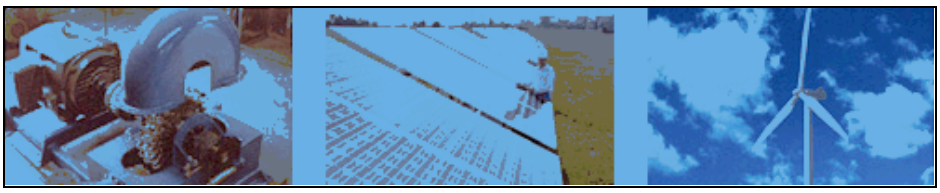
Independent Power Production: Benefits to Local Communities



Using Renewable Resources to Create Community Capacity and Economic Security

Presented to the Municipal Finance Authority
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We Can No Longer Take Energy For Granted

"When the infrastructure shifts, everything rumbles."[1]

Ice storms and power surges leave large swaths of the continent in blackness. Deregulated markets are manipulated by governance-challenged energy corporations, resulting in sky-rocketing energy costs, power utility bankruptcies, and half finished power plants in the US.

In British Columbia, we have been fortunate to be insulated from all of these shocks to date. The hydroelectric generating assets initiated by prescient former provincial governments, built and managed by BC Hydro, have left BC with a heritage of hydroelectric-based energy resources that are not only cost competitive but also environmentally benign relative to hydrocarbon-based sources that are so predominant in the rest of North America.

However, even here in BC we are not immune to the effect of volatility in continental energy prices that, combined with growing domestic demand and reliance on imported power, "represent a growing risk to British Columbia's exceptionally low electricity prices".[2]

We cannot assume that BC Hydro will always be able to insulate communities in the province from the surrounding energy turbulence; it makes sense that municipal leaders make a commitment to better understand the provincial and local energy situation and its potential risks, as well as the potential opportunities for their communities through local energy generation sources.

This discussion paper presents more of the opportunity than the risk to local communities. The silver lining inside the dark cloud of rising energy prices and increasing concern over the climatic effects of greenhouse gas emissions is an opportunity for communities like yours to attract and develop significant capital projects with positive

[1] Stephen R. Covey, "The 8th Habit: From Effectiveness to Greatness" p. 12.
[2] Scott Simpson, "Volatile North American energy markets may push B.C.'s prices higher" Vancouver Sun: February 22, 2006.

economic and social attributes. Add to that a new industrial taxpayer that will contribute to your community's long term economic health and energy security of supply.

A 'Call To Action'

This call to action has three specific messages:

1. Local officials need to become aware of the energy supply and demand issues that are specific to their jurisdiction. This includes consulting with BC Hydro to understand their community's specific relationship to the provincial power grid, the likely future cost of electricity, any potential reliability issues with the power grid, and the local conservation and energy production options available to communities.

2. To make the most of significant conservation and production opportunities - bearing in mind that all capital projects require risk capital and specialized skills for their successful development - local governments should consider how they could support qualified developers to take on the risk of seeing the resources developed. One way is to provide transparent, equitable and timely support to project permitting and rezoning processes. Local governments can and should actively participate in the development and operation of renewable energy projects with the long term goal of becoming energy self-sufficient.

3. Local officials should engage BC Hydro and the provincial government in a dialogue around the potential for a mandated price and priority of access for green energy into the province's electrical grid. This would be a natural extension of what has been referred to as the 'one window' approach for regulatory permitting that the involved agencies of the provincial government have been trying to implement to streamline the process of power project approvals.[3]

