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Before the Senate Committee on Energy and Natural Resources

Hearing to Examine the Near-Term Outlook for Energy & Commodity Markets
January 19, 2016

Thank you for the opportunity to testify before this committee. I am honored that you would request my views on the state of the electric power industry and the power markets. In these remarks I will present high level views on electric utilities, merchant power producers, and the critical issues of price formation and market structure in the wholesale power markets.

My name is James Lucier, and I am a managing director and head of the energy practice at Capital Alpha Partners, an independent research and advisory firm that stands at the intersection of the financial markets and public policy. Our clients include institutional asset managers, investment banks, commodity trading firms, private equity investors, and corporate management.

I personally have been devoting the bulk of my time to the electric power industry and the power markets since I first started following them as an analyst at Prudential Equity Group during the California power crisis of 2000 and 2001. It has been an interesting 16 years.

Overview

I appreciate the committee's close and careful attention to the power markets and the power industry as evidenced by this hearing, the very important hearing of March 17, 2015 on "The State of Technological Innovation Related to the Electric Grid," with special attention to distributed generation, other hearings, and the prolific flow of thoughtful policy papers, letters, and other statements addressing electric power and other subjects from both Chairman Murkowski and Ranking Member Cantwell. If I were to characterize the state of the power markets in five points it would be as follows:

- Inflation-adjusted retail power prices are at a historically low level, but also consistent with a historically stable range, showing that the system and the industry have generally served consumers well by maintaining low and stable prices over a considerable period of time.

- Wholesale power prices are similarly at a ten-year low, which again shows service to consumers but also reflects low interest rates and low natural gas prices, which cannot be taken for granted, and possible design flaws in the markets that I believe may not be sustainable.

- In the regulated utility space, corporate management faces a conundrum: how to maintain or increase earnings to satisfy shareholders at a time when power

demand, after declining year on year for the first time in U.S. history after 2008, remains flat or nearly flat as far as the eye can see, which is to say well into the forecastable future.

- In the merchant power space, generators are hard pressed to show a return on equity that would justify new investment in competitive markets that serve two-thirds of the U.S. population. A step change downward in natural gas prices since 2008, which we will credit to the Shale Revolution, is part of the story, but so also are troublesome issues with price formation in the energy markets and the development of appropriate pricing mechanisms for reliability and ancillary services. As generators struggle, states understandably seek out-of-market solutions without waiting for the markets and the market operators to adjust, sending mixed signals to the capital markets and ultimately helping no one.

- Finally, as this committee knows so well, the demands of the EPA's Clean Power Plan will drive the greatest investment cycle ever in the history of the U.S. power industry, perhaps amounting to hundreds of billions of dollars, as existing baseload power plants retire, beginning as we have already seen with the Mercury and Air Toxics Standard (MATS)-driven cycle of 2015; continuing through the CPP-driven cycle of 2030; and onward, as other plants, including nuclear power plants, reach the end of their useful or design lives, with natural gas applying pressure all the way.

The single greatest challenge in the power markets today is financing the technology investment and infrastructure upgrade cycle needed to replace retiring baseload and handle new, perhaps even unforeseen, demands between now and 2020. There is no question that power prices on the wholesale and retail levels will go up, to the extent that they reflect low natural gas prices and interest rates, which are transitory in nature, as well as price formation issues in the wholesale markets that may presently deter needed investment. The question is how power prices will go up and when. The choice is between a manageable, moderate course, starting now, where innovation can dampen the amount of new capital required and keep a lid on consumer costs; or sudden, disruptive price shocks from supply shortfalls coming later that could have consequences for the whole economy.

Policy Challenges

It is no exaggeration to say that electricity is synonymous with life itself in the United States. Electric power is an essential public service and the lifeblood of the economy particularly as information in the form of electrons replaces physical capital in what Alan Greenspan called the conceptualization of GDP and what we see manifested in practical terms as the Internet of Things. Electric power underlies public health and safety, national security, and all other aspects of our national well-being.

The U.S. power grid is the largest, most complex engineered structure on the face of the earth, and oldest, most diverse, and variegated of any such structure at this scale. The working power grid represents a complex ecosystem of infrastructure, skilled labor, and distributed information processing that is sustained by cashflows, large pools of invested capital, and ongoing access to the financial markets. Every element of this equation demands attention.

