Transmission Losses Seminar

Modification Proposals P198, P200 P203 and P204

5 July 2006

ELEXON

Welcome and Introduction

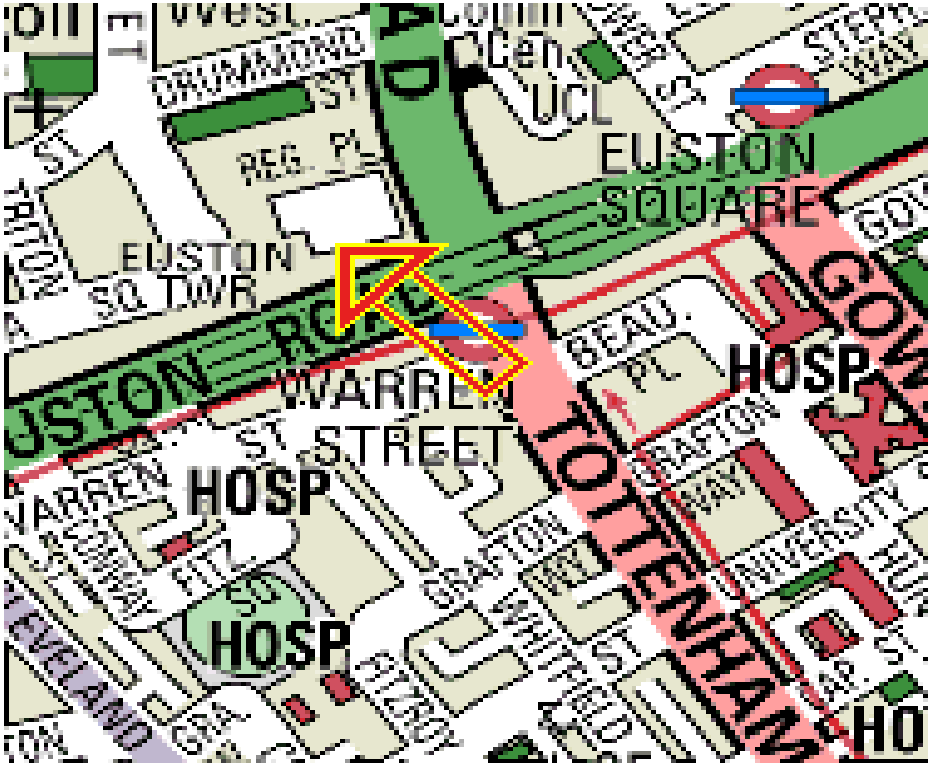
Sarah Jones

Health & Safety Information

- Please see the **'Important Information'** leaflets in reception and the meeting rooms for **Fire procedures** and **facilities** information;
- **Evacuation points** are shown on the **diagrams** on the **meeting room walls**;
- In the case of an **alarm,** please **follow the instructions** of the **Fire Wardens.**

ELEXON Evacuation Muster Point

- Opposite Prêt, adjacent to the wavy grass



Aims of Seminar

- **P198** and **P200** consultations were issued on 30 June and close on **14 July 2006**
- Seminar supports consultation process by:
  - Providing overview of P198 and P200 consultation documents
  - Providing opportunity for participant questions
- Also provides a brief overview of the two new losses modifications **P203** and **P204**

Agenda

10:00	Welcome and Introduction *(Sarah Jones)*
10:05	Explanation of Current Allocation *(Kathryn Coffin)*
10:10	Overview of P198 *(Kathryn Coffin)*
11:00	***Coffee Break***
11:30	Overview of P200 *(Justin Andrews)*
12:15	Overview of P203 and P204 *(Kathryn Coffin)*
12:25	Summary and Next Steps *(Sarah Jones)*
12:30	Questions
13:00	***Lunch***

Explanation of Current Allocation and Previous Modifications

Kathryn Coffin

Existing Arrangements (1)

- **Transmission Losses**: the difference between total generation and total demand in any given period
- 2 types of transmission losses:
  - **'Fixed' losses** (do not vary with power flow)
  - **'Variable' losses** (caused by heat and vary with power flow)

Existing Arrangements (2)

- Both fixed and variable losses currently treated equally
- **45%** of total losses allocated to **generation**, **55%** to **demand**
- Within this overall split, losses allocated to individual Parties on 'uniform' basis according to Metered Volumes

Existing Arrangements (3)

- 3 components to the transmission losses calculation:

1) **TLF** (a parameter for a non-uniform allocation of losses, currently set to zero)

2) **TLMO** (allocates losses not allocated through the TLF)

   - **$TLMO^{+}$** uniformly adjusts the Metered Volumes of all BM Units in delivering Trading Units, such that they receive 45% of total losses

   - **$TLMO^{-}$** uniformly adjusts the Metered Volumes of all BM Units in offtaking Trading Units, such that they receive 55% of total losses

3) **TLM** (the multiplier applied to BMU Metered Volumes)

   - $TLM = 1 + TLF + TLMO^{+/-}$

Previous Modification Proposals (1)

- 4 previous Modification Proposals raised in 2002:
  - **P75** & **P105** sought to allocate **all** losses on 'zonal' basis through the TLF (according to proportion caused by each Party)
  - **P82** sought to allocate only **variable** (heating) element of losses on zonal basis through the TLF, retaining uniform allocation of 'fixed' losses
  - **P109** sought to introduce a 'hedging' scheme to mitigate the impact of any change to the value of TLF

Previous Modification Proposals (2)

- P75, P105 and P109 **rejected** by Authority in 2003
- P82 initially **approved**, but subsequently rejected part-way through implementation in 2004 following a judicial review
- P198 is closely based on P82, whilst P200 shares some similarities with elements of both P82 and P109

Overview of P198

Kathryn Coffin

P198: Modification Proposal (1)

- P198 argues that existing arrangements perpetuate a **north-south divide** in generation and demand, since they do not provide signals to despatch and locate generation closer to demand
- P198 argues that this represents a **cross-subsidy**, whereby southern generators and northern Suppliers pay part of cost of transporting electricity to the south
- P198 therefore seeks to allocate losses to Parties according to the extent to which Parties give rise to them – providing signals for more economically efficient **despatch** and **location**

P198: Modification Proposal (2)

- **P198**:
  - Retains existing 45:55 overall allocation of total losses to generation and demand
  - Allocates only **variable** losses through zonal TLFs, to be calculated using a **Load Flow Model**
  - All BM Units within a Zone receive same TLF
  - Retains existing uniform allocation of remaining 'fixed' losses through TLMO (since location is not a determinant of the level of these losses)
  - Solution based on Modification Proposal **P82**

