LRMC – Transport Model Options

Gas TCMWG - Gas Transmission Charging Methodologies Working Group

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Introduction

- This presentation covers
  - Options for potential enhancements to the LRMC Methodology Transport model
  - Initial Option Assessment

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LRMC Methodology Enhancement Options

Potential Enhancements

Potential Enhancements

- **Transport Model**
  - Investigating potential enhancements to “Transcost” and alternative “simpler” models
  - If Transcost is to be retained, considering ways in which model could be made easier to use by industry

- **Tariff Model (post processing)**
  - Assessing whether there are any better alternatives to the way in which the outputs from the Transport Model are used to derive tariffs

Today we will consider the Transport Model Options

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Key Questions for the Review: Transport Model

1. **S&D Scenarios: 1 Year or multiple Year?**
2. **How should incremental costs be modelled?**
3. **How should spare network capacity be treated?**
4. **Should decrement (back flow) costs be considered?**

Key Questions for the Review

1. **S&D Scenarios: 1 Year or multiple Year?**
2. How should incremental costs be modelled?
3. How sho… treated?
4. Should d… consider…

- *a) How should S&D scenarios be generated?*
- *b) If multiple years,*
  - *i) The number of years might depend on the duration of capacity on offer*
  - *Ii) When in the sequence should costs be combined?*
  - *iii) Should yearly costs be combined by a weighted or a simple average?*

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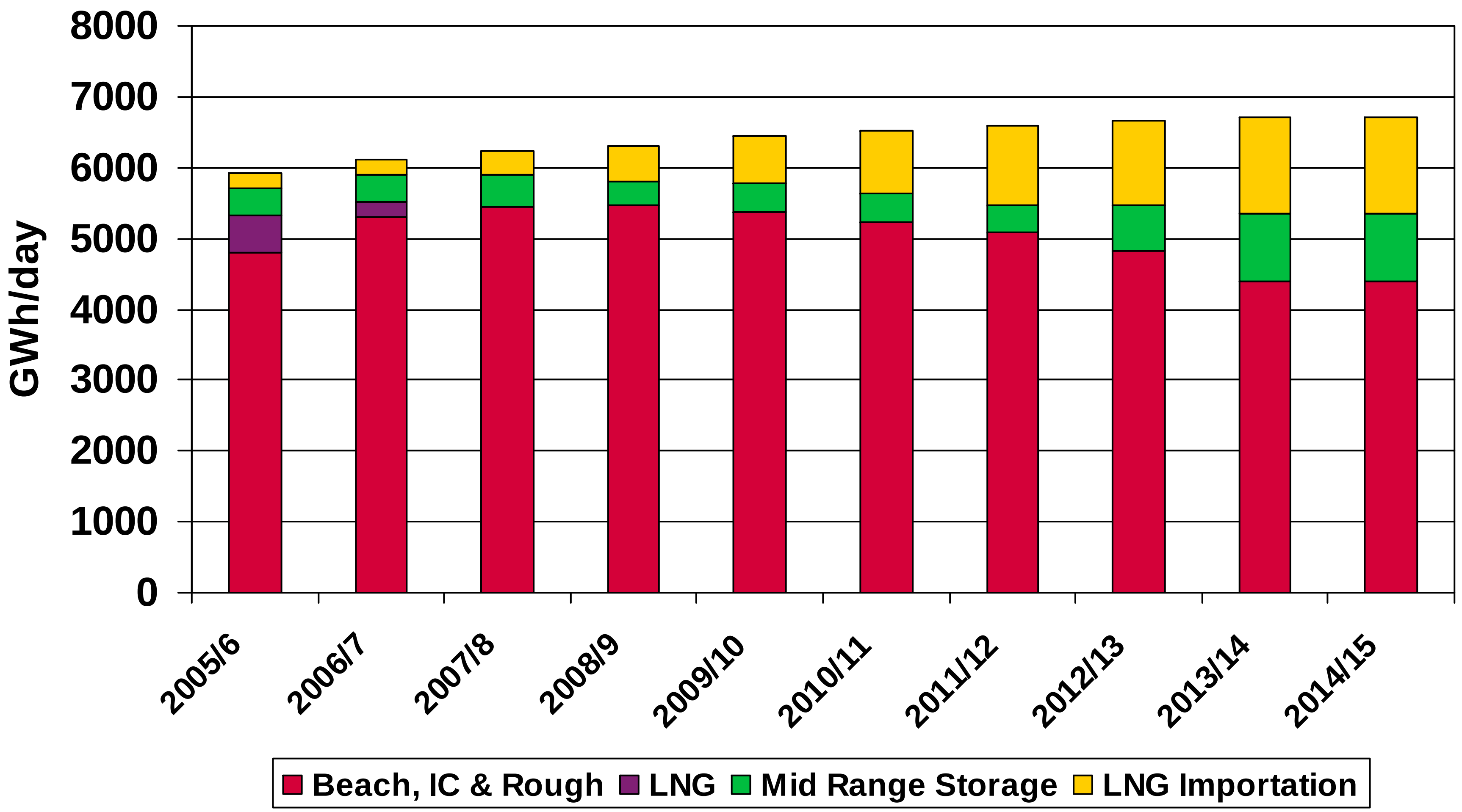
Ten Year Supply Forecast



