CLIMATE POLICY INITIATIVE

European Electricity Infrastructure: Planning, Regulation, and Financing

CPI Workshop Report

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Background

Investment in European electricity transmission requires facilitation at the European level. The rate at which renewable energy is integrated into the power sector over the next decade will necessitate significant transmission infrastructure expansion and upgrades, with clear pan-European objectives, in order to cope with the new and dynamic flow patterns.

Historically, grid planning was primarily carried out at the national level with limited arrangements to share investment costs and assign benefits with a clear and agreed-upon methodology. Now, however, engagement and cooperation at the regional and European level is increasingly important. The processes aim to assist this grid development: (i) the bi-annual Ten Year Network Development Plans as managed by the European association of transmission system operators, and; (ii) the Infrastructure Package, a regulation proposed by the European Commission (EC) which brings together national and European infrastructure financing, planning, and development.

Because of the importance of electricity infrastructure to Europe's energy and climate objectives, CPI Berlin and the Florence School for Regulation hosted an informal workshop on 20 October 2011, supported by the Agency for the Cooperation of Energy Regulators (ACER), which brought together perspectives on EU grid infrastructure from regulators, national and EU policy makers, transmission system operators (TSOs), generation companies and academics. This Workshop Report provides a summary of the ideas that emerged from the discussions. The report is structured in three sections:

1. **Financing Grid Investments**: How can regulatory frameworks provide sufficient incentives, facilitate access, and reduce cost of financing to deliver necessary large-scale grid investments?
2. **Aligning European and National Planning**: What is the role of the proposed EU Infrastructure Package in aligning EU/regional and national network plans? What questions need to be tackled to ensure timely and effective implementation?
3. **International Cost Allocation and Financial Support**: How are costs shared among countries? What lessons can we draw from the existing mechanism to consider for the proposed new approach? How can the proposed EU financial support be of help?

1. Financing Grid Investment

The Infrastructure Package proposes that 9.1 billion Euros will be allocated from the EU budget to fund energy network infrastructure in the period 2013-2020. This is small compared to the investment need of 100 billion Euros for electricity transmission alone, thus grid investments will need to be financed primarily through traditional mechanisms such as using future revenues generated from increased transmission tariffs charged to network users.

In countries that have started to discuss investment plans up to 2020 in detail, it becomes apparent that under the current circumstances, TSOs cannot finance the required scale of investment by raising debt. This is because increasing the share of debt in the total finance beyond 65% or 70% would result in a downgrade of their credit rating; doing so would both increase costs of debt, and raise concerns with equity investors that own TSO assets as low-risk assets. Workshop participants discussed five options to facilitate financing of infrastructure: three which apply to incumbent TSOs, and two which apply to merchant or concession-based investment by third parties (some of the options can be combined):

Financing option	Challenges
I. Issue additional equity. TSOs maintain their current dividend yield pay-outs to shareholders and issue additional equity to finance the desired levels of growth.	Financial markets need to believe that additional equity investment reflects new opportunities, not bad performance. Publicly-owned TSOs might struggle to raise additional investment from governments, but face objections to diluting public ownership with private investment.
II. Reduce risks for investors. The regulatory environment is further developed to reduce the (perceived) risk and allow for higher leveraging of equity.	Rating agencies assess the risks facing TSOs against a set of factors including stability and predictability (of business model, regulatory regime, etc.), thus changes might initially be perceived to be discouraging, and might delay positive impacts on ratings.
III. Shift to growth model. TSOs position themselves as growth entities and retain earnings to increase their equity base.	New owners would be required to accept a more risky business model, and would require higher rates of return. Returns have to further increase to ensure revenues for financing of investment. These high costs would be imposed on current grid users and thus electricity consumers.
Hybrid approaches TSOs or third parties finance individual lines on a project-specific approach (hybrid system of TSOs and 'merchant' lines).	This allows third parties to enter investment areas where incumbent TSOs lack incentives or capacity to take forward investments.
IV. Merchant based - project finance against congestion revenue	Uncertain congestion revenue is risky and thus requires higher rates of return and financing costs. Concerns are that only very profitable projects are pursued on merchant base (cream-skimming), while other projects are pursued against regulated revenue.
V. Concession based – project finance against guaranteed payment for lines	Stable revenues and limited operational risk (no link to system operation) facilitate high leveraging of equity and low-cost finance. But integration of maintenance, operation, and future development of the overall network, and capacity for planning and public engagement needs to be ensured.