P198: Proposed Modification

- TLFs to be **annual** figures, with one value per TLF Zone (applied equally to generation and demand)
- TLFs to be calculated annually for each **BSC Year** (1 April – 31 March)
- TLFs to be calculated by a new BSC Agent – the **TLFA**
- TLFs to be calculated on '**ex-ante**' (forecast) basis using data from a previous Reference Year (1 Sep – 31 Aug)
- TLF Zones to be based on **GSP Groups**
- TLFs to be **scaled** to allocate correct level of variable losses
- TLFs to be published 3 months prior to use in Settlement
- No phased or 'hedged' implementation

P198: Alternative Modification (1)

- **TLFs to be seasonal figures, with one value per TLF Zone for each BSC Season**
- TLFs to be calculated annually for each BSC Year (1 April – 31 March)
- TLFs to be calculated by a new BSC Agent – the TLFA
- TLFs to be calculated on 'ex-ante' (forecast) basis using data from a previous Reference Year (1 September – 31 August)
- TLF Zones to be based on GSP Groups
- TLFs to be scaled to allocate correct level of variable losses
- TLFs to be published 3 months prior to use in Settlement
- **Linear phased implementation of TLFs over 4 years**

P198: Alternative Modification (2)

- BSC Seasons already defined in Section K:
  - BSC Spring: 1 March – 31 May
  - BSC Summer: 1 June – 31 August
  - BSC Autumn: 1 September – 30 November
  - BSC Winter: 1 December – 28 February
- Since Spring season spans the beginning of the BSC Year on 1 April, the new set of TLFs for each year would come into effect mid-way through this season
  - **There would therefore be a changeover in the Spring TLF value on 1 April each year**

P198: Alternative Modification (3)

- Seasonal TLFs would be **phased** in over **four years**, such that they were applied at:
  - **20%** of their full value in BSC Year 1
  - **40%** in BSC Year 2
  - **60%** in BSC Year 3
  - **80%** in BSC Year 4
  - **100%** in BSC Year 5 onwards
- Phasing applies equally to all BM Units

P198: Load-Flow Modelling

- P198 Group commissioned external load-flow modelling exercise to establish likely **magnitude** and **variability** of TLFs in first year of scheme (using 2005/2006 data)
- This allowed the Group to test the **sensitivity** of TLF values to various different scenarios – supporting consideration of potential Alternatives
- Full modelling report available from BSC Website

P198: Purpose of Load Flow Model

- **Load Flow Model** used to calculate how total variable (heating) losses on the system vary as the generation or demand at each Node varies
- Inputs to the model are **Network Data** (from National Grid) and **Metered Volumes** (from CDCA)
- **Nodes** represent points at which energy flows on or off the system, or where two circuits meet

P198: Calculation of Nodal TLFs (1)

- Load Flow Model calculates power flows along each circuit
- From the power flows, total variable losses on the system are derived
- The raw **Nodal TLF** for a given Node is the rate at which total variable losses vary with an incremental ('marginal') injection of power at that Node

P198: Calculation of Nodal TLFs (2)

- **+ve** TLFs are produced for Nodes where an incremental increase in generation or reduction in demand **decreases** losses
- **-ve** TLFs are produced for Nodes where an incremental increase in generation or reduction in demand **increases** losses
  - For example, if an extra 1kWh of generation at a Node **increases** losses by 0.02 kWh, the raw Nodal TLF for that Node in that Settlement Period is **-0.02**

P198: Conversion of Nodal TLFs to Adjusted Annual Zonal TLFs

- Nodal TLFs are averaged for all Nodes in a Zone, to get a **Zonal TLF** value
- Zonal TLFs are then averaged over a representative sample of Settlement Periods in a year, to get a single **Annual Zonal TLF** for each Zone
- A scaling factor is then applied to create an **Adjusted Annual Zonal TLF** for each Zone (see next slide)
- BM Units mapped to Zones using **Network Mapping Statement**
- An individual BM Unit receives the Adjusted Annual Zonal TLF value for the Zone to which it is mapped

