Guidelines to Cost-Benefit Analysis of Grid Development projects

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Reliable Sustainable Connected

EU objectives of CBA methodology

Transparency

- Harmonised energy system-wide CBA
- Demonstrate overall costs and benefits from a European perspective

Selection of projects of common interest

- Selection process takes into account CBA results

Cross border cost allocation

- CBA results possible input (beneficiary pays principle)

TYNDP projects

Candidate PCIs

Upon request
(Council amendment)

Stakeholder's comments

- **Environmental impact: indicator deemed non satisfactory by NGOs**
  - ✓ On-going work with NGO's to improve the indicator

- **Monetisation of lost load and ancillary services: seen as desirable by academia and by ACER**
  - ✓ Included in update: annexes explaining the "state of art"

- **Clustering of investments**: acceptable only if an indication is given on the contribution of each investment to the GTC variation (EC, ACER)
  - ✓ Included in update

- **Grid transfer capability:** distinguish cross border GTC from internal GTC
  - ✓ Included in update

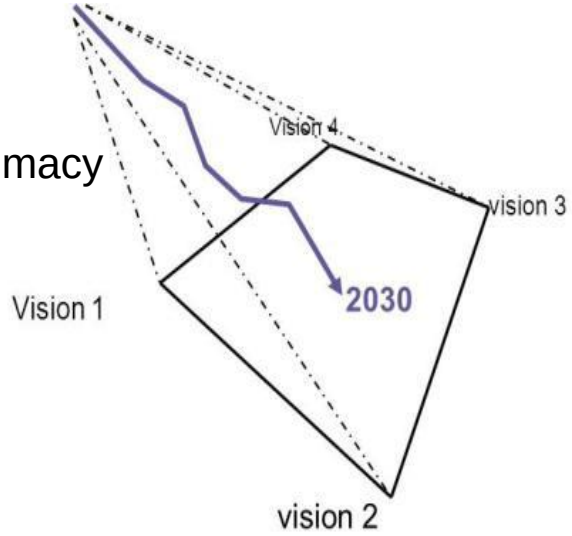
General approach to CBA: main changes compared to the 2012 methodology

Scenarios & planning cases

Use of a wider span of scenarios and sensitivity analysis

Specification of the nature, level of coherence and source of legitimacy of data and economic parameters

Specification of area of analysis



Project identification

Rules on project clustering

Cost & benefit analysis

Higher consistence on calculation methodologies for each indicator (transparency)

Quantification of each indicator in addition to colour code

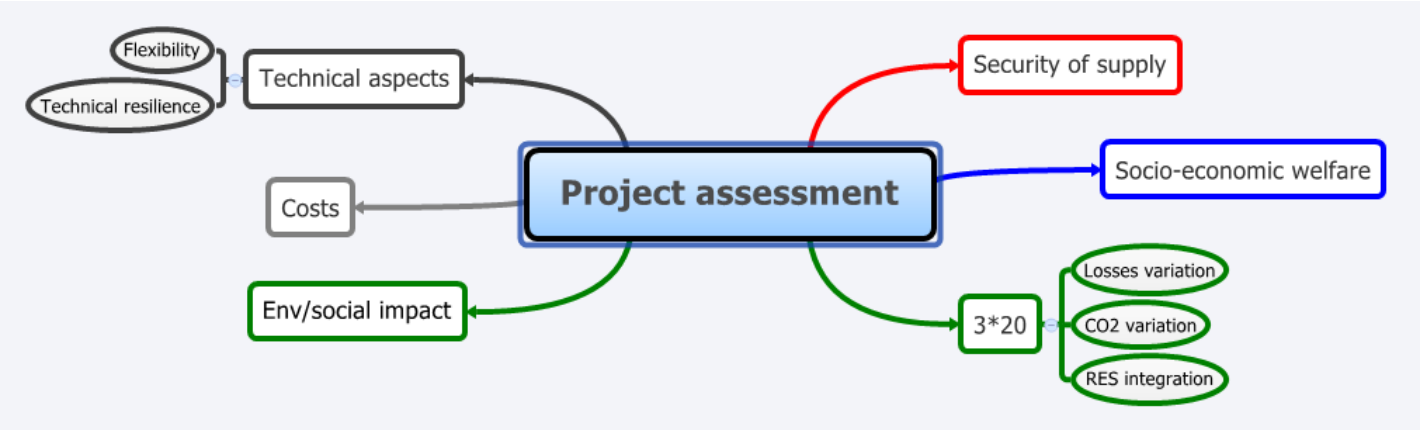
Monetization of additional indicators (losses)

