



S M A R T G R I D S

Workshop 2

Network Operations

Validation Projects –

Achieving Cost-effectiveness

R.Belmans

KULeuven

Prof

Ronnie.Belmans@esat.kuleuven.be



S M A R T **G** R I D S

Overview

- q **Research in grid operation**
- q **How to get to a R&D portfolio**
- q **Stakeholders expectations**
- q **Strategic benefits**
- q **Economic benefits**
- q **Regulators and R&D**
- q **Future organisation of R&D**



S M A R T G R I D S

Research in grid operation

- q **Needed for more efficient use**
- q **How to get a R&D portfolio?**
- q **How to validate and rank research projects?**
- q **Part of Reliance work (fp6 project)**
- q **How to collaborate ?**



How to get to a R&D portfolio

S M A R T G R I D S

- q **Describe the meaning of a R&D project portfolio selection process**
- q **Investigate the strategic and economic valuation issues of R&D projects within a TSO**
- q **Expand on the above issues when a group of TSOs address R&D projects jointly at EU level**



Stakeholder expectations

S M A R T G R I D S

- q **Investors:** either $RAB \times WACC$:OK, if part of expenditures: regulator discussion
- q **Grid users:** TSOs bring innovation on crucial issues and can respond with R&D capabilities at reduced costs and within stringent deadlines
- q **Employees:** Internal recognition but very controversial (CEO, COO, CFO, CMO, HRM), but can stimulate creativity



Stakeholder expectations

SMARTGRIDS

- q **R&D contractors: TSOs know how to specify subcontracted R&D and avoid R&D monopolies amongst R&D providers (dual source)**
- q **Regulators: The TSO mission statement as a monopoly is met**
- q **The EC: R&D is taken care of properly with little public money and maximum EU impact**
- q **The Parliament, national governments: R&D costs for TSO's have little impact on energy bills of voters**



Strategic benefits

- q **To optimize reliability to support electricity as a vital, cost-efficient energy system**
- q **To support the integration of electricity markets**
- q **To support the enhancement of electricity retail markets**
- q **To support massive penetration of RES and DER**
- q **To improve the Network robustness**
- q **Innovative product enhancing export capabilities for industry**



SMARTGRIDS

Economic benefits

- q The costs of implementing the R&D project and the costs to bring solutions into practice
- q The resulting cumulative operational costs after the solution has been implemented **over a given observation period**
- q The resulting cumulated benefits after the solution has been implemented **over a given observation period**
- q **How far can these benefits be quantified ?**



