ICES LITERACY SERIES

3 | ECONOMIC REGULATION & THE DEVELOPMENT OF INTEGRATED ENERGY SYSTEMS

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The ICES Literacy Series

This paper is a part of QUEST's ICES Literacy Series. The documents that make up the ICES Literacy Series are targeted at elected officials, policy makers, corporate decision makers, investors, building owners, planners, environmental managers, and other stakeholders critical to the successful implementation of Integrated Community Energy Solutions (ICES) in Canada.

The objective of the ICES Literacy Series is to enhance awareness and literacy with respect to ICES by exploring issues and concepts related to integrated energy systems at the community level and by considering the roles of various fuels, technologies, policies, energy players, and community builders in advancing Integrated Community Energy.

The series reflects input from leading thinkers engaged in ICES projects across Canada. The papers that comprise the series are living documents and will be updated with new information as the demand for ICES grows across Canada and as research and experience with ICES evolves.

Papers in the ICES Literacy Series

Building Smart Energy Communities: Integrated Community Energy Solutions is the introductory paper to the series and is intended for a broad audience. The paper explains the role and activity of QUEST as it relates to ICES. It describes what ICES are and what they can accomplish at the city/community-wide, neighbourhood, and project levels. It lists the critical stakeholders in ICES and outlines the basic principles required to implement ICES. The paper closes by outlining QUEST's role in advancing ICES now and going forward.

Fuels and Technologies for Integrated Community Energy Solutions presents QUEST's point of view on fuels and technologies and how they might be better integrated in smarter and more sustainable energy systems. It covers all aspects of community energy use, spanning residential, commercial, institutional, industrial, and transportation sectors, with linkages to land-use and community planning.

Economic Regulation and Integrated Energy Systems presents QUEST's position on the key role of economic regulation in facilitating the implementation of integrated energy systems. The paper describes the strength of integrated energy systems as bringing together multiple energy system components which are integrated in physical, financial and operational terms. It makes the case for proper regulatory oversight of energy systems in order to provide neutral, transparent and expert oversight and consequent protection for both consumers and investors. The paper argues that integrated energy systems are much more likely to be feasible if the regulatory system is prepared to accept some re-bundling, specifically of delivery and energy generation and experimentation to facilitate innovation.

Executive Summary

There are many challenges facing Canada with respect to its basic infrastructure systems including its energy systems. These challenges are driven by a multitude of factors, including potentially unsustainable future costs, loss of social license to build and replace infrastructure, fiscally constrained governments, and multiple environmental challenges. New approaches to energy production and use at the community level based on integrated energy systems are one part of the solution.

Integrated energy systems bring together the electric power and natural gas systems along with burgeoning thermal energy systems and in so doing create opportunities to significantly improve overall energy efficiency and introduce new technologies such as renewable sources, hybrid systems, and combined heat and power systems. Together these ideas promise improved reliability, reduced costs, and better environmental performance.

Many factors stand in the way of realizing integrated energy systems. For individual investors, action is inhibited by low near term energy costs; a multitude of investment barriers; and general consumer indifference. At the policy level, action is constrained by limits on government investment spending; government reluctance to confront consumers with the true costs of energy; and limits on the use of many traditional instruments such as subsidies and standards.

The energy regulatory system has several potential roles to play in facilitating investment in integrated energy systems provided that policy makers wish to induce such investments and are willing to provide the policy guidance to regulators. The case for making use of the regulatory system has several elements.

The backbone of integrated energy systems is district energy, or thermal energy systems (TES). TES are usually natural monopolies once they are established and, except in the few instances where contractual arrangements suffice, should be subject to regulatory oversight.

In the initial competition for TES, both established utilities and new entrants should be invited to compete. Established utilities should play under rules that avoid giving them excessive advantage but at the same time ensure that communities are able to take advantage of their many strengths. Over time a substantial number of large, financially, technically and managerially competent entities should emerge in this sector, some of which are established utilities, some of which are new entrants. All or most should be subject to regulatory oversight.

Government ownership of utilities should be a matter for individual jurisdictions to determine. However, government ownership does not substitute for proper regulation. The unique strength of the regulatory system is its ability to provide neutral, transparent and expert oversight and consequent protection for both consumers and investors.

The strength of integrated energy systems is in the fact that they bring together multiple energy system components which are integrated in physical, financial and operational terms. As such, these systems are much more likely to be feasible if the regulatory system is prepared to accept some re-bundling, specifically of delivery and energy generation, which it already has done in the case of energy generation for TES or the collection and processing of renewable natural gas sources.

Beyond the meter – in other words in or on the customer's property – there is a case for public policy to facilitate technology demonstration and drive market transformation in the case of smaller scale integrated technologies such as micro-CHP or hybrid systems such as gas/solar hot water. Regulators could support time limited utility programs that are analogous to demand side management programs but which entail utility installation and ownership of assets other than energy delivery assets per se.

