

Embedded Generation Behaviours & Customer Demand Management



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What is Demand?

Large Power Station

Embedded
Generation

Micro
Generation

Station Load

HV Transmission
Losses

LV Transmission
Losses

Initial National
Demand Outturn

Electricity
Transmission System
Demand

National Demand

Pump Storage
Demand

Interconnector Exports

Pump Storage
Generation

Interconnector Imports

Total Load Per
Bidding Zone

Demand Definitions

	Supply from GSPs	Metered Generation	Station Load	Pump Storage Pumping Load	Interconnector Exports	Transmission Losses	Embedded Large Power Stations
NG Website							
INDO - Initial National Demand Outturn		✓	X	X	X	✓	
IO14_Demand		✓	✓	X	X	✓	
IO14 TGSD		✓	✓	✓	✓	✓	
BM Reports							
TSD - Transmission System Demand							
TSDf - Transmission System Demand Forecast		✓	✓	✓	✓	✓	
ITSDO - Initial Transmission System Demand Out-Turn		✓	✓	✓	✓	✓	
National Demand Forecast		✓	X	X	X	✓	
INDO - Initial National Demand Outturn		✓	X	X	X	✓	
Grid Code							
National Demand - Grid Code	✓		X	X	X	✓	✓
National Electricity Transmission System Demand	✓		✓	✓	✓	✓	✓

European Transparency Regulations

15.6.2013

EN

Official Journal of the European Union

L 163/1

II

(Non-legislative acts)

REGULATIONS

COMMISSION REGULATION (EU) No 543/2013

of 14 June 2013

on submission and publication of data in electricity markets and amending Annex I to Regulation (EC) No 714/2009 of the European Parliament and of the Council

(Text with EEA relevance)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

gration and the rapid development of intermittent renewable energy generation sources such as wind and solar require the disclosure of complete, timely available, high quality and easily digestible information relating to supply and demand fundamentals.

European Transparency Regulations

- ETR requires all EU members to publish market data, much of it close to real time
- Data includes
 - Total Load
 - Unavailability of Demand
 - Forecast Margins
 - Unavailability of transmission infrastructure
 - Cross Zonal Capacities and Use
 - Congestion Management Measures
 - Generation – Forecast, Actual and Unavailability
 - Balancing Data

European Transparency Regulations

- Information National Grid is required to publish includes:
 - Outturn total load – one hour after end of each settlement period
 - Day-ahead forecast of total load per settlement period at 1200 on D-1, updated if forecast changes by more than 10%
 - Week-ahead forecast of daily maximum and minimum total load (Monday – Sunday) by 1400 on Friday. Updated if forecast changes by more than 10%
 - Month-ahead forecast of weekly maximum and minimum total load, one week before first day of month.
 - Year-ahead forecast of weekly maximum and minimum total load, by 15th of each month for following 12 months.

European Transparency Regulations

- Total Load Per Bidding Zone is defined as “equal to the sum of power generated by plants on both TSO/DSO networks “

