

EU指令と 欧州再生可能エネルギー政策

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1. 一連のEU指令
2. 再エネ導入と併行して実施されるグリッド政策
3. 加盟国の対応:ドイツの例
4. EUの政策フォローアップ
5. グリッドタリフによるコスト回収

おわりに

1. EUの一連の動き

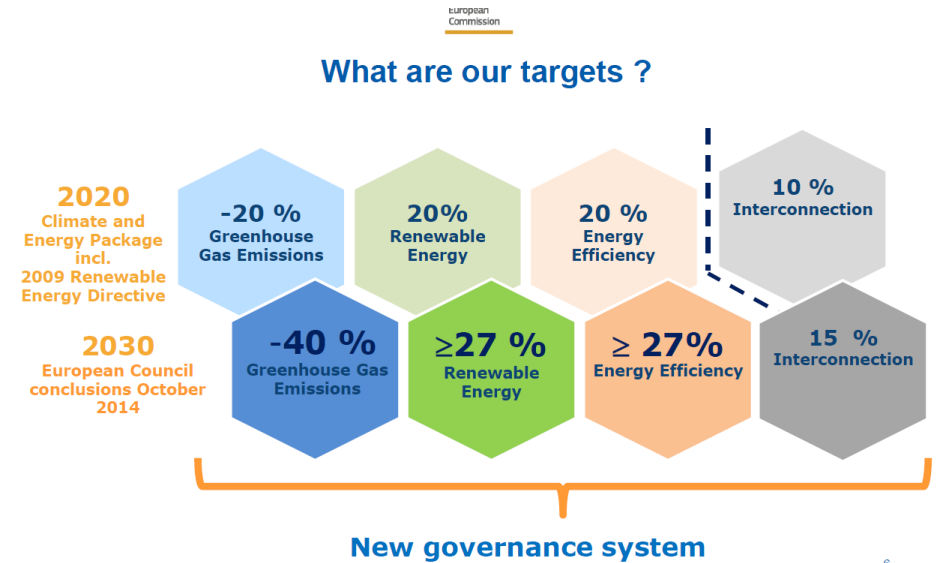
2009年4月	EU指令29 EU指令28	2°Cを超えないという目標設定 再生可能エネルギー20%目標設定、 グリッド増強政策等
2009年7月	ラクイラサミット EU指令72 EU規則714	2050年80%削減にコミット TSO、DSOの分離 entso-eの位置づけ PCIプロジェクトの規定 (2010年6月 TYNDP策定)
2011年3月	COM/2011/112	A roadmap for moving competitive low carbon economy in 2050 (2011/3/11)
2011年12月	COM/2011/885	Energy Roadmap 2050
2016年11月	EU指令72改訂 EU規則714改訂	

温暖化に関する基本的なEU指令

DIRECTIVE 2009/29/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009

(2) The ultimate objective of the United Nations Framework Convention on Climate Change (UNFCCC), which was approved on behalf of the European Community by Council Decision 94/69/EC(5) OJ L 33, 7.2.1994, p. 11., is to stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. In order to meet that objective, **the overall global annual mean surface temperature increase should not exceed 2 ° C above pre-industrial levels.**

エネルギー最終需要の 再エネ比率を義務付けるEU指令



DIRECTIVE 2009/28/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009

Article 3

Mandatory national overall targets and measures for the use of energy from renewable sources

1. Each Member State shall ensure that the share of energy from renewable sources, calculated in accordance with Articles 5 to 11, in gross final consumption of energy in 2020 is at least its national overall target for the share of energy from renewable sources in that year, as set out in the third column of the table in part A of Annex I. Such mandatory national overall targets are consistent with a target of at least a 20 % share of energy from renewable sources in the Community's gross final consumption of energy in 2020.

EUのエネルギーロードマップを定める文書

COM(2011)112.8.3.2011

A Roadmap for moving to a competitive low carbon economy in 2050

1. EUROPE'S KEY CHALLENGES

In order to keep climate change below 2°C, the European Council reconfirmed in February 2011 the EU objective of reducing greenhouse gas emissions by 80-95% by 2050 compared to 1990, in the context of necessary reductions according to the Intergovernmental Panel on Climate Change by developed countries as a group[3]. This is in line with the position endorsed by world leaders in the Copenhagen and the Cancun Agreements. These agreements include the commitment to deliver long-term low carbon development strategies. Some Member States have already made steps in this direction, or are in the process of doing so, including setting emission reduction objectives for 2050.

★ **Not about targets, but identifying cost-efficient trajectory**

★ **Gradual emission reductions:**

↳ -1.0% per year 2010-2020 vs 1990

↳ -1.5% per year 2020-2030 vs 1990

↳ -2.0% per year 2030-2050 vs 1990

★ **Sectoral milestones: all sectors contribute in different manner**

GHG reductions compared to 1990	2005	2030	2050
Power (CO ₂)	-7%	-54 to -68%	-93 to -99%
Industry (CO ₂)	-20%	-34 to -40%	-83 to -87%
Transport (incl. CO ₂ aviation, excl. maritime)	+30%	+20 to -9%	-54 to -67%
Residential and services (CO ₂)	-12%	-37 to -53%	-88 to -91%
Agriculture (non-CO ₂)	-20%	-36 to -37%	-42 to -49%
Other non-CO ₂ emissions	-30%	-72 to -73%	-70 to -78%

EUの狙いは？

①EUの化石燃料輸入額の減少・EU内投資の増大

風力等の再生可能エネルギーの多くは、設備型の発電で、燃料消費型の発電ではない。再生可能エネルギー中心のシステムにし、燃料費として域外に流出していたマネーフローをEU域内製造業への投資に変える。

EUの化石燃料輸入額は毎年1750億ユーロ～3200億ユーロ。低炭素電源への転換により、これらの資金がEU域内で循環。

②エネルギー安全保障

国際エネルギー機関(IEA)によれば、長期的には化石燃料価格は高騰。

EU経済を将来の燃料費高騰から守る。

同時にエネルギーの域外依存率が大きく低下。

③職の創造

再生可能エネルギー関連産業や域内投資は、多くの新たな雇用を生み出す。

④イノベーション

再生可能エネルギー導入等による低炭素社会の構築のためには電力・ガスグリッドの改善、自動車のEV化等の多くの新たな投資が必要。

「今日の投資が将来の経済競争力を決める」ということを考えると、成熟社会の欧州に貴重な投資機会を創出。電力システムをはじめとした、新たな社会システムへの移行は、多くのイノベーションを生み出し、次世代のEU製造業の発展の基。

◎EUの基本的な方向を示すDC885(2011年12月)

3. 11を踏まえ政策を多角的に評価し、Energy Roadmap 2050

52011DC0885

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS **Energy Roadmap 2050** /* COM/2011/0885 final */

1. Introduction

People's well-being, industrial competitiveness and the overall functioning of society are dependent on **safe, secure, sustainable and affordable energy**.