The regulatory system has many strengths at the operational level that the policy system does not have for facilitating integrated energy systems. Whereas the policy system can set the framework, the regulatory system can implement. Innovation can be encouraged by use of experimentation. As ideas are tried, as some fail and as others succeed there should be room for course correction until such time as new regulatory norms and new business models become established for integrated energy systems in communities across Canada.

Integrated Energy Systems are not a silver bullet. But they are a potentially important component of more sustainable energy systems and more sustainable communities. Policy makers can help build those systems by creating the conditions in which their energy regulators can play a constructive role.

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1.0 Introducing Integrated Community Energy Solutions (ICES)

1.1 A fundamental challenge

Canada is facing some significant energy and infrastructure challenges. Maintaining and upgrading much of our critical infrastructure will be challenging in the face of slow economic growth, aging populations, increasing claims on strained public purses, and escalating environmental concerns. In North America these issues are exacerbated because our entire basic physical infrastructure is aging and needs radical re-investment. Much of this infrastructure and much of the attendant problem lies within our urban communities. The way we have built our communities and supporting infrastructure since the mid-20th century is increasingly unaffordable. Added up, these challenges are unusual if not unprecedented. Accordingly, new solutions and ways of thinking about solutions are called for.

Energy systems are a key part of the challenge. Much can be said and has been said about electric power systems or transportation energy system. Much less has been said about the energy system downstream of the point where long distance transmission systems hand off to community distribution systems and, ultimately, the consumers on the other side of the meter. This paper looks at the “downstream” part of the energy world, centered on integrated energy systems at the community level and the consumers whose needs are the essential point. Although other parts of the energy system as a whole matter a lot to policy makers – and that is what they mainly focus on – systems at the community level have at least as much potential as any other part of the system to be radically transformed for the better. In such a transformation, the system of economic regulation has a key role to play.[1]

There is urgency behind the need to tackle these challenges. Despite slow overall population growth, Canada continues to add many thousands of urban residents every year[2] in communities built on potentially unsustainable urban systems – including energy systems – that will determine future options for a century or more. There is a strong case to act now in order to lay the groundwork for a more sustainable future.

1.2 And a potential opportunity

It is broadly understood that end use energy efficiency measures (on the customer side of the meter) can create energy and greenhouse gas (GHG) savings. Well known (but controversial) estimates from McKinsey and Company estimate possible savings for the U.S. in the order of 20 to 25 percent[3] at what is called negative cost – in other words, an investment that pays for itself with rapid payback at normal market discount rates.

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[1] The economic regulatory system does not exist in a vacuum. Its authorities and processes are established by legislation and the general directions it takes can be influenced by policy insofar as the legislation allows.

[2] Canada. Statistics Canada. 2011 Census of Population. Ottawa: Government of Canada, 2011.

[3] McKinsey & Co. 2009. “Unlocking Energy Efficiency in the U.S. Economy.” http://www.mckinsey.com/clientservice/electricpowernaturalgas/downloads/US_energy_efficiency_full_report.pdf.

Less well understood is the potential of alternative energy delivery solutions upstream of the meter as part of a necessary redesign of all community systems (land use, water, waste, transport, and energy).

1.3 Defining Integrated Community Energy Solutions (ICES)

Integrated Community Energy Solutions (ICES) entail the planning, design, implementation, and governance of energy systems at the community level in a way that maximizes energy performance while cutting costs and reducing environmental impacts.

What are integrated energy systems? They are energy systems that interconnect various energy sources, technologies, and infrastructure in a way that is tailored according to the local context - including the nature of energy end use, patterns of energy demand, and local renewable energy and waste management opportunities - in order to maximize energy performance, secure energy reliability, cut costs, and reduce environmental impacts including greenhouse gas emissions.

At the community level, this means integrating existing and potential energy assets such as electric power, natural gas, and local renewable energy opportunities, while managing the energy needs and also harnessing the potential energy productivity of community assets such as land-use, buildings, water and wastewater, waste, and transportation.

Integrated energy systems have the potential not only to reduce environmental impacts but also to reduce costs through incremental, low risk measures based largely on well understood technologies.[4] The focus of innovation in this area is not so much on the individual technologies themselves but on the way they are made to work together and the institutional and business models needed to make them practical to implement. A study undertaken for QUEST in 2010[5] suggests that the application of ICES (in a context of more compact and diverse approaches to land-use) has substantial potential to reduce greenhouse gas emissions but more importantly to do so at significant negative cost, at levels comparable to or exceeding the most cost-effective end use efficiency measures.

What does an integrated energy solution or system look like? At its most basic, this is a world of interconnected energy delivery networks and multiple primary energy inputs. The electric power system draws on distributed as well as central resources. The natural gas system fuels both power and thermal energy systems and can act as either a primary or backstop energy supplier. The thermal system enables heat management. All three enable the incorporation of alternative sources such as power from wind or solar; heat from ground and biomass sources; or gas from biomass or municipal solid waste. Traditional load centers (buildings, communities) are also energy sources, and systems within buildings are often themselves integrated - in the sense of micro-scale combined heat and power production or the incorporation of alternative and traditional energy sources in hybrid systems.

