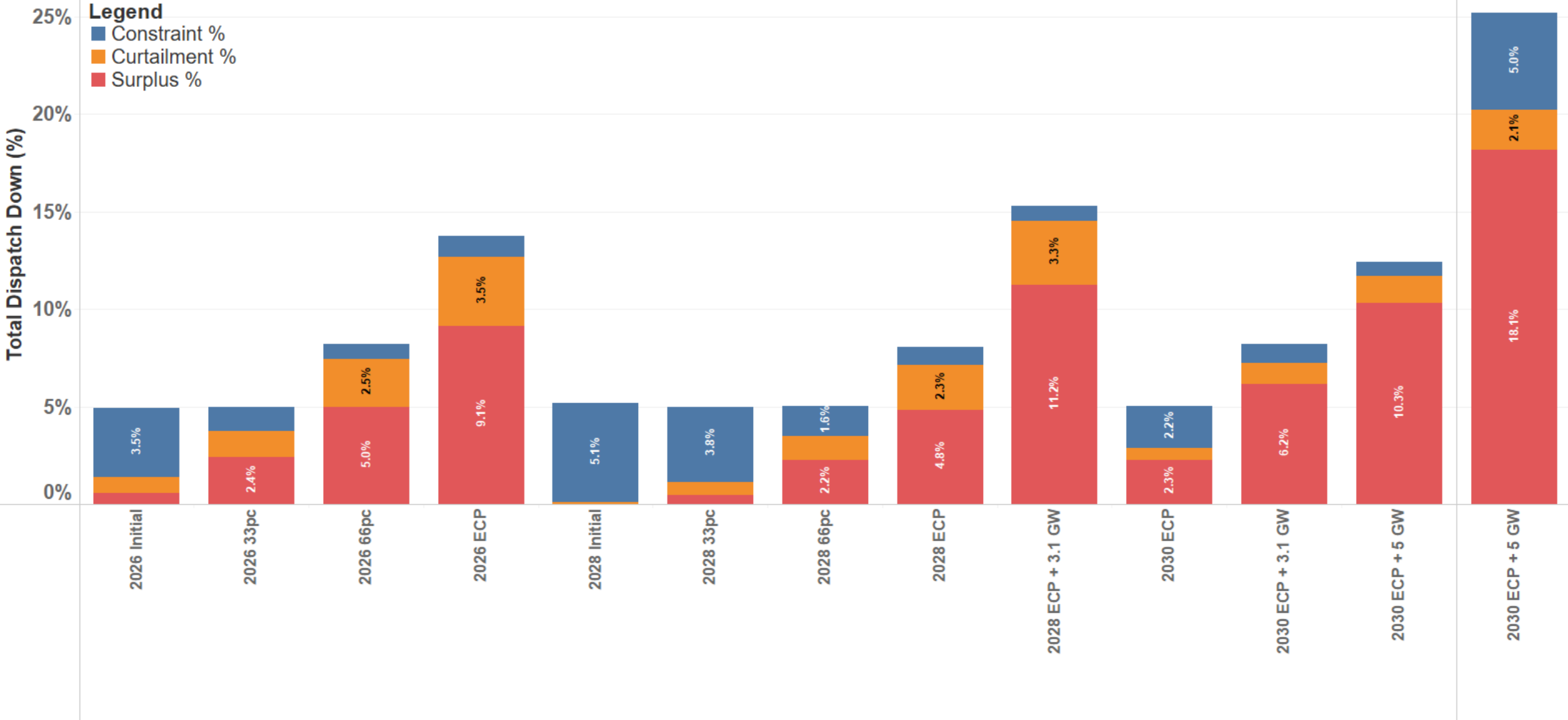


Total Dispatch Down in Area I

E,F & I solar
solar non-priority

E,F & I wind
wind non-priority

- Legend**
- Constraint %
 - Curtailment %
 - Surplus %



Area H1, H2 & K

Year	Project	Area
2026	Crane - Wexford 110 kV: uprate	H2
2026	Laois - Kilkenny (Coolnaback) 400 kV Station	H2
Future Grid	Arklow - Ballybeg - Carrickmines 220 kV: upvoltage	H2
Future Grid	Athy - Carlow 110 kV circuit: uprate	H2
Future Grid	Crane - Wexford 110 kV: DLR	H2
Future Grid	Great Island - Kellis 220 kV circuit: uprate	H2
Future Grid	Great Island - Waterford 1 110 kV: DLR	H2
Future Grid	Great Island 220/110 transformer No.3	H2
Future Grid	Killoteran - Waterford 110 kV circuit: uprate	H2
Future Grid	Knockraha - Cahir 110 kV circuit: uprate	H1