Limits to Growth in Power Production In BC

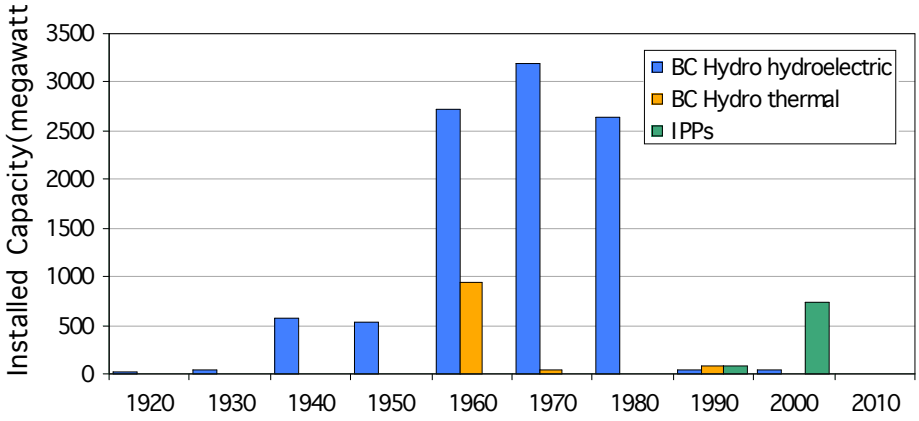
The development of strategic infrastructure, such as electricity generation and distribution systems, in any community is always a story of political and economic forces combining in different ways to accomplish the objective. In BC it is the story of the Social Credit

[3] *In jurisdictions as diverse as PEI, Colorado and Germany public policy mandates the purchase by local electricity grids of all renewable energy for a predetermined price. Ontario has just implemented a 'Standard Offer Contracts" that apparently mandates the purchase of small renewable energy (wind, biomass, small hydro) for 11 cents per kWh and solar for 42 cents per kWh.*

administration under W.A.C. Bennett creating BC Hydro in 1961 out of the take over of the privately owned BC Electric ("BCE") and its merger with the publicly owned BC Power Commission ("BCPC"). The new organization, BC Hydro, with the full covenant of the province behind it, had the financial capacity to implement the 'two rivers' strategy, which was an ambitious over-building of the province's electrical generating capacity on the Peace and Columbia Rivers at the time.

There is no question that the initiative to combine the public agency responsible for rural electrification (BCPC) and local energy self-sufficiency with the private sector enterprise that was developing power and railroads in the Lower Mainland (BCE) – was the right thing to do in order to develop hydroelectric power in the succeeding three decades to the 1980's. However, this centralized mega-project based model may have run its course as much less progress has been achieved in the last decade and a half – and the focus on local energy self-sufficiency may once again be more appropriate to the current political environment.

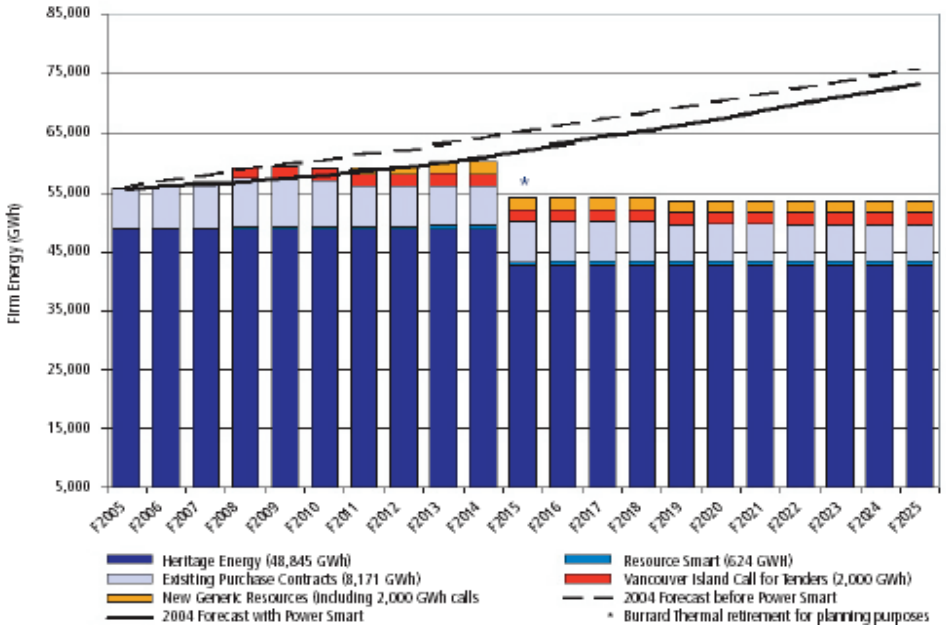
The province's hydroelectric assets were built in three distinct phases in each of the 1960's, 1970's and 1980's.