The power markets and the power grid represent a number of challenges to U.S. policymakers who must work in partnership and collegiality at the federal and state levels. The dynamic character of the markets, in which supply and demand must be balanced on the grid in real time, often wins attention, in part because it requires active management from minute to minute. But less widely recognized, explicitly, are the following long term considerations, which are vital to questions of upgrade and investments at issue today.

- How to find private financing for large fixed capital investments with long payback periods that are subject to commodity price, interest rate, and policy risk—which is a challenge which even munis and coops must address in their own way.

- How to draw the line, politically, in markets dominated by regulated monopolies and fixed infrastructure, between long term, investment oriented, market-driven evolution in a deep, diverse portfolio of options, and rent-shifting to short-term, low-cost solutions on a purely opportunistic and expedient basis.

- Resolving tension between cost-of-service and scarcity pricing, often in different segments of the same system, amid a plurality of business models.

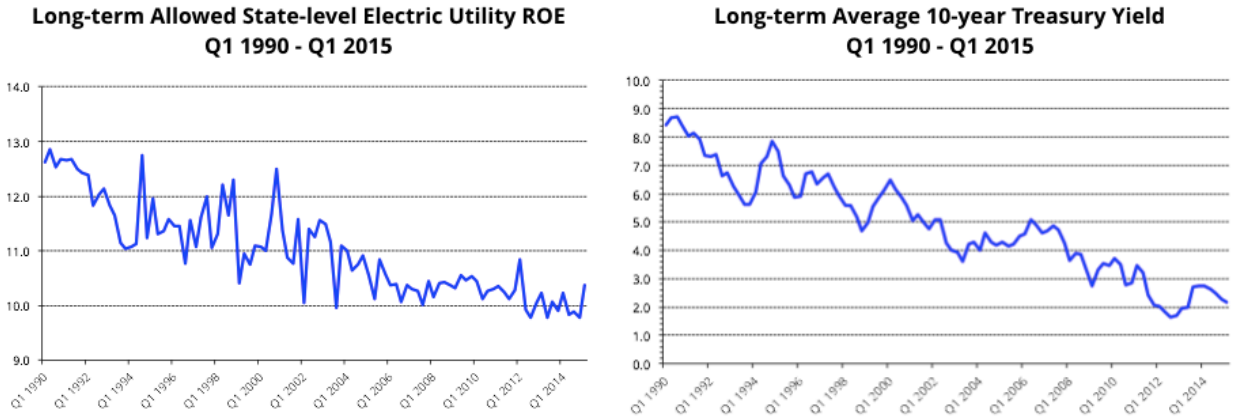
- Pricing correctly reliability in energy-only markets

Current Market Conditions

A quick survey of major issues for equity investors may provide the most convenient snapshot of the state of the power markets and the power industry, with the proviso that public power entities often face similar if not more extreme challenges in raising capital since they can access the debt market only, and ultimately rely on ratepayers, with no shareholders to ease the burden. We provide a more complete account of the policy issues raised in our Utilities, IPP & Cleantech scorecard. It was an ugly year for equity market performance.

- Regulated utilities were standout performers in 2014, but had a rough year in Calendar Year (CY) 2015, even compared to the broad market indices, where the Dow Jones Industrial Average for down 2.3% for the year and the S&P 500 was down .7%.

- The Dow Jones Utility Index, an index of 15 mostly regulated utilities, was down 7.04% in calendar year CY 2015. The S&P 500 Electric Utilities Sector Index of regulated electric utilities was down 9.1% in the same period. Even so, utilities benefited from a relatively strong finish at the end of the year. In the first half of the year especially, and then again in a turbulent fall, utility stocks took a beating from the low natural gas prices that resulted from a warm-weather driven supply glut (El Niño), and the rise of the 10-year treasury as investors looked forward to the Fed Rate hike that came in December. Utility stocks are normally considered to be defensive plays that swing up and down with risk-on and risk off trading, of which there has been much since 2008. They are also normally considered to be interest-rate sensitive instruments that trade inversely with the 10-year. But ironically in 2015, the Fed's long-time low interest rate policy also applied downward pressure as it filtered through, or threatened to filter through, to regulated ROEs. Individual utility performance was a mixed bag, depending on asset mix and other factors, with AEP down 4.75% and PSEG down 7.7%, but FirstEnergy down 19.1%, Entergy down 22.1%, and Exelon down 26.1%. It was not a good year to be nuclear.