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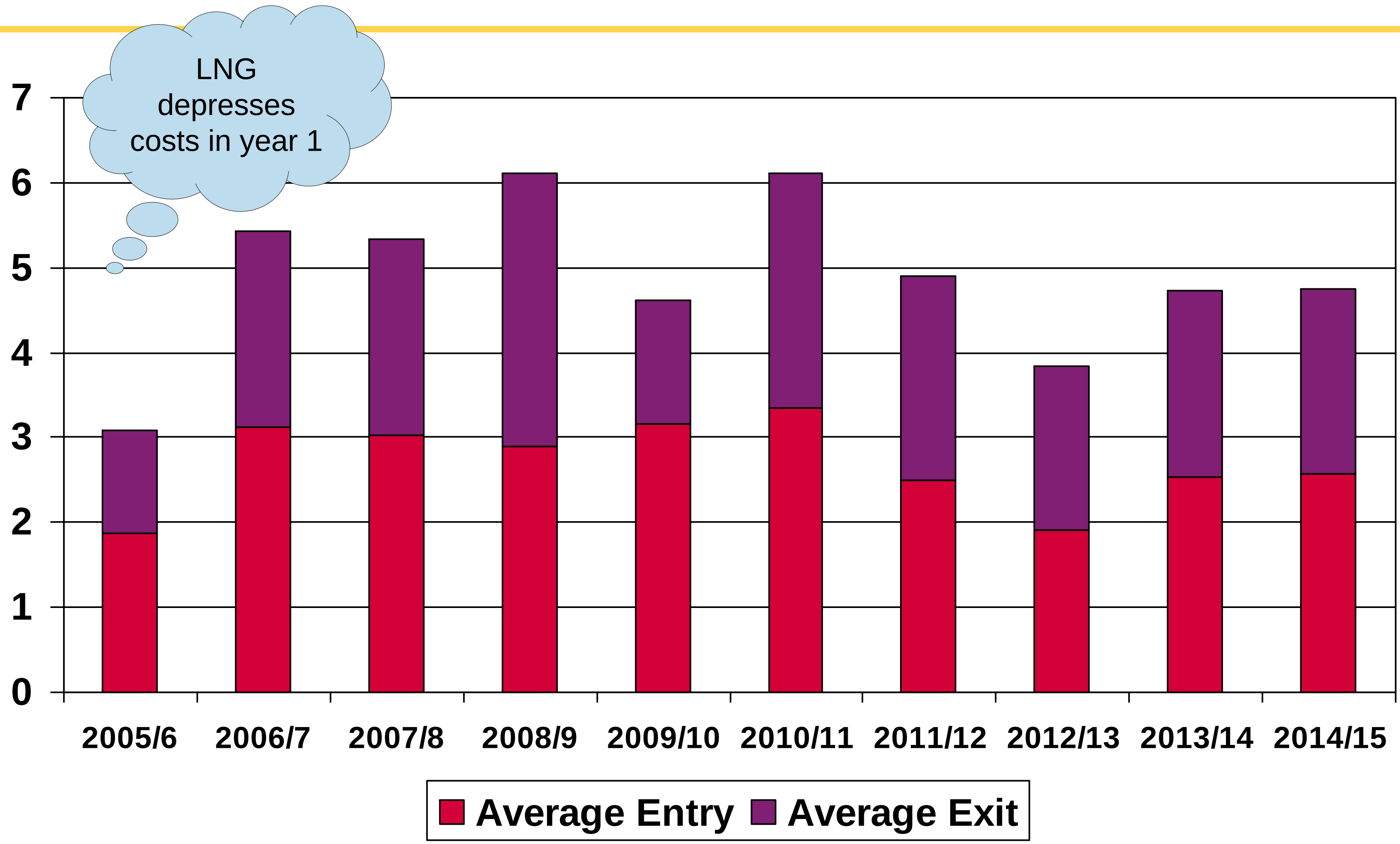
Ten Year Entry & Exit Costs (PD18 Data)