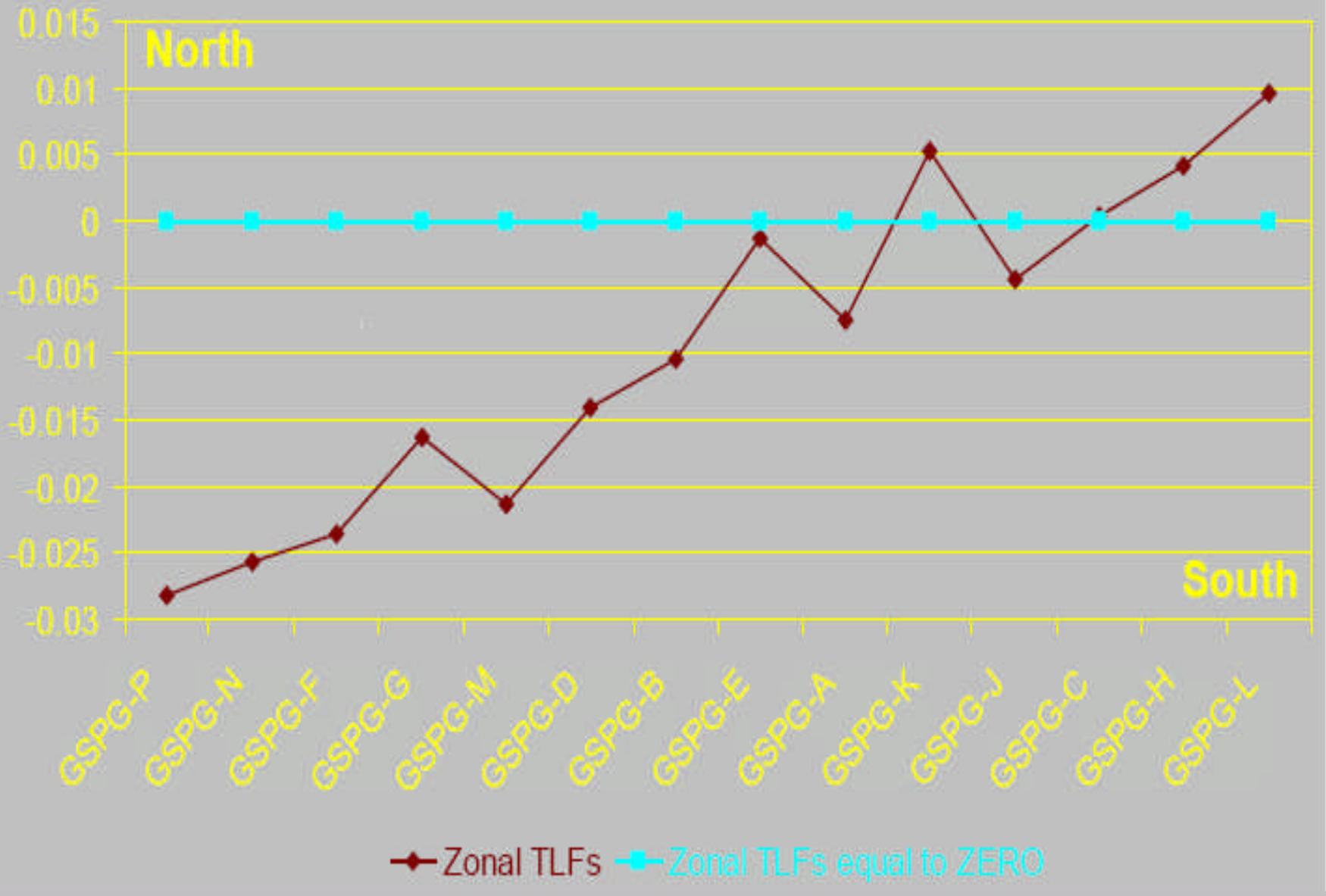
P198: Scaling Factor

- TLFs are calculated using **marginal** nodal injections of power
  - Applying unscaled TLFs to whole Metered Volumes would therefore **over-allocate** variable losses
  - Scaling factor required to ensure that variable losses allocated through TLFs are comparable to those calculated by Load Flow Model
  - P198 modelling results confirmed that **0.5** is the appropriate scaling factor to achieve this intention (as for P82)

P198: Adjusted Annual Zonal TLFs

- Modelling results confirm that locational pattern of Adjusted Annual Zonal TLFs is as expected
  - Most advantageous TLF Zones for **generators** are in the **south**, with most disadvantageous in the **north**
  - Vice versa for **Suppliers**

Adjusted Annual Zonal TLFs



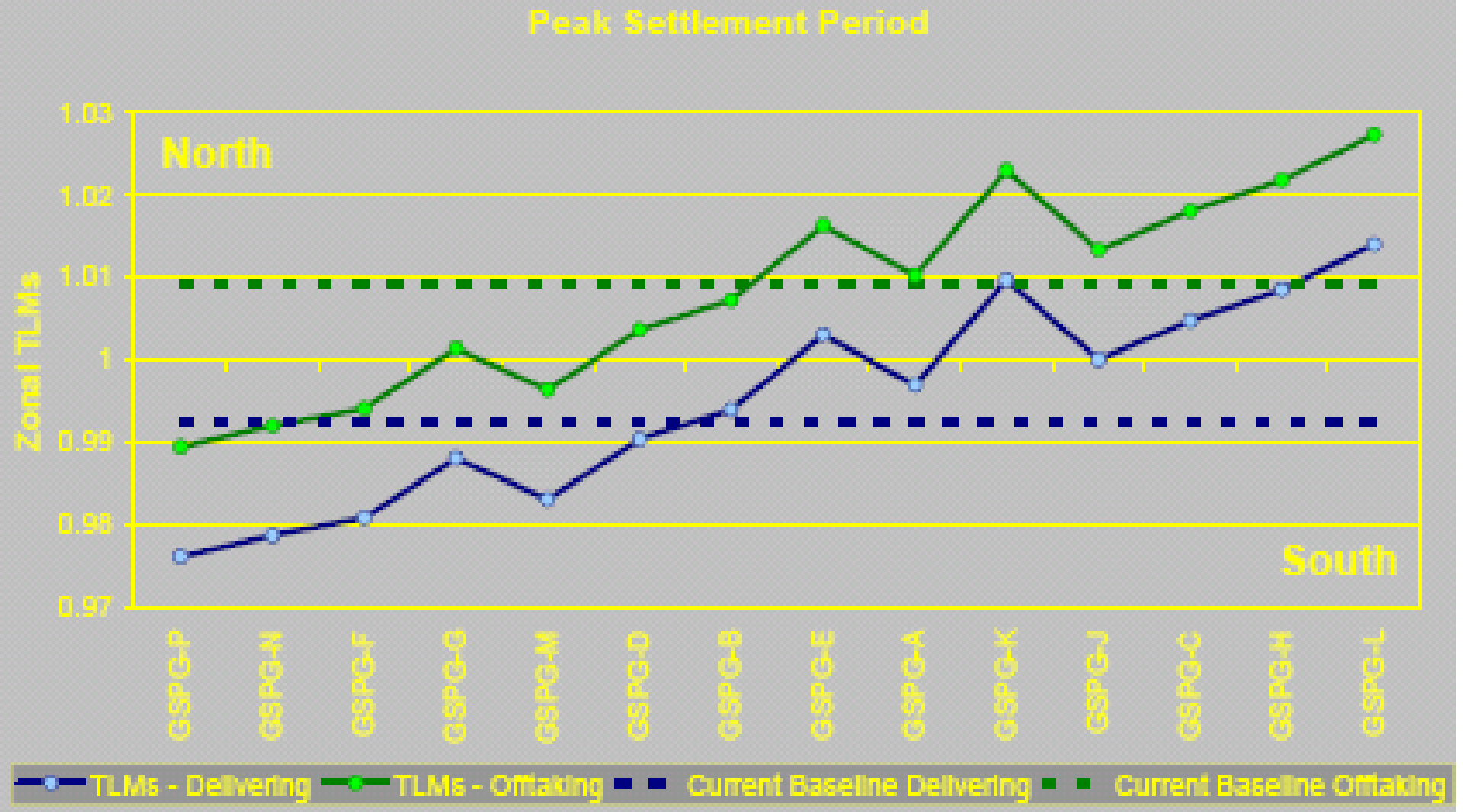
P198: TLMs (1)

- BM Unit Metered Volumes are not directly exposed to TLFs but only to TLMs
  - TLMO uniformly adjusts TLFs such to achieve 45:55 allocation of total losses to generation and demand
  - Whilst **absolute** values of TLMs may change by Settlement Period, **differentials** between Zones do not
  - A **+ve** TLF **increases** the value of TLM used to scale a BM Unit's Metered Volumes (a benefit to generators and disbenefit to Suppliers)
  - A **-ve** TLF **decreases** the value of TLM (a benefit to Suppliers and disbenefit to generators)

