Opening and Welcome

Nigel Sisman

Business Area Manager, Markets


entsog
european network
of transmission system operators
for gas
39 Transmission System Operators
23 countries
1 more application
Gasum
swedegas
SVENSKA KRAFTNÄT
premier TRANSMISSION
LIETUVOS DUJOS
ENERGINET.DK
gasLink
nationalgrid
Statoil
gasunie
gastransportservices
ontras
GAZ system
Interconnector
ERDGAS MÜNSTER
GRTgaz Deutschland
Open Grid Europe
The Gas Wheel
FLUXYS
Thyssengas
ERDGASLOGISTIK
creos
WINGAS TRANSPORT
NET4GAS
eustream
bayern
GVS
TAG
OMV Gas
GRTgaz
TRANSGAZ
MAGISTRALA ENERGIEI
geoplin plinovodi
EDISON STOCCAGIO
TIGF
BULGARTRANSGAZ
eni
snam rete gas
REN Gasodutos
enagas
DESFA

ENTSOG mission and commitment

To deliver on Third package requirements including:

- Network codes
- Ten Year Network Development Plans

by listening, being responsive and identifying and promoting what enhances the prospects of a properly functioning market.

entsog

fair partner to all

The Goal

- Producing a network code in twelve months
  - In line with the framework guidelines on balancing
  - Compliant with the provisions on balancing in Regulation (EC) 715/2009
  - Taking due account of stakeholder input

- Fulfilling Regulation (EC) 715/2009 requirement that ENTSOG "*conduct an extensive consultation process, at an early stage and in an open manner, involving all relevant market participants*"

Network Code on gas balancing in transmission systems

ENTSOGs' Kick-Off Meeting

DG ENER B2
Tanja Held

26 October 2011, Brussels

Directorate-General for Energy

EUROPEAN COMMISSION

Completion of Internal energy market by 2014

- EU Council has set 2014 as a target to complete the internal market, meaning EU-wide harmonization of market rules to promote a level playing field for all market actors,
  - to enhance cross-border trade and
  - to foster competition in the sector.
- Harmonization of market rules in the framework of the third energy package means the development of Network Codes/Guidelines

Directorate-General for Energy

EUROPEAN COMMISSION

- Network codes and guidelines foreseen to be finalized by 2014
  - Capacity Allocation Mechanism
  - Congestion Management Procedures
  - **Balancing rules**
  - Tarification principles and structures
  - Interoperability
  - Data Exchange and settlement rules

Directorate-General for Energy

EUROPEAN COMMISSION

Balancing rules and Imbalance charges

- Aim of the balancing framework guideline and network code:
  - foster liquidity at gas trading hubs
  - facilitate efficient cross-border trade
- Balancing rules to be
  - fair, non-discriminatory, transparent and based on objective criteria.
- Where the framework guideline leaves room to exercise discretion, ENTSOG should endeavour to harmonise balancing regimes

Directorate-General for Energy

EUROPEAN COMMISSION

The Balancing network code development process

- Commissions' invitation to ENTSOG will be sent beginning of November.
- The Commission is happy with the development process of the first network code on capacity allocation and wants to encourage ENTSOG and stakeholders to continue the good work.
- Impact assessement of ENTSOG's „work area" crucial
- For NC development process an active involvement of stakeholders covering the whole EU is crucial.

Directorate-General for Energy

EUROPEAN COMMISSION

- Thank you for your attention

"Introducing ACER"

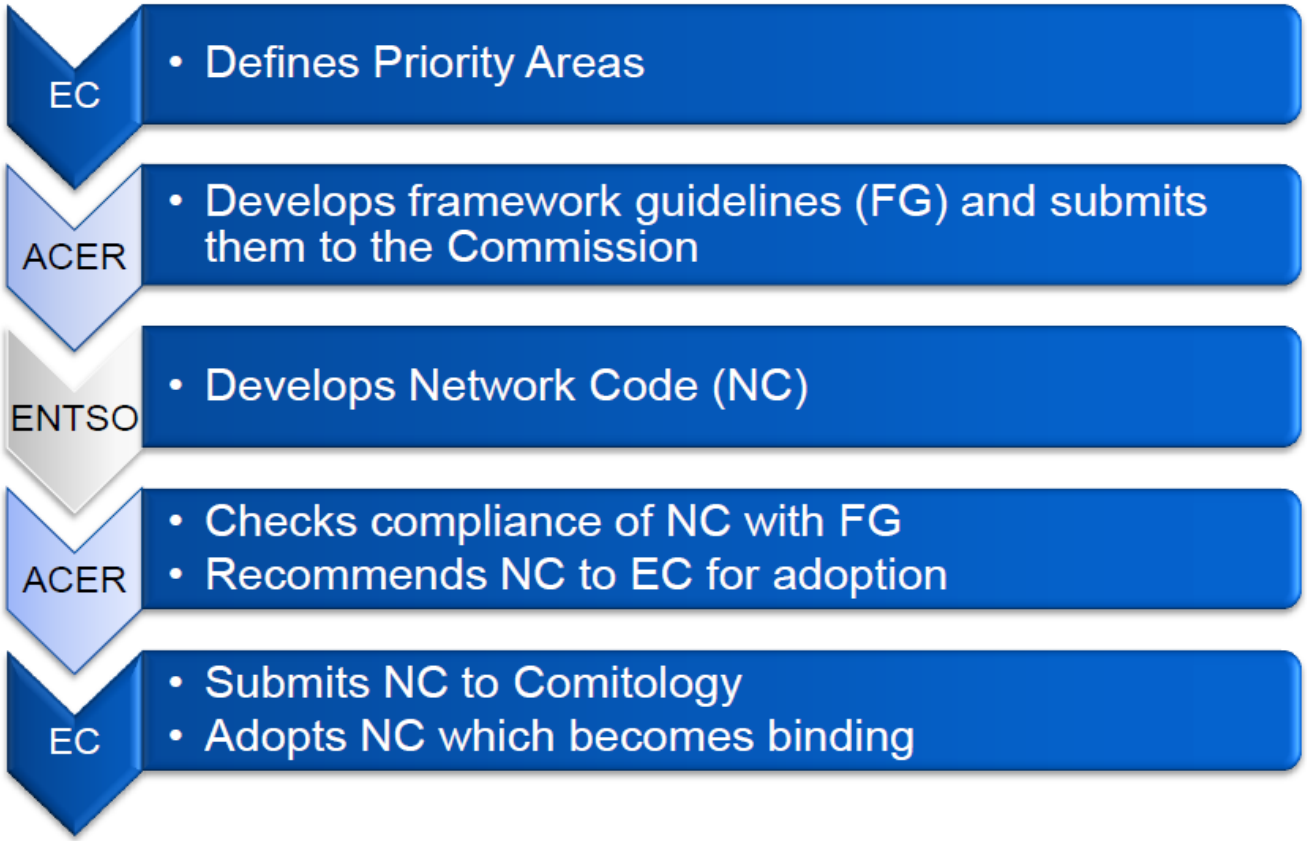
Steve Gordon
Head of the Gas Department
ACER (Agency for the Co-operation of Energy Regulators)

