Risk Analysis and Recommendations on EURELECTRIC's Power Choices Study

Chapter on Liquidity Risk – Definition of Liquidity Risk

A EURELECTRIC report

January 2013

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Dépôt légal: D/2013/12.105/2

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Chapter on Liquidity Risk – Definition of Liquidity Risk

TF Liquidity Risk
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I. Foreword

On 10 November 2009, EURELECTRIC presented its flagship roadmap entitled *"Power Choices Study: Pathways to Carbon Neutral Electricity in Europe by 2050"*. This followed a declaration – earlier in the year – signed by sixty-one European electricity company CEOs in which they expressed their commitment to achieve a carbon-neutral power supply by 2050.

The purpose of the two scenarios developed by the study was to examine how this vision can become reality. The ***Baseline* scenario** assumes all existing energy policies are followed and could be referred to as a "business as usual scenario". The ***Power Choices* scenario** however sets a 75% CO_2 reduction target across the entire EU economy to be achieved domestically – equivalent to some 80-90% when offsets are included, as in the official EU targets – and aims for an optimal power generation portfolio based on an integrated energy market.

The study shows the positive outcomes for economy, society and the environment which result from making the correct power choices on both the supply and demand side of the energy equation. Accordingly, EURELECTRIC calls on EU and national policymakers to take strong and immediate political action in order to create the framework for achieving a low-carbon future, at reasonable cost to the economy, without jeopardising energy supply security.

To complement the identification of barriers that could jeopardise the fulfilment of the *Power Choices* scenario, EURELECTRIC's Focus Group Enterprise Risk Management (FG ERM)has undertaken a risk analysis (including a quantitative assessment) on the results of the *Power Choices* scenario with a view to making appropriate policy recommendations. The purpose of this report is therefore to apply a risk analysis on EURELECTRIC's *Power Choices* Study highlighting management issues that should be addressed in order to secure the financial viability of the required investments and reduce the cost burden for the power sector.

Indeed, after more than a decade of liberalisation, risks with increasing complexity– such as market, credit and liquidity risks – are playing an increasing relevant role in the power sector. It must be noted that risks are inherent to every competitive business and volatility does usually represents a healthy indicator of demand-supply balance in a free market. At the same time, it must be also recognised that these risks represent a cost for power companies which in turn also impact investment decisions.

The aim is clearly not to avoid or eliminate risks in the electricity markets but rather to spot and reduce distortive effects which could distort price signals. In particular, EURELECTRIC FG ERM members, while believing that most risk can be adequately managed by professional risk management, are of the view that it is important that risk related to market distortions are reduced. Reducing those regulatory risks and distortions can help in reducing overall system costs which, all other things being equal, would translate into potential savings for customers, and in supporting the financial viability of new investments in the current capital intensive phase.

On this background, FG ERM members have identified five areas of interest for further investigation:

- Market volatility derived from oil and CO_2 price

- Counterparty risk (volume risk & credit risk)
- Liquidity & capital cost risk
- Regulatory risk
- Technology risk

While the drafting of the overall report on *Risk analysis and recommendations on EURELECTRIC's Power Choices Study* is still underway, the two first chapters on market volatility risk and counterparty risks were published in January 2012.

Background to EURELECTRIC's *Power Choices* Study

Power Choices: Pathways to Carbon-Neutral Electricity in Europe by 2050 is a EURELECTRIC study carried out in conjunction with Athens Technical University and VGB PowerTech.

Following a declaration signed in March 2009 by the chief executives of power companies representing over 70% of total electricity production in the EU, who made a commitment to a carbon-neutral power sector by mid-century, the EURELECTRIC *Power Choices* study was set up to examine how this vision can become reality. It uses the PRIMES energy model developed and run by a team at Athens Technical University under Professor Pantelis Capros, which is also used by the European Commission for its energy scenario work, to examine scenarios to 2050. Power plant association VGB Powertech provided plant investment and generation input data for the modelling.

The Two Scenarios

The study develops two distinct scenarios for the EU-27 countries during the 1990-2050 period.

The *Baseline* scenario assumes all existing energy policies are followed. This means inter alia that the current EU targets for reducing CO_2 emissions are pursued beyond 2020, nuclear energy is phased out in those countries currently envisaging such a move, and electricity does not become a major transport fuel in the period to 2050.

The *Power Choices* scenario sets a 75% CO_2 reduction target across the entire EU economy to be achieved domestically – equivalent to some 80-90% when offsets are included, as in the official EU targets – and aims for an optimal power generation portfolio based on an integrated energy market. In this scenario, policymakers make climate action a priority and an international carbon market defines the price of CO_2, which applies uniformly to all economic sectors ensuring that all sectors internalise the cost of the greenhouse gases they emit. Energy efficiency also becomes a top priority and is pushed by specific policies and standards on the demand side, which results in lower overall energy demand. In contrast to the *Baseline* scenario, electricity becomes a major transport fuel as plug-in hybrid and electric cars are broadly rolled out.

The *Power Choices* scenario sees electricity claim a greater share of total energy consumption, as the energy-efficiency drive squeezes out less efficient vectors. However total EU power generation reaches a level not much greater than under *Baseline*, rising by around 50% from some 3,100 TWh in 2005 to around 4,800 TWh in 2050.

The optimal power generation portfolio developed under this scenario sees power production from renewable energy sources (RES) increase dramatically and becoming – despite a phase-out of national subsidy schemes by 2030 – the greatest single source of power at 40% of total EU generation. Among RES technologies, wind power takes the lead, with on-shore wind providing 35% of the RES contribution and off-shore wind 27%. Hydropower remains stable throughout the period, accounting for 23% of the RES total. Biomass-fired electricity also sees a substantial increase, although in relative terms its share of RES power slightly decreases, while solar power also enters the picture. Nuclear power reaches 28% of total net power generation in 2050. Electricity from solid fuels also increases from 2025, due to deployment of carbon capture and storage (CCS) technology, and reaches a share of 16%. Gas-fired power reaches its peak in 2040, followed by a slight decline as gas and carbon prices rise and CCS also becomes necessary for gas-fired plants. It stabilises at 750 TWh in 2050, representing 14% of total EU electricity. In this scenario, oil-fired plants have only a marginal role, with production progressively reducing over time and reaching 1% of total production in 2050.

With this power mix, the electricity industry achieves a major reduction in CO_2 emissions from 2025 to 2040. While policy action under *Baseline* reduces sector CO_2 emissions by 66%, still leaving 750 Mt CO_2 emitted in 2050, *Power Choices* sees CO_2 emissions plummet by 90% versus the 2005 level, from 1,423 Mt to just 150 Mt in 2050.

This means that, taking as an example a typical large-size lignite-fired plant of 1,250 MW capacity, with average emissions of 0.955 tonnes of CO_2 per MWh electricity produced, and assuming an average base-load operation of 7,500 hours per year, the entire European power sector would emit in 2050 the equivalent 2009 emissions of roughly only one single power plant for every two EU member states.

This brings the industry close to carbon-free electricity. To achieve credible carbon-neutrality it is essential to calculate sector emissions accurately in a transparent manner, reduce emissions to the fullest extent feasible within the sector, then offset residual emissions through actions to reduce greenhouse gases elsewhere – via technology transfer, afforestation, etc. – such that net carbon emissions are equivalent to zero.

The *Power Choices* scenario also shows primary energy consumption across the economy to 2050 falling 20% on *Baseline*. The major part of this reduction is accounted for by considerably lower demand in the transport and residential sectors, much of this trend being due to substitution by electricity of relatively inefficient uses of oil and gas in road transport and household heating. A significant role is also played by much improved building insulation, plus efficiency advances in existing electrical applications.

The *Power Choices* scenario also delivers a major reduction in import dependency – a reduction of 40% in net energy imports compared to *Baseline*. This reduction in primary energy demand translates into an even steeper decrease in final energy consumption, a saving of 30% on *Baseline*. The *Power Choices* scenario delivers a significant part of the reduction in final energy consumption through a shift towards electric applications.

Finally, the *Power Choices* scenario sees overall energy cost in the economy decreasing from just under 10.5% in 2010 to just below 10% of GDP in 2050.

Policy Recommendations

The study shows the positive outcomes for economy, society and the environment which result from making the correct power choices on both the supply and demand side of the energy equation. Accordingly, EURELECTRIC calls on EU and national policymakers to take strong and immediate political action in order to create the framework for achieving a low-carbon future, at reasonable cost to the economy, without jeopardising energy supply security.

Policymakers must support the carbon market so as to deliver the EU CO_2 cap at least cost, ensure that all sectors internalise the cost of their greenhouse gas emissions, and – since the global challenge of climate change requires a global solution – actively promote an international agreement on climate change.

They must also enable the use by the market of all low-carbon technology options: renewable energy (RES), carbon capture and storage (CCS) technologies, new nuclear power plants, plus ‘smart’ networks. If the necessary capacity is to be constructed, they must also encourage public acceptance of modern energy infrastructure and CO_2-storage sites, and take action to streamline their licensing procedures.

However, energy efficiency will be the major driver for the carbon-neutral Europe of tomorrow, the study indicates. Public authorities must therefore take a leading role in energy efficiency, adopting standards and incentives to help consumers choose energy-efficient technologies in their domestic appliances, heating and cooling, and road transport.

II. Common Definition of Liquidity Risk

1 Definition

1.1 Foreword

Liquidity Risk is the risk that a company becomes unable to fully and timely settle obligations, or is able to meet them only at uneconomic conditions, due to difficulty or inability in raising funds (funding liquidity) or disposing assets on the market (asset liquidity). This document will focus on the funding liquidity.

1.2 General Definition

Broadly speaking, there are two main categories of liquidity risk: funding liquidity risk and asset liquidity risk. The first relates to the ability of an entity to access funding sources to face its own obligations, the latter relates to the ability of an entity to sell an asset on the market at its fair value. Though the two concepts may overlap to some extent, this document is primarily focused on the funding liquidity risk.

1.3 The impacts of financial crisis and the increase of systemic liquidity risk

As a consequence of the financial crisis, financial institutions started to experience what is called a “credit crunch”, i.e. a significant drop in the volumes of the lending activity: therefore, it turned out to be increasingly important for corporations to assess their dependency on the banking sector and mitigate their vulnerability to possible situations of liquidity tensions.

In the initial phase of the crisis, industrial firms started to look for treasury and risk management strategies aimed at ensuring the unconditional availability of resources, as an effective response to firm-specific liquidity tension; the most widespread instruments with this regard are committed credit lines provided by a single bank (bilateral) or a pool of counterparties (multilateral). Commitment (or non-utilization) fees started then to represent a non-negligible portion of the costs of funding (though, strictly speaking, they represent a cost of liquidity), in most cases around a few tens of basis points p.a.

