

## Status of ERGEG's Consultancy Study with Focus on Scenario Definitions

*"Model-based Analysis of Infrastructure Projects and Market Integration  
in Europe with Special Focus on Security of Supply Scenarios"*

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***ERGEG's 2nd Workshop on the  
10-Year Network Development Plan***

27 October 2009

# Goals of ERGEG's Study

- **Increase know-how** on European infrastructure
- **Examination / validation of GTE+ (ENTSO-G) work on 10YNDP**
  - to be seen as a complementary approach
- **Provide a tool for ERGEG (ACER) to allow for evaluation of 10YNDP**
- **Top down aspect: developing a European perspective**
  - European wide Supply and Demand assumptions as well as common infrastructure scenarios
  - European wide Map of gas flows: main cross-border points, storage and LNG facilities, consumption zones
  - Addressing European security of supply and peak demand aspects as well as economics (costs of gas/LNG transport)

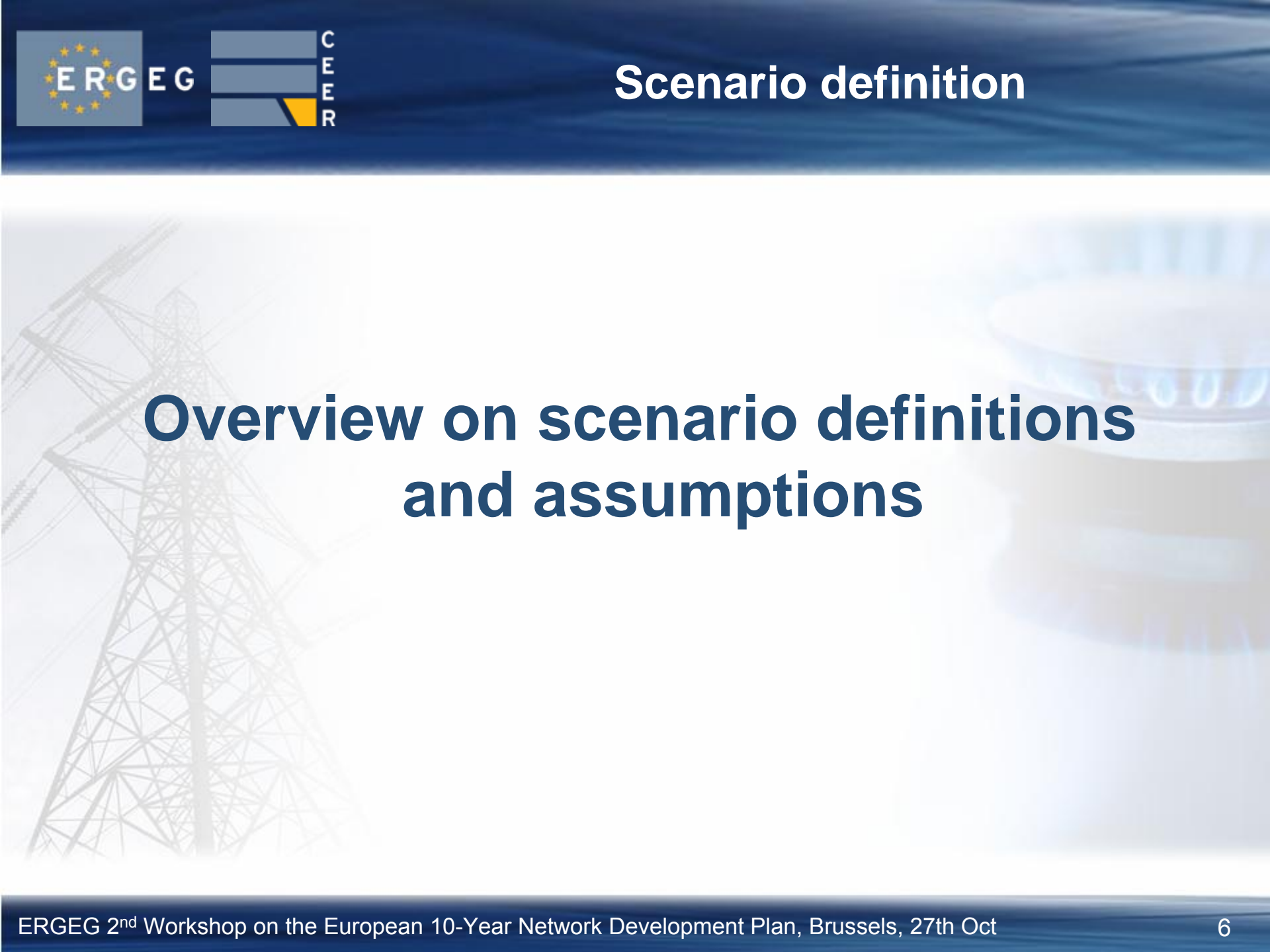
- **Tendering process by BNetzA in June - July '09**
- **Several bidders participated**
- **Criteria for Rating:**
  - modelling expertise / references
  - scope of existing models / databases
  - intended scenario definitions
  - model-based analyses & interpretations of results
  - price / budget
- **Successful bidder contracted in August '09:**
  - **EWI (Energiewirtschaftliches Institut zu Köln)**
- **Study financed by CEER + individual NRA contributions**
  - CRE (F), CNE (ESP), Ofgem (UK), NMa (NL), E-Control (A), AEEG (I), BNetzA (D)
  - = members of the established Steering Group chaired by BNetzA**



- Study / TIGER-Model is an **economic based network simulation model**, but **no (technical) flow simulation model**
- Currently, necessary **data for European wide technical flow simulation not available** (for NRA's)
- **Practical applications** of the model result in satisfactory **resemblance of real flows**
- Infrastructure Model is based on existent **published capacity data**

→ “Best feasible” approach !