ENTSOG Gas Balancing Network Code KO Meeting
Brussels 26th October 2011

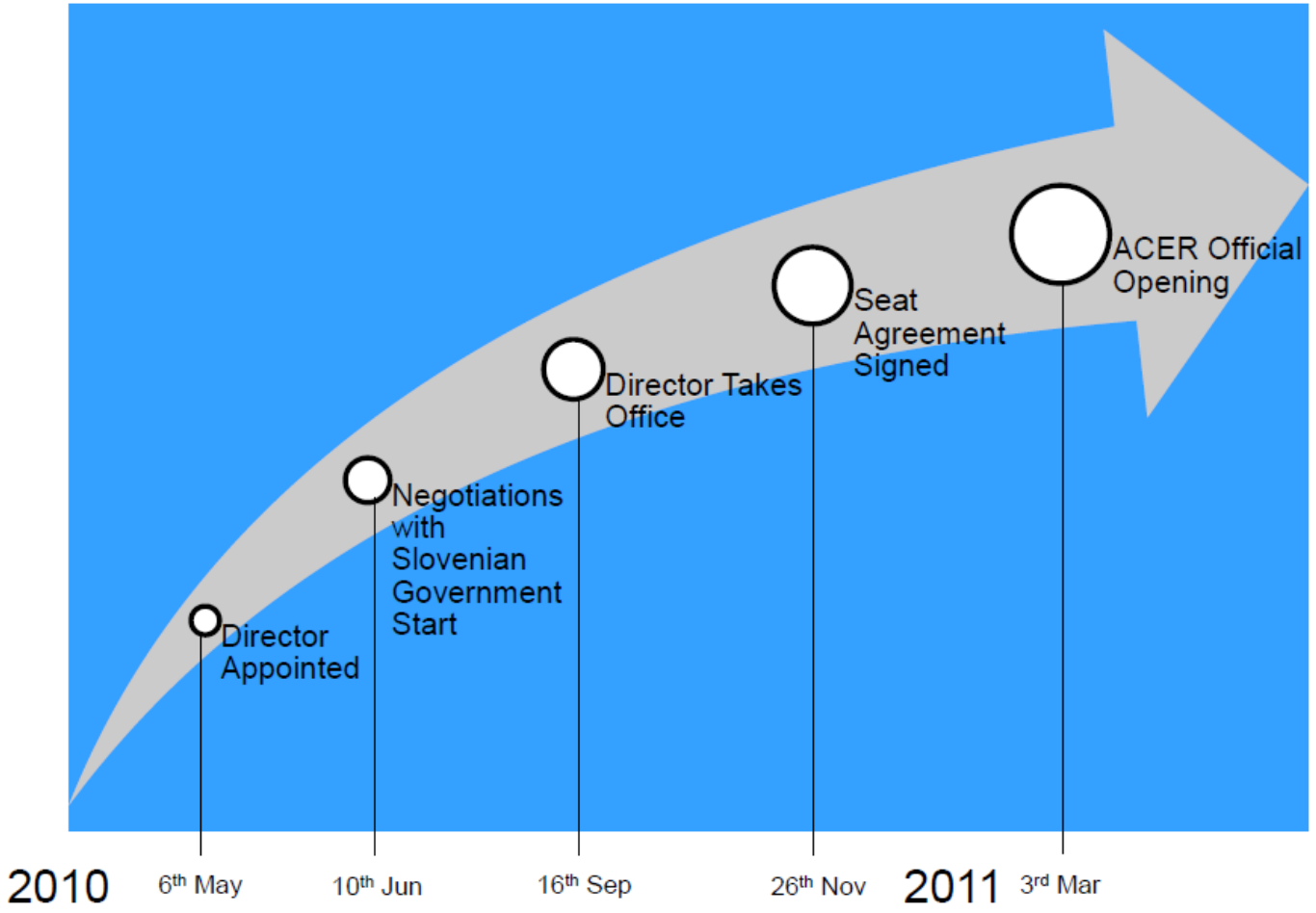
Working Together

Each of the representative bodies works together to deliver common goals

Developing Framework Guidelines and Network Codes



The Establishment of ACER



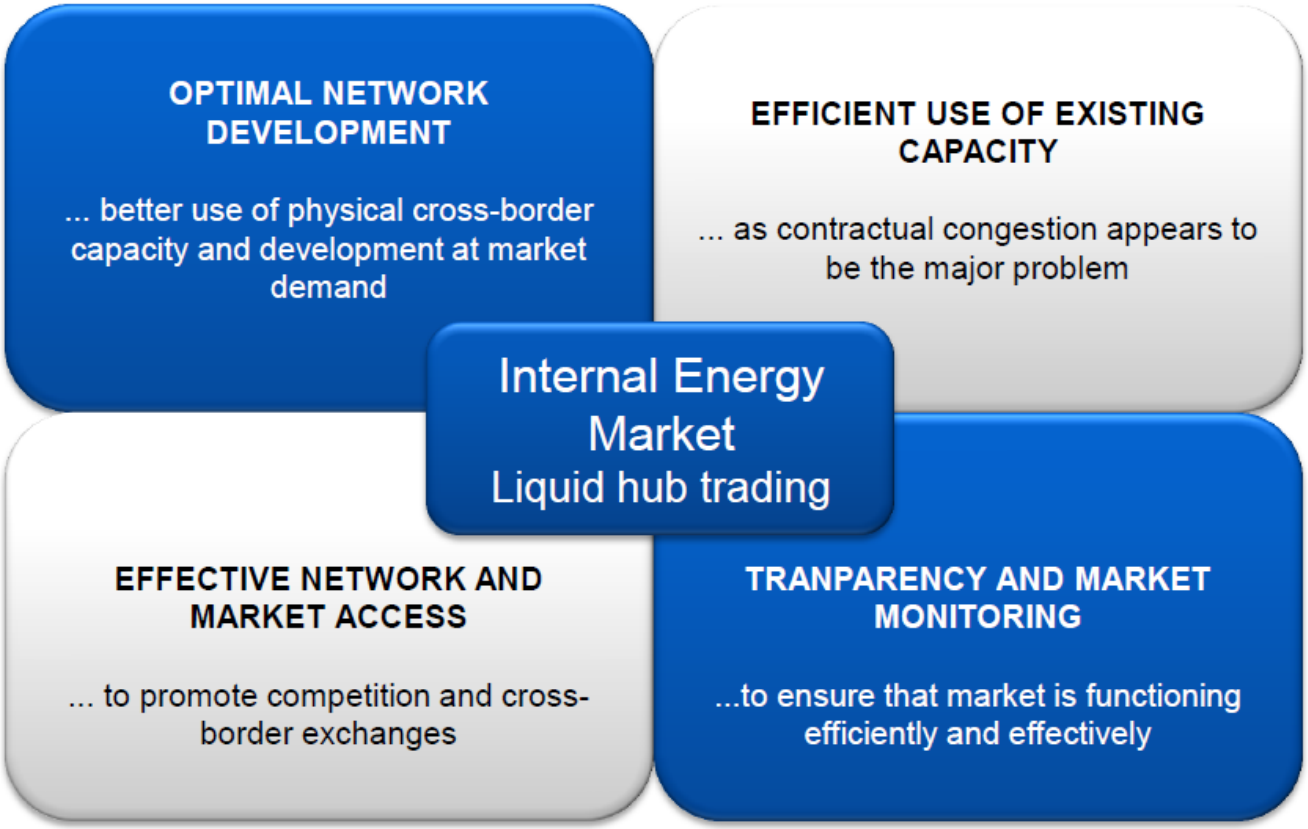
ACER was officially opened on 3rd March 2011

ACER's Departmental Structure

NRA Co-operation	TSO Co-operation	Market Monitoring	Framework Guidelines and Network Codes

Focussed on 4 key areas of delivery

Components of The Internal Market



Gas Balancing rules are key to delivering the Internal Energy Market

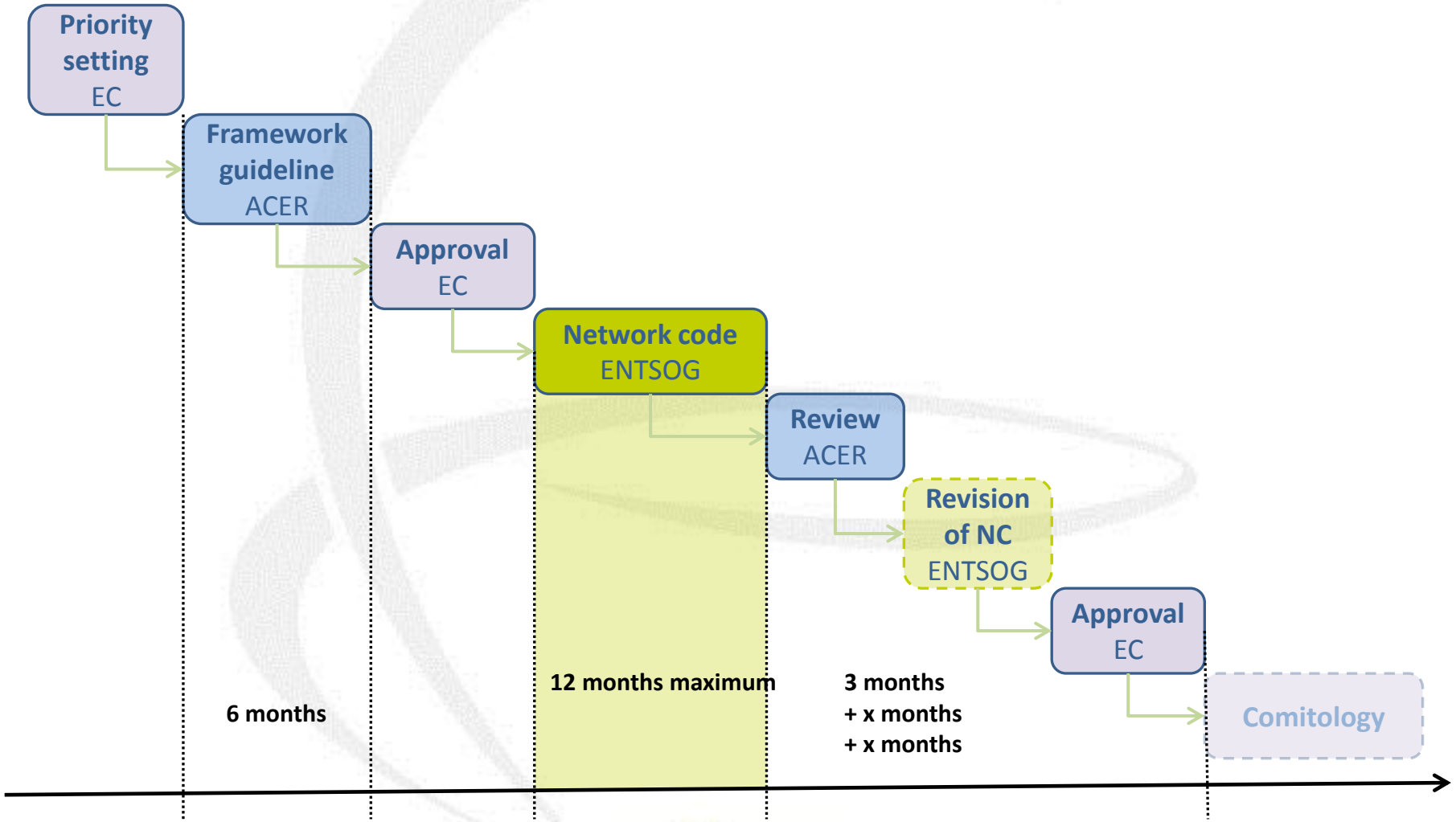
Thank you for your attention

www.acer.europa.eu

Network Code Development Process

Noel Regan, Adviser, Markets

Where does the Network Code process sit?



Context to Project Plan

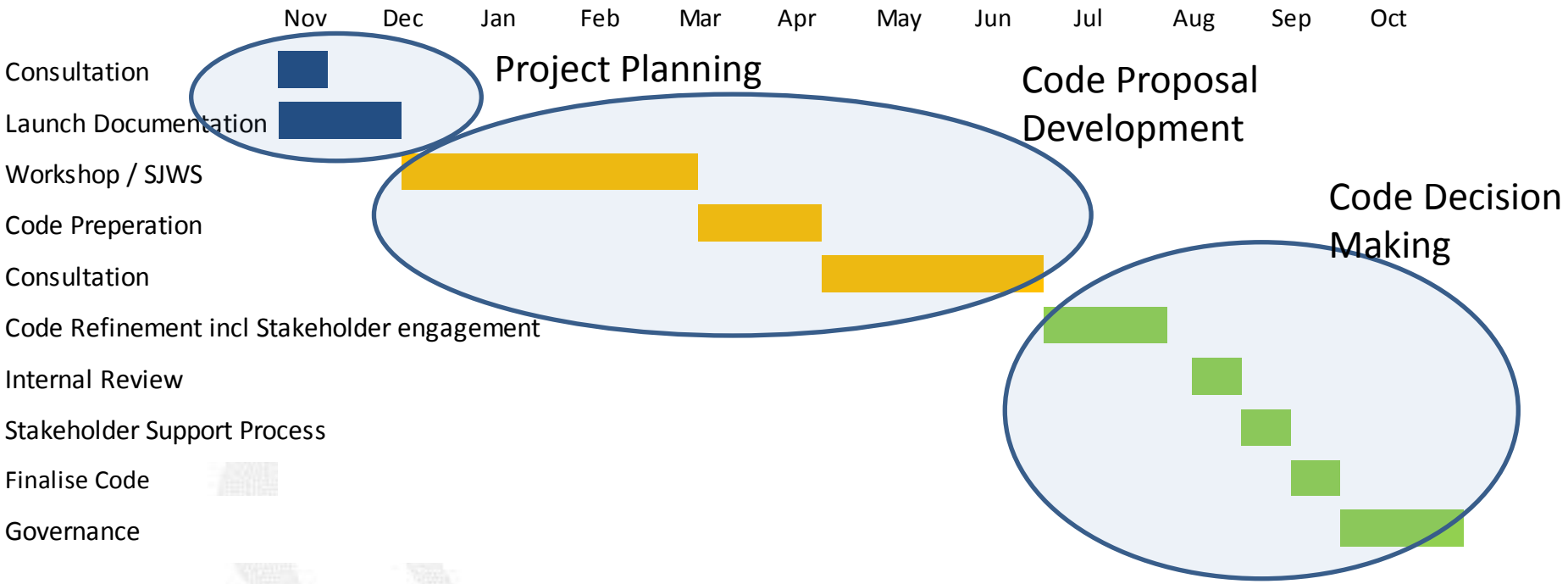
- ENTSOG process is designed to maximize stakeholder involvement, going beyond a standard consultation process

- ENTSOG aims to keep all ***interested*** stakeholders involved and informed during all 12 months of the project

- In order to do this, ENTSOG uses:
  - Workshops
  - Stakeholders Joint Working Sessions
  - Publication of meeting documents & detailed questions
  - Additional meetings with most active stakeholders
  - Prime mover concept
  - All relevant materials available on ENTSOGs website

