Resource Investment in the Golden Age of Energy Finance

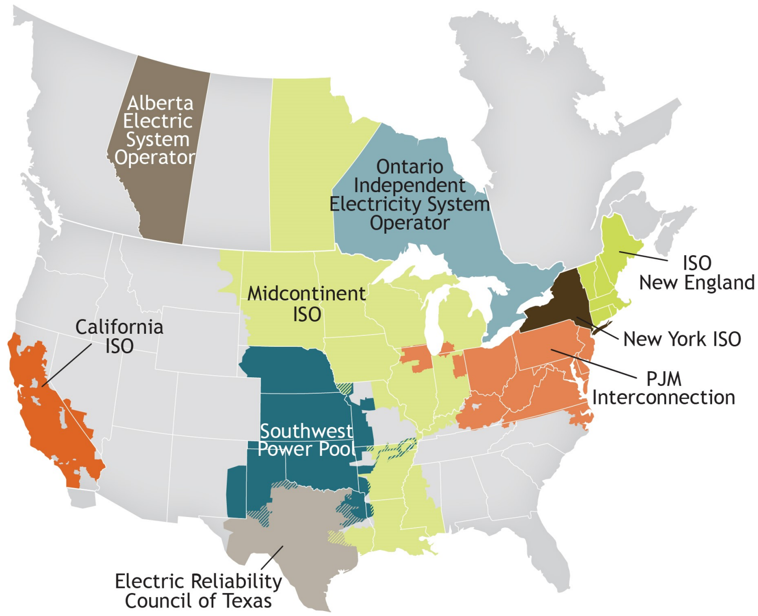
Financial Investment Drivers and Deterrents in the Competitive Electricity Markets of the US and Canada

May 2015

THE ISO/RTO COUNCIL

The ISO/RTO Council (IRC) is the umbrella group for all electricity Independent System Operators (ISOs) and Regional Transmission Operators (RTOs) in the US and Canada:

- Alberta Electricity System Operator (AESO)
- California Independent System Operator (CAISO)
- Electric Reliability Council of Texas (ERCOT)
- (Ontario) Independent Electricity System Operator (IESO)
- ISO New England (ISO-NE)
- Midcontinent Independent System Operator (MISO)
- New York Independent System Operator (NYISO)
- PJM Interconnection (PJM)
- Southwest Power Pool (SPP)



These organisations operate both the electricity transmission system and electricity spot/cash markets within their respective regions, along with a range of other markets and system-related services. Collectively their footprint spans two-thirds of electricity consumers in the US, and more than half in Canada. Through the ISO/RTO Council, its members share ideas and information, and pursue topics of common interest.

ABOUT THE AUTHORS

This report was authored by Todd Bessemer, Managing Director & Principal, and Francis X. Shields, Chairman of Market Reform.

Market Reform is a boutique international consultancy specializing in industries undergoing significant structural change – through competition, deregulation and the evolution of new business models and methods. Our work has a particular focus on energy, water and environmental markets.

TABLE OF CONTENTS

Glossary of Terms

Appendix A contains definitions for many of the terms used in this document.

Table of Figures

Table of Tables

1 EXECUTIVE SUMMARY

Electricity markets in the US and Canada have an ongoing imperative to promote resource adequacy, and ensure there is a steady flow of resource investment within their regions. Meanwhile, these markets are also experiencing significant changes in resource mix, driven by natural gas supply, environmental policy and other factors.

The objective of the Resource Investment & Revenue Analysis Project was to better inform the members of the ISO/RTO Council regarding the factors that drive financial investment in generation and other system resource, and how these are influenced by ISO policy/market design decisions and the revenue streams flowing out of the ISO-operated markets. The study's approach was to gather this information 'from the horse's mouth'; through direct conversations with those actually responsible for making investment decisions.

The Goal of Investment

All rational investors seek an attractive risk-adjusted return on capital. This money is not 'ear-marked' for generation – that is one potential path it can take, not the destination. The goal of investment is profit. For capital to find its way into generation and other system resource, these investments must provide returns that are competitive with the many other investment opportunities competing for the same funds.

This does not mean that all investors have the same requirements or approach. One of the project's fundamental tenets is that investors are not a homogeneous group – with differing fields of interest and expertise, maturity requirements, risk appetite and return expectations. Investors can, however, be segmented into a number of investor classes, with reasonable commonality of attributes within each class. The project sought input from, and to compare and contrast the opinions of, investors spanning private equity funds, project developers, merchants/IPPs, investment funds, tax equity, underwriters/financiers, and commercial lenders.

The Current Investment Context

A number of the investors interviewed for the project believed that the US and Canada are presently experiencing "a golden age of energy finance."

The interest rate environment, coupled with a number of financial engineering innovations – such as tax equity, Yieldcos, and the expansion of the Term Loan B market – has appreciably expanded the availability of low-cost financing. This coincides with the right time in the boom/bust development cycle in many of the ISO markets.

Investment Drivers and Deterrents

The project received a wide range of direct feedback from investors on the factors that encouraged, as well as deterred, their investment in generation and other system resource, and identified a number of key themes.

The 'Fundamentals' are fundamental

First and foremost, investment is driven by the fundamentals of energy supply/demand balance. While investors have strong opinions on issues of market design, such considerations were secondary to the fundamental strictures of supply/demand balance. If demand growth is strong, they will invest even if they don't like the design, and vice versa. There was some concern, though, regarding the impact that inherently 'lumpy' investment can have on these fundamentals in smaller markets.

Capacity markets are loved, but feared

As a general rule, investors were strong supporters of capacity markets, for their ability to backstop energy revenues and provide greater certainty of future cashflows. There was concern, however, regarding volatility in capacity revenues in recent years, which has led to steep discounting of projected capacity revenues when assessing potential investments. Ancillary services revenues scarcely factored into investors' considerations, with the notable exception of grid-level storage.

Renewables investment is driven by incentives

The development of renewable generation is substantially supported by incentive programs – Renewable Portfolio Standards (RPS) being most influential in the majority of markets. Tax credits are important in "lubricating the markets", especially in financing new plant. However, as incentive programs are at risk of government intervention, the revenues derived from them tend to be discounted by investors.

Energy revenues were considered to be of lesser importance to renewables, with neither wind nor solar resource expected to be 'investable' without incentives for some time.

Non-renewables are principally driven by gas, if it can be delivered

Gas-fired generation has accounted for the great bulk of new investment in non-renewable resource, driven by cheap fuel supply, emissions benefits, cheaper plant and the general flexibility of gas-fired plant.

However, issues of gas deliverability are of significant concern. Pipeline capacity expansion is not keeping pace with demand growth, and gas/electric integration is inadequate. This is already an active problem in New England and is expected to become an increasing issue in other parts of the North-East and Mid-Atlantic in the next few years. These issues are leading many to question whether the gas regulatory construct needs to be re-thought, to address the changed needs of a gas system far more dynamic and interconnected than that for which the model originally evolved. Some even suggested that "perhaps there is a need for a gas ISO?"

Investors prefer open, transparent markets

Interviewees universally expressed the view that they are more comfortable investing in markets they view as open and transparent. In those markets where an incumbent can fall back upon a franchise customer base, with regulator-guaranteed returns, the playing field is perceived to be inherently uneven. By contrast, the presence of effective retail competition was seen as an important indicator of market openness.

While each investment is assessed on its own merits, investors expressed a general aversion for markets that might be subject to incumbent dominance, and attraction to markets where they view the price-setting process as transparent and free from potential manipulation or interference. The resultant ability to trade confidently was seen as contributing directly to more effective hedging, and better liquidity in both the cash and forward markets.

The desire for transparency extends to ISO operations

Concern was expressed that out-of-market actions taken by ISOs, including the dispatch of plant out of economic merit order, and the designation of resources as Reliability Must-Run

(RMR), can appear arbitrary, and if it materially impacts market results, can dull the investment climate. It was generally appreciated that there can be valid reasons for such actions, tempered by a general conviction that they are over-used, and that greater transparency surrounding the rationale for their use would aid investor confidence, and encourage better process.

Regulatory risk is unhedgeable

A repeated and serious concern raised by investors was the risk that regulators and legislators can take, and on occasion have taken, actions which interfere with the very price signals which the market relies upon to stimulate investment. These unpredictable and unhedgeable actions – which often reward the reckless and punish the prudent – can, in the longer-term, drive capital away from the market.

A lesser concern was the general level of complexity of the ISO-operated markets, and the level of ongoing 'tweaking' of market rules. While all those interviewed would like to see less variability in market design, this concern was greatest amongst those with a shorter-term investment horizon.