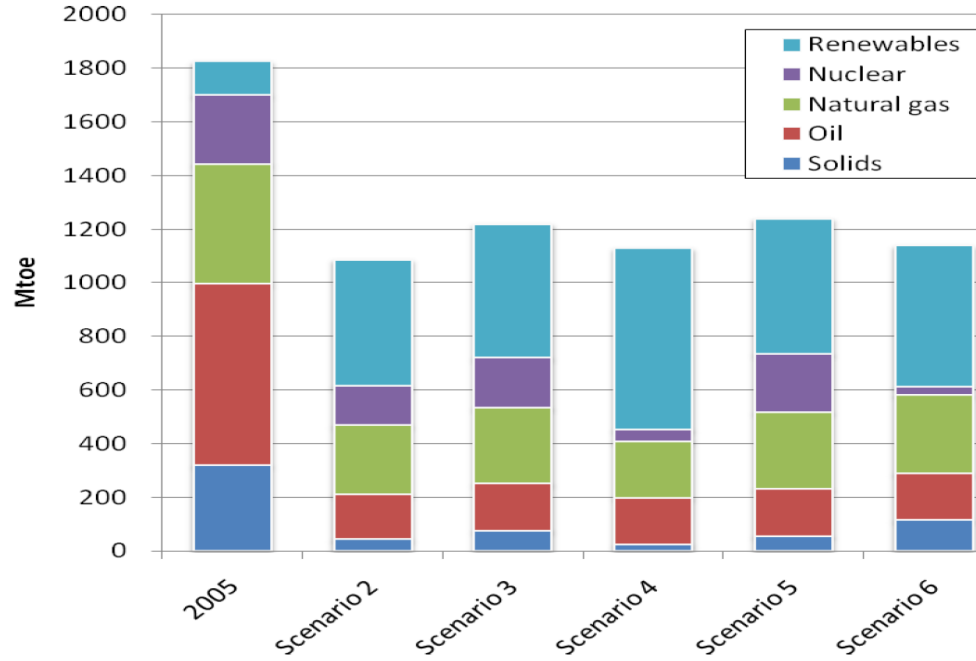
The EU is committed to reducing greenhouse gas emissions to 80-95% below 1990 levels by 2050 in the context of necessary reductions by developed countries as a group.

. In this **Energy Roadmap 2050** the Commission explores the challenges posed by delivering the EU's decarbonisation objective while at the same time ensuring security of energy supply and competitiveness. . . .

2. A Secure, Competitive and Decarbonised Energy System in 2050 is possible

The energy sector produces the lion's share of man-made greenhouse gas emissions. Therefore, reducing greenhouse gas emissions by 2050 by over 80% will **put particular pressure on energy systems**.

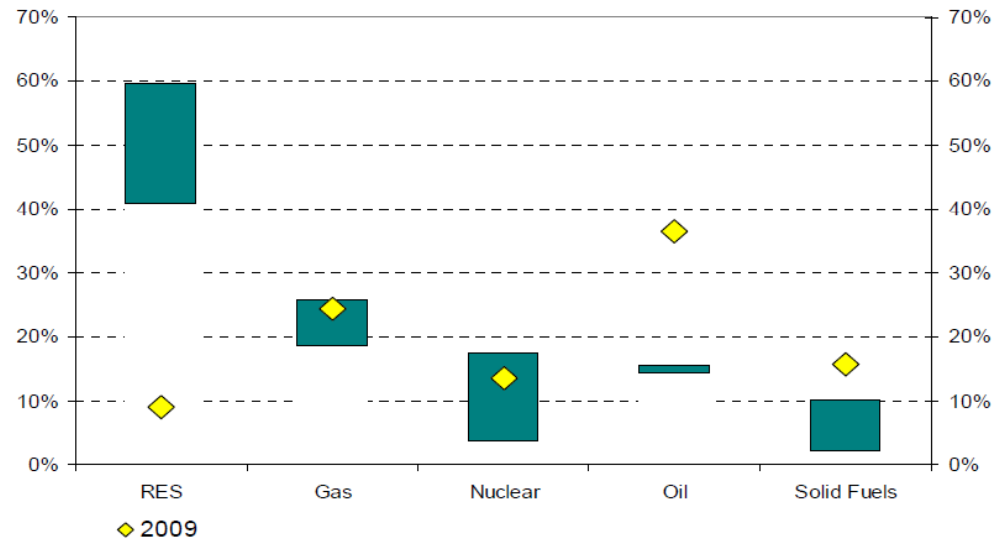
Figure 22: Total Primary Energy in 2050, by fuel



シナリオ2:省エネ依存型
 シナリオ3:市場依存・多様化型
 シナリオ4:再エネ依存型
 シナリオ5:CCS開発遅延型
 シナリオ6:脱原発・CCS型

Figure 23: Range of Fuel Shares in Primary Energy in 2050 compared with 2009 outcome

いずれにしても、
再エネが主要電源となる。



「Energy Roadmap 2050」

- ・送配電インフラへの投資は不可欠
- ・DSOのグリッド投資が大きく、TSOの投資は比較的小さい
- ・再エネ型シナリオでは、北海洋上風力からのDCラインが必要

Euro'05	Transmission Grid investment (bEUR)				
	2011-2020	2021-2030	2031-2040	2041-2050	2011-2050
Reference	47.9	52.2	53.5	52.0	205.7
CPI	47.1	49.6	64.8	66.6	228.2
Energy Efficiency	49.0	63.1	80.3	80.1	272.5
Diversified supply technologies	52.8	70.2	88.0	86.8	297.8
High RES	52.8	95.5	137.8	134.4	420.4
Delayed CCS	52.7	71.0	88.6	87.6	299.9
Low nuclear	52.9	73.8	95.2	94.8	316.6

Euro'05	Distribution Grid investment (bEUR)				
	2011-2020	2021-2030	2031-2040	2041-2050	2011-2050
Reference	243.7	263.5	280.5	276.0	1063.7
CPI	245.0	239.3	317.6	325.9	1127.8
Energy Efficiency	256.3	289.1	408.4	291.8	1245.5
Diversified supply technologies	284.2	345.9	454.3	329.8	1414.1
High RES	283.5	440.0	619.8	431.5	1774.8
Delayed CCS	283.4	349.4	445.1	339.6	1417.5
Low nuclear	286.4	350.8	472.5	366.5	1476.3

2. 再エネ導入と併行して実施されるグリッド政策

○再エネ推進EU指令の規定

DIRECTIVE 2009/28/EC OF THE EUROPEAN
PARLIAMENT AND OF THE COUNCIL

of **23 April 2009** ……20%義務付けの指令

16条 グリッドへのアクセス及びグリッドの運営

- ①再生可能エネルギーが拡大しても電力システムが確実に運転できるように必要なグリッド増強政策を実施する義務
- ②再生可能エネルギー電力をTSO、DSOに送配電させる義務
- ③再生可能エネルギーをグリッドに優先接続させる義務
- ④再生可能エネルギー電力を優先送電・給電させる義務
- ⑤再生可能エネルギーの出力抑制を最小化させる義務
- ⑥再生可能エネルギーの電力グリッドへの統合に必要な、公平な接続、増強、運営に関するコスト負担ルールを電力グリッド管理者に作らせる義務
- ⑦必要に応じTSO、DSOへ⑥のコスト負担を要求できること。
- ⑧TSO、DSOに再生可能エネルギー接続に必要な情報を開示させること。
- ⑨TSO、DSOのグリッドタリフにおいて再生可能エネルギーを公平に扱う義務

○電力関係EU指令の規定

①電カグリッド運営の基本的考え方

○EU規則により送電ネックは「**実潮流**」の**ネック**と定義されている。・・・契約上の満杯ではない！！

●「**契約上の占有**」ではなく「**実潮流の満杯**」が**送電混雑**

2009EU規則714

Article 2 Definitions

‘**congestion**’ means a situation in which all requests from market participants to trade between two bidding zones cannot be accommodated because they would significantly affect the **physical flows on network elements** which cannot accommodate those flows.