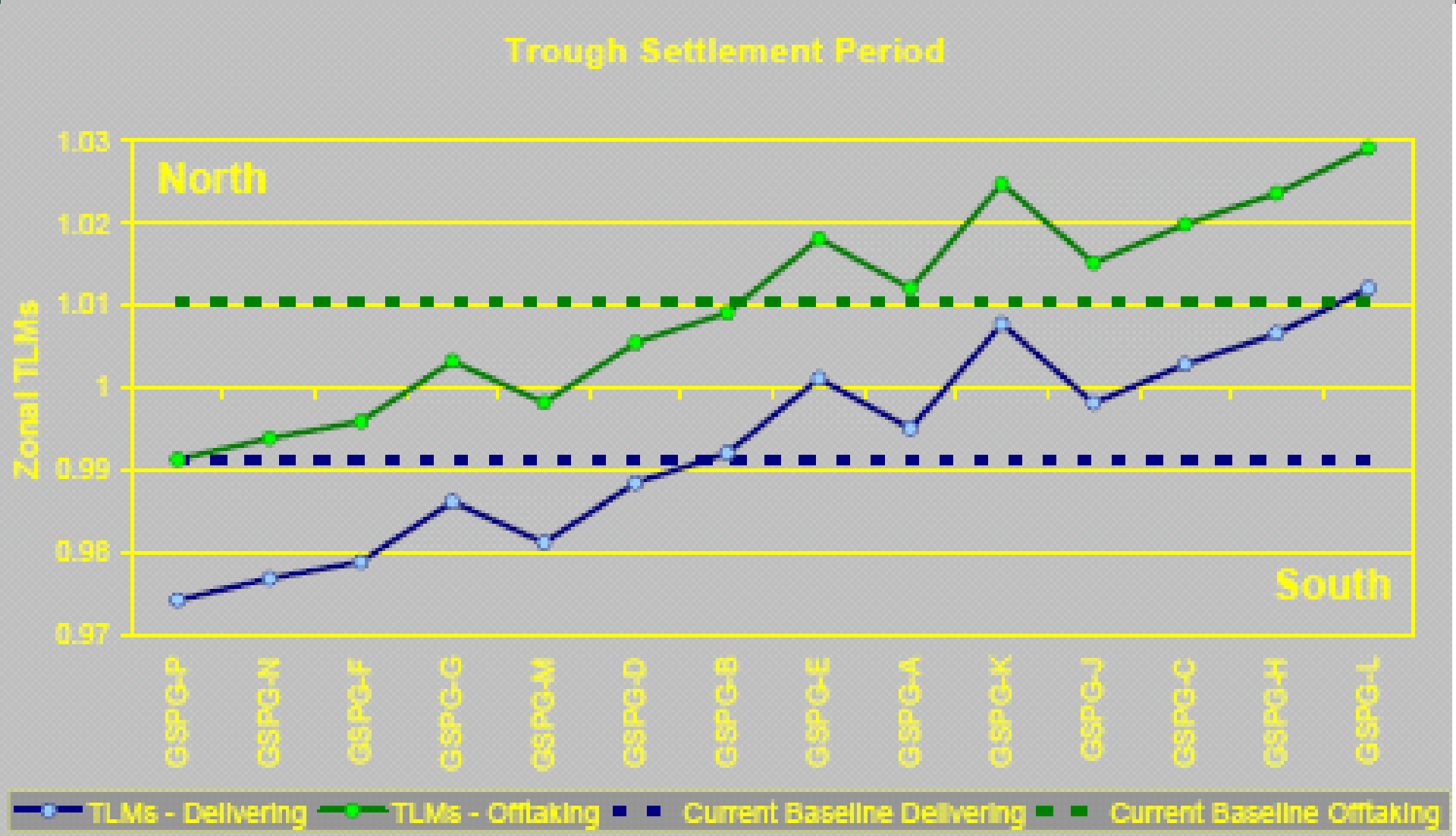
P198: TLMs (2)

- Modelling results confirm locational pattern of TLMs as expected
- As for TLF values:
  - Most advantageous Zones for **generators** are in the **south**
  - Most advantageous Zones for **Suppliers** are in the **north**

