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Report

Political and societal dimensions of hydrobalancing from Norway towards Europe.

An assessment of drivers and barriers for further development

WP 5 HydroBalance: Societal acceptance and regulatory framework

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ABSTRACT
This report provides an assessment of non-technical drivers and barriers influencing further development of the hydrobalancing potential from Norway towards European countries. The rising shares of intermittent renewable energy in Europe will increase the needs for balancing and storage capacity, and Norwegian hydrobalancing is interesting in this regard. Realizing hydrobalancing services from Norway will to a large extent depend on the EU development of a system for exchanging and valuing balancing services from renewable sources such as hydro power. In addition, the right drivers need to be in place at the Norwegian national level. A major barrier is currently the lack of comprehensive political strategies and necessary measures to realize increased hydrobalancing from Norway. Both the 'sceptics' and 'supporters' amongst societal stakeholders generally endorse interconnector projects towards Europe, like the new projects to Germany and the UK, but they do not currently demand hydrobalancing at a large scale. Still, given the probability of changes in the European energy system, as well as changes in the Norwegian economy, the overall picture can change rapidly. Consequently Norway could benefit from a more strategic thinking and approach towards hydrobalancing, where hydropower and grid facilities are considered as parts of a whole – and where the issue of societal acceptance is substantially addressed also at the local level.

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List of abbreviations

ACER	The Agency for the Cooperation of Energy Regulators
ECP	European Price Coupling
EIIs	The European Industrial Initiatives
ENTSO-E	The European Network of Transmission Operators for Electricity
ETS	EU emission trading system
MoCE	The Norwegian Ministry of Climate and Environment
MoPE	The Norwegian Ministry of Petroleum and Energy
NVE	The Norwegian Water Resources and Energy Directorate
PCI	Projects of common interest
PoM	Program of Measures in Regional River Basin Management Plans
RES Directive	EU Directive on the promotion of the use of energy from Renewable Energy Sources (RES)
RBMP	River Basin Management Plans
TEN-E	Trans-European Networks for Energy
TYNDP	10 Years Network Development Plan
SET Plan	The Strategic Energy Technology Plan
WFD	The EU Water Framework Directive

Executive summary

The report provides an assessment of the non-technical drivers and barriers related to a future development of the hydrobalancing potential from Norway towards European countries. First, the drivers and barriers at the EU level are addressed, before the regulatory challenges and socio-political acceptance on the national Norwegian level are outlined. Finally, the report investigates the local acceptance related to a potential project and suggests how opposition towards such projects can be reduced.

At the EU level the report identifies several drives for increased hydrobalancing from Norway, such as the RES Directive and increased needs for balancing capacity from e.g. hydropower in addition to plans to implement national capacity market mechanisms. An integrated energy system and predictable and standardized markets need to be in place in order to give hydrobalancing services from Norway a market value. Consequently, realizing hydrobalancing services from Norway will to a large extent depend on the EU development of a system for exchanging and valuing balancing services from renewable sources such as hydro power.

At the national level there are currently several barriers complicating an increased development of Norwegian hydrobalancing services. These are related to the lacking coordination of national and regional grid development, the distribution of costs and benefits of new interconnectors, unpredictable economic consequences for domestic energy consumption and potentially negative environmental and social impacts. A major barrier is the lack of comprehensive political strategies and necessary coordinated measures to realize increased hydrobalancing services from Norway. Moreover, while national policy-makers and interest organizations largely support the planned interconnector projects towards Europe, they do not currently demand hydrobalancing at a large scale.

Concerning acceptance for hydrobalancing projects, it is important to be aware of the difference between socio-political acceptance at the national level, and community acceptance of concrete projects in local settings. While the *idea* of hydrobalancing is not particularly contested at a national level, there are concerns at the local level for the social, economic and environmental impacts of concrete hydrobalancing projects. The interviewed local stakeholders emphasize that early consultations and possibilities for compensation measures are likely to reduce opposition of projects, assuming that the environmental and visual impacts are kept moderate.

Given the probability of changes in the European energy system, as well as changes in the Norwegian economy, this overall picture can change rapidly. Norway could, therefore, benefit from a more strategic thinking and comprehensive approach towards hydrobalancing, where hydropower and grid facilities are considered as parts of a more comprehensive reasoning – and where the issue of societal acceptance is substantially addressed.

In sum, it is recommended to formulate a policy strategy which encompass and balance different societal interests. This should be done both at the national and local levels with provisioning of guidelines for coordination of different plans, regulations and interests of relevant water resource and grid development needs. Such a comprehensive strategy should further address the political-, economic-, societal- and technological trends which will impact upon relevant European countries' demands.

1. Introduction

This report is written within the NRC-sponsored project HydroBalance (2103-17) which is part of CEDREN[1] and is a delivery of the project's work package 5: Societal acceptance and regulatory framework. This work package and report addresses the political and societal dimensions of hydrobalancing from Norway towards Europe, focusing in particular on the *Norwegian* perspective towards these concerns.

Many European countries are increasing the proportion of wind and solar power generation in their electricity supply, but to date there is only limited storage capacity to secure supplies when needed,, particularly on the European continent. As renewable energy production is rapidly expanding in European countries, there is an increasing need to secure consumption that exceeds supplies of electricity. This is known as 'balancing power'. Hydropower with reservoirs is the only form of renewable energy storage in wide commercial use today to provide such back-up supplies. Based on its hydropower reservoirs and pumping Norway can provide *hydrobalancing* for European countries.

The European Union (EU) and its Member States have set ambitious renewable energy targets: The EU Renewable Energy Directive (Directive 2009/28/EC; 'RES') requires a share of renewable energy of 20 percent in the EU as a whole by 2020 (European Union, 2009). Furthermore, the EU 'Energy Road Map 2050' provides a basis for a long-term European framework within which increasing shares of renewable energy production and storage will figure substantially (European Commission, 2011). While many EU member states have strong incentives to develop renewable energy, Norway's energy mix – with Europe's highest share of renewable energy – puts Norway in a very different situation. The environmental and economic sustainability of new renewable energy development is debated among important stakeholders in Norway (Gullberg et al., 2014; Solvang et al., 2015). Stakeholders, such as environmental organisations and energy intensive industries, are concerned that increased development of Norwegian hydrobalancing to Europe will shift the environmental and economic costs from Europe to Norway (ibid.). The promotion of hydrobalancing as part of a climate-change mitigation strategy can in certain cases be perceived as being in conflict with biodiversity concerns, representing a 'dual environmental challenge' (Knudsen et al. 2013) – as reflected by the EU's RES Directive and Water Framework Directive (Directive 2000/60/EC) (European Union, 2000). Different environmental, economic and social concerns may potentially conflict, and this can be seen in relation to the wider 'sustainability' challenge of hydrobalancing. Concerns about sustainability may therefore constitute an important barrier to Norwegian balancing power.

In sum, hydrobalancing is an important policy option, but one where a variety of interests and viewpoints at the local, national, and regional levels will influence its political viability. Hydrobalancing issues are, therefore, complex, as there are multiple stakeholders' interests, differing positions of stakeholders, and many uncertainties regarding inhabitants' preferences at various levels of aggregation. In this report we will focus on the national political level in Norway concerning the policy issues. Since decision-making at this level is also informed and influenced by an international context, and not least the eventual demand for Norwegian balancing services from other European countries, we will touch upon such issues when analyzing the Norwegian policy and regulatory framework for hydro balancing. At the same time, domestic

[1] CEDREN – Centre for Environmental Design of Renewable Energy is an interdisciplinary research centre for technical and environmental development of hydro power, wind power, power line rights-of-way and implementation of environment and energy policy. SINTEF Energy Research, the Norwegian Institute for Nature Research (NINA) and the Norwegian University of Science and Technology (NTNU) are the main research partners. A number of energy companies, Norwegian and international R&D institutes and universities are partners in the project.The centre is founded by The Research Council of Norway and energy companies and is one of eight centres that are part of the scheme Centre for Environment-friendly Energy Research (FME). Source: http://www.cedren.no/english/About-CEDREN

energy policy decisions are influenced by the societal acceptance at both national and local levels. The report will therefor address the socio-political acceptance of the idea of hydrobalancing at a national level and the acceptance of concrete projects at a local level.

It is important to explore the relevant political and societal contexts as hydrobalancing will affect existing Norwegian policy measures and regulations, and eventually imply a need for amendments. Other factors such as economic conditions, market structure, and technological alternatives to hydrobalancing for energy storage, will also be of importance in order to assess the overall potential for hydrobalancing in a European context. However, in order to delimit the present endeavor, this report focus on the political and societal aspects, whereas other parts of the HydroBalance project will address economic, technological and environmental factors.

The present report addresses the following questions:

- To what extent and how do existing EU-based and national political and regulatory factors promote or hinder hydrobalancing?
- To what extent is there a political, strategic foundation for hydrobalancing in Norway? What are the positions of key national stakeholders?
- How can social acceptance towards hydrobalancing projects be promoted at the local level in Norway?

1.1. Delimitation and outline of the report

The report is divided into the following sections:

Section 2 gives an overview of relevant recent literature on hydrobalancing from Norway. Further it outlines the research design and key analytical concepts utilized in the report such as 'governance', 'societal acceptance' and 'community acceptance'.

Section 3, provides an outline and assessment of relevant parts of the EU policy framework, as well as the status of major policy measures in key recipient European countries. Relevant EU policy developments, regulatory factors, infrastructure development, research and innovation measures, and France, Germany, UK and the Netherlands positions are briefly outlined.

Importantly, this report will take a specific Norwegian perspective towards hydrobalancing, based on the political and societal context in Norway. Consequently, the European context constitute an important backdrop in two ways: (1) EU-based policy measures and legislation condition the Norwegian hydro-balancing policy framework; and (2) the EU policy framework, as well as national policies in countries receiving Norwegian hydrobalancing services, will impact upon the actual demands for hydrobalancing. Given the present report's scope and structure, we do not, however, elaborate upon all relevant dimensions of European energy policy.

Section 4 outlines the status of public and politically decided strategies with eventual relevance for hydrobalancing form Norway. Further, we elaborate the relevant policy framework in Norway with a particular focus on hydropower and water resources management, as well as the grid development framework to identify non-technical barriers or drivers to handle eventual hydrobalancing development in Norway.

In section 5, we move on to present the socio-political acceptance of increased Norwegian hydrobalancing services and the perceived barriers and drivers for such a development.

Section 6 will analyze community acceptance based on data from a case study of the local community Tyin, which potentially could be affected by hydrobalancing activities.

Finally, section 7 is the report's concluding chapter which provides a summarizing assessment of the main findings.

2. Analytical framework

The following chapter reviews relevant contributions from technical and social scientific studies on the hydrobalancing potential from Norway, and define relevant research gap which this report aims at filling. Based on this, we will in the second part of this section outline the analytical framework for this report.

2.1. Background and frontiers of knowledge

A number of scientific reports, commissioned studies and journal articles focusing on hydrobalancing from Norway have been produced during recent years. Amongst these, relatively few analyses provide social scientific research data on hydrobalancing.

An important strategic framework in terms of research and research cooperation with relevance for hydrobalancing – also including social scientific research – has been the Norwegian research Centre for Environmental design of Renewable Energy (CEDREN). CEDREN hosted a multi-disciplinary workshop on the prospects for hydrobalancing towards Germany, in Düsseldorf, Germany, in December 2010 (Catrinu et al. 2011). Prior to this workshop, a German research group had conducted a study on the issue of measures to ensure 100 % renewable electricity provision in Germany by 2050. One measure proposed was imports of capacity from the Norwegian hydropower system as a way of backing up the increased share of intermittent renewable energy production in Germany (SRU 2011). The report was commissioned from the German Advisory Council on the Environment (SRU), the German government's advisory body on environmental policy development. CEDREN followed up on this research agenda in 2011-12, strategically informed by the German considerations, with a specific multi-disciplinary scoping of the potential for using Norwegian hydropower for large-scale electricity balancing needs (Solvang et al. 2015). This project provided a preliminary study on which the present HydroBalance project builds upon (ibid.).

The CEDREN study provides hydrological, energy system, market oriented as well as social scientific analyses of the hydrobalancing potential from Norway, including more specific regional case studies (Solvang et al. 2015). We will in other parts of this report refer more concretely to findings from this study, particularly the ones pertaining to socio-political acceptance on a national level.

Prior to the CEDREN study, the research institute FAFO conducted a study on economic consequences and the distribution of benefits and burdens related to interconnectors and increased usage of the hydrobalancing potential (Tennbakk et al. 2010). This study has a primarily economic focus and aims at complementing former studies which are considered to be too limited in terms of economic analytical scope (ibid: 5). A major background is the industrial and workers' organizations' concerns of the economic consequences of increased energy export from Norway on Norwegian electricity prices – not least for the energy-intensive industry. The report points to the uncertainty related to future carbon prices given the complex development of the EU emission trading system (ETS) (Tennbakk et al. 2010). A major conclusion of this study is that the social economic profitability of interconnectors from Norway towards Europe depends on many, intertwined variables not least the connection between European energy prices, carbon prices and the possible surplus of renewable electricity in the NordPool area (ibid: 50). Moreover, the report points to the lack of strategic coherence in the political approach, and that there is too limited focus on the possible un-intended consequences and spill-over effects from decisions taken in one field on other fields pertaining to

interconnectors, thus clearly indicating a coordination challenge for a complex policy issue that involves several sectors with separate decision-making structures.

Approximately during the same period, in 2010-11, a report was commissioned from the Norwegian association of energy companies, Energy Norway, from the consulting companies Thema and EC Group on the potential of delivering 10.000 MW renewable flexibility from Norway to Europe (Bjørndalen 2011). The report concludes that this will be possible provided that some crucial barriers are removed. The report points to the need for an improved market framework enabling more profitable business models for the needed interconnector projects. Furthermore, this framework must build on a clear political commitment which can ensure favourable framework conditions in the long term. Interestingly in the present context, the report points to the prominent significance of ensuring societal support and that political commitment must build on a clarification of consequences for different economic and societal stakeholders (Bjørndalen 2011).

This study was followed by a more economically oriented study by Thema Consulting Group, commissioned by a number of energy companies (Thema Consulting Group 2012). A major finding here is that increased exchange between markets with different characteristics provides more values, in addition to representing a more effective usage of European energy resources. The report also finds that there are number of economic challenges with increased production of renewable energy that is to be finance by the end-users related to the distribution of benefits and burdens. The report contends that this situation will be influenced by the interconnectors that are seen as economic beneficial for particularly the energy-intensive industry.

In 2012 the Norwegian environmental foundation Zero published a report which is more focused on the political fundament for the construction of more interconnectors from Norway to Europe, within the perspective of ensuring provision of flexibility to a European renewable energy system (Bakken et al. 2012). The report builds on a number of interviews with Norwegian stakeholders within the industry, NGO's and political decision-makers. This report also points at the political framework and eventual commitment from the political level as the major barrier and possible driver for increased export of Norwegian hydropower flexibility. In particular, what is perceived as unclear and unpredictable consequences for the electricity prices for Norwegian end-users is seen as major barrier affecting the political interest for a more offensive hydrobalancing strategy. On the other hand, a number of positive consequences are also identified through the interviews; related to value creation and industrial development in Norway, contributions to reduced greenhouse gas emissions in Europe, and increased security of supply in Norway.

Moreover, the relevant Norwegian policy approach stands out as fragmented and very much depending on specific actors and actor constellations (Bakken et al. 2012). The government's approach is by most interviewees considered to be too focused on economic and technical aspects – and only on single projects and only to a limited degree oriented towards a more long-term strategic thinking. However, the report also concludes that the policy and market development in Europe is fragmented and uncertain, not least due to the low and unpredictable price on CO_2, which again will impact upon the political-strategic thinking by Norwegian authorities who are very much oriented towards the profitability of each interconnector project, as well as the social economic prospects of hydrobalancing (ibid: 60).

More recently, in 2014, the consulting company Sweco conducted a study on capacity markets in Europe, and the related impacts on trade and investments (Sweco 2014). The study highlights an important problematic for the hydrobalancing potential from Norway, namely what shapes and structures the demand and realization of relevant business models. As will be further elaborated in section 4 in this report, the question of capacity markets – either at a European level or nationally, stands out as a very critical issue for the prospect of increased hydrobalancing from Norway within a European context. The Sweco study points to the current situation in the European electricity markets where the phase-in of large volumes of subsidized renewable electricity contributes to more volatile markets where extreme prices become more frequent. The

report further points to the possible reason for an increased interest in capacity market mechanisms in Europe which is considered to depend on the actual power prices, both for electricity and carbon. The report does not, however, provide any policy analysis of this background, or on possible future policy decisions.

More recently as well, but from a regional perspective in Norway, the consulting group ADAPT has provided an analysis and strategic memo, commissioned by regional stakeholders in the southernmost counties of Norway (Agder) (ADAPT Consulting AS 2014). Interestingly, this is the first and thus far only report that takes a clear regional point of departure in its analysis of the economic potential for hydrobalancing from Norway. The report also considers the contribution from hydrobalancing from this region to the de-carbonization of Europe, through the support of increased renewable electricity. The report also constitutes an input to the Government's work on a new white paper for energy policy, and aims at placing hydrobalancing centrally within this document. The report recommends a more pro-active work from Norwegian decision-makers and stakeholders towards Europe, promoting the hydrobalancing potential. It also recommends a strategic framework where hydrobalancing is a prioritized measure based on quantified targets for climate- and energy policy development. In particular, the report recommends that expansion of the hydrobalancing potential and eventual other regulative energy sources are given priority over the further establishment of intermittent renewable production (ADAPT Consulting AS 2014: 50). Given its regional-local perspective, the study specifically recommends that the municipalities hosting infrastructure for hydrobalancing are compensated and can take part in the related value creation.

From a political scientific perspective, a number of interesting studies have appeared during recent years from the Norwegian research center on climate change, CICERO, and from CICERO in cooperation with the Environmental Policy Research Centre at the Freie Universität in Berlin (FFU). In a recent study by CICERO and FFU the potential for a reinforced cooperation on the development of renewable energy production between Norway and Germany is analyzed, with hydrobalancing as a focal point (Gullberg et al. 2014). The article finds that German actors see Norwegian electricity as a means for enhancing the stability of their own electricity system, since Germany shifts to a greater reliance on renewables. In Norway the picture is more mixed; Norwegian state-owned electricity producers and grid operators are interested in cooperation largely out of profit motives, but expect Germany to create a favorable environment for investors (ibid.). Energy-intensive industries and consumers on the other hand, are afraid that more electricity cooperation with Germany will raise electricity prices, whereas the Norwegian environmental movement is diverging on this issue. Parts of the movement see renewable energy cooperation as an important step towards a European low-carbon energy future. Nature and outdoor organizations, however, argue that new renewable energy infrastructure, including pumped-storage hydropower, will result in major environmental impacts.

In her study from 2013, Gullberg at the CICERO Center analyses various scenarios for future policy development for hydrobalancing from Norway focusing on political feasibility, and relate them to Norwegian decision-makers and interest groups' positions. A main conclusion is that the present policy approach is characterized by incremental change and very project-specific considerations related to individual interconnectors (Gullberg, 2013). The author concludes that the likeliness for any imminent changes in this policy approach is very limited. However, when presented with a vision of Norway being a 'green battery for Europe', many stakeholders support this idea in principle. Hence, a more long-term outcome can be that this strategic thinking will be more thoroughly anchored and can result in a more strategic policy approach for hydrobalancing.

In sum, quite extensive research and documentation on hydrobalancing from Norway has been conducted during recent years, being also relatively multi-disciplinary – including analyses pertaining to policy and societal framework as well. However, there is relatively limited research on policy-specific drivers and barriers as compared to more economically oriented studies. There are further relatively few studies, with the exception of Gullberg et al. (2014), which combine approaches to policy framework with the issue of

societal acceptance. Hence, this report will provide an updated assessment of relevant policy framework conditions, further informed by data on key stakeholder positions, and specifically addressing the issue of societal acceptance.

2.2. Research design for the report

In this report we will focus on the political foundation and policy framework for hydrobalancing services from Norway towards European countries, mainly seen from a Norwegian perspective. Given this approach we seek to understand and analyze the relevant decision-making structures which impact upon the potential for an expanded hydrobalancing activity from Norway. The relevant decisions and, premises for these decisions, are in this context to be found both in Norway itself and within a European context – composed of both the relevant EU framework and national policies in relevant European countries eventually receiving Norwegian hydrobalancing services. Importantly, however, it is highly relevant to include the local levels that will be affected by the concrete implications of such decisions. In relation to hydrobalancing this include – *inter alia* - landfall points for interconnectors (sea cables) and related infrastructure (transformation stations), eventual upgrading and expansion of on-shore electricity grid, and – not least – eventual changes in water level in the concerned water reservoirs and water courses (Solvang et al. 2015). Hence, the concrete consequences, particularly related to eventual changes in the landscape, will very concretely implicate local inhabitants and eventually trigger reactions against hydrobalancing-related decisions. Therefore, we will combine an analytical focus on the multi-level decision-making system with an analysis of social acceptance at the national and local levels.

More concretely, we seek to identify the main components of the relevant decision-making structures, and to what extent different stakeholders and interests will be mobilized in connection to hydrobalancing-relevant decisions. Decision-making structures and involved stakeholders are found in a wide range of policy fields and sub-fields – such as for example energy (water resources and grid), environmental (climate-change mitigation and nature protection) and industrial policy (the energy-producing industry and the energy-consuming industry), and are related to different economic sectors – such as for example energy producing companies, grid companies, energy-consuming industry.

A focus on 'governance' builds on the acknowledgement that the directionality and coordination of complex societies imply different approaches than traditional policy paradigms such as a classic top-down steering model. A strengthened focus on governance is therefore in accordance with the growing interaction between multiple societal groups (Pierre & Peters, 2005). An important theoretical point of departure is ‘multi-level governance’ which can be seen as a wide-ranging concept focusing on the dynamics between several levels of decision-making and intertwined policy areas (Bache & Flinders 2004; Hooghe & Marks 2003; Smith 2007). The concept encompasses both public and non-governmental strategies and actors. Secondly, since decisions related to hydrobalancing will crosscut different policy domains and interests we need to understand the combined effect of different policy measures. Perspectives on 'policy coherence' can be employed in this regard (Nilsson et al. 2012). According to this perspective one analyzes the stringency of policy objectives and targets set at different decision-making levels, and within different policy sectors – as well as how they are followed up during the phases of policy implementation and execution.
There are few sector studies within the field of multi-level governance and policy coherence, not least related to the transition towards a sustainable energy system (c.f. Jordan & Lenschow 2010); hence this report will also contribute analytically and empirically in this regard.