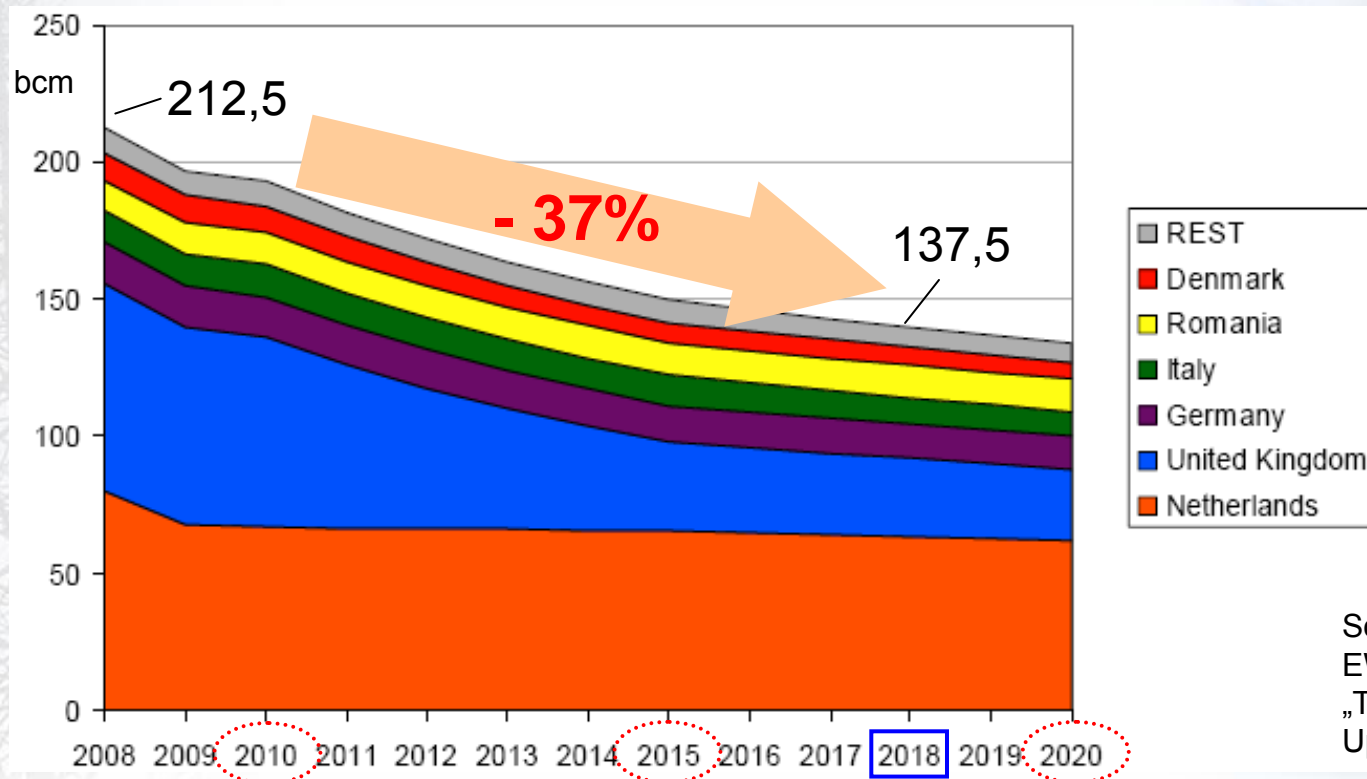
- **Kick-Off Meeting** with Consultant and Steering Group in September: Presentation of TIGER-Model and first proposal on scenarios by consultant
- **Intensive discussion on scenarios** and changes concerning **modelling period**
  - 2018 calculation instead of annual analysis: more scenarios possible
  - First common understanding on scenarios reached
    - preliminary results to be presented today
  - Final agreement on scenarios soon
- **EWI to start modelling calculations and first analyses by end of October/beginning November 2009 – intermediate results in Dec.**
- **Final results** will be publicly presented and published in **Q1/2010**



## Overview on scenario definitions and assumptions

- **Scenario dimensions** (number of variations):
  - **Supply** (1) → EU production, pipeline ~ & LNG imports
  - **Demand** (2) → Reference & high demand case
  - **Infrastructure** (6) → **core of this study**
- **Number of computable scenario combinations is limited, therefore analyses / evaluations will focus on the year 2018** (and the validation for the year 2008), but not the intermediate years of 2009 to 2017 as planned originally
  - **This allows for more infrastructure scenarios to be looked at**
  - **Impact of uncertainties concerning exact dates of commissioning of single infrastructure projects can be reduced**
- **Additionally:**
  - Performing **sensitivity analyses** for **Security of Supply** aspects