TLMs Calculated Using 2005/6 Data



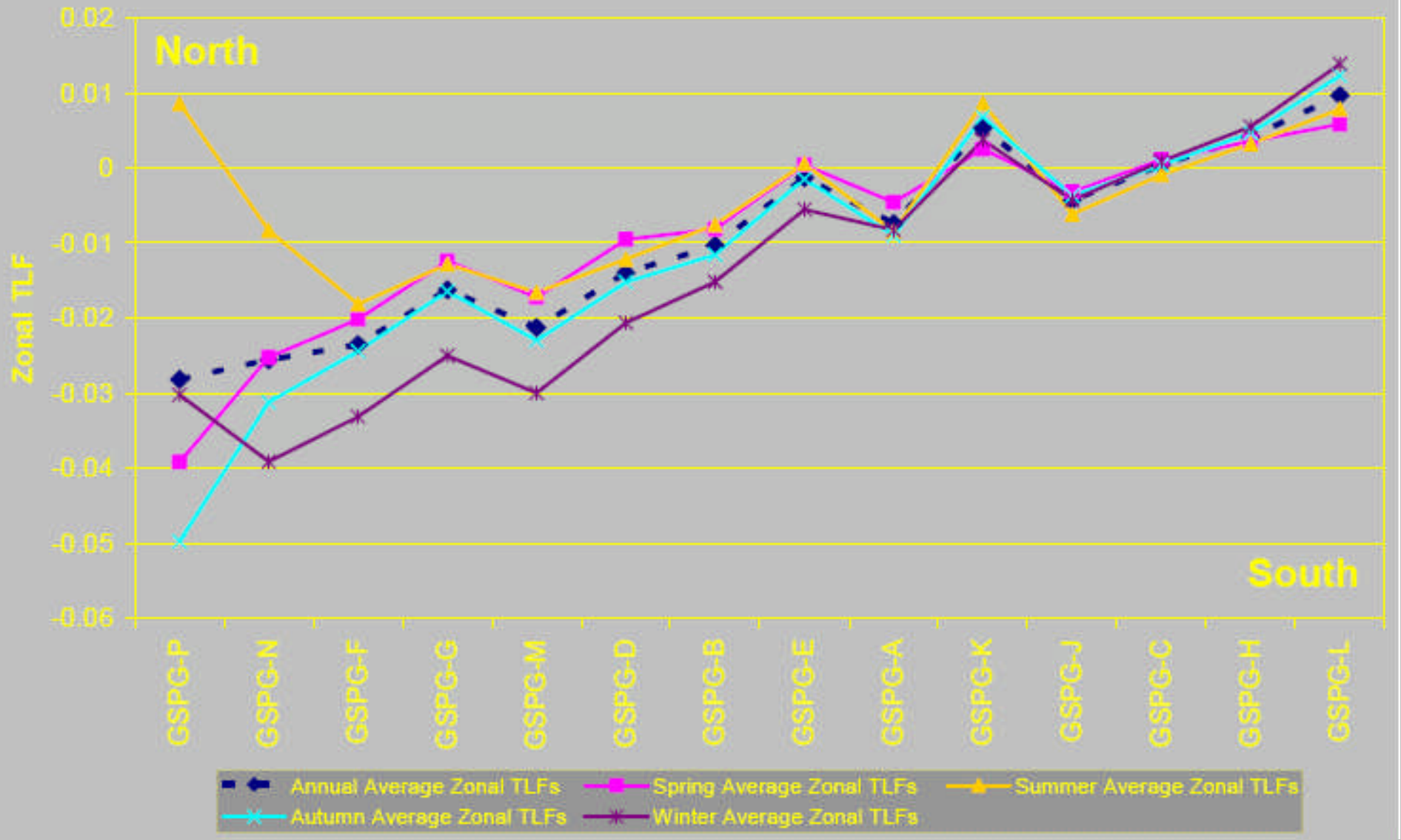
TLMs Calculated Using 2005/6 Data



P198: Seasonal Variation in TLFs

- Modelling results demonstrated a significant variation in **seasonal** TLF values from annual average, which is most pronounced in Scotland and northern England
  - This led the Group to develop an Alternative Modification including an annual calculation of seasonal TLFs
  - Other forms of temporal variation (monthly, daily etc.) less pronounced

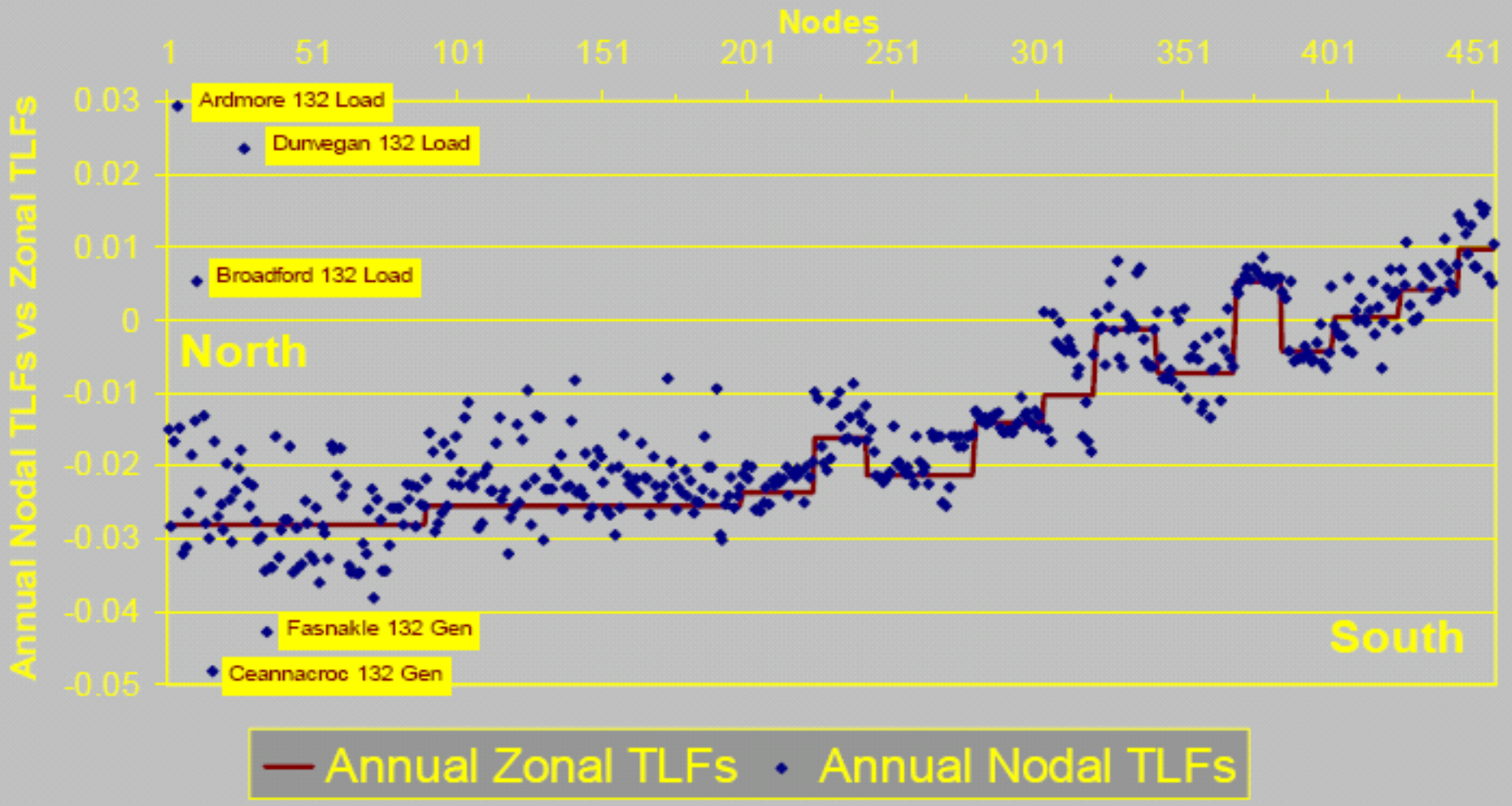
Seasonal Variation from Annual Zonal TLFs



P198: Effect of Zonal Averaging

- Modelling results demonstrated that **Nodal TLFs** for some Nodes can be significantly different to their **Zonal TLFs**, particularly in Scotland
  - This variation is inherent in **averaging** process
  - A level of zonal averaging is necessary so that TLFs can be used in Settlement

Nodal Variation from Zonal TLFs



P198: Cost-Benefit Analysis

- Modification Group commissioned an external **cost-benefit analysis** of P198
- Aim of analysis was to quantify the **net benefit** of P198 to the market over **ten years**
  - TLFs calculated using 2005/6 data were fed into an **economic despatch model** to see how they affected the generation merit order
  - Changes in despatch were then fed into a **load-flow model** to calculate the resulting effect on losses and the TLFs for the following year
  - This **iterative** process was followed for ten years

P198: Distributional Effects

- Cost-benefit analysis concluded that P198 would result in the following transfers of money in the first year of the scheme:

	North	**South**
Generators (Total)	**Increase** payments by: **£43m** in Scotland **£42m** in Northern England	**Decrease** payments by **£85m**
Suppliers (Total)	**Decrease** payments by: **£32m** in Scotland **£41m** in Northern England	**Increase** payments by **£73m**

P198: Net Benefit (1)

- Cost-benefit analysis identified a total net benefit from the introduction of TLFs of **£20m-£65m** over **ten years**
  - **£3-£9m** savings **per annum** from more economically-efficient **despatch**, resulting in reduction in losses
  - **£0.5-0.9m** savings **per annum** from **demand-side response** (limited by demand inelasticity)
- These savings were **net** of the P198 total implementation costs (£2m) and operational costs (£0.3m per annum) to the market