Furthermore, a recurrent issue in policy analyses is whether policy decision-making should mainly be understood according to political-administrative framework within which decisions are taken, with a focus on rules and procedures, or – alternatively more in terms of substantial results ‘on the ground’ (Persson 2007). Hence, it is important to acknowledge the distinction between policy *outputs* and policy *outcomes*, as succinctly pointed out by Vedung (2004). While the former can generally be considered results of the decision-making process and the formal products of policy formulation; the latter can be understood as the

actual effects and impacts of the policy within the field of action being governed (ibid: 5). In the present report, the main empirical references are 'policy outputs'; that is the priorities set and the designated instruments designed to achieve policy goals. However, experience-based knowledge and project-specific assessments including impact analyses of potential policy *outcomes,* clearly inform the policy outputs. Hence, although there is a distinction between policy outputs and outcomes, it is also important to understand how these factors interact- and also probably should interact more in order to obtain well-informed policy decisions.

Finally, but not least, an important theoretical and analytical reference for this report is the extensive research conducted during recent years on social acceptance of energy-related infrastructure. This is a growing research field, not least within a European context (Knudsen et al., 2015). Internationally, this has for a while been related to the so-called 'NIMBY-phenomenon' ('Not in my backyard'). Recent research demonstrates, however, that this concept needs to be nuanced (Devine-Wright & Batel 2013). Stronger consciousness and knowledge regarding measures for public involvement can, moreover, modify the conflict potential and the general resistance against the construction of energy infrastructure. The growing research literature also includes analyses of public involvement and how to design plans and projects in order to ascertain that local opinions are reflected, as a way of preventing conflicts during the construction and phase-in of energy infrastructure (see e.g. Batel & Devine-Wright 2014; Aas et al. 2014; Knudsen et al. 2015).

'Social acceptance' can also be understood in different ways. It has been emphasized that this concept must be nuanced and differentiated according to the part of the societal context it is actually meant to capture (Wüstenhagen et al. 2007; Wollsink 2012). Wollsink (2012) makes a distinction between socio-political acceptance and community acceptance, which we have found useful to apply to the analysis of societal acceptance in this report. The first dimension, 'socio-political acceptance' encompasses a general, macro-level understanding of acceptance. For hydrobalancing this could include an acceptance of the underlying rationale behind; for example, the need to support the transition towards a carbon-neutral, renewable energy system in Europe. It can also imply the support and eventual agreement of the national economic benefits, more generally – whereas there can be more limited support related to the economic implications of a specific project. This level can also be understood to encompass the degree of support and acceptance from national decision-makers, government and parliament and major interest organizations.

The second dimension of societal acceptance; 'community acceptance', can be associated with the acceptance needed at a local level towards the more concrete energy-related installation, and which is frequently the most critical and concrete acceptance challenges faced by renewable energy developers. Here it is also important to acknowledge the critical difference between the acceptance and legitimacy one can obtain at a national and macro level – as compared to the possible lack of acceptance by the people which are the most exposed to the relevant physical implications of the decisions. In this report, the Tyin case is used to assess community acceptance issues related to Norwegian hydro balancing.

3. The European context

In order to understand the potential for delivering large amounts of balancing services from the Norwegian hydropower system to European countries, it is important to understand the political dynamic shaping the European energy system. In this dynamic, the European Union (EU) – with its common decision-making system and institutions - plays a crucial role, in addition to the EU Member States. A common European energy market system is being promoted by the European Commission, and the European Union (EU) and its Member States have been considered to be at the global fore-front in climate-change mitigation efforts, not least by its promotion of renewable energy. At the same time, energy policy developments have been characterized by major and persistent conflicts of interest between the Commission, the Member States, and various interest groups (energy, industry and environment). Moreover, energy policy in the EU has historically represented a challenging area for stronger policy integration (c.f. Matlary 1997; Eikeland 2008). From the mid-1980's, however, energy policy became an important concern in relation to the general internal market programme, giving rise to various initiatives of an integrative nature designed and carried out by the Commission. Still, after the most recent constitutional amendments of the EU decision-making framework, the EU institutions do not have any supra-national mandate, and the structuring of the national energy system and the mix of energy sources, is still entirely within the national sovereignty of each EU Member State.

Given this backdrop, we will in this section of the report examine relevant processes and regulations stemming from the EU level, supposed to affect the realization of hydrobalancing from Norway. In addition, we will give a brief overview of national policies towards "balancing-services" from four European countries that are potential recipients of Norwegian hydrobalancing services.

3.1. Background: EU energy policy development

The European Union has set quite ambitious, strategic goals for the development of common energy infrastructure in Europe, in order to strengthen the security of supply and the functioning of the internal energy market. This priority is also related to the EU strategy on climate change mitigation with its objectives of increasing the share of renewable energy sources, as well as the ambition of becoming a more innovative, competitive economy. Recently, these intertwined strategic goals have been accentuated by the EU Commission's launch of a strategy for a European Energy Union, in February 2015 (ENDS Europe Daily, 2015a).

An important point of departure for considering the hydrobalancing potential within the EU is the EU climate-energy package – finally adopted in late 2008 (European Commission, 2008b). This strategy is considered to be the major framework for the EU priority of reducing energy consumption and increasing the use of renewable energy (Skjærseth 2013). The targets of the climate-energy package of 2008 were: 20 % less emissions of greenhouse gases, 20 % more renewable energy used, and 20 % more efficient energy usage – all targets by 2020, and compared to the level in 1990 (European Commission, 2008b). The target with the most substantial, direct influence on the problematic discussed in this report is the one set for increasing the share of renewable energy – by 20 % by 2020, but to be fulfilled by differentiated national commitments and targets for each Member State (European Union, 2009a). An important aspect of this is the ongoing increasing share of intermittent renewable energy production in Europe, which is considered to reinforce the need for both market-based and infrastructure-related flexibility – across borders (European Commission, 2015b).

Recently, the energy-climate strategic framework has been updated towards 2030, whereby the EU is set to achieve 40 per cent reduction of GHG emissions with respect to the 1990 level, which is to be reviewed according to the outcome of the global climate negotiations within the UN framework (European Commission, 2014a). The EU has also decided to achieve 27 per cent more renewable energy production and higher energy efficiency – respectively, as compared to the 1990 level (ENDS Europe Daily 2014a;

European Commission, 2014a). However, the 27 % target for renewable energy is not set to be legally binding for the Member States; it is a so-called 'indicative target'. That is, the various national measures initiated should jointly contribute the overall fulfilment of this target.

Nevertheless, the concrete follow-up of the 2030 targets is not finally settled, and new measures can be proposed from the Commission. A stronger focus on a transition towards a renewable energy system in Europe represents, however, also a potentially interesting possibility for the Norwegian energy sector and related industries.

An important dimension in the energy policy development at the EU level is the inherent tension between the different concerns and interests related to security of supply, the internal market, and the environment – particularly climate-change mitigation. Different visions and interests are crisscrossing the EU institutions – between the Commission and the other EU institutions (European Parliament and the Union Council), where the Member States are to decide on the proposals from the Commission, and between the different Member States (Ruud et al., 2011c). A major aspect limiting the Commission's efforts for more standardized energy policy measures is the fundamental sovereignty the EU Member States still have regarding the composition of their energy mix. This situation implies quite different, and frequently divergent, national interests. The EU Commission's latest efforts of formulating a stronger common energy policy framework through an Energy Union (c.f. European Commission, 2015a) must be understood in light of this situation, as well as the challenge of predicting the future outcomes of these efforts.

The general potential for harmonizing different national policy instruments must, therefore, also be considered in relation to the political interests nationally. A general observation is that the EU Commission in most cases, not least in the energy policy area, is a stronger protagonist for common, standardized policy instruments than the different Member State governments (Lafferty & Ruud, 2008; Eikeland, 2012). Furthermore, this standardization is historically very much linked to the overall goal of establishing an internal energy market (Eikeland, 2012). There can, therefore, be important tensions between the interests of the Commission and the individual Member States – as illustrated by the introduction of capacity market mechanisms (see below).

The objective of an internal energy market was addressed for the first time in 1988 (Eikeland, 2012). Deregulation and the establishment of a common market constitutes one of two main policy areas (in addition to the environment) where the EU Commission can propose common legislation with effect for energy, and where qualified majorities apply (supra-national decision-making). The linkage with the environmental aspects of energy is, however, seldom made explicit (Ruud et al., 2011c). The process before the ‘first generation’ of deregulation directives (Electricity and Natural gas, in 1996 and 1998, respectively) was long and cumbersome (ibid.). These directives included, moreover, no strong enforcement mechanisms, and, as it turned out, did not lead to a functioning internal energy market. Some incremental changes were undertaken through amendments of the Electricity and Gas directives in 2003, through ‘the second liberalization package’ (Eikeland, 2012).

More significant changes did appear, however, in 2007 with the ‘3rd internal energy policy package’ (European Commission, 2007a). The revised liberalization measures were prepared within the wider framework of a more consolidated and integrated policy approach to climate and energy (Eikeland, 2012).

The proposal for a third package included new and stricter rules for unbundling between commercial interests related to energy production and distribution and better functioning markets for electricity and natural gas. The proposal also emphasized a stronger coordination of national market regulation, and grid/transmission regulation (in parallel to increased focus on security of supply). Finally – and not least, the

package included stronger mechanisms for border exchanges (again linked to concerns of security of supply) (Ruud et al., 2011c).

As part of the third energy market package, the European Network of Transmission Operators for Electricity, ENTSO-E, was established in 2009. The ENTSO-E is to work on common European strategies for grid development – not least through the 10 Years Network Development Plan (TYNDP). The ENTSO-E is also an important partner on the work on network codes. The ENTSO-E was established in tandem with a similar cooperation organization for the national TSO's for natural gas; an *ENTSO-G*. The ENTSO-E and ENTSO-G are provided with parallel mandates and functions vis-à-vis common infrastructure development and coordination of national TSO activities and plans.

In the aftermath of the establishment of two ENTSO-units, the Agency for the Cooperation of Energy Regulators (ACER), a European Union Agency, was also created as part of the *Third Energy Market Package,* in order to further progress on the completion of the internal energy market both for electricity and for natural gas. The overall mission of ACER is to complement and coordinate the work of the national energy regulators at EU level, and work towards the completion of the single EU energy market for electricity and natural gas. ACER plays a central role in the development of EU-wide network and market rules with a view to enhance competition. It coordinates regional and cross-regional initiatives which favour market integration. ENTSO-E and ACER have also been important actors in the efforts of coupling the different electricity markets in Europe, or areas for power exchange. All of Europe is to be coupled into a European Price Coupling (ECP) (ACER, 2015). When accomplish this will provide Europe with a common day-ahead mechanism for pricing electricity. This can also contribute to a more standardized and predictable renewable market and, hence, a more predictable framework for potential hydrobalancing services from Norway.

Given this background, the next section will highlight main, relevant features of more specific current and planned EU policy measures.

3.2. Relevant political and regulatory factors from the EU level

We will here take as a point of departure the intertwined goals related to increasing the share of renewable energy in the total energy usage of the EU, and the further development of a common European energy infrastructure. A major reason for the demand for Norwegian hydrobalancing is the increased shares of intermittent renewable electricity production in Europe, not least as the result of the targets set in the EU Renewable Energy Directive. The regulation of flows of electricity, and the process of establishing more common, cross-border infrastructure for electricity, will also impact upon the potential for providing hydrobalancing through interconnectors and related grids, from Norway. Furthermore, the innovation and research policy of the EU will impact upon the agenda for the various technological options for energy capacity balancing and storage – where hydrobalancing is but one alternative. Finally, the provision of renewable electricity as well as the balancing and storage options must to an increasing degree be related to the 'dual environmental challenge': That is, when planning and designing energy installations and infrastructure one must also take into account the impacts upon biodiversity and landscapes – in addition to the positive effects provided vis-à-vis reduced emissions of greenhouse gases. The EU strategy towards water resources management can be seen in relation to this dual challenge.

3.3. The EU framework pertaining to the promotion of renewable energy

Although the RES Directive (European Union, 2009a) contributes to promoting intermittent energy production with the related need for more energy storage facilities, the Directive does not stipulate any specific measures in this regard. In general, the Directive is to be followed up in each EU Member State, as well as in Norway. The EU has decided that the follow-up measures are to be designed, decided and executed nationally. Hence, as a result, there is a multitude of different promotional instruments for renewable energy in different European countries. However, the Directive also clearly stipulates the possibility of cooperation between Member States, and common policy instruments across national domains. The Directive provides guidelines as to how such support can be accounted for when crediting towards different national targets.

Thus far, Norway and Sweden are the only countries to have established a common support scheme. There is a common certificate system whereby eligible, renewable electricity production obtains a certificate and related economic support. However, thus far, there has been no focus on the funding of capacity or more innovative projects. Moreover, innovation and development of new technologies have not been the main focus of this system. Besides, the system has been criticized for being skewed in favor of Swedish wind power plants as compared to Norwegian ones, since the Swedish tax system has provided additional alleviations as compared to the Norwegian taxes. However, the Norwegian government has aimed at rectifying this difference by promising measures which will adjust the different ways of accounting depreciation of the concerned renewable energy installations. Recently, an agreement was signed with the Swedish Government aiming at reducing the fiscal differences between the two national regulations (Ministry of Petroleum and Energy, 2015a). Still, however, these regulatory changes do not imply any increases in the structure of the support scheme, and hence, no additional impetus for hydrobalancing from Norway.

It is also important to be aware of the trade-off between different environmental concerns, which can be termed the 'dual environmental challenge' (Knudsen et al., 2013). The EU RES Directive is adopted as part of a climate-change mitigation strategy whereby increased usage of renewable energy is to contribute to reduced emissions of greenhouse gases within the EU. However, no energy installation is completely neutral vis-à-vis the surrounding nature and landscape. This is also clearly a part of the EU agenda where biodiversity and nature protection are crucial parts of the broader EU environmental policy. Pertaining to hydrobalancing and the disposal of the Norwegian hydropower resources, the EU policy for water resources is of particular interest. The EU Water Framework Directive (WFD) is the major part of this framework.

This Directive was adopted in 2000 in order to protect and improve water quality as a way of ensuring a long-term, sustainable use of water for people, economic activities and the environment (EU, 2000). The Directive can be seen as a follow-up and consolidation of the EU's water policy which was formulated already during the 1970's (Egeland & Jacobsen, 2013: 9). The major focus during this period was primarily to resolve the challenge of pollution, and the related measures were to a large extent related to different economic sectors, resulting in a relatively fragmented water policy with no framework for tackling inter-sector coordination. On this background, the WFD was designed to work more cross-sectorally, and providing an encompassing framework (European Union, 2000).

The WFD is formally designed to be an environmental directive, but the water quality targets set are to be achieved by taking into account the different activities from other sectors, related to the water resources – such as, for example; energy, transport and irrigation (EU, 2000). However, a focal point of the Directive is the formulation of environmental quality objectives, mainly related to biological factors and chemical conditions in a water course.

As far as hydropower is concerned, the WFD framework places major installations in the category of constructions and operations which affect the ecological status of the concerned water course. In such cases one speaks of 'highly modified water courses', for which the objective is to achieve a 'good ecological potential' where the environmental objective is to be weighed against other socio-economic concerns. This is in contrast to the preservation of a 'good ecological status' in water courses where no such installations have affected the environmental quality, thus the objective is purely environmental.

Hydropower production is one of many activities which can affect the water quality, albeit more prominent in Norway than compared to other European countries. In other European countries there is a stronger focus on chemical emissions from agriculture and industry. Given this mixed overall picture, which will wary extensively from one country to another, the EU Commission has emphasized that specific national approaches should take these various contexts into consideration. In general the Directive, therefore, stands out as less concrete and standardized than other environmental directives, due to the needed differentiation accounting for different national circumstances.

The WFD in many ways stands out as a process-oriented Directive, with less focus on specific requirements and measures (Egeland & Jacobsen, 2013). This is illustrated by the EU Commission's evaluation of the various national River Basin Management Plans (RBMP's). The Commission's position can be understood as a check-out of process organization and the provision of well-documented data, as well as a transparent and comparable method (European Commission, 2012). Hence, the WFD implementation is characterized by a step-by-step approach whereby the EU Commission maintains the importance of fulfilling all necessary steps in order to achieve the overall objectives (Egeland & Jacobsen, 2013). In sum, given this mainly process-oriented approach, there are no clear requirements concerning hydropower development, including hydrobalancing and the use of water reservoirs. The actual and potential environmental consequences of such activities are to be considered according to the relevant national and regional context, within the framework of the relevant RBMP.

In section 4.5 below, we will take a closer look at the Norwegian follow-up of the WFD, and the implications for hydrobalancing from Norway.

3.3.1. EU energy infrastructure development

An EU framework for energy infrastructure development has been developed in order to strengthen the security of supply, the functioning of the internal energy market, as well as providing enhanced provision of renewable energy (EU Commission, 2015b). This priority is also related to the EU strategy on climate change mitigation. Pertaining to the potential for increased hydrobalancing the ambitions of establishing more EU-wide electricity infrastructure – as well as more standardized regulation of flows of electricity, are of interest since it can contribute to a more predictable, European market for hydrobalancing with more standardized regulations across national domains.

In particular, this includes a focus both on the regulation of cross-border flows of electricity, and the development of common infrastructure projects – between EU countries with the support from the EU Commission – for a reinforced and more diversified distribution of electricity. The EU Regulation on cross-border exchanges of electricity, and the framework for Projects of common interest (PCI) – are some of the most relevant EU policy measures in this regard, and will be highlighted here.

The concrete regulation of the electricity flows between the Member States is anchored within the Regulation on cross-border exchanges of electricity (Regulation no. 714/2009) (European Union, 2009b). This entails a work on specifying network codes, which can be understood as the main requirements for how energy flows are to be managed in cross-border infrastructure. The organization of the follow-up of the Regulation is based on a comitology procedure whereby an expert group with national representatives is to

agree upon further technical specifications of the exchanges. This applies to both on-shore and off-shore energy infrastructure. Technical specifications for interconnector flows are the main focus of this work, but these have clear economic ramifications and will impact upon the functioning of the market. Other political considerations are not an explicit part of this work, and there is no explicit focus on public engagement.

The expert groups for network codes are facilitated by ENTSO-E, and consist of representatives of national authorities and TSO's. They receive inputs from the Commission and ACER, and draft proposals for codes which are then presented by ENTSO-E, before eventually being adopted by the EU Commission. These standards will later be adopted by the Commission, if acceptable for the EU as a whole – and then constitute the EU legislation in this field. This also pertains to the interconnectors and sea cables. This means that the expert groups define technical standards that will regulate the actual amount of exchange, and thereby set an important agenda for the functioning of future interconnectors, and indirectly the market framework for hydrobalancing. A major challenge here, seen from a Norwegian view point, is that Norwegian authorities do not have formal access to these expert groups (Jevnaker, 2012). However, through its participation in the ENTSO-E Norwegian actors can influence on the premises delivered from that organization.

In sum, the support of the EU Member States is crucial in order to succeed with the visions and plans for more common European energy infrastructure, and increased cross-border exchanges. This requires a willingness to commit resources and contributing to a coordinated effort.

The overall goal, reported on by the Commission is to achieve 10 % minimum interconnection of installed electricity production capacity of the Member States by 2020. In its Communication on security of supply, from 2014, the Commission has already signaled that it wants to increase this ambition to 15 % by 2030 (European Commission 2014a). This is ambitious given the fact that there still are missing interconnection links between several EU countries.

In 2015, the EU Commission also presented a strategy for interconnectors (EU Commission 2015b). The Commission here maintains that in order to succeed with an internal energy market, the interconnection must be a political priority for the EU in the years to come. A major instrument for speeding up the construction and phase-in of cross-border interconnectors will be to employ the Project of Common Interest framework (PCI; see below). The Commission also refers to the financial instrument for the funding of PCI's – the so-called Connecting Europe Facility (CEF), as well as the EU Structural and Investment Funds, in addition to the recently established European Fund for Strategic Investment (EFSI).

Furthermore, it is worth noting that the Commission aims at establishing a new Energy Infrastructure Forum in 2015, in order to discuss and find solutions to issues that are common to all regions across Europe, and where relevant, neighboring countries. Although this strategy does not mention specifically anything on the significance infrastructure related to balancing and storage, the EU's framework conditions for interconnectors as reflected in this recent communication, will be an important reference for the further development of this framework as well as the related EU support for specific interconnector projects. As will elaborated more extensively below, the EU scheme related to projects of common interest (PCI) includes sea cabled interconnectors, including the scheduled interconnector between Norway and the UK. Hence, a new drive and more ambitious targets set at the EU could contribute favorably for the promotion of the necessary infrastructure for hydrobalancing from Norway.

In 1996, as part of the EU efforts of completing the single market, the trans-European Networks for Energy (TEN-E) were developed (European Commission, 2010a: 2). The purpose was to provide a more political impulse to energy infrastructure investment. The focus was on the feasibility stage of gas and electricity network projects which contribute to the working of the single market, particularly cross-border initiatives

(ibid.). A framework for common infrastructure projects has thus been developed since the 1990's, through successive TEN-E Guidelines and a corresponding Financial Regulation.

The TEN-E Guidelines have formed the basis for the approach towards Projects of European interest, and later developed into Projects of Common Interest (PCI). Projects of European Interest are projects to have a cross-border nature or significant impact on trans-border capacity. These projects are to be provided with first priority for allocations from the TEN-E budget (ibid: 3).