- Southeast of Ireland, two reinforcements going into the H2 region by 2026.
- Future Grid: 8 reinforcements.
- Greenlink interconnector also connected in the H2 region, this has been modelled in the 2026, 2028 and Future Grid studies.





Top 3 Contingencies Areas H1, H2 & K
(2026 ECP (All) Scenario)

- Loss of Cullnagh_Knockraha_220 causes binding on Cahir_Doon_110_1
- Loss of Arklow_220_110_2 causes binding on Arklow_220_110_1
- Loss of Cahir_Doon_110 causes bindings on Knockraha_BarrymoreT_110_1

Top 3 Contingencies Areas H1, H2 & K
(2028 ECP (All) Scenario)

- Loss of Cahir_Doon_110 causes binding on Cahir_BarrymoreT_110_1
- Loss of Cahir_Doon_110 causes binding on Knockraha_BarrymoreT_110_1
- Loss of Killonan_Knockraha_220 causes binding on Knockraha_BarrymoreT_110_1

Total Dispatch Down in Area H1

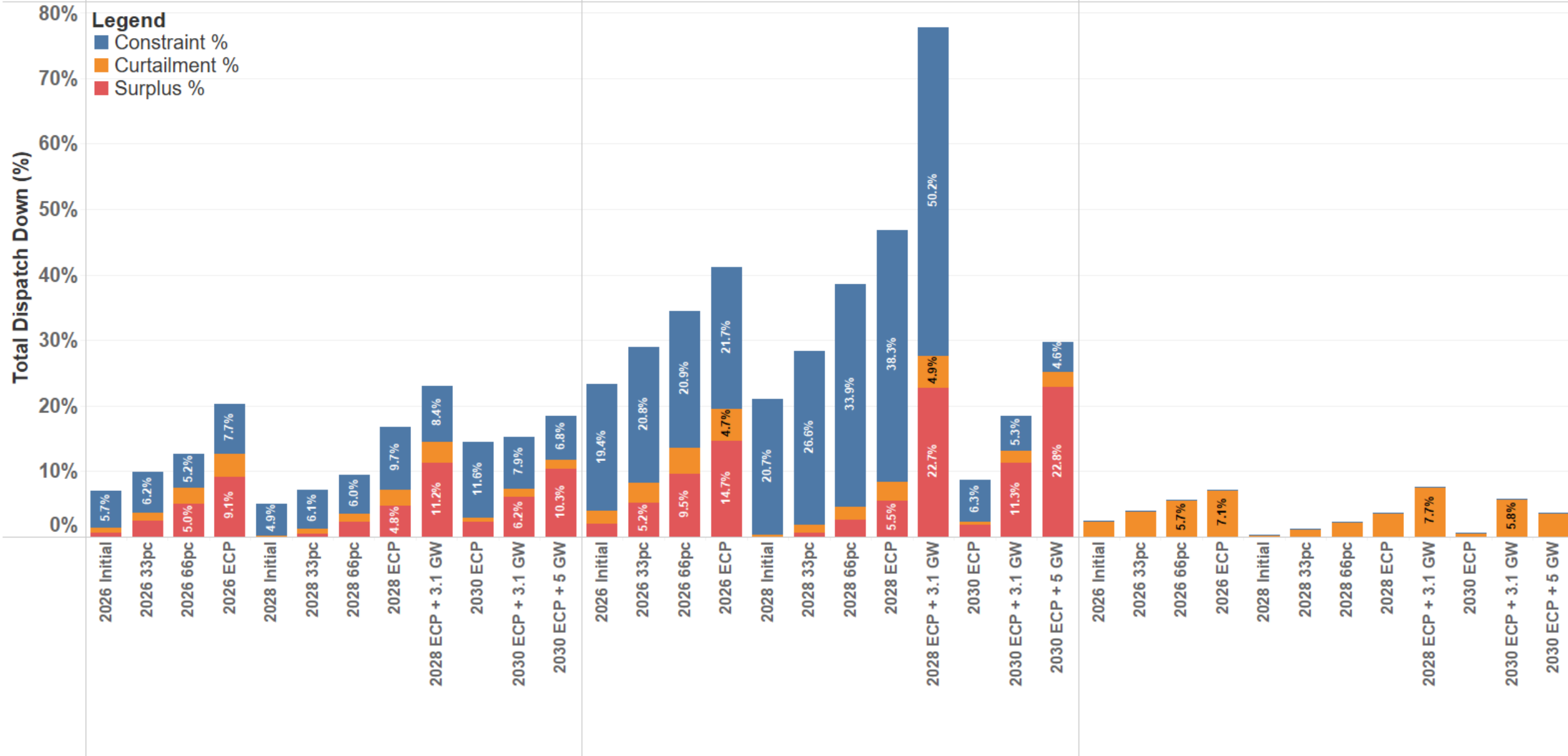
H1 solar

solar non-priority

H1 wind

wind non-priority

wind priority



Total Dispatch Down in Area H2

H2 & K solar

solar non-priority

H2 & K wind

wind non-priority

wind priority

Legend

- Constraint %
- Curtailment %
- Surplus %

25%

20%

15%

10%

5%

0%

Total Dispatch Down (%)

Scenario	Surplus %	Curtailment %	Constraint %	Total Dispatch Down (%)