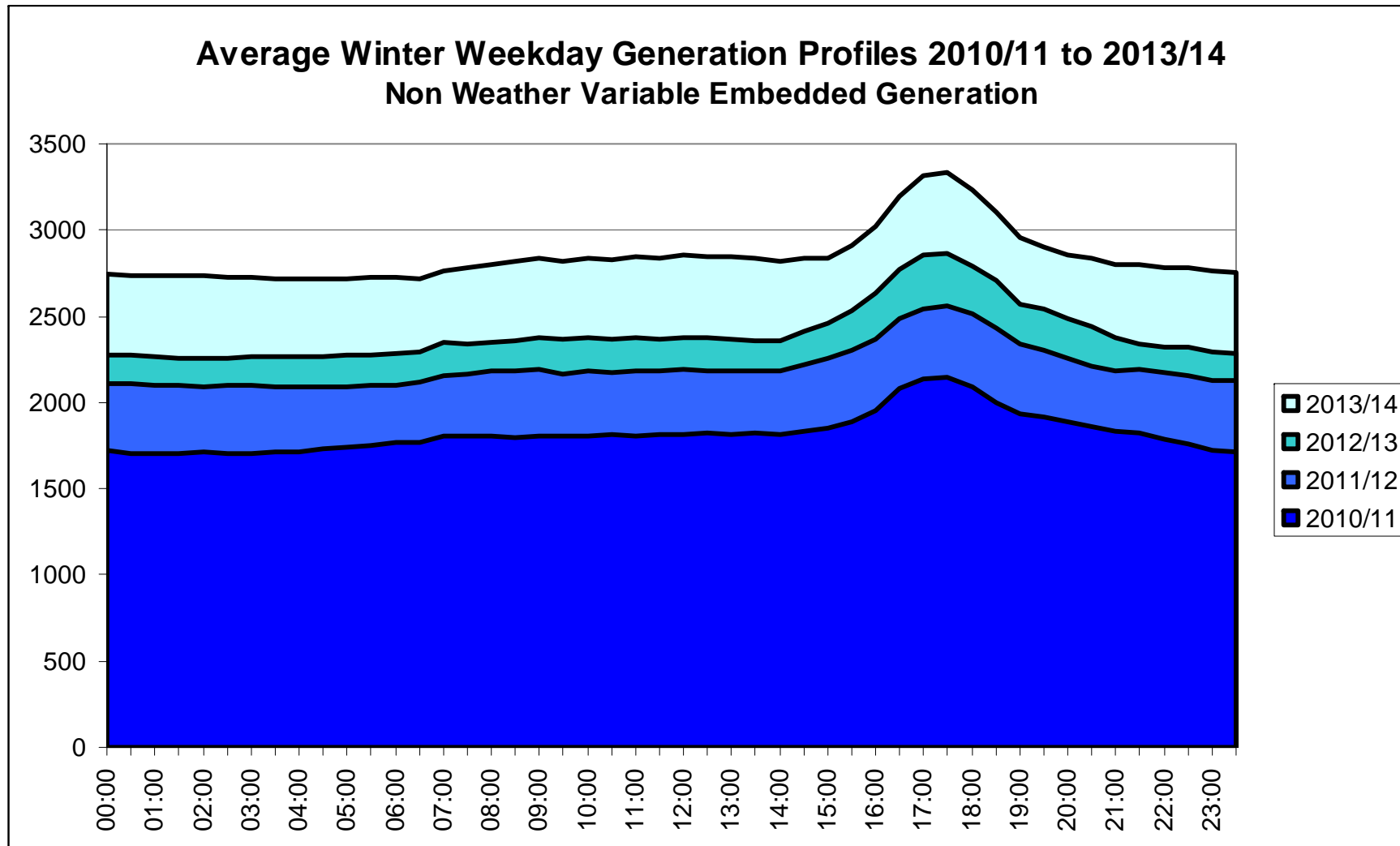
Demand Definitions

	Supply from GSPs	Metered Generation	Station Load	Pump Storage Pumping Load	Interconnector Exports	Transmission Losses	Embedded Large Power Stations	Embedded Non Weather Variable Generation > 1MW	Embedded Wind > 1MW	Embedded PV > 1MW
NG Website										
INDO - Initial National Demand Outturn		✓	X	X	X	✓				
IO14_Demand		✓	✓	X	X	✓				
IO14 TGSD		✓	✓	✓	✓	✓				
BM Reports										
TSD - Transmission System Demand										
TSDf - Transmission System Demand Forecast		✓	✓	✓	✓	✓				
ITSDO - Initial Transmission System Demand Out-Turn		✓	✓	✓	✓	✓				
National Demand Forecast		✓	X	X	X	✓				
INDO - Initial National Demand Outturn		✓	X	X	X	✓				
Grid Code										
National Demand - Grid Code	✓		X	X	X	✓	✓			
National Electricity Transmission System Demand	✓		✓	✓	✓	✓	✓			
European Transparency Regulations										
ETR Total Load		✓	✓	✓	✓	✓		✓	✓	✓

Embedded Generation Behaviours

- Until now, our models have implicitly assumed consistent behaviour of ‘conventional’ (non-weather variable) embedded generation
- We are starting to see variations in the behaviour of this plant year on year
- In order to comply with the European Transparency Regulations we have developed models of embedded generation
- Non-weather variable embedded generation has increased in recent years