In general, private companies involved in infrastructure investment have - and will continue to have - the final say on which financial structure is best suited for their needs. Public policy and regulation can only provide support or (unintentional) obstacles for certain financial approaches, which in turn impact on financing costs that, ultimately, feed through to consumers. Workshop participants further discussed Option II – reducing risks for investors.

Options to Reduce (Perceived) Investor Risks

Investors in grid infrastructure benefit from the safety of regulatory guarantees combined with the securitisation through the physical asset. Grid investment should thus in principle be more attractive – and allow for lower financing costs – than public debt. In practice, while costs of capital for TSOs are lower than for other industries, they are significantly higher than for public debt. What can individual

European countries or European institutions do to improve this situation? Workshop participants discussed some ways to reduce (perceived) investor risks.

Investor perception of risk	Policy options
Certainty in recovering investment costs	▪ Define a regulatory asset base for the depreciation period of assets, rather than restricting explicit guarantees to regulatory period (e.g. 3-5 years); ▪ Limit the scope of incentive schemes to revenues associated with operational costs.
Confidence in remuneration level	▪ Build on tradition of improving tariff setting methodology, but possibly shift emphasis from incentivizing operation and maintenance costs to facilitating low-cost financing. ▪ Further standardise methodologies to determine cost of capital, and establish the role of national courts and European institutions in reviewing regulatory decisions on weighted costs of capital.
Regulatory asset base time-lag for new investment	▪ Address remaining time-lags between incurred investment costs for new lines and remuneration as part of the regulatory asset base.
Operation risk	▪ Uncertain costs of re-dispatch to address internal constraints can be avoided with small zones or nodal pricing schemes. ▪ Liabilities for black-outs can be avoided where operation is shifted to an independent system operator (ISO).
Diverse ownership structure	▪ If a large number of grid companies are covered by a common regulatory framework, financial markets can develop a rating tailored to grid companies instead of joint evaluation with other utilities. This allows grid companies - and ultimately users - to fully capitalise on the attractive risk profile.

Workshop participants also discussed whether transmission owners have sufficient incentives to expand grid capacity, and whether alternative approaches could create additional incentives or opportunities for third parties to pursue projects.

Open questions on financing grid investment	
Additional incentives to plan and execute new regulated transmission investment?	▪ In the past, transmission owners had limited incentives to increase transmission capacity where this increases competition for affiliated power generators. Does removing this disincentive through full unbundling suffice, or are additional incentives necessary? ▪ Some regulators increase incentives for the construction of new lines by offering higher rates of return for new investment. Is this efficient and effective? ▪ How can direct support for planning and permitting costs increase incentives to pursue such activities? The Infrastructure Package envisages such support, but how can it be operationalized?

Integration of concession-based transmission investment	▪ Concession-based transmission investment allows for a tender to build a pre-specified transmission line. A subsequent contract guaranteeing future revenues allows for low-cost financing. Is it important to establish how such individual lines can be fully integrated in operation, maintenance and future grid development?
A role for merchant-based transmission investment?	▪ Merchant-based transmission investment allows the investor to retain all profits from congestion management. Does the option for merchant-based transmission investment risk cream-skimming? TSOs choose to pursue very profitable lines as merchant lines, and privatise the profits (e.g. BritNed), while more risky investments are pursued against regulated revenue. ▪ Do investors in merchant lines i) limit the scale of the line, or ii) limit subsequent parallel investments below welfare maximising levels, so as to maximise the profits on the merchant line? ▪ Is merchant-based transmission investment necessary? Do regulated and concession-based approaches fail to provide incentives, attract capital, or relevant actors with capacity to execute the projects?
Compatibility of approaches	▪ Merchant-based transmission investment, along with design choices for concession-based investment, and financing strategies for regulated investments (e.g. securitisation of individual lines), all increase complexity of contractual and financial structures. How can transparency, effective regulation and ultimately access to low-cost finance be ensured under such circumstances? ▪ How can flexibility for the future adjustment of grid architecture, technology, and operational paradigm be retained?