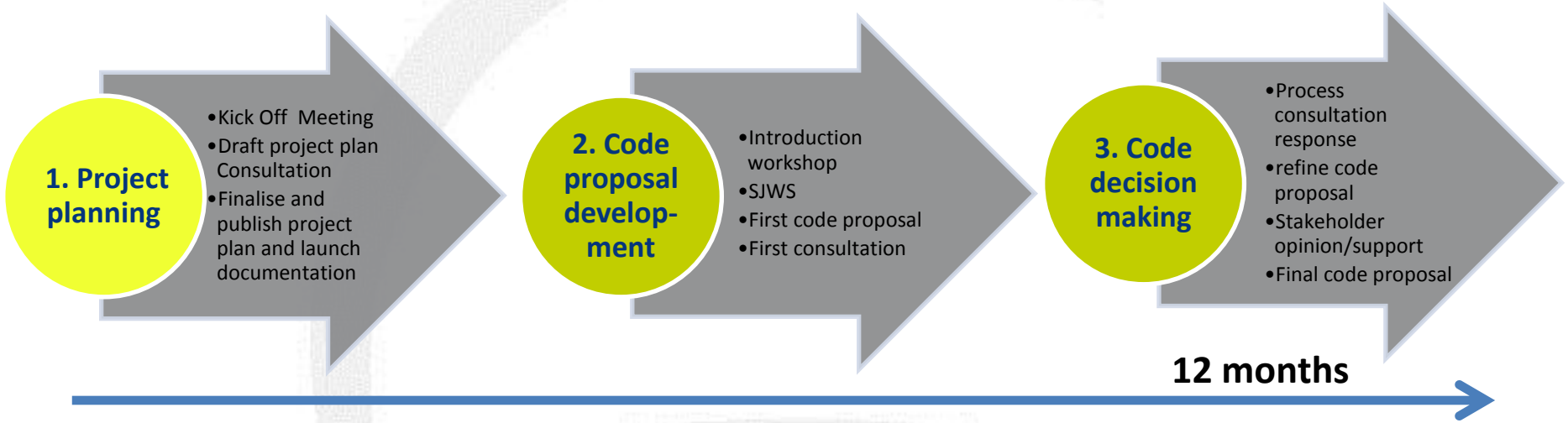
- A distinct role for the DSOs

Timetable



- A detailed plan will be provided in the project plan consultation

Phases in ENTSOG's Network Code Development



STAKEHOLDER INVOLVEMENT

- KICK OFF MEETING
- PROJECT PLAN CONSULTATION
- LAUNCH DOCUMENTATION
- LAUNCH WORKSHOP
- STAKEHOLDER JOINT WORKING SESSIONS
- FORMAL CONSULTATION
- CONSULTATION WORKSHOP
- REFINEMENT WORKSHOP
- STAKEHOLDER SUPPORT PROCESS

INFORMAL, BI-LATERAL and ADHOC INTERACTIONS AS REQUIRED THROUGHOUT THE PROCESS

Phase 1

Project Planning

Project Planning

ENTSOG intend to interact with Stakeholder in several ways for this phase:

- Host a kick-off workshop – “what we’re doing here today!”
- Conduct a short consultation on the project plan itself
  - Aim to release in coming days
- Release of Launch Documentation including final project plan

Project Plan Consultation

"A short consultation on the process ENTSOG intends to use for network code delivery"

- Will provide an in-depth description of the three phases of the network code development
- Including a MS Project timetable
- Specifically looking for feedback on:
  - The overall plan
  - Your level of involvement - four categories proposed
  - The proposed timeline
  - The Proposed topics for each of the SJWS
- Feedback received from CAM network code consultation process has been taken into account in the project plan

Target Structure

- In Project Plan we ask Stakeholders to let us know their degree of participation:

Level	Description	Comments
1	Prime Mover	Committed to work on a bilateral basis and dedicate a lot of resources to assist formulate and evaluate/refine ideas/proposals for SJWS consideration – commitment to be intensive and involving many days during intensive phases of the network code development
2	Active SJWS Participant	Expected to attend all SJWS and to read and review all material prior to meetings and to be prepared to explore detail within the SJWS – commitment of around 3 days per month during intensive period of activity
3	Consultation Respondent	Will respond to consultations
4	Observer	Expected not to actively contribute to the development effort or to participate in the formal consultations

- Keen to have a good spread of:
  - Activity
  - Geographical area of activity – where or with which of TSO they cooperate now

Feedback from CAM Network Code Process

Stakeholder Feedback	ENTSOG Response
Many would like to attend workshops and meetings *before* the network code process starts officially. Particularly the wish for pre-meetings in Balancing was expressed.	• Introduced this kick-off meeting at start of 'Project Planning' phase • Extended launch documentation
Preparatory working papers are requested to be distributed in advance of workshops.	• Commitment to provide papers in advance of each SJWS
Web streams of SJWS and workshops are asked for.	• Seeking feedback in planning consultation • Potential for surgery clinic
Email alerts for new documents and events are to be considered.	Email distribution list to inform of: • Upcoming meetings / workshops • When papers published on website
The Auction workshop was deemed particularly useful.	• Intention to host interactive game in process

Feedback from CAM Network Code Process

Stakeholder Feedback	ENTSOG Response
Clearer output of SJWS with documentation of all views expressed needed.	• Commitment to publish meeting notes shortly after SJWS on website
Time for written consultation is too short. Workshops are very helpful, but no replacement for a written answer.	• Committing to a full two month consultation period. • We do note that a second consultation has been set-out in the CAM process. It should be noted that this process will not have the additional 6 weeks that have been allocated to CAM to allow this – SWJS are a key tool to getting your feedback on top of the formal process.
More stakeholder discipline is wanted: they are to concentrate on issues to be solved, not on reiterating political positions.	• Start workshop always with the current status in the process and organizational issues – recap on framework guidelines • Facility for questions to be sent ahead of SJWS
Representation – location and size	• Seeking a geographical spread and variety in size of prime movers as much as possible.

Launch Documentation

Launch documents are intended to:

a) Present a final project plan consultation conducted during the first phase of the project

b) Provide the basis for the discussions in the SJWS and it therefore contains several concepts for further debate with market participants.

c) Describes the interactions with other areas, for example:
   a) CAM Network Code
   b) CMP Guidelines
   c) Interoperability

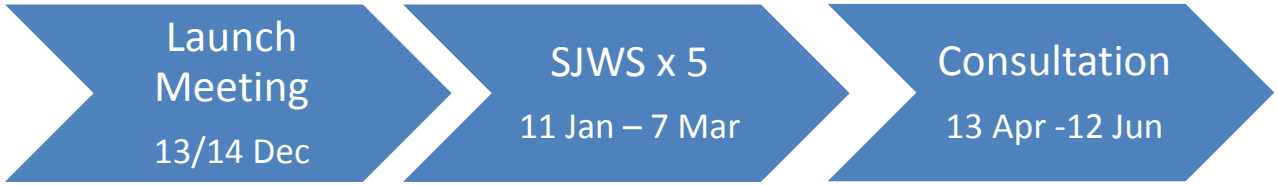
d) Explains the underlying assumptions that ENTSOG will use in drafting the Balancing network code

Phase 2

Code Development Proposal

Code Development Proposal

ENTSOG intend to interact with Stakeholder in several ways in this phase:



- Project Launch Workshop
- Stakeholder Joint Working Sessions
- Network Code Consultation
  - Draft network code
  - Comprehensive consultation document
  - Workshop during consultation period

SJWS

SJWS have been successfully used in CAM process:

- It is a round table session on specific topics for the network code in order to get Stakeholders views early in the process, thereby helping to shape the development of the network code
- An essential tool in the timely development of a robust network code proposal
- Held in Brussels

ENTSOG provide:

- Invitation
- Agenda
- supporting material
- Meeting notes

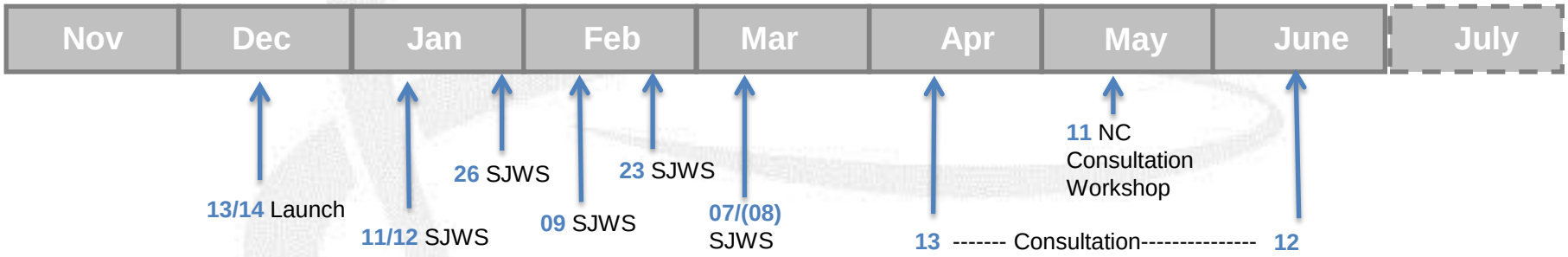
We strongly encourage stakeholders to comprehensively examine the launch documentation and pre-meeting materials in advance of the SJWS

Proposed Time Schedule

SJWS process

- For each SJWS ENTSOG will:
  - provide pre-meeting materials in advance
  - ENTSOG will provide minutes and conclusions shortly after the meeting

SJWS Time Schedule



- The following slides demonstrate the planned topics for the SJWS
- The Project Plan will seek your views on these

Launch Workshop: 2 Days (13/14 Dec)

- Concepts and Foundations for Network Code
  - "Spirit" and objectives of FG
  - Scope (what parts will be harmonized in the NC, what is out of scope)
  - Interpretation of framework guidelines
  - Roles and responsibilities
  - Balancing period and within-day obligations and incentives (brief)
  - Procurement of balancing energy by TSO
    - Products (standardized / non-standardized)
    - Balancing platforms
    - Merit-order-list
  - Information provisions
    - TSO→ network users
    - Network users/DSOs → TSO
  - Imbalance and other charges
  - Cross Border topics

SJWS 1: 2 Days (11/12 Jan)

Balancing Target Model

Roles and Responsibilities

Imbalances / financial considerations

Within-day Obligations and incentives

Within-day Information Provision

- ENTSOG's view on these topics
- Prime movers and stakeholders views
- Discussion on topics

SJWS 2 (26 Jan)

Balancing Target Model

Balancing products

Merit order

Charges

Interim Measures

- ENTSOG's view on these topics
- Prime movers' and stakeholders' views
- Discussion on topics

SJWS 3 (09 Feb)

Balancing Target Model

Within-day Obligations and incentives

Within-day Information Provision

Balancing Products

Interim Measures

- Changes based on the responses / feedback received
- Discussion on topics, see above, and changes
- Prime movers' and stakeholders' views

- Potentially game to illustrate
  - Information provisions to network user
  - TSO balancing actions
  - Imbalance Charges on network user

SJWS 4 (23 Feb)

Consolidation

Preview of network code

Cross Border Topics

- Changes based on the responses / feedback received
- Discussion on how topics are related
- Prime movers' and stakeholders' views

SJWS 5 (07/(08) Mar)

- Intend to leave agenda open for this session as thinking will evolve during process.