Source: BC Ministry of Energy & Mines, Oct. 2004

There have always been a few Independent Power Producers ("IPPs"). Most of the non-BC Hydro power development over the years was initiated by major industrial users such as Alcan at Kitimat, Cominco at Trail (built in the 1950's) and others for their own use. By 2001, the last year that BC's domestic production was more or less in balance with domestic demand – about 7% of the power was from IPPs that were dedicated to the grid. By 2006, in spite of two calls for new power – generation from IPPs had only grown to to 9% of the total production in the province.

BC Hydro's major dams – our heritage assets. - produce roughly 40,000 gigawatt-hours ("GWh") of the total 48,000 GWh that was produced in 2005. This is considerably less than the 55,000 GWh that the province consumes in a given year and decreasing as a percentage of total consumption as projected over the next 20 years.



**From BC Hydro 2005 Resource Expenditure and Acquisition Plan (REAP)*
*** 'Heritage Energy' declines 8,000 GWhs in 2014 due to the decommissioning of the gas-fired Burrard Thermal Generating Station.*

The above figure understates the severity of the electricity supply/demand shortfall in BC as much of the theoretical 55,000 GWh of generating capacity is not available either because it is generated from the expensive natural gas-fired capacity of BC Hydro's Burrard Thermal plant, or it is from sources that have been contracted for but not brought on line for other reasons, such as restrictions in local water use plans and/or political opposition at the regional district level to new projects.

The 2,000 GWh shown as being available in F2008 and that had been contracted for Vancouver Island pursuant to a lengthy tender process in 2005 has been indefinitely derailed by BC Hydro itself. The story is no better for most of the 16 IPPs signed up by BC Hydro in 2003 to deliver 1,763 GWh of energy by September 2006, of which only one is likely to be built within their committed time frame. The delays and likely failures to date have been a result of escalating construction costs, inability to obtain financing and

regulatory permitting difficulties. With hindsight it is clear that the 5.5 cents per kilowatt-hour (less a natural resource tax of 5 cents) was too low to make most of these projects economically viable through construction.

In the current environment it is very difficult for BC Hydro and IPPs to enter into workable contracts when there is a great deal of volatility in prices and costs. While obtaining a long-term contract for price and quantity from BC Hydro is important, without equal levels of certainty in permitting, local rezoning and construction costs – that certainty is wasted for IPPs. Building a typical IPP these days is something like trying to secure a large tarp in a high wind – the power purchase contract from BC Hydro is only one corner of the tarp.

The upside to IPPs is the numerous potential renewable resources in BC. The B.C. Sustainable Energy Association ("BCSEA") states that the province has huge green power potential that could provide not only renewable sources of energy but could also stimulate economic development and employment within the province. Their estimate of BC's maximum long-term (25-year) potential for sustainable resources is as follows[4]:

Resource Type	Energy (GWh/year)	Cost (per kWh)	Jobs (person-hours)
Wind	11,000	6-12¢	31,250
Small hydro	11,108	4-9¢	5,700
Wood waste	1,800	4-9¢	484
Geothermal	9,000	5-9¢	7,000
Tidal	13,000	11-25¢	13,906
Landfill Gas	85	4-5¢	20
Solar PV	12,000	60-200¢	210,000
Efficiency projects	12,500	3-6¢	145,000
Solar Hot Water	10,000	n/a	60,000
Geothermal Exchange	3,750	n/a	21,420
Total	84,250**		413,560

Assumptions:

[4] Vancouver Sun article, Tuesday, November 22, 2005, by Scott Simpson

1. Cost of electricity production from BC Hydro's existing heritage assets is 2.5¢/kWh
2. Cost of adding new large hydro assets is 6.5¢/kWh
3. Total potential renewable generation is 50% above Hydro's current total generation

These costs are estimates only and the actual costs are realized when IPP developers actually submit fixed bid prices to BC Hydro when BC Hydro initiates its calls for proposals for new projects.

The true cost of new, renewable energy sources is dependent primarily on the cost of construction labour, materials and financing, which can vary depending on local labour demand, international commodity prices (i.e. steel, copper), and interest rates. The BCSEA table shown previously provides a relative cost comparison for the various types of renewable energy sources available in BC.

Without the least slight intended with respect to BC Hydro and its management, the centralized tendering process is structurally incompatible with a situation that requires timely interaction and adjustment between changing factors on the supply and demand sides of the equation. Furthermore, for smaller capital projects – the long lead times inherent in the centralized tendering process and significant costs in terms of time and money – become even more untenable.