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[4] Cleland, Mike and Laszlo, Richard. Fuels and Technologies in Integrated Community Energy Systems. Ottawa: QUEST, 2012 .

[5] MK Jaccard and Associates Inc. The capacity for integrated community energy solutions (ICES) policies to reduce urban greenhouse gas emissions. Ottawa: QUEST, 2010.

Such systems are more locally distributed insofar as electric power sources are concerned. They are also more centralized in the case of some parts of the heat system because individual customers may no longer have their own in building heating systems. But the whole system – and its three main sub-systems - is still networked – actually more so. Customers are still physically connected to monopoly distribution service providers.

ICES are built fundamentally on the notion of optimizing full cycle efficiency to reduce both costs and environmental impacts. They are "open architecture", in the sense that they are built to readily accommodate new, alternative energy sources. In cold climate industrial economies such as Canada, ICES are founded on the heat system since heat (space, water, industrial heat) accounts for 50 per cent of Canadian energy use and fully half of the energy entering the system is lost as waste heat.[6]

If we have learned nothing else from several decades of promised energy miracles, it is that "too good to be true" is usually just that. That said, ICES hold promise of several advantages. These include much higher full cycle energy efficiency in part through much more effective heat management; a platform for the low risk, low cost introduction of renewables; high reliability; and lower fuel cost volatility. Moreover, the environmental and cost benefits accrue to the community as a whole. Most importantly they hold promise of considerable consumer benefit but without requiring active consumer engagement. The potential prize is sizeable and it can be pursued incrementally and at low risk.

2.0 Driving Innovation in the Face of Competing Realities

If ICES have such significant benefits, it begs the question of why their application is not already more widespread. The answer is that this is an instance of market failure and, more specifically, an investment inefficiency.[7] There are many possible sources of market failure. Most frequent in the case of energy is the failure to incorporate external costs such as carbon in market prices. If energy costs were higher than they are today and if they incorporated carbon costs these factors would drive change.

But even if such cost signals were present, many other factors[8] make it unlikely that consumers will drive the change. Energy system investors have the potential to drive change but they too face investment inefficiencies. In the face of long established traditional modes of delivering energy and generally indifferent consumers,[9] and given that there are long waiting times for investment recovery on energy

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[6] Laszlo, Richard and Oliver, Bob. A Primer on Energy Systems in Canada. Toronto: Pollution Probe, 2011.

[7] Allcott, Hunt and Greenstone, Michael. Is there an Efficiency Gap? MIT Department of Economics Working Paper No. 12-03. Feb 2012. The study is critical of the McKinsey paper and provides a useful analytical frame for examining issues, such as the critical distinction between unpriced externalities and investment inefficiencies.

[8] Several aspects of consumer behaviour create very high investment barriers. These include high implicit discount rates, capital constraint, inability to absorb transaction and information acquisition costs and high risk aversion.

[9] As discussed on page 8, energy is largely a back of mind matter for most consumers and this has not changed over several decades.

infrastructure (typically beyond twenty years), the risk entailed is not matched by the investment return. In short, there is no business model in a pure market context.

If the assumption holds that ICES promise significant public policy benefits as well as future consumer benefits then both the opportunity and the challenge call for public policy solutions. The question then is what instruments of policy are at hand. One of these instruments is the energy regulatory system.

There are many ways that the regulatory system can fulfill the public policy need. There are also several barriers to it doing so as well as counter arguments that the regulatory system should in fact have a lesser role. As we look to the future there are several possible paths. One of those paths keeps in line with the regulatory model of the past two decades with all of its well established benefits. Another is to go even further toward deregulation and open up new avenues for competition and innovation, a course of action that has often worked to positive effect in other industries. A third approach builds on the foundation of the regulatory model and takes it in new – and not so new – directions. The choice of which path to pursue should be determined by several key factors.

2.1 Public policy realities

As policy makers contemplate the future of energy delivery they tend to be mindful of several realities.

One is cost. In the current economic context the focus is unavoidably on near term cost but the deeper public policy imperative is cost over the long run. Arguably, the fixation on near term cost for public services in general is at the root of the growing crisis in public infrastructure[10]. Energy is a long game: infrastructure investments have lives measured in multiple decades. Against the political reality of short term costs, the public policy issue is how – taking a multi-decade view - we can build systems that address deficiencies, are adequate to the need but not over-built, are efficient (in both economic and energy terms), robust in the face of various economic uncertainties, and adaptable in the face of technological change.

A second reality is the need for consumer confidence and protection. Safety cannot be compromised. Nor can reliability. Consumers need to be protected against the potential of abuse by unrestricted monopolies. Failures of these sorts in energy systems can have both economic and human health and safety consequences – not to mention political consequences – of primary concern to any policy maker.