- **Indigenous gas production EU-27**  
 → Baseline Scenario of DGTREN's "Trends to 2030" (2008)

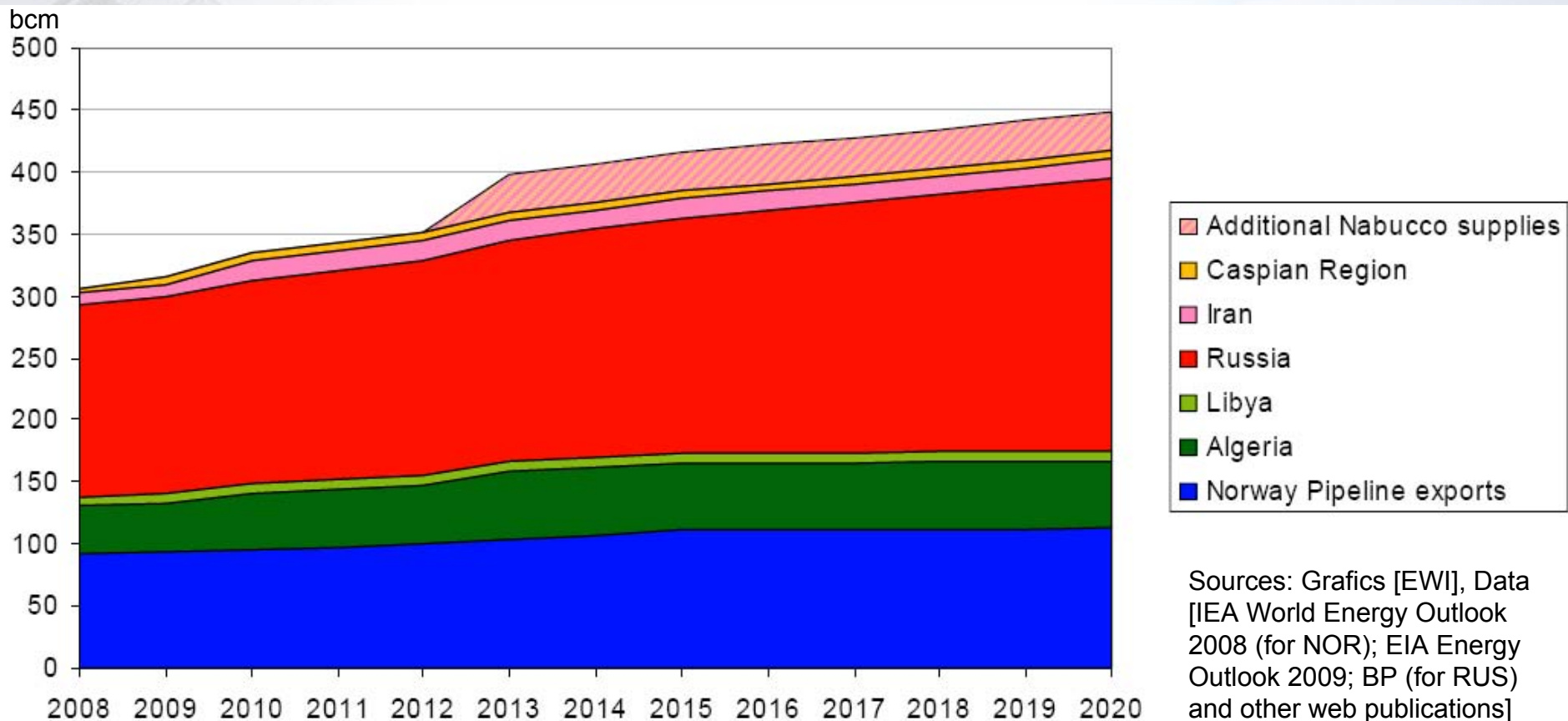


Source:  
 EWI / EC DG TREN  
 „Trends to 2030 –  
 Update 2007“



# Supply assumptions: Imports

- Potential Pipeline imports from existing and potential gas suppliers outside the EU** (Algeria, Azerbaijan, Iran, Iraq, Lybia, Norway, Russia)



- **Pipeline imports (examples)**

- **Supply from Russia:**

- It is assumed that exports do not increase until 2011 due to the economic crisis in Europe.
    - Exports are assumed to be able to grow by 3% a year from 2011 on until 2018 (upper limit for imports from Russia of about 189,5 bcm/a in 2018)
    - Leads to an average growth factor for 2.1 % annually from 2008-18

- **Possible sources for Nabucco:**

- Azerbaijan, Egypt, Iran, Iraq, Turkmenistan

- **LNG supplies**

- Volumes are determined by the relative LNG price compared to long-term oil-indexed pipeline gas contracts
  - currently, LNG market is a buyer's market with lower LNG than pipeline LTC prices; but this situation might not persist