After the spillover of the crisis from the banking sector to the sovereign bond market, questions that corporates started to ask themselves were increasingly related to hedging of systemic risks, such as the default of one or more governments, the possible exit of one or more countries from the Euro area, and even the possible complete break-up of the European single currency. With this regard, the degree of uncertainty surrounding the identification of possible scenarios is very high and finding mitigation actions is all but intuitive. Nevertheless, some corporates have been trying to define contingency plans and started to implement related managerial actions, trying to hedge, for example, the political risk of Euro break-up (comprising counterparty risk, liquidity risk and foreign exchange rate risk). As the cost of some of these strategies could be of a different order of magnitude (hundreds of basis points) in terms of cost of carry, questions arise about whether it is reasonable to affirm that the utility sector (as the other non-financial sectors) should bear the cost of hedging such systemic liquidity risk, which finally stems from a potential failure of another sector

– the failure of the financial sector – to ensure availability of enough liquidity in a prolonged and structural way.

1.4 Sources of Risk

It should be remarked that European energy utilities, facing financial constraints, are also being required or expected to implement ambitious investment plans mainly driven by government action on carbon neutrality. All these investments need to be financed and might decrease a company's financial strength (e.g. increasing gearing) or might prove difficult to implement, given the present liquidity constraints.

Liquidity risk can have different sources. It could be systemic or firm specific. In this paragraph we summarize the main sources of liquidity risk for non-financial companies, with particular reference to the present financial constraints.

- **Systemic liquidity risk sources**

    - **General market or banking system liquidity crisis (credit crunch):**

      Because of lack of trust and/or a crisis within the financial markets banks stop lending money among themselves or to corporates. If money is lent to corporates under such market condition the relatively high costs of funding do not only reflect the credit risk related to a specific counterparty, but do also include systemic risk costs related to the financial markets.
      Moreover, due to tighter banking regulations financial institutions have to increase their equity base leading to less capital available for the private sector in forms of loans and other investments.

    - **Sovereign debt crisis**

      In case of a severe sovereign debt crisis there might be government intervention that can inhibit the withdrawal of funds (so called deposit freeze).

      Also, austerity measures putted in place by countries in difficulties, impact negatively the cash flow generation of utilities, through changes in regulation in order to reduce tariffs, tax increases and the indirect impact on volumes (these measures usually imply recession in the short term and have a negative effect in GDP growth and private consumption).

    - **Country ceiling**

      A company's rating is highly dependent on the rating of the country where it is based. This is especially true for utilities, which are in most cases at least partially owned by state or regional authorities. A country's downgrade by a rating agency can have automatic implications on the rating of a corporate in this country and its financing costs when the country's rating falls below the company's rating, although the actual credit worthiness of the specific company might not have changed at all (e.g. still strong or satisfactory financial and business risk profile). Such scenarios already came true for corporates, which are based in countries that severely suffer from the euro / debt crisis like Greece, Ireland, Italy, Spain and Portugal.

    - **Impact of regulation (over-the-counter derivates – central clearing)**

Finally another source of cash liquidity risk is raising for energy trading activities, as they are being more and more affected by regulation initiatives designed to financial markets and financial players. One of these legislative initiatives (which lead to the recent adoption of the regulation on OTC derivatives, central counterparties and trade repositories – EMIR) aims at extending the use of central clearing in OTC derivative markets and to impose some techniques of risk mitigation for transactions not centrally cleared. In consequence, energy companies may have to reserve more and more cash (or cash-equivalent) for margin and collateral requirements.

- **Firm specific liquidity risk sources**
  - Default of a major counterparty in meeting committed obligations;
  - Market perception of firm specific issues

    Due to unfavorable business perspectives or an unstable financial position (e.g. highly levered), a company's credit worthiness might deteriorate and this could lead to increased costs of financing (higher credit risk premium / spread).
  - Breach of covenants or activation of material adverse change clauses, embedded in financial contracts that can trigger early repayment or loss of funds availability;
  - Concentration of firm's debt maturities, or of similar issuers' debt maturities, that can reduce the market appetite for the issuer;
  - Firm's rating downgrade, that in some cases (for example, falling below investment grade) can make the issuer no longer eligible to institutional investors;
  - Activation of contingent liabilities, such as for example the obligation to purchase minority stakes of participations;
  - Commercial debt can also influence a company's liquidity negatively. Especially if a company's negotiating or bargaining power is unfavourable there might be a rather long time for payment allowed (credit period) for business partners influencing the working capital and liquidity situation. This working capital risk can be further increased by e.g. delays in payment which are linked to counterparty risks;
  - Unexpected operational event of significant magnitude: power plant outage, natural disaster, etc.

2 Impacts and consequences of liquidity risk

Liquidity risk, which as such does not necessarily imply the risk that the Company is insolvent (since it may be able to settle the required obligations at some unspecified time thereafter), could have the following impacts:

- Difficulty/impossibility to draw down committed or uncommitted credit facilities when needed
- Difficulty/impossibility to access a specific market (e.g. Commercial Paper, Bond, etc.) for debt rollover or additional funding
- Difficulty/impossibility to dispose of cash/deposits when needed

Liquidity risk may determine an **impact on results**, in the event that the company is compelled to incur additional costs to meet its commitments or to unwind a portfolio of illiquid instruments selling them at less than their fair value. For example, the insolvency of a huge multinational financial institution like Lehman Brothers can cause a crisis of confidence in the financial market and lead to a credit crunch. A company facing a significant debt repayment in such a financial market situation might be forced to draw money from banks by drawing uncommitted credit lines at conditions it would usually find unfeasible. Because of the operational needs the company has only limited ability to choose the most suitable time for debt rollover or rising of additional funding.

Another example refers to a European company holding a portfolio of government bonds as a liquidity investment: let's assume that suddenly concerns about the ability of a certain country to remain in the currency union raise, resulting in a sudden variation in foreign exchange rate and in the country's credit spread; let's assume that the company's derivatives portfolio is covered by collateral margining mechanism, requiring it to post additional cash in case of euro currency depreciation. Then, it might be the case that the derivatives fair value drops significantly and, as a consequence, the company has to sell part of the bond portfolio at prices well below their fair value in order to fulfill the margin call.

As an extreme consequence, liquidity risk may determine a situation of distress which could put the going concern at risk. In both examples, shouldn't the company be able to raise enough money, the failure to meet its commitments could trigger a default event.

If a country leaves the euro zone, it is likely that there would be a breakdown of the financial system during the transition phase in that country. Banks and other investors from outside this country would not be willing to lend money to banks and corporates in the country leaving the euro zone. In no time banks and corporates would become illiquid.

A prolonged liquidity distress would cause a worsening in the creditworthiness of the company, triggering consequences like rating downgrades by some rating agencies and tighter credit access conditions, e.g. higher credit risk premium required by lenders or shorter financing periods. In turn, market capitalization of the company would suffer in case of increased perception of riskiness by the market. Furthermore, lenders could require stricter covenants and more collaterals from the company leading to further increasing risks and costs. Moreover, lower availability of liquid resources and higher financing costs could lead to a reduction in the dividend distribution for self-financing purposes and to a review of the investments plans through delays or cancellations. Divestments in some business units could be considered as well.

III. Evolution of Liquidity Risk

European energy companies are facing a growth of liquidity constraints, due to the trends described above (chapter I.1.4) and to the increased use of bilateral and central clearing practices.

A market-driven push to bilateral clearing is already affecting liquidity (chapter III.2). Moreover, in the medium term, non-financial entities will also have to face a push toward central clearing and risk mitigation: these provisions are included in the recently approved European Regulation n. 648/2012 (the so-called EMIR), which in many cases has extended them to non-financial counterparties, in spite of the fact that these counterparties are not systemically relevant and usually engage in trading for pure hedging purposes. Both central clearing and some risk mitigation techniques can affect liquidity.

These market dynamics and regulatory provisions are taking place in a context of increasing constraints and reduced attractiveness of the power sector, so that they can result in a further negative impact on investments, installed capacity, supply security and carbon neutrality goals.

1. Risk drivers in the short term: regulatory framework pushing for central clearing

The recent financial crisis brought trading over-the-counter (OTC) derivatives on top of the international regulatory agenda. Several episodes of financial distress occurred in sequence during 2008, from the near-collapse of Bear Sterns, to the default of Lehman Brothers and the bail-out of AIG. According to EU institutions these episodes were pointing out, a general weakness in the functioning of the OTC derivatives market. Particular focus was dedicated to credit default swaps (CDS) derivatives instruments, since they were recognized as the main vehicle for spreading the risk associated to sub-prime mortgages.

Such environment triggered the G20 reaction in 2009, asking for a prompt intervention in order to reduce systemic risk associated with derivatives markets:

"All standardized OTC derivative contracts should be traded on exchanges or electronic trading platforms, where appropriate, and cleared through central counterparties by end-2012 at the latest. OTC derivative contracts should be reported to trade repositories. Non-centrally cleared contracts should be subject to higher capital requirements. We ask the FSB and its relevant members to assess regularly implementation and whether it is sufficient to improve transparency in the derivatives markets, mitigate systemic risk, and protect against market abuse."

Following the G20 resolution, some legislative initiative were introduced, both in the US and in Europe, trying to push towards central clearing, which was identified as the main tool to manage credit exposure: the so-called Dodd-Frank act in the US, which included provisions concerning trade repository, trade reporting, central clearing of eligible derivatives, and capital/collateral requirements for OTC derivatives bilaterally cleared and, in the EU, the regulation on OTC derivatives, central counterparties and trade repositories (commonly referred to as EMIR).

The lack of transparency was the major problem spotted by the European Commission in its analysis on the OTC derivatives markets failure. Said lack of transparency would, on one hand, prevent regulators from exercising their role of efficient market supervision and, on the other hand, determine a credit risk mispricing with a general underestimation of the need for mitigation collaterals. According to the Commission, this underestimation would be a source of systemic risk, ultimately passed to taxpayers. Moreover, central clearing has been seen by the Commission as a way to promote additional objectives, which are inherently connected to it:

- reduction of operational risk, by increasing the standardization of traded contracts and by boosting the electronic processing of derivatives contracts;
- creation of trade repositories, which can gather and easily provide regulators with relevant information on trades made on centrally cleared market

The above conclusions constituted the background for developing the EMIR proposal, aimed at driving most of derivatives trading into central Clearing Counterparties (CCPs) with margining rules.

EURELECTRIC has always called for continued recognition that EU energy markets need appropriate treatment under the new EU financial regulatory proposals. In order to be able to manage the risks that stem from their asset- and sales portfolio, EURELECTRIC's members are highly dependent on well-functioning and liquid wholesale energy markets. We believe that EMIR should recognize the specific needs to manage the commercial risk of electricity companies by imposing proportionate measures, without affecting the overall aim of reducing systemic risk and increasing transparency in financial markets.