Environmental issues are important. Three or four years ago, environmental issues, particularly concerns about greenhouse gas emissions, might have been first on most peoples' concerns about energy. Today the priority ranking of the environment has fallen [11] due to the 2008 recession and its aftermath. This

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[10] In the face of competing cost pressures and a desire to avoid tax and service cost increases in the near term, by far the easiest and least publically visible course of action for policy makers is to defer re-investment and maintenance in capital assets. Effective asset management strategies for long lived infrastructure are increasingly the norm in well managed utilities but little public infrastructure has been subject to such strategies over past decades.

[11] Most public opinion work since about 2008 shows the economy far ahead of other issues with health care second and environment far down the scale. See for example, "Natural Gas and Public Opinion: Issues, Threats and Opportunities." Patrick Muttart, Mercury Communications . Regulator Industry Dialogue. Toronto. 7 Dec. 2011.

creates a risk of driving policy with short-term thinking. If environmental issues were compelling prior to 2008 then they must be a compelling part of our longer term energy thinking. In any event, smarter energy management generates both economic and environmental benefits.

A final factor to consider, which is more of an enabler than an objective in itself, is innovation. Innovation underpins everything else: cost reduction, efficiency, safety, reliability and environmental performance. New energy generation and delivery technologies combined with information and communication technology open new opportunities for both utilities and consumers on both sides of the meter. Policy makers need to be thinking about how more innovation can be brought into energy systems and how best to realize the emerging opportunities.

2.2 Economic realities

The immediate economic environment is far from conducive to new energy investments and likely even less so for experimentation with new systems of any sort. While it is essential to keep a focus on the long run, several barriers stand in the way of new solutions between now and then.

A general climate of economic uncertainty is likely to inhibit new energy investment – notwithstanding low financing costs – and inhibit risk taking even more. Consumers and governments are indebted and will be deleveraging for some time into the future. Consumers will be unwilling to take on new debt for energy-related capital and most will be hesitant in the face of new energy ideas, having seen too many deliver less than promised. Governments will be debt-burdened and even once they return to fiscal health will likely face a continued tax resistance from voters that make public financing of many things a hard sell. And there are higher priority services that governments need to finance such as health care, education, and municipal infrastructure.

Meanwhile, the good news for economic recovery but bad news for creating incentive for energy innovation is that some energy cost drivers (natural gas prices and, by extension, power costs at the margin in many jurisdictions) could well be soft for some time. Falling or stagnant stationary energy costs spell a strong case for “not fixing what isn’t broken”.

Over the long run the story looks different. The growing infrastructure deficit; public resistance to new energy projects across the spectrum; continued public policy driven penetration of renewables; and eventually the price of carbon could all contribute to upward price pressure. The challenge is to make the case that cost-effective energy use and delivery solutions mean consumers will realize a net saving which will grow as energy prices escalate.

2.3 Consumer realities

The consumer seems unlikely to be a driver of change and not only because of economic conditions.

The energy value proposition seems unlikely to change and without such a change it is hard to see what might motivate consumers to invest in innovative ideas. Energy and the services it delivers are commodities – heat is heat, light is light. And even if the electrons enable whole new sources of consumer value such as iPads, the electrons themselves are still an undifferentiated commodity. The personal computer, the smart phone and their progeny opened the possibility of a whole new form of consumer utility. Their impact was utterly disruptive in the same sense as was the early 20th century application of the internal combustion engine and widespread availability of electric power (the last disruptive "energy" technologies). The energy system on the other hand – even if radically transformed in the production or delivery system – will deliver the same basic value proposition to consumers as it has done for over 100 years.

All evidence points to a short list of unchanging customer imperatives on energy: safety, reliability, peace of mind. In other words, energy should be out of sight, out of mind. And when energy is in sight, such as in the form of a utility bill, the imperative of cost dominates everything else.

In a more optimistic economic context in which environment issues return to the forefront, customers will no doubt turn attention back to environmental performance. But the odds – based on decades of experience - are very strong that environment will still be a desirable rather than an imperative and that it will more often than not lose out when it contends with price, and more than that when it contends with non-negotiable attributes such as safety and reliability.

Consumers usually want choice – and that is certainly evident in other markets. But the story of retail deregulation in energy is instructive. Only a few North American jurisdictions have gone as far as retail deregulation of power. In many jurisdictions retail deregulation of natural gas unfolded smoothly enough, but in many jurisdictions the majority of consumers have chosen to stay with the incumbent provider. Meanwhile, some who had changed are migrating back.[12] By and large, energy consumers seem to be indifferent to choice and, if anything, seem to prefer the *status quo* of the monopoly provider, perhaps reflecting the imperative of peace of mind referred to above. While many consumers have secured improved efficiency furnaces, lighting and hot water heating, the energy delivery system itself is simply outside their normal purview.