●TSOは、「**契約ベース**」に捕らわれずに「**発電の割当**」

●TSOは、エネルギーロスとキャパシティ・リザーブのための電力は、**市場調達**。

Directive2009/72/EC

Article 15

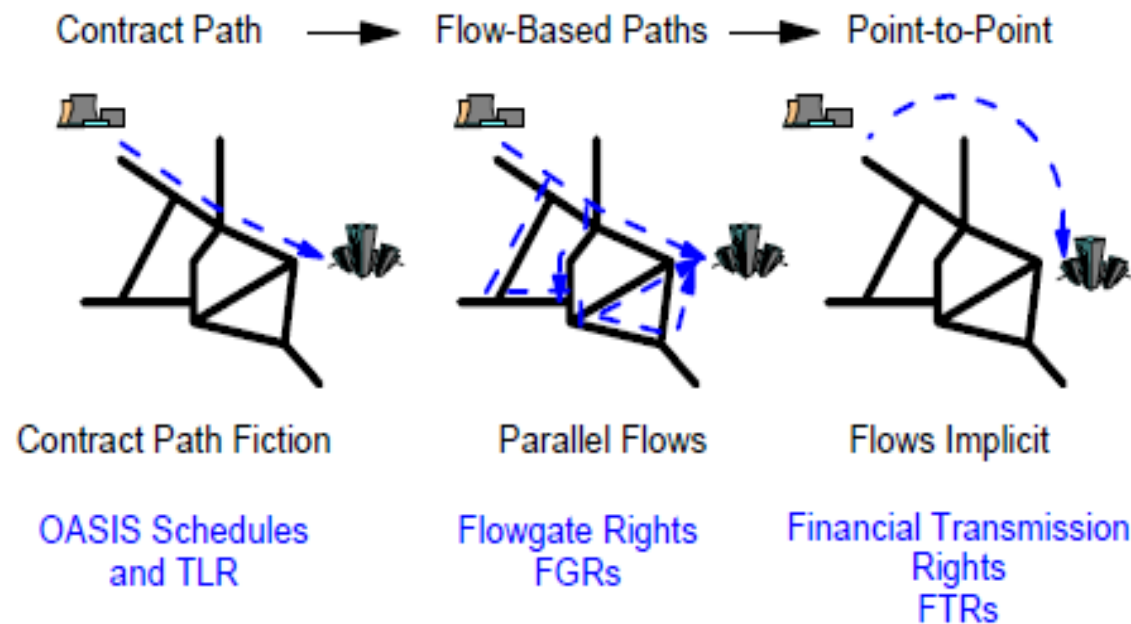
Dispatching and balancing

●Without prejudice to the supply of electricity on the basis of **contractual obligations**, including those which derive from the tendering specifications, **the transmission system operator shall**, where it has such a function, **be responsible for dispatching the generating installations in its area** and for determining the use of interconnectors with other systems.

●Transmission system operators shall procure the energy they use to cover **energy losses** and **reserve capacity** in their system **according to transparent, non-discriminatory and market-based procedures**, whenever they have such a function.

Flow-Based Pricing

Transmission Capacity Definitions



The **fictional contract path approach** would not work in theory!

注)FTR:実潮流リアルタイムの価格変動による経営上のリスクをヘッジするための一種のデリバティブ

米国の考え方: 1996年 4月 Order No. 888,889

②TSO、DSOの分離

○超高压送電と高压送電接続変電所がTSO。2012年3月までにEU全体で分離。
2009年EU指令72

Article 2 Definitions

●‘**transmission**’ means the **transport of electricity on the extra high-voltage and high-voltage interconnected system** with a view to its delivery to final customers or to distributors, but does not include supply;

●‘**distribution**’ means the transport of electricity on **high-voltage, medium-voltage and low-voltage distribution systems** with a view to its delivery to customers, but does not include supply;

Article 9 Unbundling of transmission systems and transmission system operators

1. Member States shall ensure that from **3 March 2012**:

●TSOは、隣接のTSOとの協力・連携の義務

Article 40 Tasks of transmission system operators

1. Each transmission system operator shall be responsible for:

(a) ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity, operating, maintaining and developing under economic conditions secure, reliable and efficient transmission systems with due regard to the environment , **in close cooperation with neighbouring transmission system operators and distribution system operators and transparency** ;

(b)(c) (d) managing electricity flows on the system, **taking into account exchanges with other interconnected systems.**

③Entso-eの設置

- EU内のTSOの連合組織としてEntso-eの設立
- TSO間のやり取り、共通の技術的細則、EU全体のグリッド増強10年計画

2009EU規則714（2016年改正）

Article 25 European network of transmission system operators for electricity

1. Transmission system operators shall cooperate at Union level through the ENTSO for Electricity, in order to promote the completion and functioning of the internal market in electricity and cross-border trade and to ensure the optimal management, coordinated operation and sound technical evolution of the European electricity transmission network.

Article 26 Establishment of the ENTSO for Electricity

Article 27 Tasks of the ENTSO for Electricity

1. The ENTSO for Electricity may shall have the following tasks :

(a) to elaborate network codes in the areas set out in Article 55 (1) with a view to achieving the objectives set out in Article 25.

(b) to adopt a non-binding **Union-wide ten-year network development plan, every two years;**

④TSOのグリッド増強計画

●TSOは、毎年全ての関係者と協議の上で受給の将来予測に基づきグリッド増強10年計画を提出

Article 22(Directive2009/72/EC)

Network development and powers to make investment decisions

Every year, transmission system operators shall submit to the regulatory authority a **ten-year network development plan** based on existing and forecast supply and demand **after having consulted all the relevant stakeholders.**

⑤TSOのグリッド接続拒否の禁止

●TSOは、ネットワークキャパシティの限界をもって新規発電施設のグリッド接続を拒否してはならない。TSOは、新発電施設の接続によるグリッド設備増強経費増を理由に接続拒否をしてはならない。

Article 23(Directive2009/72/EC)

Decision-making powers regarding the connection of new power plant to the transmission system

The transmission system operator **shall not be entitled to refuse the connection of a new power plant on the grounds of possible future limitations to available network capacities,** such as congestion in distant parts of the transmission system. The transmission system operator shall supply necessary information.

The transmission system operator **shall not be entitled to refuse a new connection point, on the ground that it will lead to additional costs linked with necessary capacity increase of system elements** in the close-up range to the connection point.

⑥グリッドキャパシティ増強

●10年計画では、隣接国との連携、新たな投資計画を考慮する。2016改定で、蓄エネ、エネルギーユニオンレベルの考慮を追加。

●最終的にはグリッド投資コストを関係タリフで手当て。

Directive 2009/72/EC Article 22 (2016改定では51)

Network development and powers to make investment decisions

3. When elaborating the ten-year network development plan, the transmission system operator shall make reasonable assumptions about the evolution of the generation, supply, **energy storage, consumption and exchanges with other countries, taking into account investment plans for regional and Union-wide networks.**

7. In circumstances where **the transmission system operator**, other than for overriding reasons beyond its control, **does not execute an investment**, which, **under the ten-year network development plan**, was to be executed in the following three years, **Member States shall ensure that the regulatory authority is required to take at least one of the following measures** to ensure that the investment in question is made if such investment is still relevant on the basis of the most recent ten-year network development plan:

(a) to require the transmission system operator to execute the investments in question;

(b) to organise a tender procedure open to any investors for the investment in question; or

(c) to oblige the transmission system operator to accept a capital increase to finance the necessary investments and allow independent investors to participate in the capital. Where the regulatory authority has made use of its powers under point (b) of the first subparagraph, it may oblige the transmission system operator to agree to one or more of the following: (a) financing by any third party; (b) construction by any third party; (c) building the new assets concerned itself; (d) operating the new asset concerned itself. 以下略

8. Where the regulatory authority has made use of its powers under the first subparagraph of paragraph 7, the **relevant tariff regulations shall cover the costs of the investments in question.**

Entso-eの10年計画

2009 EU規則714 Article 45

Ten-year network development plan

1. The Union-wide network development plan referred to under Article 27 (1) (b) shall include the modelling of the integrated network, scenario development and an assessment of the resilience of the system.

⑦送電キャパシティの配分と混雑管理の原則

- 送電混雑は市場参加者個々の契約の選択を含まない方法で解決しなければならない。
- カーテイルメントは補償されなければならない。
- 使われていない送電キャパシティは市場に戻さなければならない。

2009EU規則714 Article14

General principles of capacity allocation and congestion management

1. Network congestion problems shall be addressed with non-discriminatory marketbased solutions which give efficient economic signals to the market participants and transmission system operators involved. **Network congestion problems shall preferentially be solved with non-transaction based methods, i.e. methods that do not involve a selection between the contracts of individual market participants.**

••••the transmission system operator **shall take into account the effect of those measures on neighbouring control areas** and coordinate such measures with other affected transmission system operators as provided for in Regulation.