P198: Net Benefit (2)

- Higher end of this net benefit achieved by the use of **seasonal** TLFs, which was three times more than the lower-end annual benefit
  - Led Group to develop Alternative including seasonal TLFs
- Cost-benefit analysis concluded that whether net benefit of P198 was sufficient to outweigh its distributional effects was a judgement to be made by the industry
- Full report can be found on BSC Website

P198: Impact on Despatch Signals

- Cost-benefit analysis concluded that P198 **would** give rise to more efficient **despatch**, leading to reduction in level of variable losses
- However, whilst savings in losses evident in early years, these reduced in later years from c. 2012

Reduction in Losses 2006/07 – 2015/16

P198: Impact on Locational Signals

- Reduction in losses in later years due to introduction of planned new build in south from c.2012
  - This new southern capacity already planned
  - Savings in later years would therefore also have occurred **without** P198
  - Suggests that other factors such as TNUoS already providing signals to locate new plant in south
  - No plant would have relocated as result of P198
- Suggests effect of P198 on **locational** signals is **ambiguous** and a second-order consideration

P198: Impact on Risk/Cost of Capital

- Cost-benefit analysis concluded that P198 **would not** increase existing levels of regulatory risk or the cost of capital for participants since:
  - Introduction of a zonal losses scheme has been mooted since privatisation
  - Changes involved in the scheme represent a diversifiable risk

P198: Impact on Types of Party

- Cost-benefit analysis concluded that P198 **would not** have a disproportionate impact on **renewables**, who would be protected by government's Renewables Obligation scheme
- Cost-benefit analysis concluded that P198 would have a **minor** or **ambiguous** impact on future **nuclear**, **embedded** and **large-scale conventional** plant

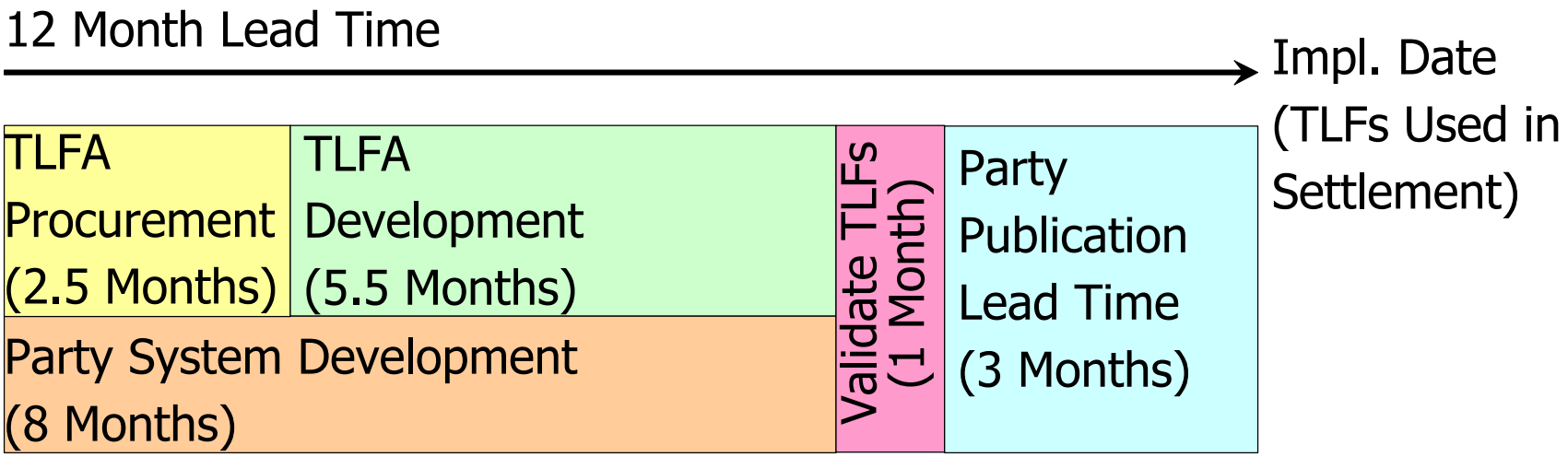
P198: Modification Group's Views of Cost-Benefit Analysis

- Group agreed that cost-benefit analysis delivered its requirements
- However, members did not necessarily agree with all of its specific findings (of which more later…)

P198: Implementation Approach (1)

- Group agreed that the Implementation Date and annual TLF calculation for both the Proposed and Alternative Modifications should be tied to Parties **contractual rounds**
  - Would allow Parties to factor TLFs into contracts
- Recommended Implementation Dates are:
  - **1 April 2008** if decision by 22 March 2007; or
  - **1 October 2008** if decision by 20 September 2007
- Reflects 12-month lead time required to implement P198

P198: Implementation Approach (2)



P198: Central Costs - Proposed

- Proposed Modification total **implementation** cost approx. **£470k**
  - Includes central systems costs of £335k (including TLFA) and ELEXON costs of £135k
- Proposed Modification total **operational** cost per annum approx. **£160k**
  - Includes central systems costs of £145k (including TLFA) and ELEXON costs of £15k

P198: Central Costs - Alternative

- Alternative Modification total implementation cost approx. **£10k** higher, with marginally lower operational costs

P198: Assessment Against BSC Objectives

- Proposed against baseline: **Worse** (majority)
- Alternative against Proposed: **Better** (majority)
- Alternative against baseline: **Worse** (majority)
- Objectives (b) and (c) most relevant

P198: Views for Proposed

- More efficient despatch
- Reduction in losses
- Removal of existing cross-subsidy
- More reflective allocation of losses
- Does not increase regulatory risk/cost of capital

P198: Views Against Proposed

- No long-term locational signal
- Distributional effects represent windfall gains and losses
- Disproportionate impact on some types of Party (e.g. renewables)
- Increases regulatory risk/cost of capital
- Increased cost and complexity

P198: Views of Alternative v Proposed

- **Better** (majority):
  - **Seasonal TLFs** give more accurate allocation of losses, and better despatch signals leading to greater reduction in losses
  - **Phasing** mitigates windfall gains and losses created by a sudden step-change in rules
- **Worse** (minority):
  - **Phasing** delays benefits; and/or
  - **Seasonal TLFs** add complexity
- Some members who supported seasonal TLFs did not support phasing, and vice versa (see P203)

P198: Views of Alternative v Baseline

- **Worse** (majority):
  - Arguments against Proposed not fully mitigated by phasing
- **Better** (minority):
  - Partly addresses cross-subsidy despite phasing; or
  - Phasing gives more managed and efficient implementation, whilst seasonal TLFs give most reflective allocation and efficient despatch