The discussion emphasised the importance of national regulatory regimes in retaining access to finance, providing appropriate costs of capital, and offering the flexibility for future network development and operation. Thus their refinement and further strengthening is key to European grid development.

2. Aligning EU and National Planning

Network development has traditionally been carried out at the national or sub-national level, but coordination and cooperation at the regional and European levels is increasingly important.

Transmission projects have positive impacts on the network and system security in neighbouring countries, enhance the benefits of a common energy market, and can facilitate the EU-wide sharing of renewables and energy storage. Such international benefits are typically not reflected in national grid expansion decisions. Without a coordinated approach to grid planning and development, investments can result in sub-optimal lock-ins and inefficiencies. ENTSO-E's Ten Year Network Development Plan (TYNDP) was a first step towards a more integrated perspective.

The EU Infrastructure Package now provides a comprehensive approach to EU grid expansion that builds and incorporates the existing initiatives. The new process ensures that bottom-up network planning from Member States is in line with expectations on the European level. In particular, it has identified the status of Project Promoters: an actor/a set of actors who cooperate to propose

transmission projects with international relevance (Projects of Common Interest – PCI); these could be a group of National Regulatory Authorities, or private parties. The process is directly linked to the latest TYNDP by requiring that PCIs are included. This also ensures that the project has a positive cost-benefit ratio at a European scale. This list of PCIs can then be prioritised, and approved, by the European Commission.

Project Promoters proposing a project also suggest a cost- and benefit-sharing arrangement. Where the Project Promoters, including the relevant National Regulatory Authorities, fail to agree on such an agreement, the Agency for the Cooperation of Energy Regulators (ACER) serves as an arbitrageur of last resort. At all steps, clear time-lines are defined and responsibilities are allocated.

The Elements of the EU infrastructure Package

The Energy Packages aimed to expedite competitive, secure and sustainable operation of the European energy markets. A European strategy was needed to facilitate infrastructure planning, financing and accelerated development under medium- to long-term energy and climate objectives. On October 19 2011, the European Commission unveiled its proposal for the Infrastructure Package, aiming to facilitate an environment for public and private investment in European energy network and storage development.

Main Components

1. **Projects of Common Interest:** Methodology to identify and select projects that are deemed necessary for implementing priority corridors - Projects of Common Interest (PCIs).
2. **Permitting:** Shortening and streamlining national and European permit granting procedures, and improving public involvement.
3. **Removing Regulatory Barriers:** Removing regulatory barriers for investments in infrastructure of European relevance (one part of which is allocation of benefits and costs of new lines).
4. **Financial Support:** Providing appropriate direct financial support for PCIs where the necessary funding is unavailable – fund of 9.1 billion Euros.

Next steps

- ***End-2012:*** *Adoption of proposed regulation by European Parliament and EU Council of Ministers.*
- ***Beginning-2013:*** *Planned entry into force of proposed regulation.*
- ***End-2013:*** *List of Projects of Common Interest for period 2014-2022 to be finalised.*
- ***2014:*** *Planned entry into force of Connecting Europe Facility (CEF), through which energy infrastructure can access 9.1 billion Euros.*

The future success of the Infrastructure Package depends on the effective implementation of a set of technical details. Given the tight timelines, these aspects deserve attention prior to approval of the package, and were discussed by workshop participants.

Factors necessary for the success of the Infrastructure Package

Robust scenarios for power system development	▪ Assessing transmission network requirements needs scenarios for the location and time-profile of generation and load. ▪ National/regional TSOs provide such scenarios, which are merged by ENTSO-E. ▪ How are inconsistencies between countries' scenarios or with national and EU policy targets addressed?