2. Transaction **curtailment** procedures **shall only be used in emergency situations** where the transmission system operator must act in an expeditious manner and **redispatching or countertrading is not possible**. Any such procedure shall be applied in a non-discriminatory manner. Except in cases of force majeure, **market participants who have been allocated capacity shall be compensated for any curtailment**.

8. Market participants shall inform the transmission system operators concerned a reasonable time in advance of the relevant operational period whether they intend to use allocated capacity. **Any allocated capacity that will not be used shall be reattributed to the market, in an open, transparent and non-discriminatory manner.**

⑧TSOの情報提供

- グリッドの電氣的、物理的な特徴に基づく送電キャパシティ計算の情報
- TSOは、前日、一週間前、一か月前の利用可能キャパシティの情報を公表しなければならない。

2009EU規則714 *Article 47*

Provision of information

2. The safety, operational and planning standards used by transmission system operators shall be made public. **The information published shall include a general scheme for the calculation of the total transfer capacity and the transmission reliability margin based upon the electrical and physical features of the network.**

Such schemes shall be subject to the approval of the regulatory authorities.

3. **Transmission system operators shall publish estimates of available transfer capacity for each day,** indicating any available transfer capacity already reserved. Those publications shall be made at specified **intervals before the day of transport and shall include, in any event, week-ahead and month-ahead estimates,** as well as a quantitative indication of the expected reliability of the available capacity.

⑨2016年の改定で蓄電、EV等を位置づけ

●加盟各国の規制において電力国際融通、デマンドレスポンス、蓄電、EV等への妨害をしてはならない。

Directive 2009/72/EC 2016年改訂

Article 3 Competitive, consumer-centered, flexible and non-discriminatory electricity market

1. Member States shall ensure that their **national legislation does not unduly hamper cross-border flows of electricity**, consumer participation including through **demand-side response**, investments into flexible energy generation, **energy storage**, the **deployment of electro-mobility or new interconnectors**, and that electricity prices reflect actual demand and supply.
2. Member States shall ensure that no undue barriers exist for market entry and market exit of electricity generation and electricity supply undertakings.

⑩電気自動車のグリッドへの組み込み

- 加盟国は、DSOグリッドに電気自動車の充電システムを設けるような措置を実施

Directive 2009/72/EC 2016年改訂

Article 33 Integration of electro-mobility into the electricity network

1. Member States shall provide the necessary regulatory framework to **facilitate the connection of publicly accessible and private recharging points to the distribution networks**. Member States shall ensure that distribution system operators cooperate on a non-discriminatory basis with any undertaking that **owns, develops, operates or manages recharging points for electric vehicles, including with regard to connection to the grid**.

⑪ Directive 2009/72/EC 2016年改訂で位置づけられたもの

● アクティブカスタマー、地域エネルギーコミュニティ、デマンドレスポンス等

Article 2 Definitions

6. 'active customer' means a customer or a group of jointly acting customers who consume, store or sell electricity generated on their premises, including through aggregators, or participate in demand response or energy efficiency schemes provided that these activities do not constitute their primary commercial or professional activity;
7. 'local energy community' means: an association, a cooperative, a partnership, a non-profit organisation or other legal entity which is effectively controlled by local shareholders or members, generally value rather than profit-driven, involved in distributed generation and in performing activities of a distribution system operator, supplier or aggregator at local level, including across borders;

Article 15 Active customers

1. Member States shall ensure that final customers:
 - (a) are entitled to generate, store, consume and sell self-generated electricity in all organised markets either individually or through aggregators without being subject to disproportionately burdensome procedures and charges that are not cost reflective;
 - (b) are subject to cost reflective, transparent and non-discriminatory network charges, accounting separately for the electricity fed into the grid and the electricity consumed from the grid, in line with Article 59.

Article 16 Local energy communities

1. Member States shall ensure that local energy communities:
 - (a) are entitled to own, establish, or lease community networks and to autonomously manage them;
 - (b) can access all organised markets either directly or through aggregators or suppliers in a non-discriminatory manner;

Article 17 Demand response

1. Member States shall ensure that national regulatory authorities encourage final customers, including those offering demand response through aggregators, to participate alongside generators in a non-discriminatory manner in all organised markets.
2. Member States shall ensure that transmission system operators and distribution system operators when procuring ancillary services, treat demand response providers, including independent aggregators, in a non-discriminatory manner, on the basis of their technical capabilities.

⑫TSO、DSOの出力抑制、リディスパッチの原則

- 再エネの出力抑制・リディスパッチは、原則として市場へのオファーによる。
- 出力抑制・リディスパッチを最小限とし、再エネ等のキャパシティの5%を超えてはならない。
- 出力抑制・リディスパッチが最小限になるように送配電管理しなければならない。
- 出力抑制、リディスパッチは補償されなければならない。

2009EU規則714 *Regulation Article 12* 2016年改訂

Redispatching and curtailment

2. **The resources curtailed or redispatched shall be selected amongst generation or demand facilities submitting offers for curtailment or redispatching using marketbased mechanisms and be financially compensated.** Non-market-based curtailment or redispatching of generation or redispatching of demand response shall only be used where no market-based alternative is available, where all available market-based resources have been used, or where the number of generation or demand facilities available in the area where suitable generation or demand facilities for the provision of the service are located is too low to ensure effective competition. 以下略
3. 前略(規制当局への報告義務) **Curtailment or redispatching of renewable energies or high-efficiency cogeneration shall be subject to compensation** pursuant to paragraph 6.
4. Subject to requirements relating to the maintenance of the reliability and safety of the grid, based on transparent and non-discriminatory criteria defined by the competent national authorities, **transmission system operators and distribution system operators shall:**
 - (a) **guarantee the capability of transmission and distribution networks** to transmit electricity produced from renewable energy sources or high-efficiency cogeneration **with minimum possible curtailment or redispatching.** That shall **not prevent network planning** from taking into account limited curtailment or redispatching where this is shown to be more economically efficient and **does not exceed 5 % of installed capacities** using renewable energy sources or high-efficiency cogeneration in their area;
 - (b) **take appropriate grid and market-related operational measures in order to minimise the curtailment** or downward redispatching of electricity produced from renewable energy sources or high-efficiency cogeneration.
6. Where **non-market based curtailment or redispatching** is used, it **shall be subject to financial compensation** by the system operator requesting the curtailment or redispatching to the owner of the curtailed or redispatched generation or demand facility. Financial compensation shall at least be equal to the highest of the following elements:
 - (a) **additional operating cost caused by the curtailment or redispatching**, such as additional fuel costs in case of upward redispatching, or backup heat provision in case of downward redispatching or curtailment of generating installations using high efficiency cogeneration;
 - (b) **90 % of the net revenues from the sale of electricity on the day-ahead market** that the generating or demand facility would have generated without the curtailment or redispatching request. Where financial support is granted to generating or demand facilities based on the electricity volume generated or consumed, lost financial support shall be deemed part of the net revenues.