P198: Other Alternatives Considered But Not Progressed

- Ex-post (retrospective) calculation
- Different constitution of TLF Zones
- 'Hedging' or 'grandfathering' schemes (see P200)
- Exclusion of some BM Units from zonal TLF scheme
- Exclusion of some transmission losses from TLF calculation
- Change to 45:55 split between generation and demand
- An 'alternative scaling' approach to ensure no BM Units credited with energy as a result of TLFs (see P204)

P198: Consultation

- Seeks views on whether:
  - Proposed Modification would better facilitate BSC Objectives compared with existing baseline
  - Alternative Modification would better facilitate BSC Objectives compared with Proposed
  - Implementation approach appropriate
  - P198 would have a disproportionate impact on any class or classes of Party
  - P198 would increase perceptions of regulatory risk and/or the cost of capital

P198: Questions

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Coffee Break

Overview of P200

Justin Andrews

P200 Proposed Modification (1)

- 'P198' plus a transitional 'hedging' scheme
- Hedging scheme 'mitigate impact of zonal TX losses'
- Existing 'generators' only
- Mitigation via a fixed (F-factor) volume that receives non- zonal losses
- Variation in output allocated zonal losses
- Mitigation for 15 years

Qualification

- CVA Trading Units only
- Trading Unit aggregate net export in the period (i.e. metered volume> 0)
- All BM Units qualify in Trading Unit and relationship as of 31 March 2006
- Period is BSC Year: 1 April 2005 – 31 March 2006
- Interconnector treated as whole and allocated to Interconnector Error Administrator

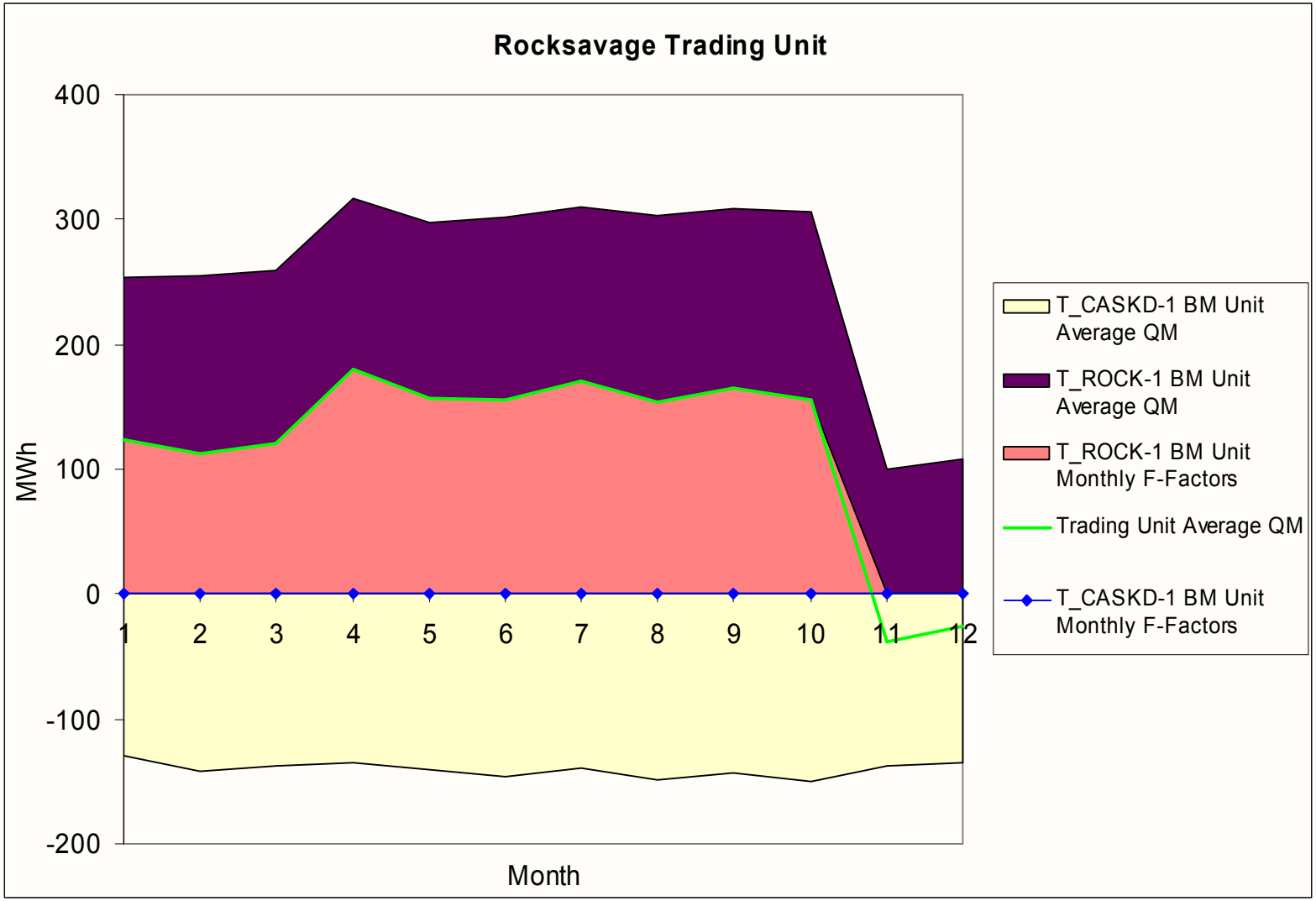
Calculation (1)

- Baseline Period 2 options
  - 1 year: 1 April 2005– 31 March 2006
  - 4 years: 1 April 2002– 31 March 2006
- Issue re Scottish data pre BETTA go-live

Calculation (2)

- Monthly F-factors, 12 values for 15 years
- F-factor:
  - Net monthly metered volume per Trading Unit
  - Pro-rata per BM Unit in Trading Unit (net of demand)
- Newly registered: use data when started generating

Rocksavage


Rocksavage Trading Unit
400
300
200
100
0
-100
-200
MWh
1
2
3
4
5
6
7
8
9
10
11
12
Month
T_CASKD-1 BM Unit Average QM
T_ROCK-1 BM Unit Average QM
T_ROCK-1 BM Unit Monthly F-Factors
Trading Unit Average QM
T_CASKD-1 BM Unit Monthly F-Factors