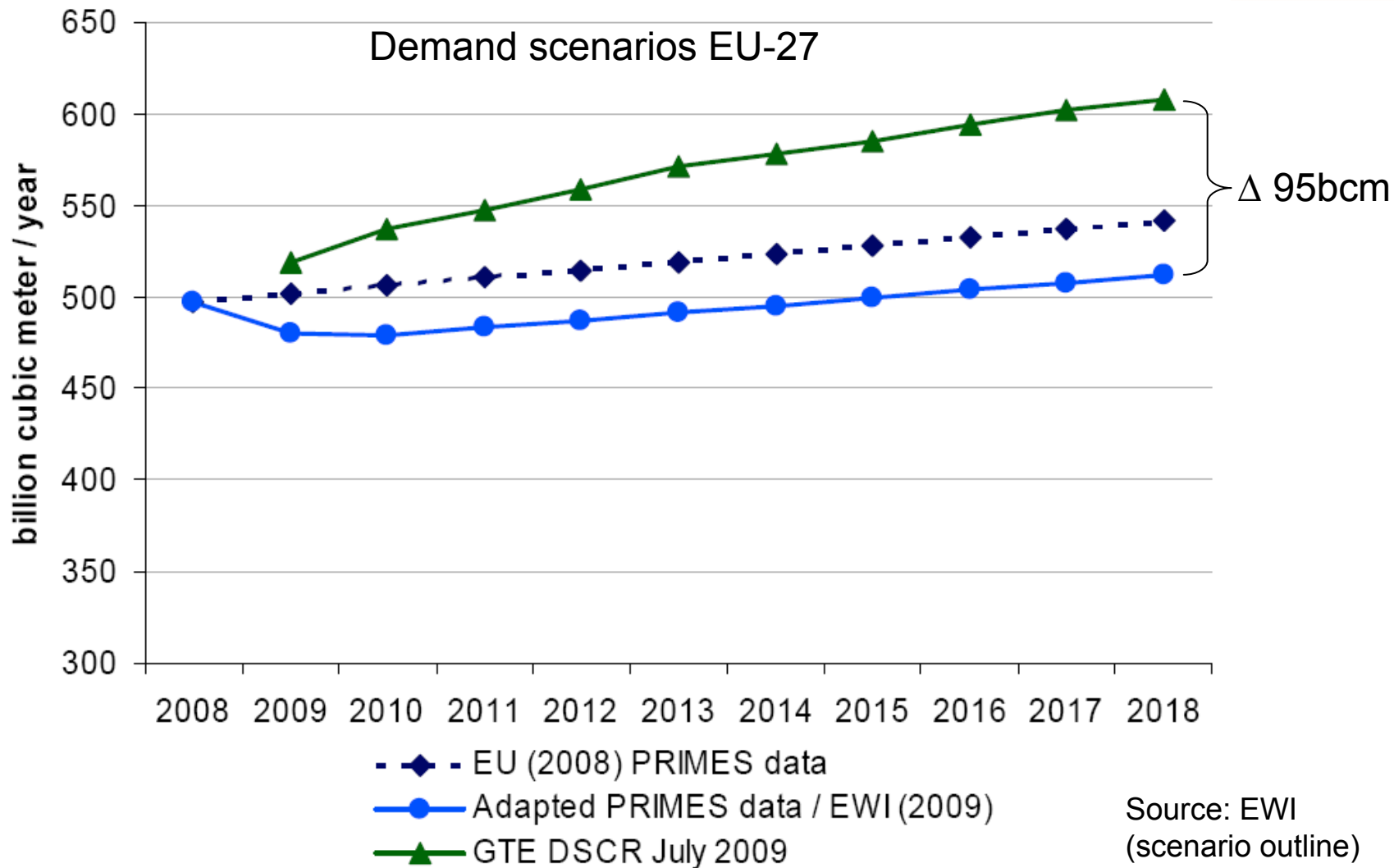
## Two Scenarios will be investigated (out of 5 official forecasts):

- **EU COM (2007, DG TREN “Trends to 2030”),  
baseline scenario (growth rate 2009-18: 0,9% p.a.)**
  - + official & consistent assumptions regarding economic development
  - + detailed per country and sector (9 different scenarios) - not up-to-date
- **GTE+ Scenario (growth rate 2009-18: 1,8% p.a.)**
  - + full consistency of ERGEG Study with GTE+ Statement
  - data sources do not reflect a common underlying economic scenario
  - Eurogas (2007) (growth rate 2010-20: 1,6% p.a.)
    - consistent assumptions regarding economic development, but not up-to-date, just aggregated data for EU-27, very optimistic growth rate assumed
  - IEA (WEO 2008) (growth rate 2010-20: 1,1% p.a.)
    - derived from consistent global scenario, but no sufficient sector and country differentiation
  - EIA (IEO 2009) (growth rate 2010-20: 1,0% p.a.)
    - derived from consistent global scenario, but no sufficient differentiation, focus US, not EU

# Demand assumptions: Reasoning for selection

- **Reference demand case:** EC (2008) / PRIMES Baseline demand (*although there are also significantly lower projections, even with a decline, but here the focus is on infrastructure development („to be on the safe side“)*)
    - due to the economic crisis, scenario will be **adjusted downwards** to reflect decrease in gas demand in 2009 (and the expected low growth rate for 2010)
    - afterwards original growth rates will be used
  - **High demand case:** ~ GTE+ aggregate growth path  
Reasoning:
    - Eurogas + GTE+ assume higher growth, need for ensuring comparability
    - “worst case” for infrastructure
    - difference to adjusted reference case: 95 bcm in 2018
- **sufficient bandwidth of possible demand evolution until 2018**