Allowed state level ROEs have followed ten year interest rates on Treasury notes downward, long-term.

Data Source: Edison Electric Institute (EEI), 2015 Q3 Financial Updates, Rate Case Summary Backup Data, http://www.eei.org/resourcesandmedia/industrydataanalysis/industryfinancialanalysis/QtrlyFinancialUpdates/Pages/default.aspx

- Merchant power companies got off to a similar rough start at the beginning of 2015, but unfortunately for them, there was no relief and partial recovery in the second half. Instead, things got worse, and got worse faster. The S&P 500 Independent Power Producers & Energy Traders Sector Index finished the year down 43%. Individual names suffered notably, with Calpine down 36.3%, Dynegy down 56.4%, NRG down 57.2%, and Talen down 70.0%. Natural gas was probably a dominant factor, but ongoing concerns over market structure, out-of-market developments, and uncertainty over major market structure cases before the

Supreme Court also weighed on the group. Oil was a factor as well, with the commodity price drop tearing through the energy sector. As these issues weighed on the group, high-yield bond markets tightened, restricting the terms and availability of credit.

- Yieldcos also a saw a steep selloff. The pressure began in summer and intensified in early fall. The initial slide may have resulted from cross-selling by investors to cover oil-related losses (that is, by income-oriented investors also holding MLPs), even though the yieldcos held no assets with earnings linked to oil, but declines in the equity markets also meant a higher cost of equity financing and thus a higher return bar for project acquisitions and thus earnings growth. Among prominent names, Abengoa Yield was down 30.7% for the year, Terraform Global was down 60.1%, and NRG Yield was down 70.2%.

Power Markets

For merchant power, a key backdrop to these developments is that power prices continue to decline, following a long term trend. According to EIA, wholesale peak-hour power prices declined 27-37% YoY, according to a January 11 *Today in Energy* release. (See also the similar, additional chart below, compiled using EIA Wholesale Power Price data, illustrating sustained decline in 30-day moving average of PJM-West power for on-peak hours through 2014 and 2015.)

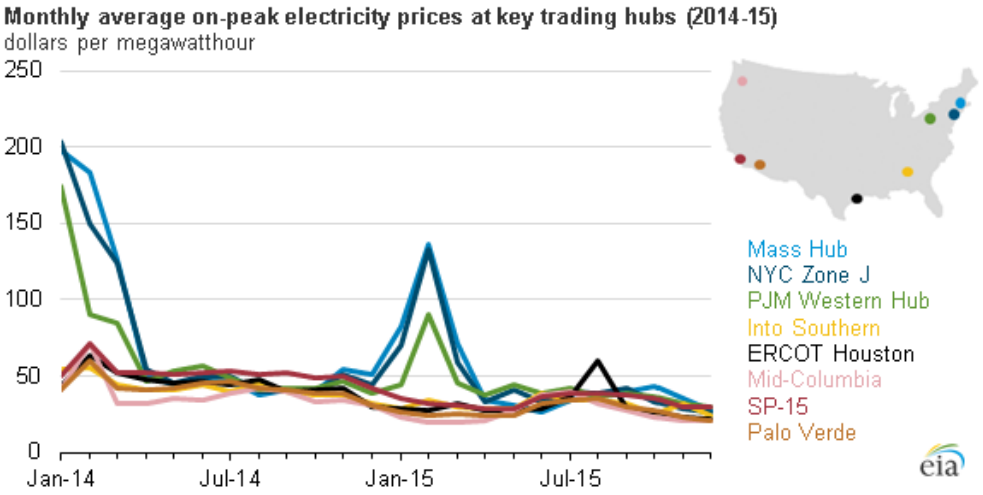
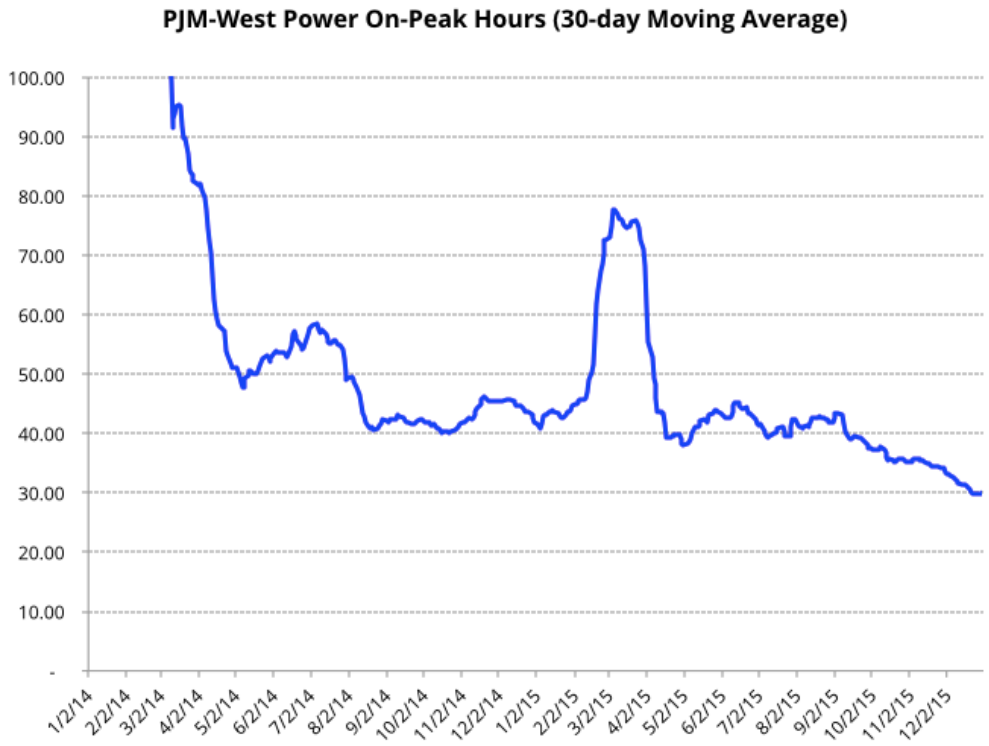