In light of this, the EU started its work on amending the guidelines for cross-border energy infrastructure projects. In late 2012 the EU institutions found a compromise regarding a common agreement for new guidelines which were to identify and speeding up such projects (ENDS Europe Daily, 2012). A main element of this agreement was to define a time limit for the planning and licensing process under the auspices of national authorities. The compromise resulted in a time limit of 3, 5 years. This time limit as well as other guidelines concerning cross-border projects, not least the Projects of Common Interest – were then codified into an amended regulation called 'Regulation on guidelines for trans-European energy infrastructure (Regulation (EU) No. 347/2013, of 17 April 2013) (European Union, 2013).

The Regulation states that electricity and gas projects, to be eligible for the lists of PCIs, should be part of the latest available TYNDP (Regulation 347/2013, preamble). The Regulation furthermore stipulates that regional groups should propose and review potential PCI's leading to the establishment of regional list of PCI's. These groups are to be composed of national TSO's, energy regulators, project promoters and stakeholders. ENTSO-E has, furthermore, an advisory role and comments upon the proposed PCI projects.

The TEN-E Regulation only provides the main targets and framework for a more coordinated handling of PCI projects. As far as more concrete procedures are concerned, the EU Commission has issued a non-binding guidance document (European Commission, 2013b). This document is intended to support MS in defining adequate legislative and non-legislative measures to streamline the environmental assessment procedures and to ensure the coherent application of EA procedures required under the Union law for PCI . Furthermore, the Member States should by May 2014 publish *Manuals of Permit Granting Process Procedures* applicable to PCIs, as a coordinated effort across different, concerned national authorities. It is unclear to what extent and how the EU Member States have followed this up.

Finally, based on the regional groups' proposals, the EU Commission is to select and nominate the PCIs to be promoted within the PCI framework, and which are then provided priority funding from the TEN-E funding scheme, as well as to be treated as efficiently as possible during the planning and authorization phases.

The 2013 regulation is often referred to as the "new TEN-E Regulation", seeking to facilitate the permitting of projects which are of significant European interest. The regulation is a one of the building blocks for achieving a new energy infrastructure policy to optimize network development at European level as called for in "The Blueprint for an integrated European energy network".

One of the main focus areas concerning grid development in Europe has been the challenge of delayed and lengthy permit granting procedures due to legal issues or public acceptance. According to the Commission fragmentation in the national permitting processes, as well as insufficient coordination between national authorities in cross border projects, can entail very long lead times (European Commission, 2010a). The Regulation EC 347/2013 facilitating the development of PCI projects has tried to partly resolve these problems through time-restrictions and "one-stop-shops".

3.3.2. Research and innovation measures

In addition to the framework provided by the climate-energy strategy, the EU has for a number of years also been developing a technology policy for energy which is seen as a response to the energy and innovation challenges Europe is facing in the global competition – in addition to the other energy concerns (market, security of supply and climate-change).

The Strategic Energy Technology Plan (SET Plan) is considered to be the technology pillar of the EU's energy and climate policy (European Commission, 2007b). The EU's Strategic Energy Technology (SET) Plan was established in 2008 as the technology push framework of the EU's energy and climate policies.

The SET Plan prioritized those technologies most relevant to the energy and climate policy objectives for 2020: wind, solar, electricity networks, CCS, bioenergy, nuclear, fuel cells and hydrogen, energy efficiency. The European Industrial Initiatives (EIIs) set-up for all these sectors have defined priority research and innovation areas through Technology Roadmaps including a dedicated roadmap on materials and focused their action on large projects of European value. There is not a specific EII for hydropower, but many of the other EII's can be of relevance for hydrobalancing – such as renewable grids. Through the EERA national research capacities are pooled to develop new solutions that will impact beyond 2020. The dynamic between the EII, the EERA and related networks – as well as with the EU research funding program Horizon 2020, can be of importance for developing new knowledge and concrete development and demonstration projects that can promote hydrobalancing in a European context.

3.3.3. Towards a European Energy Union

As mentioned above, the EU Commission recently forwarded proposals concerning the establishment of an Energy Union (EU Commission, 2015a). The proposal is in the form of a brief strategy document, and contains proposals for main strategic goals and priority areas, but less concrete policy proposals. A very relevant part of the Commission's proposal, given the present context, is the objective of reinforcing the efforts for common, cross-border infrastructure – including interconnectors.

Another important aspect is the EU's ambition of providing a stronger and more centralized coordination of the EU's energy policy, across the different national domains. That is, to reinforce the EU governance on areas where the EU institutions already have a certain legal foundation for governance, such as consumption, network codes, financial arrangements and state aid rules, as well as the role of the EU energy regulator, ACER. ACER is foreseen to play a more active role and have a stronger mandate in the further development of a European energy market. Norway is not yet part of this organization. Hence, Norway can meet stronger challenges in the future when trying to convey Norwegian interests and positions towards the EU system in energy-related affairs. An open question remains as to what extent the Commission will provide some new decisions in relation to the issue of capacity markets, and to what extent different national mechanisms will have to cope with some overall EU guidelines or framework.

If Norwegian decision-makers conclude that they will promote hydrobalancing from Norway more forcefully within a European context, they must therefore take into consideration the various processes going on related to the very governance of European energy policy.

3.4. Selected European countries and status for relevant policy measures (as of spring 2015)

Realizing increased Norwegian hydrobalancing for Europe will be dependent upon the policy priorities of recipient European countries. It will require an understanding of both Member State and European regulatory frameworks and legislation. The construction of bilateral interconnectors is a crucial part of hydrobalancing, but such projects are not only driven by the need for system flexibility, but also by cost efficiencies enabled

by cross-border trading with electricity, as well as the public acceptance of such projects in the concerned countries and local communities (c.f. Batel & Devine-Wright 2014).

We will in this section present the status for policy measures regarding energy balancing. A crucial aspect in this regard is the question of capacity market regulations whereby energy producers are stimulated to withhold certain amounts of capacity reserves as a way of compensating for intermittent energy production – such as wind and solar power. The EU Commission has signaled that it is important to ensure a European, common capacity market instead of different national arrangements – which are considered to be distorting a common energy market (European Commission, 2015a).

However, with reference to the need for security of supply and the provision of a stable long-term framework for planned increase of renewable energy production, several European countries are considering nationally based regulations for balancing. These measures can generally be associated with the notion of 'capacity market mechanisms'.

We will here consider some of the European countries which could potentially be the recipients of Norwegian balancing services. We here look into to the basis for considering capacity markets; that is, the targets and ambitions set for renewable energy production and whether specific goals have been set for intermittent energy sources. We consider whether there are processes concerning the establishment of capacity market mechanisms.

The policy status concerning capacity markets in European countries, together with the fact that there is no agreement in place within the EU concerning a common capacity market, provide us with a picture of the policy landscape Norwegian decision-makers will have to deal with if Norway intends to promote large-scale hydrobalancing as an option for the European energy transition.

3.4.1. France

The national target set for France's renewable energy usage by 2020 is, according to the EU RES Directive, 23 % - given its baseline of 9.6 % share in 2005 (National RES Action Plan France, 2010). Wind power and biomass are considered to be the main sources for new renewable energy production in France.

As far as more intermittent sources for renewable electricity is concerned, France has during recent years experienced a significant growth in its wind power production. Wind power has demonstrated a strong progress, and 9.285 MW installed by 2014 – up from only 68 MW in 2000 (Wind power net 2015). *Solar power* in France has also been growing rapidly with more than 4,000 GWh of generated photovoltaic (PV) electricity every year. In 2013, an additional 613 MW of PV capacity was installed. By the end of 2013, the cumulative photovoltaic capacity reached almost 4.7 GW. This makes France the seventh biggest producer of PV electricity in the world, only behind Germany, China, Italy, Japan, the United States and Spain. (EurObserver, 2013).

The increase of production from intermittent energy resources is considered to be necessary in order to meet the targets set for renewable energy production by 2020 (National RES Action Plan France, 2010). On this background, the French TSO, RTE (Réseau de transport d'électricité), was commissioned by the Government to assess options concerning capacity reserves, resulting in a report which recommends the introduction of a capacity market mechanism (RTE, 2014). The main objective of this mechanism is to induce investments in production and consumption reduction in order to reinforce the security of supply.

Following up on this, the French Ministry of Energy adopted a regulation introducing a capacity market mechanism in France by 2016/17 (French Ministry of Energy, 2015). This mechanism consists of an

obligation for the electricity producers and the grid operators to provide a certain amount of guaranteed capacities based on the documented amount of peak hours. This amount is to be adjusted annually.

The need for capacity can even increase in the case of France, if the current Government's plan of reinforcing the French energy transition is given parliamentary approval (ENDS Europe Daily, 2015b). A law proposed in 2014 by the Energy Minister, S. Royal, an Energy Transition Law, also includes provisions for reducing the share of nuclear in the French energy mix. In its proposal, the French Government proposed to reduce the share of nuclear from 75 to 50 % by 2025. The Law is – as of April 2015 – scrutinized by the two chambers of the French parliament. If the law is passed, and the ambition of reducing the share of nuclear energy is upheld, this will have consequences for France's need for base load.

3.4.2. Germany

The national target set for Germany's renewable energy usage by 2020 is, according to the EU RES Directive, 18 % - given its baseline of 5.8 % in 2005 (German National RES ActionPlan, 2010). However, an even more ambitious target is set by the German government; that is, to achieve 40-45 % renewable electricity usage by 2025 – where wind power is to contribute substantially (Kirsten, 2013).

Germany is well known for its stimulation of wind power and PV installations and production. In 2013, approx. 9 % of wind power consumed in Germany stemmed from wind power (BundesVerband VindEnergi 2015). Solar power in Germany consists mostly of photovoltaics (PV) and accounted for an estimated 6.2 to 6.9 percent of the country's net-electricity generation in 2014 (Burger, 2015).

The German approach to an eventual national capacity market mechanism has been discussed during recent years (Lang, 2014). The acting federal government signaled as part of its initial strategy to revise the relevant regulations and mechanisms in this regard, and subsequently to decide on the eventual establishment of a national capacity market. A conclusion is expected during the spring of 2015. A major question in the preparation of this coming proposal is the eventual payment towards nuclear and coal-fired plants in order to ensure that the necessary capacity for base-load is reserved and made available when needed. The Government currently considers the possibility of employing an existent regulation on reserved power capacities as a legislative instrument in this regard. These perspectives were presented in a Green Paper from the federal government from October 2014. Afterwards, there has been a hearing of the Green Paper – until March 2015. On this basis, as well as other commissioned reports, the German Government will draw its conclusions which will be presented in a White Paper in the near future.

Dialogues with other European countries have also been a part of the Government's process. In this respect, there have been meetings between the German Economic Affairs and Energy Minister and his Norwegian colleague (Ministry of Petroleum and Energy, 2014b). In this contact the arrangement pertaining to the planned interconnector between Germany and Norway has been a crucial issue. From the Norwegian side, it has been important to convey that any new German regulatory arrangement should not distort the profitability of the new interconnector which is stipulated to be in operation by 2020.

3.4.3. The Netherlands

The national target set for the Netherlands' renewable energy usage by 2020 is, according to the EU RES Directive, 14 % - given its baseline of 2.4 % in 2005 (Netherlands' National RES ActionPlan, 2010).

Intermittent renewable energy sources are not very significant in the Dutch energy mix, wind and solar constitute under 1 % in 2012 (IEA, 2014). Biomass constitutes the largest share of renewables in the country (4-5 % by 2012). Wind power in the Netherlands has recently been used as a renewable energy source. By December 2013, 1,975 wind turbines were operational on land in the Netherlands, with an aggregate capacity of 2,479 MW. An additional 228 MW of capacity was installed at sea. Wind power will therefore represent

an important part of the Netherlands' effort of fulfilling the 14 % EU RES Directive target by 2020. Windmills have, moreover, historically played a major part in the Netherlands by providing an alternative to water driven mills. (Windpower, 2015b).

Hence, thus far, the need for capacity mechanisms in the Netherlands stands out as moderate given the limited share of intermittent electricity production. However, given the relatively ambitious target for 2020, one can assume that the need for more reserved capacity will increase. As far as we are aware of, there is no current plan at the governmental level concerning the establishment of a national capacity mechanism.

3.4.4. United Kingdom

The national target set for the UK's renewable energy usage by 2020 is, according to the EU RES Directive, 15 % - given its baseline of 1.3 % in 2005 (United Kingdom's National RES ActionPlan, 2010). Wind power, both on- and off-shore is an important part of the UK's plan for following up this target. In 2014 wind power in the United Kingdom had a total installed capacity of just under 12 gigawatts: 7,950 megawatts of onshore capacity and 4,049 megawatts of offshore capacity (Renewable UK, 2015) The United Kingdom is ranked as the world's sixth largest producer of wind power, having overtaken France and Italy in 2012.

Through the Renewables Obligation, British electricity suppliers are now required by law to provide a proportion of their sales from renewable sources such as wind power or pay a penalty fee. The supplier then receives a Renewables Obligation Certificate for each MWh of electricity they have purchased. Within the United Kingdom, wind power is the largest source of renewable electricity, and the second largest source of renewable energy after (Department of Energy & Climate Change, 2015). The use of solar power in the United Kingdom has increased very rapidly in recent years, albeit from a small base, as a result of reductions in the cost of photovoltaic (PV) panels, and the introduction of a feed-in tariff subsidy in April 2010. In 2014, the almost 650,000 solar installations had a total capacity of over 5,000 MW of solar power.

United Kingdom introduced a national capacity market mechanism in 2014. The UK Capacity market scheme aims to ensure that sufficient electricity supply is available to cover consumption at peak times. The Commission found in particular that the scheme will contribute to ensure the security of energy supply in the United Kingdom (UK), in line with EU objectives, without distorting competition in the Single Market. This is the first time that the Commission has assessed a capacity market under the new provisions on capacity markets in the new Environmental and Energy State Aid Guidelines (European Commission, 2014c).

Interconnectors have been excluded by the UK government from participating in the first auction later this year. But the government has firmly signaled its intention to include interconnector capacity in the 2015 auction. In addition to Capacity Market support, Ofgem (the UK energy regulator) is paving the way for additional regulatory support in the form of a cap and floor mechanism for interconnector revenues. With a substantial positive power price differential from Continental markets to the UK, interconnector investment projects are an increasingly attractive proposition.

The Capacity Market, which will be applicable in Great Britain (Northern Ireland has separate electricity market arrangements), aims to ensure security of electricity supplies in view of the projected increases in electricity demand and the upcoming closure of a significant share of the current UK generation capacity. However, critics have been raised after the first auction round arranged in December 2014, because gas, nuclear and coal plants were among the plants granted capacity subsidies (ENDS Europe Daily, 2014b).

3.5 Summary and issues at stake in a changing Europe

The EU is in the process of re-defining its energy policy framework, and there is a reinforced focus and priority of common infrastructure development. However, no new measures explicitly aiming at developing balancing services have been proposed so far. In parallel, there is an ongoing process of coupling the

different European market electricity markets into an integrated market structure encompassing the whole EU area – as well as neighboring countries. The interplay between the EU Commission, the European regulator ACER, the ENTSO-E and the EU Member States are important in relation both to the further development of the relevant market framework, the prospect of European infrastructure, and the role of renewable energy – as compared to other options for mitigating greenhouse gas emissions. As indicated above, one can expect different kinds of interplay and different policy outputs – depending on the issue in question, and – not least – the extent to which, and how, the different EU Member States perceive their national energy interests to be in accordance with eventual compromises between different interests at the EU level.

Norway's position and latitude vis-à-vis these different processes will also vary, and not just only depending on Norway's formal role as an EEA country. It is also important to consider Norway's relative political leverage. As will be further elaborated in section 4, and given the current political situation and government constellation, three areas are of specific importance in the bilateral energy policy dialogue between Norway and the EU: The role of natural gas, the contributions to developing a common European energy market (where Norway is at the forefront), and the role of interconnectors. Hence, hydrobalancing is indirectly at the top of the agenda, although the current government has not promoted this issue explicitly in its strategic communication with the EU.

Two very concrete processes stand out as particularly important regarding the future policy development in Europe and within the EU. First, the discussion on capacity market mechanisms is part of the considerations pertaining to this market integration process. However, the issue of whether a capacity market should be anchored at the EU level, being standardized and providing a level playing field versus the eventual establishment of national and eventually divergent regulations, is still not landed. As the country-based overview in section 3.4 demonstrates, France and the UK have already decided to introduce national capacity market mechanisms whereas German politicians still are in the process of further considering what market arrangement they will go for. On the other hand, the decisions pertaining to infrastructure development, and more specifically the EU Commission's recent proposal for an interconnector strategy, can be seen as efforts of providing more common, EU-based and standardized regulations for cross-border energy flows. More changes in this direction can also emerge as part of the establishment of a European Energy Union, and a reinforced mandate to the EU energy regulator, ACER; which is one the EU Commission's recently major signals concerning the further energy policy development in Europe.

4. The Norwegian context

We will now move on to the Norwegian context and explore the regulatory and policy barriers and drivers related to the flexible services a hydro balance scenario poses. First we will explore how existing regulatory factors facilitate or hinder hydrobalancing development (section 4) and secondly we will assess how increased use of balancing services are perceived among stakeholders at the national, regional and local level (section 5 and 6)

4.1. Planning and regulatory framework

In this section we will particularly focus on the main components of the formal policy and regulatory framework impacting upon the realization of hydrobalancing from Norway. That is, the needed reinforcements of grids – and the system for regulating hydropower production – including the changes needed for allowing stronger variations in the regulation and usage of water level in water courses and water reservoirs. This latter aspect is also closely related to the national water management system, as Norway is a part of the common EU policy framework as regulated by the EU Water Framework Directive. Still, sector specific legislation is creating a demanding situation for hydropower.

The principal institutional actor regarding planning and licensing for grids, interconnectors and hydropower is the *Ministry of Petroleum and Energy* (MoPE). In addition to being the political secretariat for the Minister of Energy and Petroleum, the MoPE is responsible for formulating the regulations which supplement the different legal acts that guide relevant parts of a regulatory framework for hydrobalancing. The MoPE is also the appeals instance for licenses granted by the NVE.

The crucial inter-ministerial axis for hydropower goes between the MoPE and the *Ministry of Climate and Environment* (MoCE). MoCE is particularly involved in all issues pertaining to nature and landscape protection, biodiversity, as well as land-use and spatial planning. In addition, the MoCE is responsible for the climate-change policy in Norway. MoCE and its subordinate agencies are also responsible for coordinating and approving environmental assessments concerning larger hydropower plants and grid development projects.

As a sub-ordinate agency to the MoPE, the Norwegian Water Resources and Energy Directorate (NVE), has the following responsibilities: Managing Norway's water resources; promoting an efficient energy market and cost-effective energy system; and promoting efficient energy use. The NVE is by origin anchored within the hydropower segment in Norway, and was established in 1921 based on the public river basin management established in the late 19th century (Angell & Brekke, 2011). From 1991, in the aftermath of the adoption of the Energy Act, NVE became a directorate with a broader energy policy mandate, as reflected in the changed name. Hydropower management is still a very prominent part of the mandate. The Directorate is mandated by the Energy Act to issue licenses for new electricity production, including both hydropower and other energy forms (wind power, bioenergy, national use of natural gas), as well as electricity grids. In relation to interconnectors, the NVE is assessing the applications for license before a recommendation is forwarded to the Ministry of Petroleum and Energy.

4.2. Main features of the formal system for licensing of hydropower in Norway

In this section, we will provide an outline of the formal framework for hydropower in Norway. In addition to the planning and permitting of new hydropower production, this framework pertains to the regulation of amendments and eventual expansions of existing hydropower installations. The latter aspect is relevant in a hydrobalancing perspective, where changes in the operation of water flows between different water courses and reservoirs – as well as the 'storage' at different levels and within different water sources, can contribute to realizing hydrobalancing projects.

The system of managing hydropower is part of an overall water resources framework. This framework is rather complex, being composed of different sectoral authorities at different levels, different plans and legislation, and has emerged as part of a historical process (Knudsen & Ruud, 2011; Angell & Brekke, 2011). Given this backdrop, and the potential effect vis-à-vis coming hydrobalancing projects, we will in this section outline the main components of this system – in the form of political and institutional mandates, major planning processes and major regulations.

In this light, there are currently *in principle* three major options for further development of hydropower in Norway (c.f. Ruud et al., 2011b): (1) extend the potential for pumping and storage to increase capacity for balancing; (2) refurbish and/or upgrade existing power production; and (3) promote small-scale hydropower. The second option can also be related to the first, since upgrading can entail increased storage capacity. Furthermore, with respect to environmental concerns for the water courses, there is a fourth 'path' which implies a stronger regard for environmental concerns in the formal processes for revising licenses for existing facilities – with possible modifications and reductions in the production volume.

4.3 Planning processes for hydropower

Public management of watercourses has a long tradition in Norway, starting with legislation in 1887, which is still valid – albeit revised and amended several times. Thus, the political and legal framework for hydropower is significantly rooted in historical processes, by legislative principles and practice characterised by various historic periods (see Angell & Brekke, 2011). From the 1970's onwards, there have been successive versions of a Protection plan, as well as an overall Master Plan for watercourses.

The first version of the Master Plan was adopted by the Parliament in 1986, and later updated in 1988 and 1993. The objective of the Master plan was to provide a mapping and assessment of all potential hydropower projects and stipulate priorities vis-à-vis further development and actual realisation. The assessment was related to economic and technical feasibility, and environmental impacts of potential hydropower projects. Angell & Brekke, 2011).

The Master plan contains a categorisation of the different watercourses and the related feasibility for hydropower development. From 1993, updates and consideration of new and continued projects are only treated administratively. The responsibility for this has been delegated to the Environment Agency. Decisions pertaining to the status of the projects included in the Master plan are taken by the Agency, in close dialogue with the NVE.

New projects and upgrading most often imply new assessments within the framework of the Master plan. However, projects with less than 10 MW installed capacity are exempted from the Master plan, and the NVE can proceed directly with the licensing procedures for small-scale hydropower projects.
Another important dimension of projects related to the Master plan is the connection with the *Protection plans for water courses*. The Parliament adopted four protection plans between 1973 and 1993, with a final supplement in 2009. The protection plans contain binding instructions to the authorities not to license regulation or development of certain watercourses for the purpose of hydropower generation. When evaluating which watercourses to protect, importance has been attached to preserving a representative selection of Norwegian river systems (Knudsen & Ruud, 2011).