Embedded Generation Behaviours

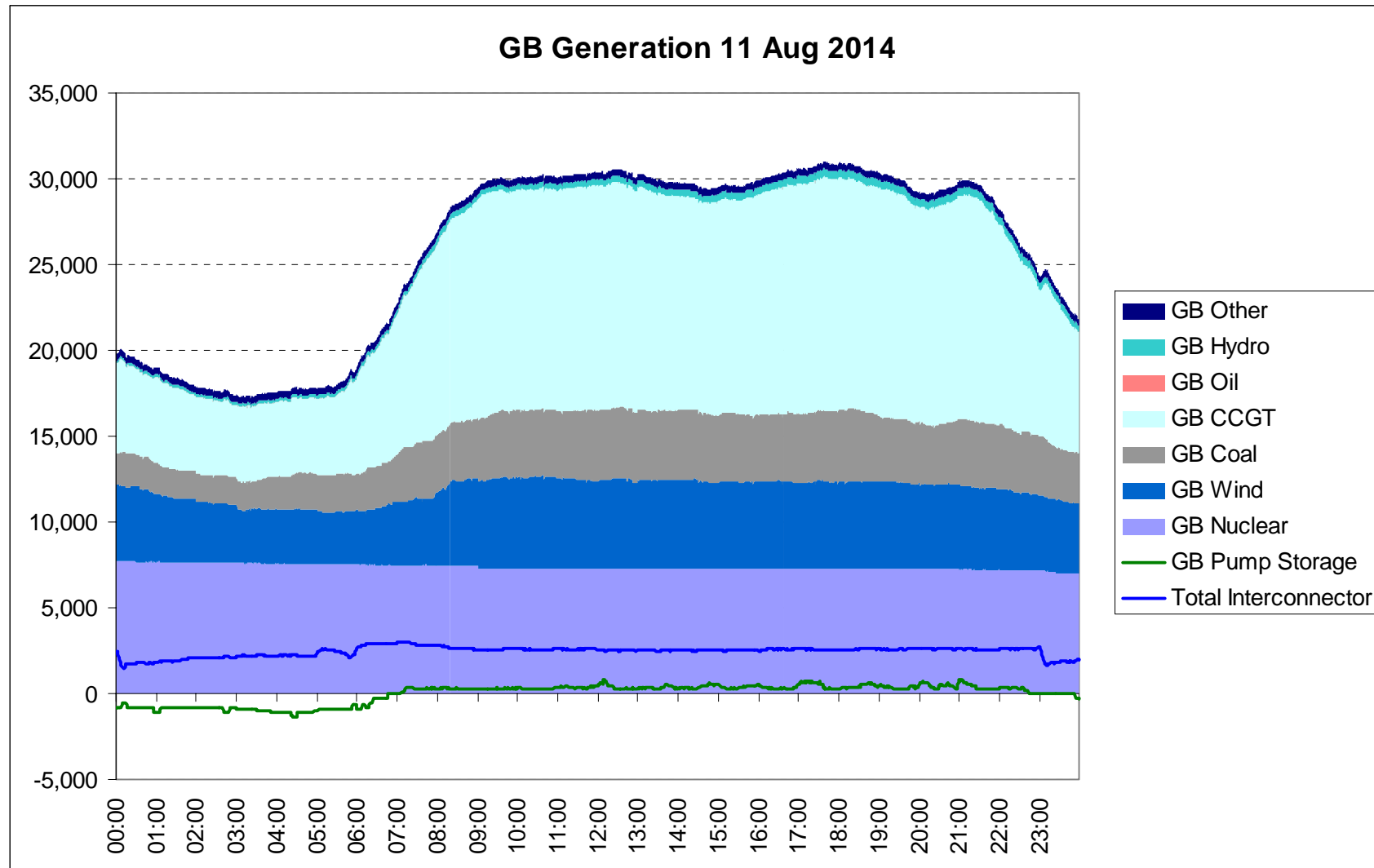


Embedded Generation Behaviours

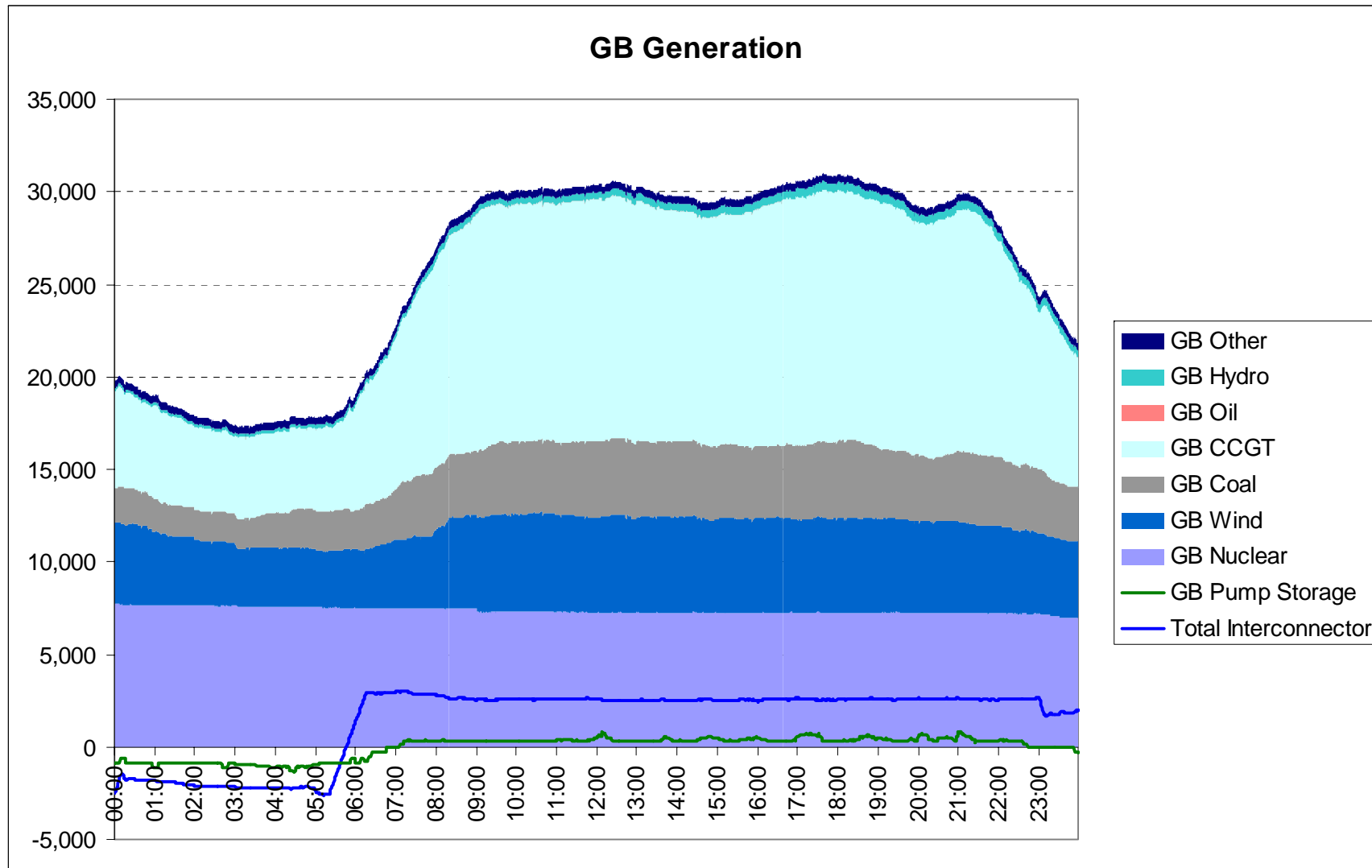
- Base generation has increased by 1 GW since 10/11
- Peak generation has increased by 1.2 GW since 10/11
- Ratio of Peak to Base much the same (about 1.25)
- According to Digest of UK Energy Statistics (DUKES) embedded generation capacity increase by 147 MW between 2011 and 2014
- It would appear that embedded generators are running at higher load factors