Although the energy industry, working alongside the European Commission, has made substantial progress towards the development of wholesale markets, there is still more effort to make to decrease the potential lack of maturity, depth and liquidity of certain geographic and product markets for electricity and gas. The substantial results already achieved remain to a certain degree fragile, and an unnecessary extension of financial regulation to the energy sector might reverse them by introducing disproportionate regulation including significant cash and capital funding requirements, higher transaction costs, and reduced competition and flexibility in trading venues.

If these concerns are not addressed, non-proportionate and overlapping regulation could increase the cost for commercial risk mitigating activities.

1.1. Extension of policy action

Though the original scope of the regulatory initiative was mainly CDS derivatives markets and financial institutions, proposed interventions were immediately extended in scope for both counterparties and instruments. Hence, non-financial firms, which were not the natural target of the push towards mandatory clearing were not granted a full and unconditional exemption in EMIR final proposal, except for the definition of a threshold below which some of the EMIR provisions would not apply to them (first of all, clearing obligation).

These provisions also apply to non-financial companies active in the energy sector, in spite of the non-systemic relevance and hedging purpose of trading by energy companies.

These provisions also apply to non-financial companies active in the energy sector, in spite of the non-systemic relevance and hedging purpose of trading by energy companies.

In the time of the EC proposal, European energy companies remarked that commodity markets, and power companies in particular, already used a wide range of tools to measure, monitor and mitigate operational and credit risks (e.g. collaterals, letters of credit, bank guarantees, etc.), which had proven adequate so far. Moreover, they stresses that “it is important that sufficient flexibility is left to companies in choosing the risk management tools (including central clearing) that suits them best (depending on the company size, structure, etc.)”.[1]

Price risk, cash flow risk (margining) and credit risk are managed through an integrated risk management policy, which would be hindered in case of mandatory clearing. Energy companies foresaw that central clearing obligation would actually increase risks and costs, that “a focus on credit risk only would be at the expense of either cash-flow risk or price risk” and that “any unbalanced approach (…) can boost individual exposure to other risks”.[2] In particular, being clearing a complex credit risk hedging tool (also not easily accessible to smaller companies), EMIR provisions would have had the effect of (i) increasing the risk for firm failures, due to the growth of a cash liquidity risk, (ii) weakening credit ratings, with consequent higher costs for borrowing, and (iii) reducing investments in the energy sector.

In spite of these arguments, the European Commission excluded the possibility of a full exemption, mentioning the following reasons:

1. *Excluding non-financial counterparties would diminish the effectiveness of the clearing obligation, as they are active participants in the OTC derivatives market and often transact with financial counterparties.*
2. *Some non-financial counterparties may take systemically important positions in OTC derivatives and their failure would have a significant negative effect on the market.*

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[1] See Eurelectric Response to EC Public consultation on Derivatives and Market infrastructures

[2] See Eurelectric Response to EC Public consultation on Derivatives and Market infrastructures

3. *There would be a risk of regulatory arbitrage as financial counterparties could easily circumvent EMIR obligations by establishing a new non-financial entity and direct their OTC derivative business through it.*

As a consequence, energy companies, classified as “non-financial counterparties” for the purposes of EMIR, ended up being subject to

- central clearing for OTC eligible products if they breach a clearing threshold (which, according to the recent ESMA proposal, is set at a relatively low level)
- some demanding risk mitigation measures (collateralization among them) for products bilaterally cleared
- very challenging reporting requirements on all their derivative contracts.

Risk mitigation requirements, which become even more demanding for companies above the clearing thresholds, are intended to reduce the possibilities of economic arbitrage between centrally and bilaterally cleared trades, but further contribute to the liquidity stress imposed to non-financial entities.

Source:

Brussels, COM(2010) 484/5 - 2010/0250 (COD)

Proposal for a: REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on OTC derivatives, central counterparties and trade repositories

2. Risk drivers in the short-term: business framework pushing for bilateral clearing

Some market-driven dynamics are bringing about a more extensive use of bilateral clearing between trading counterparties. This practice, which is spreading as a means for managing credit risk, implies as a counter effect an increase of the cash liquidity risk.

2.1. The trigger for an evolution of credit risk management

As a matter of fact in wholesale energy markets cash is increasingly becoming the most relevant instrument for managing credit exposure. This evolution has been pushed forward by the change of credit risk profile and by the increased relative relevance of credit risk amongst the risk drivers of an energy company.

Before the rapid growing of energy wholesale markets and of the relative trading business, credit risk profile of energy company was essentially concentrated on the commercial exposure for the final sales. In practice the most relevant component of credit risk profile was the settlement risk due to volumes delivered but not yet invoiced and to volumes invoiced but not yet paid by customers (for a detailed description of credit risk profile please see FG ERM white paper on credit risk). Such credit risk profile concentrated on settlement risk had a natural cap provided by the possibility for an energy company to cut energy supply to customers not paying their bills, always complying with the applicable legal terms.

With the rapid development of forward/future markets, credit risk profile in the energy sector has been more and more impacted by the replacement risk, i.e. the part of credit risk relative to the future rather than to the past. In essence the credit exposure of an energy firm is characterized not only by the unpaid bills of the past but also by the market value of future volumes closed with forward sales: if volumes sold forward have a positive value with respect to the reference price of the relevant market and the buyer default, the seller will lose such positive value because it will be obliged to spill the volumes at the reference market price.

The replacement risk has become very often the main source of credit risk exposure due to the increased amount of forward/future sales and to their longer maturities and tenors. Such replacement risk has two main peculiarities with respect to settlement risk related to unpaid bills: it is highly volatile, since it is linked to market fluctuations, and it can potentially grow indefinitively, if the price increases indefinitively. These two characteristics of credit exposure related to replacement risk pushed energy companies to use cash as a preferred collateral because normal credit limits backed by guarantees were often triggered by markets' volatility and sometimes the tenor of some contracts, e.g. assets' long term hedging on financial markets, was determining potential credit exposure not compatible with normal limits associated to counterparty creditworthiness.

The change in credit exposure due to the growing chunk of replacement risk was also accompanied by the increasing relevance of wholesale physical/financial trading: in these activities traded volumes are normally a multiple of volume delivered for final consumption and, especially in liquid markets, very big volumes mean very low unit margins attached, therefore the default of one single counterparty can jeopardize the result of a whole budget.

2.2. The trigger related to rating downgrade (sovereign risk)

Other important trigger to the recent increase in liquidity risk for companies in the sector was the sovereign debt crisis in Euro Zone. In the past few years, first with Greece, Ireland and Portugal (countries that are under intervention of IMF/EC/ECB troika) and more recently with Italy and Spain, we have been observing a continuous deterioration of peripheral countries credit metrics. The rating downgrades were so significant that presently all of them present ratings lower than BBB+ for S&P and Baa1 for Moody's, when 3 years ago all were in at least AA rating zone (with the exception of Greece which was in A zone).

This had a significant effect in the big power companies of these countries, that historically have had the objective to stay in the A rating zone (and in many cases defined it in its Risk Appetite statement and communicated to investors). However, in July/2012, due to referred sovereign downgrades, there was not a single big power company in the peripheral countries that stayed in the A rating zone (and PPC from Greece with S&P's CC and EDP from Portugal with S&P's BB+ and Moody's Ba1 were in sub investment grade zone).

As a consequence, for all these companies, being perceived as at higher risk of default, were less able to skip certain collateral requirements needed to perform some deals with other companies. In some cases, it is very difficult for these companies with low rating to continue trading derivatives on OTC without bilateral clearing: their bargaining powers are reduced relatively to its counterparties. They are thus being pushed to bilateral clearing, to continue with its normal operations (namely the hedging ones).

2.3. The trigger related to new capital requirements provisions

A third trigger pushing for bilateral clearing is a consequence of recent and upcoming regulations being implemented by the EU Authorities, in particular related to Basel III proposals, which is intended for European banks and aims at reducing systemic risk by increasing capital adequacy required for covering risks supported by banks. Strengthened requirements on counterparty risk coverage directly raises the capital cost of trading books. When contracting OTC derivatives with corporate counterparties, banks are incented to reduce risk exposure in order to reduce capital costs and by the way, reach more easily upgraded capital levels required by Basel III implementation. Enforcing Credit Support Annex (CSA) and margining credit exposure with non-financial counterparties is a practice widely used by the market place that permits to significantly reduce risk exposure and required capital. Depending on its size, credit rating, sovereign risk and global credit risk, corporate firms are more or less firmly incentivized to contract a CSA. Hence as a side effect of these regulatory provisions, the liquidity cost of systemic risk reduction is, in some way transferred from banks to corporate firms.

2.4. Objectives of market driven bilateral clearing

Managing credit risk of a relevant energy trading business can be ineffective with the only use of traditional collaterals: the volatility of replacement risk can lead to continuous adjustments of credit limits and relative posted guarantees. Normally trading counterparties assign each other credit limits in line with creditworthiness linked to internal/external rating models. When the credit limit is exceeded a company is blocked from the list of tradable counterparties and traders are prevented to deal with it till the limit is revised and/or collaterals are adjusted. The fluctuations of replacement risk determine a relative ineffectiveness of normal guarantees: if they are sized tightly there will be a need for continuous adjustments with consequent stop and go in trading activities, if they are sized in excess in order to cover markets fluctuations there will be over allocation and/or extra costs.

Finally cumulative guarantees necessary to cover the potential replacement risk under stressed markets conditions can easily exceed the maximum amount of guarantees that a company is willing to provide or that a company can afford, given its creditworthiness.

In view of an efficient and cost-effective credit management supporting a liquid trading business, a rapid diffusion of bilateral clearing occurred in energy markets. Currently all most traded standard contractual frameworks (e.g. ISDA for financial derivatives and EFET for physical deals) allow for a Credit Support Annex (CSA) in which companies can specify the basic clauses for bilateral clearing. Essentially trading counterparties agree on a mutual threshold, normally symmetrical, that can be “open credit” (i.e. not backed by any guarantee, given the standing of a counterparty) or covered by a form of guarantee. When credit exposure, inclusive of settlement and replacement risk, is beyond said threshold the exceeding amount is regulated directly in cash with a liquidation that can be daily, weekly or monthly.

Analyzing OTC derivatives markets, the ISDA Margin Survey 2010 highlights the use of bilateral collateral agreement as the main instrument to mitigate credit risk: ISDA Margin Survey 2010 shows that the number of collateral agreement in use in the OTC derivative market grew to 171,879 by end-2009 with an estimated amount of Collateral in Circulation in the OTC derivatives market at the end of 2009 of around $3.2 trillion. Cash used as collateral represents around 82 percent of collateral received and 83 percent of collateral delivered in 2009.