In sum, the Master Plan and Protection plans constitute the wider framework for the management of hydropower resources in Norway, delimiting the scope for the development of projects within certain water courses. This strategic framework is not, however, updated with regard to the possibilities represented by hydrobalancing. Furthermore, this framework must be seen in relation to the more recent regional planning pertaining to Norway's follow-up of the EU Water Framework Directive.

4.4 The legal framework for licensing of hydropower

A number of legal acts and regulations apply to different stages of initiating, planning, licensing and revision of hydropower projects. The most essential are the Industrial Concession Act, the Water Regulations Act and the Water Resources Act. In addition, the Planning and Building Act applies for the localisation of the hydropower plants above a certain size level, as well as additional installations and infrastructure. The Energy Act regulates the technical installations related to hydropower production, including the connection to the grid. In addition to the role played by the NVE and other public authorities at the national level, both the municipalities and counties are provided with the mandate of managing overall objectives and principles for affected areas and the relevant land-use within their jurisdictions. Regional and local assessments substantially influence the potential for existing and future hydropower projects. In addition to the laws outlined below, there are specific regulations related to expropriation (the Expropriation Act) and related indemnities and compensations for the use of land for hydropower installations. Figure 1 below provides a schematic overview of the legal acts regulating the licencing and authorization of hydropower in Norway.

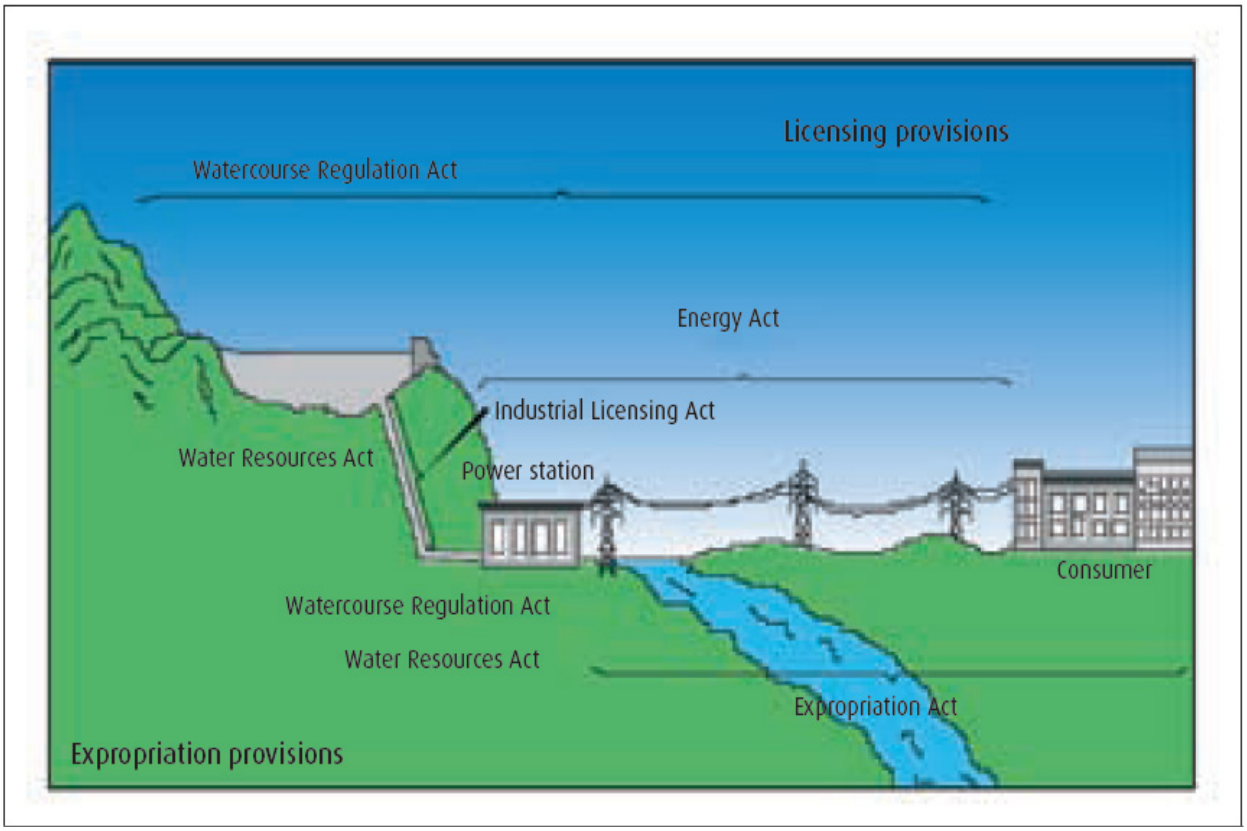

Figure 1: An oversight of the relevant regulations pertaining to hydropower licensing. The acts illustrated above will be further elaborated below (except the Expropriation Act). Illustration from MoPE (2008a). See Knudsen & Ruud (2011) for an overview and assessment of the legal framework pertaining to hydropower.

As mentioned above the licensing processes for hydropower production are coordinated by the NVE, with important inputs from the environmental administration and regional and local authorities, in addition to other stakeholders affected by the projects. The major stages of this process mainly mirror the licensing process for grid development projects. However, a major difference is the multitude of legal acts framing the regulation and licensing of hydropower, in contrast to the more focused approach based on the Energy Act for the licensing of grid.

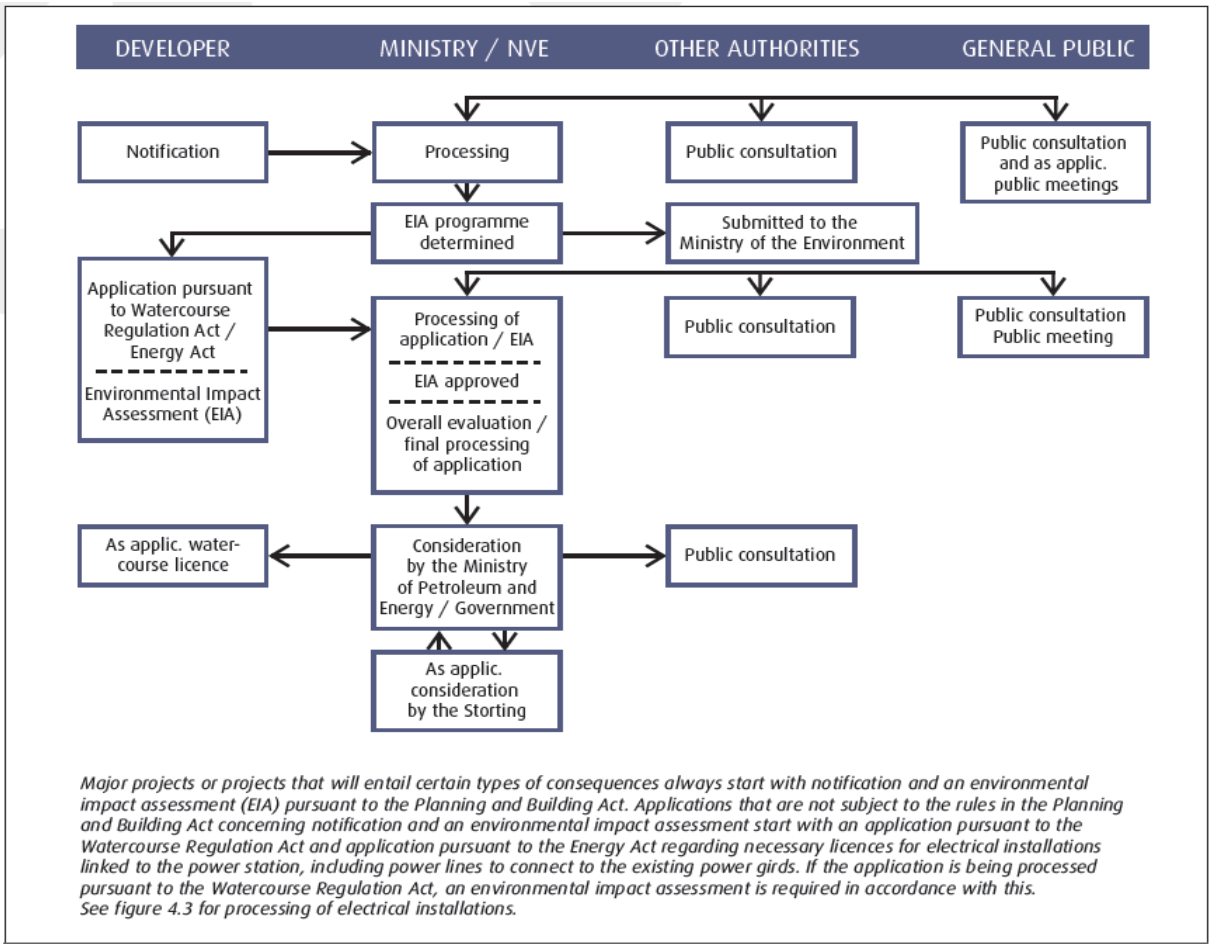

Figure 2: Outline of the main procedures for licensing of hydropower in Norway. Source: Ministry of Petroleum and Energy 2008: 62.

The relevant regulations are mainly based on national legislation, but the EU-based water management legislation based on the Water Framework Directive is increasingly important and substantial guidelines for the management of the water level in reservoirs and water courses, particularly relevant for hydrobalancing operations, will be formulated as part of the WFD-based water resource management framework – which has a clear regional anchoring.

4.5 Norway's follow-up of the EU Water Framework Directive (WFD)

The EU WFD was finally adopted by the EU in 2000. The Water Regulation ('Vannforskriften') was adopted in late 2006 as Norway's main follow-up instrument of the EU WFD, and entered into force on 1 Jan. 2007. In the first implementation phase of the WFD in Norway 29 pilot areas were appointed by the Government. The first 9 river basin management plans, together with the program of measures for all the 29 pilot areas were finally approved by the Government in June 2010. Norwegian authorities thereby aimed at coordinating their initial follow-up (through 'the first phase') with the common EU implementation, and thereby be able to participate in what was termed the 'common European learning process'. This initial phase was, however, not part of Norway's formal follow-up, which is constituted by the current planning phase which is to be coordinated with the second phase of the EU implementation; that is, 2010-15. There are currently 16 water regions in Norway, coordinated by 11 water management authorities. Regional River Basin Management Plans including Program of Measures (PoMs) for the water regions are now being

prepared by the county councils and finally approved by the Government by the end of 2015 before reporting to the EU by the end of March 2016..

The Water Regulation defines the roles and responsibilities for the various governmental agencies, not least the areas of responsibility of the Ministry of the Environment, including the Norwegian Environment Agency, vis-à-vis the other sectoral authorities. A revised Water Regulation from 2009 transfers the formal responsibility for the WFD at the regional level from the County Governor (the Government's representative at the county level) to the County Councils' administration. A main finding from recent Norwegian research on the follow-up of the WFD is that the actual organisation and network constellations as to the follow-up of the water management plans vary substantially from region to region (Indseth et al. 2010: 9). How this variation actually can impact on hydropower remains a question for further research.

In line with the prescriptions in the EU WFD, the focal point is the formulation of environmental quality objectives; mainly related to biological factors and chemical conditions in the watercourse. A major objective of the WFD is to identify watercourses where constructions or operations have affected the ecological status (OJEC 2000). In such cases, water courses can be exempted from achieving 'good ecological status' by being characterised as a 'highly modified watercourses'; for which the objective is to achieve 'good ecological potential' (ibid.). The exemption is to be based on the cost-benefit analyses of identified measures in the PoM and after a public hearing be evaluated by the County Council. All measures stipulated by the plans must be based on the sectoral legislation, and the sectors' management of this. This means that licences for hydropower, including revisions, is to be conducted as before, although they must take the regional water management plan, and eventual programme of measures, into account (NVE 2010b). There is, furthermore, an explicit statement saying that the regional plans can include a proposal for a future state of the environment which can imply a changed minimum release of water in the watercourse. Environmental quality objectives set for regulated watercourses as part of the first 6 year cycle in the WFD follow-up are, however, to be based on existing terms set by the current licenses. Eventual revision of the terms of licenses is, therefore, to be decided by the licensing authorities. However, there is an ongoing dispute involving EFTA surveillance agency concerning the interpretation of the WFD in Norway where several stakeholders claims that the Government is using the revision institute and traditional water management as barriers to obtain necessary environmental objectives to comply with requirements in WFD (Ruud&Fjeldstad 2015).

4.6 A closer look at modifications and revisions of licenses for established hydropower production

For hydrobalancing projects, processes opening up for modification (both limitations and expansions of production capacity), including the integration of environmental concerns, in already established hydropower production, are of relevance. Such processes include: (1) Various processes of revisions of terms of granted licenses; and (2) the process of refurbishment or upgrading. In all of these processes the Norwegian licensing authority, the Water Resources and Energy Directorate (NVE), is mandated to coordinate the process and the related assessments of environmental, economic and social concerns. The actual inputs from different interests and actors, as well as the assessment and trade-off of the different interests and concerns conducted by the NVE, will vary from case to case – depending on the character of the different projects. In cases related to the Watercourse Regulation Act the NVE recommends amendments before the MoPE which then prepares a decision that can be taken by the King in Council.

There are six alternative ways of changing and revising the terms in already granted hydropower licenses (according to the Watercourse Regulation Act; and the Water Resources Act for small-scale hydropower plants) (NVE, 2010). The most relevant (and frequently used) alternative is the "The legal provision of a general revision of terms, as stipulated in the Water regulations Act. This is related to certain time intervals. Such revisions must be initiated by stakeholders representing general, public interests and will be checked

against specific guidelines as elaborated in more detail below.[2] More than 400 hydro power regulations now face the possibility of being revised. Given the relatively high number of hydropower licenses which are to be revised in coming years, the energy and environment authorities have aimed at coordinating the priority of projects to be considered, and agreed upon a list of various water courses and projects where environmental concerns are to be prioritized. The report providing the basis for this list has, however, not explicitly considered any consequences related to increased hydrobalancing. The other alternatives can be; revision of specific terms within the specific license, reversal of permissions based on the Water Resources Act, licensing processes of hydropower projects which are only granted local permission according to the Planning and Building Act, revision clause as part of the rules of manoeuvring of the water currents and finally, possibilities for the concessionaire (energy/electricity company) of applying for a revision him/herself.

Although the revision of licenses poses an eventual restrictions on further hydro power development for hydrobalancing services, the possibility for such development are closely interlinked with refurbishment and upgrading (R/U) of existing plants and current licenses – probably the most important potential for hydrobalancing. In conducting revision of licences that might lead to production losses both the WFD and the MoPE strongly encourages consideration of R/U projects at the same time as revisions are undertaken.

R/U projects generally cover a relatively broad scope of cases; from changing the mechanics within the turbine of power station, to the building of a new or additional plant, new grids, increase the plant capacity flow, or an additional or expanded water reservoir (Thaulow et al. 2007). For hydrobalancing this can also be related to changes in pumping capacity, installation of new pumps, and changes in flows between the hydropower plants, related pumping devices and reservoirs. Upgrading generally has a larger conflict potential than refurbishment, since it – in practice – often implies additional constructions with important environmental impacts – occasionally equally important as those associated with new constructions.

In general, for R/U projects licensing, environmental measures need to be balanced with the potential benefits of increased production. The priority of environmental concerns is generally less pronounced in such cases, as compared to revision of terms, as referred to above. However, there is an increased emphasis of the benefits for climate-change mitigation of reinforcing the hydropower potential through R/U projects.

Given the different ramifications and impacts associated with the two categories of projects, *refurbishment* is most often limited to the licensing procedures in accordance with the Energy Act (and hence only assessed by the NVE), and eventually the Water Resources Act, whereas an *upgrading* implies a licensing procedure based on both the Energy Act and the Watercourse Regulation Act (and hence are to be decided by the Government), and/or the Water Resources Act (in the case of river-based hydropower stations). R/U cases are also encompassed by the rules pertaining to the Planning and Building act and impact assessment if the project exceeds 10 MW installed capacity or 40 GWh annual production. The Environmental Impact Assessment procedures also pertain, however, if the project affects important local environmental interests.

In cases of upgrading implying substantial expansion of the hydropower production, the impacts on the local environment can be perceived as substantial by the local population or the municipality. In such cases, and when the project is considered in relation to the Watercourse Regulation Act – the question of the establishment or increase of a local industrial fund can be raised from the local level. The perceptions related to environmental damages are not necessarily proportional with the size of the project and the actual

[2] The time for revision of licenses granted according to the Watercourse Regulation Act and the Industrial Concession Act are inscribed as a term in the individual licenses. The time frame varies from 30 to 50 years after the granting of license, depending on the date of the original license. In general, licenses granted before 1959, and between 1959 and 1972, are up for revision after 50 years. All licenses granted between 1972-92 can be revised from 2022, whereas all licenses granted after 1992 can be revised after 30 years.

environmental impact (Thaulow et al., 2007; Angell & Brekke 2011). There is also a question of mobilization of environmental interests when the project is more substantial and more visible both in the landscape, and on the political agenda (Egeland & Jacobsen, 2011; 2012).

At the same time, R/U – in line with the overall challenge for hydrobalancing – illustrates the dilemma related to the environmental policy agenda. On the one hand, an R/U project can potentially contribute to reduction of GHG emissions if it replaces non-renewable electricity generation (in a European perspective), on the other hand such projects can increase the pressure on the local environment and biotopes – through expanded stretches with changed water regulations. The latter aspect can also conflict with environmental objectives set through the regional plans for the follow-up of the EU Water Framework Directive. R/U-projects are non the less seen as positive also from an environmental point of view as they can enable environmental measures which involves production loss where such measures are needed while at the same time increasing production in the R/U project (Ruud & Fjeldstad 2015). Such projects are therefore viewed as positive both by the EU and the Norwegian Government and should be considered at the same time as revisions are conducted or environmental measures (that involves production loss) more generally are evaluated in the WFD (Ministry of Petroleum and Energy 2012a).

4.7 Main features of the formal system for licensing of grids in Norway

The Norwegian grid development is managed by the national TSO Statnett. Statnett is responsible for the formulation and publication of an annual, National Grid Development Plan ('Nettutviklingsplanen', NUP). The Plan is developed by Statnett, building on regional grid development plans –prepared by the responsible regional grid operators. Formally, the NUP Plan is not part of any decision-making process at the governmental level or within the Parliament. When it comes to formal features of the licensing process for national grid in Norway, the system has been characterized as lacking a clear guidance from the political level (Brekke & Sataøen 2012). In the most recent NUP Plan, Statnett points to ongoing processes for realizing new interconnectors toGermany and the UK, and states that these constitute the main focus towards a European energy system development (Statnett 2015:112). The interconnectors are considered to be important contributions from Norway to Europe's shift towards a de-carbonized energy system.

Interconnectors, and more particularly sea cables, from Norway to other countries is licensed by the MoPE, whereas the planning and projecting are undertaken by the TSO, Statnett. The NVE coordinates the planning and licensing process, and prepares the case for the MoPE. The licensing process includes a specific programme for environmental impact assessments. The legal aspect of an interconnector licensing process is based on the Energy Act and the Maritime Energy Act (Knudsen et al. 2015).

This overall approach, or 'grid development regime' (c.f. Sataøen et al., 2015) provides a number of challenges in relation to hydrobalancing. First, political authorities are rarely involved in consideration or discussion regarding grid development and needs. Needs assessments takes place outside the formal licensing process, and is very much an expert arena. Secondly, coordination and integration is a challenge in the Norwegian grid development policy. This includes coordination and communication between different grid levels and the coordination of new energy production and grid development. The link between different planning levels in the Norwegian system for energy planning is generally weak. Thirdly, the importance of improved early political involvement has been recognized as an important and previously neglected aspect of the Norwegian grid development regime, and a reform of the system was approved by the Parliament in 2012 (White Paper on grid development/Ministry of Petroleum and Energy 2012a). Following this decision, in large transmission line projects there is now a pre-assessment phase where the Ministry of Petroleum and Energy conducts a concept evaluation. Hence, there has been a recent modification implying an initial, political assessment of transmission grid projects in Norway.

As emphasized above, interconnectors will also relate to and depend on the on-shore grid system, and may result in needs for reinforcements of the land-based grid. In relation to hydrobalancing-relevant projects new or amended grid infrastructure in connection with the relevant installations may also be crucial. A general challenge not only in the Norwegian energy system, but also in a European context is the coordination between development of new renewable energy production and grids (ENTSOE-E, 2014). Furthermore, there is a challenge of coordinating the different plans and licensing processes relevant for the national grid with the various projects for the regional and local grids (Ruud & Knudsen, 2014).

Moreover, the national grid is considered to be confronted with several challenges ahead, in terms of needs for expansion and upgrading (Statnett, 2015). There are regional bottle-necks which need to be amended. In addition, the current and planned increase in intermittent renewable electricity production (wind power) within the Nordic energy system, not least given the Swedish-Norwegian joint certificate market scheme, represent challenges in terms of balancing the within overall grid system – independently of any large-scale realization of Norwegian hydrobalancing.

In sum, hydrobalancing projects will in most cases have to be seen in connection with grid development, both nationally, regionally – and probably also at a local grid level. Interconnectors can be seen as a major manifestation of hydrobalancing-relevant infrastructure, anchored within the TSO Statnett's realm, but other grid companies can also be affected given the possible needs for regional and local up-grading. Moreover, all energy infrastructures will have to be realized within local settings, implying the need for appropriately addressing stakeholders and affected inhabitants. A coherent planning framework concerning the hydrobalancing needs related to the grid is currently not in place at national level, but could make hydrobalancing projects more feasible in practice. This is the theme for the next sections of this report, namely the acceptance issues that will be crucial in both giving political support for strategic hydrobalancing planning, but also actual realization of concrete projects at a local level.