Given that BC Hydro itself is restricted by policy, and some significant environmental challenges, from building new greenfield mega-power projects, the provincial energy situation is worsening every year. The current practical reliance on electricity imports from the US for 13% of BC's annual energy requirements itself seems inappropriate given the abundant and cost effective green energy potential in the province. This is potential that BC Hydro itself has taken considerable pains to map out for potential developers (see various papers and map resources at www.bchydro.com/environment/greenpower).

The limits to the development of electrical power generation in BC are more than just price. They are also inherent in the current institutional structure of power industry. Positive change is likely to be in the direction of a more decentralized approach that would entail greater involvement of local authorities.

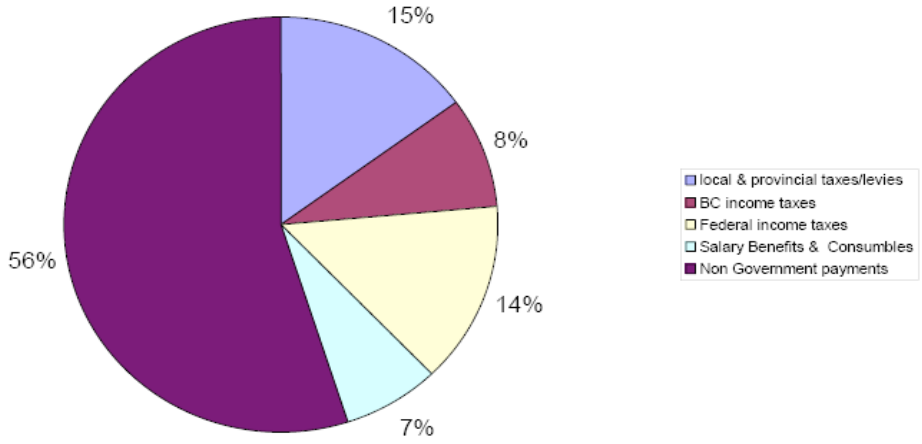
The Inexorable Influence of Markets

It may surprise you to know that BC Hydro trades much more power in the US electricity market than simply purchasing what is needed to make up for the 13% deficiency in cost-effective supply of power in BC. Over the transmission infrastructure that was originally built to facilitate the sale of surplus electricity to the US market, we now use it to simply extract the value inherent in the flexible and dispatchable nature of hydroelectric dam-generated power to 'arbitrage' the day/night and seasonal variations in the US electricity market.

In any given year, a third to a half of the electrical power generated by BC's hydroelectric dams is sold into the US market through BC Hydro's trading arm, Powerex. That amount, plus the amount needed to cover our production shortfall, is purchased and imported to BC. This two-way trade of energy has gone on for many years and has earned BC Hydro – and therefore the Province – hundreds of millions of dollars in 'windfall' profits.

However, there may be opportunity costs only now is becoming apparent in that a bias has crept into BC Hydro's electricity purchasing practises that has undervalued domestic power generation and has made it more difficult to develop and integrate new green energy projects than would be the case if there was not a trading bias in the management of our existing electrical resources. Specifically it does this in two ways:

First of all, BC Hydro pays roughly the same price for imported power as it has for new, domestic green IPP power – roughly 5.4 cents per kWh (as per BC Hydro's 2003 call for new green power generation). However, this price does not take into account the fact that an estimated 2 cents out of each 5.4 cents (or 37%) from a domestic power producer goes directly into government revenue of one kind or another[5]. A breakdown of the payments made by a domestic power producer is as follows:

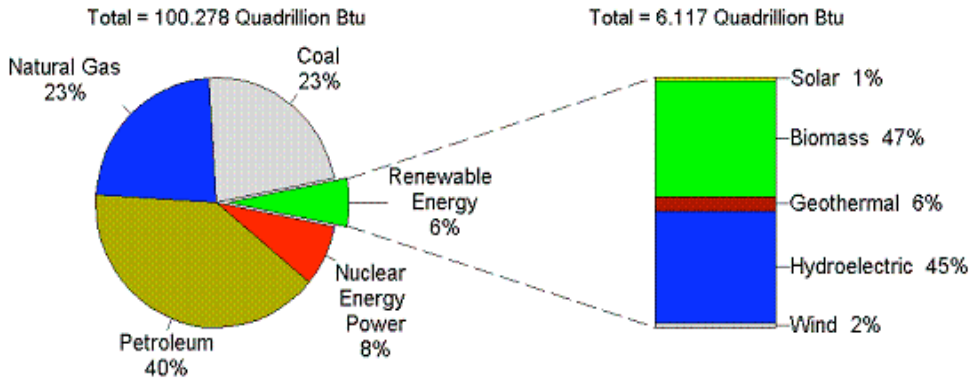


IPPBC, "Cost of Importing Electricity: Pre-Budget Submission to the Ministry of Finance" October 15, 2004

