



## ETSAP – TIAM Collaboration Status / Next Steps

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### Motivation

- **One main target of the Annexes of ETSAP is to realize common scenario analysis, discuss technology improvements and then evaluate the impacts on the future energy system.**
- **The collaboration project of ETSAP-TIAM emphasizes how the work on improvements of TIAM is productive for promising solutions of modeling.**
- **The first phase of the ETSAP-TIAM collaboration has delivered crucial insights on the different TIAM versions and first improvements to the ETSAP-TIAM model version (ETSAP-TIAM 2012).**
- **Another advantage of the overall knowledge exchange is the possibility to share efforts in fixing bugs in the database and model structure. Moreover, to have an improved version of the ETSAP-TIAM model will increase chances to win projects and receive more funds.**

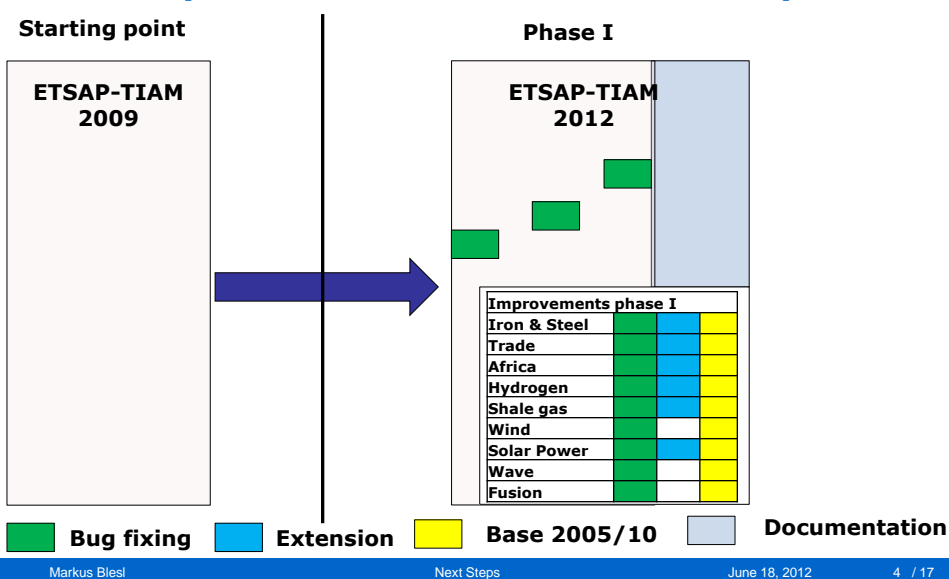


## Participants

- Active Participants:
  - Belgium, VITO (Wouter Nijs )
  - European Commission, JRC (Francesco Gracceva, Sofia Simoes)
  - France, CMA (Nadia Maizi, Sandrine Selosse, Nicklas Forsell, Edi Assoumou)
  - Germany, IER (Markus Blesl, Elif Özenc )
  - Netherlands, ECN (Hilke Rösler )
  - Norway, IFE (Pernille Seljom)
  - Spain, CIEMAT (Helena Cabal)
  - United Kingdom, UCL (Gabrial Anandarajah)
- Informal Participants:
  - Denmark, Risø DTU
  - Finland, VTT (Tiina Koljonen, Antti Lehtila)
  - Greece, CRES (George Giannakidis)
  - Italy, ENEA (Umberto Ciorba)



## Roadmap ETSAP-TIAM Collaboration phase I





## Status of the improvements for ETSAP-TIAM

Institute	Area of improvement	Improvements in ETSAP TIAM	Documentation of improvements
Belgium, VITO (Wouter Nijs )	Iron and steel technologies, emission allocation mechanism, oxygen production technology	Some open issues	Not yet
European Commission, JRC (Francesco Gracceva)	Global energy trade, oil and gas trade	Realized	Realized
France, CMA (Nadia Maizi, Sandrine Selosse)	Regional improvement: Transformation of the African electricity sector	Realized	Realized
Netherlands, ECN (Hilke Rösler )	Hydrogen representation in TIAM: Update hydrogen production and distribution	Realized	Realized
Norway, IFE (Pernille Seljom)	Offshore - Onshore wind	Theoretical	Realized
Spain, CIEMAT (Helena Cabal)	Concentrating Solar Power with storage and tide and waves energy technologies	Realized	Realized
United Kingdom, UCL (Gabrial Anandarajah)	The extension of shale gas in the model	Realized	Realized
Germany, IER (Markus Blesl, Elif Özenc )	Create a new version based on the improvements	Version without VITO	Version without VITO



## Improvement Iron and steel (VITO/IER)

Iron and steel producing technologies will be updated. They will be brought in line with E-TechDB. Emission allocation mechanism will be introduced for a better allocation of GHG emissions between IIS sector and ELC. The implementation of a technology based RES for IIS into ETSAP-TIAM will be realized rather than an energy balance based. Oxygen production technology for IIS (mainly consuming electricity) will be introduced. Existing methodology (energy balance based with some constraints for the use of coal) will be checked. The technology representation in TIMES (generic model before putting it into TIAM) will be improved. The discussion of the boundaries of the use of scrap will be improved.