2026 Initial	0.0%	0.5%	3.7%	4.2%
2026 33pc	2.4%	1.5%	3.9%	7.8%
2026 66pc	5.0%	2.5%	4.5%	12.0%
2026 ECP	9.1%	3.5%	5.6%	18.2%
2028 Initial	0.0%	0.0%	4.9%	4.9%
2028 33pc	0.5%	0.5%	3.5%	4.5%
2028 66pc	2.2%	1.2%	2.9%	6.3%
2028 ECP	4.8%	2.3%	4.6%	11.7%
2028 ECP + 3.1 GW	11.2%	3.3%	3.3%	17.8%
2030 ECP	2.3%	0.5%	4.1%	6.9%
2030 ECP + 3.1 GW	6.2%	1.0%	2.8%	10.0%
2030 ECP + 5 GW	10.3%	1.5%	2.6%	14.4%
2026 Initial	1.7%	1.7%	16.9%	20.3%
2026 33pc	4.3%	2.7%	9.6%	16.6%
2026 66pc	8.2%	3.6%	7.0%	18.8%
2026 ECP	12.9%	4.4%	5.1%	22.4%
2028 Initial	0.0%	0.0%	7.6%	7.6%
2028 33pc	0.5%	0.5%	5.7%	6.7%
2028 66pc	2.3%	1.7%	4.6%	8.6%
2028 ECP	4.7%	2.7%	3.9%	11.3%
2028 ECP + 3.1 GW	20.8%	4.8%	2.0%	27.6%
2030 ECP	1.2%	0.4%	4.6%	6.2%
2030 ECP + 3.1 GW	9.9%	1.7%	1.8%	13.4%
2030 ECP + 5 GW	19.4%	2.2%	1.8%	23.4%
2026 Initial	2.0%	0.0%	0.0%	2.0%
2026 33pc	3.5%	0.0%	0.0%	3.5%
2026 66pc	5.0%	0.0%	0.0%	5.0%
2026 ECP	6.4%	0.0%	0.0%	6.4%
2028 Initial	0.0%	0.0%	0.0%	0.0%
2028 33pc	0.5%	0.0%	0.0%	0.5%
2028 66pc	2.0%	0.0%	0.0%	2.0%
2028 ECP	3.3%	0.0%	0.0%	3.3%
2028 ECP + 3.1 GW	7.4%	0.0%	0.0%	7.4%
2030 ECP	0.1%	0.0%	0.0%	0.1%
2030 ECP + 3.1 GW	5.5%	0.0%	0.0%	5.5%
2030 ECP + 5 GW	3.5%	0.0%	0.0%	3.5%