[5] IPPBC "Cost of Importing Electricity: Pre-Budget Submission to the Ministry of Finance" October 15, 2004. pg. 12. In fact its worse, the standard form of BC Hydro purchase contract no longer (it once did) allow for unanticipated increases in these charges and taxes by other arms and levels of government to 'flow through' to an appropriate adjustment of the long term contract price.

Secondly, the 'greenest' of the new energy sources that can be developed in the province – wind and run-of-river hydro – are not 'firm' or constant energy sources as they rely on natural resources (rain and wind) that are variable on a daily and seasonal basis. Electricity generated from these sources needs to be combined with the storage capacity from the large BC Hydro dams in order to become dispatchable as a firm and reliable source of power to the grid and ultimately to the end consumers. With the bias in government policy and BC Hydro towards the use of the storage capacity of the hydroelectric dams to support energy trading activities, this storage capacity is not available to support new, non-firm energy from IPPs that might be otherwise more economic to develop.

The uniqueness and value of the energy resources available and potentially developable in BC is brought into sharp relief when you consider how the United States obtains most of its energy:



US Energy Information Administration "Annual Energy Outlook" (December 2005)

In the large, much more diverse market for energy in the United States, the predominant sources have been oil and gas, followed by coal and nuclear sources. Renewable energy, at 6% of the total energy produced, and hydroelectric power is half again of that or less than 3% of total US energy consumption.

Historically, markets for energy in the US have not paid prices that reflect what are now being seen to be higher social costs related to burning hydrocarbons. It is likely that they will do so in the future, which bodes well for a region relatively rich in renewable energy sources like BC. The development of renewable energy in BC is a long term hedge against these future price increases that, in the case of most IPP contracts, caps potential price increases to no more than one half the increase in the Consumer Price Index.

IPPs: Contributors to Economic Development & Energy Security in Your Community

The benefits of IPP development in your community are immediate and long term. The immediate benefit is positive economic impact of a capital project that will create local jobs during construction and result in significant expenditures for goods and services in the local economy – and an increase in the local tax base in perpetuity.

To date, the experience in the Province has been primarily with run-of-river hydroelectric projects of various sizes ranging from 2 MW to 50 MW. This is due to the relatively inexpensive electricity that can be produced from run-of-river projects compared to other renewable energy sources such as wind. BC is a unique province with respect to its vast hydroelectric potential due to its mountainous topography and precipitation, factors that favour hydroelectric developments.

Economic Benefits

With respect to the economic benefits to local communities from the development of a run-of-river project, we have selected a 7 MW project to be our case study. A typical breakdown of the development and construction costs was provided to BC Stats, a service within the provincial ministry of Labour and Citizen's Services, who developed an economic model that estimates the impact of a capital project in terms of its contribution to Gross Domestic Product (total direct and indirect spending in the community) and to direct and indirect government revenues and employment.

The following table summarizes the output from the analysis of a 7MW project in terms of capital expenditures within BC, the employment created, and the tax contributions. Extrapolations for projects of 20MW was made for comparative purposes.