## Improvement in global trade (JRC)

Trade is investigated in TIAM to improve the representation of global energy trade, oil and gas trade in particular. The objectives are to assess the capacity of global energy trade in TIAM and to assess if/how a weak representation of energy trade can affect the overall results of the model. A deliverable are excel files translating model outputs regarding gas and oil trade into the matrix of trade, for both pipeline and LNG with a comparison with BP historical data. Assumptions for the future are made transparent, through tables added directly in the model files and compared with some literature. These factors are supply side (total gas reserves/resources and projected limits to production capacity), infrastructures (current and projected network for trade channels and costs of transportation, for both pipelines and LNG), demand side (assumptions on GDP growth, projected costs of electricity generation, efficiency in fuel use in transportation, CO2 tax)



## Regional improvement: Transformation of the african electricity sector (CMA)

Economic and energy realities are different within Africa. The African energy mix, although broadly similar to other continents, changes significantly from one region to another. North Africa and South Africa represent 75% of the energy consumed by Africa, even as the rest of Africa, Sub-Saharan Africa, represents three quarters of the population. Energy resources and potential are unequally distributed in Africa. Based on this reality, the improvement in TIAM is mainly on the calibration of the total power sector and the implementation of three power sub-sectors in Africa (North Africa (MENA), Sub-Saharan Africa, South Africa). This evolution will concern all electricity commodities of the power sector, namely ELCC, ELCD and ELCS. and steel producing technologies will be updated.



## Update hydrogen production and distribution (ECN)

Review of the original structure and data for hydrogen chain in TIAM. A well-documented description of the hydrogen production and distribution sector is delivered. More realistic (smooth) growth of hydrogen for transport purpose is realized. Growth potentials of hydrogen in transport sector as well growth/decline potentials of alternative fuels are provided. The distinction of hydrogen transport to trucks and pipelines is realized. Constraints to model more realistic approach of build-up pipeline infrastructure are structured. Technology data for hydrogen production is improved (e.g. centralized and decentralized steam methane reforming (SMR) plants, coal gasification plants, biomass gasification plants, electrolysis plants). Distribution and dispensing of hydrogen is described in detail in the model (Truck transport of gaseous hydrogen, truck transport of liquid hydrogen, hydrogen transport using pipelines, refueling station for hydrogen). Cost assumptions and model growth constraints for hydrogen infrastructure are constituted in TIAM model.



## Improvement onshore/offshore wind (IFE)

The documentation of wind (onshore-offshore) is planned to update and improve through input data. A better overview of input data will be provided to understand the different shares of wind in electricity mix in both reference and climate scenarios. The existing data, including technology, potentials and availability will be evaluated and eventually updated based on a literature review. The technical focus will be on future technologies, meaning technologies included in the Sub-RES. The wind resource is independent of season and there is no distinction between mounted or floated offshore wind In TIAM. Further improvement of technology and potential data is aimed.



## Improvement Concentrating Solar Power with storage and tide and waves energy technologies (CIMAT)

The usage of concentrating solar power and tides and waves energy technologies will be increased. Today those energies have been limited by high costs and intermittency problems. The cost of these technologies will be apparently lower in the future on account of technology learning and mass productions. These technologies are being used with storage capability concerned of the intermittency. The concentrating solar power with storage is able to save the energy when the energy potential is high during the day then supply electricity to the grid in peak times. Storage technologies are helpful to smooth the grid capacity and make the demand and supply adequate to each other. CSP technologies are described with special focus on technology, costs, potential and storage capacity. In CSP analysis, it is investigated on the global potential, technology and costs of tide and wave technologies.



## Improvement extension of shale gas (UCL)

Shale gas is seen as a game changing resource in the world. New mining technologies in each of the upstream B-Y templates for all regions with three supply cost curves for the production. The extension of shale gas of the shale gas for each region are added. Costs and the cumulative and annual availability of shale gas are added to the Base-Extraction scenario file, in addition to adding new constraints to control production profile of each mining technology. The integration of shale gas in TIAM influence the price and the uptake of fossil fuels and consequently all other TIAM results. and steel producing technologies will be updated.