Image Source: Energy Information Administration (EIA), January 11, 2016, Today in Energy, http://www.eia.gov/todayinenergy/detail.cfm?id=24492&src=email#



Data Source: Energy Information Administration (EIA), Wholesale Electricity and Natural Gas Market Data, "Current Year" and "Historical" data files; https://www.eia.gov/electricity/wholesale/ ; 30-day moving average trend-line calculated by Capital Alpha Partners of "weighted average" daily price listed in spreadsheets.

It is encouraging that the major RTOs and ISOs have begun to move forward with improved reliability pricing in their capacity market designs. After extensive review, FERC approved PJM's Capacity Performance design changes on June 9, 2015. The rule changes reward generators for reliable performance during power shortage events. For ISO New England, FERC approved similar Pay for Performance design changes in May of 2014, and recently upheld the changes in a rehearing order released in November. FERC is also moving forward with technical changes to energy and ancillary services markets rules to improve price formation, via an inquiry initiated in late 2014. The inquiry has resulted in several technical conferences, staff workshops and a proposed rule on scarcity pricing, but many in the industry may feel the inquiry should be moving faster given market conditions described above.

Beyond the market design issues, power generators face an uncertain legal and regulatory outlook as well. Key ongoing litigation at the Supreme Court around demand response and state-level capacity procurement "contracts for differences" could significantly alter the supply-demand landscape in energy and capacity markets, as well. The presence of demand response in energy and capacity markets matters - a sensitivity analysis, conducted in early 2015 by PJM's Independent Market Monitor, on the results of the 2017/2018 Capacity Auction in the PJM market noted that the region-wide market clearing

price would have been 135.1% higher had demand-side resources not participated in the auction.

Meanwhile, alarmed at the lack of new entry in the generation markets, states are choosing to assert their traditional roles in resource adequacy and to act independently of markets to ensure reliability amid fears of premature resource retirements and constraints in later years. Some notable instances include:

- Ohio - The Ohio PUC is currently reviewing contracts between FirstEnergy and AEP load-serving utilities and their independent generator affiliates that would provide long-term fixed income to plants that might otherwise retire under current short-term market conditions.

- Illinois - MISO, Illinois regulators and legislators are considering various measures that would sustain at-risk plants in Illinois through current market conditions. Some parties are especially concerned about the implications for Clean Power Plan compliance if several nuclear plants in the state retire.