Back to Demand Definitions

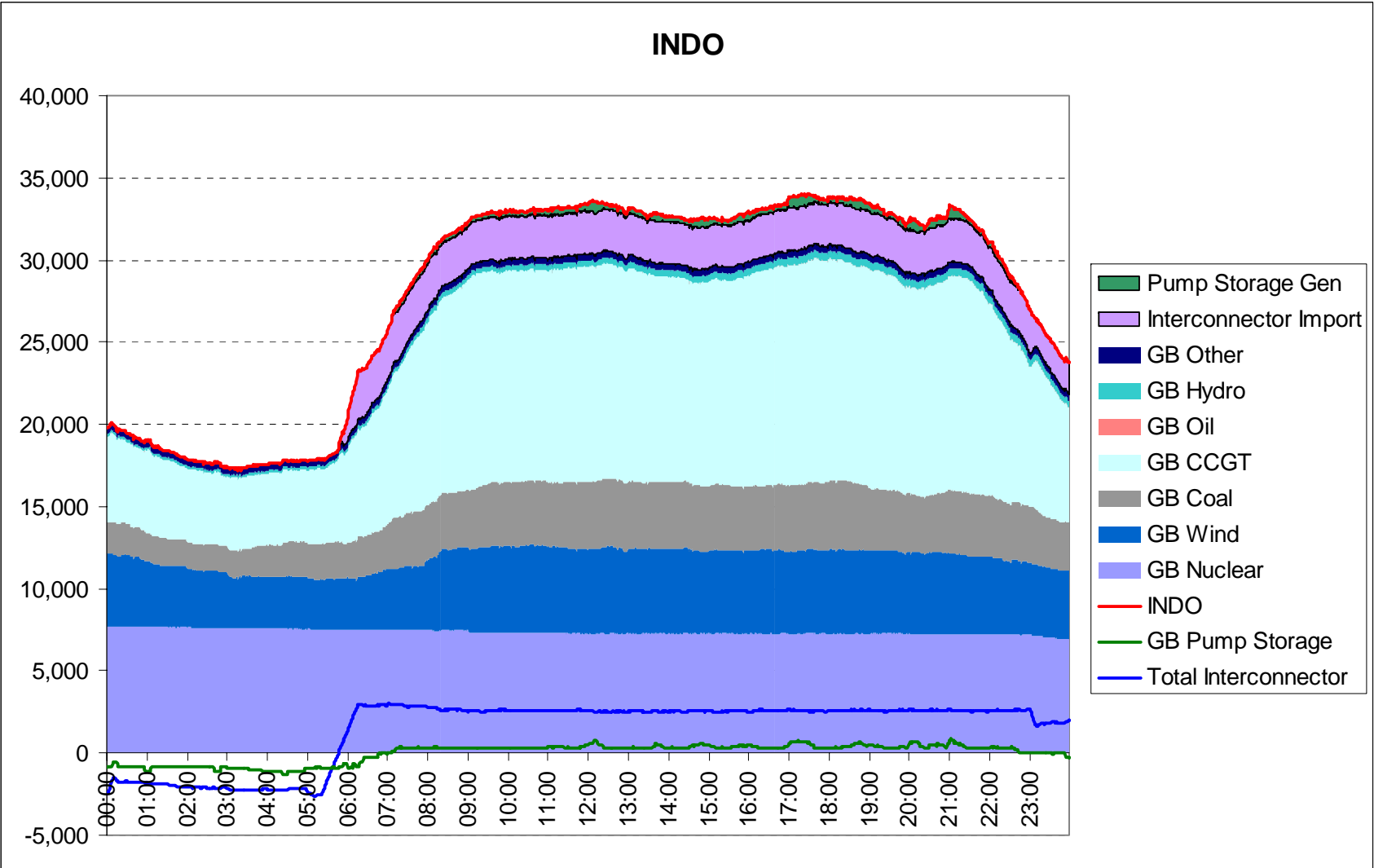
Demand Definitions – Starting Point



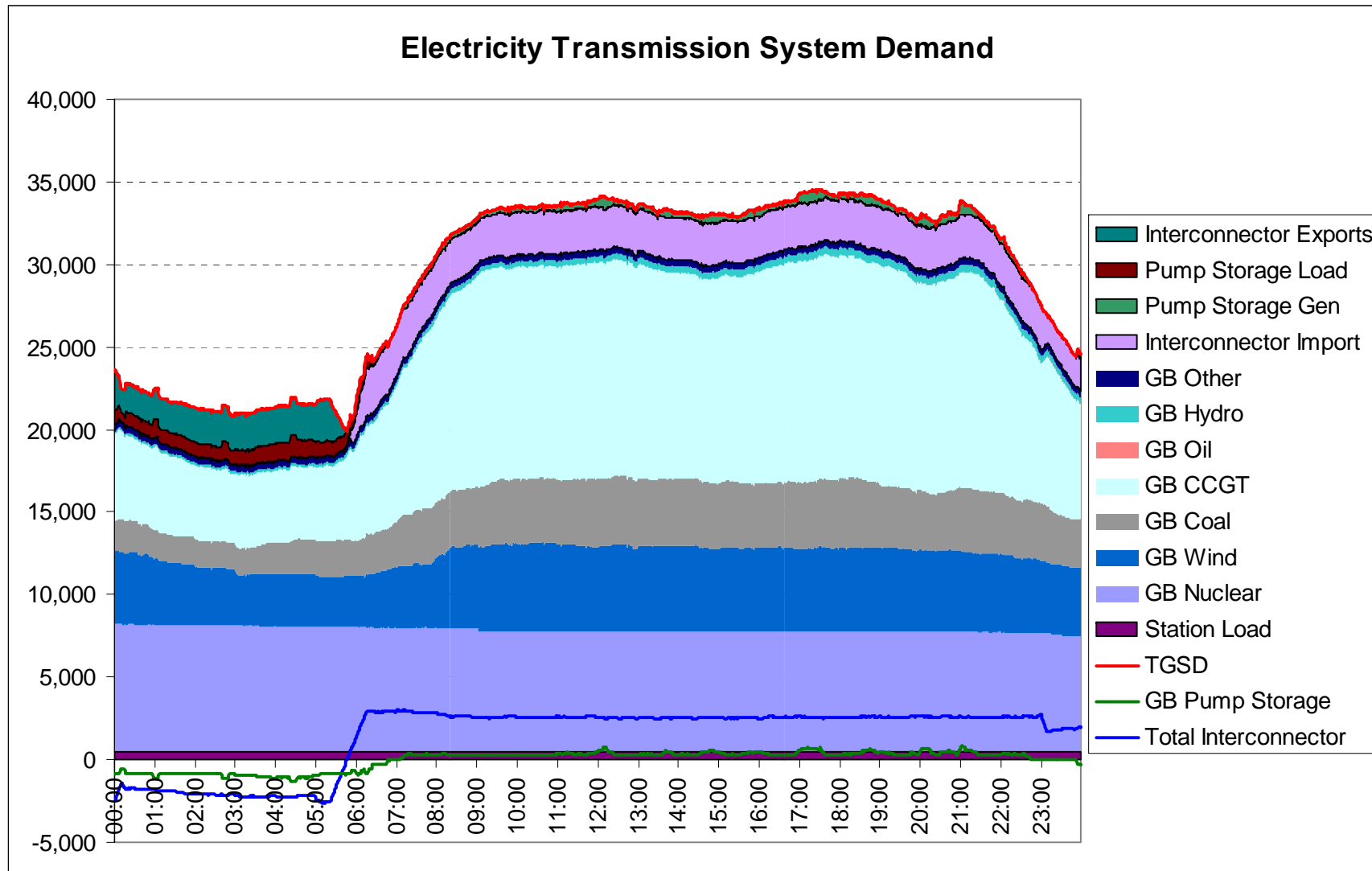
Demand Definitions – Modified for Illustration