3.0 Reconciling Competing Realities: The role of the regulated energy system

3.1 Networked energy systems – a (recent) capsule history

Most of the energy systems that serve our communities are subject to economic regulation. This includes natural gas service and electricity service. Typically, the commodity (molecules or electrons) is subject to a substantial degree of competition at the production or wholesale level, a more mixed picture at the

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[12] For example, in BC and Ontario, data from FortisBC, Union Gas Limited and Enbridge Gas Distribution show the following: In the recently opened BC market (2004 for Commercial, 2007 Residential), direct sales appear to have flattened at 13% of the market (FortisBC correspondence). In Ontario, after market opening in 1985, direct sales climbed to a high of just over 40% in 2001 and have since dropped to less than 20% (Union Gas Limited correspondence).

retail level, and a the physical connection to the customer which is regulated. We refer to this as the "networked" system.[13]

The physical connections – wires and pipes – underlying networked systems make them natural monopolies[14] which are typically subject to oversight by a regulatory process of one sort or another. Characteristically this oversight entails the transfer of exclusive franchise rights on the investor combined with regulation of prices and quality of service to protect the consumer from the exercise of monopoly power. All of it is knitted together by the two notions of "just and reasonable" rates for the consumer and a "fair return" for the investor. The regulator's job is to replace the market as the ultimate arbiter and to do so while mimicking the effects of the market as closely as is practical. In the strictest sense the economic regulatory system is not intended to be the instrument of any other public policy purpose.

Traditionally the gas and power systems were subject to regulation – from energy production through to the customer. The 1980's brought a fundamental rethink of economic regulation across the economy and with it a reappraisal of what systems and what parts need be subject to regulation. In most jurisdictions some measure of energy deregulation followed: the commodity itself in the case of natural gas, followed by the power generation process and, in the case of electricity, the retail sale of the commodity itself to some degree. "Unbundling", as the process of separating the different components was called, led to a strict separation of functions with the regulated utility limited to providing the monopoly service itself.

The two systems – gas and electricity – evolved in very different ways and have been viewed as entirely separate services. Accordingly, they are regulated entirely separately and each is typically subject to its own legislation.

Separate streams; deregulation as far as practical; and unbundled services, with separation of regulated and non-regulated components, has been our governing paradigm for over two decades. It has worked well enough. Deregulated components create scope for new entrants and innovators in service offerings – such as power generators, gas storage providers and commodity marketers. Unbundling and segregation of functions ensures transparency of costs and minimizes the risk of cross-subsidization, thereby protecting consumers. The idea of pure play utility companies promises an easily understandable, low risk model for investors, arguably contributing to lower cost of capital.

If the essential regulatory model is to restrict regulation to parts of the system which are natural monopolies, the corresponding essential business model for utilities involves owning and operating rate

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[13] The transportation fuels system is the other component. Over time, should battery electric vehicles or home refuelled natural gas vehicles) become common, transportation will also become tied to the networked system

[14] Natural monopoly arises where economies of scale are such that more than one supplier (such as two sets of wires serving a neighbourhood) would produce a less economically efficient outcome than relying on one supplier. Once a supplier is established it will have such competitive advantages that new entrants will be blocked from competing and customers will accordingly be "captive", thereby giving the supplier what is known as "market power'. Alfred Kahn's book, Natural Monopoly Regulation: Principle and Practice.

regulated assets on which shareholders earn a relatively predictable and low risk return. Investors in such utilities provide capital at relatively low cost in exchange for corresponding low risk.

How do the new systems contemplated in this paper either fit with or challenge these basic models?

- The case for engagement of the regulated model should be clear where there is in fact a natural monopoly, although the precise timing and role of the regulatory system is a matter for debate.
- For functions ancillary to the network itself, such as heat or power sources, the case for regulation is more ambiguous and would need to be founded on a compelling public policy case that regulated systems are the most practical means to achieve a desired outcome.
- For functions on the other side of the customer meter, the regulatory case is weaker still and would also need a compelling policy case.

The emergence of integrated community energy solutions challenges both the regulatory model and the utility business model. Regulators, energy delivery utilities, and consumers find themselves rethinking the fundamental business relationship, potentially replacing sales of electricity and natural gas with end-use services aimed at providing customers with a package of heating, cooling, hot water, lighting, and power for electrical equipment. If such energy service models are potentially desirable from a public policy and consumer interest perspective then it may be advisable to consider departing from strict adherence to traditional regulatory and utility business models. The alternative may be for the regulators and incumbent utilities to be not simply neutral in the face of change but actual impediments to change due to current low commodity costs for traditional energy sources, established infrastructure, and preoccupation with short term costs.