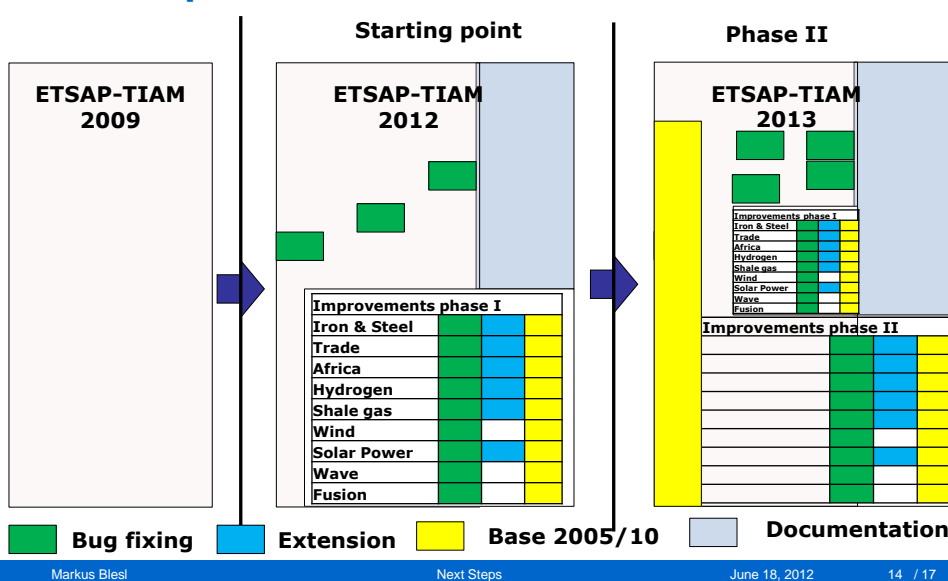


## Satus ETSAP-TIAM Versions

- Starting point ETSAP TIAM Version 2009
- ETSAP-TIAM Version 2012 improved Version with a better representation of Hydrogen, a extension of shale gas, Concentrating Solar Power with storage and tide and waves energy technologies and a first bug fixing. Official transformed to George during the ETSAP meeting in Cape town.
- ETSAP-TIAM Version 2012 (II) improved Version with a better representation Global energy trade, oil and gas trade and the regional improvement of the African electricity sector was tested and is available between the partners.
- Some open issues related the iron steel sector – waiting for response.



## Roadmap ETSAP-TIAM Collaboration





## Road Map for phase II:

1. **Scenario definition (e.g. renewable or emission reductions targets, technology restrictions, for example on nuclear and CCS) in a first workshop.**
2. **Each team runs the scenarios and defines the possible improvements.**
3. **Second workshop: presentations from each partner and discussion of the planned improvements.**
4. **Each team provides the improvements in separate files**
5. **Discussion on the first improvements in the third workshop, evaluation of the relevance of these improvements.**
6. **The common version of ETSAP-TIAM will be prepared by IER**



## Deliverables

- **An updated second version of a common ETSAP-TIAM for energy systems analysis, including extensions provided by the partners**
- **Technical reports on the feasibility or actual extension of the second ETSAP-TIAM phase**
- **Periodic reports on workshops or seminars, and on analytical studies undertaken in connection with the partners**
- **A final report on the activities of the second ETSAP-TIAM phase**





## Status on the Road Map for phase II:

- **For the collaboration work of Phase-II, it is decided to organize a competition between partners on the improvement of CO<sub>2</sub> scenarios. The idea of this competition is in general: "Who will go deeper for CO<sub>2</sub> scenarios, who can achieve targets in 2050 in a realistic way"**
- **The extension of CO<sub>2</sub> scenarios and the results of running the model with these improved scenarios will be documented with standard tables. Improvements to pollutants/emissions and climate scenarios, CO<sub>2</sub> emissions per sector and other emissions will be explained in detail.**
- **This competition aims to define the most realistic and deepest CO<sub>2</sub> scenarios and at the same time the technology mixture which performs these climate targets.**
- **These areas can be examples which will help to evaluate and improve CO<sub>2</sub> scenarios; biomass, comparison of the models in terms of energy, which emissions to reduce.**
- **Additional to this more extension areas will be evaluated by partners. Every partner will prepare one-page report for their improvement proposals. Then they will provide the excel files of the improvements.**



## Status on the Road Map for phase II (II):

- **Project of phase two starts at May 2013.**
- **First the scenario results of the competition will be presented today.**
- **A ETSAP TIAM workshop will be in September in Amsterdam at ECN to discuss with all partners there results and define the areas of contribution from each partner.**



## Status of partners ETSAP-TIAM phase II

Institute	Area of improvement	Status Participation
Belgium, VITO		Interest
European Commission, JRC (Francesco Gracceva)		??
France, CMA (Nadia Maizi, Sandrine Selosse)		Interest
Netherlands, ECN (Tom Kober, Hilke Rösler )		Active
Norway, IFE		Interest
Spain, CIEMAT (Helena Cabal)		Interest
United Kingdom, UCL (Gabrial Anandarajah)		Active
Denmark, DTU		Interest
Finland, VTT		Interest
Germany, IER (Markus Blesl)	Create a new version based on the improvements	Active



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