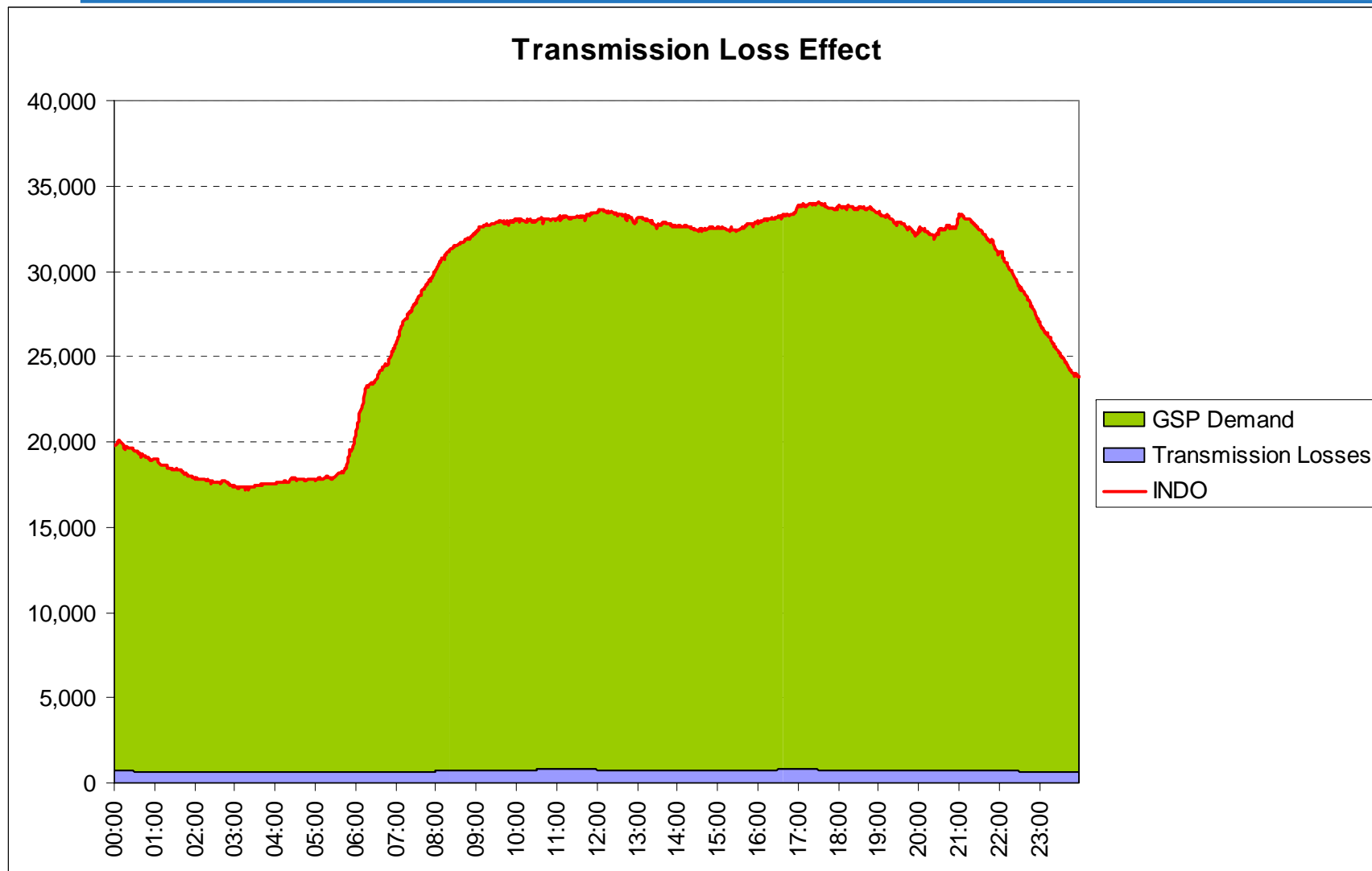
Initial National Demand Outturn



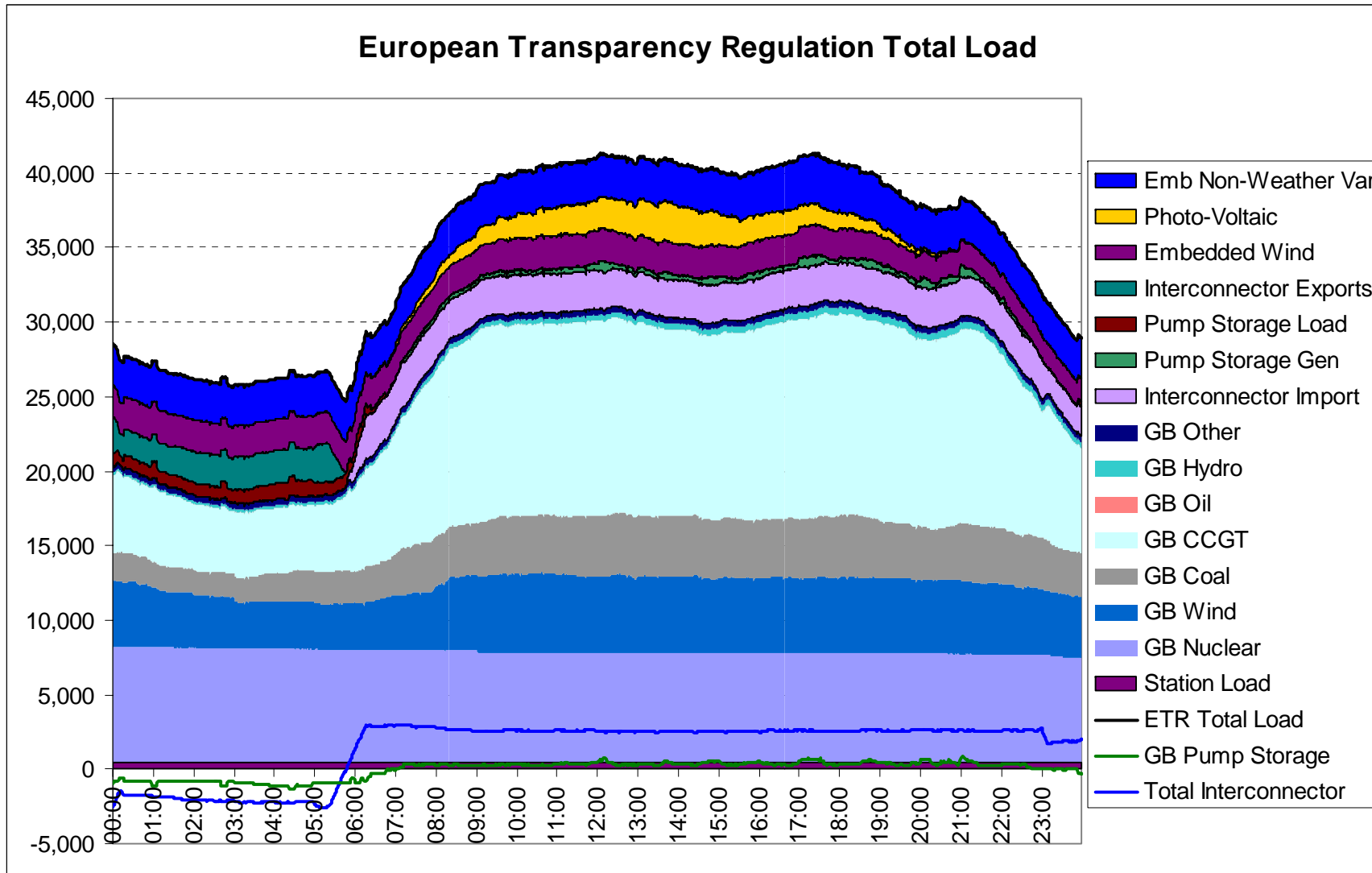
Electricity Transmission System Demand



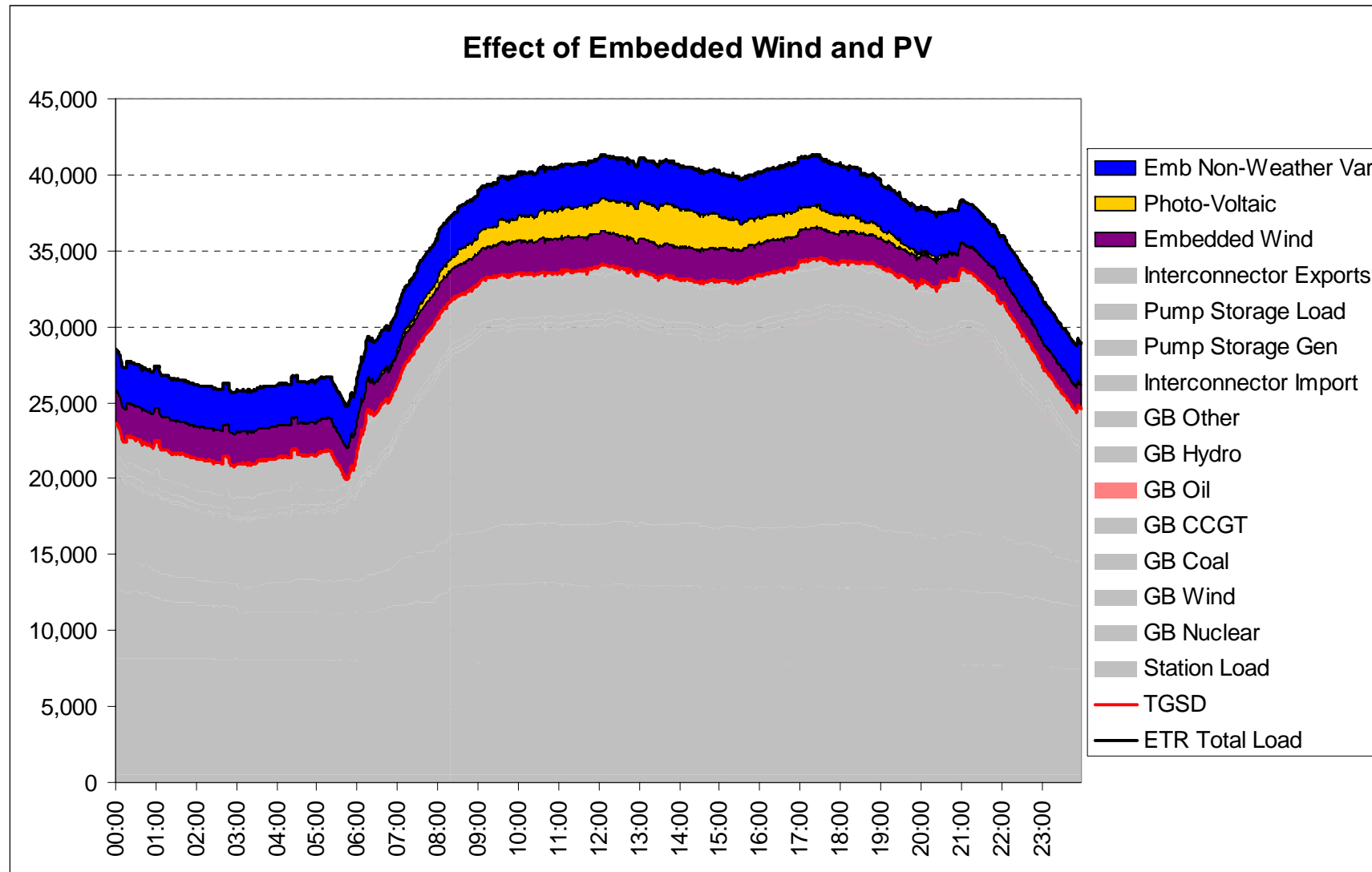
Where Have Transmission Losses Gone?