3. 加盟国の対応:ドイツの例

ドイツEEGの規定

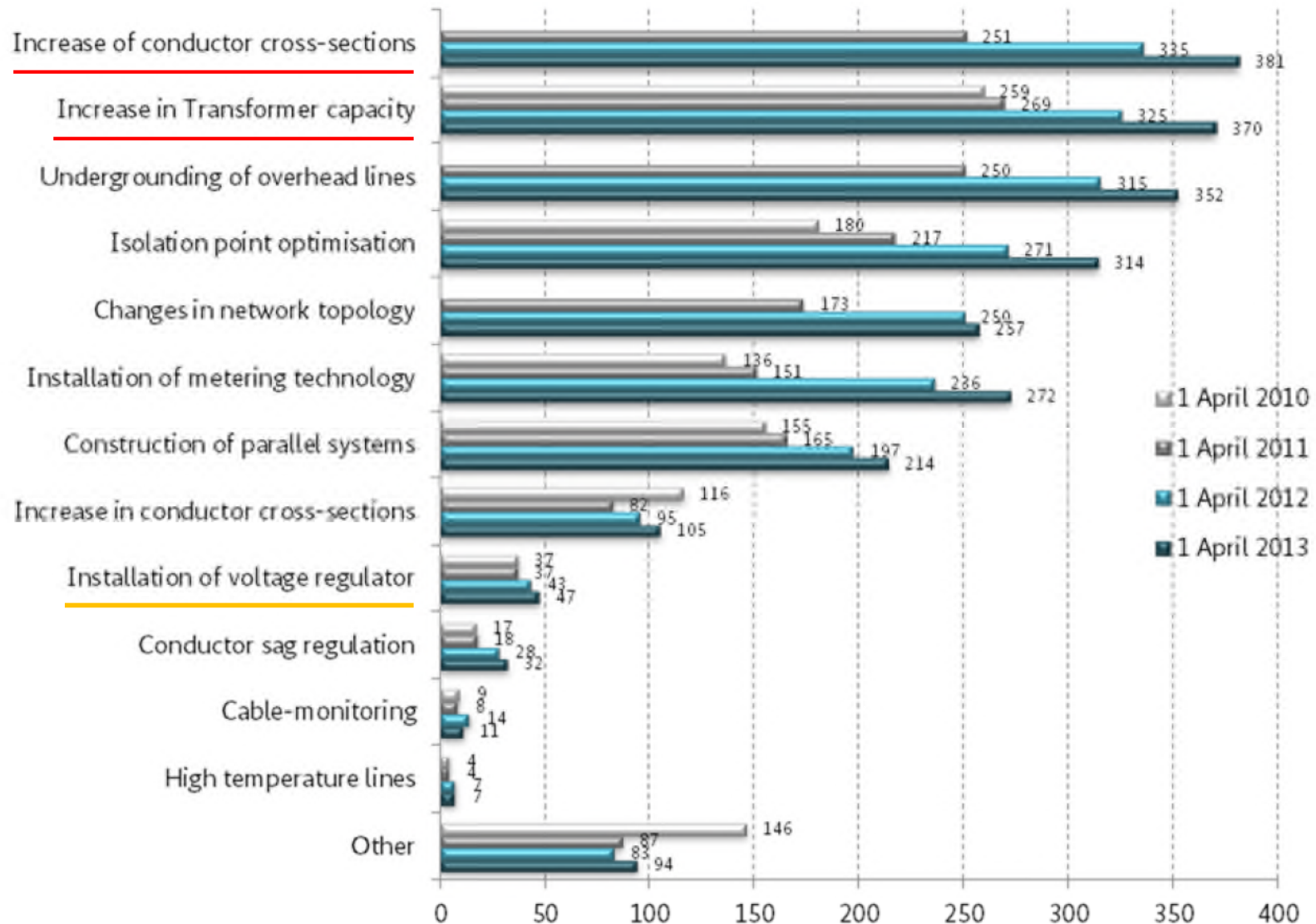
優先接続 第5条	<ul style="list-style-type: none">・グリッドの管理者(送電、配電ともに)は、「直ちに、かつ、優先的に」再エネ発電施設をグリッドの電圧及び最短直線距離の観点から最適な点において接続しなければならない。・接続義務は、グリッドの最適化、増強、拡張が不可欠の場合にも適用される。
優先送配電 第8条	グリッド管理者は、「 直ちに、かつ、優先的に 」、再エネから 利用可能な電力の全て を、購入、送電、配電しなければならない。
優先給電 第11条	他の発電施設が接続されている限り、 再生エネに優先順位 が与えられる。
系統増強義務 第9条	グリッドの管理者(間接的に関係する上位系統運営者も含む。)には系統増強義務が課されている。
グリッド管理者の系統増強コスト負担義務 第14条	グリッドの管理者は、グリッドシステムを最適化、増強、拡大するコストを負担 しなければならない。

条文は2012年改正EEG、2014年改正EEGにおいても同様の規定。

第5条(2012)→第8条(2014), 第8条(2012)→第11条(2014), 第9条(2012)→第12条(2014), 第11条(2012)→第14条(2014), 第14条(2012)→第17条(2014)

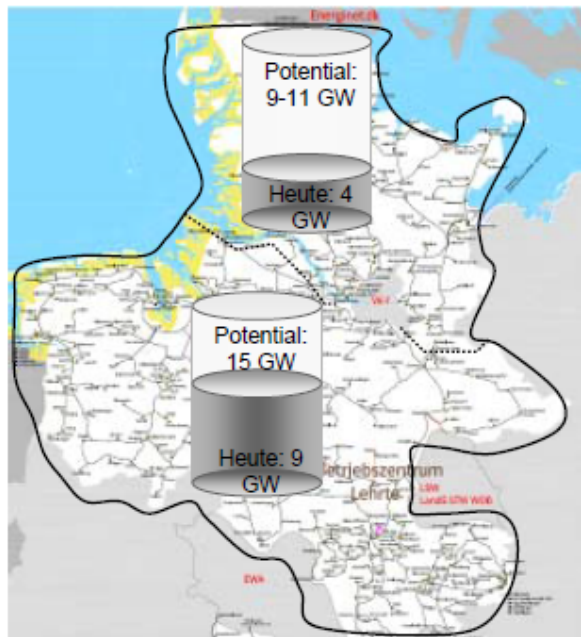
EEG第九条のグリッド増強義務規定の施行状況報告

Figure 21: Overview of network optimisation and reinforcement measures applied under section 9(1) of the EEG

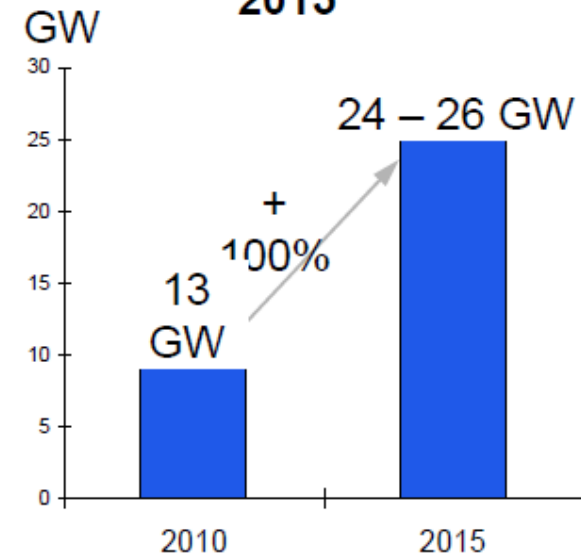


Challenges (1)

- Nearly half of the electricity generated by wind in Germany enters the E.ON Netz territory
- Focus northern Germany: Doubling of renewable infeed by 2015 forecasted
- Expansion of renewable infeed requires synchronized grid expansion