Guidance on discount rate

Life cycle cost, residual value

General approach to CBA: scope

✓Benefit framework



Stem from European Policies + draft Regulation (=TYNDP 2012)

Quantification of all main indicators (new)

NEW

- Analysis with and without the project

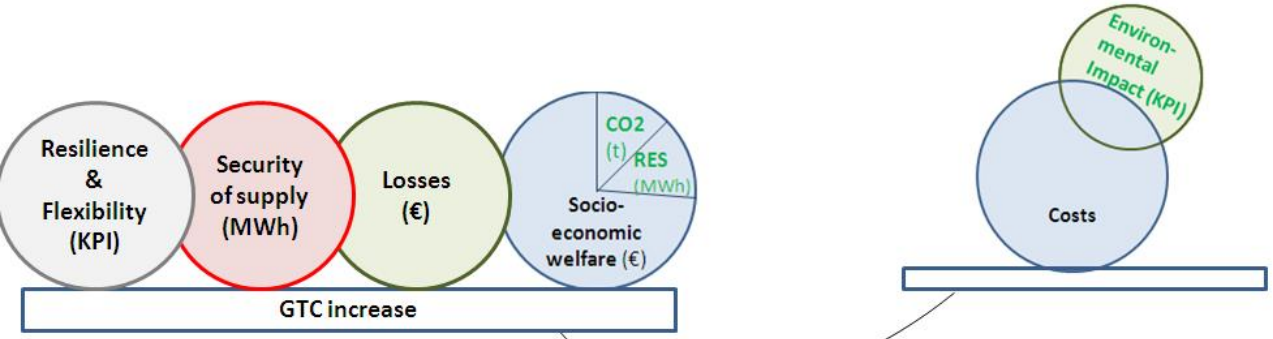
✓Geographical framework

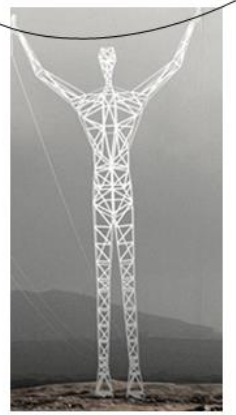
-Pan-European database

-Simulation ENTSO-E Region + neighbours

How to ensure that benefits outweigh costs ?

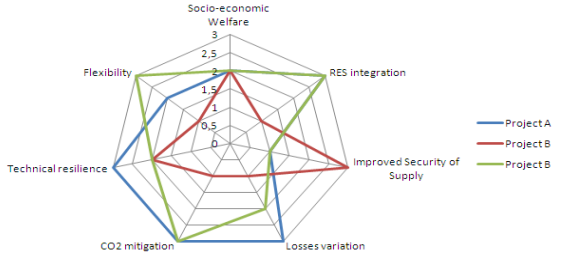
Computation





Presentation

Criteria	Grid Transfer Capability Increase	Socio-economic Welfare	RES integration	Improved Security of Supply	Losses variation	CO2 mitigation	Technical resilience	Flexibility	Social and environmental Impact	Project costs
	MW	M€/year	MWh/year	MWh/year	M€	Mt				M€
Project A	1000	90-150	500-550			0.5-0.6	+++	++		650-700
Project B	500	30-50		3000	20-30		++			25
Project C	800	225-300	3000-3500		10-20	1-1.5	++	+++		150



Goal : best possible information for stakeholders and decision-makers

Storage

New draft regulation requires the inclusion of the storage in the ENTSO-E CBA methodology:

-> ENTSO-E CBA will include an annex on the storage assessment

->ENTSO-E CBA for storage will look at the same indicators as for the transmission

Inclusion of storage: indicators

B1. Security of supply. Energy storage may smooth the load pattern ("peak shaving"),by increasing off-peak load and lowering peak load hence alleviating network constraints and insulating consumers from energy price spikes. Network studies will be able to assess this service in regional networks, whereas market studies will account for the value provided at the level of a European Region (specific cases of very large storage devices). Both will be measured as variations in **EENS or LOLE.**

B2. Socio-economic welfare. The impact of storage on socio-economic welfare (generation portfolio optimisation) is generally known as arbitrage value. It is the main claimed benefit of large-scale storage. **Market studies** will be able to assess this value **based on an hourly resolution, which is consistent with current market models.**

B3. RES integration. Storage devices provide resources for the electricity system in order to manage RES generation and in particular to deal with intermittent generation sources. As for transmission, this service will be **measured by avoided spillage, using market studies or network studies, and its economic value is internalised in socio-economic welfa**re.