Formal Consultation

ENTSOG will release a consultation package:

- A draft network code
- An accompanying consultation document
  - Rational for decisions
  - Highlighting specific area seeking feedback
- A workshop within the 2 month period
  - Address any initial queries stakeholders may have

Stakeholders will have 2 months to respond to this consultation

Phase 3

Code Decision Making

Code Decision Making

ENTSOG intend to interact with Stakeholder in several ways for this phase:

- Conclusions Workshop
- Stakeholder Support Process

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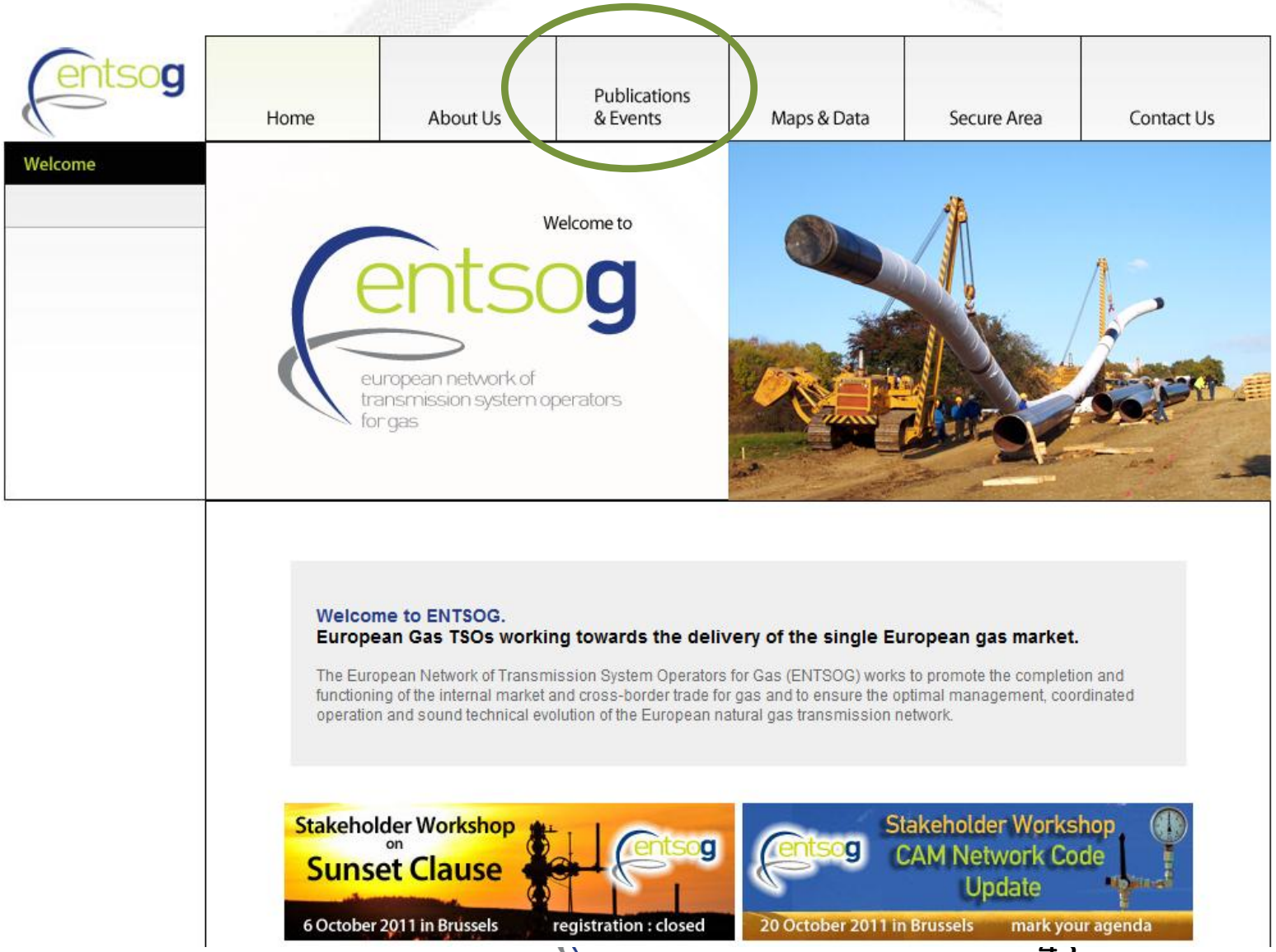

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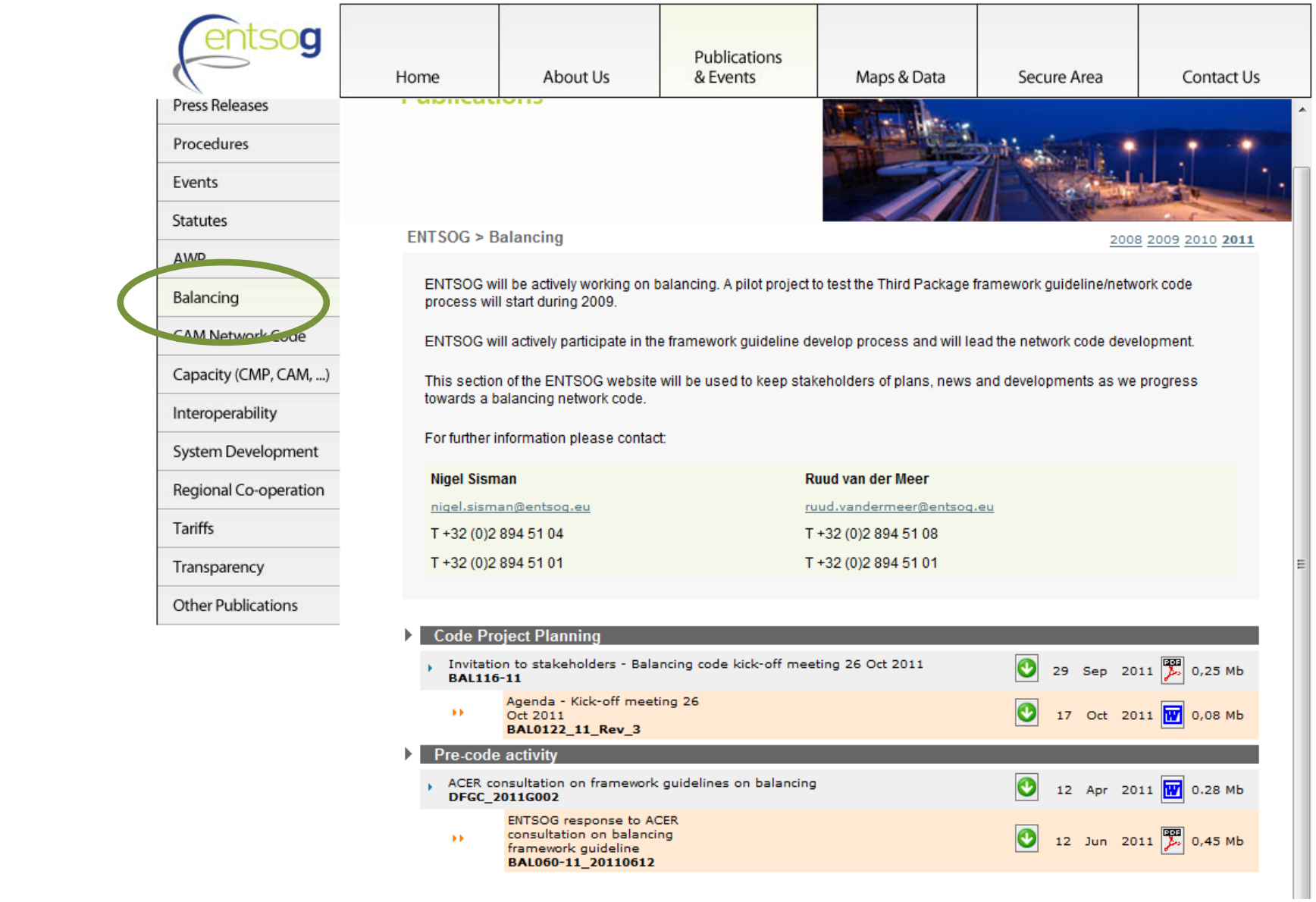

Conclusions

- Feedback from our project plan consultation most welcome
- Please note the dates of our SJWSs / workshops
- The greater the preparation on all our parts for these the more robust a network code we can consult upon….experience to date has shown that front-loading is key!

Thank You for Your Attention

ENTSOG -- European Network of Transmission System Operators for Gas
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Framework Guideline on gas balancing

- Konrad Keyserlingk
  ACER gas balancing workstream

- Balancing Network Code Kick-off meeting,
  Brussels, 26th October 2011

Where are we now

- **2010 to March 2011:** ERGEG work on pilot FG
- **12th April to 18th October:** ACER Framework Guideline development
- **Stakeholder engagement**: through public consultation, Expert Group, public workshops, consultation processes, bilateral meetings, discussions and informal written comment from EC
- **Next steps**:
  - European Commission to initiate Network Code development process
  - Comitology

The vision

Balancing framework guidelines – key to market design
(not just technical rules)

Facilitating a single market

- **Remove barriers to cross-border trade** created by different balancing arrangements
- **Reduce fragmentation of the market** by looking at ways to merge balancing zones
- **Promote the development of regional markets** by encouraging the use of interconnectors (and gas from cross-borders) in balancing

Develop liquid traded market

- **Facilitate new entry** by ensuring balancing arrangements are non-discriminatory;
- **Promote market liquidity at emerging gas hubs**
- by encouraging shipper trading across timescales;
- by having market arrangements for TSO procurement of balancing gas

Suitable for all parts of Europe

- **Provides a coherent set of rules,** which
- lead to a common vision of balancing arrangements;
- can be implemented in network codes and is enforceable by NRAs;
- take account of the different degree of market development across Europe (need for interim steps)

Problem identification

- Lack of access to relevant information, flexible gas and network capacity reduces shippers' ability to balance efficiently
- Fragmentation of balancing zones may create barriers to cross-border trade
- Some imbalance charges do not provide the right incentives to shippers and are potentially discriminatory
- Non-market based methods for TSO procurement of balancing services reduce market liquidity
- All of this results in TSOs doing most of the balancing instead of the market

Key elements of Framework Guideline

- Network users to balance their portfolio, reduced role for TSOs
- TSO to procure balancing services on the wholesale market as far as possible
- Harmonised daily balancing period as far as possible
- Information provision as much as is cost-effective

Public Consultation

- 57 responses received
- Generally **very supportive** (almost all responses complemented ACER on their document)
- Most comments focused on detail
- Responses and evaluation published on ACER website

Changes to FG as result of consultation

- No wholesale change, but clarification of application of interim steps
- Balancing platforms can also be used where locational and temporal products are not available on the wholesale market
- Clarify criteria for within-day obligations and their approval process; need for sufficient information
- Allows for more frequent information provision subject to cost-benefit analysis
- Clarification of role of DSOs

Challenges for network code process

- Purpose of “network code” is to flesh out the specific requirements in a form appropriate to pass Comitology and be annexed to Regulation
- ENTSOG will have 12 months to deliver
  - Needs to be well organised and to access appropriate expertise
- Engagement with DSOs will be important as well as other stakeholders

Thank you for your attention

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ENTSOG Initial Reaction to Revised Framework Guidelines