In practice, the credit risk of a company is mitigated by the threshold and by the frequency of cash liquidation. However, this practice has the non-eligible side effect of correspondingly increasing the liquidity risk of said company, which is more exposed to volatile cash payments due to markets fluctuations. Taking into consideration notional amounts and markets volatilities normally entailed in energy trading business, bilateral clearing may lead to the need of consistent liquid cash or cash equivalent credit lines.

Source:

ISDA Margin Survey 2010

3. Risk drivers in the long-term: reduced attractiveness of Power Sector

Electricity utilities are currently facing a very difficult political and macroeconomic situation. Eurozone forecasts for Gross Domestic Product (GDP) are pessimistic and the sovereign risk is exacerbated in several countries, which only intensifies the public sector's financial needs and leads to restrictive financial and fiscal policies. Government interventions increase the uncertainty and the regulatory risk for the European electricity industry. Sovereign risk has also extended its effects to the Eurozone's banking sector, intensifying financial market tensions. As a result, the recovery of bank lending to private companies has come to a halt. The European Central Bank (ECB) intervened in December 2011 to prevent a liquidity crisis, but the real impact on credit availability is still unclear.

The utility sector underperformed the average stock market quite significantly in 2009/10 and slightly again in 2011. As a consequence, the market perception of the utility sector is quite negative. Those two trends are mainly due to political interventions. Furthermore, lower electricity demand in 2009/10 together with falling prices, the need to refinance debt under strained capital market conditions plus stringent analysis from both financial analysts and credit agencies have forced utilities to reinforce their balance sheets. They have done so by setting aside assets for disposal and reducing capital expenditures.

With a modest cash flow generation capacity, and being forced to reduce their debt level, companies might use as a solution to maintain credit ratings and financial costs at tolerable levels the decommissioning of existing plants and reduction of investments in new assets. In addition, the new operating conditions (lower load factor of conventional power plants and current market price levels) do not offer a sufficient margin to cover the fixed costs of existing and new fossil-fuel fired power plants. Those plants are however highly needed to ensure security of supply, as back-up capacity in the context of the increasing penetration of intermittent renewables in the market.

Source:

EURELECTRIC FG Finance & Economics Report "The Financial Situation & Investment Climate of the Electricity Industry – Econ

IV. Liquidity Risk Management Model

The following part presents a summary of possible features (non-binding) a company could put in place to manage its liquidity risk exposure.

1. LRM Objectives

The **liquidity risk management model** should have the following **objectives**:

a. to guarantee a suitable level of liquidity for the Company;
b. to maintain a balanced debt structure in terms of the due-date profile and a diversified funding sources (in terms of counterparties, instruments, markets etc.);
c. to limit covenants to the extent necessary (e.g. Cross Default and Negative Pledge clauses).

2. LRM Framework

An **effective liquidity risk management model** relies on the following key factors:

- **Risk Governance**

  A formalized risk governance framework should be put in place, including the following elements:

  - Well defined and applicable risk management process comprising at least of the steps liquidity risk identification and definition, risk (driver) analysis and measurement, risk management, risk reporting and review of risk management framework and measures;
  - Definition of roles and responsibilities in the risk management process;
  - Definition of a set of suitable liquidity risk management measures and a limit system based upon benchmarks and key risk indicators identified, with the indication of limits and thresholds;
  - Liquidity contingency plan, identifying the steps to be taken in case of liquidity crisis.

- **Liquidity Management Practice**

  A sound liquidity management practice should include:

  - Identification, analysis and continuous monitoring of risk drivers;
  - Distinguishing between manageable and not manageable liquidity risk drivers, which can also be a basis for a liquidity risk management action plan;
  - Development of a reliable cash forecasting system;
  - Attuning of investment planning and strategies to financing abilities and financial constraints;
  - Careful funding policy, aiming at:

a. Establishing solid relationships with banks
b. Diversification of funding sources in terms of:
   - Bilateral or multilateral banking agreements;
   - Balanced reliance on both banking system and capital markets;
   - Short-term and long term instruments;
   - Markets (instrument type and currencies);
c. Diversification of debt maturities;
d. Availability of committed credit facilities, with limited covenants or clauses that can compromise the effective availability of funds in a liquidity tension scenario (MAC etc);
e. Availability of uncommitted credit facilities;
f. Portfolio of highly liquid assets;

- Cash management within a group (including e.g. cash pooling) to limit cash surplus to the extent required and optimize interest / transaction costs and fees;
- Working capital optimization including effective accounts receivable and inventory management and negotiating terms and conditions (e.g. credit terms, cash discounts, advance payment etc.);
- Management and monitoring of contingent liabilities (covenants, guarantees, letters of comfort, performance bonds …);
- Consideration and weighing of interdependencies with other risk types (counterparty risk, market risk, tax risk etc.) before taking liquidity risk management actions. A well balanced risk portfolio should take into account all identified risk drivers and types. For instance, if a company tries to avoid central clearing to reduce liquidity risk, this action might mean accepting increased counterparty risk. It is therefore essential, that risk mitigation measures for certain types of risk are not isolated from one another.

- **Liquidity Risk Analysis, Control and Monitoring**

  A prudent risk control activity should comprise:
  - Analysis of level and composition of available resources (e.g. financial status reporting, short- and medium-term liquidity planning);
  - Monitoring of market credit standing (e.g. credit spread analysis, benchmarking);
  - Monitoring of key rating indicators (e.g. Funds from Operations, Net debt);
  - Monitoring of other market indicators (e.g. spread between overnight and other short term deposit rates);

- Circle of monitoring and reaction to changes in legislation (e.g. initiatives for central clearing of over-the-counter derivatives)
- Regular Risk Reporting including the key risk indicators, scenario analysis and cash flow at risk.

3. Parameters for reporting

A regular liquidity risk monitoring and reporting should be established to allow timely availability of information and make effective risk management possible in order to anticipate tensions and prevent a liquidity crisis.

3.1. Generic Features of Key Risk Indicators

With the purpose of having a good understanding of a company's resilience to liquidity shocks in the short term and detecting in advance potential threats a liquidity risk cockpit should include a few key risk indicators that should have the following features:

- Measure the short term resilience to expected and unexpected shocks (such as unavailability of specific funding sources such as commercial papers, extreme collateral margin calls, default of a major lending counterparty); Measure the period of time in which the company may be able to meet its obligations without making recourse to additional funding sources;
- Measure the excess of liquid resources over liquidity needs at different time steps in the future.

For example, a feasible indicator (*as proposed in the methodology adopted by S&P's*) could be the ***Liquidity Coverage Ratio*** (computed as liquidity sources divided by liquidity uses) or ***Liquidity Coverage Gap*** (computed as liquidity sources less liquidity uses). This indicator could then be computed (in terms of ratio or gap) at different time steps. Moreover, the period in which liquidity uses overcome the sources (ratio less than 1 or negative gap) can be defined as the ***Survival Period***.

Furthermore, these metrics should be computed under current market scenario (business as usual), under reasonable what-if scenarios and using a probabilistic approach (e.g. Cash Flow at Risk) by means of simulating main risk drivers (such as fair values impacting on collateral margin calls, counterparties defaults etc.).

Alongside, an additional set of analysis could be performed, to detect and prevent the risk of excess indebtedness (i.e. high gearing and contingent liabilities), debt concentration (in terms of maturities, markets) and excessive exposure to short-term financing.

4. Liquidity Risk – quantification

Liquidity risk associated with hedging exposures in Futures markets

In this section we present conceptual examples of transactions that can have significant liquidity risks associated with hedging market risks through Futures markets (subject to margining). We analyze the following scenarios (both in Energy Trading and Treasury divisions):

- Quantification 1: Sell Hydro volume:
    - Scenario 1.1: Sell Hydro volume in OTC (when we mention OTC, we mean forward contracts without the need for margining) or client; liquidity risk = 0;
    - Scenario 1.2: Sell Hydro volume in the power market hedged by futures; liquidity risk when power prices go up;
- Quantification 2: Sell CCGT volume:
    - Scenario 2.1: Sell CCGT volume in OTC or client and hedge gas costs in OTC; liquidity risk = 0;
    - Scenario 2.2: Sell CCGT volume in OTC or client and hedge gas costs in Futures market; liquidity risk when fuel prices go down;
    - Scenario 2.3: Sell CCGT volume in the power market hedged by futures and hedge gas costs in OTC; liquidity risk when power prices go up;
    - Scenario 2.4: Sell CCGT volume in the power market hedged by futures and hedge gas costs in Futures market; liquidity risk = 0 if power price equal to marginal cost of gas (assumption taken in this analysis);
- Quantification 3: Bond issued in USD, and hedged to EUR with a Currency Interest Rate Swap (CIRS).
    - Scenario 3.1: CIRS in OTC with no margining; liquidity risk = 0;
    - Scenario 3.2: CIRS subject to margining; liquidity risk when USD depreciates relatively to EUR;

As a definition it is considered that Liquidity Needs corresponds to the difference between the accumulated expected margin and the accumulated real margin, if positive.

The need for margining requires a company to have dedicated credit lines, which have cost as system costs, commitment cost and of course interests. Since the liquidity needs in these trading activities are part of the business capital (we can consider it equivalent to working capital), it makes sense that in terms of cost we do not consider it equivalent to debt costs. Taking this into account, we consider the use of WACC to calculate possible capital costs with the use of these credit lines.

Scenarios Assumptions:

- Volume: 1 TWh/month
- Gas price = 0.3*Brent
- CCGT efficiency = 50%
- CO_2 emissions factor = 0.35 ton/MWh
- Marginal Cost of CCGT = Gas price/50% + 0.35*CO_2 price

- As a simplification, we consider Power price = Marginal cost of CCGT for all time periods (Clean Spark Spread = 0 as a simplified assumption)
- Sell power price = marginal cost of CCGT at t=0 (45.25€/MWh)
- Monthly Standard Deviations (Jan/09 – May/11): Brent = 8%; EUR/USD = 4%; CO2 = 11%
- Spot prices in t=0: Brent = 100$/bbl; EUR/USD = 1.5; CO2 = 15€/ton
- Futures prices are equal to spot prices
- Rate to calculate capital costs for margining credit lines = 10% (assumed WACC)

Figure 1: Analyzed Scenarios (5th and 95th percentiles) – monthly evolution

		0	1	2	3	4	5	6	7	8	9	10	11	12
5th percentile														
Brent	$/bbl	100.0	86.9	81.4	77.3	73.8	70.7	67.9	65.3	62.9	60.6	58.5	56.5	54.6
EUR/USD	EUR/USD	1.50	1.4	1.4	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2
CO2	€/ton	15.0	12.3	11.2	10.3	9.6	8.9	8.4	7.8	7.3	6.9	6.4	6.0	5.6
Gas price	€/MWh	20.0	18.6	18.0	17.4	17.0	16.6	16.2	15.8	15.4	15.1	14.8	14.4	14.1
Power price	€/MWh	45.3	41.5	39.8	38.5	37.3	36.3	35.3	34.3	33.5	32.6	31.8	31.0	30.2
95th percentile														
Brent	$/bbl	100.0	113.1	118.6	122.7	126.2	129.3	132.1	134.7	137.1	139.4	141.5	143.5	145.4
EUR/USD	EUR/USD	1.50	1.6	1.6	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.8
CO2	€/ton	15.0	17.7	18.8	19.7	20.4	21.1	21.6	22.2	22.7	23.1	23.6	24.0	24.4
Gas price	€/MWh	20.0	21.2	21.7	22.0	22.3	22.6	22.8	23.0	23.1	23.3	23.4	23.6	23.7
Power price	€/MWh	45.3	48.7	50.0	51.0	51.8	52.5	53.1	53.7	54.2	54.7	55.1	55.5	55.9

Note: Brent(t=i) 5th percentile = Brent(t=0)*(1-SD*1.64*sqrt(i)); Correlations between Brent, EUR/USD and CO2 were assumed to be equal to 1.