E.ON Netz forecast for additional infeed of renewable energy until 2015



4. EUのグリッド政策フォローアップ

DIRECTIVE 2009/28/EC OF THE EUROPEAN
PARLIAMENT AND OF THE COUNCIL of 23 April 2009

EU DG—Energy の 報告書

RES Integration – Final Report

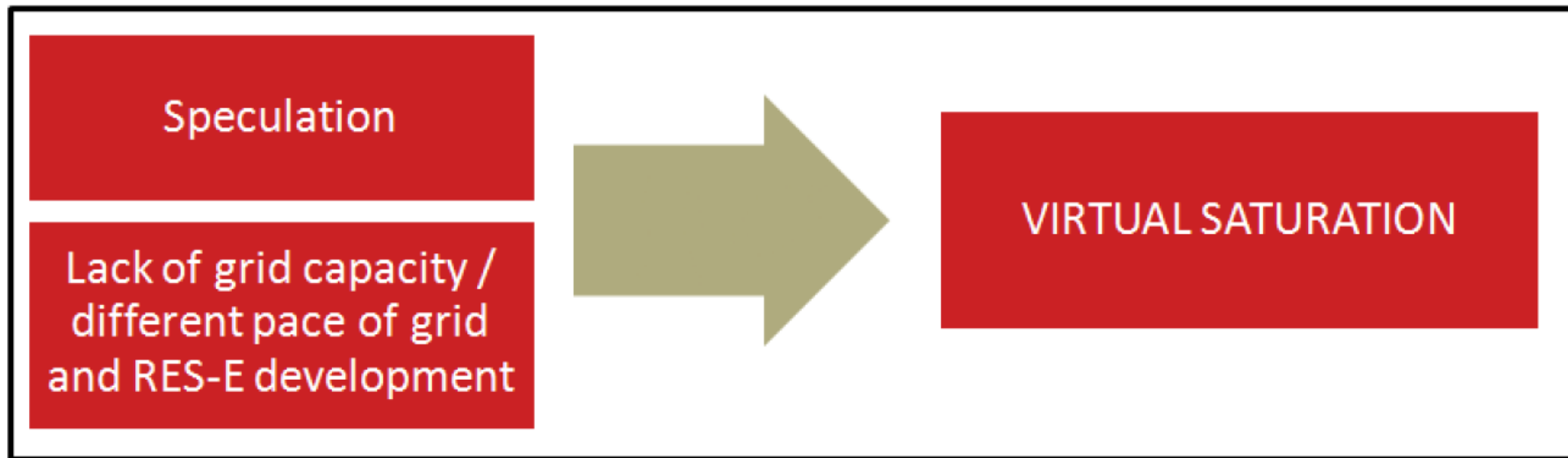
このdirectiveの実施状況を整理したレポート

- ・再エネ普及上の課題を整理
- ・EU加盟各国で実際に起こった障害と解決策

・見かけ上のグリッド満杯

- ……接続見込未定の接続予約によりグリッドが満杯となり、本来の接続需要が排除される。9加盟国から報告。投機的な動きと連動。投機的な動きは再エネの評価を下げ、再エネ支援やグリッド管理者のグリッド増強を阻害。グリッドキャパシティの欠如という状況に便乗して、投機目的に接続予約を行い、接続権の転売による利益を見込むような動きが主因。

→グリッド接続の手続をいくつかのステップに分割、ステップ毎にグリッド接続枠の期限付き仮予約、期限内に次のステップに行けない場合には、仮予約を解除。ただし、行政側の理由による手続進行遅延は考慮。グリッド側もプロジェクトの熟度把握可能。接続予約料の設定。グリッド投資の原資が増えるが、資金力のある大規模再エネ以外は対応不能となる可能性。



Graph 5: Main reasons in the EU 27 for the issue “Virtual saturation”. Source: RES Integration Project

・グリッドキャパシティの欠如

・・・多くのEU加盟国に見られる。基本的には、**一時的な問題**。

再エネのグリッド接続に否定的状況下で、グリッドキャパシティの欠如が深刻な問題として提起されることが多い。

→エネルギーシステムの転換の法的枠組みが適用されているかの強い指標となる。

グリッド接続とグリッド増強とは、強い相補的關係。

7-8か国で再エネのグリッド接続のためにグリッド増強が必要な場合には、**グリッド管理者がグリッド増強義務を負うことが法定**されている。

再エネ導入とグリッド増強のペースを調和させるための計画.....TYNDP
電力システムの転換計画を含む再エネ導入目標の設定。

関連するデータセットの公表・共有.....entso-e



・再エネ発電がグリッド整備計画に十分に考慮されていない

・・・グリッド整備計画に再エネを組み込むことは、再エネのインテグレーションに不可欠

原因: 利害の対立と再エネの弱い立場

→少なくともグリッド増強の10年計画が必要

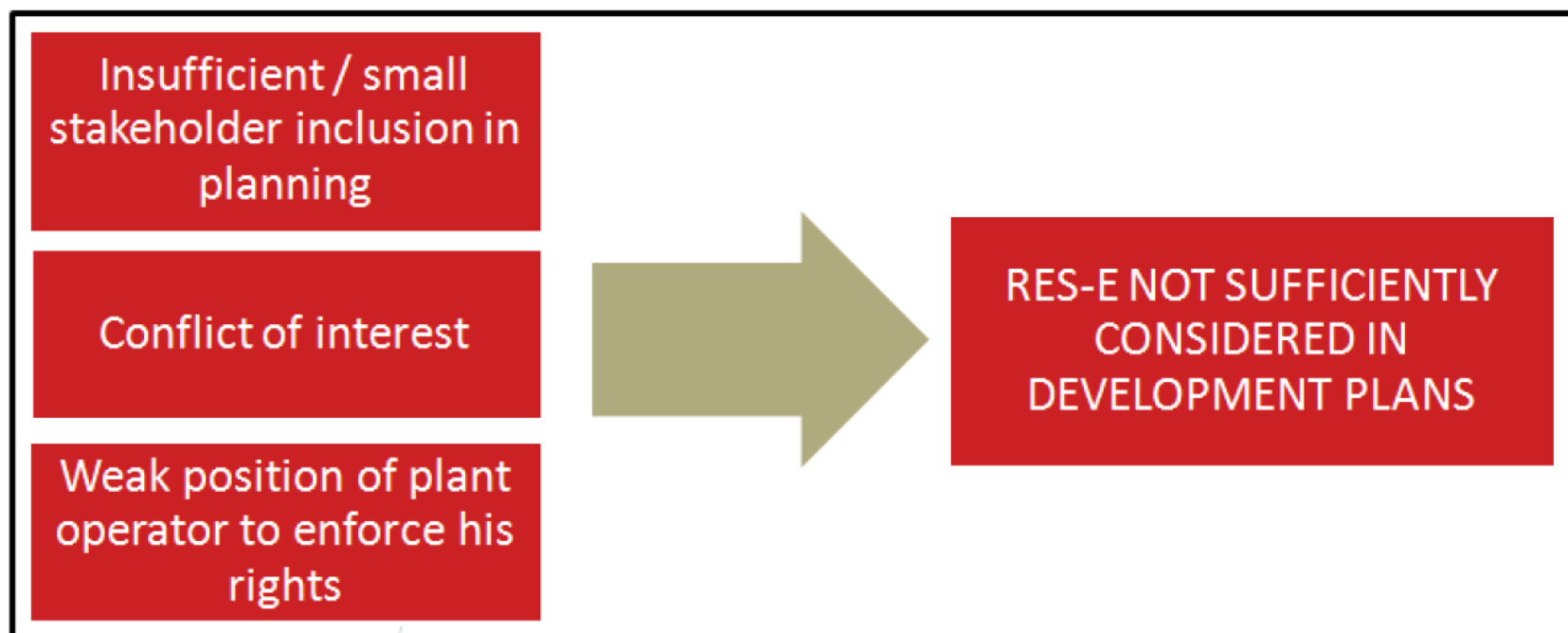
再エネをグリッド整備長期計画に組み込むこと

→アンバンドリングが完成し、グリッドの自然独占が再エネと競合しないこと。

再エネを支援する立場の独立規制機関が設置されていること。

小規模再エネも含め、全ての関係者が参加すること。

未来志向型の関係者の常設のコミュニケーションの場の設置。



Graph 7: Main reasons in the EU 27 for the issue “RES-E not sufficiently considered in development plans”. Source: RES Integration Project