Ruud van der Meer
Adviser

BAL NC Kick-Off meeting – 26th October 2011

Framework Guidelines

The revised framework guidelines provide some helpful clarity in specific areas:

- Definition of Balancing Zone
  - Clearly allows for circumstances where distribution system included
- Imbalance Definitions
  - Greater clarity on marginal sell and buy price
- Role of DSO
  - sets out clearly the level of DSO involvement with an emphasis that TSOs and DSOs shall cooperate in developing and implementing the Network Code, where relevant and appropriate

Framework Guidelines

- Additional circumstances for use of the interim measure of a Balancing platform
  - Where temporal or locational products are not available on wholesale market
  - Addresses a real concern of ENTSOG

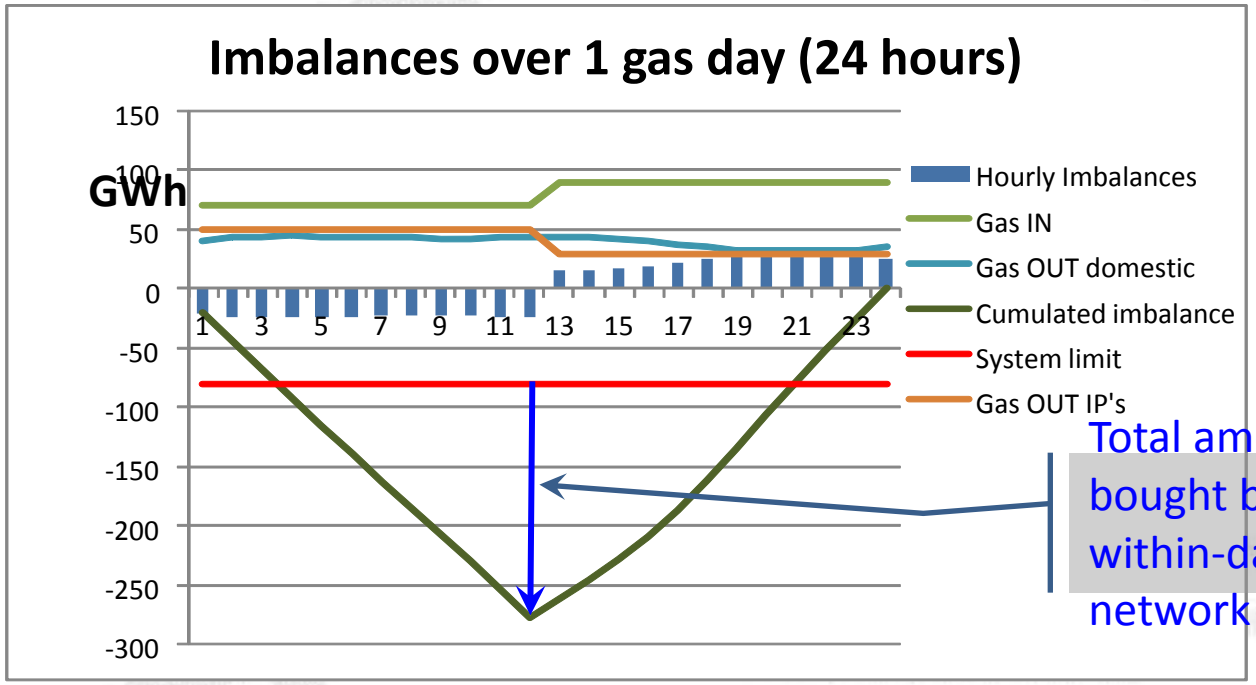
- Use of a roadmap to deliver the balancing target model, where interim measures are required
  - A sensible approach to implementation

Example – within day obligations

Assume

- profiled entry
  - 70 GWh/h in 1st half of day
  - 90 GWh/h in 2nd half of day
- Exit flow:
  - Domestic exits
    - average of 40 GWh/h with swing of 50 GWh
  - Border IP's
    - 50 GWh/h in 1st half of day
    - 30 GWh/h in 2nd half of day
- Total available linepack: 60 GWh

Example – within-day obligations



Total amount of gas bought by TSO to manage within-day position of the network

- Significant cost for managing within-day position of the network
- End-of-day settlement is minimal
- Requirement that within day obligation cost small proportion of end of day cost

- How is network user charged for cost of within-day balancing action?

Framework Guidelines

- The new framework guidelines enhance understanding
- Further work is required to understand their implications

ENTSOG Introductory session on Balancing

Ruud van der Meer
Adviser

BAL NC Kick-Off meeting – 26th October 2011

Agenda

- **Objectives**
- Definitions
- Balancing: Key concepts
- Illustrations

Objectives

- The objective of this session is to work on
  - a common understanding of key concepts
  - a common set terminology
- To ensure the highest possible involvement of all stakeholders, it is key that there is a common understanding of balancing concepts, well understood by all
- The description of balancing concepts contained in this document is intended to provide a high-level vision of the basic concepts: it is not an description of particular balancing regimes currently in place in different systems
- This document does not represent in any way ENTSOG's position or preference for the drafting of the future Network Code
- Questions can be adressed to:
  - Ruud van der Meer (ruud.vandermeer@entsog.eu)
  - Noel Regan (noel.regan@entsog.eu)

Agenda

- Objectives
- **Definitions**
- Balancing: Key concepts
- Illustrations

Overall gas transmission model concepts:
Entry/Exit model & Virtual Trading Point

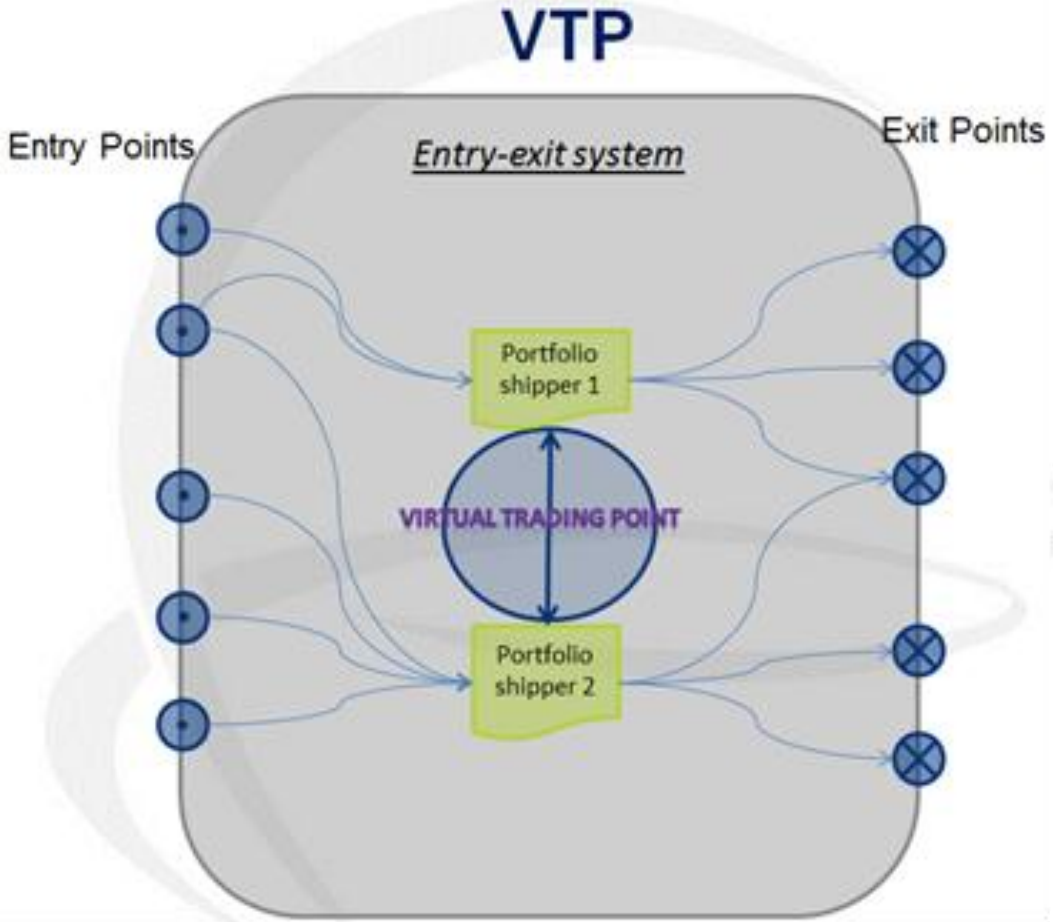
- **Entry/exit model**
  - Commercial model to market and use transmission capacity
    - No link between entry and exit when booking
    - No link between entry and exit when using
  - Enables a virtual trading point

- **Virtual Trading Point**
  - Intrinsic to an entry-exit system system
  - Allows network user to exchange title to gas within the system

66

Overall gas transmission model concepts:

Entry/Exit model & Virtual Trading Point

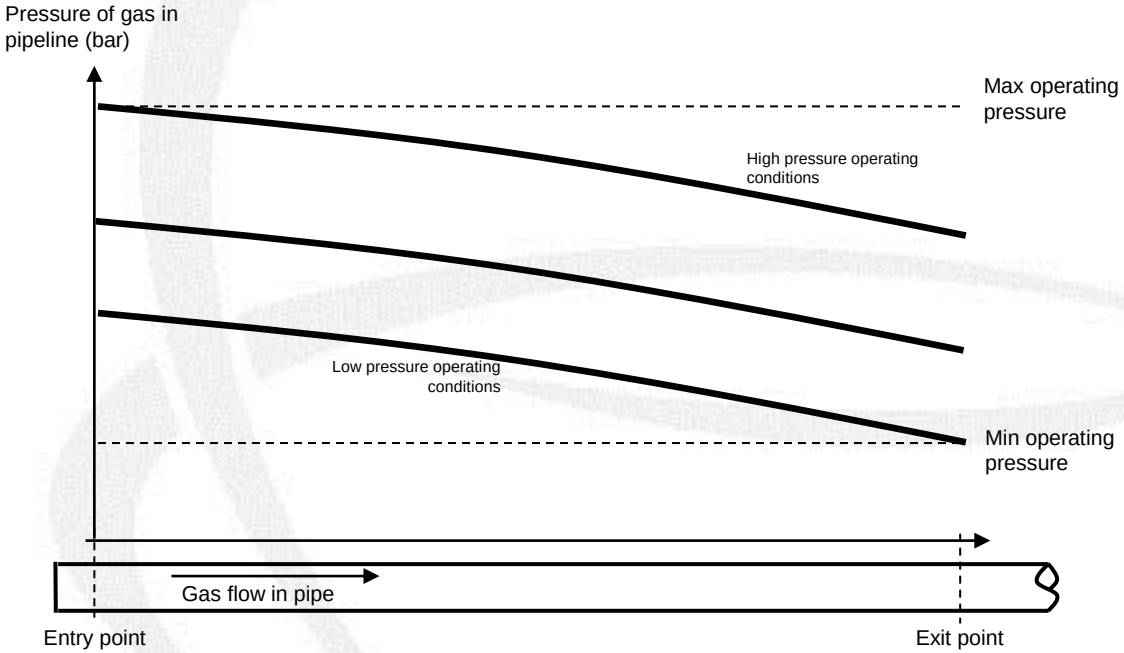


Network operation under entry-exit model

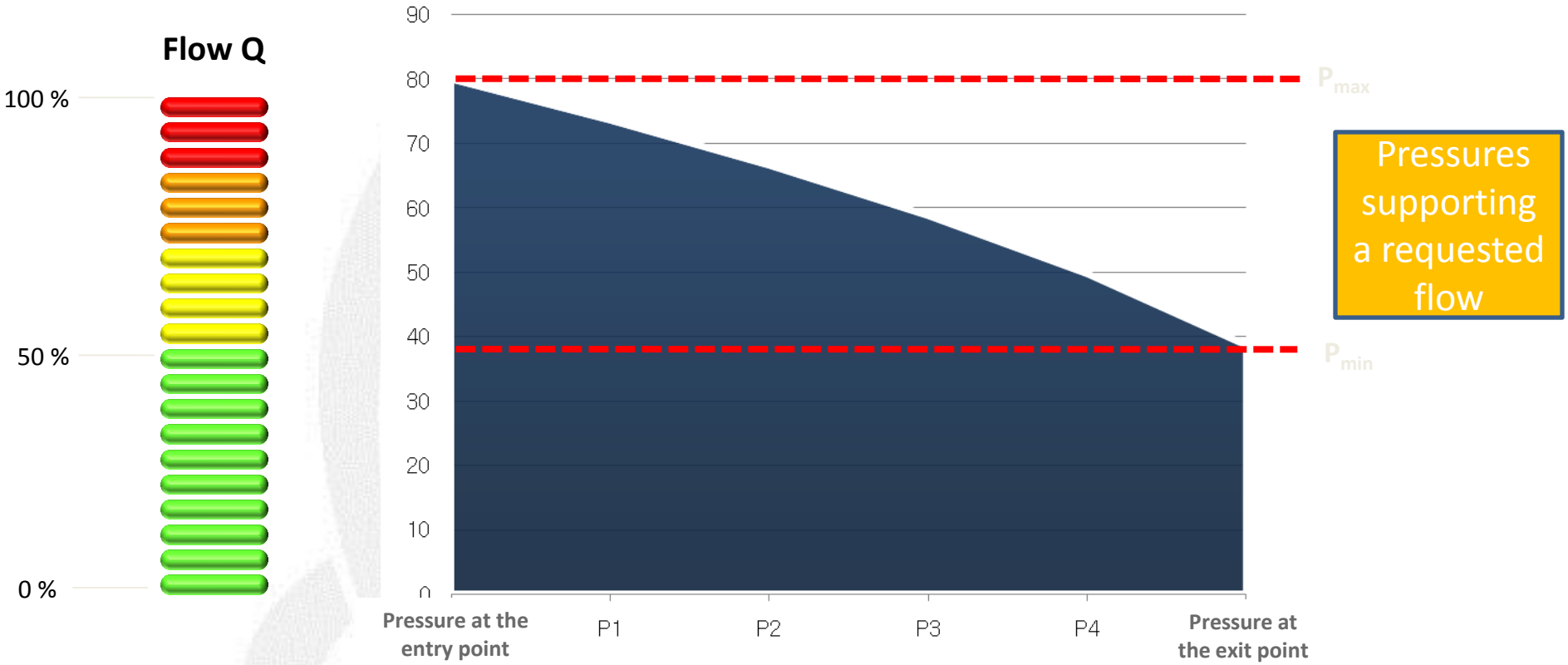
- Entry-exit: a simple, market based model
- Creates a gap between commercial model and physical network operation
- Physical network operation:
  - Meet customers' demand
  - Gas flows from high pressure areas to low pressure
  - Manage pressures in the system within operational envelop
  - Entry onto the system increases pressure
  - Exit from the system decreases pressure
  - Balance needs to be struck between total entry onto and total exit from the system
- Bridging the gap, main tools:
  - Technical capacity
  - Balancing regime

Static flow

- Same flow operated under 3 different scenarios



Animated illustration: flow and pressure



Balancing: Key definitions and concepts

- **Flexible gas:** gas required to meet short term fluctuations in demand by customers. It also contributes to overall system security by responding to unexpected system requirements

  Note flexible gas can be delivered from a number of physical sources, like

  - Production
  - Storage
  - lng terminals
  - Interconnections
  - demand side management.

Balancing: Key definitions and concepts

- **Market Based Balancing balancing system**

  characterized by 5 principles:

  1. Network users must balance, at least collectively, the inputs of gas onto and off-takes from the network
  2. Network users must be able to balance their portfolio by buying /selling on a market
  3. Network users are incentivized in doing so to limit the role of the TSO to a minimum
  4. Where the TSO needs to take balancing actions the costs of these are targeted to the network users that caused the action
  5. Balancing charges on network users are cost reflective and reflect the value of the gas or service within the balancing period

Balancing: Key definitions and concepts

- **Within Day Obligations:**
  refer to specific obligations or incentives relating to network users' inputs and off-takes during the gas day

- **Note** within-day obligations can be imposed where
  - the TSO needs to take balancing actions regarding the system's position during the day and
  - they contribute to minimizing the role of the TSO.

Conclusions

- Entry-exit systems are a simple commercial model
- E-e system by its nature has a virtual trading point
- A simple model can create a big gap with physical operation
- The challenge:
  - Design balancing regimes that
  - Help bridge the gap
  - And are market based

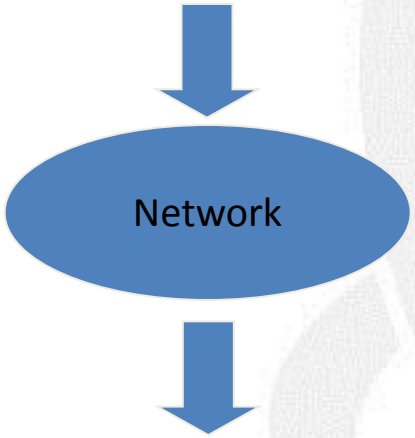
Agenda

- Objectives
- Definitions
- **Balancing: key concepts**
- Illustrations

What is “balancing” ?

Gas flow

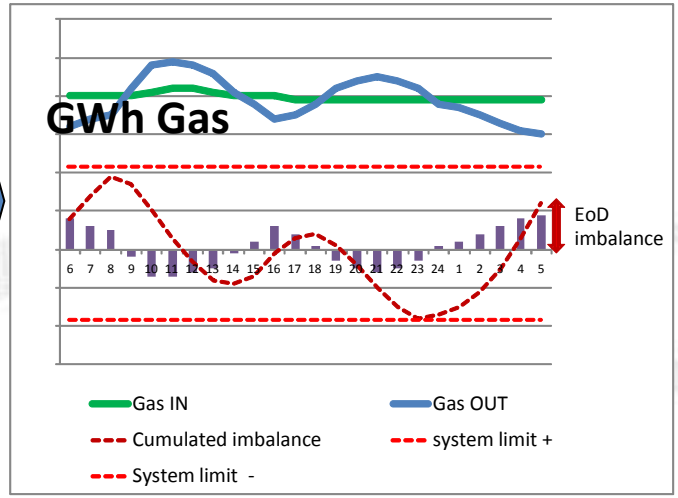
Gas IN: Import, Production, LNG, Storage emission



Gas OUT: consumption (residentials, industy, power plants), export, storage injection

Imbalances

Every difference between IN and OUT creates an imbalance that has to be « absorbed » by system



Imbalance must stay within boundaries, reflecting physical limitations of system

“Rules” vs “Tools”

2 ways to keep system integrity:

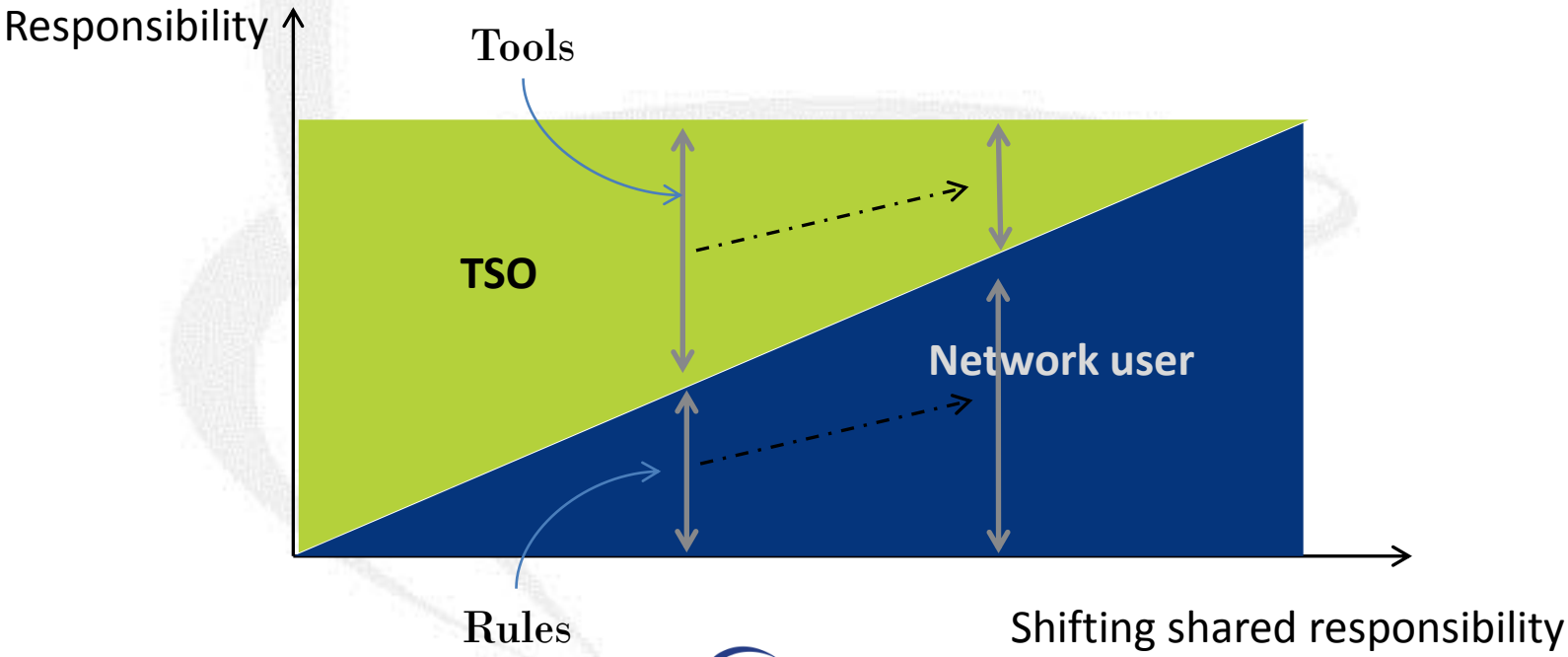
- Impose **rules on shippers** to keep imbalances within certain limits
- Provide **balancing tools to TSO** to increase system capabilities

A combination of both is always used to design a balancing system:

- Shippers are always responsible for keeping their portfolio balanced (e.g. through an end-of-day settlement system)
- TSO has always some physical tools to manage system imbalance (at least some linepack)

Shared responsibility

- Balancing is a responsibility shared between network users and TSO
- There is a choice in how to share responsibilities between network user and TSO
- Framework guidelines aim to minimize the role of the TSO
- Responsibilities must be reflected in
  - the rules on network users
  - tools available to the TSO



Which “Balancing tools” for the TSO ?