3.2 The necessary evil – physical networks and natural monopolies

It is very difficult to make the case that physically connected energy networks are not natural monopolies, or, that they will ever be anything but. Once a system is established, the effects of the scale and scope economies that define natural monopoly assert themselves. And, once connected to the system, customers have no realistic choice. They are purchasing a commodity for which there is no alternative supplier and which is essential to functioning, not to say surviving, in a modern society. In effect, the provider has market power. The public interest is, therefore, served not only by some system of oversight on rates but by an imposed obligation to serve on the part of the provider. This logic applies very clearly to gas and electricity with which consumers are well familiar. It also applies to emerging thermal energy systems (TES).[15]

In limited instances contractual processes can achieve some of the protections conferred by regulation: on the part of the service provider there is an obligation to serve, to maintain the quality of the service, and to charge only agreed upon rates; on the part of the consumer there would be an obligation to take

[15] Once connected to the TES the customer has foregone not only a gas connection where that is the alternative but, more importantly, in-building heating equipment. Faced with unacceptable financial demands from a supplier or a supplier who simply ups and quits – through financial insolvency for example - the consumer would face very large economic and practical barriers to replacing the service.

the service. For systems involving one or a few large customers the contractual model may well be viable and cost effective. For most customers, however, the transaction costs - including gaining knowledge of the systems and of the alternatives entailed in negotiating, monitoring and enforcing such contracts, not to mention the physical and financial risks entailed in the whole transaction[16] would be excessively burdensome. This is a classic instance of the investment inefficiency referred to earlier.

Among the policy drivers discussed earlier is consumer protection – with respect to both cost and reliability. If policy makers deem it advisable to induce the establishment of TES then they inescapably need to worry about creating an environment that first establishes consumer confidence and then guards against it being undercut by system failures, whether contractual or physical.

Government ownership does not substitute for regulation. Governments as owners of systems have, (and should have), an incentive to garner returns on their investment to ensure a flow of funds to sustain re-investment and, possibly, to provide an additional source of revenue to public funds. This is all well and good but these motivators are potentially in conflict with the interests of energy customers for whom "fair and reasonable rates" are the principal criterion. Nor do political processes substitute for properly constituted regulatory processes. The latter are expert, evidence-based, and subject to due process and legal appeals.

One of the principal objections to regulation in TES is the inherent unwieldiness of rate regulation as conventionally conceived and practiced. However, not all systems need be subject to the same weight of regulation. TES are inherently geographically limited, unlike power and gas systems, since thermal energy does not travel well. Many will be installed where the customers are large institutions or commercial buildings or, if serving small consumers, under the auspices of a municipal government, a business improvement district, or some other body with the capacity to represent, negotiate, and monitor. In many instances the most viable model might be one that is more analogous to settlements as they are now used on long distance transmission systems where a small number of shippers and their agents come to an agreement with the service provider under the supervision of a regulator. The regulator will set the rules of the game, monitor performance, and provide an avenue for future modifications as needed as well as a recourse, while otherwise leaving the contracting parties to their own devices.

3.3 The virtues – and limits – of competition

There are other policy drivers which are in tension with the imperative of consumer protection. Principal among these is the imperative of innovation – to drive costs down, to create new service offerings, to develop new technological solutions. It is argued with some merit that the regulated utility and its regulatory framework are far from being drivers of innovation. Instead, the competitive model has an evident track record that should be given considerable weight. This is a debatable proposition.

It is important to come back to the characteristics of the energy system to consider what competition might achieve relative to the public policy interest in transformed energy systems. Competition, in order

[16] An interesting example arises where a contractual obligation is treated as a long term liability on a customer's books whereas the obligation to take a regulated service is not.

to be effective as a driver of change, requires that the purchaser be able to discern an improved value proposition from switching from one competitor to another. And therein lies the issue.

As noted earlier, retail customer choice is not a particularly strong driver. Although most people will likely say that they prefer choice, the evidence from retail deregulation indicates that their actual preference as opposed to their abstract preference is quite different. There is also ample evidence that retail consumers routinely miss the chance to save money on their energy bills with very rapid pay-back periods. As noted earlier, the energy consumer will always be buying what is essentially a commodity, and competition in commodity markets is largely limited to price or supply security and does not extend to product differentiation or new offerings.

The potential to "green" the system matters to consumers and it matters a lot to policy makers, but experience with green offerings suggests that something less than 10 per cent of the customer base[17] will be motivated (to the point of accepting higher prices) by such offerings. This is a small foundation on which to found a robustly competitive market.

The experience in wholesale energy markets is in striking contrast to retail markets. There – especially in power generation – competition seems to have taken root and produced positive outcomes. But in that case the parties to the transaction are large players motivated by and capable of pursuing profitable opportunities in effective cost competition, driven by commercial not private discount rates, and often driven by regulation and reputation to respond to environmental imperatives. There may be lessons in this for how to approach new integrated community energy systems.

3.4 Reconciling regulation and competition – a wholesale perspective

There is a case to be made for competition in the first instance - when new systems are being contemplated - but for regulation once they are established. Such an approach has the virtue of opening up to new entrants at the critical wholesale stage of decision making and creating a climate where innovative ideas can be assessed on policy and business grounds while still affording high degrees of consumer protection. This idea is under discussion in at least some jurisdictions[18] although the exact dimensions of what constitutes both fair and efficient processes remains an evolving art.

A critical question at the center of the preceding proposition concerns the role of incumbent utilities. While such utilities' franchise may be under threat from new entrants, they could be said to have unfair advantages if they are allowed to bring to bear all of the strengths of incumbency, most notably knowledge about the customer base. Even in the face of adverse reactions to price increases, utility companies are consistently viewed as trustworthy and reliable providers of energy. Rules governing inter-affiliate transactions can mitigate unfair advantage. Beyond a certain point, however, they can also

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[17] Memorandum from Charles J. Cicchetti and Colin M. Long, Re: Customer Participation in Green Energy and Third Party Administrators based on data from National Renewable Energy Laboratories.