2 THE PROJECT BRIEF

2.1 Objective

ISOs/RTOs (hereafter referred to as ISOs), as the Reliability Coordinators for their respective regions, have a mandate to promote resource adequacy, and as such are strongly interested in maintaining a steady flow of resource investment within those regions. To inform their thinking – particularly in the light of significant changes in resource mix being driven by natural gas supply, technology, environmental policy and other factors – the ISOs wish to better understand:

1. the factors that are driving financial investment in prospective (and existing) generation and other system resource (e.g. demand response, storage), and;
2. how these are influenced by ISO policy/market design decisions, and the various revenue streams flowing out of the ISO-operated markets.

2.2 Scope

To this end, the Markets Committee of the ISO/RTO Council engaged Market Reform to undertake the Resource Financing & Revenue Analysis Project. The study's mandate was to address these questions not from the perspective of economic theory, but by seeking the views of actual 'financial' investors in resource, through equity or debt. Investors of interest fit the following profile:

- Invests directly in resources, in part or whole, or facilitates such investment – not just an investor in securities of resource/asset owners, or of bonds issued by them.
- Directly interested in the revenue flows received by those resources.
- Active investor, involved in assessing investment value, packaging the products, directing the funds, etc. – not a passive holder.
- Investments are directly exposed to revenue risk – without the protection of a franchise customer base, or rate-of-return regulation. i.e. investment in traditional utilities was explicitly out-of-scope.

2.3 Approach

The study's declared approach was to gather its information 'from the horse's mouth'; through interviews with investor personnel integrally involved in the investment evaluation and decision-making process.

This process was guided by the following principles:

- *Grounded in practice, not theory*: The project was not approached from the perspective of economic theory, and what a theoretical 'rational investor' would do, but based its analysis on the considerations of *actual* investors, who must act with imperfect information and considering the risk of how things may evolve in the future. As such, a series of interviews with a thoughtfully selected set of actual investors was at the core of the project's activities.
- *The interviewee's opinion, not the interviewer's*: By extension, Market Reform's job was to effectively prepare for, lead and analyze these discussions, and synthesize the results – requiring the team to utilize expert judgment and challenge what they heard – but not to substitute their own opinion.

- *'Investors' are not a homogenous group*: While often discussed collectively, there is no uniform investor. Nor was it viewed as particularly useful to just take a random sample of investors. Investors were divided into a number of classes (discussed further in 3.3), with representatives of each class forming part of the interviewee set.
- *Consistent, senior interview team*: In order to ensure a consistent approach to all interviews, they were conducted by the same two principal interviewers. As the project sought access to senior investment decision makers, the interview team was commensurately senior.

The project had a target of conducting 7-8 interviews, though ended up exceeding this. In all, 21 invitations were issued, with 15 interviews conducted, 2 declines and 4 failures to respond after multiple attempts. The list of organisations interviewed is included in Appendix B. To get the most value out of the discussions, approximately two-thirds of interviews were conducted in-person, with the remainder done over the phone.

By agreement with the project's steering committee, all interviews were conducted under the Chatham House Rule, whereby an attendee is free to use any information gathered from the discussion, but is not permitted to reveal who made any comment.

3 A RESOURCE INVESTMENT PRIMER

3.1 'Financial Investors' in 'Resource'

This report is concerned with 'financial investors' in 'resource'. In its broadest sense, this is any entity that invests in system resource – generation, demand response or storage – in the form of either equity or debt.

More specifically, the project is principally interested in those investing within the footprint covered by the nine IRC members, and with exposure to the revenue streams stemming from the ISO-operated markets – as opposed to revenues assured by guaranteed regulatory recovery from a captive rate base.

3.2 What Do Investors Seek?

Ultimately, all rational investors seek an attractive risk-adjusted return-on-capital. Their precise risk tolerance, return expectations, and the trade-off between these, is unique to each organisation, and dependent upon its investment thesis and policies. For most financial investors there is no default position that they must invest in generation, or any other electric system resource, and certainly no geographic restriction on where they choose to invest. Capital is deployed where it can be utilised most effectively.

Logically, investors will always seek maximum return for minimum risk. On the other hand, in a well-functioning market there is always a competitive tension amongst and between sellers and buyers that serves to restrict investment returns – a tension well understood and respected by all those the project interviewed.

For investors, this must be balanced by the competition for funds. If an investor perceives the risk as high – whether this be due to underlying fundamentals such as falling demand, the threat of competition, or a perceived systemic bias in the market – they will seek higher returns. If this would price them out of the market, or returns are constrained by other means (e.g. regulatory controls), they will decline to participate and 'place their bets' elsewhere. If multiple participants share the same perspective, it can lead to a dearth of new investment. When driven by fundamentals this may well be a desirable outcome; in other situations, less so.

The reverse argument is also true when risk adjusted returns are considered to be attractive – if multiple investors feel the same way there can be a rush of investment. Given the 'lumpiness' of generation investment, particularly when compared against the total size of smaller markets, this can lead to a 'boom/bust' cycle.

3.3 Investor Classes

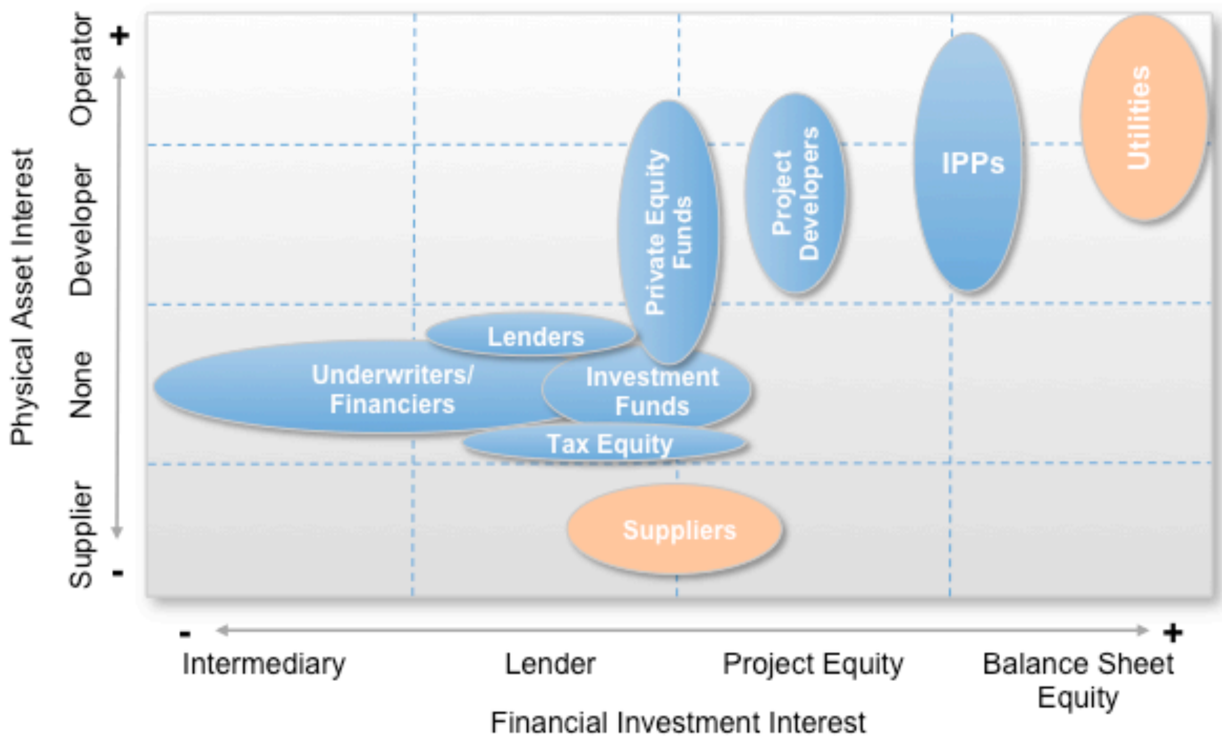
As discussed in the Approach section of this document (2.3), investors are not a homogeneous group – with differing fields of interest and expertise, maturity requirements, risk appetite and return expectations. Investors can, however, be segmented into a number of investor classes, with reasonable commonality of attributes within each class – not withstanding that some investors fall into more than one class. Key investor classes examined by the project included:

Table 1 – Investor Classes Examined

Private equity funds	Mid-stage and mature funds (early stage/venture capital tends to invest more in energy technology vs. assets). Providers of both equity and debt investment.
Project developers	Lead the development of new resources. Equity investors; projects are typically supported by equity co-investment and project-level debt. May operate the asset, or have others do this. Typically dispose of asset within 5 years of entering service.
Merchants/IPPs	Develop new resource and acquire existing resource. Projects/acquisitions typically backed by balance sheet equity and corporate debt. Typically operate the asset. Longer-term holders compared to project developers.
Investment funds	Including pension funds, mutual funds, exchange-traded funds, infrastructure funds, sovereign wealth funds. May provide equity (e.g. as a co-investor) or debt investment.
Tax equity	Corporates, banks, and insurance companies with sizable tax exposures. Only applicable to investment in renewables with tax credits. Essentially debt providers, but with an 'equity' element to allow transfer of tax credits (see 3.5.2).
Underwriters/ financiers	Typically investment banks. Act as intermediaries in arranging debt and/or equity financing. May also participate as lenders.
Commercial lenders	Insurance companies, commercial banks, project finance banks, mezzanine funds, bond markets. Providers of debt, often organised by underwriters. Type of debt highly dependent on project stage, and risk.