($1,000s)	**7MW**	**Per MW** *(rounded)*	**20MW***
Capital Cost:			
Purchased in BC	6,245	900	18,000
Imported to BC	9,175	1,300	26,000
Total Capital Cost	15,420	2,200	44,000
Employment (person-years)	**90**	**13**	**260**
GDP contribution	**$5,750**	**$820**	**$16,400**
Provincial & Local Tax	639	90	1,800
Federal Tax	537	80	1,600
Total taxes	**1,176**	**170**	**3,400**

**Extrapolation.*

The employment effects break out further as follows (the employment effects do not extrapolate in as linear a fashion as $'s spent):

Employment (person-years)	**7 MW**
Construction	9
Manufacturing	12
Retail Trade	6
Finance, Insurance & Real Estate	8
Professional, Scientific & Technical Services	28
Accommodation & Food Services	8
Other Industries	19
Total	90

With every successful power development project comes a long-term addition to the provincial and local tax bases. In the case of the Province, which charges water rentals based on the volume of water used or 'rented' and a tax on a project's capacity (i.e. the size or number of megawatts), the revenues that would accrue to them in the case of our 7 MW example is approximately $70,000 per year assuming a 40GWh/year energy production rate.

Local taxation will vary widely depending upon the jurisdiction, with large degrees of variance between regional districts and municipalities. In our example 7 MW project, depending on the project's value as established by BC Assessment and the local mill rates, the local taxation revenue is in the order of $200,000 per year.

This revenue is particularly significant when you consider that the local government provides no services to the IPP; there are no expenditures as the IPP takes full responsibility for all of its own services (i.e. road clearing, sewage, water). Unlike the tax revenue collected from most businesses, revenue from IPPs comes with no strings attached to local governments.

Distributed Generation

The other attributes that local IPP development brings are those of distributed generation. To be able to draw power from the larger electrical grid is an undoubted benefit – but to be completely reliant upon it creates a different kind of risk.

During the Quebec ice storm in 1998, the communities where power was restored first were the ones with local generation. Other communities, although underneath the large high capacity lines that were used to export power to the US, were not restored until considerably later. Local power generation can create a measure of local power security that may be important depending upon the local conditions.

BC Hydro has a program called "Community Energy Planning" (CEP) where they work with local communities to explore these options and help to determine how locally developed resources can be integrated into the grid. In a paper describing their program (www.bchydro.com/environment/greenpower/), BC Hydro describes how it has worked in communities such as Whistler and the Nemiah Valley, on-grid and off-grid communities respectively, to set targets for cost and quantities of power as well as for reductions in greenhouse gas emissions. This program dovetails with their better-known Power Smart initiative so that between the two, generation and conservation opportunities can be catalogued and evaluated.

The benefits of local distribution can be summarized as follows[6]:

Issue	Distributed Generation Benefit
Lead time to build	Small-scale power can be planned, sited, and built more quickly than large mega-projects
Fuel price/supply volatility	A more diverse, renewable-based mix of energy sources lessens exposure to fuel price fluctuations
Local economic impact	Local power projects contribute positively to local

[6] Adapted from Dunn, Seth. 2002. Micropower: New Variable in the Energy-Environment-Security Equation. Bulletin of Science, Technology & Society. Vol. 22, No. 2. pp. 72-86 and cited in "Running On Empty".

	economic activity, can be a long-term addition to the local taxation base and create sustainable long-term local employment.
Reliability and resilience	Small plants are unlikely to fail simultaneously and are easier to repair and turn back on
Grid capacity constraints	Power sources closer to demand reduce the transmission line losses and avoid delay adding new capacity by not requiring new transmission
Community control	Distributed generation provides local choice and control and can spur local economic development
Environmental impacts	Small-scale power can have fewer emissions and can have less impact on land and water resources

Harvesting Opportunities[7]

Financing can be understood as two basic activities: counting the money and assessing the risk. Wherever there is money to be made or saved – or where risk of energy consumption and production can be reduced – there is a potential opportunity.

In the municipality of Delta, energy was being produced in the form of methane gas as a by-product of organic waste being dumped into the landfill. Not only did that methane represent an untapped source of energy, it also represented a source of emissions of greenhouse gases. The GVRD, through a contract with Maxim Power, now collects the methane gas and uses it to produce 5.5 MW of electricity and 100,000 GJ/year of heat for a local greenhouse operator.

The municipality of West Vancouver retrofitted a drinking water storage reservoir – Eagle Lake - with a small hydroelectric generation facility that will generate just over one gigawatt per year of electricity to offset its electrical consumption. Total capital cost of this facility was $328,000 that was partially supported by a $50,000 grant from the Green Municipal Fund – a federal government sponsored program to encourage energy self-sufficiency.

Both of these examples demonstrate the potential renewable energy sources that exist within two, well-established communities within the boundaries of the Lower Mainland. Similar sources exist in smaller communities that could be more easily developed; they do not face the same land restrictions nor soaring property values that these projects have overcome.