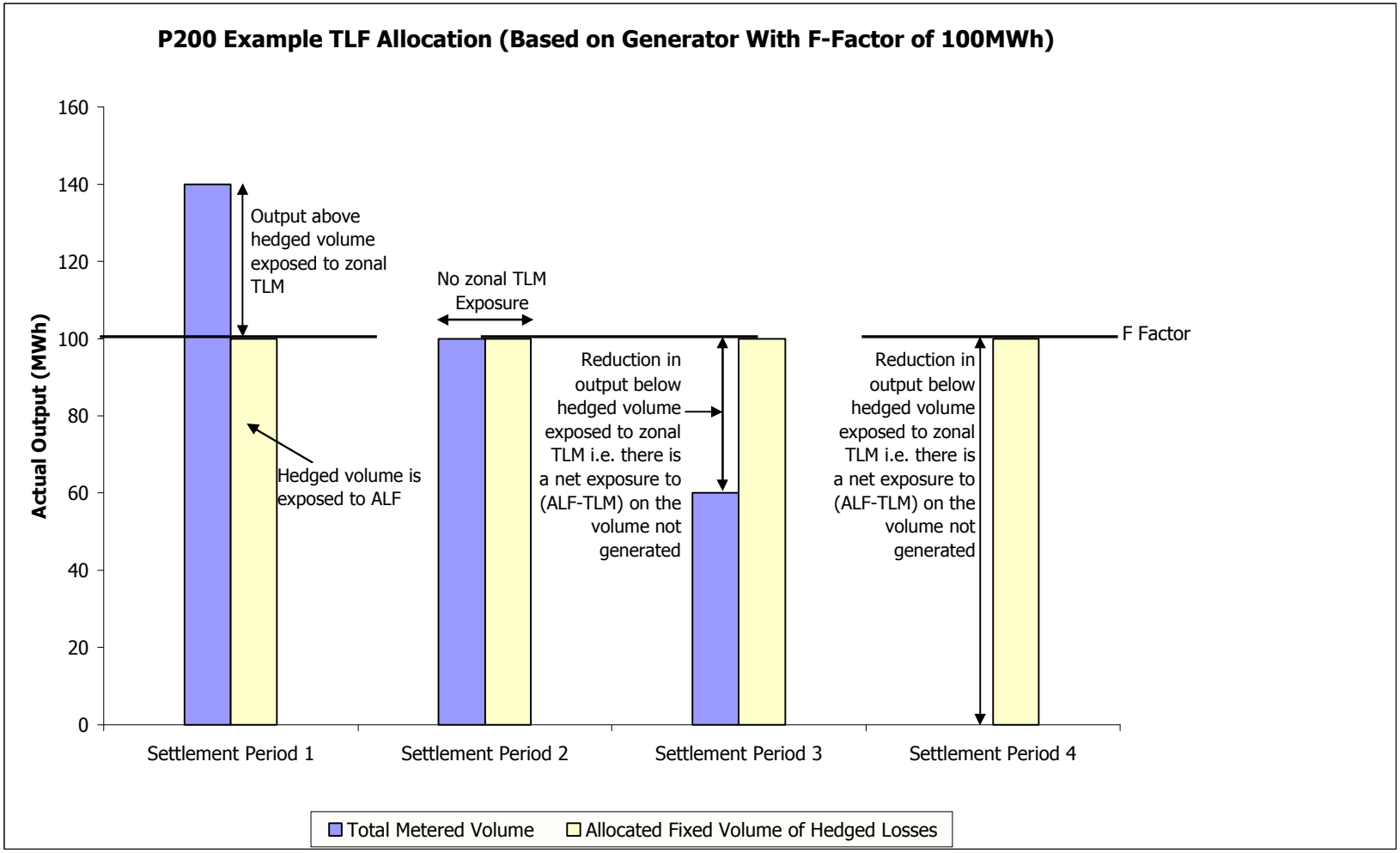
Calculation (3)

- Interconnector: treat as whole (net of demand)
- Publication 3-6 months after Authority's decision
- BM Unit re-registration: aim for BM Unit to keep history F-factor if CVA

Application in Settlement

- F-factor volume receives uniform loss adjustment
- Difference between actual output and F-factor volume receives zonal TLM

Allocation of losses



P200 Alternative Modification

- P200 Proposed with:
  - zonal TLFs that vary by BSC Season
  - As per P198 Alternative (no linear phasing)

Implementation

- Approach as per P198
- 12 month lead time, implementation 01 April 2008 (next date 1 Oct 2008)
- Extra one off calculation of F-factors
- Publication of f-factor 3-6 months after Authority approval
- Total cost approx. £810k (additional £340k over P198)
- Alternative costs to be confirmed (approx additional £10k to Proposed)

Assessment against BSC Objectives (1)

- Proposed against baseline: **Split**
- Alternative against Proposed: **Better** (majority)
- Alternative against current baseline: **Split**
- Objectives (b) and (c) most relevant

Views for Proposed

- Same benefits as P198 for despatch
  - Reduction in losses
  - Incentive to respond
- Protection of windfall gains and losses
  - Encourage investment
  - Long term efficiency

Views against Proposed

- Counter the benefits as P198 for despatch
- Increase generation costs in South
- Anti-competitive: different treatment
- Additional cross-subsidy

Views of Alternative v Proposed

- Better than Proposed (majority)
- More accurate allocation of losses

Consultation: Additional questions

- 15 year duration for F-factor
- Baseline period, 1 year or 4 years
- Practicality of provision of Scottish data
- Cost of capital affected by hedging scheme (for Group's consideration of benefit analysis)

P200: Questions

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Overview of P203 and P204

Kathryn Coffin

Overview of P203

- Proposed Modification
  - Same as P198 Alternative without linear phasing (seasonal TLFs only)
- Rationale
  - As per P198
  - More accurate allocation of losses
  - Removes issue of linear phasing which delays benefits of zonal losses

P203 timetable

- ELEXON recommending 1 month Assessment Procedure (subject to Panel agreement)
  - Mods Group from P198 and P200 membership
  - Consultation
  - Legal text
- Assessment Report: 10 August 2006 (same as P198 and P200)

Overview of P204 (1)

- **Proposed Modification**
  - Builds upon zonal transmission loss solution for P198, however:
  - Scaled TLF values
    - no BM Units are credited with energy (i.e. receive payments) as a result of TLFs
  - 2 options for scaling factor
    - Fixed single average value applied equally to delivery and offtake
    - Settlement Period-specific values, different for delivery and offtake

Overview of P204 (2)

- Rationale
  - Reduces distributional effects
  - Still provides signals for more efficient despatch and location

P204 timetable

- ELEXON recommending 3 month Assessment Procedure (subject to Panel agreement)
  - Assess options (complex algebra) & impact
  - Cost benefit analysis
  - 3-4 Mod Group meetings
  - Impact assessment
  - Consultation
- Assessment Report: 12 October 2006

P203 & P204: Questions

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Way Forward

Sarah Jones

Way Forward

- P203 and P204 IWAs – 13 July
- P198 and P200 consultations close – 14 July
- Contact details:
  - sarah.jones@elexon.co.uk
  - kathryn.coffin@elexon.co.uk
  - justin.andrews@elexon.co.uk

Further Questions?

Lunch