V. Quantification 1: Sell Hydro volume

We assume that we are in the end of a year and deciding to sell 1 TWh/month of hydro generation for the next 12 months. We present the differences in terms of liquidity between selling the volume in the OTC (or to retail clients) and selling the volume in the power market and hedging with futures, by calculating the cash inflows and outflows in the maximum exposure situation (95th percentile for our inputs).

1.1. Scenario 1.1: Sell Hydro volume in OTC or client; liquidity risk = 0

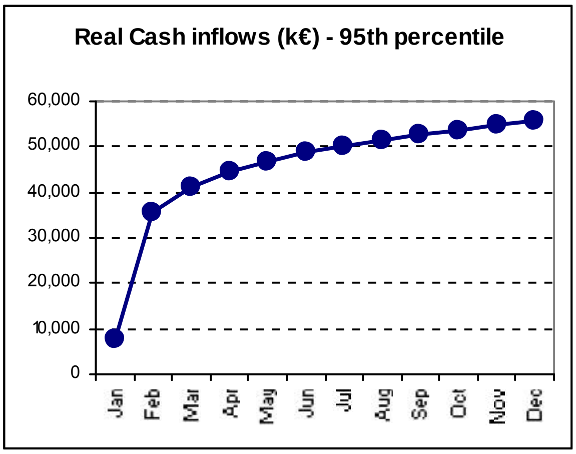
In this case there is no liquidity risk. By selling in the OTC or to clients at a fixed price, the expected cash flow will be equal to real cash flows. The deal has credit/ counterparty risk, but no liquidity risk.

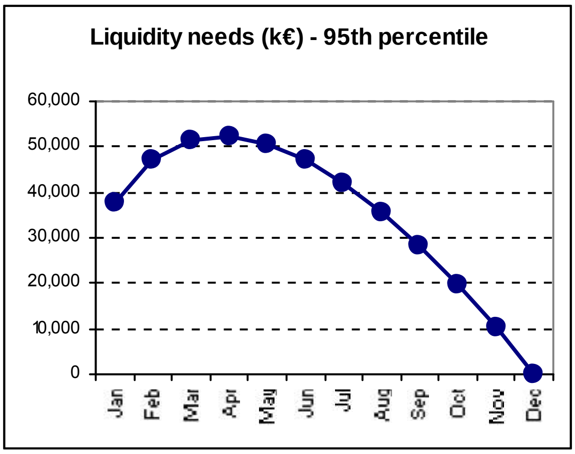
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Price	€/MWh	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3	45.3
Volume	GWh	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Cash inflow	k€	45,250	45,250	45,250	45,250	45,250	45,250	45,250	45,250	45,250	45,250	45,250	45,250
Expected (Cash inflow)	k€	45,250	45,250	45,250	45,250	45,250	45,250	45,250	45,250	45,250	45,250	45,250	45,250
Real (Cash inflow)	k€	45,250	45,250	45,250	45,250	45,250	45,250	45,250	45,250	45,250	45,250	45,250	45,250
Liquidity needs	k€	0	0	0	0	0	0	0	0	0	0	0	0

1.2. Scenario 1.2: Sell Hydro volume in the power market hedged by futures; liquidity risk when power prices go up

In this scenario there will be liquidity risk, in the case power prices go up. By selling in the power market, the company is subjected to market risk. Hedging this sell with futures setting a fixed price (45.3 €/MWh), it eliminates the market risk but starts facing liquidity risk because of margining (the company may be obliged to post liquidity in the central clearing house, if prices go up). In our example, the increase in prices in January, for example, will not only have to be compensated by a cash outflow related with this first month, but also the payment of margins to compensate for the increase in future prices for the other months.

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Price 95th percentile	€/MWh	48.7	50.0	51.0	51.8	52.5	53.1	53.7	54.2	54.7	55.1	55.5	55.9
Volume	GWh	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Cash inflow	k€	7,745	35,403	41,108	44,476	46,876	48,747	50,288	51,601	52,750	53,772	54,696	55,539
Real	k€	48,660	49,985	50,972	51,784	52,485	53,108	53,672	54,189	54,669	55,117	55,539	55,938
Margining	k€	-40,915	-14,583	-9,864	-7,307	-5,609	-4,360	-3,384	-2,588	-1,919	-1,345	-843	-399
Expected (Cash inflow)	k€	45,250	45,250	45,250	45,250	45,250	45,250	45,250	45,250	45,250	45,250	45,250	45,250
Real (Cash inflow)	k€	7,745	35,403	41,108	44,476	46,876	48,747	50,288	51,601	52,750	53,772	54,696	55,539
Liquidity needs	k€	37,505	47,353	51,495	52,268	50,643	47,145	42,108	35,756	28,257	19,734	10,289	0





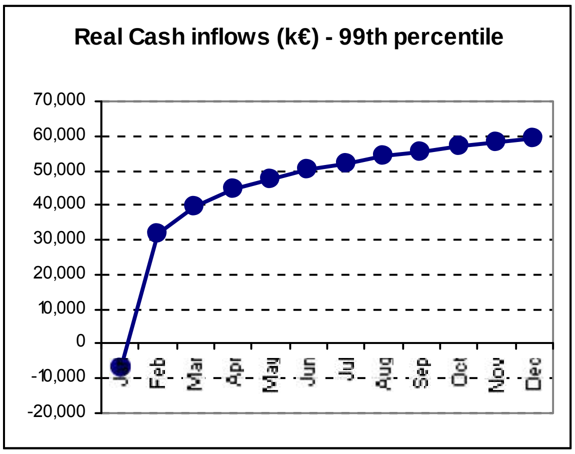
Maximum liquidity needs = 52M€

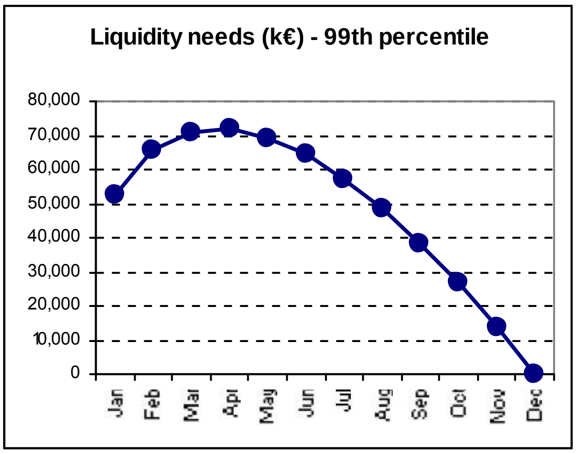
Average liquidity needs = 35M€

Annual Costs = 10% * 35M€ = 3.5M€

Next table and graphs present a variant of scenario 1.2, now considering the **99th percentile of power prices** (instead of 95th percentile values presented previously):

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Price 99th percentile	**€/MWh**	**50.0**	**51.8**	**53.1**	**54.2**	**55.2**	**56.0**	**56.7**	**57.4**	**58.0**	**58.6**	**59.2**	**59.7**
Volume	**GWh**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**
Cash inflow	**k€**	**-7,063**	**31,952**	**39,849**	**44,456**	**47,705**	**50,218**	**52,271**	**54,010**	**55,521**	**56,860**	**58,063**	**59,158**
Real	k€	50,006	51,811	53,140	54,226	55,157	55,980	56,722	57,401	58,027	58,610	59,158	59,674
Margining	k€	-57,069	-19,859	-13,291	-9,769	-7,452	-5,763	-4,452	-3,391	-2,506	-1,751	-1,094	-516
Expected (Cash inflow)	**k€**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**
Real (Cash inflow)	**k€**	**-7,063**	**31,952**	**39,849**	**44,456**	**47,705**	**50,218**	**52,271**	**54,010**	**55,521**	**56,860**	**58,063**	**59,158**
Liquidity needs	**k€**	**52,313**	**65,611**	**71,012**	**71,806**	**69,351**	**64,383**	**57,362**	**48,602**	**38,331**	**26,721**	**13,908**	**0**





Maximum liquidity needs = 72M€

Average liquidity needs = 48M€

Annual Costs = 10% * 48M€ = 4.8M€

99th percentile values higher than 95th percentile values in about 37%

2. Quantification 2: Sell CCGT volume

We assume that we are in the end of a year and deciding to sell 1 TWh/month of CCGT generation for the next year. We present the differences in terms of liquidity between selling the volume in the OTC (or clients) and selling the volume in the power market and hedging with futures, and combine it with the variable costs hedging (Gas price and CO2) with forwards (OTC) or futures.

2.1. Scenario 2.1: Sell CCGT volume in OTC or client and hedge gas costs in OTC; liquidity risk = 0

By hedging costs with forwards (OTC markets) a company becomes exposed to counterparty risk (replacement risk), but if contracts do not require margining (between current and contracted prices), it is possible to match the cash outflows with the cash inflows. In our quantification example, the lower Gas and CO2 prices in the spot markets are compensated by forwards exercise, totally matching cash outflows with cash inflows (liquidity needs will always be zero).