S M A R T G R I D S

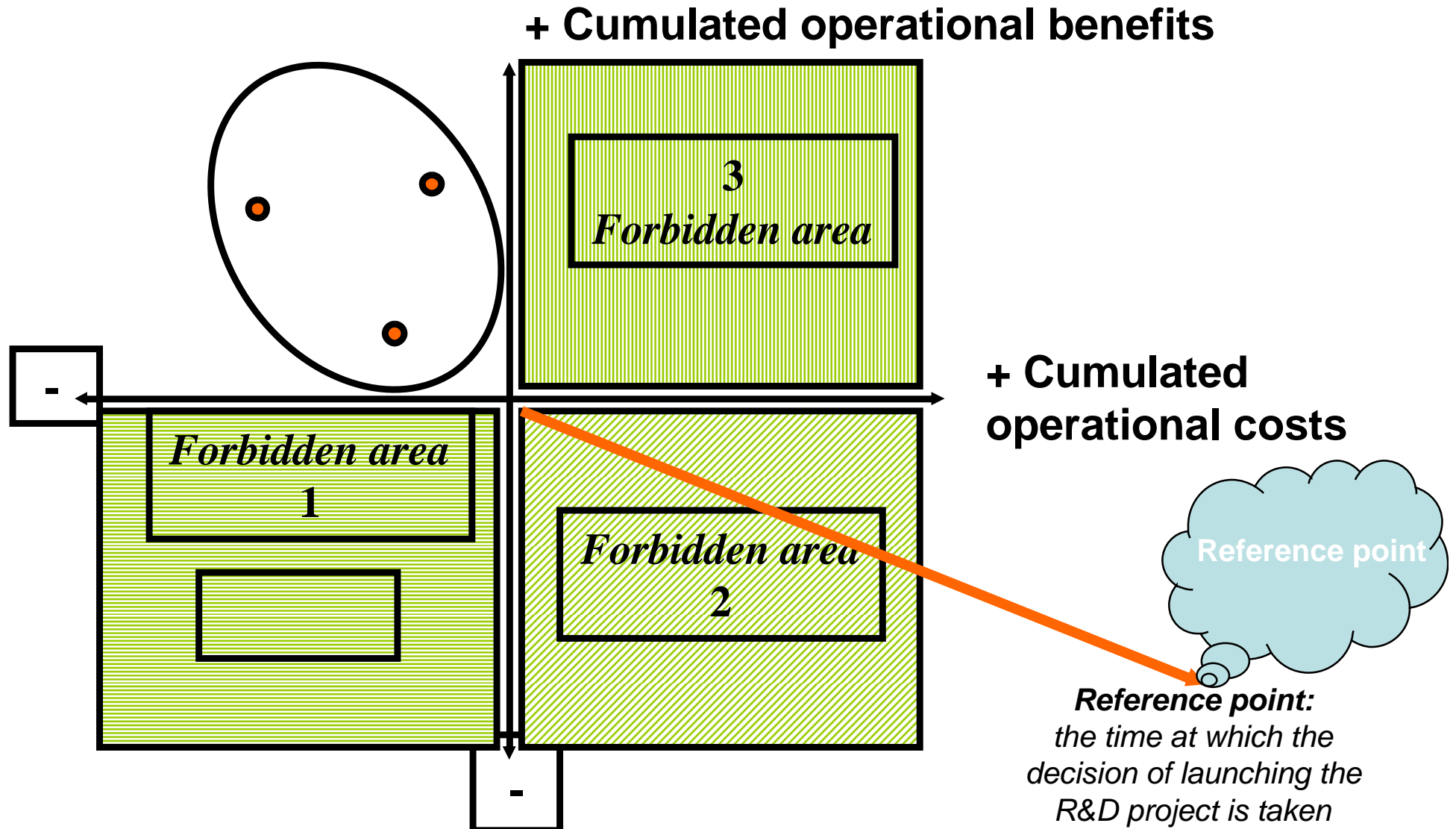
Economic benefits

- q Each TSO can have a different valuation technique of R&D costs and benefits
- q How to manage the convergence of several valuation techniques into **a single, harmonized approach** ?
- q There are cross benefits and drawbacks to perform research collectively
- q How to measure additionality of these collaborative approaches ? (every one chooses R&D projects that maximises the **probability of reaching expected impacts** !)