Total Dispatch Down in Area K

H2 & K solar

solar non-priority

H2 & K wind

wind non-priority

wind priority

Legend

- Constraint %
- Curtailment %
- Surplus %

25%

20%

15%

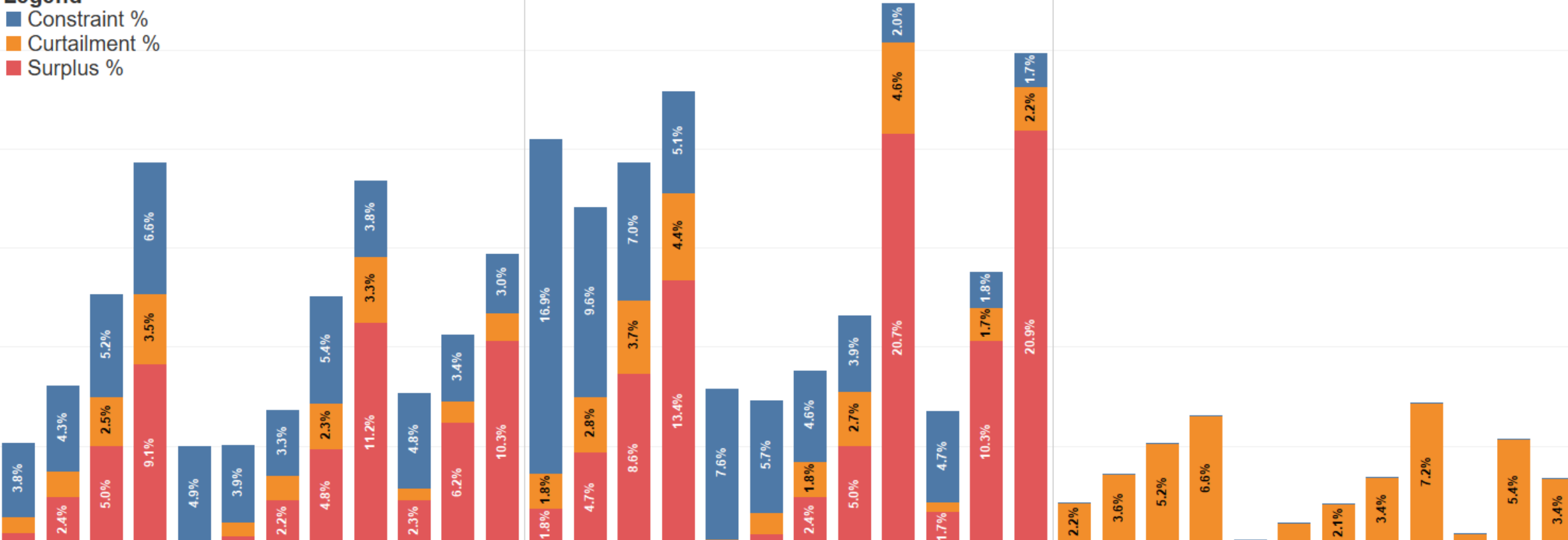
10%

5%

0%

Total Dispatch Down (%)

2026 Initial
2026 33pc
2026 66pc
2026 ECP
2028 Initial
2028 33pc
2028 66pc
2028 ECP
2028 ECP + 3.1 GW
2030 ECP
2030 ECP + 3.1 GW
2030 ECP + 5 GW
2026 Initial
2026 33pc
2026 66pc
2026 ECP
2028 Initial
2028 33pc
2028 66pc
2028 ECP
2028 ECP + 3.1 GW
2030 ECP
2030 ECP + 3.1 GW
2030 ECP + 5 GW
2026 Initial
2026 33pc
2026 66pc
2026 ECP
2028 Initial
2028 33pc
2028 66pc
2028 ECP
2028 ECP + 3.1 GW
2030 ECP
2030 ECP + 3.1 GW
2030 ECP + 5 GW



Area G & J

Year	Number of Reinforcements/Projects
2026	15
2028	4
Future Grid	25

- 2026 - 15 reinforcements
- 2028 - 4 reinforcements
- Future Grid - 25 reinforcements
- Area G - 1 GW solar generation
- Area J - 1.5 GW solar generation
- TDD reduced in Future Grid due to reinforcements.