5. Sociopolitical acceptance

We will now move on to explore to what extent is there a political, strategic foundation for hydrobalancing in Norway, and moreover the positions of key national stakeholders. A pre-study undertaken in 2011 amongst key Norwegian stakeholders published in the report Solvang et al 2015, investigated the socio-political acceptance of using Norwegian hydropower reservoirs for large-scale balancing services. The 22 informants included in this study represented four interest groups and public authorities. The interest groups were divided into energy companies (Agder Energy, E-Co Energy, Norsk Hydro, Lyse energy, Sira-Kvina energy, Statkraft and Statnett), environmental NGOs (are Norwegian Society for the Conservation of Nature (NNV), Nature and Youth, Bellona and WWF) , recreational NGOs (The Norwegian Trekking Association (DNT) and Norwegian Association of Hunters and Anglers (NJFF) , and the two municipalities hosting hydropower production; Sirdal and Kvinesdal as well as the Norwegian organization for hydroelectricity producing municipalities, LVK. The study explored whether the idea of using Norwegian hydropower as 'green battery' for Europe had legitimacy amongst the stakeholders, and further explored the main drivers and barriers for Norwegian hydrobalancing. Finally the pre-study examined how the most important barriers could be overcome.

In this report we draw on this pre-study (Solvang et al 2015) and investigate possible changes in opinions since 2011 given the current government's explicit ambition of permitting merchant interconnectors (Sundvollen 2013) and the two new interconnector projects to the UK and Germany. While the 2011 pre-study interviewed LVK and the majors of two host-communities, this report extends the findings from 2011 through an in-depth case study of Tyin as well as additional interviews (see below).

5.1 Methodological notes

In 2015 we conducted 14 interviews with representatives from the relevant national *Authorities* (The Norwegian Water Resources and Energy Directorate and The Norwegian Environment Agency) and Member of Parliament (MPs) (The Conservative Party, The Liberal Party and the Labor Party). Further we have interviewed industrial *Companies* (Statnett, Statkraft), *Interest organizations* that represent environmental interest (Zero, the Norwegian Trekking Association, Friends of the Earth Norway and the Norwegian Association of Hunters and Anglers)), energy intensive industry and hydro power interest (The Federation of Norwegian Industries and Energy Norway), The groups of informants represent key economic, environmental and political actors at the national level, and their responses provide insights into how increased use or developments of balancing services are perceived, thus providing a more nuanced picture on socio-political acceptance of the idea of hydrobalancing from Norway.

Each interview was recorded and transcribed before we analyzed the information. We followed a semi-structured interview guide where relevant topics were: (1) current legislation, (2) infrastructure/grid-lines, (3) commercial potential, (4) societal legitimacy and (5) environmental impacts. In the following we will provide an outline of how the different groups of informants at the national level perceive the possibilities for increased use of Norwegian hydropower as balancing services for Europe.

5.2 Results

5.2.1 Authorities

At a general level, there has been few relevant policy documents presented by different Governments during recent years. A White Paper on national grid development was presented by the former government in 2012, but this document does not assess the prospects of hydrobalancing and the eventual consequences of a higher share of hydrobalancing-related export (Ministry of Petroleum and Energy, 2012a). Two interconnector projects have recently obtained approval from the Norwegian government from Norway to the UK and to Germany. The projects are to be realized by 2020, and will also provide increased balancing capacity from

Norway (Ministry of Petroleum and Energy, 2014a). The projects were granted licenses in October 2014 (ibid.). The Government signals an ambition of identifying measures which can alleviate and shorten the time and resources employed in relation to interconnector projects, and the coordination between new energy production and grid development (Sundvollen 2013). Politically, however, no amendments to this system have been proposed thus far in order to accommodate eventually more interconnector projects and a larger degree of hydrobalancing from Norway. We were therefore interested in investigating how relevant authorities and politically elected MPs from different parties perceived the idea of increasing shares of Norwegian balancing services for Europe.

Central *authorities* related to the realization of balancing services are The Norwegian Water Resources and Energy Directorate (NVE) organized under the Ministry of Petroleum and Energy. The Norwegian Environment Agency[3] represents the climate and nature management sector with reduction of greenhouse gas emissions and management of Norwegian nature as primary concerns in addition to the prevention of pollution. The Agency is organized under the Ministry of Climate and Environment.

NVE and the Norwegian Environment Agency both think Norwegian balancing services has great potential as one of several solutions towards a greener energy mix in Europe. NVE underlines that balancing services also are valuable for domestic use since the amount of non-regulated renewable energy production is increasing as a result of the Swedish-Norwegian joint certificate market. In the Southern parts of Norway the increase of non-regulated renewable energy is already challenging the current grid infrastructure. NVE argues that it is possible to increase effect production in the largest intake storages without causing environmental harm. In some systems increased effect production is possible, but this also depends on the capacity of the associated grid infrastructure. Both NVE and Norwegian Environment Agency underline that Norway's potential of serving Europe with balancing services largely depend on European strategies and to what extent the different countries aim towards becoming self-sufficient. Thus, while both Directorates see the potential in Norwegian hydropower to provide balancing services, they pinpoint that a lot depend on decisions within the EU.

None of the Directorates use the metaphor of Norway as a *green battery* for Europe. Norwegian Environment Agency thinks this was a nice concept, but it gave erroneous indications of Norwegian hydropower as the solution to Europe's energy challenges. Still, as the EU has set ambitious goals in terms of increasing their use of renewable energy, Norway has a good product to offer. Both Directorates perceive EU's ambitious climate targets as a driver for Norwegian balancing services. However, at the same time Norway is in need of electricity import to ensure security of supply in dry seasons with limited rainfall.

While today's electricity grid may be perceived as a barrier to increased energy export, Statnett is currently prioritizing the upgrading and building of grids nationwide in order to be able to realize the planned interconnectors by 2020. Rather than barriers related to infrastructure, NVE emphasize national market challenges, and particularly that investments in pump storage are not profitable. Norwegian Environment Agency on the other hand, emphasizes challenges with little coordination of the European grid infrastructure development. In addition, Norwegian Environment Agency is careful to remind about the empiric facts when it comes to potentially large environmental consequences and heavy controversies connected to large manmade water reservoirs. They also mention dependencies regarding the Water Frame Directives that may limit the development potential.

[3] Norwegian Environment Agency was established on 1 July 2013 as a result of the merger of the Norwegian Climate and Pollution Agency and the Norwegian Directorate for Nature Management

The three *MPs* interviewed are sitting in The Standing Committee on Energy and the Environment. The issues brought up for discussion in the Storting is commonly prepared in the different Standing Committees first. The Committee on Energy and the Environment is primarily concerned with issues related to oil, energy, watercourses, environmental protection and regional planning. The MPs interviewed were representatives from the Conservative Party, the Liberal Party and the Labor Party.

The interviewed MPs all want Norway to be connected to the European energy system through subsea interconnectors. However, the Conservative Party MP thinks that the main priority is to invest in cheap surplus energy by developing and maintaining domestic energy-intensive industry. Furthermore, the MP believes that the Norwegian contribution towards Europe will be quite modest, and that the green battery rhetoric is greatly exaggerated. The conservative MP underlines that while Norway needs to be connected to Europe it is also important to determine how many interconnectors to construct.

The Liberal Party MP is generally in favor of supporting projects that are profitable and climate-friendly and argues that the provision of balancing services to Europe does not exclude the development of domestic industry. The main challenge is now to gradually replace the oil and gas sector with renewable energy sources and infrastructure. The MP underlines that as a provider of balancing services to Europe Norway needs to closely comply with environmental standards and laws such as the Water Framework Directive.

The MP from the Labor Party argues for a discussion on the extent of energy export from Norway. A demanding situation is the expectation amongst both the industry and private consumers that the Norwegian electricity price should be low. The investments in subsea interconnectors may actually lead to higher electricity prices, and the consumers may consequently suffer. The Labor Party MP does not believe that Norwegian provision of balancing service will become 'big-business' in contrast to what the energy business predicts. The MP further pinpoints that as a result of the Swedish-Norwegian joint certificate market Norway moves towards a situation where a larger proportion of its energy mix is non-regulated. Balancing services will therefore be increasingly valuable domestically as well. The Labor Party MP argues that Norway should be careful about exporting energy and balancing services abroad in manners that may put the Norwegian energy system at risk through increased variation in prices. A sensibly balanced marked with a state-owned system operator in control is the most preferred situation according the Labor Party MP.

The MPs from both the Labor Party and the Conservative Party emphasize that the cheap surplus renewable energy should be invested in energy intensive industry. All three MPs however agree that a certain combination of domestic energy use and export is sensible.

There is a division of opinion between the MPs over the question of cable ownership. The Conservative and Liberal Party MPs both argue that Statnett's monopoly should be lifted enabling private companies to compete and own subsea interconnectors. The Liberal Party MP underlines that there should be no problem to open up for private owners as long as the regulatory framework is satisfactory. The Labor Party MP disagrees with the Liberal and Conservative Party MPs and emphasizes the importance of maintaining Statnett's monopoly. The Labor Party MP fears that private owner will be more concerned with their own profit and business than ensuring a sustainable Norwegian energy system. In order to avoid ending up in a situation where the Norwegian energy supplies becomes more vulnerable due to supplies from volatile, intermittent renewable energy sources, Statnett has to be the owner of subsea interconnector abroad. The Liberal Party suggests the use of incentives to reward hydropower reservoirs.

The three interviewed MPs are all concerned with the current regulations where the consumers have to carry the costs of subsea interconnector, and a particular concern is the effects on the energy intensive industry. The Conservative Party MP thinks a change of the regulatory framework is necessary to change how costs are distributed towards those benefiting on the interconnector. The Labor Party MP is concerned with the

domestic grid infrastructure and the increased share of non-regulated energy. The MP argues that the subsea interconnector must be planned in accordance with security of supply rather than merely to gain increased marked access for Norwegian hydropower. Norway must be careful not to plan for more than the grid infrastructure can handle as this is the most vulnerable infrastructure in society. The labor MP stresses that ensuring a robust energy supply should be priority number one.

The Conservative MP is also concerned about grid infrastructure and argues that there is still a long road before increased use of balancing services can be realized. Today, the Norwegian grid infrastructure lack both sufficient capacity and flexibility. In addition to the domestic grid infrastructure in Norway, there are challenges with the grid infrastructure in Europe. Germany is mentioned as an example where the northern and southern parts are not well connected with energy infrastructure.

In terms of public acceptance, all three MPs of parliament are concerned with how people respond to energy infrastructure. All three emphasize early involvement and the importance of communicating why different measures are necessary from a societal and a climate perspective. They agree that the regulatory framework in place is good enough to ensure sustainable solutions. The Conservative MP further argued for a more overreaching, cross-sectoral policy on climate issues, rather than the more fragmentary approach which is the case today.

5.2.2 Companies

Statnett is responsible for Norway's main grid transmission system (TSO – the transmission system operator) and is organized as a state enterprise owned by the Norwegian state through the Ministry of Petroleum and Energy. The company operates about 11 000 km of high-voltage power lines and 150 stations all over Norway. Statnett is also responsible for the interconnections to Sweden, Finland, Russia, Denmark and the Netherlands, and for the two proposed interconnectors to UK and Germany to be finalized by 2020.

Statkraft is a state-owned company specializing in production of hydropower, wind power, gas power and district heating. Statkraft employs 3700 people in 20 different countries, and is involved in power production (56 TWh annually) and energy exchange in national as well as international markets.

Statnett and Statkraft both see a large potential in using Norwegian hydropower as balancing services for Europe. From their perspectives, Norway could to a larger extent serve countries like Britain, Germany, the Netherlands and Denmark as one of several contributors towards a greener energy mix.

Statkraft pinpoints that Norway already has positive experiences with delivering balancing services to Denmark. In a European context, Norwegian hydropower has fantastic qualities with a lot of storage capacity in reservoirs as well as flexibility. Neither Statnett nor Statkraft use the metaphor of Norway as a *green battery* for Europe as they believe this creates an erroneous impression of Norway's possible contribution. In a global view, Norway's contribution could not buffer the total demand for renewable energy in Europe. Statnett argues that the Norwegian contribution towards meeting future energy needs in Europe actually will be marginal, but emphasizes that Norway can provide one of several contributions towards a more climate friendly European energy mix. Both companies emphasize that there is no contradiction between exporting hydropower and domestically exploiting the hydropower for Norwegian energy intensive industry. Statkraft underlines the benefit of exchanging energy between Norway and Europe, and that this will provide access to cheap electricity for Norway as well.

Statkraft argues that if Norway wants to develop their balancing services further there is a great and unexploited potential in developing pumping projects between existing water reservoirs. Nevertheless, in addition to current challenges with the transmission capacity, Statkraft see large challenges in developing

more extensive balancing services, and especially in relation to the profitability of developing pump storage projects within the given regulatory framework.

Statnett pinpoints that there is no profit in developing pump storage projects in Norway today. The building of more interconnectors could potentially lead to a more differentiated domestic electricity price and contribute towards making pump storage more profitable. Development of pump storage projects, however, would require a long-term political strategy in order to stimulate investments in necessary infrastructure. Pump storage projects located close to where the interconnector could be built would reduce the need for strengthening existing domestic grid infrastructure.

Developments of the domestic grid infrastructure as well as the two new subsea interconnectors are currently financed by the Norwegian consumers through the grid tariff. Statnett argues that income from the interconnectors can contribute to reducing the grid tariff, improving security of supply and ensuring import of cheap electricity. The current grid tariff, however, is not designed to stimulate the establishment of pump storage projects. Ideally those investing in pump storage projects should obtain a lower tariff, but this is not currently the case.

A related issue mentioned by Statnett is the possibility to make profit on the subsea interconnectors. If the capacity of the first interconnector is too large, the next will run with an economic deficit. To cover the investments in the new interconnectors, it is crucial that the export of electricity are realized with price levels that exceed what Norwegian energy companies would have earned by selling the electricity domestically.

In 2013, the Minister of Petroleum and Energy (Borten Moe) made statutory provisions where Statnett was granted monopoly in owning bilateral electricity interconnectors. After a shift in government in October 2013, new signals were given that Statnett's ownership monopoly would be replaced by possibilities for private ownership. This shift however, has not yet been implemented. Statkraft argues that a deregulation where smaller companies and partners in different countries could be owners, would be preferable as a business concept.

Both Statnett and Statkraft point to the current state of the domestic grid infrastructure as a challenge to realize increased use of Norwegian hydropower as balancing services for Europe. The current limitations in the national transmission grid may limit Norway's capacity to deliver balancing services to Europe if not improved. Strengthening of the national grid may however result in public protests as there have been several examples of local disputes in grid development projects the last couple of years. Changes have been made in the concessionary process in order to increase public participation and decrease opposition. Statnett emphasizes increased communication and transparency in addition to early involvement of affected interests.

On a national scale, the companies are well aware that pump storage and balancing services may have negative effects on the environment, for example through the construction of new infrastructure. However, both underline that they have gained substantial experience in reducing negative environmental impacts through collaborating with research institutions. In sum, they both perceive the idea of providing balancing services to Europe as good, but point to challenges related to operating technology, European legislation and regulatory framework in addition to the distribution of costs and benefits.

5.2.3 Interest organizations

The group we have termed interest organizations constitute a heterogeneous group representing both energy consuming and energy producing industry as well as environmental, outdoor and climate interests. What these interviewees have in common is that they are member-based organizations representing key societal, economic and environmental interests in hydrobalancing development. One exception is Zero, which is an

ideal foundation with economic sponsors working to promote zero emission solutions in energy consumption.

Beginning with the business organizations, *Energy Norway* (Energi Norge) represents 99 % of the energy producing industry companies in Norway. Together these companies serve approximately 91 per cent of Norway's grid costumers. Energy Norway is a non-profit organization that works on behalf of its members to develop the renewable energy sector with a particular focus on production, grid development and energy markets.

The *Federation of Norwegian Industries* (Norsk Industri), on the other hand, voices the interest of energy consumers and energy intensive industry. The Federation of Norwegian Industries represents approximately 2550 member companies and works actively to ensure a long-term fiscal policy which safeguard the competitiveness of Norwegian technology-intensive industry.

Zero Emission Resource Organisation (ZERO) is an independent foundation working to limit climate change and meeting the world's growing energy demand without harming the environment. ZERO work to promote zero emission solutions for all types of energy consumption and has 30 employees with background from social and natural science in addition to business, politics and media training. Zero works to get an overview of technological innovations and solutions and promote these to politicians and business companies. They also work in international projects to promote solutions to the climate crisis. Zero is founded by a broad range of public and private sponsors

Moving on to the environmental and outdoor organizations, the *Norwegian Trekking Association* (DNT) is Norway's largest outdoor life organization, with more than 240,000 members organized in 57 local member organizations across the country. DNT works to promote outdoor activities and preserve natural and cultural landscapes. For nearly a hundred years, DNT has been involved in conservation in Norway and are particularly concerned with protecting outdoor areas and their qualities against development and disruption.

Another outdoor organization is The *Norwegian Association of Hunters and Anglers* (NJFF) which is the only nationwide interest organization for hunters and anglers in Norway. NJFF has around 120 000 members divided into 570 local hunting and fishing clubs across the country. NJFF aims to ensure and maintain present and future viable game and fish stocks, and to ensure access to harvest natural resources for hunters and anglers.

While DNT and NJFF represent particular user-interest, *Friends of the Earth Norway* (Norges Naturvernforbund) is Norway's oldest environmental and nature protection organization founded in 1914. Norges Naturvernforbund has over 20 000 members that are organized in around 100 local groups nationwide. Conservation of nature against unsustainable human impact is a main goal and key focus areas are conservation, climate change, energy and transportation.

Energy Norway describes a challenging situation where Norwegian companies involved in energy production currently are faced with falling energy prices and consequently lower incomes. Parts of this picture are national initiatives like the Swedish-Norwegian joint certificate market which create a situation of energy surplus, while the planned subsea interconnectors to Germany and Britain are expected to contribute towards an increase in the energy price. Within this wider picture, Energy Norway supports the building of subsea interconnectors to ensure market access abroad, domestic security of supply and more stable electricity prices. Energy Norway finds that Norway is in a good position to contribute towards Europe's energy demand, and consequently supports the building of more interconnectors in addition to the two that are already planned.

The Federation of Norwegian Industries expresses a more doubtful attitude towards the idea of using Norwegian hydropower as balancing services for Europe. The primary concern is that subsea interconnectors and a substantial growth in the energy export abroad may lead to increased electricity prices which will undermine the Norwegian industries' abilities to compete within international markets. The Federation of Norwegian Industries emphasizes that while they recognize the energy producing companies' needs for market access abroad, the energy-intensive industry need conditions which make it possible to survive including access to cheap electricity. While the Federation has accepted the two interconnectors they are hesitant to accept additional projects. Increased grid costs are a concern and particularly how the expenses will be distributed in the future. In order to make long term investments the industry needs predictable conditions and energy-intensive industries are not necessarily willing to carry the costs of additional interconnectors.

The climate and environmental NGOs are divided in their views on the use of Norwegian hydropower as balancing services for Europe. The DNT, NJFF and Friends of the Earth Norway are primarily concerned with limiting the impacts of energy infrastructure on nature, biodiversity and recreational areas.

DNT experiences that energy related issues becomes increasingly important for their membership groups locally, since energy development often affects the environment. DNT is critical of the green battery idea, since this in their opinion would lead to increased pressure on nature and recreational landscapes.
Like DNT, NJFF is also critical of the "green battery" idea and the effect of balancing services. In their view, the Norwegian contribution is modest in relation to the total European demand. NJFF advocates that enough water bodies have already been affected and focus should rather turn towards improving the existing hydropower systems which have been impacted. For example, increased use of hydropeaking is negative to fishery and fish stocks. Still, NJFF do not oppose hydropower per se, as long as it is developed and operated in an environmentally sustainable manner.

Finally, Friends of the Earth Norway shares DNT and NJFF's critical view of an extended use of Norway's hydropower to serve European needs. After the implementation of the joint certificate market they have seen increased pressure on Norway's water resources and landscapes. None the less, they support the international aim of reducing pollution and climate gas emissions by increasing the share of energy consumption from renewable energy sources.

Zero supports increased export of balancing services to Europe and the development of more renewable energy production in Norway (e.g. wind, hydropower and sun). In contrast to the environmental and outdoor interest organizations, Zero wishes to continue the Swedish-Norwegian joint certificate market agreement after 2020. In addition, Zero focuses less on local and national impacts and more on how to solve the global climate crises through e.g. increased use of renewable energy.

Most of the interest organizations perceived the image of Norway as a *green battery for Europe* as an outdated and oversimplified metaphor. The Federation of Norwegian Industries argues that the green battery rhetoric has been harmful as it created an unrealistic image of Norway as the solution to Europe's energy demands. In addition the 'green battery' metaphor has triggered opposition amongst the energy-intensive industry related to their concerns about increased electricity prices. The Federation of Norwegian Industries argues that the green battery idea was launched before there was a clear funding strategy of financing and no assessments were made of what would be the economic consequences for the domestic energy intensive industry.

Zero has also stopped using the green battery metaphor as it creates an impression that Norway will try to solve Europe's energy crises singlehandedly. Zero underlines the importance of keeping the electricity price

in Norway at a level that is bearable to energy intensive industry, while simultaneously arrange for subsea interconnector and foreign energy exchange.

The outdoor and environmental organizations share the reluctant attitude to the "green battery" metaphor and Friends of the Earth Norway has decided not to use the term. Friends of the Earth Norway actively support the idea of reducing CO2-emissions in a global perspective. On the other hand, together with NJFF and DNT, they do not support establishments of more overseas interconnectors from Norway to Europe, because this may lead to increased pressure on the development of Norwegian hydropower and consequently natural resources. The outdoor and environmental organizations agreed that the limit for hydropower development and pressure on Norwegian nature have been reached.

The Federation of Norwegian Industries, Energy Norway and Zero all agree that export of balancing services should be combined with providing advantageous conditions for energy intensive industry production. The Federation of Norwegian Industries argues that in a situation with production of cheap surplus energy most of this should be used to stimulate new domestic industry production rather than being exported to Europe. In sum, the primary export of renewable energy should not happen via subsea interconnectors but rather through export of products produced with renewable energy. Energy Norway and Zero, on the other hand, argue that increased export of balancing services is possible to combine with increased Norwegian energy-intensive industry production.

Both Friends of the Earth Norway and DNT support the idea of "short-traveled energy", as far as it beneficial from a climatic point of view, and with no impacts on other sectors in society (i.e. transportation demands and land use). NJFF, on the other hand, did not state any clear opinions on this matter, but made it clear that they do not support further developments that might include balancing needs and hydro-peaking, because the negative impacts on biodiversity.