・グリッド管理者の再エネを接続するためのグリッド増強義務の欠如

……初めの内はさほど問題とならないが、再エネの拡大に伴い深刻な問題となる。

→再エネの接続のためにグリッド増強が必要な場合に、グリッド管理者にグリッド増強義務があることを法律上明定すること。

・グリッド管理者のグリッド増強の際の法的枠組とインセンティブの欠如

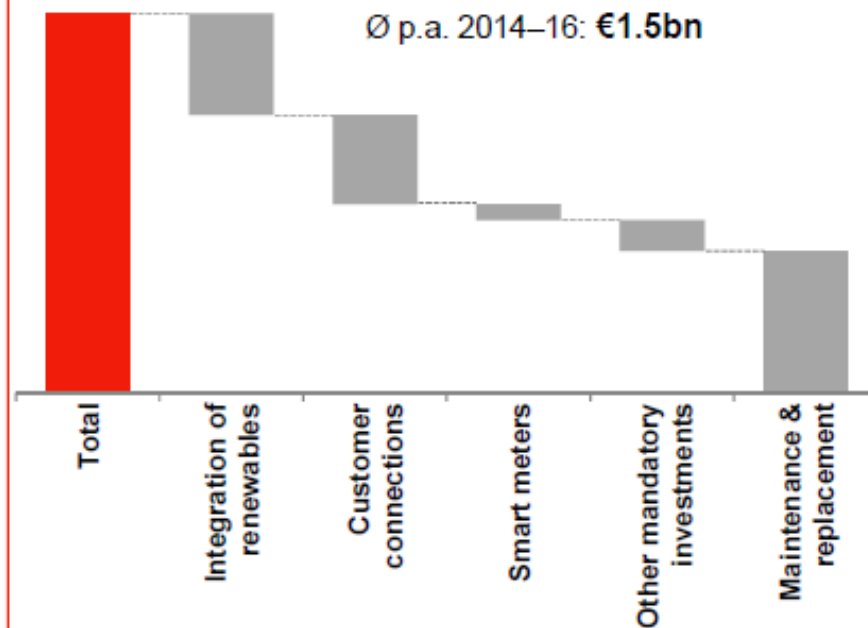
……グリッド増強はコストがかかり、グリッド管理者は必ずしも喜んで取り組まない。しかし、見返りがリスクに見合い、資財が利用できるなら、グリッド管理者は、基本設備を増強しようとする。

→グリッドタリフに関する規制のありようが、グリッド管理者がグリッド増強投資をするかどうかの決定的要因。多くの国でグリッドタリフの誘導的規制メカニズムを活用。

- ・タリフ規制システムを投資家に透明、比較可能なものに調整
- ・投資家にとって長期安定の制度

5. グリッドタリフによるコスト回収

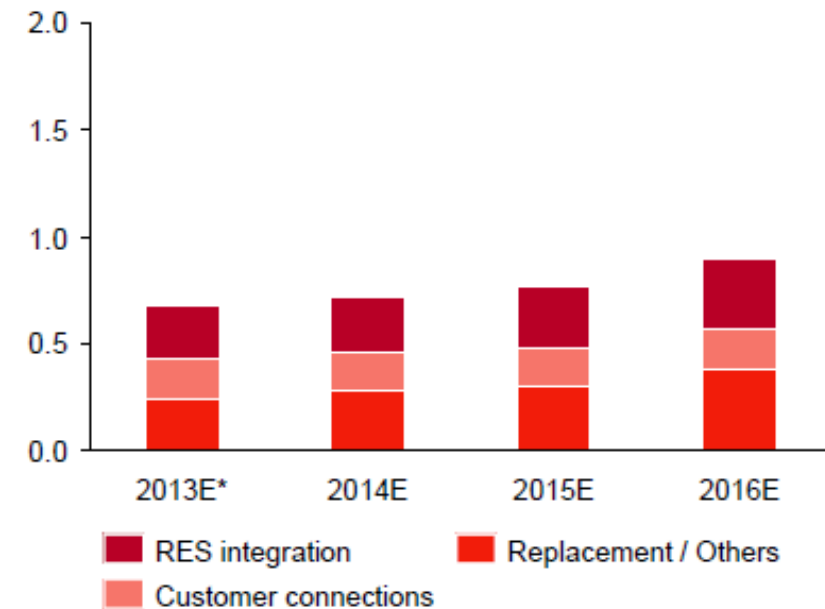
Expected distribution capex by category



- Roughly 50% of expected total distribution capex is allocated to grow the networks
- Total capex needs are expected to rise further beyond 2016

CAPEX

Expected cash-effective investments (€bn)



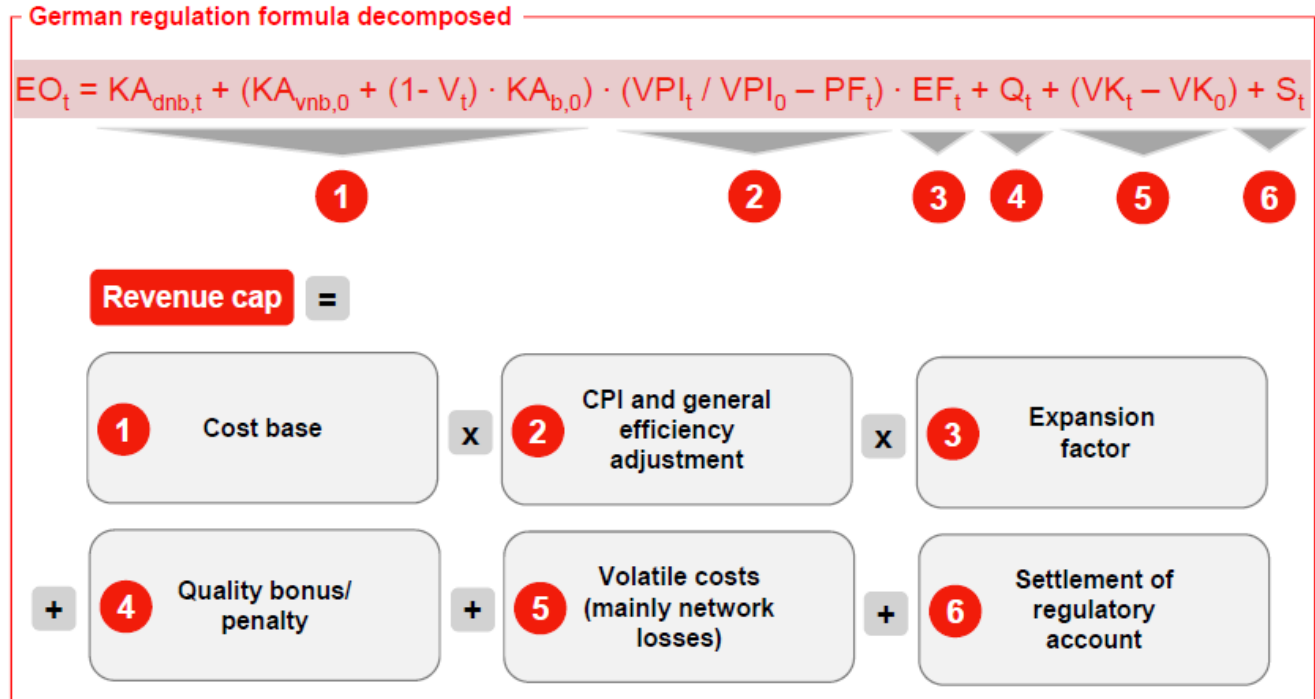
- Increasing network investments for RES integration due to “Energiewende”
- Smart meter roll-out starting in 2016

* Expected pro-forma cash-effective investments excluding the investments of the disposed companies

ODSOの設備コストの内訳

- 再エネ接続コストが相当の割合を占める

Regulation – Formula



* ARegV (Anreizregulierungsverordnung) = Ordinance for incentive regulation

Multiple levers to be managed

○料金規制の計算式

・EFtはグリッドの拡大のための係数(再エネの年間拡大率)