A, B & G

G North

B South

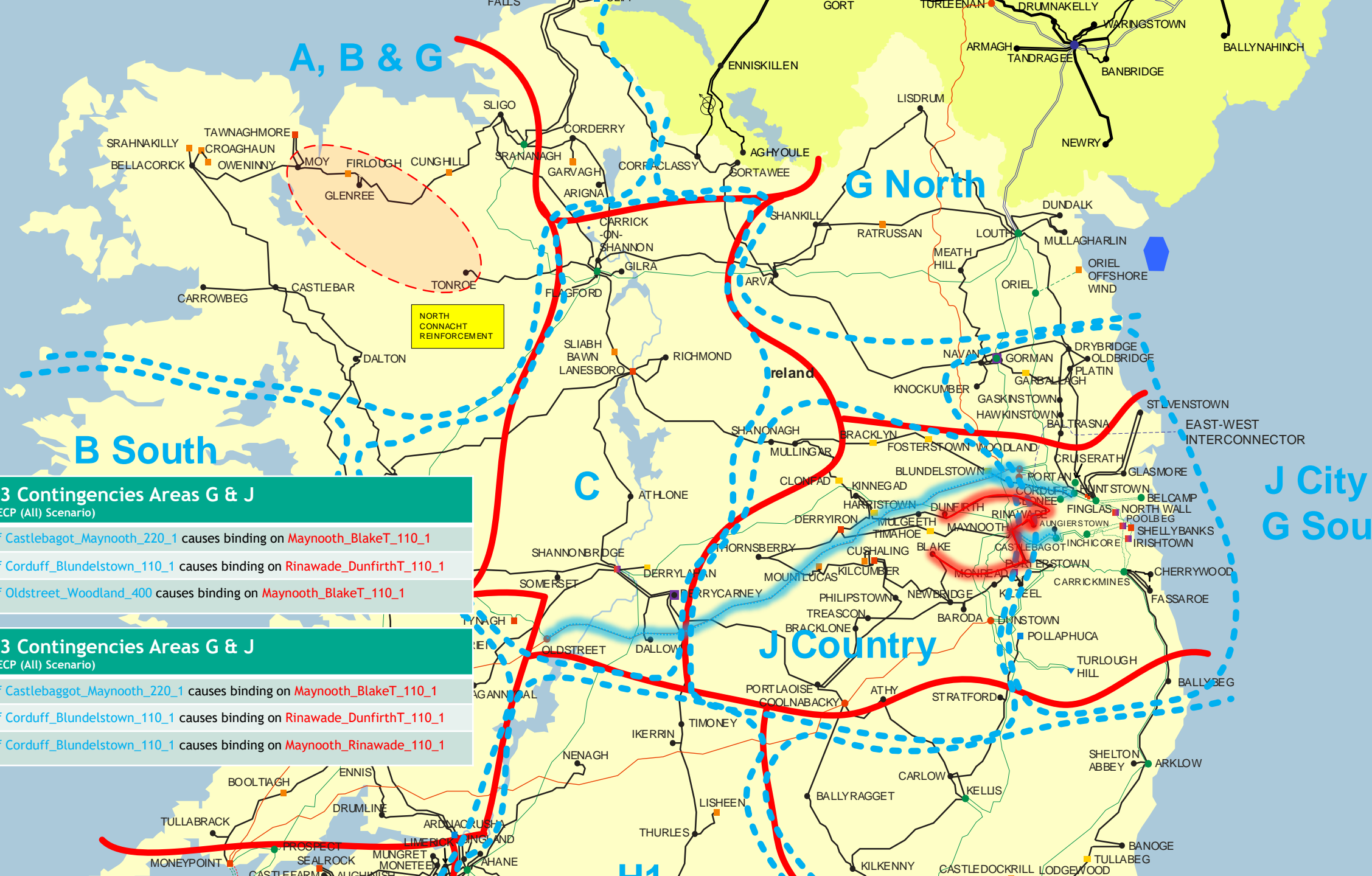
J City & G South

Top 3 Contingencies Areas G & J
(2026 ECP (All) Scenario)

- Loss of Castlebagot_Maynooth_220_1 causes binding on Maynooth_BlakeT_110_1
- Loss of Corduff_Blundelstown_110_1 causes binding on Rinawade_DunfirthT_110_1
- Loss of Oldstreet_Woodland_400 causes binding on Maynooth_BlakeT_110_1

Top 3 Contingencies Areas G & J
(2028 ECP (All) Scenario)