Several regulatory barriers to realize the idea of using Norwegian hydropower as balancing services for Europe are mentioned by the interest organizations. Energy Norway and Zero mention Statnett's current monopoly to own the interconnector projects. In their view this ownership structure hinders the possibility of initiating new interconnector projects as Statnett has a limited capacity due to the challenges with domestic grid development projects. Opening up for additional project owners would probably speed up the process of building subsea interconnectors.

Energy Norway, the Federation of Norwegian Industries and Zero mention the current model where the consumers have to pay for the interconnectors as a barrier. All three organizations argue for the advantages of introducing an alternative model where the beneficiaries pay for the interconnectors and that the costs could be shared between the countries using the interconnectors. The Federation of Norwegian Industries argues that the current tariff system has been working, but increases in costs would put the energy intensive industry at risk. The Federation of Norwegian Industries is against the current model where the industry in principle is subsidizing the energy companies.

Zero further stresses that the municipalities traditionally are entitled a part of the outcome from the hydropower production and they will lose income on pump storage production. The reason for this is that the municipal entitlements are linked to actual hydropower production and as the total production is reduced through pump storage, this will lead to income loss for the host municipalities[4]. Furthermore, as the current regulatory framework is designed there is no profit associated with investments in pump storage. If increased

[4] The host municipalities receive income on hydropower production through concession power (compulsory power) and concession fee (license fee) regulated through the Concession Act of 1917. Today most new hydropower licenses are given in accordance with the Water Resources Act (2000) which has led to a reduction of income as this act does not cover concession power (Solvang et al. 2015).

export of Norwegian hydro power as balancing services abroad is to be realized, long-term plans and dialogue with other countries is necessary to find measures that will reward balancing services.

The Federation of Norwegian Industries, Energy Norway and Zero highlight the lack of long term political strategies as a barrier. Energy Norway stresses that many hydropower plants are currently reinvesting and upgrading their facilities. A question is whether to maintain the current capacity or increase the investment. In order to increase investments and e.g. facilitate pump storage a prerequisite is long-term political support. Zero argues that as subsea interconnectors take many years to realize the lack of political clarity makes future plans difficult. Zero underlines that there are few political signals about Norway's energy and climate strategy after 2020.

NJFF and DNT did not discuss barriers in detail, and were largely concerned with the environmental effects of pump storage, hydro peaking and energy infrastructure. Friends of the Earth Norway were dubious to more oversea-interconnectors, as these could increase the need for enforced grid-lines near access - or delivery points.

5.3 Discussion of main results

While the 2011 study found a general legitimacy amongst all informants of providing Norwegian hydropower as balancing services for Europe, several of the informants appeared slightly more critical in 2015. In general, the informants in the 2015 study can be divided into those in favour of primarily focusing on 'short-travelled energy', domestic energy exploitation and environmental consequences, and those who wish to combine focus and development of domestic energy-intensive industry with increased export of balancing services. The first group consists of The Federation of Norwegian Industries, the environmental and outdoor interest organizations DNT, NJFF and Friends of the Earth Norway, while the second group is constituted by Statnett, Statkraft, Energy Norway, Zero, the authorities (NVE and the Norwegian Environment Agency) and the MPs.

Starting with the 'sceptics', the Federation of Norwegian Industry mentions increased electricity price and the current model where the consumers have to pay for the interconnectors as the primary reason for not supporting increased energy export. The environmental and outdoor interest organizations DNT, NJFF and Friends of the Earth Norway, on the other hand, are more concerned with environmental impacts of establishing more interconnectors, hydro peaking, pump storage and infrastructure development.
Opinions vary between the 'supporters' for providing balancing services to Europe. Statnett, Statkraft, Energy Norway, Zero and the authorities (NVE and the Norwegian Environment Agency) all see a great potential in using Norwegian hydropower as balancing services for particularly Northern Europe. The MPs on the other hand are more divided in their opinions. While all three MPS agree that Norway should be connected to the European energy system through subsea interconnectors, the main priority of both the Conservative Party MP and the Labor Party MP is to invest cheap surplus energy in developing and maintain domestic energy-intensive industry. All three MPs along with Statnett, Statkraft, Energy Norway, Zero and the authorities agree that a certain combination of domestic energy use and export is favorable.

Both the 'sceptics' and the 'supporters' are in favor of the two interconnectors to Germany and UK, while further ambitions beyond these two cables are rather vague. Moreover, there was generally a sobriety amongst the informants concerning Norway's potential contribution towards meeting Europe's energy need. An indication of this sobriety is that the metaphor of Norway as a "green battery" for Europe is no longer used by the informants as opposed to the 2011 study where the metaphor was extensively applied. All the informants agreed that the 'green battery' metaphor give an erroneous impression of Norway's contribution to the European energy mix.

In 2011the main perceived barrier against realizing increased uses of Norwegian hydropower as balancing services for Europe was the existing domestic grid policy (Solvang et al. 2015). Weaknesses in the existing grid policy were identified to be both Statnett's mandate to focus on developing the national grid infrastructure rather than interconnectors to Europe, and also the distribution of benefits and costs from new cables. In addition, pump storage was not considered profitable enough to be something the energy companies would invest in. Moreover, the environmental interest organizations mentioned environmental concerns while host communities were concerned with their shares of the benefits for the production of balancing services. Most of these barriers still prevail in 2015. Several of the 2015 informants such as Statkraft, Energy Norway, Zero and the MPs from the Liberal and Conservative parties further mention Stanett's ownership monopoly as an obstacle and call for private ownership of interconnectors. In addition grid tariffs and the absence of a long term Norwegian energy policy are mentioned as barriers.

The two directorates both perceived the lack of a clear European strategy as the largest barrier. They both argued that Norwegian hydropower has a large potential in providing balancing services to Europe, but realizing this potential largely depends on decisions within the EU and individual member countries.

The environmental interest organizations interviewed in 2015 were more negative than those interviewed in 2011. Both in 2011 and in 2015 the environmental interest organizations were critical of increased use of Norwegian hydropower as balancing services for Europe because of potential impacts on aquatic ecosystems, recreational and aesthetical reasons. A major difference however is that while the environmental interest organizations in 2011 found the idea of providing Norwegian balancing services as legitimate in a climate perspective, none of the environmental interest organizations found the idea legitimate in 2015 due to perceived negative impacts on the local environments and biodiversity. Statnett and Statkraft on their part, argued that they have gained substantial experience in reducing negative impacts of renewable energy projects, and that these are possible to mitigate at acceptable levels. Along the same lines of argument, both NVE and the Norwegian Environment Agency argue that there are legal measures in place to handle the environmental challenges related to hydropower development. Similarly, the MPs pinpoint that hydro balancing need to be undertaken in line with European and Norwegian environmental standards such as the Water Framework Directive, but that.

The Conservative MP and the two directorates mention challenges with the grid infrastructure in Europe and in Norway as a main barrier. They pinpointed that the Norwegian grid infrastructure today lack both sufficient capacity and flexibility. In addition, all MPs worried about the current funding-model where the consumers have to carry the cost of subsea interconnectors. Domestic security of supply and concern for domestic energy intensive industry were mentioned as main concerns related to the construction of future subsea cables. There was a division of opinion between the Conservative and Liberal MPs on the one side and Labor Party on the other concerning the question of cable ownership. While the Conservative and Liberal MPs argue for a changed Energy law which will lift Statnett's monopoly, the Labor Party MP argued against private ownership of subsea interconnectors to ensure a sustainable Norwegian energy system.

Community acceptance was a topic most of the interviewees were concerned about. Both Statnett, the MPs and Statkraft emphasized the importance of early involvement. The MPs also emphasized the importance of communication and information, but agreed that there is currently a sufficient regulatory framework in place to safeguard this aspect as long as it is exercised in each individual case.

6. Community acceptance: The case study of Tyin

Hydrobalancing and related infrastructure projects (hydropower facilities, onshore grids, and interconnectors) have in many cases proven to be highly controversial at the local level in Norway(Ruud et al., 2011a). Opposition has been mainly based on arguments regarding negative impacts on environments and landscapes. In the Sima-Samnanger grid development case on the Norwegian west coast, one of the main arguments was that the grid was planned for exporting electricity to European consumers rather than securing the energy supply in the region (Ruud et al., 2011a). Similarly, in Ørskog-Sogndal high voltage transmission line at the west coast, and Sydvestlinken in South-Eastern Norway, local citizens feared that the export of electricity to Sweden would result in higher electricity prices in Norway (Knudsen et al., 2015). Hence, it is important to consider the context within which one presents hydrobalancing- related projects, in order to prevent conflicts which can hamper and delay the licensing processes. While the opposition to onshore grid project can be intensified when local demands are few and negative impacts high, it is likely that the same arguments may be triggered in the building of pump and storage plants for hydrobalancing purposes. As few studies of such projects are conducted (although see Steffen 2012), we have chosen the hypothetical pump and storage case of Tyin.

Lake Tyin is 33 km^2 large, with a catchment area of 387 km^2, in the southwest part of the Jotunheimen national park. A major part of the lake is located in Vang municipality in Oppland County while extending into the neighboring municipality of Årdal in Sogn og Fjordane county. Vang municipality is 1503 km^2 with 1619 inhabitants. The lowest elevation is lake Slidrefjorden, 363 meters above sea level (m.a.s.l) – and the highest point is Vestre Kalvehøgda (2208 m.a.s.l.). The Tyin area is one of the main entrance points from south-west into Jotunheimen national park and a frequently used area for recreational activities such as hiking, mountaineering, skiing, hunting and angling. There are some clusters of cabins nearby the lake and several hundred cabins in the "Tyinkrysset" area, where the road up to lake Tyin starts. The area is used for recreational purposes all year round, with peaks in spring, summer and autumn.

The Tyin lake is the upper reservoir for Tyin hydro power plant and the water level is regulated between 1082.84 and 1072.50 (m.a.s.l). The water volume is estimated to 369 million m^3. The Tyin power plant was established in 1910 and totally modified in 2004. The main purpose is to provide electricity to the aluminium smelter in Årdal. The modified power plant has water outlet in Lake Årdalsvatnet (3. M.a.s.l), and has a water fall of 1040 meter. The power plant has an installed effect of 374 MW, which annually produces 1.573 GWh/year. The hydro power regulation has potential to be developed into a pump and storage facility used for balancing services.

6.1. Methodological notes

In our exploration of community acceptance for hydrobalancing we chose a qualitative case study approach which enables a thorough and in-depth exploration of the topic of interest (in line with Qualitative Case study methodology). Flyvbjerg (2006, 229) argues that '[w]hen the objective is to achieve the greatest possible amount of information on a given phenomenon, a representative case or random sample may not be the most appropriate strategy.' In this study we have been interested in obtaining rich context–dependent knowledge about how people perceive a possible 'hydrobalance project' locally, rather than more context–independent knowledge which e.g. a questionnaire survey would have provided (in line with Flyvbjerg 2006). Consequently, we have undertaken what Yin (2003) terms a *descriptive case study* which is used to describe a particular phenomenon and the context it occurs within. Shenton (2004) argues that "the trustworthiness of qualitative research generally is often questioned by positivists, perhaps because their concepts of validity and reliability cannot be addressed in the same way in naturalistic work"(Shenton 2004:63). The results from qualitative case studies are not generalizable in a statistical sense since the findings are specific to a small number of particular environments and individuals. Still, findings from qualitative case studies can be applied to other, similar situations (Shenton 2004; Merriam1998). When

exploring the transferability of qualitative results it is important to examine similar cases undertaken by other researches and investigate if similar findings "staged in different settings might enable a more inclusive, overall picture to be gained" (Shenton 2004:71).

We have chosen Tyin as a case to study community acceptance based on a set of the following criteria: To find a hydropower reservoir with a *large balance power potential*. Tyin was included as one of seven localities in a SINTEF pre-study investigating the technical potential of balancing power from Norway (Solvang et al. 2011), and consequently fitted the first criterion. Secondly, we used several criteria to ensure a wide variety of user interests, namely, *diversity in use*, *intensity of use* (high-low) and *seasonal use* of the lake and surrounding area. Being located in the national park of Jotunheiemen, Tyin is extensively used all year round for e.g. fishing, recreation, skiing etc. Thirdly, we used *water level change* (difference between LRV-HRV) and frequency of variation as criterion because we expected this to influence various recreational interests.

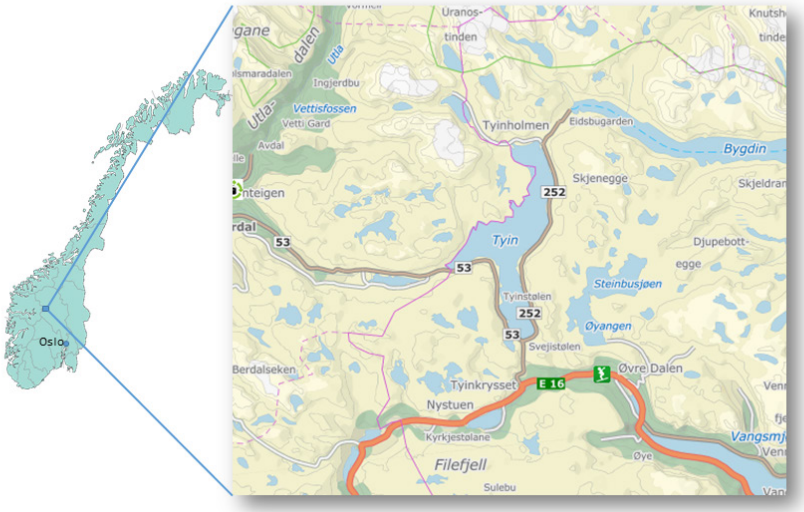

Figure 3: Map of Tyin and Bygdin

Tyin is a relatively small community, and we decided to include three tourism operators involved in lodging and transportation at the neighboring lake Bygdin (see map) to broaden our sample. Bygdin is reservoir for Upper and Lower Vinstra hydropower plant and is regulated between 1048 and 1057 m.a.s.l. Unlike Tyin, it has not been included in the Solvang et al (2011) pre-study. While operating in association with Bygdin, the three informants also knew the Tyin area well.

As hydrobalancing is not currently practiced at a large scale at Tyin or Bygdin we gave our informants some ideas of possible local impacts associated with hydrobalancing such as rapid water fluctuation, unstable ice sheet, increased water temperatures and possible impact on biodiversity and landscape qualities. We asked about how they use the area today, thoughts about the current water regulation regime, general views on Norwegian hydrobalancing of the European renewable energy infrastructure, opinions about local impacts and possible measures to increase the community acceptance of hydrobalancing development.

6.2. The informants

On the local level we arranged a focus group interview with in total 13 stakeholders representing various interest groups, such as landowners, local users, cabin owners, tourist entrepreneurs local authorities and local representatives from the NGOs Friends of the Earth (Naturvernforbundet) and the Norwegian Association for Hunting and Fishing (Vang JFF). We interviewed two representatives for Oppland county authority one from the administration of Lærdal municipality, three persons representing tourism business and transportation and one representative for the cabin owners. The focus group included six representatives from the above mentioned NGO's and landowners. In addition, we interviewed representatives from the local tourism industry (two lodges, and a transportation company) that not where able to participate on the focus group meeting.

We categorized the informants into four groups:

Local and regional authorities consisted of Oppland county authority (OCA) and Lærdal municipality (LM). OCA is the principal stockholder in the Eidsiva energy group, one of the largest energy companies in Norway. Eidsiva energy is owned by Oppland and Hedmark counties authorities and 27 municipalities in the two counties. Oppland county authority receives annually around 25-30 million NOK in profit from the Eidsiva energy group. Lærdal and Vang municipality involvement in Eidsiva is related to area-planning within the Tyin-catchment and their daily executive work. They also have registered the nature qualities in the municipality which is an important knowledge base related to the revision of the hydropower license. Vang has substantial economic income related to the hydropower production in Tyin.

Tourist businesses (lodging and transportation) are represented by a tourist lodge and a hotel in the area, and the transportation company operating ferry boats on Lake Bygdin during summer and snowmobile transportation from Tyin to Eidsbugarden in the winter season.

Landowners were represented by three landowners with area and fishing rights in Tyin, also representing landowners on the adjacent areas to the lake. One landowner was fishing for commercial purposes.

Cabin owners and NGO's were presented by one member of the Board for a cabin owner organization, representing approximately 180 cabin owners in the surrounding area, and the umbrella organization for all cabin owner organizations in the Tyin-Filefjell area. In addition, local department of Friends of the Earth and the Norwegian Association for Hunting and Fishing was represented.

6.3. NIMBY and community acceptance

Recent studies show that while the public in most European countries tend to be supportive of increased development of renewable energy technologies, concrete projects are often opposed (e.g., Cowell 2010; Pidgeon & Demski 2012; Ruud et al. 2011; Wüstenhagen et al. 2007; Aas et al 2014, Knudsen et al 2015). Public opposition has been explained to as 'NIMBY' (Not in My Back Yard) responses, meaning locals oppose renewable infrastructure when they have to carry the local 'costs' of having them in their proximity (Cohen et al. 2014). A NIMBY response is understandable given the negative aesthetical, environmental and economic impacts that often are carried by the local communities (Wolsink 2007; Cohen et al. 2014). Despite the legitimacy of NIMBY responses of affected locals, the NIMBY notion has been criticized for simplifying the complexities of local opposition and portraying local inhabitants as selfish and ignorant (Devine-Wright 2009,; Soini et al. 2011).

Rather than selfish concerns, local opponents may care for wider impacts on their local community or places of particular significance (Wolsink 2013; van der Horst). Local opposition may further be related to place identity and perceptions of energy infrastructure as unfit in a community or in an 'un-spoilt' rural landscape

(Devine-Wright & Howes 2010, Devine-Wright & Batel 2013). Moreover, research indicates that also the concessionary process related to renewable energy technology projects may trigger opposition (Knudsen et al. 2015; Aas et al. 2014; Cotton & Devine-Wright 2011; Schweizer-Ries 2010). Knudsen et al. (2015) discovered that local inhabitants in Norway and the UK perceived the opportunities for influencing grid development processes to be limited. Several other studies have investigated measures for improving public involvement (Cotton & Devine-Wright 2011; 2012; Schweizer-Ries 2010) as public influence on decision making is argued to be limited (Knudsen et al. 2015; Aas et al. 2014; Devine-Wright et al. 2010).
A variety of manners to obtain increased social acceptance of renewable energy technology projects have been suggested in the academic literature. Few studies have been undertaken to study the social acceptance of pumped hydro storage. There are, however, some exceptions such as Cohen et al. 2014; Steffen 2012. Cohen et al (2014) suggest that developers should avoid projects that greatly influence environmental values and areas of high appreciation to locals. They further argue that procedural issues may be more relevant than siting to ensure community acceptance of pumped hydro-storage projects. Cohen et al (2014) further argue that acceptance may increase if local groups are given the opportunity to give inputs during construction phase. This suggestion is in line with extensive research on other renewable energy technology projects (e.g. grid development and wind farm projects) demonstrating how social acceptance is closely linked to procedural justice, i.e. perceptions of fairness in the decision-making process (in line with 2001, Gross, 2007; Zoellner etal. 2008). Although there are extensive mechanisms for public consultations (e.g. public hearings, institutionalized guidelines to enhance participation and 'open-office days') in the Norwegian and UK planning and licensing of transmission line projects, Knudsen et al (2015) demonstrates how public opposition in both countries was triggered as a result of what was perceived as insufficient involvement of local inhabitants, especially related to early involvement. In line with this study, Steffen (2012) argues that participation in the planning process improve the community acceptance for pumped hydro-storage projects. Drawing on examples from established pumped hydro-storage projects in Germany he shows how companies have made an effort to involve local communities at an early stage. In addition, he argues that local opposition towards pumped hydro-storage projects tends to occur in areas unfamiliar with hydro storage plants. Extensive and transparent information to the public is therefore of vital importance. Steffen (2012) mention an example from Germany where an 'unexperienced' community sought dialogue with a community close to a pumped hydro-storage plant.

A related aspect Steffen emphasises is the issue of community compensation for bearing negative impacts locally. He argues that rather than monetary compensation a variety of measures may increase community acceptance, such as making the socio-environmental burden of the construction phase as modest as possible and invest in e.g. community infrastructure (ibid). These findings correspond well with the results from Tyin case study that we will now present.

6.4. Results from the case study

In the following, we give some more details for each category of informants, before we draw conclusions from the local case study.

6.4.1. Local and regional authorities

Oppland county authority 's interest in power- supply is mainly twofold: (1) to create economic value and ensure financial income and (2) use the Eidsiva company as a regional business developer and entrepreneur. They support the idea of providing Norwegian hydropower to Europe, but are critical of the actual contribution from Norwegian balancing services towards Europe. Oppland county authority questions whether hydrobalancing would impact on nature and biodiversity. The informants perceive this to be a political question to be dealt with at the national level, and question the international orientation amongst the regional politicians. They further point at other ways to save energy, and to produce energy (i.e. bioenergy from forests). They do not support the idea of hydrobalancing, if this leads to reduced income to Oppland county authority and increased prices for electricity in general.

Lærdal municipality emphasized problems with flooding, area-planning and applications related to the Planning and Building act. Furthermore, the municipality underlined the cumulative environmental effects of hydro power and criticizes the current situation where hydro power cases are often handled one by one rather than been handled jointly. They are also unsatisfied with the planning process where they perceive that alternatives often are decided before sufficient knowledge about environmental effects is evaluated. They emphasize the importance of assessing environmental impacts first, which will enable easier identification of conflict areas and thereby the development of good alternatives.

Vang municipality has advantages from the hydropower production and gets substantial economic income, which also benefits the inhabitants. One example is that due to the municipality's financial capacity, they were able to lay the power line and fiber-cable up to Tyinstølen underground and consequently not visible for tourists. Underground cables are far more expensive than overhead lines, but have the benefit of creating fewer conflicts with tourism as they are 'out of sight'.

Both the regional and local authorities were primarily concerned with local benefits and impacts rather than contributing towards climate-friendly solutions internationally. They questioned the importance of Norwegian hydrobalancing as a measure to solve the global climate crises. Moreover they were rather unwilling to let their local communities bear the environmental costs of increasing the renewable energy supply globally.

