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# Cable or overhead line – the Swiss method of weighing up the interests

Cornelia Gogel, Swiss Federal Office of Energy SFOE, Service Head sectoral plan and Planning Approval Procedure
The Swiss method of weighing up interests cable – overhead lines; RGI Workshop hosted by SWISSGRID, Spreitenbach, 13.02.2013

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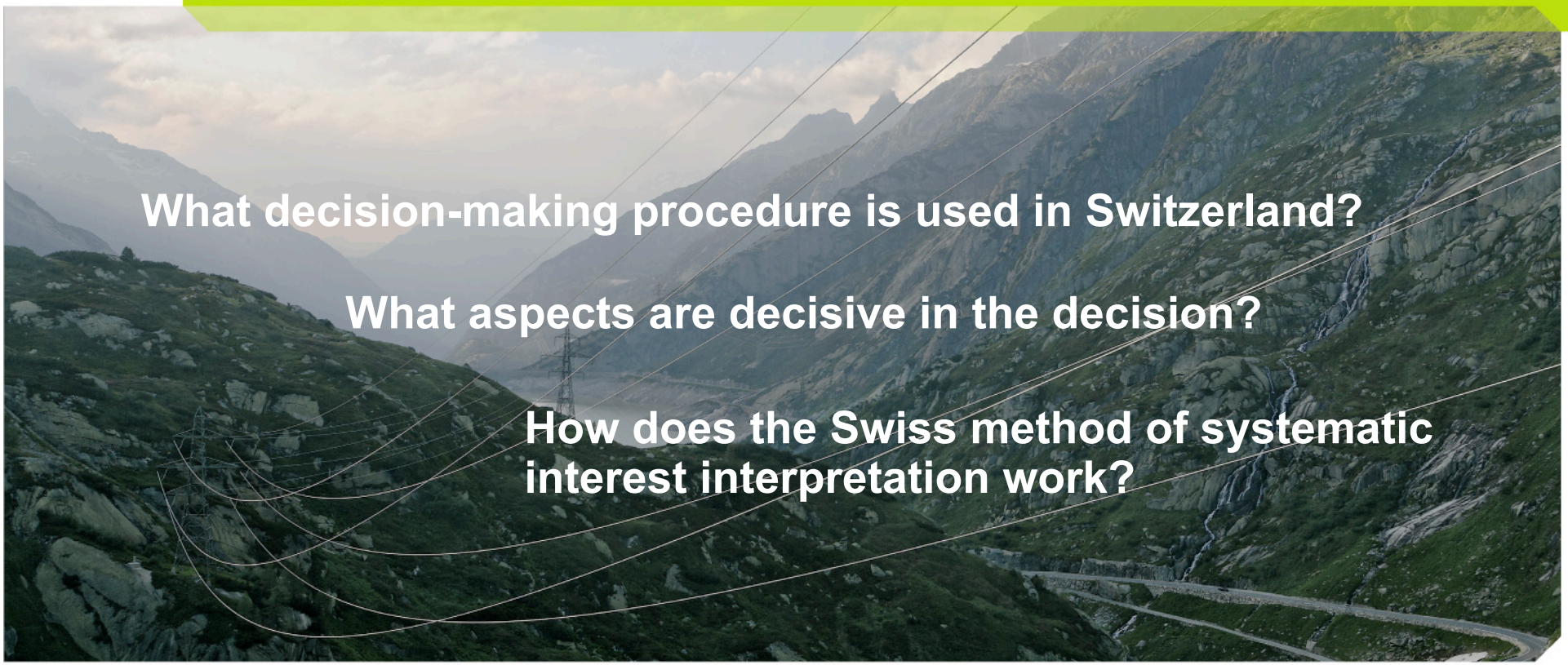
# Cable or overhead line – the Swiss method of weighing up the interests