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5th percentile													
Gas	€/MWh	18.6	18.0	17.4	17.0	16.6	16.2	15.8	15.4	15.1	14.8	14.4	14.1
CO2	€/ton	12.3	11.2	10.3	9.6	8.9	8.4	7.8	7.3	6.9	6.4	6.0	5.6
Cash inflow	**k€**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**
Cash outflow	**k€**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**
Real	k€	41,495	39,820	38,482	37,315	36,256	35,272	34,344	33,459	32,608	31,785	30,986	30,206
Cost Gas Spot	k€	37,192	35,910	34,872	33,959	33,124	32,342	31,600	30,887	30,199	29,530	28,877	28,237
Cost Co2 Spot	k€	4,303	3,911	3,610	3,356	3,132	2,930	2,744	2,571	2,409	2,255	2,109	1,969
Hedging	k€	3,755	5,430	6,768	7,935	8,994	9,978	10,906	11,791	12,642	13,465	14,264	15,044
Gas	k€	2,808	4,090	5,128	6,041	6,876	7,658	8,400	9,113	9,801	10,470	11,123	11,763
Co2	k€	947	1,339	1,640	1,894	2,118	2,320	2,506	2,679	2,841	2,995	3,141	3,281
Expected (Cash inflow - Cash outflow)	**k€**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Real (Cash inflow - Cash outflow)	**k€**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Liquidity needs	**k€**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

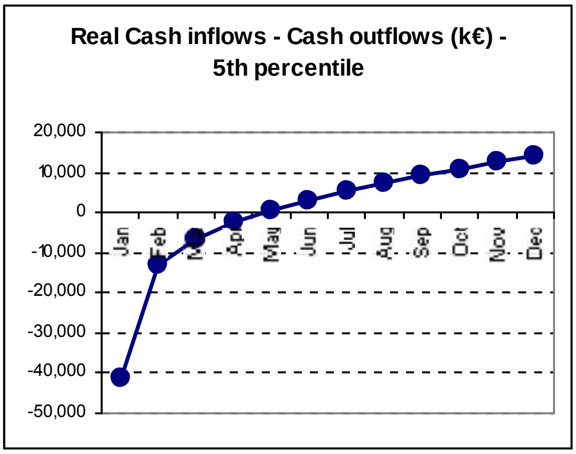
2.2. Scenario 2.2: Sell CCGT volume in OTC or client and hedge gas costs in Futures market; liquidity risk when fuel prices go down

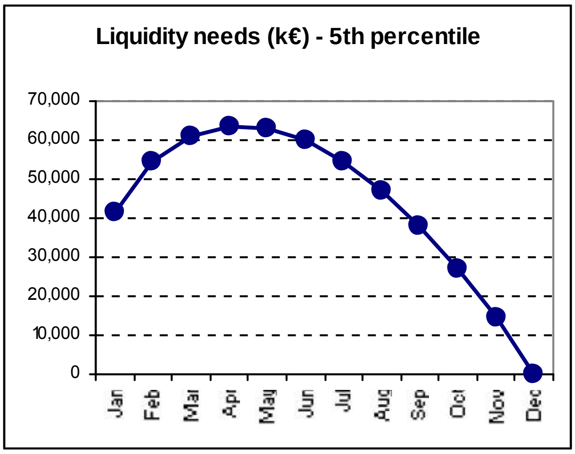
Hedging with futures has the advantage of not being exposed to counterparty risk (central clearing), but it requires margining. In our example, the decrease of prices in January will not only have to be compensated by a cash outflow related with this first month, but also the payment of margins to compensate for the decrease in future prices for the other months.

The company will, in this case, face liquidity needs. In aggregated terms (the whole 12 months), cash inflows will match cash outflows, but will temporarily need liquidity due to margining. A company facing cash constraints can have financial troubles due to these issues, and that has to be taken into account in the hedging decision (though hedging mitigates market risk, it can be worse than not hedging if liquidity can be an issue).

When selling to retail clients it is not possible to avoid liquidity risks if we have to hedge in organized markets (or central clear) because it is very difficult to make clients bear margining (retail clients have a clear preference for fixed prices and stay away from market risks).

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5th percentile													
Gas	€/MWh	18.6	18.0	17.4	17.0	16.6	16.2	15.8	15.4	15.1	14.8	14.4	14.1
CO2	€/ton	12.3	11.2	10.3	9.6	8.9	8.4	7.8	7.3	6.9	6.4	6.0	5.6
Cash inflow	**k€**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**
Cash outflow	**k€**	**86,559**	**58,239**	**51,864**	**47,816**	**44,729**	**42,161**	**39,914**	**37,884**	**36,011**	**34,253**	**32,585**	**30,986**
Real	k€	41,495	39,820	38,482	37,315	36,256	35,272	34,344	33,459	32,608	31,785	30,986	30,206
Cost Gas Spot	k€	37,192	35,910	34,872	33,959	33,124	32,342	31,600	30,887	30,199	29,530	28,877	28,237
Cost Co2 Spot	k€	4,303	3,911	3,610	3,356	3,132	2,930	2,744	2,571	2,409	2,255	2,109	1,969
Margining	k€	45,064	18,419	13,382	10,501	8,473	6,888	5,570	4,426	3,403	2,468	1,599	780
Gas	k€	33,699	14,104	10,371	8,217	6,684	5,474	4,455	3,561	2,753	2,007	1,306	640
Co2	k€	11,365	4,315	3,010	2,284	1,789	1,415	1,115	865	650	461	292	140
Expected Cash inflow - Cash outflow	**k€**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Real Cash inflow - Cash outflow	**k€**	**-41,309**	**-12,989**	**-6,614**	**-2,566**	**521**	**3,089**	**5,336**	**7,366**	**9,239**	**10,997**	**12,665**	**14,264**
Liquidity needs	**k€**	**41,309**	**54,298**	**60,911**	**63,478**	**62,957**	**59,867**	**54,531**	**47,166**	**37,926**	**26,929**	**14,264**	**0**





Maximum liquidity needs = 63M€

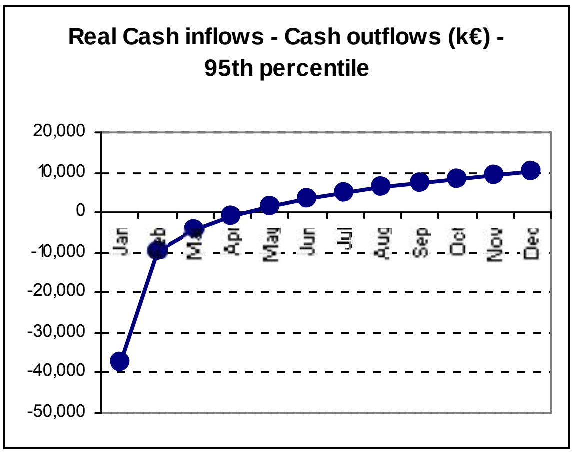
Average liquidity needs = 44M€

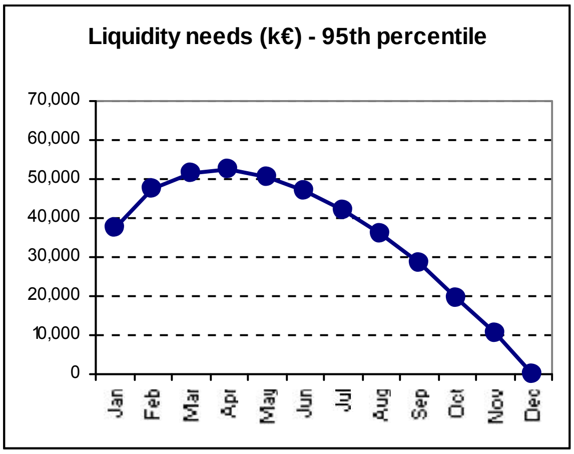
Annual Costs = 10% * 44M€ = 4.4M€

2.3. Scenario 2.3: Sell CCGT volume in the power market hedged by futures and hedge gas costs in OTC; liquidity risk when power prices go up

This scenario is much like scenario 1.2, with liquidity risks rising from the possibility of having power price increases. In this case, margining for the first months will compensate not only these first month, but also the increase in future prices for the other months.

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
95th percentile													
Power price	€/MWh	48.7	50.0	51.0	51.8	52.5	53.1	53.7	54.2	54.7	55.1	55.5	55.9
Gas	€/MWh	21.2	21.7	22.0	22.3	22.6	22.8	23.0	23.1	23.3	23.4	23.6	23.7
CO2	€/ton	17.7	18.8	19.7	20.4	21.1	21.6	22.2	22.7	23.1	23.6	24.0	24.4
Cash inflow	**k€**	**7,745**	**35,403**	**41,108**	**44,476**	**46,876**	**48,747**	**50,288**	**51,601**	**52,750**	**53,772**	**54,696**	**55,539**
Real	k€	48,660	49,985	50,972	51,784	52,485	53,108	53,672	54,189	54,669	55,117	55,539	55,938
Margining	k€	-40,915	-14,583	-9,864	-7,307	-5,609	-4,360	-3,384	-2,588	-1,919	-1,345	-843	-399
Cash outflow	**k€**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**	**45,250**
Real	k€	48,660	49,985	50,972	51,784	52,485	53,108	53,672	54,189	54,669	55,117	55,539	55,938
Cost Gas Spot	k€	42,462	43,396	44,081	44,639	45,117	45,538	45,916	46,260	46,578	46,872	47,148	47,407
Cost Co2 Spot	k€	6,197	6,589	6,890	7,144	7,368	7,570	7,756	7,929	8,091	8,245	8,391	8,531
Hedging	k€	-3,410	-4,735	-5,722	-6,534	-7,235	-7,858	-8,422	-8,939	-9,419	-9,867	-10,289	-10,688
Gas	k€	-2,462	-3,396	-4,081	-4,639	-5,117	-5,538	-5,916	-6,260	-6,578	-6,872	-7,148	-7,407
Co2	k€	-947	-1,339	-1,640	-1,894	-2,118	-2,320	-2,506	-2,679	-2,841	-2,995	-3,141	-3,281
Expected (Cash inflow - Cash outflow)	**k€**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Real (Cash inflow - Cash outflow)	**k€**	**-37,505**	**-9,847**	**-4,142**	**-774**	**1,626**	**3,497**	**5,038**	**6,351**	**7,500**	**8,522**	**9,446**	**10,289**
Liquidity needs	**k€**	**37,505**	**47,353**	**51,495**	**52,268**	**50,643**	**47,145**	**42,108**	**35,756**	**28,257**	**19,734**	**10,289**	**0**





Maximum liquidity needs = 52M€

Average liquidity needs = 35M€

Annual Costs = 10% * 35M€ = 3.5M€

2.4. Scenario 2.4: Sell CCGT volume in the power market hedged by futures and hedge gas costs in Futures market; liquidity risk = 0 if power price equal to marginal cost of gas (assumption taken in this analysis)

In this scenario we have two opposite effects in terms of liquidity risk. If prices increase, margining will require posting liquidity related with the power futures contracts, but will have the opposite effect in the hedging of variable costs (where the margining will favor the company). With our simplifications (power price equal to marginal cost of the CCGT), the margin will be equal to zero, and there will be no liquidity issues because the compensation is total.