# Demand assumptions: scenario comparison



- **Intra-European Pipeline Projects**
    - will be included in all scenario combinations according to current planning status of GTE+ Capacity vs. Demand Report (07/09), verified and updated by Steering Group members
  - **Storage Projects**
    - will be included in all scenario combinations according to current planning status of GTE+ Capacity vs. Demand Report (storage deliverability) and GSE database, verified and updated by Steering Group members
  - **LNG Import (Regas) Terminal Projects**
    - will be included in all scenario combinations according to current planning status of project websites, verified and updated by Steering Group members
- **All of these projects are constant over all scenarios / sensitivities**

**Major Import Pipeline Projects allow for several scenarios**  
(to be modelled and analysed for 2018):

1. **Reference:** Nord Stream I only (but no other major projects)
2. **Nord Stream II:** Reference + 2nd line of Nord Stream
3. **Nabucco:** Reference + Nabucco pipeline
4. **South Stream:** Reference + South Stream pipeline
5. **DG-TREN:** Reference + 2nd line of Nord Stream + Nabucco
6. **Low LNG-Price:** DG-TREN + lower LNG prices

→ leads to 6 different infrastructure scenarios to be combined with the 2 demand scenarios = 12 „simulations“

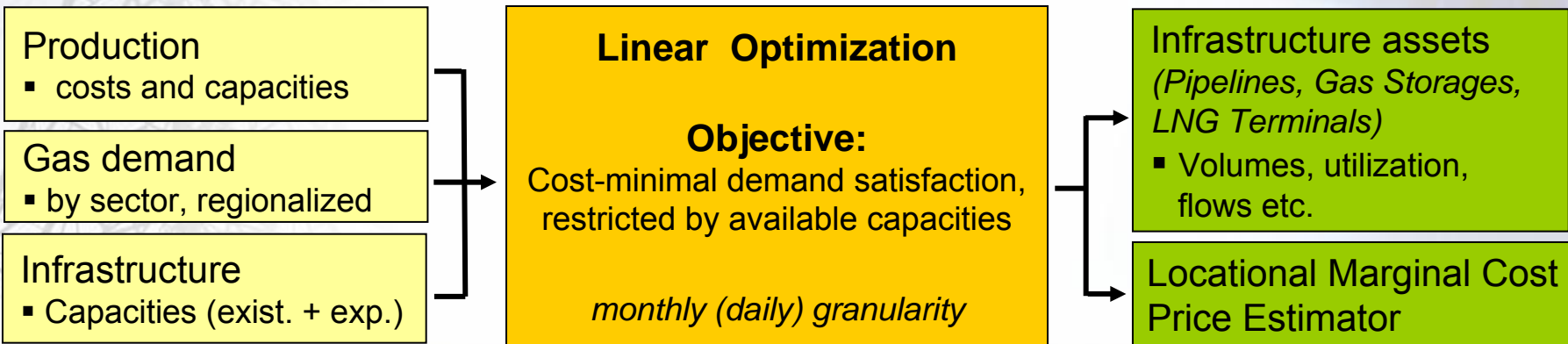
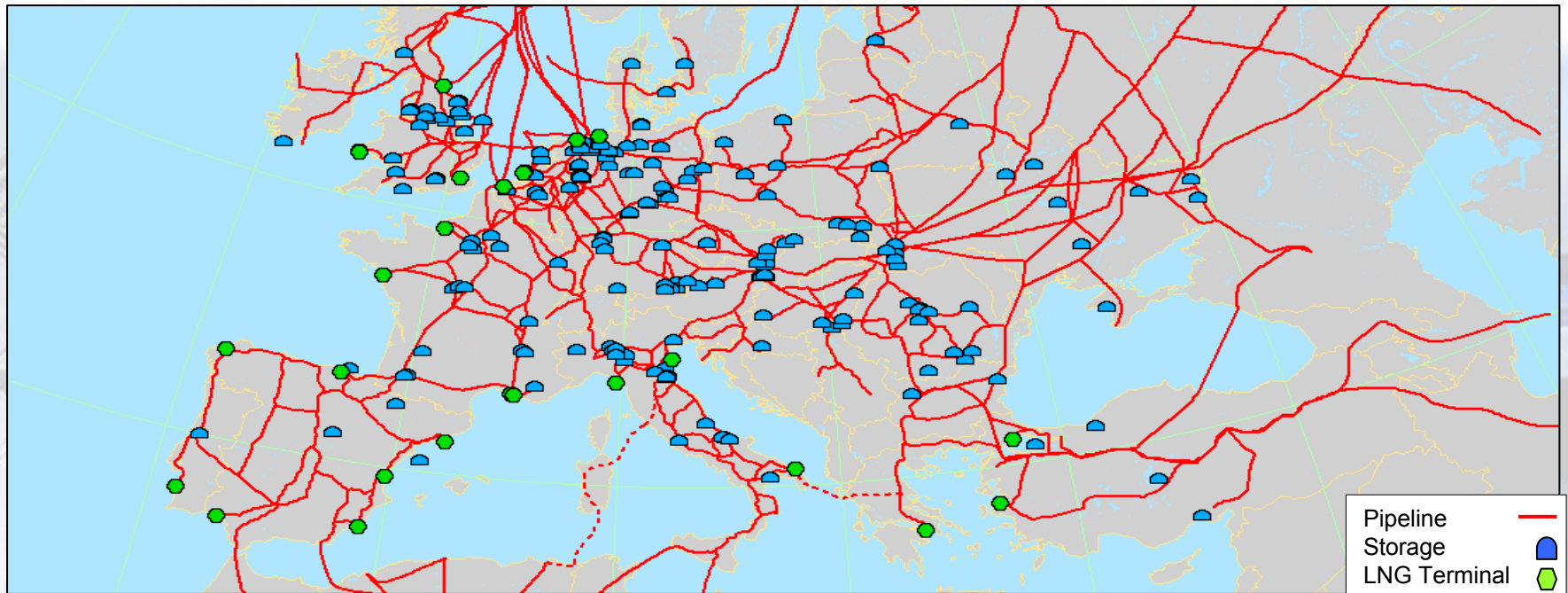
# Planned Sensitivity Analyses