6.4.2. Tourist business (lodging and transport)

The tourist businesses' main concerns are related to aesthetical and economic impacts of hydrobalancing development. The water level in Lake Tyin and Lake Bygdin are of key importance. Low water level affects the operating of the ferry boat, since the Bygdin basin around the hotel Eidsbugarden is quite shallow. In addition, the tourism operators are afraid visitors get a negative visual impression of both lakes when water levels are low and the landscape looks 'ugly'. However on the positive side, pump storage could potentially improve the aesthetical impression during spring if the water levels are higher than the current operating regimes. On the other hand, during winter, the lakes are heavily used by skiers and also as transportation route by snowmobiles and unsafe ice conditions will have a negative impact on the utilization of the lake during winter. The informants pinpoint that globally, nature-based tourism is an important business that will last longer than the Norwegian oil reserves. Therefore, it is important, in their opinion, to keep the nature qualities in the area as intact as possible. However, they support the general idea that Norway should contribute towards renewable energy production globally as long as concrete projects are undertaken with least possible environmental impacts locally. Early-involvement of local stakeholders and information about hydrobalancing projects is seen as crucial to create community acceptance.

The following compensation measures are mentioned: making roads accessible during winter-time, improvements of roads and maintenance of ferry piers. In sum, the local benefits seem to be more important than contributing to global climate solutions. Furthermore infrastructure measures seem more important than merely monetary compensation as also pointed out by Steffen (2012).

6.4.3. Landowners

The fish stocks are known to be of high quality in the lake of Tyin. Due to the commercial- and recreational fishing, a high water level is preferred, especially in the autumn. If pump storage and hydropeaking were to be developed in Tyin, the landowners emphasized rapid water level fluctuations that would negatively affect the aquatic production (invertebrates) as a main concern. Other aspects of concern would be possibilities for using the ice for transportation purposes, especially near the shore, as hydrobalancing may lead to unstable ice sheet. There are further safety issues regarding the effects of hydro power on the domestic reindeer herds use of the area, and several informants called for an electronic warning system when unsafe ice conditions.

All emphasize that the landowners as well as other affected stakeholders have to be consulted/involved early in the process of upcoming hydrobalancing projects.

Several informants mentioned that compensation measures like improved roads, maintenance of ski tracks, and a local business development fund would help make the local impacts from hydrobalancing more acceptable.

Some non-landowners mentioned the landowners' economic compensation from the Hydropower Company and income from hydropower production. They speculated that if hydrobalancing would lead to reduced profit in the municipality, the landowners might be negative to operating the hydropower magazine for balancing services.

6.4.4. Cabin owners and NGO's

Based on the nature qualities, Vang municipality aims to be one of Norway's most attractive cabin destinations. Development and infrastructure that harms nature qualities (i.e. windmills) are not wanted, and cabin owners support this strategy. There are mentioned examples of conflicts regarding infrastructure and developments of the area in general, and one example where there were large scale protests against a wind mill project which, in the end, was never realized. The cabin owners represent a strong stakeholder group in the area, and wish to be consulted early in case of development plans.

The current uses of lake Tyin during winter is not affected by the regulation, but if pump storage and rapid water fluctuations become a reality, there is a need for better information and warning systems regarding the ice cover. As a consequence, ski/snowmobile tracks may be relocated to other safer areas. In case of pumped hydro-storage, the informants from the cabin owners and some of the NGO's think it is reasonable that the municipality or the power company (Hydro) carries some of the costs of maintaining good conditions in ski trails and snow clearance of the winter road as compensation measures.

6.5. Discussion of main results

As mentioned above Tyin is a qualitative, descriptive case study and findings from this study are consequently not statistically generalizable. Still, findings from a qualitative case study can provide insights with transferability to similar case studies. Few scientific studies have been undertaken on community acceptance of hydrobalancing projects locally except from Cohen et al. (2014) and Steffen (2012 mentioned in section 6.3. There are currently no reservoirs in Norway that to a great extent are used to provide balancing services for Europe. Tyin was therefore selected as an illustrative case to explore community acceptance as it has a hydropower reservoir with a large balance power potential (Solvang et al 2011) in addition to extensive user-interests locally. A comparative study of locations with actual hydrobalancing in other countries would have been preferable. Given the limitations of using an illustrative case, however, the findings from Tyin provide valuable insights on how to enhance community acceptance in future projects.

Firstly, in line with international research on other renewable energy technology projects (e.g., Cowell 2010; Pidgeon & Demski 2012; Ruud et al. 2011; Wüstenhagen et al. 2007; Aas et al 2014, Knudsen et al 2015) we found that the local and regional stakeholders in Tyin were critical of carrying the local impacts of moving towards more renewable energy globally. As argued by e.g. Devine-Wright (2009), Soini et al.(2011) and Wolsink (2013), we found that the local resistance amongst Tyin informants could not be reduced to selfish NIMBYism, but rather concerns for the local environment and biodiversity, negative impacts on business, recreation and transportation in the area, and safety issues related to rapidly fluctuating water levels.

In addition, this illustrates the importance of the 'need argument' used to legitimize renewable energy technology projects. When the need argument of a project focuses on diffuse benefits elsewhere with few local benefits, it will be challenging to build community acceptance (in line with e.g. Knudsen et al 2015;

Qvenild and Wold 2014). This is in line with studies grid infrastructure projects where the export argument might create opposition as well as in in the pump and storage development projects in Tyin where it is perceived that all costs are taken locally while the benefits are globally or nationally. This is obviously a challenge for grid or production projects that aims at providing hydrobalancing services – benefits that will not automatically be allocated to the local community. Much discussed measures to counterbalance non-existing or negative local impacts of renewable energy technology projects are various forms of local compensation but not necessarily monetary compensation (Cohen et al 2014; Steffen 2012). As 'hydrobalancing' projects will have few local benefits, community compensation could be a relevant measure to give something back to those carrying the negative impacts. Most of the Tyin respondents mentioned non-monetary compensation measures like local infrastructure, early warning system and a local development fund in line with Steffen (2012).

Secondly, in line with recommendations from studies of pumped hydro-storage projects specifically (Cohen et al. 2014; Steffen 2012) and renewable energy technology projects more generally (Gross, 2007; Zoellner etal.,2008; Wolsink) early involvement of local stakeholders and procedural justice is of vital importance to ensure community acceptance. Norway has a regulatory system where public consultation is ensured during the planning and licensing processes of renewable energy technology projects, studies still shows that local stakeholders feel ignored and unable to influence the decision-making process (e.g. Knudsen et al 2015, Qvenild and Wold 2014). Steffen (2012) argue that several companies in Germany have started with early involvement of communities in proposed pumped hydro-storage projects. Most of the Tyin informants emphasized the importance of early involvement, and if possible prior to the startup of the formal planning process.

To sum up, it may be difficult to completely avoid local resistance towards hydrobalancing projects. Nevertheless, our research from Tyin, in addition to other similar studies on grid projects for export purposes, indicates that measures such as community compensation and early involvement may sufficiently enhance community acceptance.

7. Summarizing conclusion

The present report has aimed at providing assessments of the drivers and barriers related to a further development of the hydrobalancing potential from Norway towards European countries. We will now summarize the main findings by starting by drivers and barriers at the EU level, and then move on to the regulatory challenges and socio-political acceptance on a national level. Finally, we summarize the concerns of the local stakeholders and possibilities for reducing local opposition towards potential projects.

7.1. Regulatory and political factors at the EU level

Throughout this report we have addressed several factors at the EU level which impact upon the interest and demand for Norwegian hydrobalancing services. This can be summarized in figure 4.

		Drivers	**Consequence**
EU	**Regulations**	RES Directive gives rice to increased intermittent renewable energy	Increased share of storage and balancing power
		European Price Coupling	Standardized and predictable renewable market at EU level
		Regulation on cross-border exchanges of electricity	Standardized grid codes?
		Connecting Europe Facility (CEF), EU Structural and Investment Funds, European Fund for Strategic Investment	Facilitate financial realization of PCI
		PCI-framework	Promotes interconnectors
	Strategies	Strategy for interconnectors	
		Strategy for a cross border electricity infrastructure	
	Political will	Transition towards an integrated energy system.	
			Bilateral agreements

Figure 4: Drivers and consequences at the EU level

As we see from the figure 4 above, most of the drivers are related to current EU regulations. The RES Directive has undoubtedly given rise to increased development of irregular renewable energy in Europe such as wind power which will require increased development of balancing capacity and storage preferably from renewable resources such as hydro power. Countries such as Germany, France and UK have recognized the need for securing the balancing power in the electricity system and have or are having concrete plans of implementing national capacity market mechanisms. It is however uncertain what implications this will have for Norway's potential for delivering balancing services unless a European capacity market is in place, a concern shared by several national stakeholders.

A main objective at the EU level is to create an integrated energy system both to meet energy security needs and the overall climate challenges. Policy instruments such as the European Price Coupling can enhance the realization of an integrated energy system through giving a more predictable and standardized market, a prerequisite for giving hydrobalancing services from Norway a market value.

As a part of the vision of creating an overall integrated energy system, the EU has already established several arenas and instruments to facilitate a more common, cross-border infrastructure for electricity which can provide hydrobalancing through interconnectors and related grids, from Norway. The scheduled interconnector between Norway and the UK was picked by the ENTOS-E to be a so called PCI. Hence, a new drive and more ambitious targets set at the EU could contribute favorably for the promotion of the necessary infrastructure for hydrobalancing from Norway.

In many ways the regulations, strategies and political will at the EU level may create favorable conditions for a Norwegian development of the necessary infrastructure and supporting policy instruments to facilitate hydrobalancing services. The EU energy policy is however unpredictable due to conflicting interests. Furthermore, the EU institutions do not have any supra-national mandate, thus the structuring of the national energy system and the mix of energy sources, is still entirely within the national sovereignty of each EU Member State. Moreover, since ACER is foreseen to play a more active role with a mandate to develop a European energy market, this can constitute a challenge of safeguarding Norway's interests as a non-member and thus with no formal influence or access to this arena.

Finally, the demands for Norwegian balancing services have to be present in the individual European countries. If such a demand exists there is also a possibility to develop more bilateral interconnector agreements. Several European countries are considering nationally based regulations for balancing which can give enough profit to develop hydrobalancing services from Norway.

7.2. Drivers and barriers at the Norwegian national level

As we have seen above, realizing hydrobalancing services from Norway will to a large extent depend on the EU development of a system for exchanging and valuing balancing services from renewable sources such as hydro power. In addition, the right drivers need to be in place on the Norwegian national level. Figure 5 provides an overview of the main drivers and barriers for realizing Norwegian hydrobalancing services towards Europe.

		Drivers	Barriers	Consequence
National	**Regulations**	Hydropower reservoirs	No clear statement or objective on the realization of the potential	Potential for value creation
			Lacking coordination of grid development and increased HP production	Need for reinforcement of onshore grid
		Permit processes grid and production development	Negative environmental and social consequences	Possible public opposition
	Strategies		No strategy on HB	-
	Political Will	Promoting interconnectors	HB not a high priority	-

Figure 5: Drivers and barriers at the national level

Norway has long traditions of developing and constructing hydropower dams with big potential for providing balancing services by either upgrading pump and storage plants or through increased effect

regulation. Importantly, a major national barrier is the lack of political strategies and necessary measures to realize hydrobalancing. Currently, there is no clear political statement or objectives stipulating the realization of such a potential. The number of drivers identified at the EU level is encouraging since most national stakeholders, and especially Norwegian MPs, seem to await EU developments before developing a clear national strategy on hydrobalancing. Still, the political realization of hydrobalancing development would be more realistic if more drivers existed at a national level (see figure 6 below).

Currently, the national grid is confronted with substantial needs for expansion and upgrading (Statnett, 2013). Furthermore, there are regional bottle-necks which need to be amended and a general challenge of coordinating the different plans and licensing processes relevant for the national grid with the various projects for the regional and local grids (Ruud & Knudsen, 2014). One major barrier is the lacking coordination of grid development and plans for how hydrobalancing projects could be feasible in practice, both on a regional, national and European levels.

While the Norwegian government has expressed positive signals towards permitting merchant interconnectors, no formal process has thus far been initiated (Sundvollen 2013). Furthermore, also in this document, the Government signals an ambition of identifying measures which can alleviate and shorten the time and resources employed in relation to interconnector projects, and the coordination between new energy production and grid development (ibid.). Politically, however, no amendments to this system have been proposed thus far in order to accommodate eventually more interconnector projects and a larger degree of hydrobalancing from Norway.

7.3. Socio-political acceptance at the national level

In light of a lacking coherent political strategy to realize the provision of Norwegian hydro balancing services from Norway to Europe, we have interviewed influential stakeholders at the national level to investigate how they perceive the future drivers and barriers of Norwegian balancing services. The response by the stakeholders enables us to say something about the general socio-political acceptance of the idea of hydrobalancing from Norway.

	Driver/mitigating measure	Barrier
Supporters(industry, Energy Norway, Zero and authorities and MPs)	Norwegian balancing services great potential for a green European energy mix	Green battery erroneous
	Environmental and social consequences in grid and production safeguarded in national regulations	Public acceptance of grid and production development
	Important to be connected to EU energy system – export opportunities	Balance with support of domestic energy industry
	EU RES targets	Grid infrastructure insufficient capacity and flexibility.
		Cable ownership
Sceptics (The Federation of Norwegian Industries and environmental NGOs)		Green battery erroneous
		Short travelled energy prioritized
		Unpredictable consequences for domestic energy consumption
		Grid infrastructure insufficient capacity and flexibility.
		Distribution of costs and benefits (esp. host communities)
		Environmental concerns (not outweighing climate benefits)

Figure 6: Drivers and barriers of hydrobalancing from Norway to Europe. National stakeholders' perceptions.

Figure 6 gives an overview of the main drivers and barriers as seen from the perspective of the interviewed stakeholders at the national level. According to their view points, we divided the informants into two "groups"; 'sceptics' and 'supporters for providing Norwegian hydrobalancing services to Europe. The supporters generally saw a great potential in developing Norwegian hydrobalancing for Europe, while emphasizing the domestic energy use and export in combination. Amongst the sceptics, the main concerns were increased electricity prices and/or environmental impacts of hydropeaking, pump storage and infrastructure development.

Both the 'sceptics' and the 'supporters' were in favor of the two planned interconnectors to Germany and UK, while further ambitions beyond these two cables were rather vague. Moreover, there was generally a sobriety amongst most of the informants concerning Norway's potential contribution towards meeting Europe's energy needs, and most had stopped using the metaphor of Norway as a "green battery".

The main barriers mentioned by the supporters against the realization of increased hydrobalancing from Norway were the national and regional grid infrastructure, the distribution of costs and benefits from future interconnectors and the lacking profitability of pump storage projects. The sceptics were divided into environmental NGOs that primarily focused on the possible environmental impacts of projects, and The Federation of Norwegian Industries which was concerned about energy prices and conditions for energy intensive industry. In addition, the absence of long term energy policies both on Norwegian and EU levels were emphasized as important barriers by both the sceptics and the supporters.

Since both onshore grid development and hydro power development projects (R/U or changed regulations concerning flow variation and water level in dams) are risking negative environmental and social consequences, there is a concern amongst several national stakeholders of increased public opposition if hydrobalancing services are to be developed fully in Norway. A related concern is the sharing of benefits which will not necessarily be of local or regional character but rather serve international climate change mitigation and national value creation, unless compensation towards host communities is ensured.

In sum, the national stakeholders, who potentially could influence the national policies on hydrobalancing, did not at a large scale demand such a development beyond the interconnectors that currently are realized. These findings are in line with other recent studies of stakeholder positions at a national level and low political feasibility (e.g. Gullberg 2013). Given the number of barriers, extensive hydrobalancing from Norway appears to be an unrealistic idea in the near future.

If several of the barriers are to be overcome and the socio-political acceptance increase, it is important to be aware of the difference between a societal acceptance at the national level, and the acceptance of specific projects in concrete local settings. We will now move on to summarize the most important findings on how community acceptance of hydrobalancing services may be achieved locally.

7.4. Community acceptance

	Driver/mitigating measure	Barrier
Local communities (local acceptance)	Measures with least impact	Visual impacts
	Measures with least impact	Environmental impacts
	Measures with least impact	Impacts on nature based tourism
	Improve/maintain local infrastructure (ski tracks, keeping roads open over the winter, maintaining boat piers, roads, internet access)	Impacts on ice cover; ski tracks, transport to cabins, boat traffic
	Measures with least impact	Impacts on fishing during summer
		Contaminated water
	Electronic warning system	Security issues
		Lower water level during summer cannot be accepted
	Higher electricity prices and added value on electricity prices, local development funds	Reduced electricity prices is less local income
	Early involvement and information about social and environmental consequences	General public opposition

Figure 7: Drivers and barriers of hydrobalancing from Norway to Europe. Community acceptance.

As we have seen in the local case study at Tyin, potential conflicts related to aesthetical, environmental and economic impacts may occur at the local level. We have argued that public opposition may be avoided or reduced by implementing collective compensating measures and ensuring the perception of a 'just' permit process. The stakeholders at the local level emphasize early involvement, least possible environmental impacts and collective compensation measures related to infrastructure and local development as important to ensure community acceptance.

7.5. Concluding remark

The barriers and drivers identified in the EU and national regulatory and political frameworks corresponds well with the drivers and barriers mentioned by the interviewed national stakeholders. The fact that there is a lacking overall strategy for the realization of increased hydrobalancing from Norway may be partly explained by the relatively low socio-political acceptance amongst key authorities and politicians at the national level. Unresolved energy policy at an EU level (e.g. needs for developing a common capacity mechanism) may further lead to modest socio-political acceptance in Norway until the necessary EU mechanism is implemented. Although regulations and policy frameworks might be in place to facilitate hydropower development, societal acceptance issues related to higher electricity prices and local opposition to concrete projects, are well-founded concerns as illustrated by the Tyin case and the energy-intensive industry.

Hence, in order to realize the hydrobalancing potential from Norway it is recommended to formulate a policy strategy which encompass and balance different societal interests – both at the national and local levels, as well as providing guidelines for the coordination of different plans, regulations and interests pertaining to the related water resource and grid development needs. Last, but not least, such a strategy must address the European context towards which Norwegian hydrobalancing services are to support; that is, both the political, market, societal and technological factors and trends which will impact upon Europe's need for balancing services from Norway.

References

Aas, Ø., P. Devine-Wright, T. Tangeland, S. Batel & A. Ruud (2014): 'Public beliefs about high-voltage powerlines in Norway, Sweden and the United Kingdom: A comparative survey', *Energy Research & Social Science* 2: 30-37.

ACER (2015): 'Market coupling', at the ACER website, accessible via: http://www.acer.europa.eu/Electricity/Regional_initiatives/Cross_Regional_Roadmaps/Pages/1.-Market-Coupling.aspx [downloaded, 20.04.15]

ADAPT Consulting AS (2014): 'Innspill til energimeldingen: Kraftutveksling med Europa mot 2050', oppdrag fra politisk samordningsgruppe for Regionplan Agder 2020.

Angell, S.I. & O.A. Brekke (2011): 'Fra kraft versus natur mot miljøvenleg energi? Norsk vasskraftpolitikk i eit hundreårsperspektiv', *UNI Rapport* 3-2011. Bergen: UNI Rokkansenteret.

Bache I. & M. Flinders (eds), 2004, *Multi-level Governance,* Oxford: Oxford University Press.

Bakken, M., S.H. Arnhøy, H. Moen & E. Wilhelmsen (2012): 'Kommer Norge på nett med Europa', *Zero Report,* Oslo: Zero (environmental foundation).

Batel, S. & P. Devine-Wright (2014): 'A critical and empirical analysis of the national-local 'gap' in public responses to large-scale energy infrastructures', *Journal of Environmental Planning and Management* 57, available at: http://www.tandfonline.com/action/showCitFormats?doi=10.1080/09640568.2014.914020 [Accessed on 18 December 2014]

Baxter, P. & S.Jack, (2008): 'Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. The Qualitative Report'. 13: 544-559.

Bjørndalen, J. (red.) (2011): 'Norge som leverandør av fornybar fleksibilitet. Kan Norge levere 10.000 MW fornybar elektrisitet til Europa?', utredningsrapport fra Thema Consulting Group og EC Group på oppdrag fra Energi Norge, Oslo: Thema Consulting Group and EC Group.

Brekke, O.A. & H.L. Sataøen (2012): 'Ekspertise, politikk eller dialog? Nettutvikling i Norge, Sverige og Storbritannia', *Rapport* 8/12, Bergen: UNI Rokkansenteret.

BundesVerband VindEnergi (2015): Wind power in Germany, available via https://www.wind-energie.de/en [Accessed on 10.04.15]

Burger, B. (2015): 'Stromerzeugung aus Solar- und Windenergie im Jahr 2014', *Presentation* provided by Prof. Dr. B. Burger, IS Fraunhofer, Freiburg, 07.01.15.

Catrinu, D., J.K. Knudsen & E. Solvang (2011): 'Perspectives on hydropower's role to balance non-regulated renewable power production in Northern Europe'. Report on the CEDREN workshop, Düsseldorf, 15-16 December 2010', *SINTEF Technical Report* TR A7107, Trondheim: SINTEF Energy Research AS.

Cohen, J. J., J. Reichl, & M. Schmidthaler (2014): 'Re-focusing research efforts on the public acceptance of energy infrastructure: A critical review', *Energy* 76: 4-9.

Cotton, M. & P. Devine-Wright (2013): 'Putting pylons into place: a UK case study of public perspectives on the impacts of high voltage overhead transmissionlines', *J. Environ. Plann. Manage* 56: 1225–1245.

Cowell, R. (2010): 'Wind power, landscape and strategic, spatial planning: the construction of acceptable locations in Wales'. *Land Use Policy* 27: 222–32.

Department of Energy and Climate Change (2015): 'Digest of United Kingdom energy statistics (DUKES)'. available via https://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes [Accessed on 10.04.15]

Devine-Wright, P. (2009): 'Rethinking NIMBYism: The role of place attachment and place identity in explaining place-protective action'. *Journal of Community & Applied Social Psychology* 19: 426-441.

Devine-Wright, P. & S. Batel (2013): 'Explaining public preferences for high voltage pylon designs: An empirical study of perceived fit in a rural landscape', *Land Use Policy* 31: 640-649.