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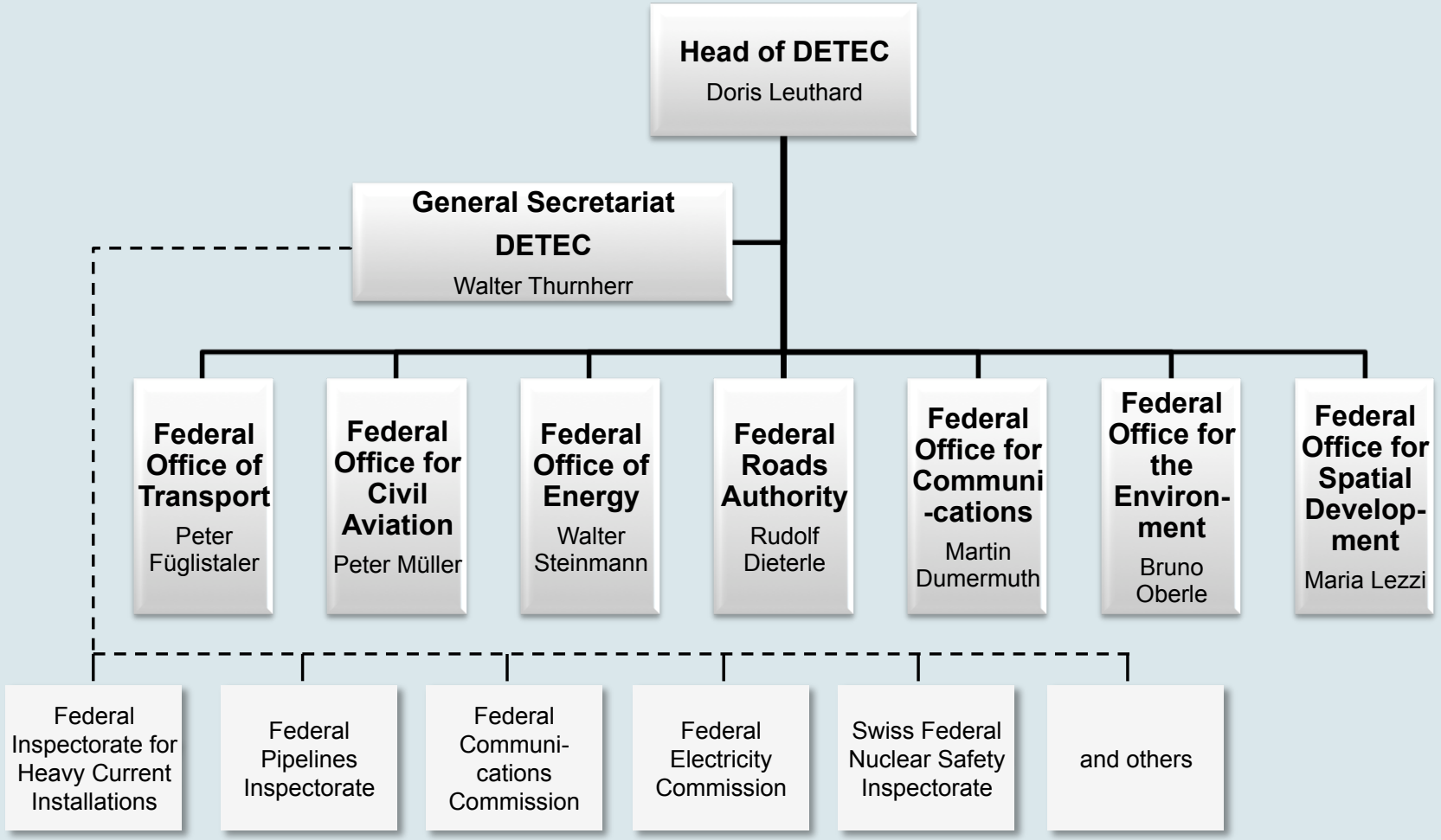
# DETEC department



# Swiss Federal Office of Energy SFOE

- Department: DETEC (Environment, Transport, Energy, Communication)
- Location: Mühlestrasse 4
  CH-3063 Ittigen (near Bern)
- Director: Walter Steinmann
- Website: www.bfe.admin.ch

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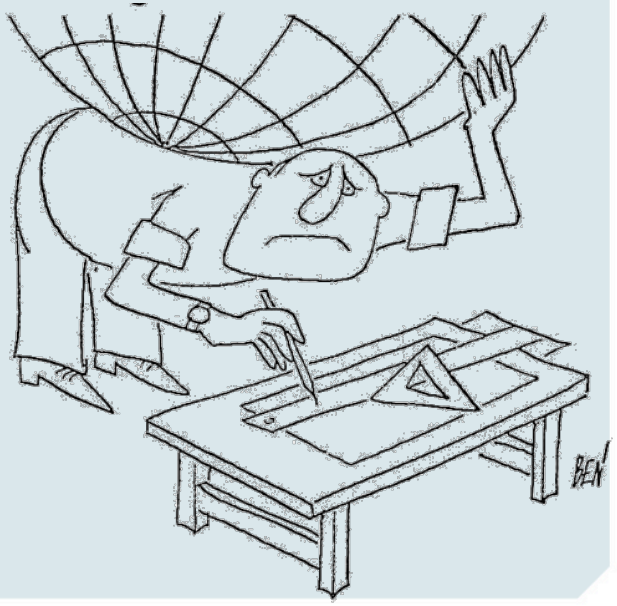
# What is the sectoral plan?