- Maryland - Maryland, as early as 2012, sought to procure additional capacity for reliability purposes via a "Contract-for-Differences" capacity and energy arrangement, procured by a competitive bidding process, that resulted in the procurement of power from a new 661 MW CCGT plant from CPV Maryland. The CfD scheme, which dictates credits or payments from load to CPV based off of the clearing price in PJM auctions, is currently under review in two consolidated cases —the “Maryland cases”—at the Supreme Court. These are being considered in the same term as FERC v. EPSA, the demand response case mentioned previously. A petition for cert. in cases surrounding a similar CfD program in New Jersey is pending at the Supreme Court.

Gas Pipelines

Timely construction of natural gas pipelines remains a concern, for both takeaway and delivery. Appalachian basin shale gas trading hubs, even in current winter months, are trading at a deep discount to Henry Hub gas and other major hubs. The discount flows through to power prices, putting additional pressure on struggling baseload coal and nuclear plants in the Marcellus and adjoining regions, where many such plants are located. Planned takeaway capacity is set to grow significantly, if production isn’t curtailed before then, but opposition to infrastructure development could prolong the supply glut and put the timing of relief in question. Meanwhile, a growing number of pipeline proposals is threatening to slow the siting process at FERC, again while opposition to pipelines mounts, everywhere, by environmental groups that oppose construction of any pipeline, for any reason.

The Polar Vortex of 2014 remains an unhappy memory this year, though its urgent clarion call helpfully called attention to electric reliability and fuel delivery supply chains throughout the country. But even now, in lingering El Niño conditions, New England power and gas prices are still higher than elsewhere in the Winter and reflect infrastructure constraints that could cause problems in future severe winters, especially as the region becomes even more reliant on natural gas and non-gas plants, such as the 680MW Pilgrim Nuclear Plant, retire. Though the pace of gas pipeline infrastructure into New England has picked up a bit - with several major projects proposed, such as the Northeast Energy Direct pipeline and the Access Northeast pipeline - progress remains painfully slow.

Nuclear Power

On the nuclear front, Entergy's Pilgrim and Fitzpatrick plants were the latest to announce closures last year. Exelon's Ginna plant remains in operation due to a reliability agreement, while the Byron, Clinton, and Quad Cities nuclear plants in Illinois remain widely considered at risk. The Illinois legislature has been debating legislation that would institute a "Low Carbon Energy Standard" nuclear power procurement program, but the legislation has been slow to move in that state. Meanwhile, the Clean Power Plan's final rule provided little in the way of explicit support for nuclear that investors were hoping for, leaving the fate of nuclear power to whether states could develop a sufficiently robust carbon price on their own. Issues facing nuclear power include low gas prices, increasing operating and maintenance (O&M) costs due to post-Fukushima regulations, and competition from zero-marginal cost renewables placed lower in the dispatch curve.

Transmission

Electric transmission remains a key source of frustration for investors who regard long distance transmission assets, in principle, as being highly investible and yet have few, if any projects to invest in. Some investors argue that the FERC Order 1000 process, once the source of high hopes, does not seem to be working as intended to expedite siting decision. Others say Order 1000 can yet deliver results, but we are still in the early stages of compliance. This might well be an appropriate area for committee oversight. Meanwhile, investors who have lost patience with "lumpy" large transmission projects are looking for opportunity in the distribution-level grid where steady incremental progress is more consistent.

Distributed Renewables

Renewable energy is mostly a state story, as state public utilities commissions are employing varying strategies to deal with increased rapid growth of distributed solar on their systems.

Recent developments include the following:

- Nevada - The Nevada PUC in December unanimously finalized a new net metering rate design that would gradually reduce the value of credits for excess generation from net metered customers and impose a higher service charge for rooftop solar customers. The PUC recently refused to stay the order, and in response SunRun and SolarCity have announced significant drawbacks in their operations in the state.

- Mississippi - Mississippi finalized mandatory net metering rate regulations for the first time ever in December. The final decision sets the rate for excess generation paid to net metering customers equal to wholesale power cost plus 2.5 cents, far lower than the retail rate value enjoyed by solar resources in other states, and sets a cap on net metered systems equal to 3% of capacity.