- **« Market Based Tools »: short term buying/selling gas on markets, like**
  - Trading title: transfer end-of-day at VTP
  - Trading intra-day products: transfer during a specific time window during the day at VTP
  - Trading physical products: transfer at a specific entry or exit point during an agreed period

- **« Balancing services »: bilateral contract between TSO and flexible gas provider, which can take several forms, e.g.**
  - Option to injection or withdrawal gas at a specific point in the network
  - Parking & Lending of gas in storage
  - Flexible supply contracts
  - Etc.

What “Balancing rules” ?

- **Balancing rules on shipper’s portfolios**
- **Balancing rules on overall system imbalance**
- **Rules on flow profiles at entry/exit points**

Information provision

Two types of information flows required in a gas transmission network

Information to the TSO:

- **From the Network Users**
  - (Re)Nomination at entry / Exit points: required by the TSO to steer the desired gas flow and to ensure system safety
- **From the Adjacent operators**
  - Matching of nominations/allocations at both sides of a border to ensure the right steering/allocation
- **From the DSO**
  - Required by the TSO to manage the system and/or to provide the information to the network users
- **From other sources**
  - E.g: weather forecast

Information from the TSO:

- **To the Network users (required to manage imbalance charge exposure)**
  - System imbalance information: within-day linepack, sume of shipper's imbalance, etc.
  - Gas flow allocations: end-of-day information or within-day information on shipper's allocations
  - Forecast: in some systems, the TSO provides forecasts of consumption of some (groups of) end-customers
- **To adjacent operators**
  - Matching of nominations/allocations at both sides of a border to ensure the right steering/allocation

Information provision shall support both network user and TSO in efficiently manage its portfolios

Imbalance charges

- **Objective: imbalance charges are aimed at:**
  - Recovering the costs of TSO balancing actions
  - Incentivizing network users to balance
    - inputs of gas onto against
    - off-takes from the network
- **Criteria: imbalance charges shall**
  - be cost-reflective
  - avoid cross-subsidization among network users, targetting those that triggered the costs
  - reflect the value within the balancing period of the gas or service
- **Tools: Two types of imbalance charges can be distinguished**
  - Settlement of imbalance position at a given price (implicit commodity transaction)
  - Incentive applied on an imbalance (no implicit commodity transaction)

Balancing: who does what?

- **TSO: system balancing**
  - Maintain system integrity
  - Balancing action when required to maintain system integrity (inject or withdrawal flexible gas)
  - Bill imbalance charges to Network Users
  - Provide information to Network Users to balance their portfolio
- **Network User / Shipper: Portfolio balancing**
  - Matching inputs and offtakes from the system (at portfolio level) through (re)nominations of entry and/or exit gas flows
  - Pays imbalance charges
- **End-customer:** Offtakes gas according to need
- **DSO:**
  - Offtakes gas according to demand
  - Provide information to TSO to enable forecast and allocation
- **Storage Operator / LNG operator / Gas Producer**
  - Flexibility provider by enabling entry/exit (re)nominations
- **Neighboring Network Operator:** agreements and mutual assistance for balancing

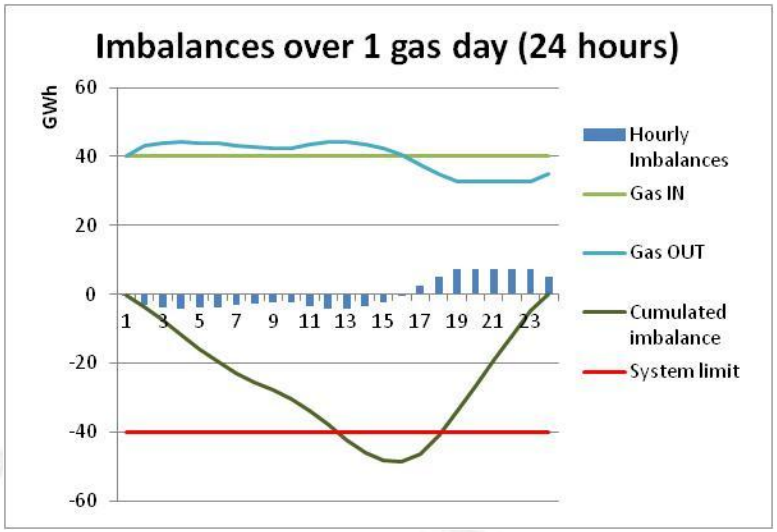
Agenda

- Objectives
- Definitions
- Balancing: key concepts
- **Illustrations**

Illustration 1: system with limited linepack and high swing in demand

System characteristic:

- Assumed flat entry : 40 GWh/h
- Exit flow: According to domestic demand (swing of 50 GWh)
- Total export capacity:0 GWh/h
- Total available linepack: 40 GWh
- Assumption of no internal system transport constraints



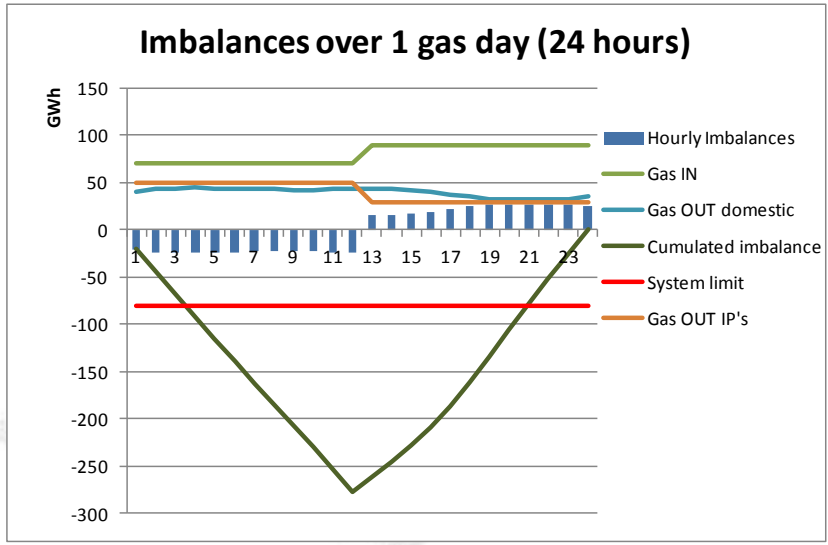
Options

- Within-day constraints → incentivize network users to profile their entry in such a way that the system imbalance remains within acceptable limits
- Tools for the TSO. E.g.:
  - Balancing service: Access to storage to compensate the within-day swing
  - Market tool: buy gas in the morning & sell same amount of gas in the evening

Illustration 2: transit system with limited linepack

System characteristic:

- Assumed profiled entry : 70 GWh/h in 1st half of day, 90 GWh/h in 2nd half of day
- Exit flow:
  - Domestic exits: average of 40 GWh/h with swing of 50 GWh
  - Border IP's: 50 GWh/h in 1st half of day, 30 GWh/h in 2nd half of day
- Total export capacity:50 GWh/h
- Total available linepack: 60 GWh
- Assumption of no internal system transport constraints



Options

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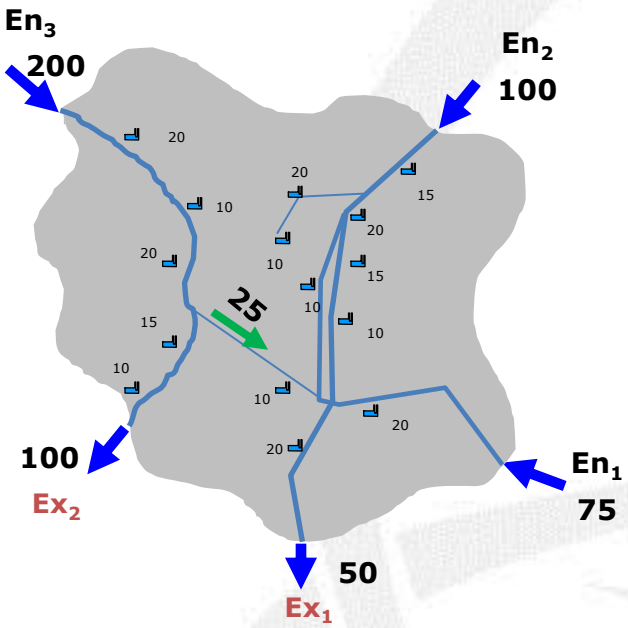
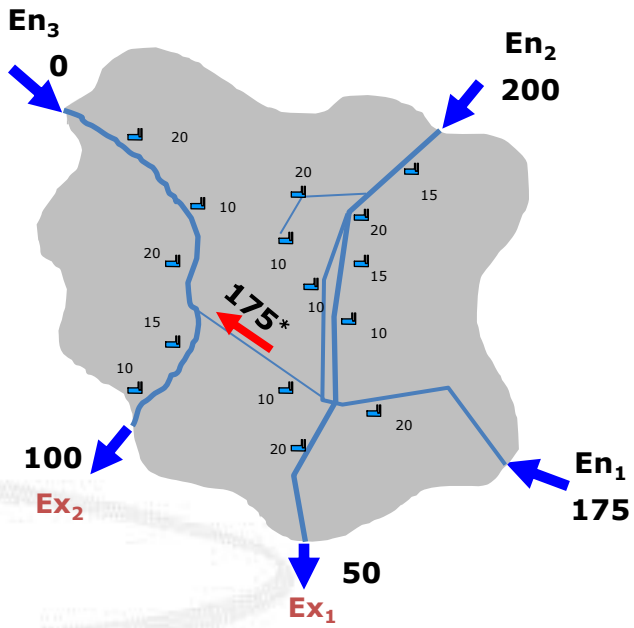
  - Market tool: buy gas in the morning & sell same amount of gas in the evening

Illustration 3: large system with local constraints



The entries from En_3 are replaced by additional entries from En_1 and En_2

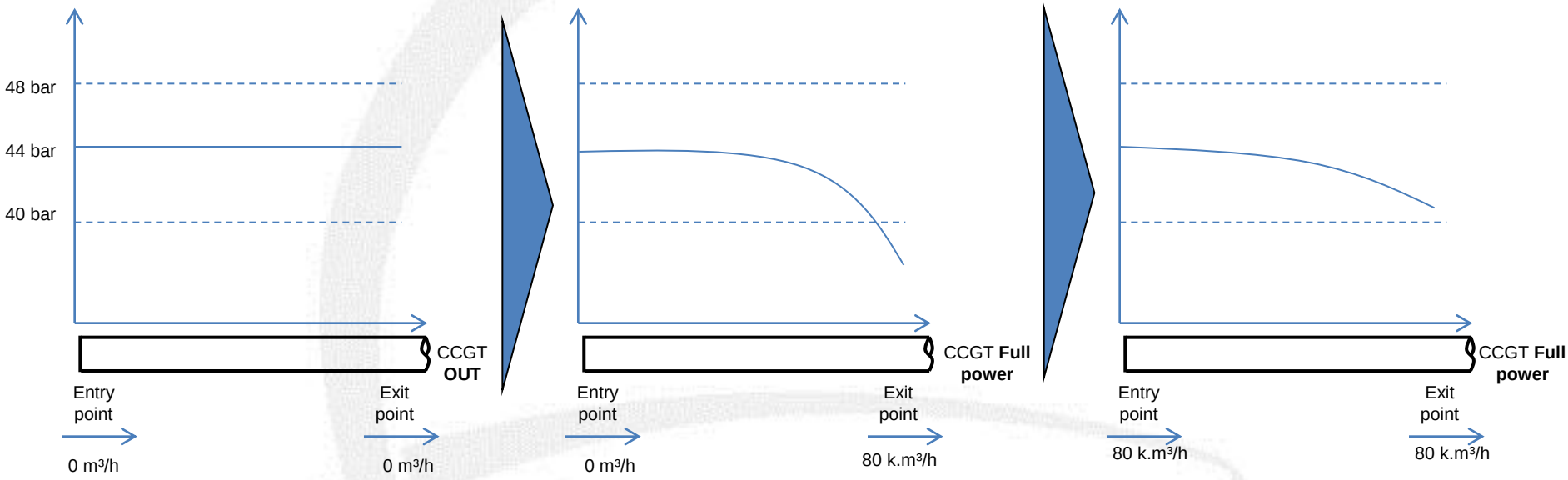


(*) Internal network congestion (if max capacity is for example 100) → Pressure in western area of system falls below min pressure