- Sensitivities to be calculated for all scenarios, analyses for relevant scenarios only
- **Peak Demand Day** sensitivities:
  - will include not just monthly, but daily granularity
  - analyses will focus on utilisation of assets, physical market integration and potential economic bottlenecks on the peak day
- **Security of Supply** sensitivities:
  - simulate system in a stress scenario
  - use **Russia-Ukraine** gas crisis to simulate effects for Jan. 2018
  - disruption of **13 days** (and 4 weeks)
  - potentially: disruptions of supplies via **Belarus** (Yamal-PL)
  - evaluation will highlight the impacts of the various infra projects and demand developments on the robustness of the gas supply in 2018
  - bottlenecks / supply disruptions during a future crisis become evident



## Overview of **TIGER Infrastructure Model**

(**T**ransport **I**nfrastructure for **G**as  
with **E**nhanced **R**esolution)

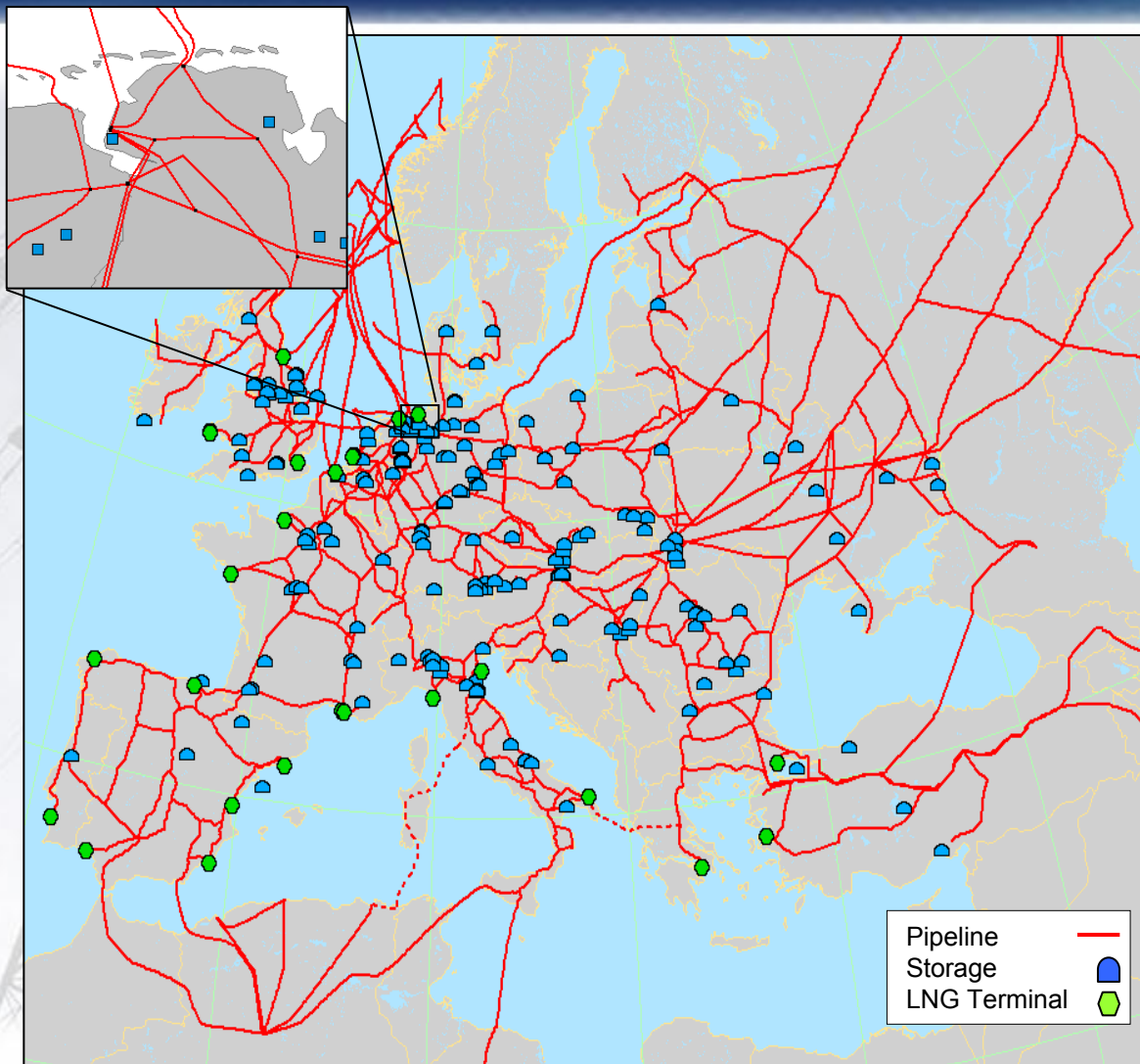


## Temporal granularity:

- Forecasting horizon: 2008-2018 in monthly periods
- (up to daily granularity in short-term security of supply scenario simulations for limited time periods (i.e. one year))
- Accounting for intertemporal interdependencies (e.g. gas storages, seasonal production flexibilities)
- Region-specific seasonal demand profile

## Areal granularity:

- Europe plus surrounding production countries (Russia, Algeria, Iran)
- Natural gas supply infrastructure
  - All long-distance transmission pipelines
  - Border points
  - LNG import terminals
  - Natural gas storages



## Geocoded Database:

Coverage >EU-27

>550 Nodes

>750 Pipelinesections

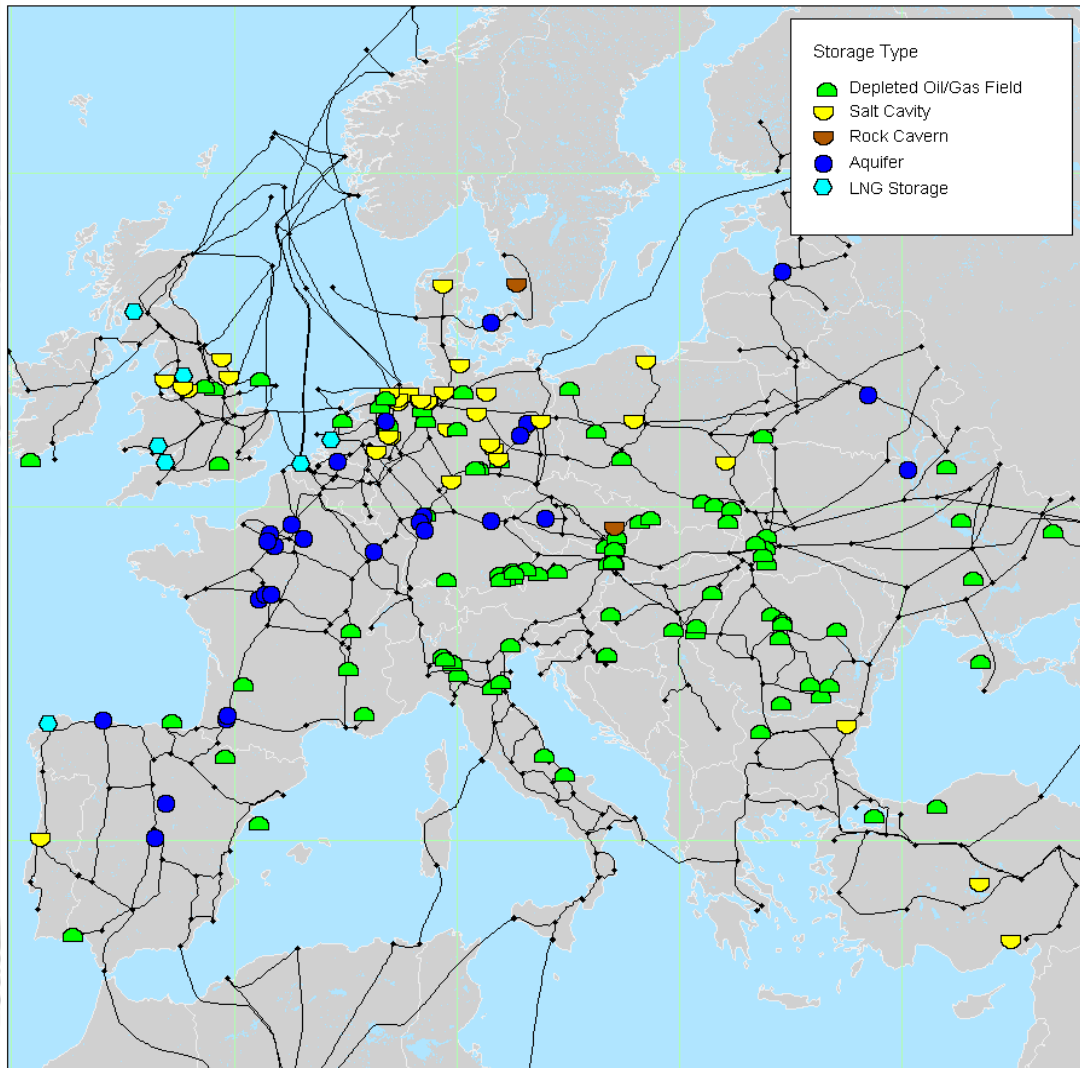
- Based on TSO Maps
- Capacity / Pressure / Diameter
- Nearly all Entry-Points
- Major Exit Points
- Border point capacities