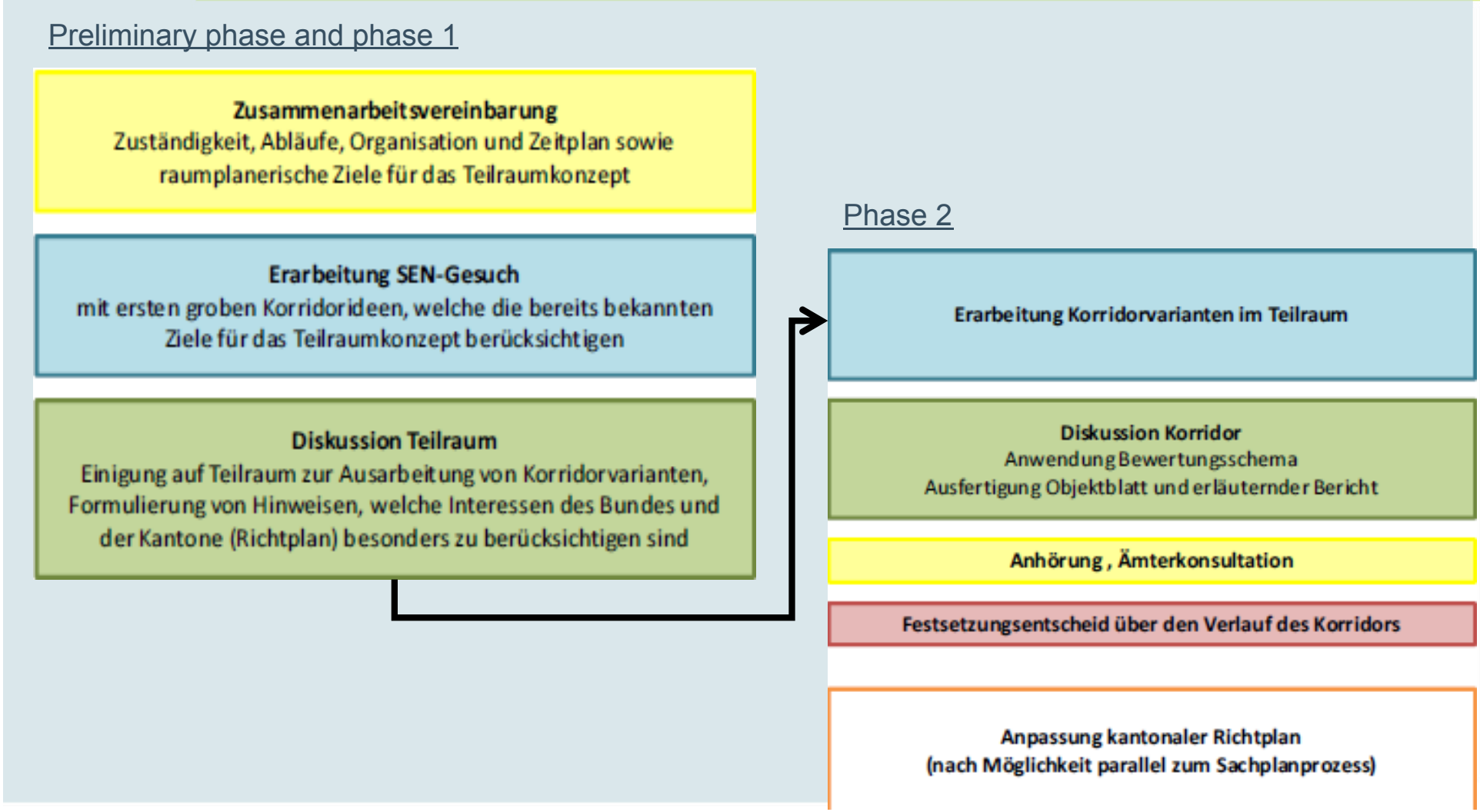
- **Art. 13 (1) RPG:** The federal government creates the foundations enabling it to fulfil its regionally significant tasks. It draws up the concepts and sectorial plans required and coordinates them with one another**.**
- **Art. 16 (5) EleG:** Planning approval for projects with a significant effect on the region and environment is generally dependent on an sectoral plan according to the federal law of 22 June 1970 on spatial planning.

➢ It is the **overriding planning instrument** for the extension and new construction of high-voltage lines in the voltage bands 220 kV and 380 kV (general electricity supply 50 Hz, power stations) and 132 kV (rail electricity supply, 16.7 Hz, SBB)

➢ and simultaneously the **preliminary stage** for the planning approval procedure (actual construction permit)