Are data and methodologies for network modelling available?	▪ Do all TSOs share complete, accurate, and sufficiently detailed information about their existing network and connected generation and load with ENTSO-E in a timely manner? ▪ What methodology will be used to capture the variety of factors relevant for grid investment choices? (E.g. peak demand, weekly energy balance for low-wind winter week, capturing energy with different wind patterns, wind spill, 'N-1' security criteria during grid maintenance, provision of system services, ramping constraints, operational aspects of DC lines). ▪ At what time and at what level of detail are data and methodologies shared with national regulators? Under what conditions are they accessible to third parties, enhancing credibility of results and facilitating continued improvement?
How to pursue Cost Benefit Analysis (CBA)?	▪ CBAs typically evaluate each line as individual grid expansion. Do lines need to be assessed as package or against long-term scenarios to ensure a modular approach is compatible with long-term objectives? (E.g. given the "lumpy" nature of grid, initial oversizing might be beneficial in the longer term). ▪ Usually benefits like congestion-revenue or fuel savings are quantified. Projects can contribute to market integration, improved integration of renewables, secure operation, or improved interoperability of system. How can these benefits be valued and included in the cost-benefit analysis?
What are the incentives to deliver at the EU level?	▪ What entities are held responsible and what are the consequences in the event that timelines are missed? Do TSOs have sufficient incentives to provide resources for ENTSO-E to fulfil the required tasks? ▪ Will public institutions at the EU or national level build-up the capacity needed to pursue independent modelling at a level of detail that: i) empowers regulators to independently assess investment choices, ii) provides alternative planning options should ENTSO-E fail to deliver on time. (Given the approximately 100 billion Euro transmission investment that is core to European energy security, some resilience in process seems appropriate.)

3. International Cost-Allocation and Financial Support

The volume of investment expected will require a clear and agreed-upon method to avoid cost allocation disputes which result in delays.

The Infrastructure Package envisages that proponents of Projects of Common Interest agree on how to share the costs the project. This builds on two precedencies:

- The Inter-TSO Compensation mechanism (ITC) requires that each TSO puts revenue in a common pot that is then allocated to TSOs according to the share of international flows they host. National regulators subsequently account for the net-costs for each TSO, to determine the allowed revenue that is charged to grid users. Costs are thus shared between grid users of different European countries.
- For international tie-lines, a typical 50:50 cost sharing rule has been applied in the past between respective TSOs and thus grid users in the respective countries. This needs to be

expanded for Projects of Common Interest as they might well be located within and not only at the boundary of a country, and can include more than one country.

Inter-TSO Compensation mechanism

In principle, an ITC type of approach has attractive incentive properties to support grid expansion. Grid users from all European countries have to pay into a pot, which can then be accessed in proportion to the international transfers their grid facilitates. If the national grid facilitates additional transfers, the national users have to provide for a share of the increased size of the pot, but receive the full disbursement from the pot afterwards.

In practice, the current methodology was initially introduced as a temporary solution until a methodology with sufficient precision was established and agreed upon. Several such attempts to replace the 'temporary' solution have failed over the last decade. This can be attributed to the decision that existing and new lines are treated equivalently. As more lines exist than are built, the existing lines primarily determine how the pot is allocated. Therefore discussions are dominated by attempts of all parties to capture a larger share of the pot, rather than by finding a precise methodology to appropriately reward benefits of new lines. Hence the only change that was possible was a downsizing of the pot so as to limit the rent transfer between countries. The result is an imprecise mechanism of insufficient scale.

Agreeing on cost sharing between Projects of Common Interest proponents

Given the limited scale and precision of the ITC, it can only play a limited role in providing financial incentives for Projects of Common Interest. This emphasises the importance of the cost-sharing decision among project proponents for the success of projects of common interest. The following issues seem to be of particular relevance for a successful agreement between the national regulatory authorities:

Issues relevant for cost sharing decisions	
How to disaggregate system-wide benefits to national level?	▪ A clear objective function can be defined for system wide cost-benefit analysis. A set of questions emerge if benefits are to be allocated to countries: - How are changes in rent allocation between different national and international generation companies and load accounted for? How is congestion revenue accounted for? How are benefits from increased system security shared across the network? - If the questions are answered prior to negotiations on a specific cost-sharing arrangement, the use of different approaches as part of negotiations might be avoided.
Does allocation of grid cost between generation and load impact international cost sharing?	▪ In continental Europe, grid costs are primarily charged to load. This would suggest allocation of international grid expansion costs to countries where load benefits from the expansion. ▪ Such an approach could limit opposition from i) generation in importing regions that fear additional competition, (ii) load in exporting regions that fear power price increases. ▪ All consumers benefit from increased market integration and increased system security, and thus would need to share some part of the cost.