>200 Storages

- Type
- Max In/Outflow
- Capacity

>20 Terminals

- Max hourly/yearly Cap.
- Storage Capacity



## Detailed Storage Data:

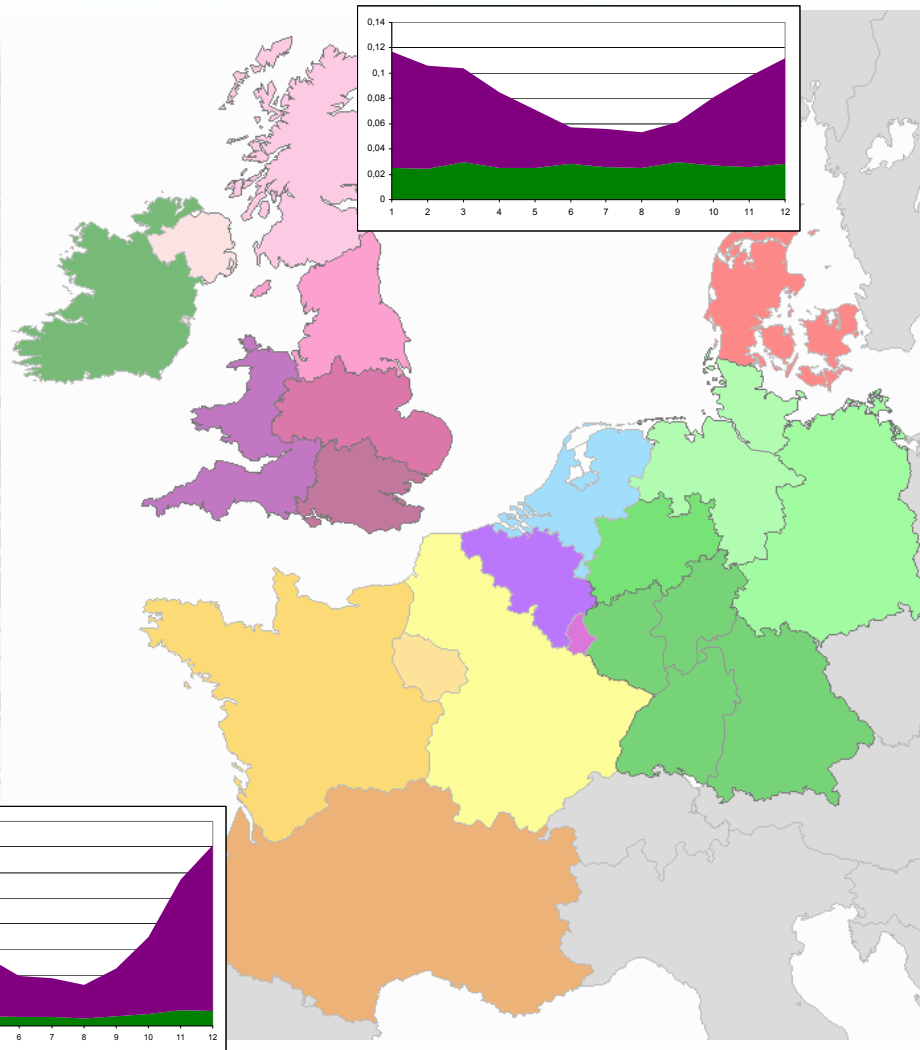
### Technical Parameters

- Storage Type
- Working Gas Volume
- Withdrawal / Injection rates

### Ownership / Operator

### Location

### Network integration



## Detailed Demand Data:

### 58 European demand regions

- Share of total demand
- Individual sector distribution in each region

### Monthly demand data

- 57 sector and country specific demand profiles for easy parameterization

### Sectoral differentiation

- Typically Power / Households & Industry

### Individual demand curves

- For sector and region

## TIGER-Model:

- Minimization of dispatch costs
- Results reflect efficient allocation, e.g. as obtained in a competitive market
- I.e. results on gas flows assume that all efficient swaps have taken place



# EU 10-year network development plan for gas

## 2<sup>nd</sup> ERGEG Workshop

Brussels, 27 October, 2009

10.00 – 12.30

Hotel Crowne Plaza – « Le Palace »



- 10:00 – 10:10 **Address of Welcome** *by BNetzA / CRE*
- 10:10 – 10:30 **The European Commission's Approach to the 10-Year Network Development Plan: Revision of the TEN-E Policy**  
*Presentation by the European Commission*
- 10:30 – 11:00 **ER GEG's Approach to the 10-Year Network Development Plan:**  
Recent regulatory developments: 3rd Package and SOS Regulation  
Results of the consultation on ER GEG recommendations  
*Presentation by CRE*
- 11:00 – 11:30 **Status of ER GEG's Consultancy Study with Focus on Scenario Definitions:**  
"Model-based Analysis of Infrastructure Projects and Market Integration in Europe with Special Focus on Security of Supply Scenarios"  
*Presentation by BNetzA*
- 11:30 – 12:30 **Discussion with Stakeholders and Conclusions**
-  **12:30 - 13:30** *Lunch (standing buffet)*
- 13:30 - 16:00** *GTE+ Workshop on the 10-Year Investment Statement*