[18] For example, in BC. See Jaccard, Mark. Written direct evidence from British Columbia Utilities Commission inquiry into FortisBC Energy Inc. regarding the offering of Products and Services in Alternative Energy Solutions and other new initiatives. November, 2011.

dissipate the fundamental economic efficiencies of incumbent utilities. The costs and risks of new energy systems are substantial. Established utilities are able to mobilize low cost capital; they enjoy economies of scale and established customer confidence, all of which do give them a competitive edge but which also facilitate the public policy purpose of driving investment in efficient new systems. The determination of the right balance among the interests of customers, incumbent utilities and new entrants turns on the question of competing policy objectives and is the business of policy makers to reconcile.

3.5 The conundrum of integration in an unbundled world

Whether pipes and wires should be regulated is relatively uncontroversial. Less obvious is the appropriate treatment of other elements connected to the pipes and wires, such as energy sources.

To take an obvious example, a TES built around an energy center based on a combined heat and power system is not just a TES but also a supplier to the power system. In deregulated power markets, that power is bid in under competitive conditions but its mode of production is also integral to the (regulated) thermal system. Alternatively, should the energy sources in a TES be thought of as integral to the system? Or should they be treated as analogous to power generators, in other words as functionally separated from the thermal distribution system and subject to competition? Extending beyond TES, if biomass-sourced natural gas is to be introduced to the gas stream, is it part of the delivery system or a stand-alone facility? Although it is analogous to an upstream gas supplier, it may more logically be financed and managed as an integral part of the gas distribution system.

One approach is to expand wholesale markets to include new unconventional supply sources, but it is difficult to see a viable business model – at least at present - to support many such stand-alone suppliers. The advantage of integrated energy systems is precisely in their integration – from a management, operational, and a financial perspective. It is difficult to envisage how a system strictly structured around a regulated core of pipes supplemented by competitive energy suppliers could be made to work. And, even at the cost of seeming to reverse many years of deregulation, the regulatory path may be the easiest to follow, at least until such time as integrated community energy systems become firmly established and viable business models begin to emerge.

3.6 Integrated systems beyond the customer meter

Getting even further from the core regulatory paradigm, some aspects of integrated systems are found on the other side of the customer meter. Since the beginning of deregulation and unbundling, customer equipment has been firmly outside of the regulated utility and this model has worked well. There is a policy case for considering a departure from this practice.

The Demand Side Management (DSM) model stands as an exception to the strict notion that the utility role ends at the meter. Because of public policy drivers that will not be satisfied by consumers choosing freely in competitive markets, the system accepts a compromise which it might not accept if regulatory purity were the main objective. In most jurisdictions DSM services are financed from customer rates, carefully scrutinized and overseen by regulators, and managed by the utility, although they are often[19] delivered by competitive energy service companies (or ESCOs).

New opportunities beyond traditional approaches to energy efficiency (such as tighter building envelopes or more efficient equipment) are rapidly emerging. Some involve the energy equipment itself, such as micro-co-generation systems, hybrid gas/renewable systems, or stand-alone renewable systems at an individual building scale. Many of these are at the stage of technology demonstration where a strict market driver would be inadequate under any circumstances. Others involve online information allowing consumers to assess their energy use as compared to similar residences. Still others offer opportunities for real time energy management through monitoring and adjusting the performance of energy using equipment. Many of these technologies and services may become viable through competitive markets. On the other hand, where significant investment in energy equipment is entailed, especially unfamiliar and untried equipment, it seems unlikely that an unassisted competitive model will succeed.

If there is a public policy interest in transforming markets beyond conventional DSM, then policy makers need to reflect on how best to induce that change. In an ideal world that inducement would first take the form of market based prices, including a price for carbon, after which things could be left to competitive suppliers to enter the market. But, as noted earlier, there is more than one sort of market failure and several aspects of consumer behaviour combine to create very high investment barriers.

Policy makers have several instruments at their disposal to help overcome such barriers. Regulation (in the sense of standards) is one instrument, but standards are typically best suited to cutting off the inefficient tail; they are more limited in their ability to lead innovation for the obvious reason that standards processes are quite the opposite of technological and entrepreneurial processes. Subsidies delivered through government agencies or their surrogates are another obvious mechanism.

Alternatively, policy makers can consider the role of regulatory systems as potentially efficient delivery mechanisms. The advantages of regulatory systems include utilities with strong customer connections and deep knowledge of the marketplace and regulators with long experience with management mechanisms such as system benefit tests and extensive research on the cost effectiveness of DSM type mechanisms as well as experience with how to achieve income neutrality and how to provide performance incentives.