Inclusion of storage: indicators

B4. Variation in losses. Depending on the location, the technology and the services provided by storage may increase or decrease losses in the system. This effect is measured by network studies.

B5. Variation in CO_2 emissions. As for transmission, the CO2 indicator is directly derived from the ability of the storage device to impact generation portfolio optimisation. Its economic value is internalised in socio-economic welfare.

B6. Technical resilience/system safety. Electricity storage systems can be employed to control power fluctuations and to improve management of large incidents occurring on power transmission structures, providing voltage support or frequency regulation. As for transmission, specific studies or expert assessments will help evaluating

Inclusion of storage: indicators

C.1. Total project expenditure of storage includes investment costs, costs of operation and maintenance during the project lifecycle as well as environmental costs (compensations, dismantling costs etc…)..

S.1. Social and environmental sensibility. The social and environmental impact of a storage project is very different from transmission, and highly dependent on technology. *To de discussed with EASE.*

CBA of storage will use the same boundary conditions, parameters, overall assessment and sensitivity analysis techniques as CBA for transmission. In particular, the TOOT methodology implies that the assessment will be carried out including all storage projects of the TYNDP, taking out one storage project at the time in order to assess it benefits.

The methodology performed shall be used for storage project appraisals carried out for the TYNDP and for individual storage project appraisals undertaken by TSOs or project promoters.

Social and enviromental indicator- NGOs proposals

1) Clarification on environmental costs

- Costs should be more detailed and disaggregated
- Environmental costs should be internalized to C1

2) Improvement of the indicator with new sub indicators

- Sub indicator with residual landscape impact
- Sub indicator with residual biodiversity impact
- Sub indicator with residual amenity impact

3) EU-wide and regional impact assessment

- Use of principles of strategic environmental assessment

Environmental indicator

Possible starting point for environmental aspects: CIGRE report

Aspects	Objectives	Indicators	Parameters	Internalised?
Land use	Optimize land use and limit fragmentation	Direct land use	Surface x factor (fragmentation)	Yes (compensations)
Biodiversity	Prevent impact on ecosystems and species	Presence of ecosystems and species	Distance from/ length in/ surface in x factor (protection level)	No (some exceptions)
Water	Reduce water quantity	Total amount of water consumed by new projects	Total amount of water x availability of water	Yes (market price)
Aquatic environment	Reduce modification	Total extension of aquatic environment modified by the plan	Total extension modified x total extension existent	Yes (legal requirements)
Noise	Minimize noise impact	Noise level of installations	Noise level x factor (norm)	Yes (legal requirements) residual impact possible
Soil	Minimize perturbation of soil and groundwater	Situation in vulnerable soil Vicinity of water-collection area	Length/ surface x factor (soil type) Distance from	Yes (legal requirements)
Waste	Avoid waste	Waste produced	Quantities x factor (type of waste)	Yes (legal requirements)

Environmental indicator

Aspects	Objectives	Indicators	Parameters	Internalised?
Climate	Reduce emissions of CO_2 Prevent SF_6 losses	Electricity transmission losses SF6 volume in installation	Electricity loss x factor (CO_2 emission) Volume	Yes Yes (potentially)
Landscape	Preserve landscape integrity Preserve protected buildings	Visual impact installation Presence/ crossing of protected buildings/ landscapes	Frontal surface x factor (surrounding) Distance from /length in	Partly(compensations, mitigation)
Erosion	Preserve soil integrity	Relation between susceptible areas to erosion (SAE) and affected area of the plan or programme (AAP)	SAE/AAP	Not relevant
Indigenous land	Reduce interference	Number of lands affected by the plan	Number of affected lands x total amount of indigenous lands	Not relevant
Conservation Units	Reduce interference	Number of units affected by the plan	Number of affected units x total amount of conservation units	Partly
Material welfare	Maintain reliability of provisioning the residential tissue	Average Interruption Time (AIT) to the distribution network	AIT	SoS indicator

Environmental indicator

				Internalised?
Employment	Supporting employment	Investments in new infrastructure Number of created jobs	Investment budget Number of jobs/MW	Yes*
Integration of infrastructure	Taking into account the apprehension for new electric installations	Localisation of infrastructure in living areas	Length/ surface in living area x factor (installation)	No
Safety	Minimize the electric and magnetic field risks	Number of people living under or nearby a HV line	Number of people	Partly
Economic efficiency and competitiveness	Assure transmission to meet the needs of the economy and society.	Contribution in the increase of GNP	% increase in power distribution to the industry	Not relevant
Liberalization of the market	Develop international interconnections Increase independency of production	Increase of the import capacity Reduction of risk on re-dispatch	Power Reduction stress factor installations	GTC, SEW
Tariff	Find the economic optimum for customers	Optimal for the HV/MV/LV* network	Transmission tariffs	Not relevant
Diversification in sources of provisioning	Receive new unities of RES**.	New connected RES** unites	Connected power	RES indicator