Figure 1 below provides a diagrammatic overview of the typical financial investment and physical asset interest of various investor classes in a resource. Those shown in blue are those of interest to this project.

Figure 1 – Investment Interests in Resource



3.4 Stages of Investment

New resource – or at least, project-developed resource – tends to be financed differently depending upon its stage of development, utilising higher cost funds during its riskier earlier stages, later supplanting these with less expensive longer-term funds as it moves into operation. The three typical phases are:

- *Development*: All work to identify, qualify and quantify the opportunity, determine siting and conduct interconnection studies, arrange permitting and approvals, select contractors, arrange financing, negotiate off-take agreements or other hedging, etc., through to issuance of a notice-to-proceed for construction.
- *Construction*: All construction works and commissioning of the facility, interconnection to the grid, and connection to fuel (e.g. gas pipeline), through to commencement of operations.
- *Operation*: Full operation of the resource in the electricity market

The helpful diagram in Figure 2 below – adapted from an original produced by Marathon Capital – provides an overview of the various types of debt and equity financing typically utilised in each development stage, and common providers of each type of financing.

Figure 2 – Types of Finance and Providers, by Project Lifecycle Stage[1]

Development	Construction	Operation
Debt		
Corporate Debt • Bond Markets (for IPPs)	Corporate Debt • Bond Markets (for IPPs) Bank Debt • Project Finance Banks • Commercial Banks Mezzanine Debt • Infrastructure Funds • Mezzanine Debt Funds	Corporate Debt • Bond Markets (for IPPs) Senior / Long-Term Debt • Project Finance Banks • Commercial Banks • Insurance Companies • Bond Markets
Equity		
Balance Sheet Equity • IPPs Development Equity • Private Equity • Project Developer	Construction Equity • IPPs • Private Equity • Infrastructure Funds • Equipment Providers	Tax Equity • International + Regional Banks • Insurance Companies • Corporates Project Equity • Private Equity • Investment Funds • Private Placements • Public Markets (YieldCos)

3.5 "A Golden Age of Energy Finance"

This characterisation, or similar, was used by several of the investors interviewed by the project.

The interest rate environment in the US and Canada (at the time of writing), coupled with a number of financial engineering innovations, has appreciably expanded the availability of low-cost financing. Anecdotally, debt financing deals that were being done 3-4 years ago at LIBOR plus 700-900 basis points (bps), are now being done at LIBOR plus 300-400 bps. Project debt-equity ratios have also been increasing from around 1:1, to closer to 2:1. While the variety of financing deals that can be done are limited only by the ingenuity of the financial engineers, and what a buyer and seller are willing to agree, three general trends are noteworthy:

3.5.1 Growth of 'Term Loan B'

Investors with a suitably robust balance sheet typically obtain debt financing at the corporate level, through the bond market and bank lines of credit, providing leverage across their entire asset portfolio. By contrast, project developers have historically obtained finance through the senior term loan – also known as Term Loan A – market, potentially augmented by more expensive shorter-term financing. However, Term Loan A comes with significant covenants, including the requirement that almost all off-take price exposure be hedged out 5-7 years (the holding period of the asset for many developers), and substantial amortisation (repayment of loan principal over the loan period).

The last couple of years have seen an increasing use of Term Loan B for major project debt. Term Loan B typically sits equal to Term Loan A on a security basis, but has fewer restrictive covenants – e.g. 50% vs. 100% hedging requirements – and requires nil or minimal amortisation.

[1] Adapted from the original diagram by Marathon Capital. Source: Ted Brandt, Marathon Capital, *The State of Power*

These eased restrictions imply a greater risk, and thus higher interest rates, compared to Term Loan A. However, spreads have narrowed substantially as lenders have become more comfortable with the risks associated with the use of Term Loan B for generation financing.

3.5.2 Tax Equity

'Tax equity' has become a popular method of financing renewable generation in the US. This form of finance has its origins in the various tax incentives for development of renewable generation, including:

- *Production Tax Credit (PTC)*: chiefly used by wind generation, these provide a $23/MWh credit for wind, geothermal and closed-loop biomass, and $11/MWh for other eligible technologies, generally over the first 10 years of operation. PTCs are no longer being issued for projects not already under construction.
- *Investment Tax Credit (ITC)*: chiefly used by solar, these provide a credit equal to 30% of investment value for solar, fuel cells and small wind, and 10% for geothermal, micro-turbines and combined heat and power (CHP). The solar credit reduces to 10% at the end of 2016. ITCs are realized in the year in which the project begins commercial operations, but vest linearly over a 5-year period.
- *Accelerated Depreciation*: assets can be fully depreciated within five years for most solar, geothermal and wind assets, even though their useful life may be 30+ years.

The complication is that many developers of renewable generation cannot take full advantage of these tax benefits as they are not sufficiently profitable. Tax rules do, however, allow these benefits to be assigned to other equity holders in the business. Enter tax equity.

Under a tax equity arrangement, the majority of the resource owner's tax credits are assigned to tax-equity investors. These deals are typically debt-like, paying an agreed return, and having creditor priority superior to trade creditors and regular equity, but include a call option, which allows the arrangement to be considered equity for tax purposes. Given these attributes, investors in tax equity are typically organisations with substantial available cash to invest, and sizable tax liabilities which can be offset – such as major banks, large corporates, and insurance companies.

3.5.3 YieldCos

In the current low interest rate environment, yields have been substantially reduced on traditional fixed income investments, such as treasuries and municipal bonds. As a result, there is significant investor appetite for instruments that can provide better long-term, fixed income yields.

YieldCos are a financial innovation developed to take advantage of this need. They consist of a portfolio of assets with steady revenues, backed by long-term (15-25 year) forward contracts, paying out most of their cash flow to shareholders as dividends. Due to these characteristics they are sometimes referred to as 'synthetic MLPs'. The 'sponsor' of the YieldCo – usually the original owner and ongoing operator of the YieldCo's assets – tends to maintain management control and a sizable shareholding.

Because of the requirement for steady revenues, YieldCo portfolios have tended to consist predominantly of renewable assets contracted to utilities under long-term power purchase agreements, or deregulated assets in rate-regulated regions, again under long-term utility contract.

An important part of the stated proposition for many YieldCos, and a key influencing factor in their valuation multiples, is the 'growth story' – the expectation, often explicitly promised, that they will continue to develop and/or acquire a stream of assets with attractive, steady revenues which will be 'dropped down' into the YieldCo.

There is concern, though, regarding the sustainability of this model. With the growing popularity of YieldCos and a limited supply of assets with long-term stable revenues to 'drop down', some questioned how YieldCos could keep "feeding the beast", and whether they would begin seeking out opportunities with lower quality revenues (e.g. shorter tenors), thus "debasing the currency". In the longer-term there is concern that, when interest rates come back up, YieldCos could lose their relative attractiveness to other steady yield investments, and thus some of premium valuation they presently attract.