- Loss of Castlebagot_Maynooth_220_1 causes binding on Maynooth_BlakeT_110_1
- Loss of Corduff_Blundelstown_110_1 causes binding on Rinawade_DunfirthT_110_1
- Loss of Corduff_Blundelstown_110_1 causes binding on Maynooth_Rinawade_110_1



H1

Total Dispatch Down in Area G

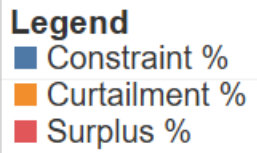
G North solar

solar non-priority

G North wind

wind non-priority

wind priority



Total Dispatch Down (%)

25%

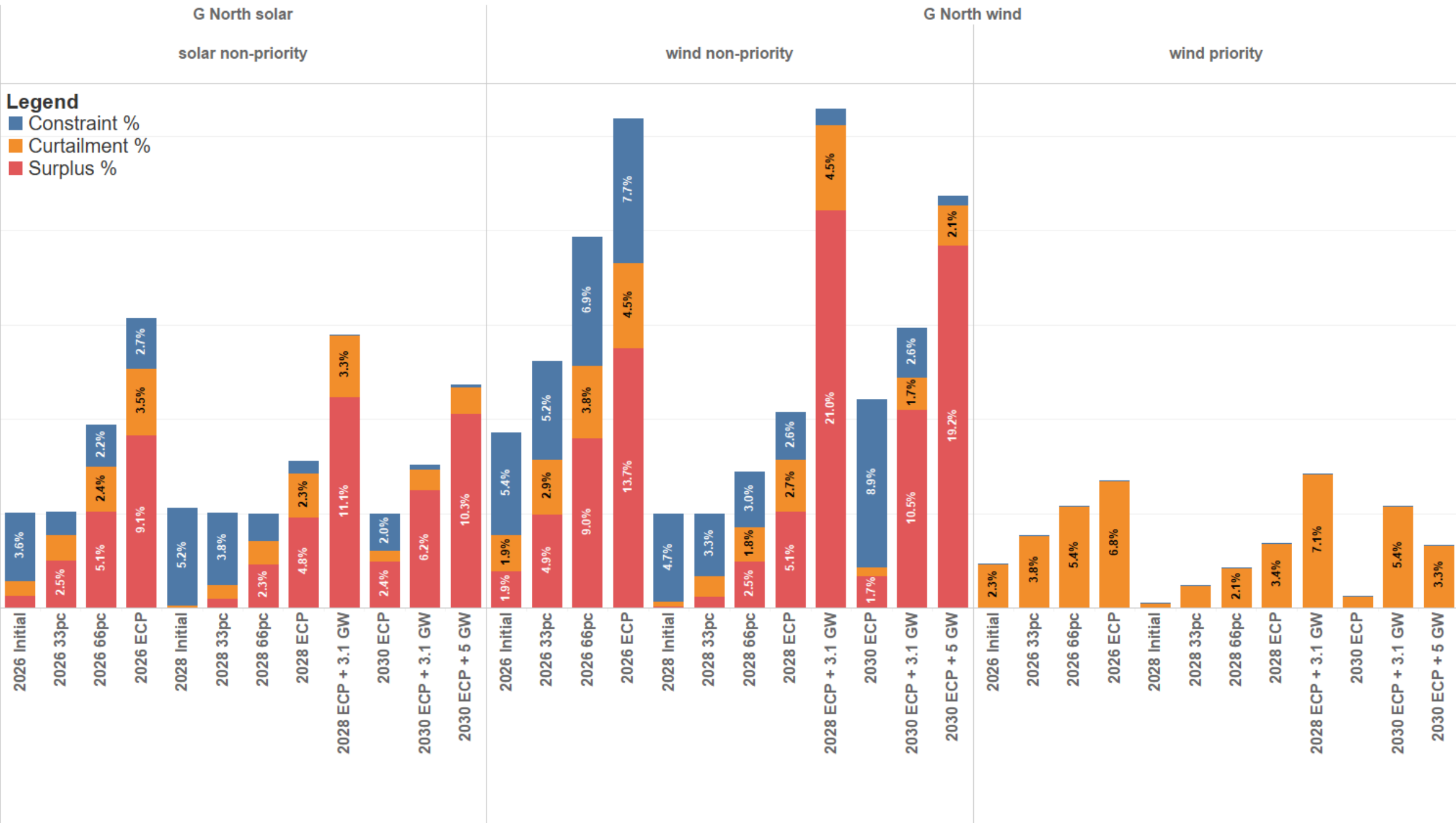
20%

15%

10%

5%

0%



Total Dispatch Down in Area J

J City, G South solar
solar non-priority

J City, G South wind
wind non-priority

J Country solar
solar non-priority

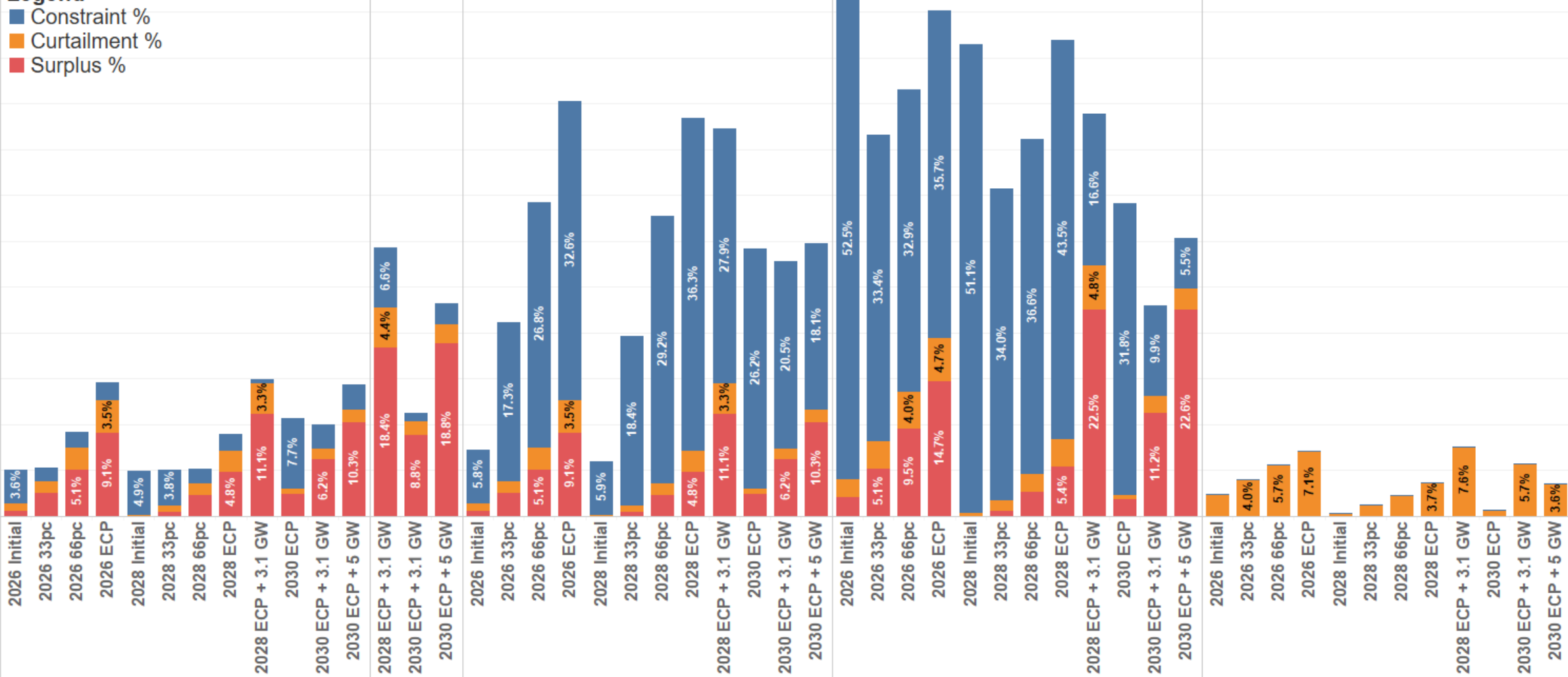
wind non-priority

J Country wind

wind priority

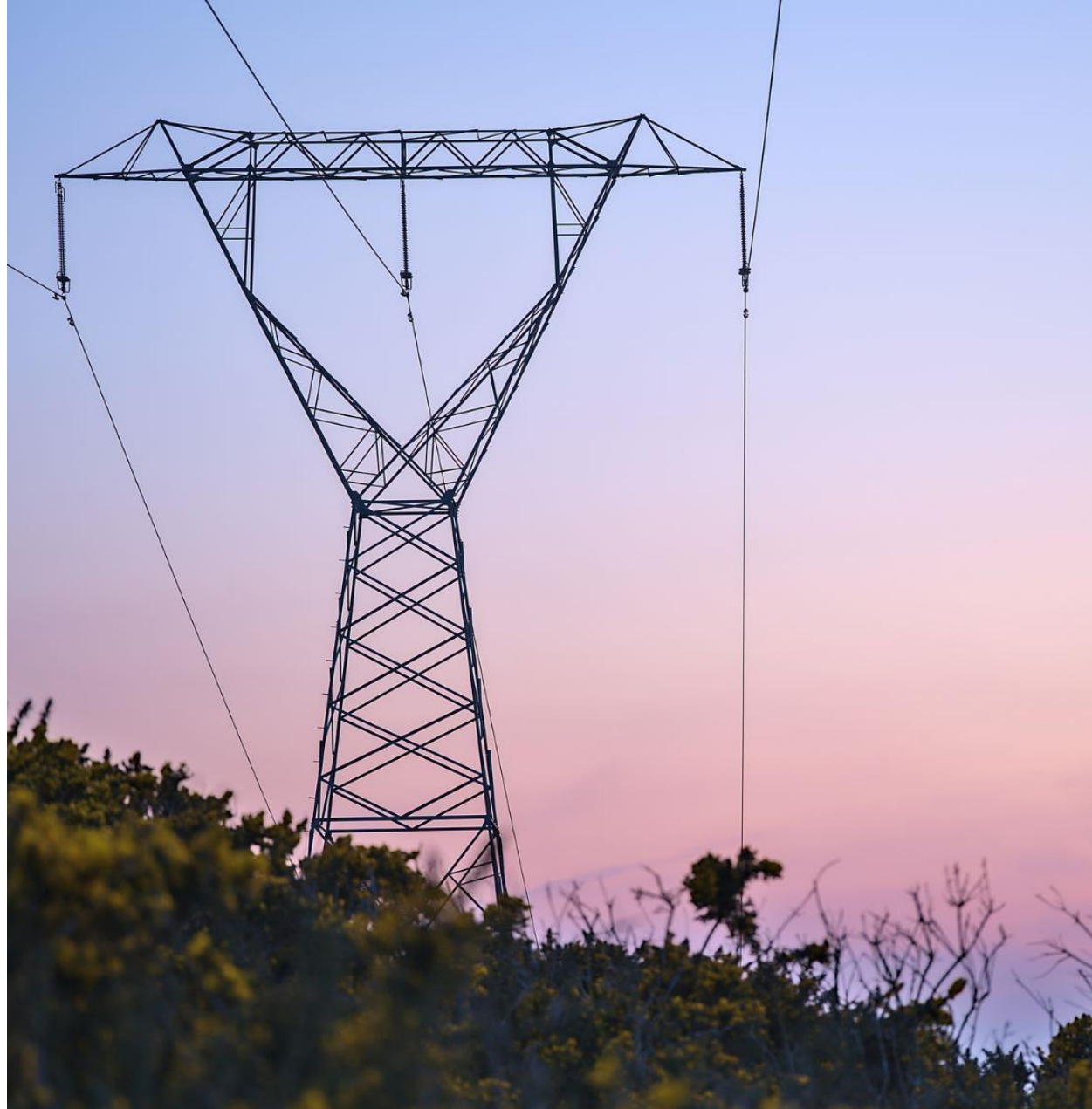
Legend
■ Constraint %
■ Curtailment %
■ Surplus %

Total Dispatch Down (%)



Key Messages

- Grandfathering of constraints leads to significantly higher volumes of TDD for non-priority generators.
- TDD is reducing from 2026 to 2028, main reason is the reduction in surplus and curtailment due to additional demand and interconnection along with relaxation of operational constraints.
- While constraints increase from 2026 to 2028 these reduce by 2030/Future Grid due to additional network reinforcements.



Questions