SMARTGRIDS

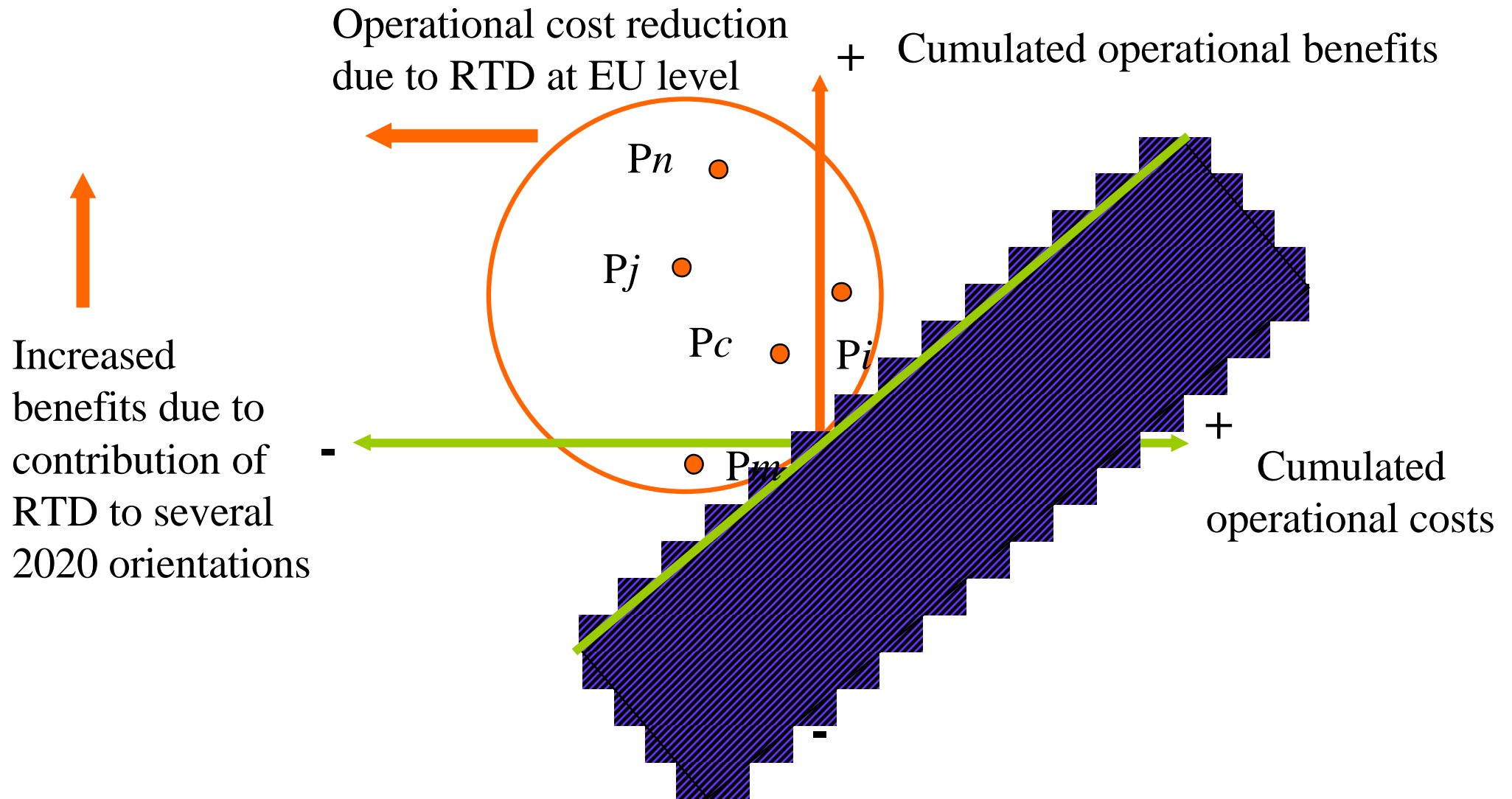
TSO Economic benefits





SMARTGRIDS

Macroscopic Economic Benefits





SMARTGRIDS

Regulators and R&D

- q **Two main ways to deal with R&D projects**
 - **Cost +:** pre specified cost reduction approach
 - **Remuneration of capital:** investment management over a given period of time
- q **At a EU level, regulators must admit that a given TSO may see significant operational cost increases, yet leading overall to EU benefits**



SMARTGRIDS

Future organisation of R&D

- q **Coordinated R&D actions will require a dedicated organisation where permanent R&D managers, experts and visiting research players will work together to perform R&D tasks.**
- q **There are several legal structures possible:**
 - EIG
 - Foundation
 - Private company with TSO's as shareholders
 - Association



SMARTGRIDS

Future organisation of R&D

q “Check list”

- Risk sharing
- Neutrality
- Credibility
- Taxes, subsidisation, ...
- Outsource non-core activities (?)
- IP-issues handling
- ...



SMARTGRIDS

Future organisation of R&D

- q **Examples differ seriously**
- q **EPRI**
- q **CESI**
- q **Government institutes**
 - EU-institutes, e.g. Ispra
 - US National Labs
- q **Research institutes (mostly governed by universities)**
 - Labein (ES)
 - ECN (NL)
 - SINTEF (NO)
 - INESC (P)
 - CRIEPI (J)
 - KULeuven Energy Institute



Example: EPRI

SMARTGRIDS

- q **Tax-exempt, non-profit center for public interest**
- q **Energy and environmental research**
- q **Home base: Palo Alto, CA**
- q **Membership of utilities and big industries**
 - (Expensive) programs on broad themes
 - Outsource research to universities, consultants, ...
 - ‘Consultant look-and-feel’
- q **Some public research as well (e.g. bid in DoE contracts), with public results**
- q **Resembles a sort of fund on the one hand**
- q **Has own labs on the other hand (e.g. EPRI-PEAC)**



SMARTGRIDS

Example: KULeuven EI

q <http://www.kuleuven.be/ei/>

q **Fund: K.U.Leuven Energy Foundation Industry-University**

- Members can advise on potential research areas (currently: *global warming* and the *liberalisation of electricity markets*)
- Members (sponsors) are key Belgian energy companies and large energy users
- Membership 5 years

q **(Sponsored) research is conducted in “Energy Institute”**

- Joint KUL labs & groups dealing with energy matters (electrical eng., mechanical eng., economy, law)
- dual structure is used to guarantee an independent administration of funds within the K.U.Leuven Energy Institute
- EI also bids in for regular research work (EU-projects,...)



SMARTGRIDS

National-International

q Go for national structures, who may internationally subcontract or make joint ventures?

- Will always serve national interests first
- Use national ‘public money’

q Go for international structures!

- Use international ‘public money’



SMARTGRIDS

Structural options I

q Fund

- Put in money, sort of ‘blank check’
- Writes out research calls or tenders
- Who decides subject?
 - Let the academics decide ?
 - Extensive peer review
 - Put forward own agenda
- Fiscal advantage?
- National research funds (broad)

q Association

- Difference with fund: (in theory) performs research itself, decide autonomously
- Tenders
- E.g. ETSO, UCTE, ...



SMARTGRIDS

Structural options II

q Research institute(s)

- Fixed staff = fixed ideas?
- Build where?
- Not a ‘lean organization’
- Often gets ‘politized’
- Need independent ‘watchdog’ to make sure it stays at the top, is neutral, ... (often academics)
- Knowledge (in theory) well preserved



Membership

q **Strict rules defining members?**

q **For how long?**

q **Only TSO/DSO?**

– Also regulators, metering companies, asset companies, utility, ... ?

q **Make rules to avoid domination**



S M A R T **G** R I D S

**Thank you for your
attention!**

Ronnie Belmans
ronnie.belmans@esat.kuleuven.be