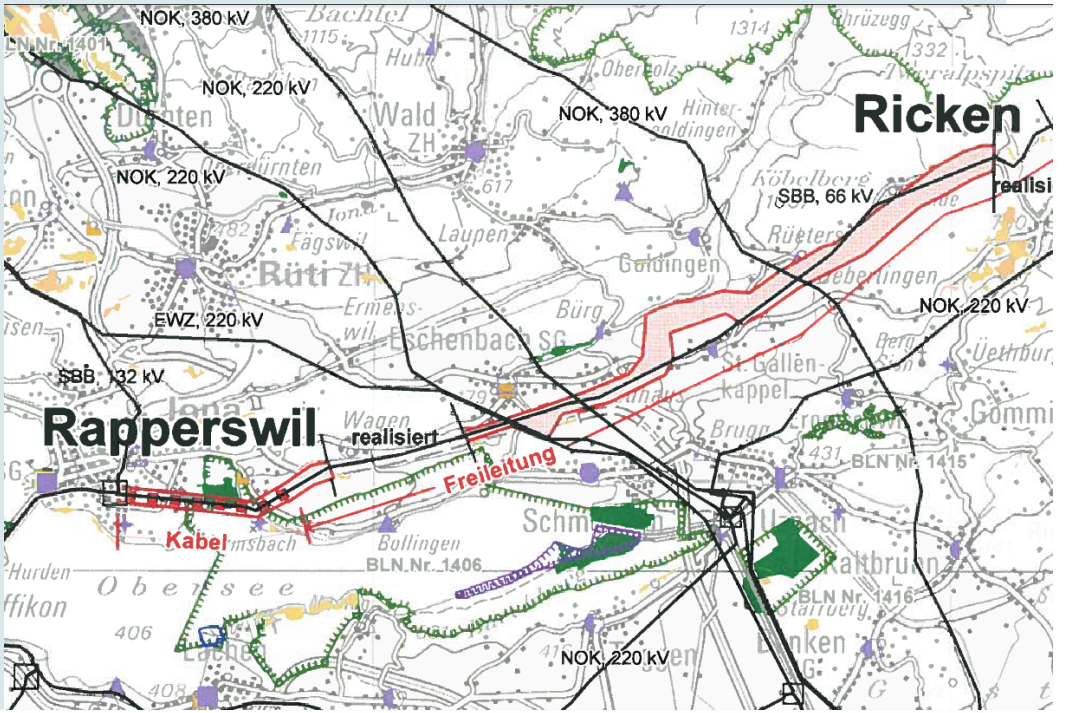


# New sequence of the sectoral plan process (according to the new concept of grid strategy)



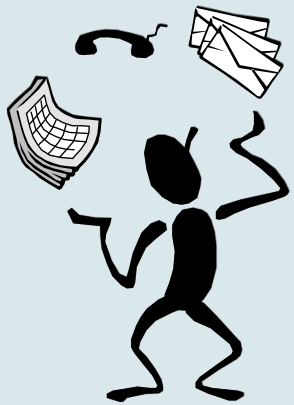
# Goal and purpose of the sectoral plan process

- Determination of the most suitable **corridor** for planned line construction projects
- Uncovering and resolving any conflicts at higher level
- Evaluation of need and corridor variants
- Decision on cable or overhead line
- Coordination and optimisation of existing Swiss transmission grid
- Detailed project planning of line construction projects are **not** part of the sectoral plan



# Where are the problem areas?

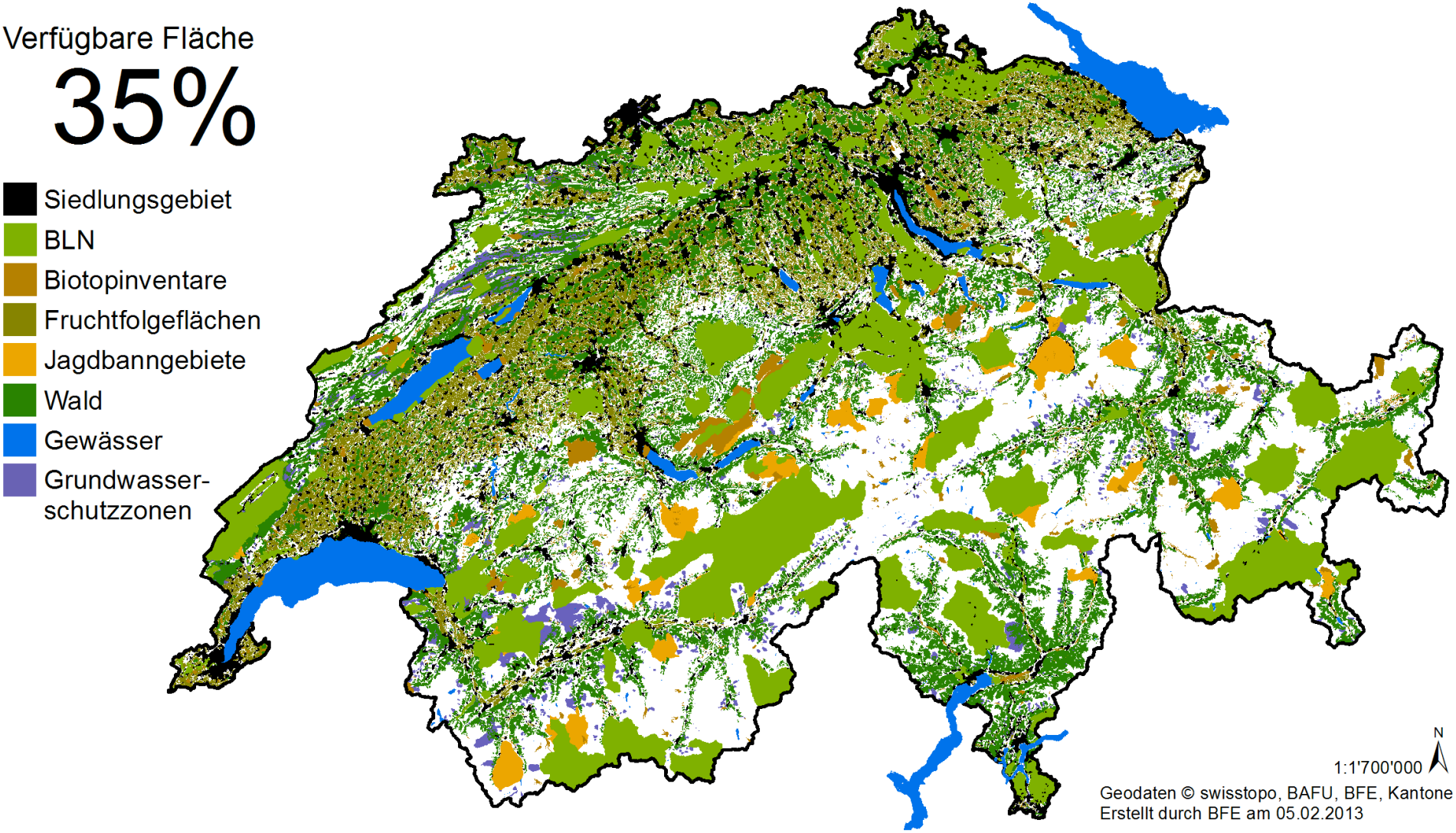
- Size of the working group ➔ up to 30 people and more
- Communication among those interested in use and those in protection ➔ special development and care needed
- Political resistance by the region affected
- Landscape protection ➔ cabling promoted
- Non-ionising radiation ➔ fear of “electrosmog”
- Need for the line (which is not in the strategic grid)
- Urgency of individual projects
- Protected and settlement areas ➔ no “unused” areas