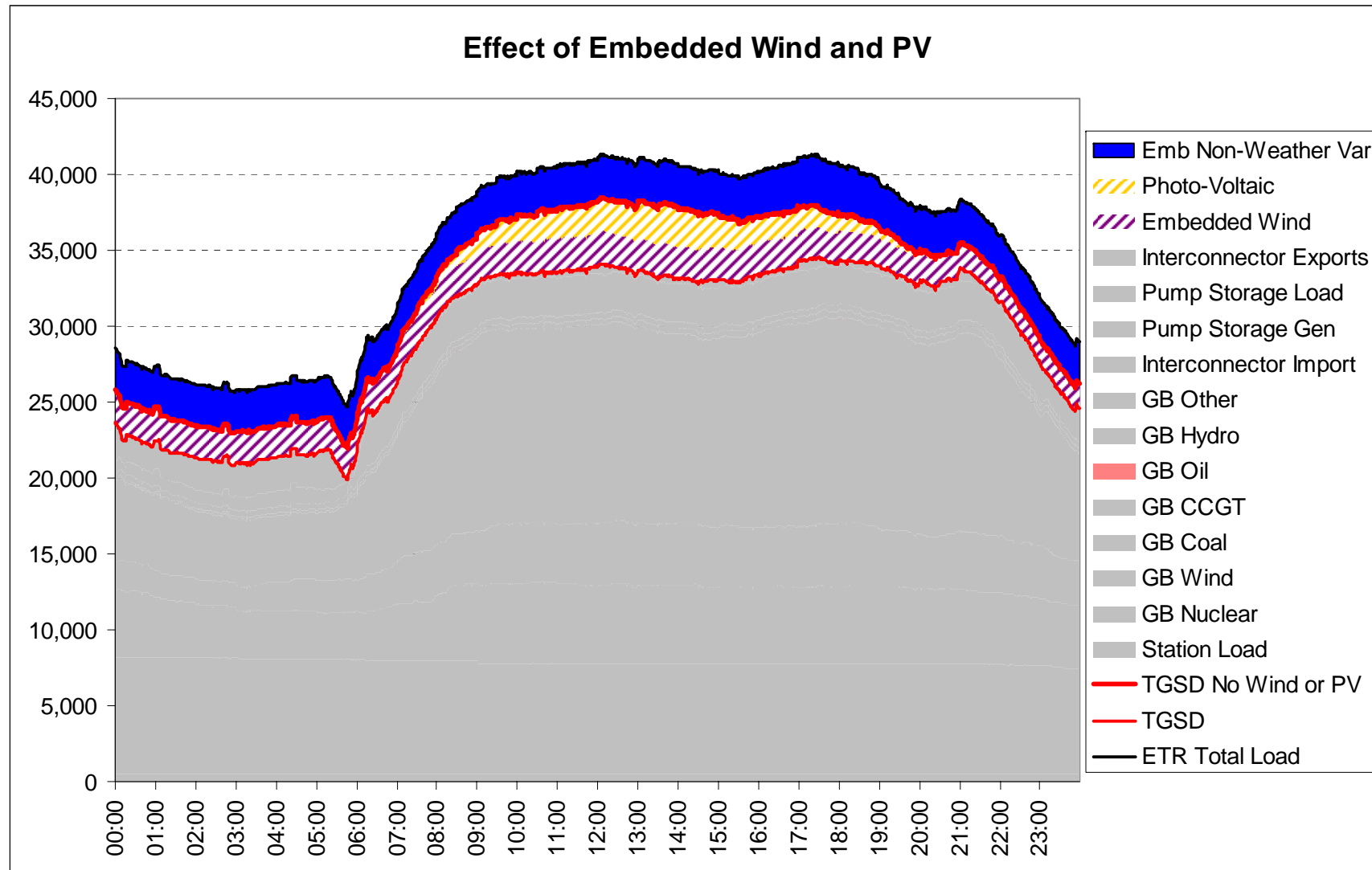
ETR Total Load



Effect of Weather Variable Embedded Generation



Effect of Weather Variable Embedded Generation



Customer Demand Management

Customer Demand Management

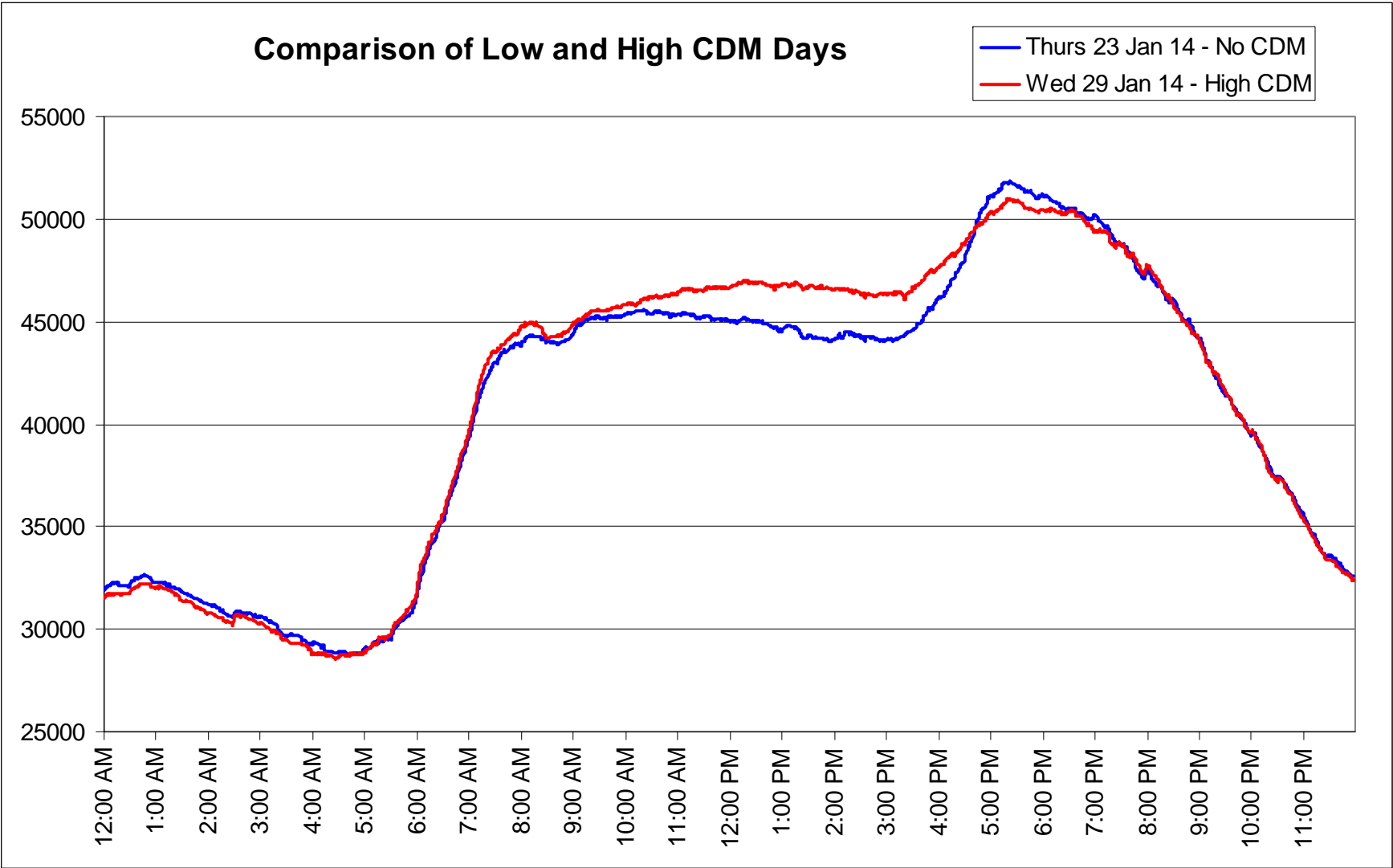
- Grid Code Defines Customer Demand Management as:

Reducing the supply of electricity to a **Customer** or disconnecting a **Customer** in a manner agreed for commercial purposes between a **Supplier** and its **Customer**.

Customer Demand Management

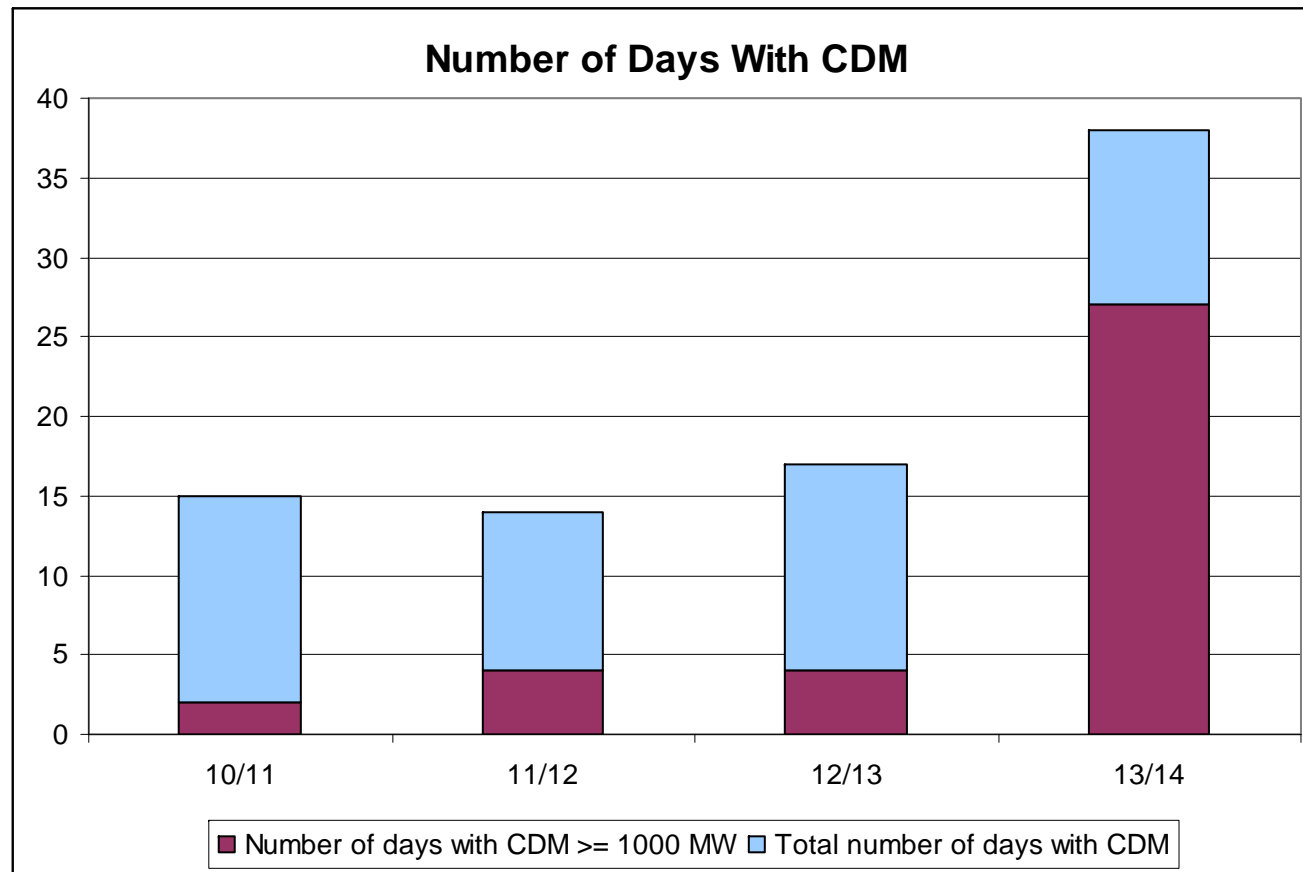
- National Grid can not measure CDM
- CDM can be estimated by looking at shape of demand curve at darkness peak – CDM gives flatter profile over peak