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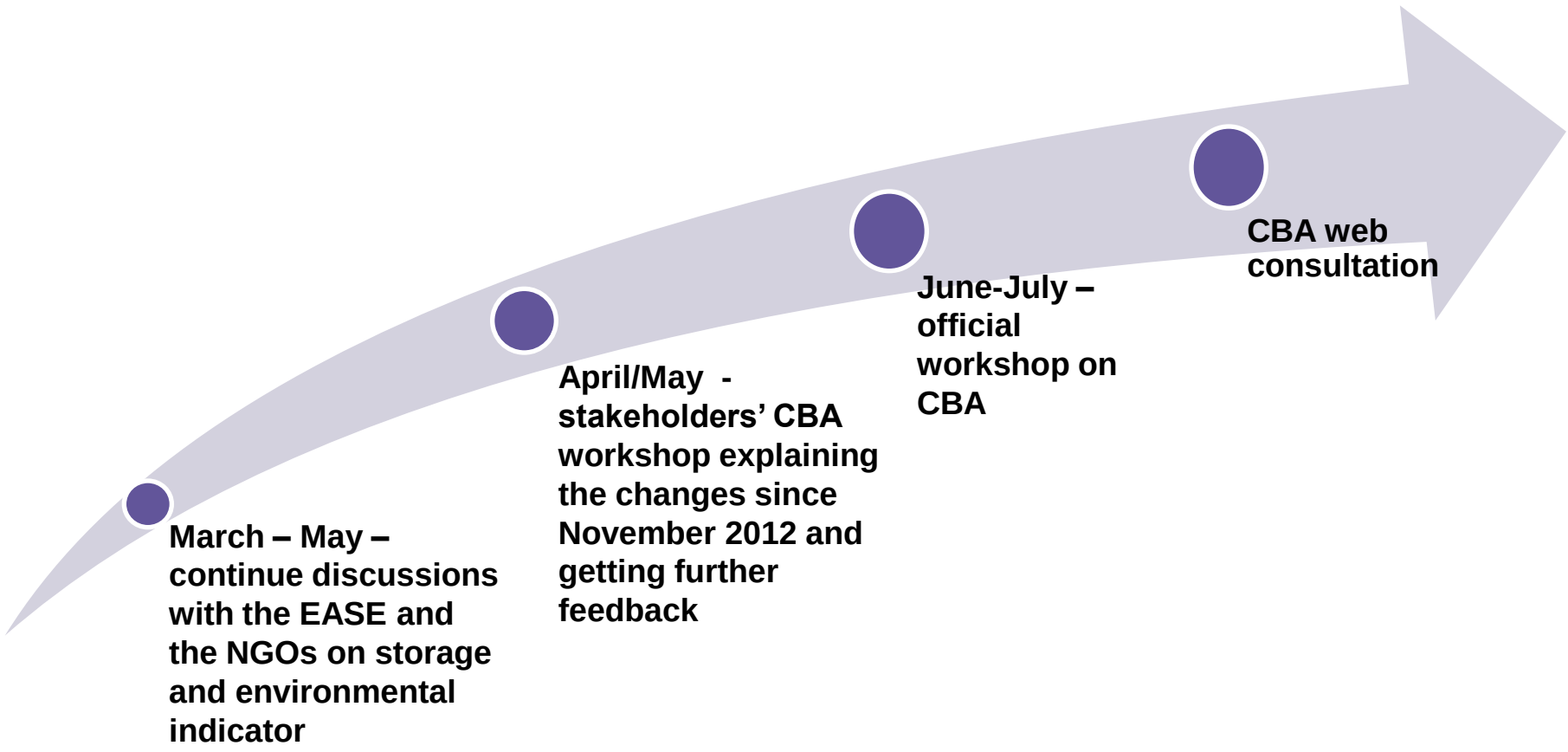
Nest steps


March – May – continue discussions with the EASE and the NGOs on storage and environmental indicator
April/May - stakeholders' CBA workshop explaining the changes since November 2012 and getting further feedback
June-July – official workshop on CBA
CBA web consultation

Next steps -EIP