# No unused areas

Verfügbare Fläche

35%



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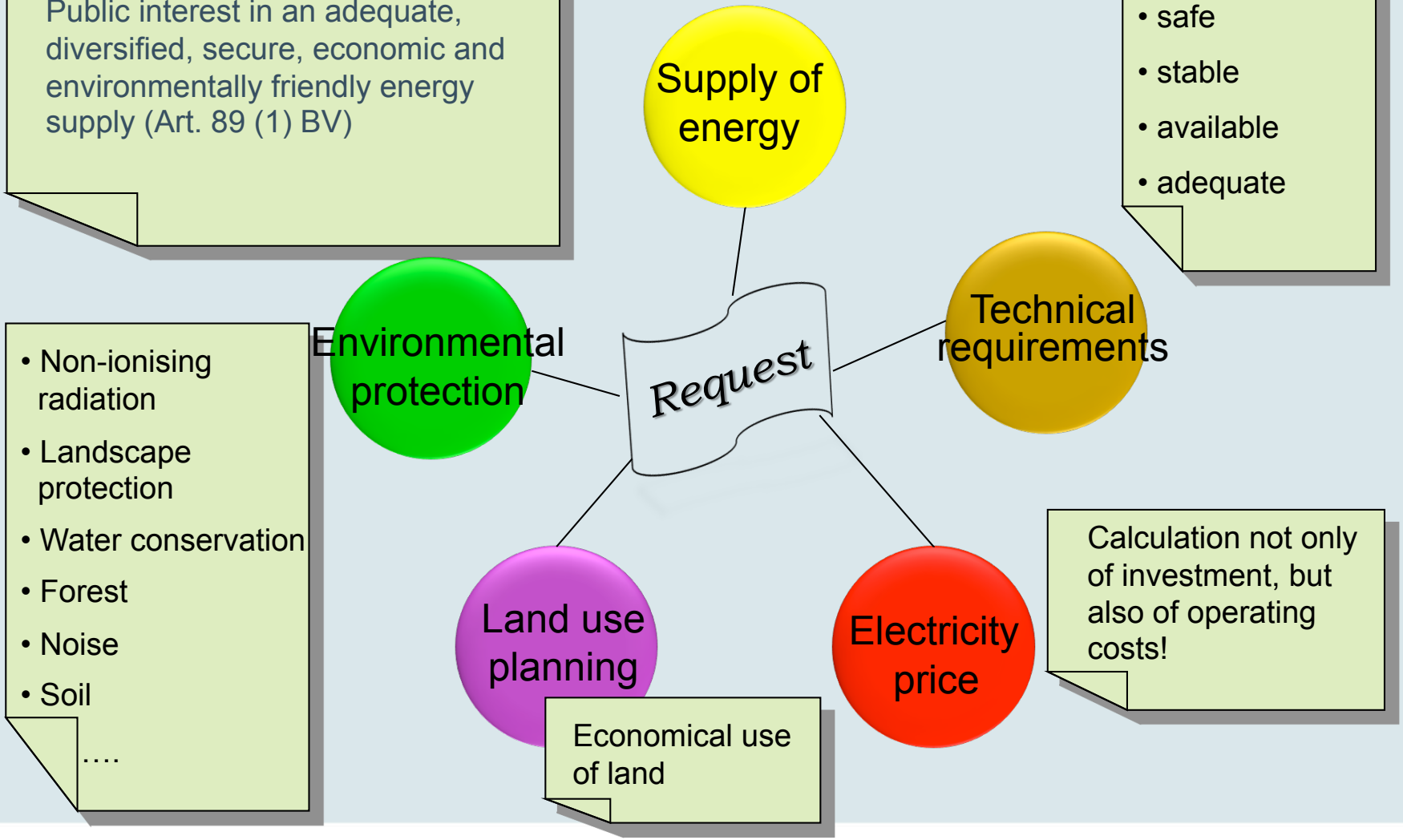
# Consideration of interests - overview

Public interest in an adequate, diversified, secure, economic and environmentally friendly energy supply (Art. 89 (1) BV)



# Criteria or overhead line?
# Consideration of interests – regional planning

BV Art. 75 (1)
**Appropriate and economical use of land**

Land use planning

- Where is energy produced? Where needed?
- Future developments must be taken into consideration
- The whole point is about using existing routes and/or bundling as many as possible with pre-existing infrastructure
- Areas of settlement are to be spared – but there is no prohibition on using areas of settlement
- Protected areas are not to be further impaired, or the situation is to be improved
- Topography/geology, accessibility of an area, line length

# Criteria cable or overhead line?
# Consideration of interests – technical requirements

**Technical aspects**

- Availability
- Different requirements depending on importance of the line
- No outages
- Short repair time
- …


**Security of supply / operational reliability**

Importance of the disputed line
- in the European grid
- in the national grid
- in the regional grid

Susceptibility to failure / repair duration and -expense

Efficiency

⇨ How much (additional) expense will produce the desired / demanded / necessary benefits?