Regulation – How it works in detail

German regulation formula

$$EO_t = KA_{dnb,t} + (KA_{vnb,0} + (1 - V_t) \cdot KA_{b,0}) \cdot (VPI_t / VPI_0 - PF_t) \cdot EF_t + Q_t + (VK_t - VK_0) + S_t$$

EO_t	Revenue Cap for the year t	VPI_t	Consumer inflation index for the year t
$KA_{vnb,t}$	Permanently non-controllable costs for the year t	VPI_0	Consumer inflation index for the base year
$KA_{vnb,0}$	Currently non-controllable costs from cost audit & benchmarking	PF_t	Productivity factor for the year t
$KA_{b,0}$	Controllable costs from cost audit & benchmarking	EF_t	RES growth factor for the year t
V_t	Allocation factor for the year t	Q_t	Quality element for the year t
		VK_t	Volatile costs for the year t
		VK_0	Volatile costs from cost audit & benchmarking
		S_t	Regulatory account settlement for the year t

Duration of regulatory period 5 years
→ t ranges from 1 to 5

Formula enshrined in law

Table 4.1. Main characteristics of TSO tariffs in Europe

	Sharing of network operator charges		Price signal		Are losses included in the tariffs charged by TSO?	Are system services included in the tariffs charged by TSO?
	Generation	Load	Seasonal / time-of-day (1)	Location		
Austria	43%	57%	No	No	Yes	Yes
Belgium	7%	93%	XXX	No	Not included for grid >=150 kV	Tariff for ancillary services
Bosnia and Herzegovina	0%	100%	No	No	No	No
Bulgaria	0%	100%	n/a	n/a	Yes	Yes
Croatia	0%	100%	X	No / post stamp	Yes	Yes
Cyprus	0%	100%	N/A	N/A	Yes	Yes
Czech Republic	0%	100%	No	No	Yes	Yes
Denmark	5%	95%	No	No	Yes	Yes
Estonia	0%	100%	Yes	No	Yes	Yes
Finland	18%	82%	X		Yes	Yes
France	2%	98%	- / XXX	No	Yes	Yes
Germany	0%	100%	No	No	Yes	Yes
Great Britain	TNUoS 27% BSUoS 50%	TNUoS 73% BSUoS 50%	XX	TNUoS locational, BSUoS non-locational	No, recovered in the energy market	Included in BSUoS tariff
Greece	0% (TUOS and Uplift charges)	100% (TUOS and Uplift charges)	X	No	No, recovered in the energy market	Included in Uplift charges
Hungary	0%	100%	No	No	Yes	Yes, recovered by specific tariff, Tariff for ancillary services
Iceland	0%	100%	No	No	Yes	Yes
Ireland	25%	75%	No	Generation only	No, recovered in the energy market	Yes
Italy	0%	100%	No	No	No	Yes
Latvia	0%	100%	No	No	Yes	Yes
Lithuania	0%	100%	No	No	Yes	Yes
Luxembourg	0%	100%	No	No	Yes	Yes
FYROM	0%	100%			Yes	Yes
Montenegro	0%	100%	X	No	Yes	Yes
Netherlands	0%	100%	No	No	Yes	Yes
Northern Ireland	25%	75%	XXXX Load	Generation	No	No
Norway	40%	60%	XXX	xxx	Yes	Yes
Poland	0%	100%	No	No	Yes	Yes
Portugal	9%	91%	XX	No	No, included in energy price	No, included in energy price
Romania	19%	81%	No	Generation and Load	Yes	Yes
Serbia	0%	100%	X	No	Yes	Yes
Slovak Rep.	3%	97%	No	No	Yes	Yes
Slovenia	0%	100%	XX	No	Yes	Tariff for ancillary services
Spain	10%	90%	XXX	No	No, they are recovered through the energy market	No, they are included in the energy price
Sweden	39%	61%	No	Yes	Yes	40% of primary reserve
Switzerland	0%	100%	No	No	No, there is a separate tariff for losses	No, there is a separate tariff for ancillary services

OTSOの収入はTSOタリフより

・TSOタリフは「発電側ではなく需要側に課す」のが欧州では基本

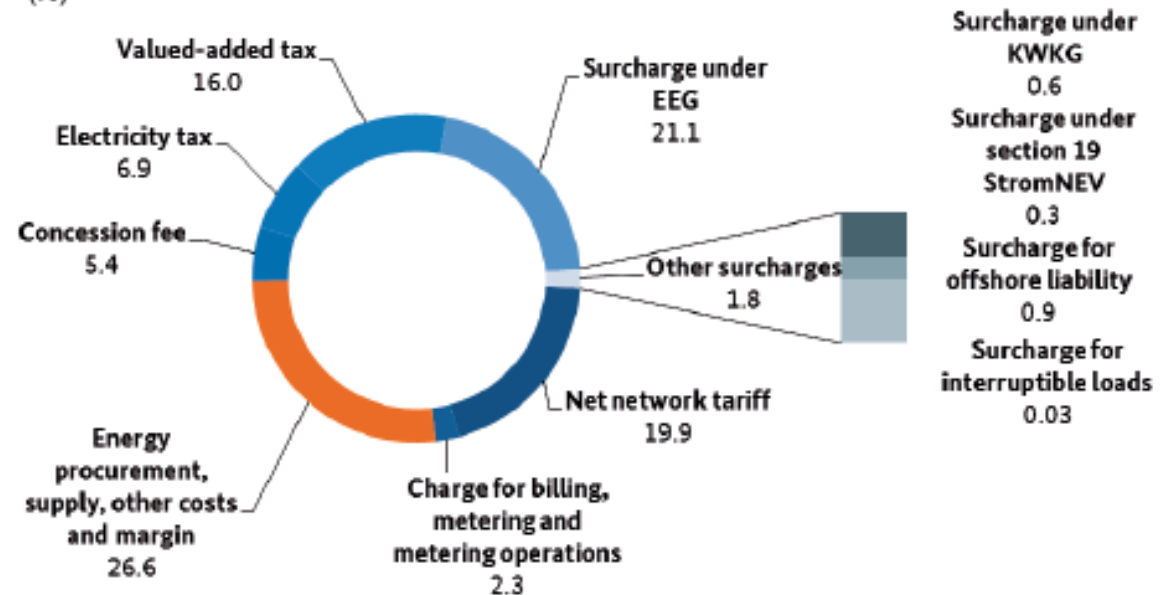
・TSOタリフ: 平均1.2円/kwh (2015年)

	2015	Δ 2015/2014
Average European UTT	9.40 €/MWh	+ 2.54 %
• Due to TSO Costs	7.98 €/MWh	+ 1.24 %
• Due to Non-TSO Costs (*)	1.42 €/MWh	+ 9.80 %

TSO costs (infrastructure, system services and losses) non-TSO costs (renewable energy support, regulatory levies, stranded costs, etc)

○ネットワークタリフ(TSO+DSO)は20%程度

Composition of the retail price level for household customers for the 3,500 kWh/year purchase case on 1 April (volume-weighted average for all tariffs) (%)



- ・EUには「特定送電ルートを意識したいわゆる託送料」という概念がない。→グリッド管理者は全ての電源を平等に扱う
- ・グリッドキャパシティの増強はグリッドタリフによる需要者負担
→大規模火力接続も再エネ接続もグリッドタリフにより増強
- ・グリッドタリフの上限はネットワーク規制庁が規制→需要者の過度な負担を防止

おわりに

- ①長期的かつ広い視野から見たエネルギー戦略
- ②グリッドの役割の変化の認識とグリッドの公平性・中立性
- ③再生可能エネルギーも考慮したグリッドの計画的増強とグリッドの計画的増強の誘導策
- ④EV等の普及を視野に入れた先取りの政策
- ⑤実潮流ベースの送電キャパシティ管理

我が国も長期的な戦略眼のもとに再生可能エネルギー導入を戦略的かつ体系的、科学的に行うべきであろう。

御静聴ありがとうございました。