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Single v Multiple Years

- Single Year
  - More transparent and replicable by users than a 10 year model because of the reduced need for subjective forecasts?
  - Might under estimate costs if spare capacity is modelled
- Multi-year
  - Costs are only accurate if the Supply & Demand forecasts are correct
  - Forecast includes expected auction outcomes
  - Makes the process of deriving charges more complex for participants to understand and replicate.

NB Single or multiple years could be modelled with Transport Models 1, 2 or 3

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Key Questions for the Review

1. S&D Scenarios: 1 Year or multiple Year?
2. **How should incremental costs be modelled?**
   - *Three Transport Model Options…..*
3. How s … treated?
4. Should decrement (back flow) costs be considered?

Transport Model 1: Transcost

- Under this option, Transcost would be retained.
  - Incremental flows based on physical flow model
  - Incremental costs based on minimum cost of pipe and/or compression required to maintain pressures
    - Additional compressor units added at existing sites
    - Additional pipe added in parallel to existing pipes
      - NB there is no requirement to fully duplicate a route so the minimum pipe is identified

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Transport Model 2:
Transcost + Expansion Factor

- Under this option, a Transcost type model would be used to simulate incremental injections and offtakes to calculate incremental flows.

  - $P_1^2 - P_2^2 = klq^2/d^5$

- The output used from Transcost would be:
  - the incremental (or decremental) flows on each line segment for a given incremental injection / offtake pair; and
  - the length and diameter of each line segment.
- Separately, an estimate would be made of the cost of accommodating an incremental MWkm of flow over different diameter pipelines (termed the “expansion constant” in the electricity regime).

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Transport Model 3:
Transportation model + Expansion Factor

- Under this option, the Transcost model is not used.
- The estimation of incremental flows is simply derived from a Transportation model
  - The Transportation Model retains the underlying network model characteristics but does not model flows based on physical flow equations (pan-handle).
  - As in Model 2, an estimated cost to accommodate incremental MWkm on pipes of different diameters is used.