Cable technology

The current state of cable technology is decisive
Operational reliability must be taken into consideration

# Criteria cable or overhead line?
# Consideration of interests – environmental protection

**Art. 74 (1) and (2) BV:** The federal government issues regulations **for the protection of people and their natural environment against harmful or troublesome influences.**
[2] It makes sure that such influences are avoided.
=> Non-ionising radiation, noise, etc.…


**Art. 78 (2) RPG:** The federal government makes allowances in fulfilling its tasks for the concerns of nature and heritage protection. **It conserves landscapes, landmarks, historical sites and natural and cultural monuments;** it preserves them undiminished if this is in the public interest.

**Landscape protection according to Art. 3 and 6 NHG:**

- Intervention only in the event of **predominant** general interest
- What counts with regard to whether the disadvantages of cabling have to be accepted is the **degree to which a landscape is worthy of protection**:
  - Comprehensive concentration of interests
  - Cabling also in the event of medium worthiness of protection
  - Cabling obligation in the case of areas that are especially worthy of protection in individual cases on account of the NHG
  - Impairment of the landscape must be accepted
- **Undiminished protection** of inventoried areas
- Intervention only in the case of equal or greater interests of national importance

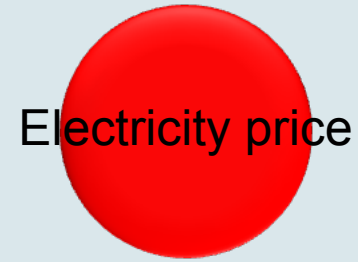
# Criteria cable or overhead line?
# Consideration of interests – electricity price

**Energy price**

There is a **public interest in low energy prices.** This leads to an interest in keeping the **costs** (in this connection the investment and operating costs) **as low as possible**.

**Electricity price**

- affordable
- inexpensive
- low production costs
- low maintenance costs
- low operating costs
- …



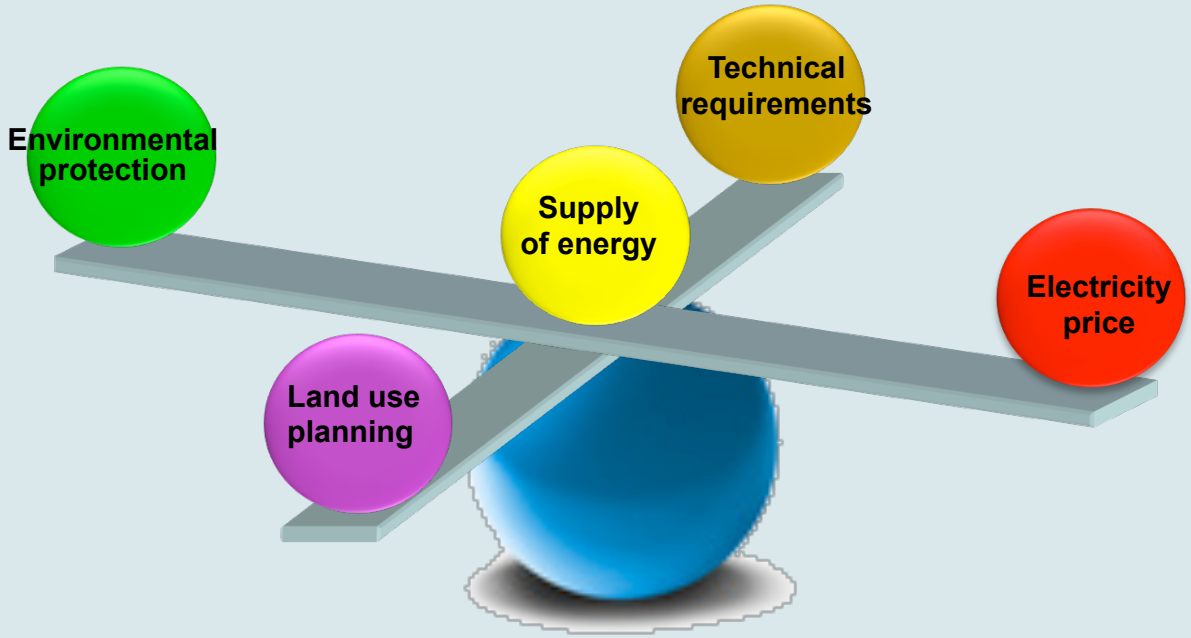

**Allowances must be made for the following**

•economic, technical and operational aspects
•intentions regarding the future development of the line
•any compensation measures
•all costs incurred during the service life of an installation

**Practice:**

- **10-fold** additional costs are admittedly disproportional, but this alone cannot be decisive
- Additional costs of a factor of **2 - 5** are disproportional
- Offer of cost participation of third parties is not relevant
- Relationship of the costs of cabling to the overall costs is not relevant, but rather the cost relationship of the sections to be compared with it
- Riniken: Additional cost factor of **0.66 to 1.83**

# Balance of interests



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1. DETEC - SFOE
2. Sectoral plan process
3. Interpretation and consideration of interests
4. Method

# Evaluation scheme for transmission lines (1)

**Objective** Decision on the technical design of a high voltage line (cable or overhead line)

**Procedure** Evaluation and assessment of advantages and disadvantages of various corridor variants

**Result** Systematic interpretation of interests
Objectivised and understandable justification of the advantages and disadvantages of each corridor variant