Ultimately, the investor view of YieldCos was mixed. Some saw them as creating competition for funds, leading to an increase in the cost of capital. Others saw them as "an attractive platform", opening up opportunities for participation by investors who might not normally invest so directly in generation, and allowing asset owners to free up capital for other investments

3.6 Project Finance Example

Figure 3 below provides an overview of the various parties involved in financing a recently announced project – Panda Power's Stonewall facility in Loudon County, Virginia.[2]

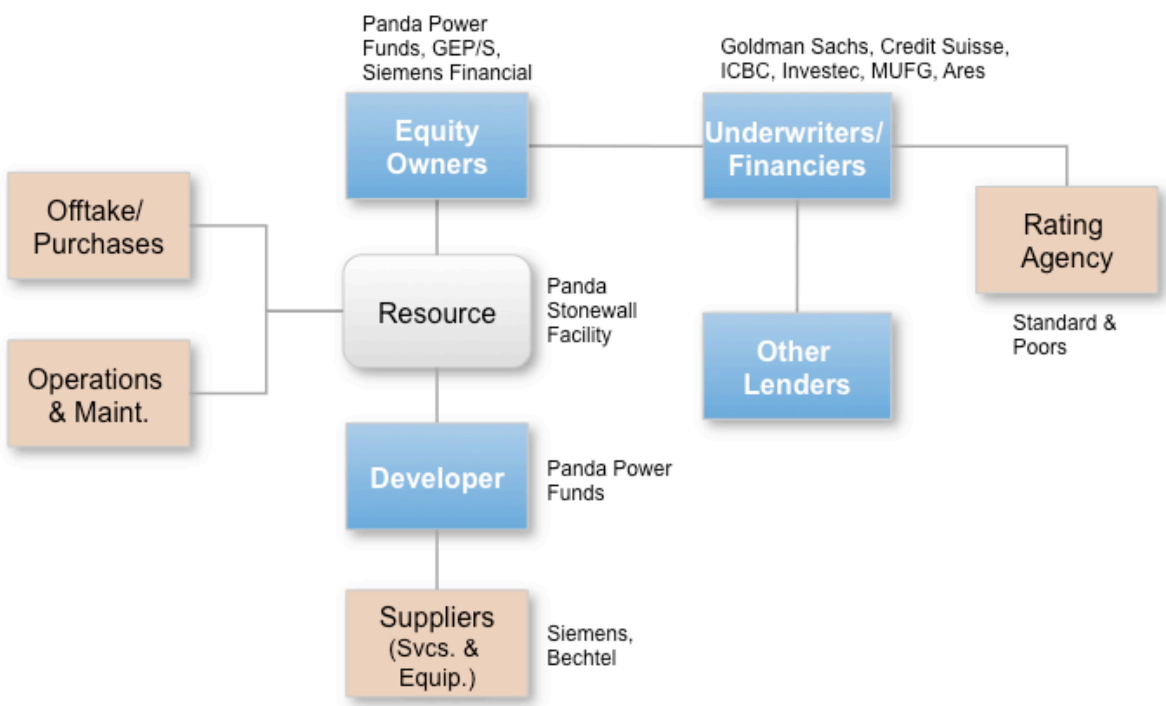


Figure 3 – Example Project Structure: Panda Stonewall

[2] Data source: Business Wire, November 17 2004, *Panda Power Funds Secures Financing for 778 MW/$571 million Virginia Power Project*. While Panda Power was interviewed for this project, all information contained in this diagram was obtained from publicly available sources.

The role of various debt and equity investors can be seen, with a few other points also worth noting:

- The definition of key equipment and construction service providers, ongoing operations and maintenance, and key off-take and fuel supply arrangements, are all essential to obtaining finance.
- The finance arm of the key equipment provider is also an equity participant in the project. Equipment provider participation in equity and/or debt has been seen in a number of recent projects.
- Participation of the rating agencies. Even though debt is not being raised from the public markets, obtaining a credit rating is generally required for Term Loan B financing also.

Figure 4 below summarises a number of the key elements which must be resolved during the development stage of a project in order to secure financing for later stages of the project lifecycle.

Figure 4 – Key Project Development Elements

4 INVESTMENT DRIVERS – AND DETERRENTS

The Resource Investment & Revenue Analysis Project received a wide range of direct feedback from investors on the factors that encouraged, as well as deterred, their investment in generation and other system resource. While every investor and its investment thesis is subtly different, certain influences recurred with sufficient frequency to represent key themes.

4.1 It's the Fundamentals …

4.1.1 Energy Supply and Demand

Investor:	*We are strongly in favour of capacity markets, and capacity revenues are an important contributor to our investment thesis.*
Market Reform:	*But you invest within the ERCOT region?*
Investor:	*Well, yes, they have steady demand growth.*

This paraphrased dialogue was a common one.

During the course of the interview process it became readily apparent that despite preferences for various market design features – and investors certainly had strong opinions on these – such considerations were secondary to the fundamental strictures of supply/demand balance. First and foremost, investment is being driven by energy revenues, and investors' assessments that demand will increase, or in some cases, that supply will decrease (e.g. due to plant retirements related to age, mercury emissions regulations, etc.), thus creating an opportunity for new supply to enter the market.

ERCOT was an oft-mentioned example, with a number of investors being active in the region, despite their own stated preference for markets with capacity revenues. Similarly, PJM was seen as rebounding from a demand trough, and consequently seeing strong investment. Conversely, some other regions were perceived as being in over-supply, and not seeing investment, independent of investors' perception of the market design or regulatory issues.

As a variant on this theme, several investors noted that, even if the fundamentals didn't seem to be in place for a market as a whole, they had invested where they perceived a location-specific advantage, such as siting within a constrained load pocket, or close to cheap fuel supply.

4.1.2 Relative Importance of Non-Energy Revenues

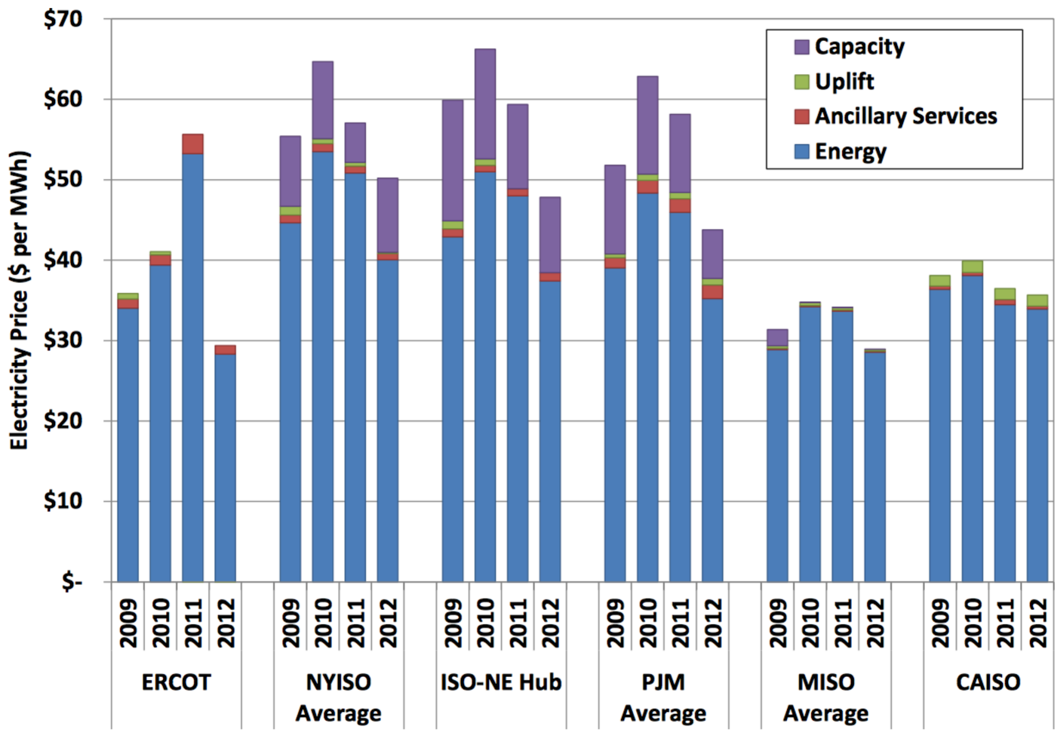
While some ISO-operated markets have a range of payment streams from which resources can derive revenues, the two principal non-energy revenue sources relate to:

- *Capacity*: Payments made to generation (and demand) resource for the capability to generate (or reduce demand) to protect the system's adequacy to serve load at times of system peak demand. This is a payment for the capability to generate, not actually doing so – which would result in an energy payment. There are a range of different treatments of capacity amongst the IRC members. ERCOT and Alberta are 'energy only' markets, with no capacity payments – the energy price alone provides the signal for new build (as is the case with every other commodity). PJM, New York and New England all have sophisticated capacity markets, albeit with different designs. Ontario, California, MISO and SPP have separate adequacy constructs or procurement mechanisms that are part-way in between, and tend to be driven by long-term contracts procured by incumbent utilities or a central authority[3].

- *Ancillary Services*: Payments for services provided to the system to maintain system security. Usually purchased by the system operator on behalf of the market as a whole, some of these services are procured via market mechanism – reserves (of various classes) and frequency regulation capability being the most common – and others via periodic contract, e.g. black-start capability, reactive power.