Devine-Wright, P., H. Devine-Wright, & F. Sherry-Brennan (2010): 'Visibletechnologies, invisible organizations: an empirical study of public beliefs aboutelectricity supply networks'. *Energy Policy* 38: 4127–4134

Devine-Wright, P. & Y. Howes (2010): 'Disruption to place attachment and the protection of restorative environments: A wind energy case study'. *Journal of Environmental Psychology* 30: 271–280.

Egeland, H. & G.B. Jacobsen (2011): 'Kraften i vannet. En anlyse av hvordan ulike miljømål veies opp mot ulike økonomiske, sosiale og miljømessige interesser i to vannkraftcase', *SINTEF Report* TR A7127, Trondheim: SINTEF Energy Research.

Egeland, H. & G.B. Jacobsen (2012): 'Kampen om kunnskapsgrunnlaget. En analyse av prosessen knyttet til endring av manøvreringsreglementet i Suldalslågen', *SINTEF Report* TR A7222. Trondheim: SINTEF Energy Research.

Egeland, H. & G.B. Jacobsen (2013): 'EUs evaluering av implementeringen av vanndirektivet. Hva er 'godt nok'?', *SINTEF Report* TR A7308. Trondheim: SINTEF Energy Research.

Eikeland, P.O. (2012): 'EU Policy Integration – Stakeholders, Institutions and Issue-linkages', *FNI Report* 13/2012, Lysaker: The Fridtjof Nansen Institute.
Eikeland, P.O. (2008): 'EU Internal Energy Market Policy. New Dynamics in the Brussels Policy Game?', *FNI Report* 14/2008, Lysaker: The Fridtjof Nansen Institute.

ENDS Europe Daily (2014a): 'EU leaders set 2030 climate, energy targets', ENDS online, [internet] 24 Oct. 2014. Available at: http://www.endseuropedaily.com/articles [Accessed on 31 October 2014].

ENDS Europe Daily (2014b): 'UK capacity scheme to subsidise gas, nuclear, coal', News article, 19 Dec. 2014, accessible via http://www.endseurope.com/38495/uk-capacity-scheme-to-subsidise-gas-nuclear-coal?referrer=search [downloaded 13 April 2015]

ENDS Europe Daily (2015a): 'Brussels promises robust energy union governance', accessible at http://www.endseurope.com/39597/brussels-promises-robust-energy-union-governance?referrer=bulletin&DCMP=EMC-ENDS-EUROPE-DAILY [downloaded 16 March 2015]

ENDS Europe Daily (2015b): 'French Senate weakens energy transition law', accessible at ht http://www.endseurope.com/39759/french-senate-weakens-energy-transition-law?referrer=search [downloaded 10 April 2015]

Energi21 (2014): *Strategi 2014. Najonal strategi for forskning, utvikling, demonstrasjon og kommersialisering av energiteknologi*. Oslo, 2014

ENTSO-E (2014): 'Regional Investment Plan 2014 North Sea Region - Report to be improved based on the stakeholders' comments after the public consultation Consultation period: 10 July – 20 September' – RGNS 10/ 7/ 2014 (RIP 2014).

EurObserver (2013): 'PV Barometer', Brussels: EurObserver, April 2013.

Europalov (2015): 'Etablering av et byrå for europeisk samarbeid mellom energiregulatorer', accessible at http://europalov.no/rettsakt/etablering-av-et-byra-for-for-europeisk-samarbeid-mellom-energiregulatorer/id-384, [downloaded on 16 March 2015]

European Commission (2007a): 'An Energy Policy for Europe'. COM(2007)1 final. Brussels, 10 Jan 2007: Commission of the European Communities (CEC).

European Commission (2007b): 'COM(2007) 723 final. A European Strategic Energy Technology Plan (SET-PLAN) – towards a Low Carbon Future', Brussels: The European Commission.

European Commission (2008a): 'COM(2008) 781 final. Second Strategic Energy Review. An EU Energy security and solidarity action plan', Brussels: European Commission.

European Commission (2008b): 'Climate change: Commission welcomes final adoption of Europe's climate and energy package', *Press Release,* 17 Dec 2008, Brussels: The European Commission.

European Commission (2010a): COM(2010) 203 final 'On the implementation of the Trans-European Networks in the period 2007-09', Brussels: European Commission.

European Commission (2010b): COM(2010) 677 final 'Energy infrastructure priorities for 2020 and beyond - A Blueprint for an integrated European energy network', Brussels: European Commission.

European Commission (2011): 'Energy Roadmap 2050', COM(2011) 885 final, Communication from the European Commission, Brussels: European Commission.

European Commission (2012): *A Blueprint to Safeguard Europe's Water Resources*. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. COM (2012) 673 final, Brussels.

European Commission (2013a): COM(2013) 711 final 'Long term infrastructure vision for Europe and beyond', Brussels: European Commission

European Commission (2013b): Streamlining environmental assessment procedures for energy infrastructure Projects of Common Interest (PCIs), available at: http://ec.europa.eu/energy/infrastructure/doc/assessment/20130919_pci-en-guidance.pdf

European Commission (2013c): 'COM(2013) 253 final. Energy Technologies and Innovation', Brussels: European Commission.

European Commission (2014a): 'COM(2014) 15 final. A policy framework for climate and energy in the period from 2020 to 2030', Brussels: European Commission.

European Commission (2014b): ' Energy: EU invests €647 million in key energy infrastructure', *Press Release,* Brussels, 29 Oct. 2014.

European Commission (2014c): ' State aid: Commission authorises UK Capacity Market electricity generation scheme', *Press Release,* Brussels, 23 July 2014.

European Commission (2015a): COM(2015) 80 final 'Energy Union Package: A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy', Brussels: The European Commission.

European Commission (2015b): COM(2015) 82 final 'Achieving the 10 % electricity interconnection target. Making Europe's electricity grid fit for 2020', Brussels: The European Commission.

European Union (2000): 'Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy', ***in*** Official Journal of the European Communities, 22 Dec. 2000, L 327/1.

European Union (2009a): 'Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC', in *Official Journal of the European Communities*, 5 June 2009, L 140/16.

European Union (2009b): 'Regulation EC No. 713/2009 on establishing an Agency for the Cooperation of Energy Regulators', *Official journal of the European Union* L 211/1.

European Union (2013): 'Regulation (EU) No. 347/2013 on guidelines for trans-European energy infrastructure (TEN-E Regulation)', of 17 April 2013.

Flyvbjerg, B. (2006): 'Five misunderstandings about case–study research'. *Qualitative Inquiry* 12: **219–245.**

French Ministry of Energy (2015): 'Règle du mécanisme de capacité', Regulation of national capacity mechanism.

Gross, C. (2007): 'Community perspectives of wind energy in Australia: the application of a justice and community fairness framework to increase social acceptance'. *Energy Policy* 35: 2727–2736.
Gullberg, A.T. (2013): 'The political feasibility of Norway as the 'green battery' of Europe', *Energy Policy* 57: 615-623.

Gullberg, A.T., D. Ohlhorst & M. Schreurs (2014): 'Towards a low carbon energy future – Renewable energy cooperation between Germany and Norway', *Renewable Energy* 68 (2014): 216-222.

Hooghe, L. & D. Marks (2003): 'Unraveling the Central State, but How? Types of Multilevel Governance'. *American Political Science Review,* 97: 233-243.

Horst, V. D. D. (2007): 'NIMBY or not? Exploring the relevance of location and the politics of voiced opinions in renewable energy siting controversies'. *Energy Policy* 35: 2705-2714.
International Energy Agency (IEA) (2014): *Energy Policies of IEA Countries. The Netherlands 2014 Review,* Paris: IEA.

Jevnaker, T. (2012): 'An Electric Mandate. The EU procedure for harmonising cross-border network codes for electricity', *FNI Report* 18/2012, Lysaker: The Fridtjof Nansen Institute.
Jordan, A. & A. Lenschow (2010): 'Environmental policy integration: a state of the art review, *Environmental Policy and Governance* 20: 147-158.

Kirsten, S. (2014): 'Renewable Energy Sources Act and Trading of Emission Certificates: A national and a supranational tool direct energy turnover to renewable electricity supply in Germany', *Energy Policy* 64 (2014): 302-312.

Knudsen J., O.M. Larsen & A. Ruud (2008): 'Norway: Trying to maintain maximum RES-E in a petroleum driven economy', in W.M. Lafferty & A. Ruud (eds), *Promoting Sustainable Electricity in Europe: Challenging the Path Dependency of Dominant Energy Systems,* Cheltenham UK: Edward Elgar: 250-278.

Knudsen, Jørgen K. & A. Ruud (2011b): 'Changing currents in Norwegian hydropower governance? The challenge of reconciling conflicting interests', *SINTEF Technical Report* TR A7111, Trondheim: SINTEF Energy Research AS.

Knudsen, J.K., H. Egeland, G. Jacobsen & A. Ruud (2013): 'Norsk vannkraft og "den doble miljøutfordringen"' (Norwegian hydropower management and" the dual environmental challenge" – *in Norwegian)*, *Kart og Plan,* 73(5): 345-354.

Knudsen, J.K., G.B. Jacobsen & J.J. Haug (2015): 'Towards a Meshed North Sea Grid. Policy challenges and potential solutions from a Norwegian perspective', *SINTEF Report* TR A7478, Trondheim: SINTEF Energy Research.

Knudsen, J.K., L.C. Wold, Ø. Aas, J.J.K. Haug, S. Batel, P. Devine-Wright, M. Qvenild & G. Jacobsen (2015): 'Local perceptions of opportunities for engagement and procedural justice in electricity transmission line projects in Norway and the UK'. *Land Use Policy* 48: 299-308.

Lafferty W.M. & A. Ruud (eds) (2008): *Promoting Sustainable Electricity in Europe: Challenging the Path Dependency of Dominant Energy Systems,* Cheltenham UK: Edward Elgar.

Lang, M. (2014): 'Green Paper: An Electricity Market for the Energiewende – the Capacity Market Discussion Paper by German Energy Ministry', *German Energy Blog*, available via http://www.germanenergyblog.de, [Accessed on 11.02.15].

Matlary, J.H. (1997): *Energy Policy and the European Union.* Basingstoke: Macmillan.

Merriam, S.B. (1998): *'Qualitative research and case study applications in education'*. San Francisco: Jossey-Bass.

Ministry of Petroleum and Energy (2015a): 'Enighet om endringer i elsertifikatavtalen' ('Agreement on changes in the accord concerning the el-certicate scheme' – in Norwegian), *Press Release,* Oslo, 13 March 2015.

Ministry of Petroleum and Energy (2015b): *Fakta 2015. Energi og vannressurser i Norge,* Oslo: Olje- og energidepartmentet.

Ministry of Petroleum and Energy (2014a): Document on the decision of licensing interconnectors between Norway and Germany, and the UK, Oslo: Olje- og energidepartmentet.

Ministry of Petroleum and Energy (2014b): 'Møtte Tysklands energiminister', *Press release,* 28 March 2014. Oslo: Ministry of Petroleum and Energy.

Ministry of Petroleum and Energy (2014c): 'Tilleggshøring. Forslag til endringer i energiloven (gjennomføring av Europaparlaments- og rådsdirektiv 2009/72/EF – tredje elmarkedsdirektiv', 19 Dec. 2014. Oslo: Ministry of Petroleum and Energy.

Ministry of Petroleum and Energy (2012a): Meld. St. 14 (2011-12) 'Vi bygger landet – om utbygging av strømnettet', (White paper on national grid development – in Norwegian), Oslo: Olje- og energidepartementet.

Ministry of Petroleum and Energy (2012b): 'Prop. 1S (2012-13)' (state budget document from the MoPE), Oslo: Olje- og energidepartementet.

Ministry of Petroleum and Energy (2008): *Fakta 2008. Energi- og vassdragsvirksomheten i Norge* (Facts 2008: The Energy Sector and Water Resources in Norway – in Norwegian), Oslo: Ministry of Petroleum and Energy.

National RES Action Plan France (2010): National action plan in accordance with 'Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC'.

National RES Action Plan Germany (2010): National action plan in accordance with 'Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC'
National RES Action Plan the Netherlands (2010): National action plan in accordance with 'Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC'

National RES Action Plan the United Kingdom (2010): National action plan in accordance with 'Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC'

Nilsson, M., T. Zamparutti, J. E. Petersen, B. Nykvist, P. Rudberg & J. McGuinn (2012): 'Understanding Policy Coherence: Analytical Framework and Examples of Sector-Environment Policy Interactions in the EU'. *Environmental Policy and Governance* 22: 395-423.

Norway's EU Delegation (2015a): 'Rapport: Dette er energiunionen', accessible at https://www.regjeringen.no/nb/aktuelt/eu-satsar-pa-mellomlandskablar/id2398417/, [downloaded on 16 March 2015]

Norway's EU Delegation (2015b): 'Energiunionen – melding om 10 prosent mellomlandskablar', accessible at https://www.regjeringen.no/nb/aktuelt/eu-satsar-pa-mellomlandskablar/id2398417/ , [downloaded on 16 March 2015]

Norwegian Government (2014): Letter from the Norwegian Prime Minister to the President of the European Council expressing Norway's views on the climate-energy policy framework of the EU', Oslo, 19.03.14: The Office of the Prime Minister.

Norwegian Government (2015): 'Norway's preliminary views on the Energy Union' Non paper, Oslo, 06.02.15, Oslo: Ministry of Petroleum and Energy.

NOU (2012a): 'Energiutredningen – verdiskaping, forsyningssikkerhet og miljø. Utredning fra et utvalg oppnevnt ved kongelig resolusjon av 4. mars 2011 Avgitt til Olje- og energidepartementet 5. mars 2012', *NOU Norges offentlige utredninger* 2012: 9, Oslo: Departementenes servicesenter Informasjonsforvaltning.

NOU (2012b): 'Utenfor og innenfor. Norges avtaler med EU', Utredning fra et utvalg oppnevnt ved 7. januar 2010 av Utenriksdepartementet, rapport avgitt Utenriksdepartementet 17. januar 2012, *NOU Norges offentlige utredninger* 2012: 2, Oslo: Departementenes servicesenter Informasjonsforvaltning.

NVE (2010): 'Retningslinjer of rrevisjon av konsesjonsvilkår for vannkraftverk – til bruk for hovedaktørene i en revisjonsprosess (kravstillere, konsesjonærer og NVE), oppdatert 28.08.10, Oslo: Norwegian Water Resources and Energy Directorate (NVE).

Persson Å. (2007): 'Different Perspectives on EPI", in M. Nilsson & K. Eckerberg (eds), *Environmental Policy Integration in Practice. Shaping Institutions for Learning,* London: Earthscan, pp. 25-48.

Pidgeon, N. & C. Demski (2012): 'From nuclear to renewable: energy systems transformation and public attitudes'. *Bulletin of Atomic Science* 68: 1–12.

Pierre, J. & B.G. Peters (2005): *Governing Complex Societies. Trajectories and Scenarios,* Basingstoke: Palgrave Macmillan.

Qvenild, M. & L.C. Wold (2014): SusGrid (Sustainable Grid Development): Lokale, regionale og nasjonale aktørers opplevelse av nettutviklingsprosesser. [Local, regional and national stakeholders experiences of grid development processes] NINA Rapport 1085, Lillehammer: NINA

Renewable UK (2015): 'Data and figures on UK renewable energy production', available via; http://www.renewableuk.com/en/renewable-energy/wind-energy/uk-wind-energy-database/ [Accessed on 10.04.15]

RTE (2014): 'Mécanisme de capacité. Rapport d'accompagnement de la proposition de règles', La Défense: RTE.

Ruud, A. & H. P. Fjeldstad (2015): 'Vannforskriften og norsk vannkraftproduksjon. Kan miljødesign og funksjonsmål gi bedre planprosesser?' *Tidsskriftet Vann* 02: 152-162

Ruud, A. & J.K. Knudsen (2014): 'Veier til styrket forankring og aksept av det glemte regionalnettet', *SINTEF Report* TR A7445, Trondheim: SINTEF Energy Research.

Ruud, A., J.J. Kielland Haug & W.M. Lafferty (2011a): 'Case Hardanger: The application for an overhead transmission line. An assessment of the licensing process and the media coverage', *SINTEF Report* TR A7093, Trondheim: SINTEF Energy Research.

Ruud, A., H. Egeland, G.B. Jacobsen, J.K. Knudsen, W.M. Lafferty (2011b): 'Channelling Norwegian hydropower towards greener currents: The challenge of conflicting environmental concerns?', *Research paper* for the World Renewable Energy Congress 2011 – Sweden Policies for renewable energies, 8-11 May 2011, Linköping, Sweden.

Ruud, A., J. K. Knudsen & G. B. Jacobsen (2011c): 'Energy for Climate in Europe. An assessment of energy policies with climate-relevance within the EU/EEA', *SINTEF Technical Report* TR A7066, Trondheim: SINTEF Energy Research AS.

Ruud, A. & J. K. Knudsen (2009): 'Renewable energy policy making in the EU: What has been the role of Norwegian stakeholders?', *Teknisk Rapport* TR A6860, Trondheim: SINTEF Energy Research AS.
Sachverständingenrat für Umweltfragen (SRU) (2011): *Wege zur 100 % erneuerbaren Stromversorgung. Sondergutachten,* Berlin: Erich Schmidt Verlag.

Sataøen, H., O.A. Brekke, S. Batel & M. Albrecht (2015): 'Towards a Sustainable Grid Development Regime? A comparison of British, Norwegian and Swedish grid development', accepted for publishing in *Energy Research and Social Science,* Special Issue on Smart grids and the social sciences.

Schweizer-Ries, P. (2010): 'Environmental-psychological study of the acceptanceof measures for integrating renewable energies into the grid in theWahle-Mecklar region (Lower Saxony and Hesse) ', ForschungruppeUmweltpsychologie.

Shenton, A.K. (2004): 'Strategies for ensuring trustworthiness in qualitative research projects'. *Education for Information* 22: 63-75.

Skjærseth, J.B. (2013): 'Unpacking the EU Climate and Energy Package. Causes, Content and Consequences', FNI Report 2/2013, Polhøgda: Fridtjof Nansen Institute.

Smith, A. (2007): 'Emerging in between: The multi-level governance of renewable energy in the English regions', in *Energy Policy* 35: 6266-6280.

Solvang, E., J. Charmasson, J. Sauterleute, A. Harby, Å. Killingtveit, H. Egeland, O. Andersen, A. Ruud and Ø. Aas (2015): 'Norwegian hydropower for large-scale electricity balancing needs. Technical, environmental and social needs', *SINTEF Report* TR A7227, Trondheim: SINTEF Energy Research.

Soini, K., E. Pouta, M .Salmiovirta, M. Uusitalo, & T. Kivinen (2011): 'Local residents' perceptions of energy landscape: The case of transmission lines'. *Land Use Policy* 28: 294-305.

Steffen B. (2012): 'Prospects for pumped-hydro storage in Germany'. *Energy Policy* 45: 420-429.

Statnett. 2015. Nettutviklingplan 2015. Tilgjengelig på: http://www.statnett.no/Nettutvikling/Last-ned-Nettutviklingsplan-2015/

St.meld. 37 (2000-01): On hydropower and the power balance (in Norwegian), Oslo: Ministry of Petroleum and Energy (MoPE) (White Paper).
Statnett (2013): *Nettutviklingsplan* ('NUP') (National grid development plan – in Norwegian), Oslo: Statnett.

Stortingets EU/EØS-nytt (2013): 'Norsk deltakelse i energibyrået ACER på høring', accessible at https://www.stortinget.no/no/Hva-skjer-pa-Stortinget/EU-EOS-informasjon/EU-EOS-nytt/2013/EUEOS-nytt---25-september-2013/ [downloaded on 16 March 2015]

Sundvollen (2013): 'Politisk plattform for en regjering utgått av Høyre og Fremskrittspartiet, (*Political platform document for the acting Norwegian Goverment – in Norwegian).*

Sweco (2014): 'Capacity Markets in Europe: Impacts on Trade and Investments', a Sweco Multiclient Study, Stockholm: Sweco.

Tennbakk, B., B. Jordfald & G. Veland (2010): 'Kraft og kabler. Foredling og fordeling', *Fafo-notat* 2010: 19, Oslo: Fafo.

Thaulow, H., N. Arge & K. Haagensen (2007): 'Barrierer og muligheter for opprusting og utvidelse av vannkraftverk', *NIVA Rapport* LNR-5483 2007, Oslo: Norwegian Institute for Water Research (NIVA).

Thema Consulting Group (2012): 'Fornybarutbygging og mellomlandsforbindelser mot 2020', *Thema Rapport* 2012-05, på oppdrag fra BKK, Lyse Energi, Agder Energi, Statkraft og Vattenfall, Oslo: Thema Consulting Group.

Vedung E. (2004): '*Public Policy and Program Evaluation',* New Brunswick US: Transaction Publishers.

Wind Power net (2015a): 'Wind power in France', available via: http://www.thewindpower.net/country_en_1_france.php [Accessed on 10.04.15]

Wind Power net (2015b): 'Wind power in the Netherlands', available via: http://www.thewindpower.net/country_en_1_netherlands.php [Accessed on 10.04.15]

Wolsink, M. (2007): 'Planning of renewables schemes: deliberative and fair decisionmaking on landscape issues instead of reproachful accusations of non-cooperation'. *Energy Policy* 35: 692-704.

Wolsink, M. (2012): 'The research agenda on social acceptance of distributed generation in smart grids: Renewable as common pool resources'. *Renewable and Sustainable Energy Reviews* 16: 822-835.

Wolsink, M. (2013):'The next phase in social acceptance of renewable innovation'.*EDI Q*. 5:10–13.

Wüstenhagen, R., M.Wolsink, M.J Bürer (2007): Social acceptance of renewableenergy innovation: an introduction to the concept'. *Energy Policy* 35: 2683-2691.

Yin, R. K. (2003): '*Case study research: Design and methods*' (3rd ed.). Thousand Oaks, CA: Sage.

Zoellner, J., P. Schweizer-Ries, C.Wemheuer, 2008. Public acceptance of renewable energies: results from case studies in Germany. *Energy Policy* 36: 4136–4141.

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