# Evaluation scheme for transmission lines (2)

Design of the scheme

- Four pillars: spatial development, technical aspects, conservation of the environment, economic efficiency
- Each pillar consists of three to four criteria groups
- Each criteria group consists of two to seven criteria

Evaluation

- Corridor variants and line dismantling are evaluated
- According to prescribed rating and weighting
- Reference value is a prescribed actual or reference value
- Aggregation of criteria groups, not pillars
  (due to different reference values no comparison is possible at the pillar level)

# Evaluation scheme for transmission lines
# Spatial development pillar *(as of 6.12.2011)*

| Criteria groups | Criteria | Weighting | | Evaluation | Total Evaluation per criteria times Weighting | Total per criteria groups |
|---|---|---|---|---|---|---|
| Conserve resources | Bundling of electric lines with each other | 3 | nK | | 0 | 0 |
| | | | Ldis | | | |
| | Bundling with other linear infrastructure | 2 | nK | | 0 | |
| | | | Ldis | | | |
| | Use or impairment of land | 1 | nK | | 0 | |
| | | | Ldis | | | |
| Protect settlement areas | Effects on the settlement area / existing construction zone | 2 | nK | | 0 | 0 |
| | | | Ldis | | | |
| | Effects on living quality | 3 | nK | | 0 | |
| | | | Ldis | | | |
| | Conflicts with local recreation areas | 2 | nK | | 0 | |
| | | | Ldis | | | |
| | Conflicts with landmark protection / heritage protection | 2 | nK | | 0 | |
| | | | Ldis | | | |
| | Conflicts with archaeologically interesting objects and IVS | 1 | nK | | 0 | |
| | | | Ldis | | | |
| | Effects on touristic attractivity | 1 | nK | | 0 | |
| | | | Ldis | | | |
| Take spatial develop-ment planning goals into account | Compliance with regional planning | 3 | nK | | 0 | 0 |
| | | | Ldis | | | |
| | Compliance with federal government planning | 3 | nK | | 0 | |
| | | | Ldis | | | |
| | Compliance with communal use plans/development concepts | 2 | nK | | 0 | |
| | | | Ldis | | | |

# Evaluation scheme for transmission lines
# Technical aspects pillar *(as of 6.12.2011)*

| Criteria groups | Criteria | Weighting | | Evaluation | Total Evaluation per criteria times Weighting | Total per Criteria groups |
|---|---|---|---|---|---|---|
| Grid operation | Increase in N-1 security | 2 | nK | | 0 | 0 |
| | | | Ldis | | | |
| | local reactive power compensation | 1 | nK | | 0 | |
| | | | Ldis | | | |
| | Safety management of transient processes | 1 | nK | | 0 | |
| | | | Ldis | | | |
| | Active resonance suppression | 1 | nK | | 0 | |
| | | | Ldis | | | |
| Reliability Security | Non-availability | 3 | nK | | 0 | 0 |
| | | | Ldis | | | |
| | Threat from natural hazards and weather | 2 | nK | | 0 | |
| | | | Ldis | | | |
| | Threat by third parties | 1 | nK | | 0 | |
| | | | Ldis | | | |
| Life cycle | Energy losses | 3 | nK | | 0 | 0 |
| | | | Ldis | | | |
| | Recycling | 1 | nK | | 0 | |
| | | | Ldis | | | |
| | Energy and $CO_2$ -Balance Sheet | 2 | nK | | 0 | |
| | | | Ldis | | | |

# Evaluation scheme for transmission lines
# Conservation of the environment pillar *(as of 6.12.2011)*

| Criteria groups | Criteria | Weighting | | Evaluation | Total Evaluation per criteria times Weighting | Total per criteria groups |
|---|---|---|---|---|---|---|
| Emis-sion protection | Non-ionising radiation | 3 | nK<br>Ldis | | 0 | 0 |
| | Noise | 2 | nK<br>Ldis | | 0 | |
| Land-scape protection | Moorland of particular beauty and national significance | 3 | nL<br>Ldis | | 0 | 0 |
| | BLN | 3 | nK<br>Ldis | | 0 | |
| | General obligation to conserve the landscape (Art. 3 NHG) | 2 | nK<br>Ldis | | 0 | |
| habitats | Forest | 2 | nK<br>Ldis | | 0 | 0 |
| | Moor biotopes of national importance | 3 | nK<br>Ldis | | 0 | |
| | Wetlands of national importance | 2 | nK<br>Ldis | | 0 | |
| | Dry meadows and pastures | 2 | nK<br>Ldis | | 0 | |
| | Aquatic and migratory bird reserves of national importance | 2 | nK<br>Ldis | | 0 | |
| | Habitats according to Art. 18 NHG (regional or local importance) | 2 | nK<br>Ldis | | 0 | |
| ground water / soil / Polluted sites | Ground water protection zone S1 | 1 | nK<br>Ldis | | 0 | 0 |
| | ground water protection zone S2 and ground water protection site | 1 | nK<br>Ldis | | 0 | |
| | Ground water protection zone S3 | 1 | nK<br>Ldis | | 0 | |
| | Water pollution control area A | 1 | nK<br>Ldis | | 0 | |
| | Soil protection | 2 | nK<br>Ldis | | 0 | |
| | Polluted Sites Ordinance | 1 | nK<br>Ldis | | 0 | |
| | Flood protection | 1 | nK<br>Ldis | | 0 | |