Figure 5 below, from the ERCOT 2012 State of the Market Report, provides an overview of the contribution of both capacity and ancillary services, in contrast with energy, to the all-in energy price across six US markets.[4] This provides a reasonable proxy for the contribution of these revenue streams to resource revenues.[5]

Figure 5 – Comparison of Price Contributors Across Markets[6]



As a general rule, investors were strong supporters of capacity markets, for their ability to backstop energy revenues and provide greater certainty of future cashflows.

However, a broad concern was expressed by some regarding volatility in capacity revenues in recent years ("no-one believes the capacity numbers are accurate").[7] Banks, in particular, indicated that this had led them to heavily discount predicted capacity revenues (e.g. by 50-

[3] In Ontario the central authority responsible for procuring such contracts is the Ontario Power Authority (OPA), which has recently been merged with the IESO.
[4] The one element of the diagram not covered above, 'uplift', refers to the costs associated with the operation of economically out-of-merit resources. This topic is discussed in further detail in 4.3.3.
[5] Note that this refers only to revenues derived from ISO-administered markets/programs. Some resources, renewables in particular, are also supported by a range of external revenue streams (discussed further in 4.2.1).
[6] Source: Potomac Economics (Independent Market Monitor for the ERCOT Wholesale Market), *ERCOT 2012 State of the Market Report*, June 2013.
[7] More specific comments on capacity market design are discussed in 5.1.

70%) in their consideration of an investment proposition. Those with a longer-term investment outlook, such as balance sheet-backed investors, indicated that they discounted projected capacity revenues less heavily, and also felt that they had a better capability to model these revenues.

Ancillary services revenues, by contrast, “don’t factor” into the investment decision-making of many investors, particularly as it relates to generation resource. A few longer-term investors indicated that they took some account of ancillary services revenues (“a distant third”), but found them to be “very volatile”, and thus discounted them heavily.

The one exception concerned investment in storage resources, where the investment thesis was substantially driven by ancillary services revenues, from frequency regulation in particular, as well as some energy ‘peak shaving’.

4.1.3 Market Scale – Size Sometimes Does Matter

Several investors expressed concern regarding the risk of investment in ‘smaller markets’, even when they generally like the market design, such as with New England and Alberta. This concern relates to the impact that large, discrete (i.e. ‘lumpy’) investments can have on supply/demand fundamentals. If multiple investors respond to price signals to invest, oversupply can result fairly quickly, depressing price and compromising the economics of the investment. While it would be possible to defer or cancel investment, this becomes more difficult and expensive the later it occurs in the development and construction process, especially if capacity commitments have been made through the capacity auction.

One obvious solution is to invest in smaller blocks, and to some extent this is what happens in these markets. However, the cost of many development activities – such as siting, permitting, arranging finance, negotiating off-take agreements, contracting fuel supply, selecting and contracting equipment suppliers, etc. – are relatively size-inelastic. Equipment and construction cost for smaller units, on a $/MW basis, also tends to be higher.

Investors appreciate that this is their risk to manage. However, when multiple opportunities are available, they will tend to spend their effort, and place their capital, where they assess it will achieve the greatest risk-adjusted returns. Thus, if other factors are equal – which of course is never precisely the case – lack of scale can have a dulling effect on investment.

4.2 A Tale of Two Resource Types

There are essentially two different theses for investment in generation resource – one for renewables, and another for non-renewable/thermal resources.

4.2.1 Renewables and Incentives

The development of renewable generation is substantially supported by incentive programs.

Table 2 – Key Renewable Incentive Programs

Incentive Program	Where
Renewable Portfolio Standards (RPS), requiring a fixed % or MW level of renewables. A Renewable Electricity Certificate (REC) is issued for each MWh of renewable energy produced.	Various states[8]

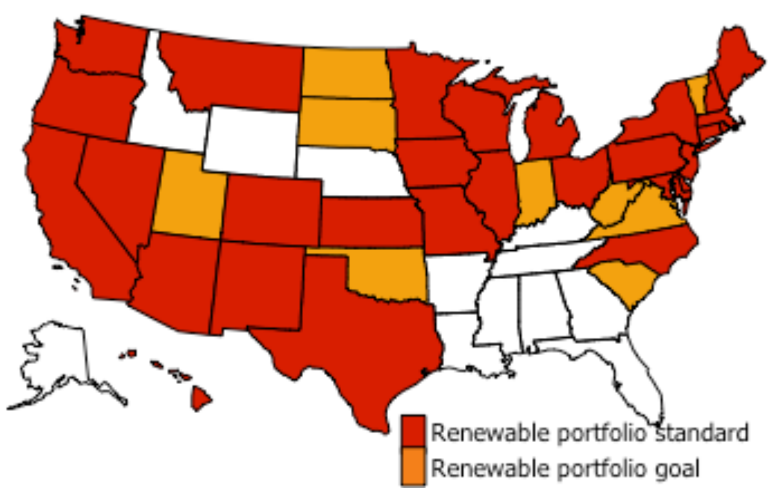
[8] While some Canadian provinces also have RPS schemes, none fall within an ISO footprint.

Incentive Program	Where
Production Tax Credit (PTC) and Investment Tax Credit (ITC) schemes.	US Federal
Feed-In Tariff (FIT)/standard offer programs: fixed payment (on a $/kWh basis) for those bringing renewable energy into the grid.	Ontario, CA, VT, ME
Tender process: to procure specified quantities of renewable plant.	Ontario
Section 1603 cash grants (in lieu of tax credits); expired for projects not in construction by Dec 31, 2011.	US Federal
Loan programs for renewables	Various states
Property tax incentives for renewables	Various state and local govt.

In the US, renewable investment is supported principally by state-based RPS schemes and federal income tax credits. There is some variation, though, regarding which has greater influence on investment decision-making.

In many regions of the US, RPS was considered more influential, serving as the key factor behind renewables being able to obtain long-term contracts. In Texas, however, installed wind generation is in excess of RPS targets – driven amongst other things by strong wind potential, and the Competitive Renewable Energy Zone (CREZ) transmission lines[9] – leading to a substantial fall in the value of RECs, and their relative importance as an investment driver.

Figure 6 – US Renewable Portfolio Standard Policies (Sep 2014)[10]



Tax credits are considered to be important in "lubricating the markets", especially in financing new plant – with tax benefits representing around 75% of the capital structure of wind deals, by one estimate. Nevertheless, as the credits aren't directly usable by most developers, tax equity was thought by many to be an inefficient way of incenting renewables development. As one

[9] The CREZ lines bring power from wind intensive regions of Texas to major load centers.
[10] Source: Database of State Incentives for Renewables & Efficiency (www.dsireusa.org)

investor commented, “we don’t get into renewables as … we don’t have a tax appetite.” Those who do, though, “view the tax equity play as a low risk position.” Tax credits were certainly seen as influencing the type of renewable investment, with many believing that investment in wind will drop off with PTC expiry, and “solar will surge” through 2016, when the ITC rate drops to 10%.

In Canada renewable incentives are province-based, with key programs including a feed-in-tariff scheme in Ontario, under which projects between 10kW and 500kW are contracted with the Ontario Power Authority at a fixed rate over a 20-year period. This program’s $/kW rate for new projects has been reduced in recent years, though existing commitments continue to be met at the old rate.

In all cases, energy revenues were a lesser consideration in the investment decision, and capacity revenues did not factor into the investment thesis at all (given the intermittency of most renewables)[11]. The consensus amongst those interviewed was that solar power “is not economic on its own”, and that wind power, while getting cheaper, is “still not reaching grid parity.”

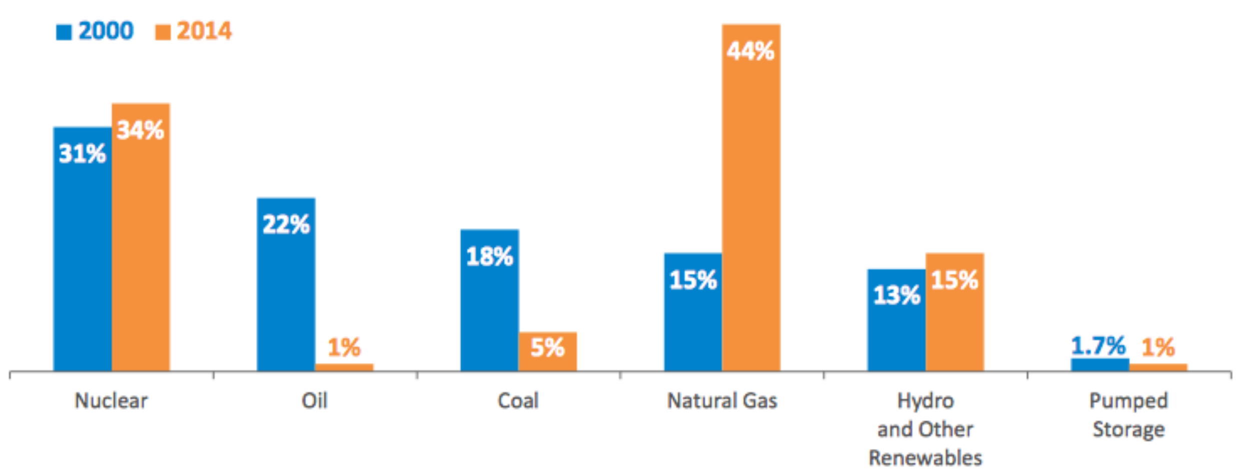
As incentive programs are at risk of government intervention, the revenues derived from them tend to be discounted by investors. Additionally, as these at-risk revenues often represent a substantial portion of the economic proposition of a project, almost all renewables investment is supported by long-term (e.g. 20-25 year) power purchase agreements (e.g. with utilities or large customers).