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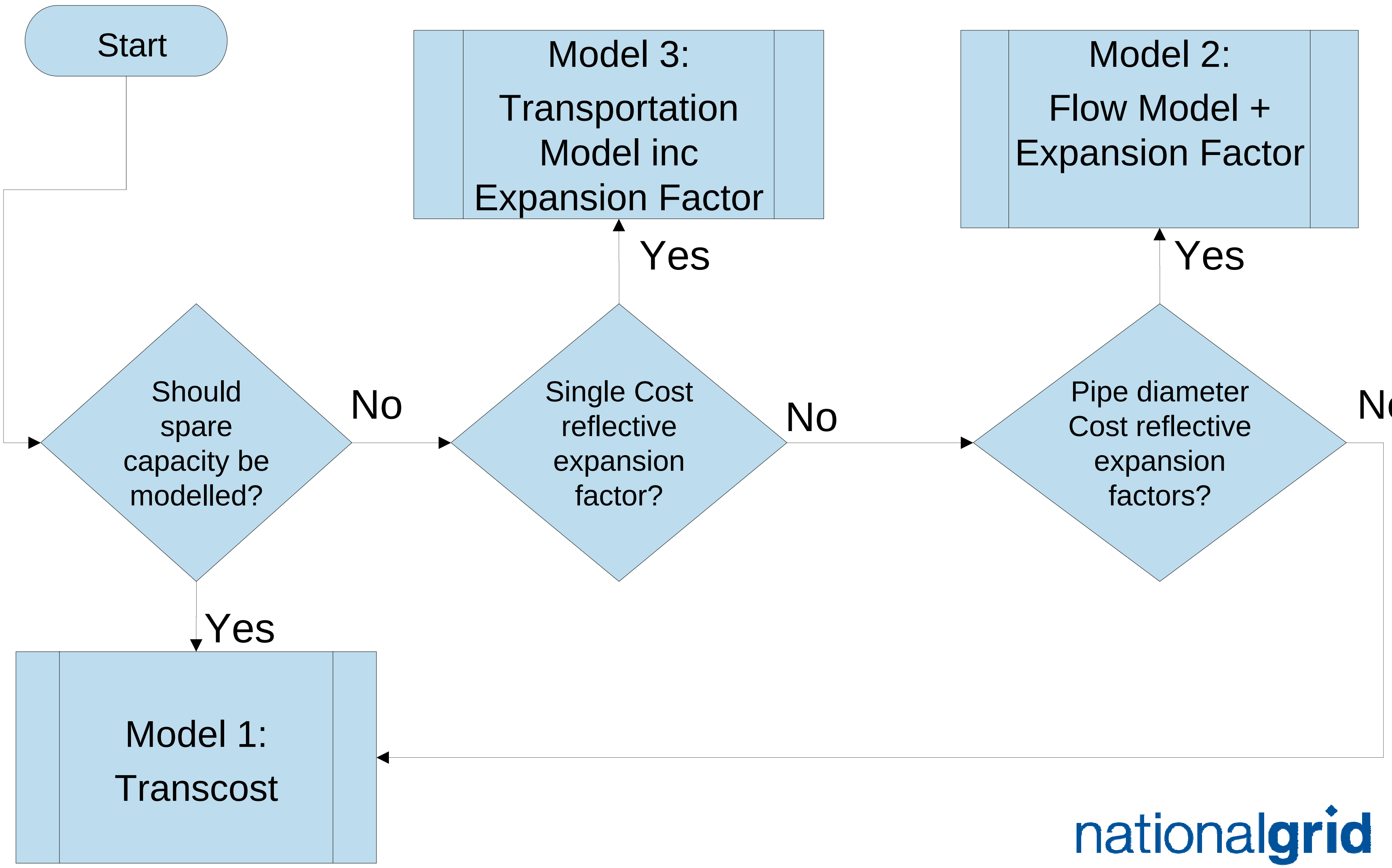
Model Decision Route



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Key Questions for the Review

1. S&D Scenarios: 1 Year or multiple Year?
2. How should incremental costs be modelled?
3. **How should spare network capacity be treated?**
   - *A) Included in the model*
   - *B) Removed by*
     - *Scaling flows*
     - *Removing assets*
     - *Capping pressures*
4. Shoul costs be consid