Customer Demand Management



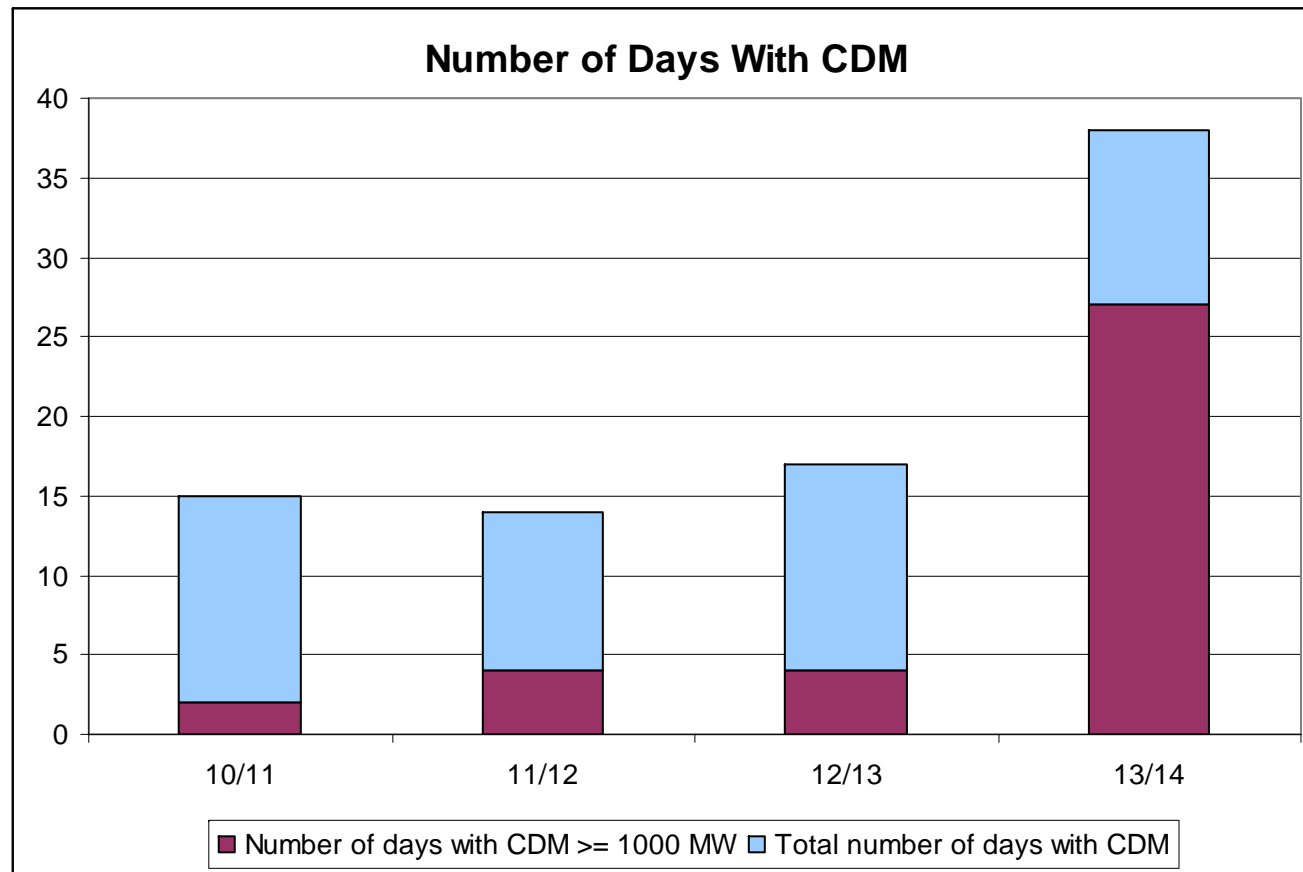
Customer Demand Management

- CDM significantly increased last year



Customer Demand Management

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Customer Demand Management

- CDM significantly increased last year
 - 27 days with CDM estimated to be 1000 MW or more compared with 10 such days in previous three years combined.
- Partially driven by Triad Avoidance
 - Last year was very hard to forecast Triads
- Partially driven by changes in customer behaviour
- We anticipate high levels of CDM this year

Customer Demand Management

- We have developed new model of CDM
- This will NOT feed into our day ahead forecasts
- All our forecasts at Day Ahead or longer timescales assume no CDM
 - If we include CDM in our forecasts then forecast demand is lower, and so less CDM will occur.
- Within Day forecasts INCLUDE CDM – published data comes direct from systems used by Control Room and so reflect forecast actual demand
- CDM Will be included in overnight forecasts by Control Room from 1930 on day ahead

Help Us Forecast Better

■ Grid Code OC1 says

OC1.5.5.2 Customer Demand Management

- (a) Each **Supplier** will notify **NGET** of any **Customer Demand Management** proposed by itself which may result in a **Demand** change equal to or greater than the **Customer Demand Management Notification Level** averaged over any half hour on any **Grid Supply Point** which is planned to occur at any time in the **Control Phase** and of any changes to the planned **Customer Demand Management** already notified to **NGET** as soon as possible after the formulation of the new plans.

Customer Demand Management Notification Level

The level above which a **Supplier** has to notify **NGET** of its proposed or achieved use of **Customer Demand Management** which is 12 MW in England and Wales and 5 MW in Scotland.

Help Us Forecast Better

- Grid Code OC1 says

OC 1.5.6 (b) Customer Demand Management

Each **Supplier** will supply MW profiles of the amount and duration of **Demand** reduction achieved by itself from the use of **Customer Demand Management** equal to or greater than the **Customer Demand Management Notification Level** (averaged over any half hour on any **Grid Supply Point**) on a half hourly and **Grid Supply Point** basis during the previous calendar day.

Help Us Forecast Better

- Some Suppliers still give us data
- Some have fallen out of the habit
- We are seeking to engage with Suppliers through several different routes to improve data flows to allow us to better forecast CDM

Help Us Forecast Better

- Grid Code requirements are out of date
- We would like to know if you plan to do on-the-day discretionary despatch of demand and generation
- At present we are not asking for the post event data, just a warning of plans for the next day
- Please send CDM plans / forecasts to Demand.Forecasting@nationalgrid.com by 1600 on day ahead



Q&A

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