4.2.2 Non-Renewables – It’s a Gas, Gas, Gas…

The investment thesis for thermal plant is driven principally by energy and, where applicable, capacity revenues derived from the ISO-operated markets. In recent years gas-fired generation has accounted for the great bulk of new investment in non-renewable resource (and as such, the bulk of all new resource), though there continues to be some investment in coal plant, where it is able to comply with toughening environmental standards.

Figure 7, by way of example, shows the dramatic move to gas generation in New England in the last decade or so. Recent PJM capacity auctions have also shown an uptick in gas plant, being the largest capacity contributor from the 2014/15 commitment period on.

Figure 7 – ISO New England Electric Energy Production by Fuel Type (2000 vs. 2014)[12]



[11] There was some feeling this may change if there is significant coupling of storage and solar.
[12] Source: ISO New England

Gas is perceived to have a competitive advantage for new thermal build in most regions, due to:

- The availability of cheap natural gas, due to the unlocking of substantial amounts of 'unconventional' or 'tight' gas through hydraulic fracturing and horizontal drilling.
- Reductions in cost of plant ($/MW), and increasing plant efficiency.
- Lower CO2 emissions compared to coal.

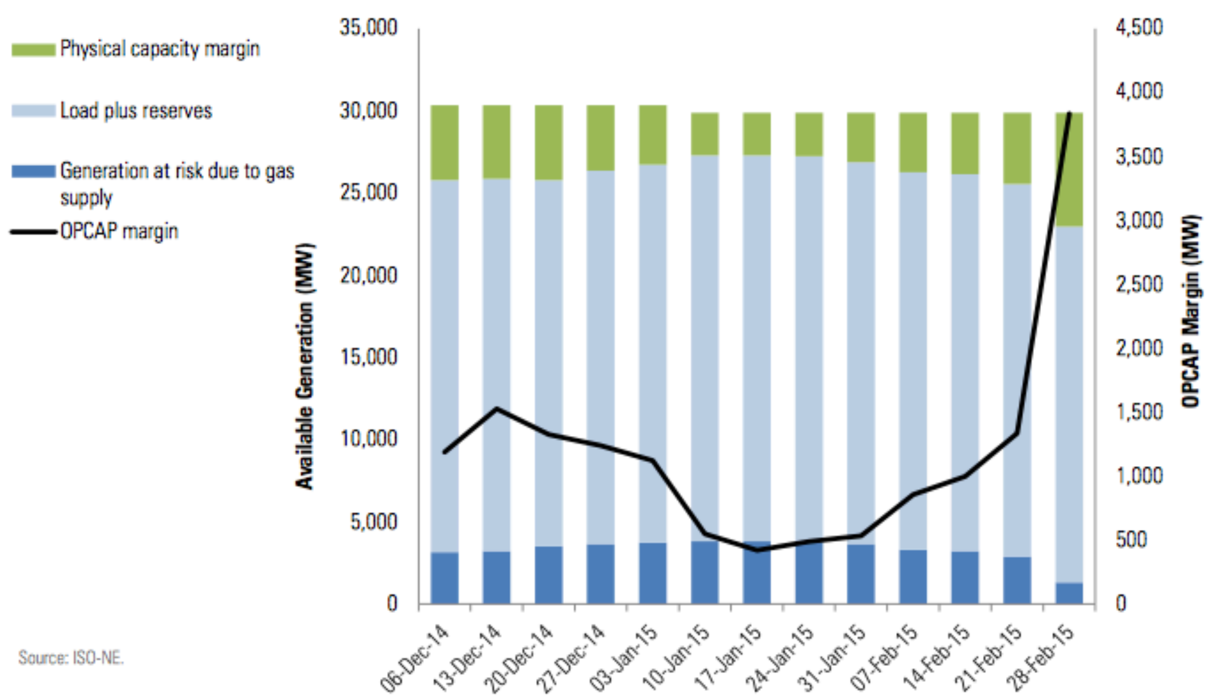
This development consists of both 'greenfield' development of new sites, as well as 'brownfield' re-powering of existing sites (generally fuel oil or coal) – which already have transmission connection, and tend to have an easier permitting process.

The gas 'play' tends to differ by region. In the North-East and Mid-Atlantic, new natural gas plants are increasingly being deployed as 'baseload' units. By contrast, in Texas, which has greater peak, flexibility and ramping requirements, new gas plants tend to be 'peaker' units.

A key threat to the continued growth of gas generation, however, is the issue of deliverability. As gas use for generation increases, constraints in the transportation of gas through the pipeline network are becoming increasingly prevalent, particularly in winter, when it coincides with peak heating demand. These problems are already manifest in New England, and New York Zones J & K – underlined by events during the 'polar vortex' during Winter 2013/14 – and are increasing in other regions. In the words of one investor: "There is not sufficient infrastructure for getting gas out of Marcellus."

This issue is highlighted by Figure 8 below, which provides an overview of ISO New England's assessment of Operating Capacity Margin for Winter 2014/15, and generation at risk due to gas supply interruption.

Figure 8 – Operating Capacity Margin Winter 2014/15[13]



[13] Source: ISO New England, as included in Morningstar Commodities Research, *Eastern US Winter Power Outlook*, 5 January 2015.

Despite what seems to be a clear need, pipeline capacity expansions to-date have mostly been 'low hanging fruit' (e.g. achieved through additional compression). While there are a number of expansion proposals, few significant additions to gas transportation infrastructure have yet been built or firmly committed to.

This has led some investors to question the current regulatory compact for natural gas in the US, where infrastructure expansion is funded by purchases of 'firm' contractual capacity (generally point-to-point or zonal), typically under long-term contract. This model was viewed as working for local gas distribution companies (LDCs), which have relatively predictable seasonal offtakes and are mostly rate-regulated, but not gas-fired generators, which have far more dynamic, market-driven consumption profiles, and may not have the forward certainty to enter into long-term (20+ year) capacity arrangements.

However, the potential of out-of-market intervention to resolve this impasse – such as the New England Governors' proposal to conduct a tender process for new gas transportation capacity, with costs to be passed on through electric tariffs[14] – has raised investor concerns regarding regulatory risk. e.g. Would such intervention disadvantage a generator who has already paid for firm capacity? Such solutions are also viewed as being 'one-off' in nature, or worse, undermining those who might invest based on price signals, and thus inviting further intervention. This raised the question: "who is looking at gas infrastructure long-term?"; with more than one investor asking, "perhaps there is a need for a gas ISO?"

Finally, even if the problem of adequate transportation infrastructure can be resolved, there remain a number of issues associated with gas/electric coordination that could impact investment thesis, spanning a range of functions and timeframes. These include:

- Planning coordination: in particular, the potential for investment in firm gas transportation ('gas by pipe') to be undercut by new electricity transmission ('gas by wire').
- Market timing: alignment of the gas day and electricity day-ahead-market timeframes – something New England and New York have addressed, but others are yet to.
- Operations coordination: coordination between pipeline and ISO operations personnel concerning outages and other operational events.

While various forums have been convened by some ISOs, and by FERC, to examine these issues, they are considered by investors to be moving too slowly. This caused the previous question to evolve to: "what about a combined gas and electricity ISO?"

4.2.3 What About Distributed Energy Resources?

None of the discussion above explicitly addresses distributed energy resources – the integrated assemblage of distributed generation, storage and demand response resources, embedded within the distribution network and behind the customer meter. Investors were well aware of developments in this area, both as an investment opportunity and as a potential disruptive technology risk to other resource investments.