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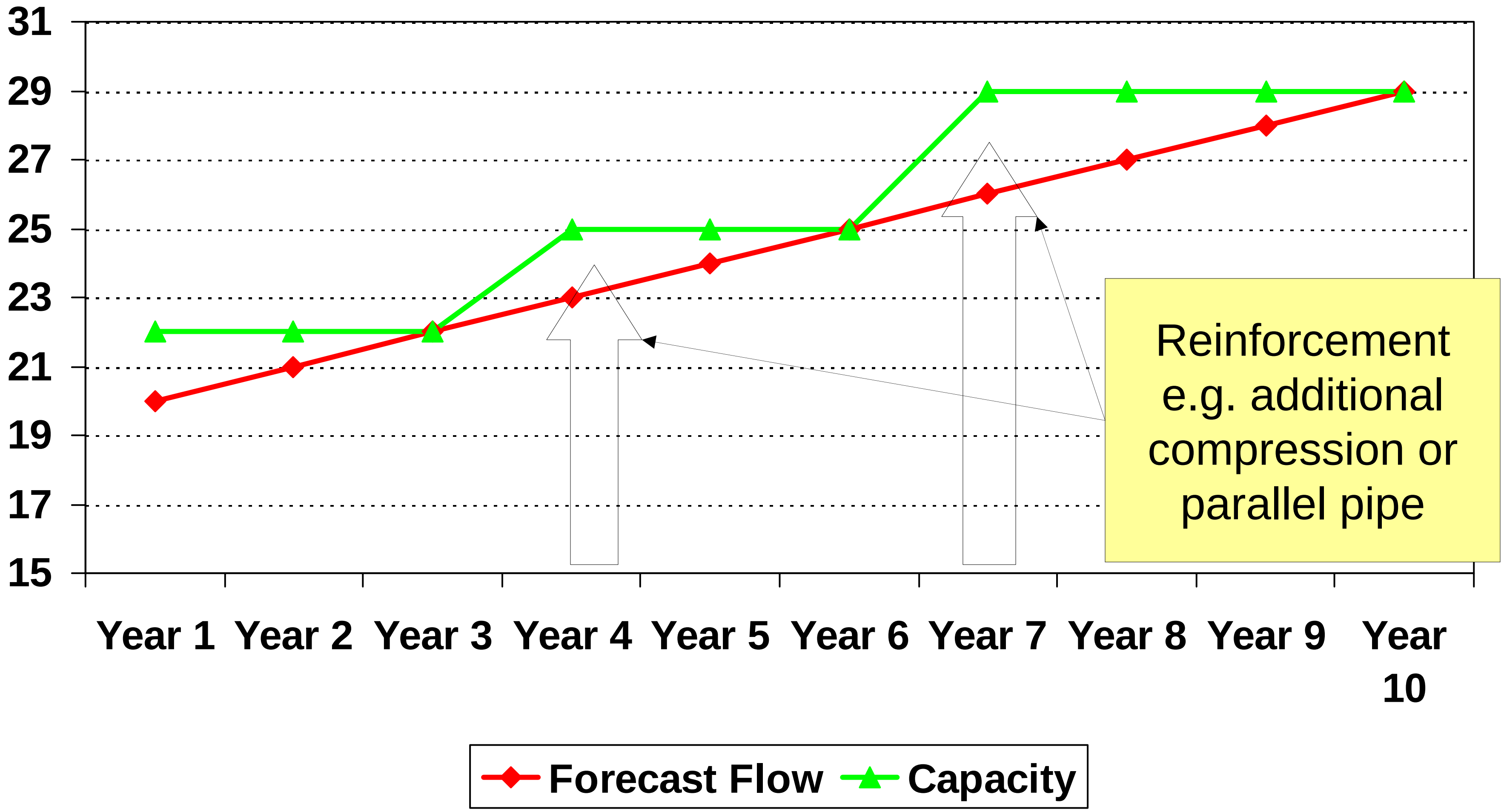
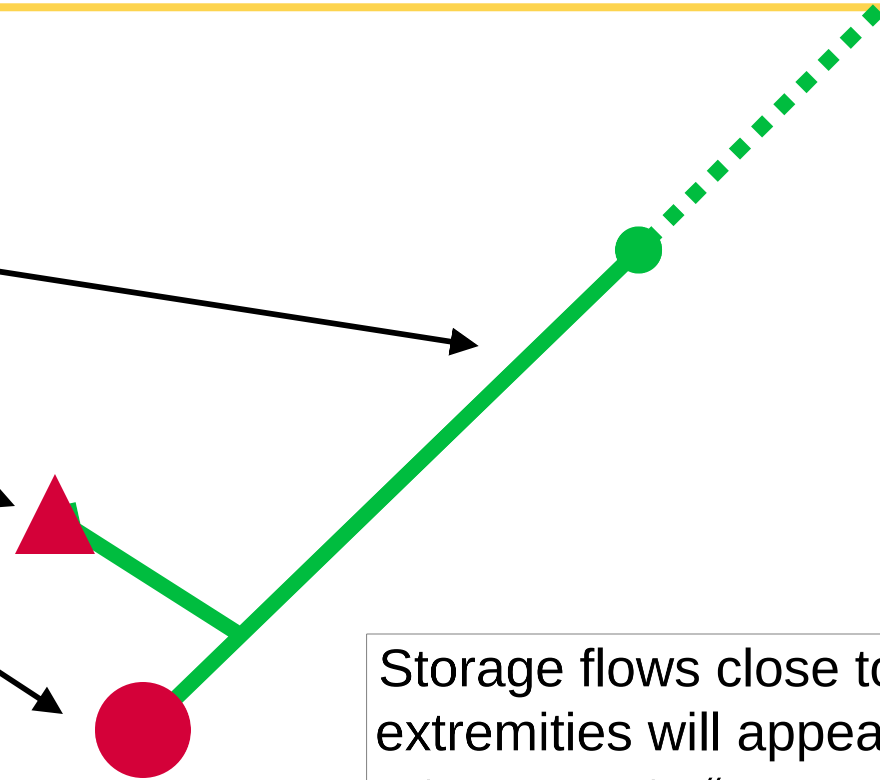
Spare Capacity – Economic Investment