We have to take into account that power price equal to marginal cost of gas is a simplified assumption and we can have liquidity risk if the CSS (Clean Spark Spread) changes along the period, which is something normal in the market. We expect to have electricity prices moving along with fuel prices and that, in a certain way, leads to a lower liquidity risk than the situation described for the hydro power plant in scenario 1.2 (in which there are mainly fixed costs and market fluctuations come from selling electricity prices), but we still have liquidity risk because, as explained, the relation between electricity prices and fuel prices is not perfect or totally stable.

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
95th percentile													
Power price	€/MWh	48.7	50.0	51.0	51.8	52.5	53.1	53.7	54.2	54.7	55.1	55.5	55.9
Gas	€/MWh	21.2	21.7	22.0	22.3	22.6	22.8	23.0	23.1	23.3	23.4	23.6	23.7
CO2	€/ton	17.7	18.8	19.7	20.4	21.1	21.6	22.2	22.7	23.1	23.6	24.0	24.4
Cash inflow	**k€**	**7,745**	**35,403**	**41,108**	**44,476**	**46,876**	**48,747**	**50,288**	**51,601**	**52,750**	**53,772**	**54,696**	**55,539**
Real	k€	48,660	49,985	50,972	51,784	52,485	53,108	53,672	54,189	54,669	55,117	55,539	55,938
Margining	k€	-40,915	-14,583	-9,864	-7,307	-5,609	-4,360	-3,384	-2,588	-1,919	-1,345	-843	-399
Cash outflow	**k€**	**7,745**	**35,403**	**41,108**	**44,476**	**46,876**	**48,747**	**50,288**	**51,601**	**52,750**	**53,772**	**54,696**	**55,539**
Real	k€	48,660	49,985	50,972	51,784	52,485	53,108	53,672	54,189	54,669	55,117	55,539	55,938
Cost Gas Spot	k€	42,462	43,396	44,081	44,639	45,117	45,538	45,916	46,260	46,578	46,872	47,148	47,407
Cost Co2 Spot	k€	6,197	6,589	6,890	7,144	7,368	7,570	7,756	7,929	8,091	8,245	8,391	8,531
Margining	k€	-40,915	-14,583	-9,864	-7,307	-5,609	-4,360	-3,384	-2,588	-1,919	-1,345	-843	-399
Gas	k€	-29,550	-10,267	-6,853	-5,023	-3,820	-2,945	-2,268	-1,723	-1,269	-884	-551	-259
Co2	k€	-11,365	-4,315	-3,010	-2,284	-1,789	-1,415	-1,115	-865	-650	-461	-292	-140
Expected (Cash inflow - Cash outflow)	**k€**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Real (Cash inflow - Cash outflow)	**k€**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Liquidity needs	**k€**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

3. Quantification 3: Bond issued in USD, and hedged to EUR with a Currency Interest Rate Swap (CIRS)

This quantification, though it analyzes as well the liquidity risks power companies can face when dealing with futures or margining obligations, is different from the previous ones as it does not concern Energy Trading area but the Treasury.

The examples here shown are more significant in the medium/long-term, as variables involved (interest rates, exchange rates) are not as volatile as fuels. On the other way the value amounts in these contracts (bond issues for example) are much higher in general than the usual energy trading contracts, and so very easily a slight change in the indexes can materialize in significant amounts of cash that can constitute important liquidity risks.

Specifically, in this example we consider issuing a bond in USD, with a nominal value of 1.5billion USD and maturity of 10 years, with a fixed coupon of 5%, and hedging it to EUR with a Currency Interest Rate Swap (CIRS). We test 2 situation: a CIRS in the OTC not subject to margining and a CIRS subject to margining.

Assumptions:

- Bond issued: 1.5 billion USD
- EUR/USD in t=0: 1.5
- CIRS paying 1 billion EUR and receiving 1.5 billion USD at maturity
- Maturities = 10 years
- Coupons paid annually
- Interest rates fixed at 5% (USD bond and both paying and receiving legs of the CIRS)
- Discount rate for CIRS MtM calculation = 0% (for simplification purposes)
- Annual Standard Deviations (Jan/04 – May/11): EUR/USD = 11%

		0	1	2	3	4	5	6	7	8	9	10
EUR/USD 5th percentile	EUR/USD	1.50	1.23	1.12	1.03	0.96	0.89	0.84	0.78	0.73	0.69	0.64
EUR/USD 95th percentile	EUR/USD	1.50	1.77	1.88	1.97	2.04	2.11	2.16	2.22	2.27	2.31	2.36

Note: EUR/USD(t=i) 5^{th} percentile = EUR/USD(t=0)*(1-SD*1.64*sqrt(i));

3.1. Scenario 3.1: CIRS in OTC with no margining; liquidity risk = 0;

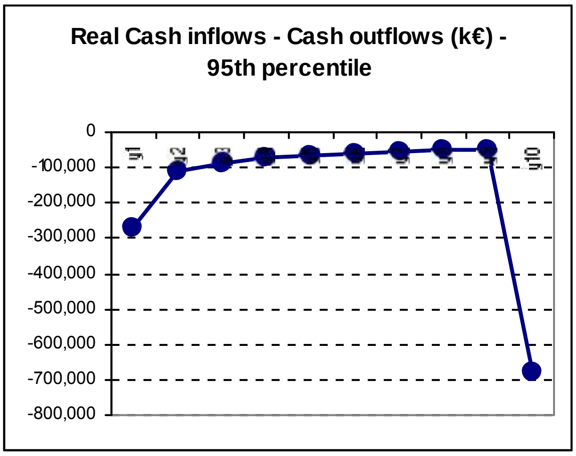
In this case the CIRS cash inflows or outflows totally match with the bond cash flows. A change in the exchange rate implies a change in the MtM, which in the case of a positive MtM will imply counterparty risk relatively to the counterparty in the CIRS. But since there is no margining, no liquidity risk exists.

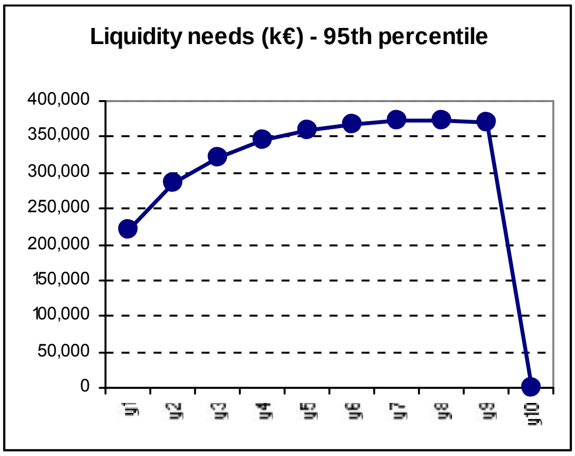
		y1	y2	y3	y4	y5	y6	y7	y8	y9	y10
EUR/USD 95th percentile		1.77	1.88	1.97	2.04	2.11	2.16	2.22	2.27	2.31	2.36
Bond											
Bond cash outflows USD	**k USD**	**75,000**	**75,000**	**75,000**	**75,000**	**75,000**	**75,000**	**75,000**	**75,000**	**75,000**	**1,575,000**
Notional	k USD	0	0	0	0	0	0	0	0	0	1,500,000
Interests	k USD	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
Bond cash outflows USD converted to EUR	**k EUR**	**42,359**	**39,837**	**38,096**	**36,743**	**35,628**	**34,677**	**33,846**	**33,107**	**32,442**	**668,588**
Notional	k EUR	0	0	0	0	0	0	0	0	0	636,750
Interests	k EUR	42,359	39,837	38,096	36,743	35,628	34,677	33,846	33,107	32,442	31,838
CIRS											
CIRS cash outflows EUR	**k EUR**	**50,000**	**50,000**	**50,000**	**50,000**	**50,000**	**50,000**	**50,000**	**50,000**	**50,000**	**1,050,000**
Notional	k EUR	0	0	0	0	0	0	0	0	0	1,000,000
Interests	k EUR	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
CIRS cash inflows USD	**k USD**	**75,000**	**75,000**	**75,000**	**75,000**	**75,000**	**75,000**	**75,000**	**75,000**	**75,000**	**1,575,000**
Notional	k USD	0	0	0	0	0	0	0	0	0	1,500,000
Interests	k USD	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
CIRS cash inflows USD converted to EUR	**k EUR**	**42,359**	**39,837**	**38,096**	**36,743**	**35,628**	**34,677**	**33,846**	**33,107**	**32,442**	**668,588**
Notional	k EUR	0	0	0	0	0	0	0	0	0	636,750
Interests	k EUR	42,359	39,837	38,096	36,743	35,628	34,677	33,846	33,107	32,442	31,838
Bond + CIRS											
Expected (Cash inflow - Cash outflow)	**k EUR**	**-50,000**	**-50,000**	**-50,000**	**-50,000**	**-50,000**	**-50,000**	**-50,000**	**-50,000**	**-50,000**	**-1,050,000**
Real (Cash inflow - Cash outflow)	**k EUR**	**-50,000**	**-50,000**	**-50,000**	**-50,000**	**-50,000**	**-50,000**	**-50,000**	**-50,000**	**-50,000**	**-1,050,000**
Liquidity needs	**k EUR**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

3.2. Scenario 3.2: CIRS subject to margining; liquidity risk when USD depreciates relatively to EUR

In this scenario, we face liquidity risk with the depreciation of USD relatively to EUR. On one side one pays less coupons and notional in EUR, but that is compensated by the CIRS. This appreciation will increase liquidity needs as the MtM of the CIRS becomes negative and that will demand a cash outflow relating margining. Because the bond's biggest flow of cash only occurs in maturity (payment of the notional), the liquidity needs will only decrease significantly in maturity.