The bulk of activity in distributed generation investment in the US/Canada at present is in the installation of rooftop photo-voltaic (PV) cells, at residential and commercial premises. Embedded storage is emerging as a complement to rooftop PV, providing smoothing for peaks and troughs due to solar intermittency. As with other renewable investments, however, both

[14] New England States Committee on Electricity, *Update on the New England Governors' Proposal to Invest in Strategic Infrastructure and Address Price Disparities*, Presentation to US Department of Energy Electricity Advisory Committee, 25 September 2014.

propositions are substantially supported by incentive schemes – and to a lesser extent, corporate imperatives – with neither approaching 'grid parity'.

Investors were alive to the possibility that this could change with ongoing innovation, though many felt that the "low hanging fruit" – e.g. cost reductions due to manufacturing economies-of-scale – was insufficient in itself to achieve grid parity, and more profound technological advances would be slower in coming. In the words of one: "Energy doesn't obey Moore's Law[15]." These investors were not greatly concerned about the risk to their non-renewable investments in the near-to-medium-term, but saw sizable "tail risk" to longer-term investment.

In the medium-term, investors were more concerned about the impact of rooftop PV and storage on the business proposition for distribution[16]. The reduction in distribution revenues from 'net metering' policies could lead to distribution monopolies spreading their sunk cost across fewer customers. This in turn could lead to 'bypass', further reduction of the revenue base, and yet higher charges for those remaining, ad infinitum, in a so-called "death spiral".

The final piece of the distributed energy resource puzzle is demand response. This was viewed as principally being about better control technologies, and as such, investment in this area was viewed as more of a "tech play" than one of grid resource investment – which would seem to be reflected in the evolving business models of key players in this space.

4.3 Competition, Open Access and Transparency

Interviewees universally expressed the view that they are more comfortable investing in markets they view as open and transparent – or to state the corollary, in one investor's words: "In monopolistic regions we get screwed."

4.3.1 Open Access and the Importance of Retail Competition

Investors indicated that they shied away from, or were far more circumspect, investing in regions where incumbent vertically integrated utilities are dominant, even where the region has an ISO-operated wholesale market.[17]

Much of this issue ties back to retail competition, and the perception that the 'playing field' is inherently uneven. Incumbent retail monopolies have a franchise customer base, with regulator-guaranteed returns – sometimes locking-in not just retail rates, but back-stopping individual plant investment. This insulates the incumbents, at least in part, from wholesale market outcomes and the consequences of their investment decisions – allowing them to commit to plant with lower risk, and thus cheaper funding. It also limits the size and diversity of the pool of potential purchasers in the wholesale market.

Where retail competition exists, the pool of retailers – and thus wholesale purchasers – is boosted by a range of new entrants, who must compete for their customers, and are thus well incented to purchase wholesale energy efficiently in order to serve them. There is no inherent bias to 'self supply', and thus equal opportunity for merchant/project and utility generation to compete. It could be argued, in fact, that without captive customers the distinction between 'merchant' and 'utility' becomes moot – perhaps one of the reasons why Alberta, which has no concept of 'incumbent', refers to itself as a 'merchant market'.

[15] Moore's Law was the observation by Gordon Moore, co-founder of Intel, that the number of transistors on an integrated circuit roughly doubled every two years.
[16] The *IEEE Power & Energy Magazine*, March/April 2015, contains a number of articles on the implications of large-scale renewable uptake for distribution systems.
[17] With the exception of renewables, where output is frequently contracted under long-term PPA (see 4.2.1).

Figure 9 below provides an overview of the status of retail competition, by state/province, mapped against the footprints of the nine ISOs/RTOs.

Figure 9 – State of Retail Competition, Mapped Against ISO/RTO Footprint[18]

4.3.2 Price Transparency, Liquidity and Hedging

Investors were similarly attracted to markets where they view the price-setting process as transparent and free from potential manipulation or interference. The resultant ability to trade confidently, and with "less event risk", was seen as contributing directly to more effective hedging, and better liquidity in both the cash and forward markets – all important investment considerations.

PJM was considered the stand-out market from a liquidity perspective – a view supported by Market Reform's own investigation of futures market data, which suggests it may now be the most liquid electricity futures market in the world, with trade multiples of over 4.7 in 2013.[19]

Concern was expressed about the depth of the forward curve across all markets, but particularly outside PJM and ERCOT. Many investors noted difficulty obtaining forward contracts beyond 6-7 years from initial development (~4-5 years from commencement of operations), with liquidity

[18] Source: ISO-RTO Council, overlaid with data on status of retail competition from: Distributed Energy Financial Group, *Annual Baseline Assessment of Choice in Canada and the United States (ABACCUS)*, January 2014.
[19] This compares with trade multiples of ~4.3 in 2013 for Nord Pool, previously the most liquid market (per Nordic Energy Regulators, *Nordic Market Report 2014*). Trade multiple = financial volume / physical volume. PJM financial volume = ~ 3000 TWh (ICE, per FERC, *2013 State of the Markets Report*) + 572 TWh (Nodal Exchange) + ~162 TWh (CME). Physical volume = ~794 TWh (*PJM 2013 Annual Report*).

very light in the back years even within that period. A number felt this had been impacted adversely by the Dodd Frank Act, and the withdrawal from electricity and gas trading of a number of sophisticated financial institutions who had previously been willing to make markets further out.

Finally, market power, and its dulling effect on the development of an effective forward market – irrespective of mitigation measures, which often serve to dilute forward market liquidity – remained a concern, and an expressed rationale for not investing in some regions.

4.3.3 Transparency of ISO Decision-Making

The transparency of ISO decisions which have an economic consequence for participants was a theme visited by several investors with an interest in plant operations.

It was generally appreciated that there can be valid reasons for resources to be dispatched out of economic merit order, and that such decisions are not made with perfect foresight. There was a broad impression, though, that in some markets this power is over-used, and more importantly, that there is a lack of transparency regarding dispatch procedures and the rationale for operator overrides of market results. In the absence of such transparency, there seems to be little impetus to reduce their frequency, or identify process improvements which might be made.

PJM's 'perfect dispatch' – a perfect hindsight look-back at unit commitment and dispatch – was viewed as a positive example in this regard. However, for those markets that currently have no review process, it was felt that even basic transparency measures, such as logging and explanation, would be valuable. In the medium-term, significant value was seen in having common transparency and information provision standards across all ISOs, and perhaps even a common platform.

The designation of resources as Reliability Must-Run (RMR) was also viewed as an overused intervention, with a price suppressing effect that is detrimental to the effective and transparent operation of the energy and ancillary services markets. As with the override of dispatch, it was felt that transparency surrounding such decisions was often lacking.

4.3.4 Transmission Connection

The ability to, and cost of, connecting to the transmission network, including any necessary network reinforcement, is a key development phase consideration in resource investment. Each ISO coordinates the transmission connection process for its respective region, with no two processes the same.

Concerns were expressed, to varying degrees, regarding the complexity, timeframe and cost of ISO transmission connection processes. ERCOT's permitting process was generally viewed as the most development-friendly, and NYISO's process, with its development queue, as providing the most useful information to potential investors. Opinions on others ranged from 'reasonable' to 'extremely difficult', with the timelines for some so slow that they were considered to function as a barrier-to-entry.

4.4 Regulatory Risk

Regulatory risk was probably the single greatest, and most consistent, concern raised by investors during this study. In this category investors tend to include not just regulatory and political action, or lack of it, but policy decisions taken by the ISO and its governance forums. These concerns took a number of forms.

4.4.1 Interference with the Functioning of the Market

There is a long history of regulatory and political interference in electricity markets in reaction to actual, or even potential, adverse events, such as short-term price spikes. Yet often times these events are the very signals which the market relies upon to stimulate investment. Interfering with them (e.g. imposing price caps, rather than relying on participants to be prudent and hedge) can entirely negate an investment thesis – not to mention rewarding the reckless and punishing the prudent. Furthermore, it is a 'binary' risk – it happens, or it doesn't – making it extremely difficult for an investor to protect (or insure) itself against.

A number of recent examples were mentioned by those interviewed. The attempt by New Jersey and Maryland to impose state-mandated power contracts – since successfully challenged by FERC – was widely regarded as government "interfering in the market for the purposes of price suppression" by "passing legislation for 3-4 lucky parties", and to have had a serious impact on the capacity markets for that year, as "reflected in the multiples." Similarly, there was general concern that the process of incenting resource investment in California "works by political fiat", and involves "picking winners", rather than establishing broad policy and letting the market function. There was a general opinion that "single-state markets are particularly prone to political interference."

One investor commented that it is focussing on achieving scale in a small number of regions, so it can better manage regulatory risk. This indicates a belief that policy issues can't be dealt with through rational argument alone, and an investor therefore must also be able to 'throw its weight around'.