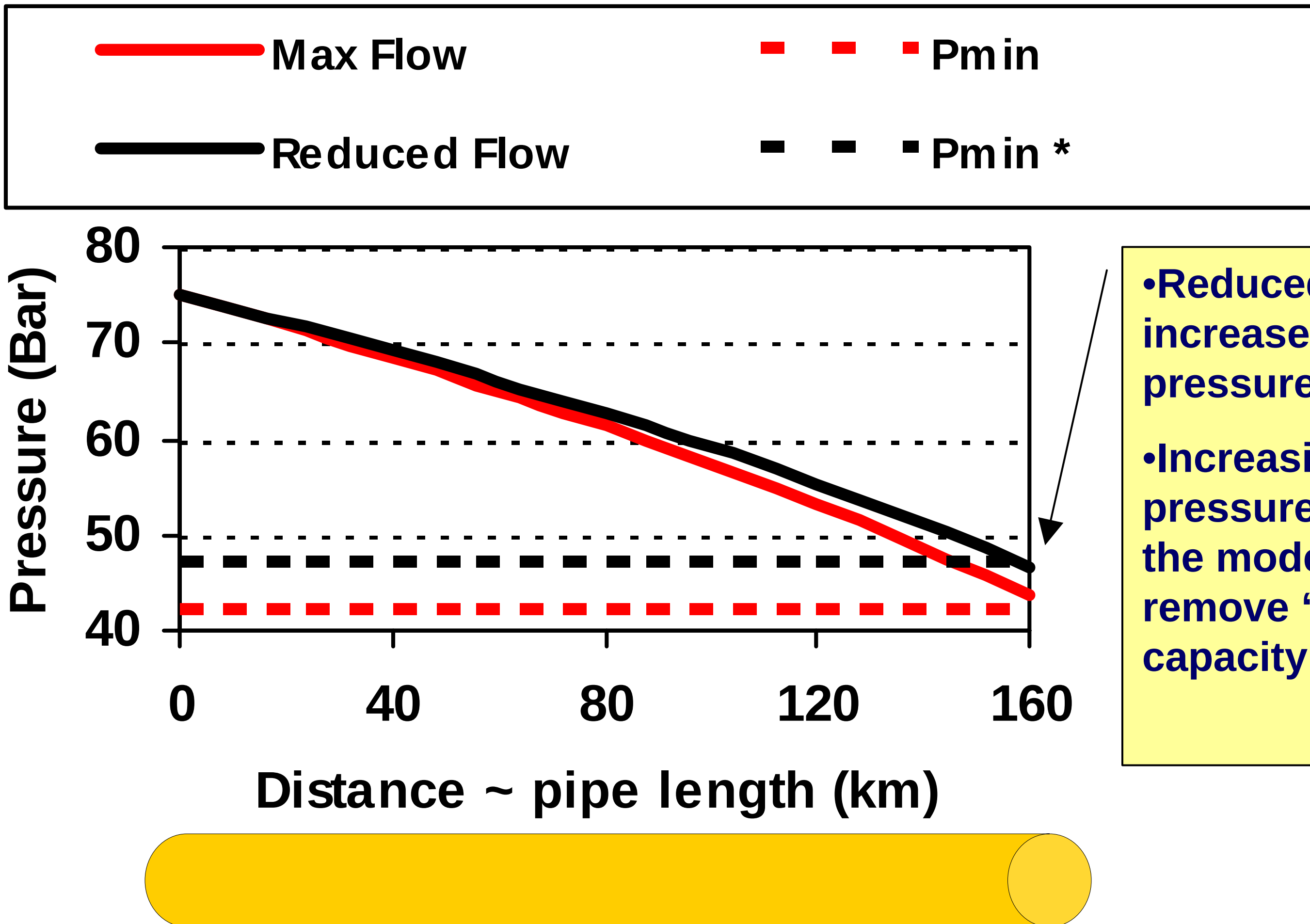
Spare Capacity – Storage Flows (1)