Options

- Tools for the TSO. E.g.:
  - Market tool: buy gas in the west & sell same amount of gas in the east
  - Balancing service (e.g. access to storage or LNG to inject gas in west and offtake in east)

Illustration 4: local constraints



CCGT is not running

CCGT starts at full power → pressure drop at exit is very high (gas is initially taken from linepack)

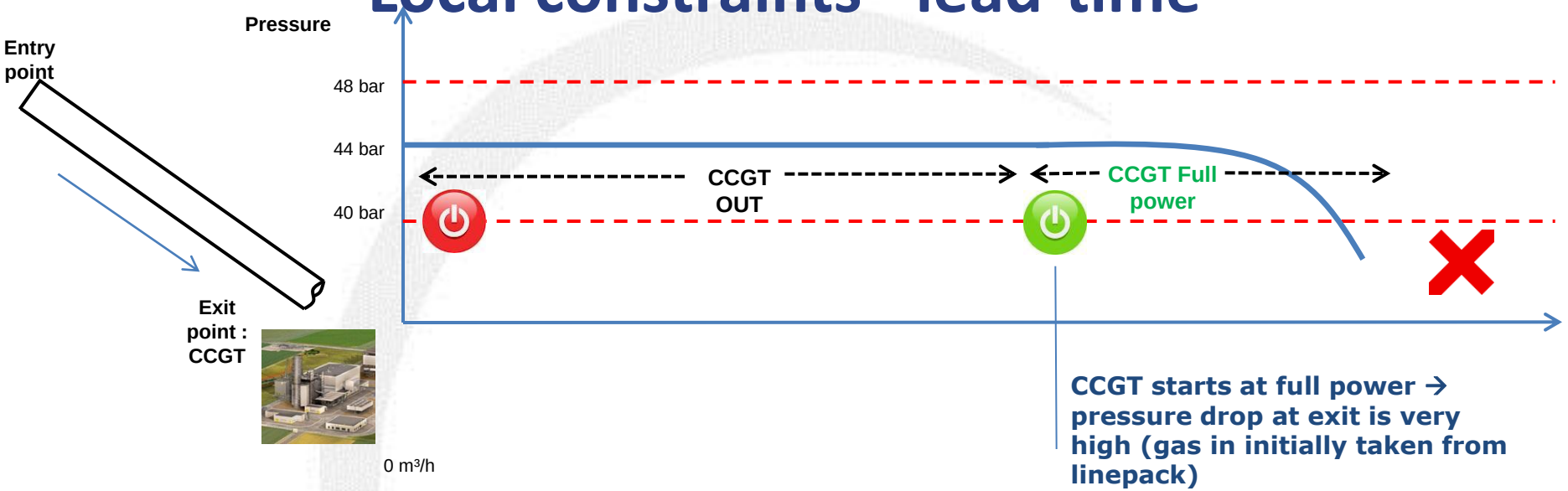
After some time,

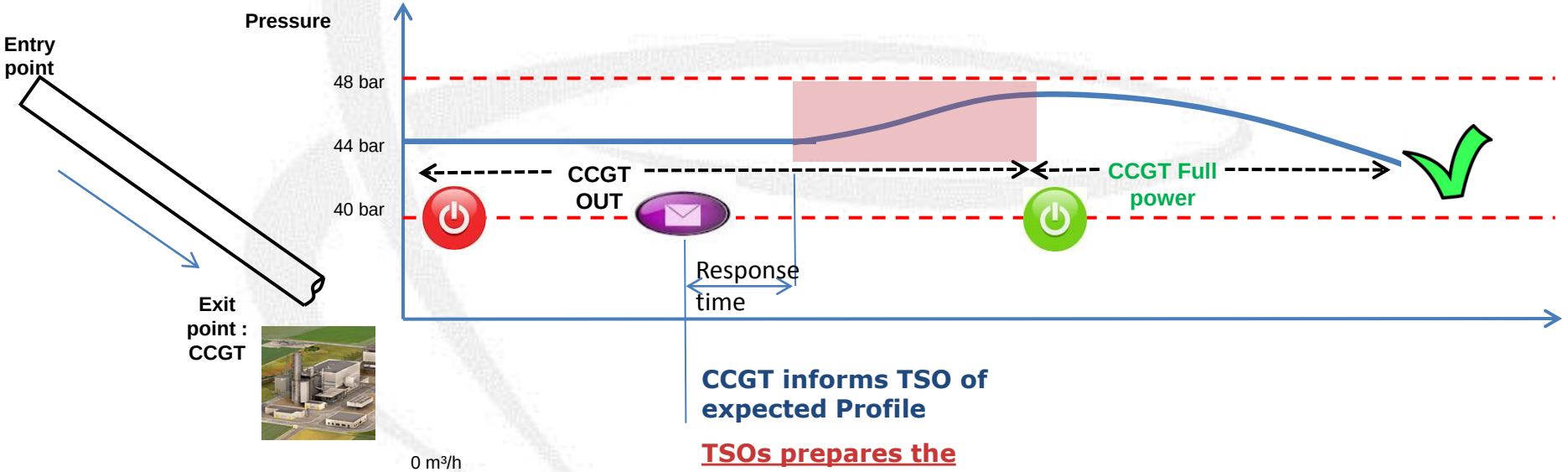
- **Pressure wave reaches entry**
- **Additional gas will come, restoring pressures**

Options

- Obligation at exit point (e.g. max flow variation; inform TSO of expected profile, etc.)

Local constraints - lead-time

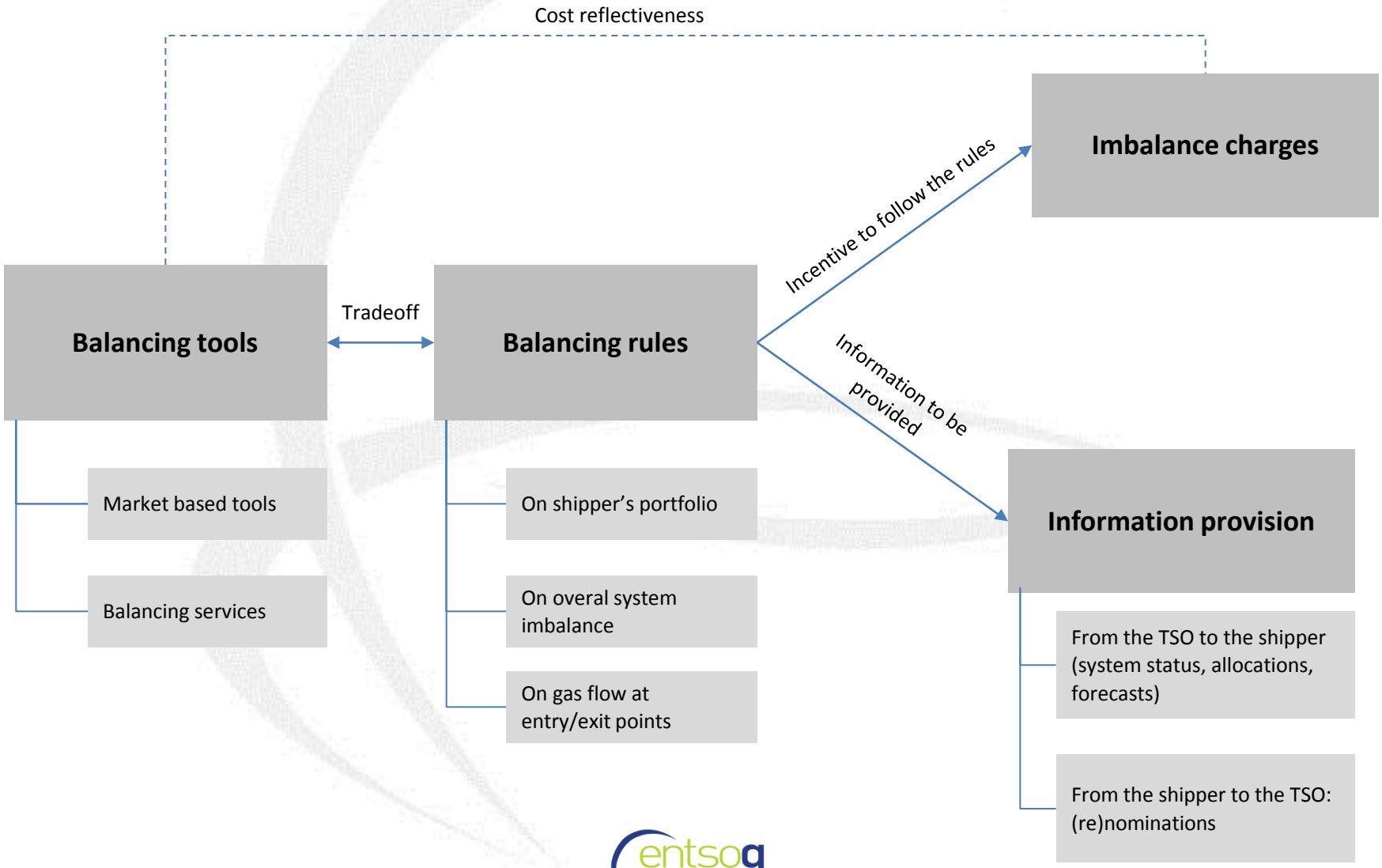




Conclusions

- The challenge:
  - Design balancing regimes that
  - Help bridge the gap between e-e systems and network operation
  - And are market based
- Solutions can be found sharing of responsibilities
  - Network users
  - TSOs
- Shared responsibilities will provide
  - Rules for network users to balance inputs and off-takes
  - Tools for TSO to keep system within safe operational envelop
- The result is a fair allocation of cost for balancing the system

Overview


Cost reflectiveness
Imbalance charges
Incentive to follow the rules
Balancing tools
Tradeoff
Balancing rules
Information to be provided
Information provision
Market based tools
Balancing services
On shipper's portfolio
On overal system imbalance
On gas flow at entry/exit points
From the TSO to the shipper (system status, allocations, forecasts)
From the shipper to the TSO: (re)nominations