4.4.2 Lack of Concerted Policy Action

Many believed that the "US has … 'shot itself in the foot' (with)… absolutely no coherent energy policy." The US is one of the few countries to have undergone significant levels of electricity market liberalisation, albeit unevenly, without comprehensive deregulation legislation. This seems to have resulted in a patchwork quilt of federal and state regulation, with the limits of FERC's authority tested from time-to-time in the courts. As noted by one investor, though, this confused policy environment can, in certain situations, "provide an opportunity for outsize returns."

4.4.3 Market Complexity and 'Tweaking'

A number of investors, particularly amongst those not actively involved in plant operations, expressed concern that the markets – probably with the exception of Alberta – "are all way too complicated", with one opining, perhaps a little tongue-in-cheek, that they are "an unholy marriage between an engineer and an economist."

This complexity is typically embodied within each market's rules. There was substantial concern regarding the impact of ongoing 'tweaking' of market rules on the predictability of revenues ("The desk view is that regulatory markets change every year").

While all those interviewed would like to see less variability in market design, there was some variation in extent. When asked to consider where they sat along the 'get it right' vs. 'keep it constant' continuum, those with a shorter-term investment interest tended to be more strongly in favour of persisting with an imperfect design that was predictable, whereas those with a longer-term investment outlook, such as balance-sheet-backed investors, were more inclined to modify the market design.

4.4.4 ISO Governance

Several investors expressed concerns about the independence of ISOs from political interference, with particular concern that some single-state/province ISOs are at risk of becoming “an extension of the Governor’s (Premier’s) office.”

The stakeholder process in some jurisdictions was seen as a handicap to investment, with many viewing it as “hostage to incumbent interests.” A number of those with a direct interest in plant operations expressed a concern that generation companies do not have “an equal voice” to load and transmission in stakeholder forums. Others were more broadly concerned with the entire stakeholder governance construct, which they viewed as “driven too much by (bloc) voting”, not “working for everybody” and “unable to produce “an apolitical market design.”

5 COMMENTS ON MARKET DESIGN CHARACTERISTICS

In additional to key themes, the interview process also captured significant investor sentiment concerning specific market design characteristics.

Some of the more consistently expressed feedback has been summarised in the discussion that follows. While none of the individual points in isolation is likely to be a substantial driver of investment, taken in totality they may be influential to an investor looking at where to 'place its bets'.

5.1 Capacity Market Design

As noted in 4.1.2, investors in general are strong supporters of capacity markets (but even bigger believers in demand growth). With respect to sentiment concerning specific capacity market design elements, there was a surprising commonality of opinion:

- There was strong support for longer commitment periods in capacity. Shorter periods were viewed more as support (albeit valued) for existing plant, rather than an encouragement to build new plant.
- There was specific support for ISO New England's capacity 'lock-in' based on the first cleared auction, though some preferred PJM's proposed construct for bidding in subsequent auctions, rather than ISO-NE's 'bid-at-zero' requirement.
- Investors were generally in favor of capacity performance incentives/penalties (as implemented at ISO-NE and proposed for PJM), despite the risk. They generally felt that good operators would be able to manage this risk, and this would provide a comparative advantage, as well as impacting relative valuation.
- There was criticism that some of the specifics of capacity performance hadn't been thought through for a wide enough range of scenarios before implementation, and were having unintended consequences (e.g. penalizing plant for events beyond its control, such as transmission outage)

Elements that received less comment, or had less agreement included:

- Some would prefer more frequent auctions (e.g. quarterly).
- A couple of investors expressed concern with the pace of recent capacity market change (e.g. at PJM). Others thought that it wasn't fast enough.

5.2 Energy Market Design

Comments regarding energy market design were somewhat more disparate, but a few themes were discernible:

- There was a general belief that the market needs more appropriate price signals during scarcity events, such as low reserve condition, not just VoLL in the event of involuntary load shedding. Consequently, there was good support for improving scarcity pricing.
- Investors believed that demand response (DR) should have a level playing field. A number believed that some previous market design constructs, until struck down by the courts, had gone too far, failing to recognize that DR is demand, not quasi-supply.
- Real concerns were expressed regarding the potential for regulatory interference in the market via bid constraints, price caps set too low, etc..

- Associated with this was a strong conviction that, where there isn't a capacity market, the energy price must be able to rise sufficiently high to incent availability, and that the remedy to the risk of price spikes is hedging, and better demand management, not price suppression.
- In markets with significant levels of intermittent generation, some believed that an ancillary services revenue stream for 'flexibility', or similar, would be "hugely valued by investors."
- Concern was expressed about the underfunding of FTRs in some markets, with the socialized shortfall representing an unhedgeable risk.

APPENDIX A – GLOSSARY OF TERMS

Term	Definition
Ancillary Services	Non-energy services required to support the reliable operation of the electricity system.
Baseload	Generation resource that tends to operate at an even level of output (often full output), irrespective of demand.
Basis Point	0.01%. Generally used with respect to interest rates.
Capacity (generation)	The amount of power (MW) a generating unit can produce.
Capacity (transmission)	The amount of power (MW) a transmission line is capable of capable of transmitting.
Capacity Factor	Measure of a generator's actual output over a period of time divided by its potential output at full capacity.
FERC	Federal Energy Regulatory Commission. Federal energy regulator for the United States.
Frequency Regulation	Ancillary service to adjust resource output in response to real-time fluctuations in demand, in order to maintain system frequency within established limits. Also known as load-following or Automated Generation Control (AGC) capability.
FTR	Financial Transmission Right. A financial right to the price differential (generally excluding consideration of losses) between two designated locations (which may be single nodes or aggregate locations). Also known as a Transmission Congestion Contract (TCC) or Congestion Revenue Right (CRR).
LIBOR	London Interbank Offered Rate. Used as the primary global benchmark for short-term interest rates.
Liquidity	The degree to which a product can be transacted in the marketplace without affecting its price. Characterised by a high level of trading activity. An indicator of market depth and transactional efficiency.
Mezzanine Debt	Secured debt finance that ranks in priority behind senior debt but ahead of trade creditors or equity. Commonly convertible into equity.
MLP	Master Limited Partnership – a limited partnership traded on a securities exchange. Allows the entity to receive the tax benefits of a limited partnership, while accessing capital in the public markets. Limited to certain types of business activity.
OTC	Over-the-counter trading. Bilateral trading between two counter-parties, facilitated by an intermediary but with all other aspects remaining between the two counter-parties.
Peaker	Generation resource that tends to operate at times of peak demand.

TERM	DEFINITION
REC	Renewable Energy Certificate. RECs are issued for each MWh of green electricity produced under an RPS scheme.
Reserves	Ancillary service. The capability to provide energy, or demand response, to replace generation lost to the system through plant outage. Most markets have various classes of reserve, generally based upon their speed of response. e.g. spinning reserve (plant already synchronised to the system) and non-spinning reserve (fast-start plant that must rapidly start-up and synchronise)
RPS	Renewable Portfolio Standard. Requirement for a percentage, or fixed amount of energy sold to end-use customers to be sourced from designated renewable sources. Often placed as an obligation on the electricity retailer.
Term Loan A	Senior term loan issued in the US market.
Term Loan B	High yield loan issued in the US market, typically of 2-7 years tenor, generally secured *pari passu* with Term Loan A.[20]
Trade Multiple	Financial trading volume / physical volume. An indicator of liquidity. Also known as trade velocity.

[20] KPMG Corporate Finance, *To Term Loan B or not to B*, KPMG 2013.

APPENDIX B – ACKNOWLEDGEMENTS

Market Reform and the members of the ISO/RTO Council gratefully acknowledge the contribution of the following organisations, who generously gave their time to be interviewed for this project.

Bank of America Merrill Lynch	Google
Calpine	Marathon Capital
Carlyle Group	NRG Energy
Citibank	Panda Power
Dynegy	Riverstone LLC
Fidelity	Sun Edison
Fiera Axium	TransAlta
Goldman Sachs	

Thanks are also extended by the authors to the following ISO/RTO personnel, for their assistance, feedback and advice:

Project Steering Committee

AESO: Jenny Chen, Kevin Dawson

CAISO: Karl Muessen, Keith Johnson

ERCOT: John Dumas

IESO: Tom Chapman, Brian Rivard

ISO-NE: Andrew Gillespie

MISO: Jeff Bladen

NYISO: Robert Pike, Nicole Bouchez

PJM: Stan Williams (Chair), Adrien Ford

SPP: Scott Smith

Chair, IRC Markets Committee

Andy Ott (PJM, 2014)

Joe Gardner (MISO, 2015)

Project Team

Christina Stotesbury (PJM)