- Pipe
- Storage
- Exit Point



Storage flows close to extremities will appear to generate "spare capacity"

Spare Capacity – Storage Flows (2)



- Reduced Flow increases extremity pressures
- Increasing min pressures within the model can remove "spare capacity"

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Spare Capacity

- Model Spare Capacity
  - Generates prices that incentivise the use of “spare capacity”
  - Prices may increase once spare capacity is utilised
  - Volume of “spare capacity” depends on supply patterns and may increase uncertainty
  - Multi-year modelling includes demand growth hence the level of spare capacity will tend to reduce.
- Remove Spare Capacity
  - All incremental flows will result in investment
  - Might improve stability of charges
  - Might need to be offset by modelling backhaul cost benefits
  - Would need to be implement if Transcost was the chosen Transport model
    - alternatively a larger increment might reduce the effect

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Key Questions for the Review

1. S&D Scenarios: 1 Year or multiple Year?
2. How should incremental costs be modelled?
3. How should spare network capacity be treated?
4. **Should decrement (back flow) costs be considered?**

- *What costs could be associated with backflow?*

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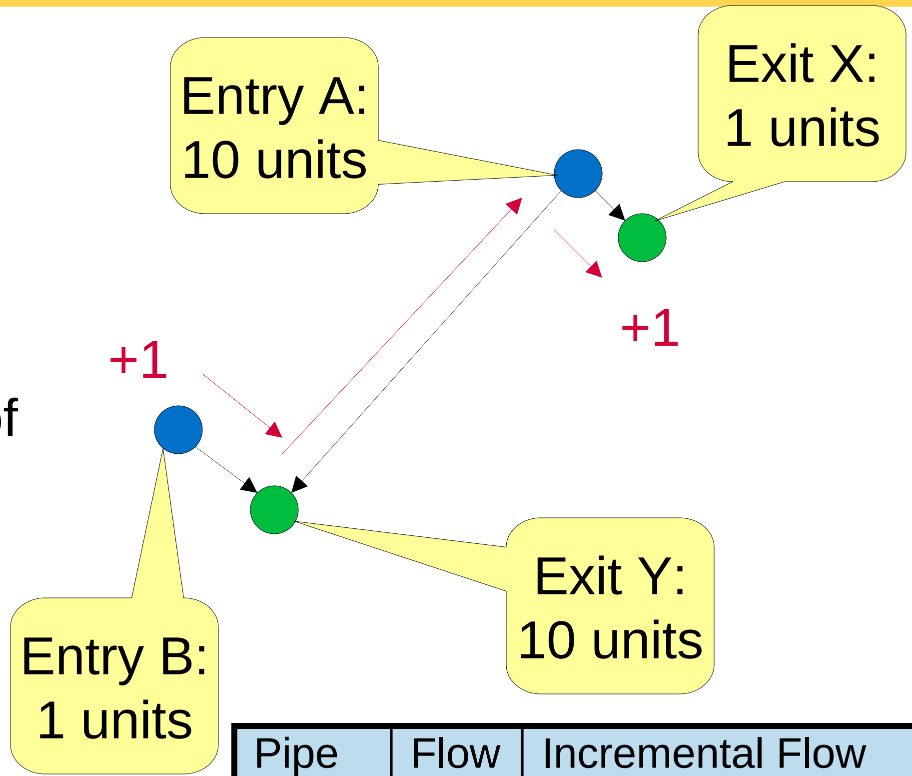
Backhaul Costs