# Evaluation scheme for transmission lines
# Economic efficiency pillar *(as of 6.12.2011)*

| Criteria groups | Criteria | Unit | lower band width | upper band width |
|---|---|---|---|---|
| Effective costs | Investment costs expansion project | [CHF] | | |
| | Investment costs accompanying measures | [CHF] | | |
| | Investment costs total | [CHF] | | |
| | Operating costs per year | [CHF/a] | | |
| Standardized costs | Investment costs per circuit kilometre | [CHF/km] | | |
| | Operating costs per circuit kilometre and year | [CHF/km/a] | | |
| | Investment costs per power circuit kilometre | [CHF/MWkm] | | |
| | Operating costs per power circuit-kilometre and year | [CHF/MWkm/a] | | |
| Efficiency | Discounted yield for the year (assumption: simultaneous construction start) | [CHF] | | |
| | Discounted yield for the year (assumption: process acceleration possible through suitable measures) | [CHF] | | |
| | Discounted yield for the year (assumption: differing dependencies on other expansion projects) | [CHF] | | |

# Application of evaluation scheme and possible results

1. **Methodical interpretation** of interests (= evaluation scheme)
2. **Systematic evaluation** of their consideration by each corridor version (= application)
3. **Substantiated arguments** pros & cons for each corridor version (= result)

➢ **Results are always arguments** – not figures!
(except in case of the economic pillar)

Possible results:

- Corridor version A conserves resources better because it has more bundling potential and these can also be exploited.
- Corridor version B makes better allowance for the planning of the federal government and canton, because it …

- Corridor version A is more disadvantageous for grid operation, because the N1-criterion is met to a lesser degree.
- Corridor version B is less reliable, since it is exposed to greater dangers.

- Corridor version A is more advantageous for forest and other habitats, since these are less impaired.
- Corridor version B is better in terms of emissions protection, since no settlement areas in the corridor are likely to be affected.

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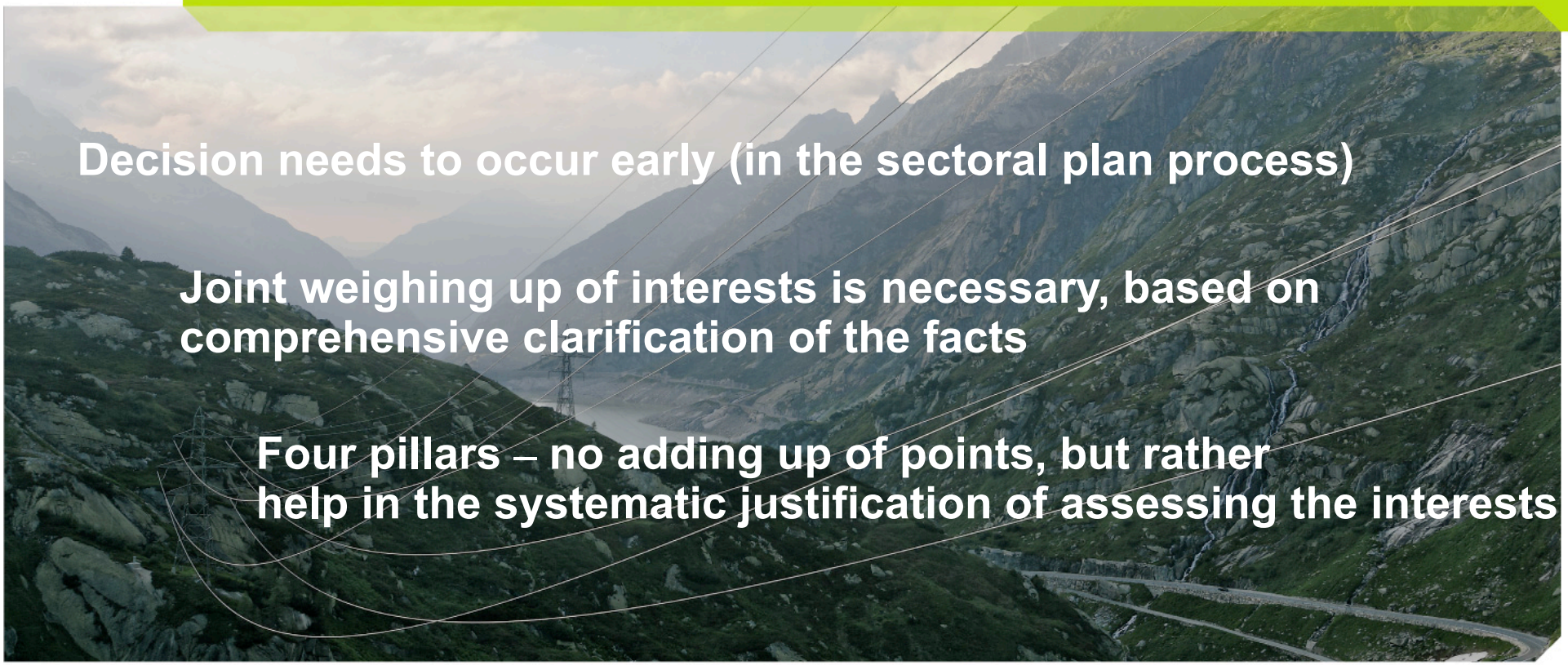


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