- California - A recent innovative proposal from California regulators would impose a one-time interconnection fee on DG customers, a payment based on gross power consumption, and time-of-use rates for DG solar power sold back to the grid. The CPUC is still considering the proposal.

Macro Shocks and Cross Currents

Our brief checklist of investor concerns shows how many disparate and seemingly unconnected shocks and tremors are rippling through the power world.

- **Economic Shock.** The Great Recession of 2008 is still with us, leaving unresolved the question of whether it broke the historical relationship between power demand and GDP, which previously had moved together in lockstep. Power demand dropped year on year for the first time in 2009. Overall demand has barely returned to 2008 levels. Industrial demand is down, commercial demand is recovering, and residential demand does seem to be growing a bit.

- **Natural Gas.** The Shale Revolution is not a one-time event but a sustained, paradigm-shattering assault on all that went before. It is hard to recall that even in 2008, a recession year, natural gas prices averaged $8/mcf for the year and peaked at $14/mcf. By 2012, natural gas in the $2-3/mcf range felt like the stunning new normal, and it did so again this year.

- **Interest Rates.** As we have noted, utilities are interest-rate sensitive stocks. Rising interest rates put pressure on valuations, and the Fed's move to tighten this year has had a strong impact. Meanwhile, the Fed's long period of near-zero interest rates has cut both ways. A low interest rate environment has reduced the cost of infrastructure investments, which is a positive for investors. But it has also exerted

downward force on ROEs for existing assets, both at the federal and state level, discouraging shareholders and making it harder for utilities to attract new capital.

- **The Price of Oil.** Natural gas is not the only commodity price that matters. The collapse in the Nymex front-month futures contract price of oil from its high of $107.26 in June 2014 to less than $30 today, a twelve-year low, has had outsized impact on electricity infrastructure investments because of its negative impact on the energy sector generally, energy infrastructure, and fixed income markets, as well as the economy as a whole as energy sector supply chain deflation drastically cuts overall capex.

- **Weather Effects and Fuel Diversity.** Weather has a major impact on natural gas prices and the power industry. It can also impact the deliverability of fuels such as coal, highlighting the importance of fuel diversity. The year 2014 was the year of the polar vortex—at both the beginning and end of the year, which posed a major test to the reliability and resiliency of the U.S. power system. This year, El Niño has posed a different problem in the form a gas glut. Meanwhile, the price of coal has fallen due to a steep drop in demand and oversupply. Coal's value as an economic hedge against natural gas price volatility has been diminished by the new supply of gas from shale but coal remains an important hedge against future weather events such as the next polar vortex. Meanwhile, in New England, the deliverability of gas remains an area of prime concern.

- **Natural Disasters.** The Fukushima Earthquake of 2011 comes most prominently to mind, but the same year saw flooding in the Missouri River and an earthquake in Virginia which affected, though modestly, U.S. nuclear plants. The NRC's follow-on regulations have raised, and may continue to raise, nuclear O&M costs in a way which is unhelpful in a low-price environment.

- **The Clean Power Plan.** The EPA's Clean Power Plan has many positive effects. It is also driving changes consistent with the current technical evolution of the industry. However, it ultimately presents a challenge to public policy, namely the conflict between economic and environmental dispatch in the competitive power markets, which will not easily be resolved, without an overhaul of the current market structure, or a significant move back to re-regulation.

Looking forward, there are more exogenous shocks and catalysts to come. The advent of cyberterrorism and state-sponsored cyber warfare is already a matter of urgent concern, and will become more so as the power grid at all levels increasingly incorporates an Information Technology (IT) component. Future challenges will include vehicle electrification and robotics—increasing automation of both home and workplace, and possibly driving demand growth once again. The always-on technologies of cloud computing, the Internet of Things, and wireless, mobile devices put a special premium on

reliable electric power. Consumers demand reliability as well. But all these things require new investment.

Given the turbulent macro environment, technological change, and the rise of competing new business models, policy makers should seek to provide a stable, predictable, regulatory environment, with a view toward market-driven evolution and investment in a broad portfolio of options that is sustainable for the long term. A cautious approach that does first no harm is warranted, since policy errors can have grave unintended consequences and take decades to correct. A consistent message on the need for new investment is also critical, since investors balancing many factors listen carefully to what policy makers and regulators have to say, gauging whether new investment is welcome or not. The markets are willing, but must be invited.