- Backhaul flow:
  - An incremental flow in the opposite direction to the prevailing flow
  - If there is an extra unit of Entry at B and an extra unit of Exit at X then the flow in pipe A to Y will <u>decrease</u> by 1 unit
- Costing Options
  - Ignore as flow may be required if no entry flow at B
  - Avoid reinforcing in future = negative of A to Y incremental cost



Pipe	Flow	Incremental Flow
A to X	1	2 (+1)
A to Y	9	8 (-1)
B to Y	1	2 (+1)

Backhaul Costs

- Include Backhaul
  - Avoid future reinforcement hence negative of incremental cost
  - Might under estimate costs if spare capacity is modelled
- Ignore Backhaul
  - There may be no capacity costs saving if the flow does not materialise at the relevant times

NB Backhaul could be included or excluded from Transport Models 1, 2 or 3

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Option Variants

Issue	Variant 1	Variant 2	Variant 3	Variant 4
Treatment of spare capacity and duration of model	No spare capacity 1 year model	Spare capacity 10 year model	Spare capacity 10 year model	No spare capacity 1 year model
Backhaul costs modelled?	Yes	No	Yes	No
Transport Model	1, 2 or 3	1. Transcost	1. Transcost	1, 2 or 3

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Options Assessment Variant 1
No spare capacity, 1 year model, Backhaul benefit

Objective	Capacity prices should	Pros	Cons
GL1: **“Reflect Costs”**	reflect the costs associated with providing that capacity	No spare capacity offset by backhaul benefit	
GL2: **“Facilitate Competition”** **GL5**: **“Promote Competition”** **GL3**: **“Business Development”**	**GM3**: be easy to understand and implement.	Single year more transparent	
	GM2: generate stable charges;	Removal of spare capacity increases stability	
GL4 **:”Promote Efficiency”**	**GM1**: promote efficient use of the transportation system;		May not incentivise “appropriate” use of spare capacity

Options Assessment Variant 2

Spare capacity, 10 year model, No backhaul benefit

Objective	Capacity prices should	Pros	Cons
GL1: "Reflect Costs"	reflect the costs associated with providing that capacity	Spare capacity offset by no backhaul benefit	
GL2: "Facilitate Competition" **GL5: "Promote Competition"** **GL3: "Business Development"**	**GM3**: be easy to understand and implement.		Multiple years more complex
	GM2: generate stable charges;		Multiple years depend on forecasts
GL4 :"Promote Efficiency"	**GM1**: promote efficient use of the transportation system;	May incentivise "appropriate" use of spare capacity	May incentivise inappropriate use of "spare capacity"

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Options Assessment Variant 3

Spare capacity, 10 year model, Backhaul benefit

Objective	Capacity prices should	Pros	Cons
GL1: "Reflect Costs"	reflect the costs associated with providing that capacity		Spare capacity, combined with backhaul benefit may understate costs
GL2: "Facilitate Competition" **GL5: "Promote Competition"** **GL3: "Business Development"**	**GM3**: be easy to understand and implement.		Multiple years more complex
	GM2: generate stable charges;		Multiple years depend on forecasts
GL4 :"Promote Efficiency"	**GM1**: promote efficient use of the transportation system;	May incentivise "appropriate" use of spare capacity	May incentivise inappropriate use of "spare capacity"

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Options Assessment Variant 4

No spare capacity, 1 year model, No backhaul benefit

Objective	Capacity prices should	Pros	Cons
GL1: "Reflect Costs"	reflect the costs associated with providing that capacity		No spare capacity, combined with No backhaul benefit may overstate costs
GL2: "Facilitate Competition" **GL5: "Promote Competition"** **GL3: "Business Development"**	**GM3**: be easy to understand and implement.	Single year more transparent	
	GM2: generate stable charges;	Removal of spare capacity increases stability	
GL4 :"Promote Efficiency"	**GM1**: promote efficient use of the transportation system;		May not incentivise "appropriate" use of spare capacity

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