The regulatory model is far from a silver bullet. For the politician, consumer resistance to rate increases looks not that different from resistance to taxes. There remain thorny issues such as due or undue subsidies, how much to charge participants, and how to protect non-participating consumers. Any subsidy approach standing on its own and without benefit of proper price signals is not particularly efficient, and

[19] There is an ongoing debate as to the best model for delivering DSM services, whether through utilities or through stand-alone agencies. There are instances of both success and failure for both models although utility delivery is still the dominant model. The point here is not to argue one side of this debate or the other but rather to note that DSM aimed at driving public policy objectives such as improved environmental performance has been embraced by regulators without fundamentally compromising the core regulatory model.

experience generally with DSM suggests that free-ridership[20] can make any subsidy much less cost-effective than one might prefer. It all depends on whether policy makers wish to induce the change and what might be the most cost effective way of doing it – always keeping in mind the longer term transformation that is at the heart of this discussion.

4.0 Reducing the Risks of Innovation: The potential in experimentation

In one session of the Regulator/Industry Dialogues – held in Ottawa in February 2011[21] – regulators, utilities and other stakeholders discussed the merits of integrated energy systems and the potential role of the regulatory system.

The discussion addressed numerous barriers. One was the failure of policy systems to give regulators the tools required to adequately respond to these new challenges – tools such as extending mandates to encompass TES, or creating the flexibility to accommodate the convergence of formerly separate systems. Another barrier that was addressed in the discussion is the inherent caution of regulators themselves, for whom risk-taking and experimentation is far from common practice. There is much about these new systems that challenges long held ideas, including the idea that regulation should be applied only to pure natural monopolies and only with strict rules to avoid cross-subsidization.[22] Even more, the idea of regulatory systems moving into new areas challenges the view that we are and should be moving away from regulation on the premise that regulation is costly and cumbersome and should give way to more nimble more innovative competitive models.

In any event, there was consensus that there are benefits to be gained from the application of integrated energy systems and, provided that the consumer interest was kept in the forefront, that there was potential benefit in experimentation in the regulatory system.

Several ideas emerged in the conversation. Not all of them gained unanimous approval and not all of them could easily be reconciled with normal regulatory practices. Some – notably directives – have arguably become part of the problem because they short circuit the regulatory system sometimes to a negative outcome. There was, nonetheless, a wide spectrum of possibilities:

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[20] Environment Canada, Energy Sector Sustainability Table – Issue Paper No. 8 "Factors Affecting the Impact of Energy Efficiency Incentives". April 2008.

[21] Final Report of the Regulator Industry Dialogue: Energy Policy, Economic Regulation and the Development of Integrated Community Energy Solutions. Ottawa: Canadian Gas Association, Canadian Electricity Association, CAMPUT, 2011

[22] The scope and extent of the differences between today and – say - twenty years ago is significant: new system management technologies; new ways of applying old technologies; more sophisticated utility companies; long experience with managing issues respecting inter-affiliate transactions; and, not least, a still compelling and still far from resolved need to radically reduce the environmental impact of energy systems.

- Pilot projects – new systems using new business and regulatory techniques but explicitly limited to the case in point and treated as laboratories.
- Transition arrangements – where assets or asset classes are brought under rate regulation for specified periods after which they transition into the competitive environment.
- Competitive alternatives – where utilities bring forward proposals under rate regulation and competitive players are invited to beat them on a set of customer and system benefits tests.
- Extension of established methods – for example the well tried methods of demand side management such as total resource cost tests applied to a broader suite of options than conventional efficiency investments or system benefits tests for assets that increase system efficiency or reliability over a short or longer time horizon.
- Shadow pricing – where implicit carbon values (tied for example to the implications of government reduction commitments) are used to estimate the value of competing alternatives.
- Directives – in jurisdictions where there is provision for directives they might be turned to as a way of allowing experimentation without unhinging good regulatory practice.[23]

What mechanism might be best suited will depend on particular circumstances. The point is simply that experimentation can be tried and that such approaches reduce the risk of locking in methods that turn out not to work.

The argument comes down to this: there is a compelling policy case for change; that change is inhibited by many factors; the regulatory system can be a facilitator of change.

The regulatory system is in its nature risk averse. But the very conservatism of the regulatory system is one of its strengths. It is a system that can evaluate alternatives on sound and transparent analysis of costs and risks. It can apply discount rates (put another way, accept pay back periods) more appropriate to a public interest time horizon while relieving consumers of the need to absorb high upfront costs or price volatility. Risks can be transparently allocated between consumers and investors.

The policy and legislative systems lack both the expertise and the transparent processes that can underpin consumer confidence. The regulated energy system risks being an impediment to change or being marginalized. Experimentation under appropriately mandated conditions established by policy makers and implemented under the well established procedures of the regulatory system would be a low risk, potentially high reward path to the future.

[23] Final Report of the Regulator Industry Dialogue: Energy Policy, Economic Regulation and the Development of Integrated Community Energy Solutions. Ottawa: Canadian Gas Association, Canadian Electricity Association, CAMPUT, 2011