- If additional lines are constructed to import renewable energy (e.g. based on Joint Projects under EU Renewables Directive), then it is likely that consumers in the importing country bear the risks or costs for the projects. Thus they would be indifferent to a cost sharing of transmission costs as part of network user fees or as part of the national mechanism sharing incremental costs/benefits of renewables.

Over what time period to recover costs?

- Countries assume different asset lifetimes and weighted costs of capital. Further differences might occur where assets are built as part of concession-based investments.
- Will cost sharing be pursued based on a standardised approach, or according to the approaches used by each regulatory authority involved? Does a fragmented approach impact on the cost-sharing? For countries with large shares of transit flows, this could create incentives for high remuneration of new lines so as to support the national transmission owner at the expense of its neighbours.

Can cost-allocation be revisited ex-post?

- Any ex-ante estimate is inherently inaccurate, as generation and flow patterns will be different from initial plans. Therefore ex-post adjustment will always be more accurate. But any such re-allocation of costs creates winners and losers, and thus conflicts between countries (see experience with ITC mechanism reported earlier).
- Re-negotiations of cost-allocation between countries also risks opening discussions on regulatory guarantees given to private investors, thus undermining regulatory stability and efforts to reduce costs of capital.
- Risks of large deviations between ex-ante and potential ex-post cost sharing decision can be mitigated by jointly pursuing transmission and generation projects so as to ensure additional line is used (e.g. as part of Joint Projects under EU Renewables Directive).

Sharing the benefits from additional transmission capacity?

- Countries with market based congestion management within the country use the congestion revenue to reduce network tariffs.
- If costs for grid investment are shared between countries, then this suggests also that such congestion revenue should be shared. Thus both downside risk (less usage than expected) and upside benefits (more use and therefore higher congestion revenue) are shared.
- In practice this would imply that the allocation of financial transmission contracts is determined jointly with the cost-sharing agreement.

European financial support

The Infrastructure Package envisages the provision of EU public financial support (grants, loans or guarantees) for benefits that are spread more widely across Europe. While in principle this could be addressed by including more countries in a cost-sharing agreement, in practice the precise attribution

of benefits like increased system security or technology innovation is difficult, and such large agreements would be complex to administer.

The details of how such financial support would be allocated are still being discussed. One option could be to use EU financial support to fill the gap between benefits calculated for countries that are proposing the projects and the project costs - assuming this is warranted given EU wide benefits of the project. However the implementation could create three difficulties. First, national regulatory authorities would have incentives to calculate fewer benefits for projects, so as to limit the domestic contribution by accessing EU funding. Second, projects for which limited national benefits are calculated will be difficult to communicate to the public and move through the planning processes. Third, the time required for negotiations between EU Commission and the countries proposing a project could jeopardize timely grid development.

Alternatively, EU financial support could be allocated independent of the benefits calculated by project proponents. A variety of options are available, but were not discussed in detail. They include extended support for planning costs, allocation to the earliest projects to create incentives for an accelerated process, allocation to projects with most project proponents to encourage cooperation, and earmarking for economically weaker regions.

The discussion highlights the value of targeted use of EU public funds to unlock specific project with large European benefit (innovative technologies, multiple countries impacted). This would also ensure that the support is material to project decisions – which would not be the case if spread across all infrastructure investment.

Grid tariffs provide the primary source of revenue against which grid investment was and will be financed. Therefore the EU financial support can have the biggest impact where it strengthens this national regulatory structure, reducing regulatory risk and financing costs for investors.