		y1	y2	y3	y4	y5	y6	y7	y8	y9	y10
EUR/USD 95th percentile		1.77	1.88	1.97	2.04	2.11	2.16	2.22	2.27	2.31	2.36
Bond											
Bond cash outflows USD	**k USD**	**75,000**	**75,000**	**75,000**	**75,000**	**75,000**	**75,000**	**75,000**	**75,000**	**75,000**	**1,575,000**
Notional	k USD	0	0	0	0	0	0	0	0	0	1,500,000
Interests	k USD	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
Bond cash outflows USD converted to EUR	**k EUR**	**42,359**	**39,837**	**38,096**	**36,743**	**35,628**	**34,677**	**33,846**	**33,107**	**32,442**	**668,588**
Notional	k EUR	0	0	0	0	0	0	0	0	0	636,750
Interests	k EUR	42,359	39,837	38,096	36,743	35,628	34,677	33,846	33,107	32,442	31,838
CIRS											
CIRS cash outflows EUR	**k EUR**	**50,000**	**50,000**	**50,000**	**50,000**	**50,000**	**50,000**	**50,000**	**50,000**	**50,000**	**1,050,000**
Notional	k EUR	0	0	0	0	0	0	0	0	0	1,000,000
Interests	k EUR	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
CIRS cash inflows USD	**k USD**	**75,000**	**75,000**	**75,000**	**75,000**	**75,000**	**75,000**	**75,000**	**75,000**	**75,000**	**1,575,000**
Notional	k USD	0	0	0	0	0	0	0	0	0	1,500,000
Interests	k USD	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
CIRS cash inflows USD converted to EUR	**k EUR**	**42,359**	**39,837**	**38,096**	**36,743**	**35,628**	**34,677**	**33,846**	**33,107**	**32,442**	**668,588**
Notional	k EUR	0	0	0	0	0	0	0	0	0	636,750
Interests	k EUR	42,359	39,837	38,096	36,743	35,628	34,677	33,846	33,107	32,442	31,838
Notional	**k EUR**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-363,250**
Interests	**k EUR**	**-7,641**	**-10,163**	**-11,904**	**-13,257**	**-14,372**	**-15,323**	**-16,154**	**-16,893**	**-17,558**	**-18,162**
MtM (0% discount rate)	**k EUR**	**-221,603**	**-284,572**	**-321,399**	**-344,680**	**-359,298**	**-367,758**	**-371,549**	**-371,643**	**-368,713**	**0**
Notional	k EUR	-152,830	-203,266	-238,073	-265,138	-287,438	-306,465	-323,086	-337,857	-351,155	0
Interests	k EUR	-68,773	-81,306	-83,326	-79,541	-71,860	-61,293	-48,463	-33,786	-17,558	0
Margining	**k EUR**	**-221,603**	**-62,970**	**-36,826**	**-23,281**	**-14,618**	**-8,460**	**-3,792**	**-93**	**2,930**	**368,713**
Bond + CIRS											
Expected (Cash inflow - Cash outflow)	**k EUR**	**-50,000**	**-50,000**	**-50,000**	**-50,000**	**-50,000**	**-50,000**	**-50,000**	**-50,000**	**-50,000**	**-1,050,000**
Real (Cash inflow - Cash outflow)	**k EUR**	**-271,603**	**-112,970**	**-86,826**	**-73,281**	**-64,618**	**-58,460**	**-53,792**	**-50,093**	**-47,070**	**-681,287**
Liquidity needs	**k EUR**	**221,603**	**284,572**	**321,399**	**344,680**	**359,298**	**367,758**	**371,549**	**371,643**	**368,713**	**0**

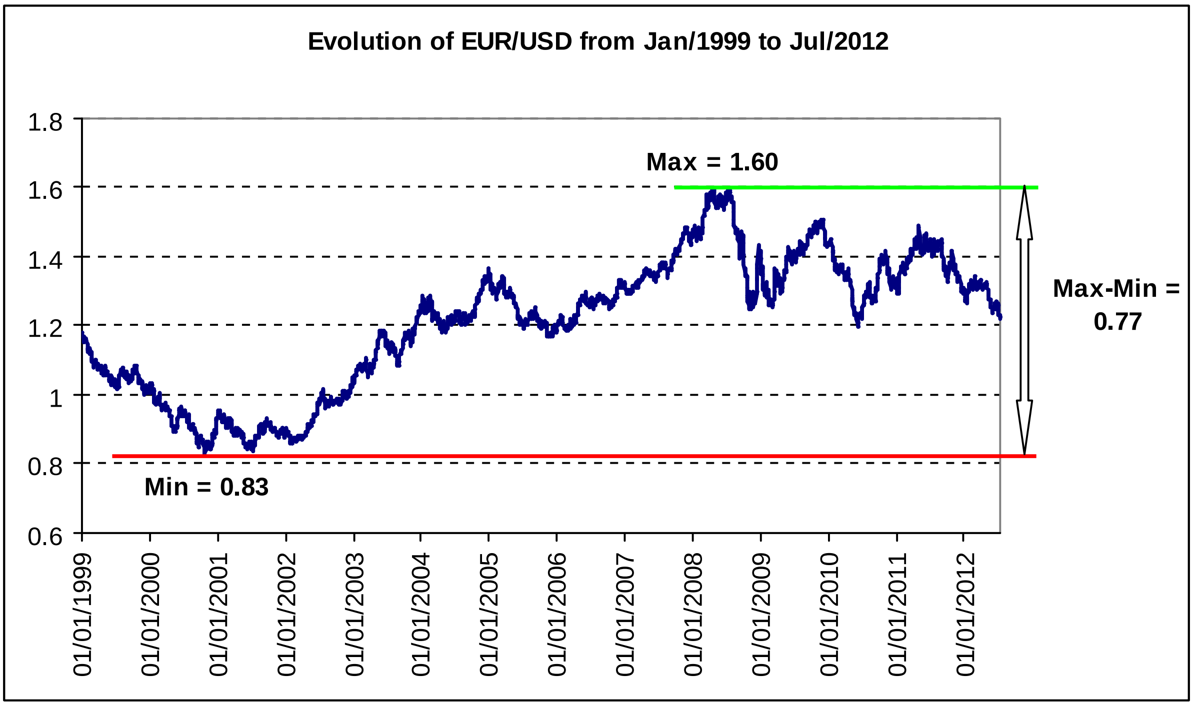




		y1	y2	y3	y4	y5	y6	y7	y8	y9	y10
Liquidity needs (end of December)	M EUR	222	285	321	345	359	368	372	372	369	0
Average Liquidity needs	M EUR	111	253	303	333	352	364	370	372	370	369
Costs (10% * Average Liquidity needs)	M EUR	11	25	30	33	35	36	37	37	37	37

Note: Average Liquidity needs (y1) = average (0; end of y1); Average Liquidity needs (y10) = average (end of y9; margining y10).

The evolution of EURUSD in 10 years might seem too significant (from 1.50 in t=0 to 2.36 in t=10y, representing an increase of 0.86), but if we analyze the historical evolution of that exchange rate we verify a similar amount in the evolution from 2001 to 2008 (increase of 0.77).



We also have to take into account that the example here drawn analyzes one of the riskier derivative instruments in terms of change in MtM that are usually present in treasury portfolios (CIRS). An interest rate derivative, for example an IRS or an interest rate collar, would lead to much lower levels risk for the same considered notional values.

Extrapolation of the outcomes of Energy Trading and Treasury liquidity risks to an example of a large company in the sector

Here we extrapolate the values we found in this analysis to an example of a fictitious large company in the sector that:

- Generates 200TWh/year including 100TWh/year with Hydro (mostly fixed costs power plants) and 100TWh/year with CCGT (mostly variable costs power plants);
- Has a total financial debt of 30billion€, of which 10% (3b€) is issued in a currency other than Euros (in our example USD) and swapped to Euros using CIRS.

For the power generation side we analyze two hypothesis:

1. The company sells all its energy to retail clients and has to hedge its variable cost with futures (no risk for Hydro and risk for CCGT hedging gas and CO2 prices): in this case we apply scenario 1.1 for Hydro and scenario 2.2 for CCGT, in which Maximum Liquidity Needs are 63M€ for 12TWh/year of CCGT generation. Scaling for 100TWh we get 525M€ (63*100/12) of Maximum Liquidity Needs, when prices go down;
2. The company sells all energy in organized markets and hedges with futures: in this case we apply scenario 1.2 for Hydro and scenario 2.4 for CCGT, in which Maximum Liquidity Needs are 52M€ for 12TWh/year of Hydro generation. Scaling for 100TWh we get 433M€ of Maximum Liquidity Needs, when prices go up.
3.

For the Treasury side, if we scale our example of 1b€ CIRS to 3b€ we get around 1.1b€ of Maximum Liquidity Needs, when prices go up.

In the worst case scenario, when prices go up (95th percentile), if we add the Power Generation (the 2nd hypothesis) with the Treasury we get to Maximum Liquidity Needs of more than 1.5b€.

VI. Conclusion

When hedging a position in the financial markets we reduce market risk but exchange it by counterparty risk. Liquidity risk (associated with hedging) arises from the intention of reducing or eliminating counterparty risk.

Market vs Counterparty vs Liquidity Risks

As we have seen, getting involved in CSA agreements or central clearing, can increase significantly liquidity risk, and that has of course costs for the company (unused credit facilities or cash to support possible shortfalls). When migrating from market risk to counterparty risk and eventually to liquidity risk one has to analyze which are the benefits and costs of each possibility.

One thing is certain, an option always has value, and the possibility to decide between keeping counterparty risk and mitigate that risk with margining (CSA or central clearing) has more value than a possible obligation to always do central clearing, as in some cases or to a certain segment of clients it can be less costly to retain the counterparty risk in the company.

In the analyzed scenarios we can verify that the liquidity needs can become very significant the hedging activities both in the energy trading and treasury areas. We verified that on one side the energy trading deals with more volatile prices than treasury (Brent, coal or gas have higher volatilities than interest rates or even exchange rate), but on the other side treasury deals with much longer periods (and as known, volatility increases with time). Taking all this into account, though the Treasury deals with lower underlying asset's volatility, the much longer maturity of their hedging instruments can make the associated liquidity risk very significant and even larger than the Energy Trading risks. In our extrapolation example, the liquidity risk for the treasury is more significant than the Energy Trading one (in a scale 2 to 1), because while the maturity for Energy Trading deals is 1 year, the Bond here considered has a maturity of 10 years (and of course we are analyzing a derivative that has exchange rate risk, that despite EUR/USD exchange rate volatility is lower than Fuels volatility, it is still much higher than interest rate volatility).

ANNEX 1 - Impact of Liquidity constraints in credit ratings

Liquidity is a very important issue in financial analysis: it shows how capable a company is to generate cash from internal sources (as well as the ability to obtain external financing), essential for fulfilling its short term financial commitments. If a company has higher liquidity risk, the costs of financing are supposed to raise, as there is a higher risk of default (higher liquidity risk implies higher risk of defaulting, which will result in a rating deterioration). The impact on WACC will be mainly obtained from an increase in Credit Spreads (see quantification in Credit Risk Chapter):

WACC = D/(D+E)*(1-Tc)*Cost_Debt + E/(D+E)*Cost_Equity

Cost_Debt = Rf + Credit_Spread

Assuming that only **Credit Spread** changes, than change in WACC will be:

a**WACC = D/(D+E)*(1-Tc)***a**Credit_Spread**

In the example shown in Credit Risk chapter:

a**WACC = 50%*(1-30%)***a**Credit_Spread**

Rating agencies consider general liquidity, and liquidity ratios, as main components to assess the financial risk of a certain corporate. Next we show some examples of rating methodologies for corporates (and some specific for Electric Utilities), in which liquidity impact on credit ratings is very important and broadly present.

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