The Anmore Foundation (www.anmorefoundation.ca) is an initiative of the municipality of Anmore to promote the development of

[7] "Harvesting Opportunities" was the title of the Union of British Columbia Municipalities ("UBCM") 2004 Conference for which BC Hydro was a major sponsor.

renewable energy sources at the community level. It has received assurances of support from BC Hydro, Kinder Morgan and the federal government through the Western Diversification Fund to fund the construction of a renewable energy demonstration facility that will showcase current technology for micro wind, solar and run-of-river power generation technologies. Renaissance Power Corporation has been contracted by Anmore to organize the project.

Wherever there is water flowing, landfill gas being created, winds consistently blowing – even the sun shining – there is a potential opportunity to create energy locally that may offset local energy requirements or even make a net contribution to the province's grid. The process for evaluating these opportunities is, at one level, quite simple. Wherever there is a cash outflow that can be reduced (by reducing an energy cost), or a cash inflow that can be created (from the sale of power) – less the appropriate amortization of what has to be spent to make it happen – there is a value that can be created and shared.

These can be extended into sophisticated financial models with many levels of nuance and complexity to handle different scenarios and scales of project, but at the end of the day it is simply money out for money in. For low risk projects such as the energy retro-fit opportunities that are supported by BC Hydro through PowerSmart and guaranteed by the BC Ministry of Finance, a local government agency is getting 'free money'.

For high risk projects that are intended to generate power by sale to the grid, local governments need to attract a private sector partner to take on the project who should bring a track record of success and expertise along with private sector capital where the financial returns warrant.

With so many moving parts – purchase agreements, design and construction, permitting as well as financing, - involved in building any kind of project in the current environment – anything that can be done to reduce uncertainty, increase the speed of and access to decision-making – is going to be important to achieving tangible results. An initiative such as the one mentioned at the outset of this paper to give distributed green power generation preferential access to the grid, would take away some of the uncertainty and make more projects feasible.

In a perfect world – where environmental values were truly reflected in economic decision-making - we would consume green renewable energy first, stored green energy second, and fossil fuel based energy only last and based upon price. Furthermore, that price would be one that could be incorporated into our financial analysis with certainty and not obtained only after the long and arduous process of participating in a BC Hydro tender process. With the development

of a less onerous form of agreement for under 10 MW sized projects, BC Hydro has gone a long way down a path towards reducing uncertainty for small renewable energy projects. Granting an assumption of access to projects that have already been approved by local municipalities is only a logical extension of this initiative to a point that might relieve the decision-making gridlock begin to reverse the trend towards increasing reliance on imported power.

An appropriate price is not just the avoided cost of electricity imports, as we discussed above, but one with included premiums to reflect:

1. Greater value for the 'green characteristics' and Kyoto emission benefits of renewable energy,

2. Full value for all of the payments that domestic power producers pay (up to 20 cents per kWh) to various levels of government,

3. More value for distributed generation capacity that can reduce the pressure on our overstretched transmission infrastructure. There are currently discounts for remote generation but not premiums for capacity that is close to load centres.

4. Less of a discount for the non-dispatchable nature of renewable power considering the unique capacity of BC electrical system to store energy.

Next Steps

Reflecting back on the three points in the call to action at the beginning of the paper, a number of more specific items for a 'to do list' come to mind.

1. Becoming Informed:

To become informed as to the full extent of the energy conservation and generation potential in your own community, it makes a lot of sense to access one or more of the many programs offered by the provincial and federal governments – and by BC Hydro itself. Data gathering and opportunity spotting are the first steps and there are a number of programs that can be accessed and firms that can be retained to support you in this process.

Do you know the actual cost of electrical power in your community? When we took a look at one community's actual power bill we saw prices per kWh that ranged from 5 cents in low periods to 21 cents in peak periods. While the power from BC Hydro's hydroelectric dams

costs only about 3 cents to produce – there simply is not enough of it to meet the total demand in the province. Someone has to be paying the cost of increasingly expensive imports – or the price that is going to be high enough to attract new construction. You can passively accept your vulnerability to these future price fluctuations – or you can actively consider whether there is generation potential in your own community.

2. Making the most of opportunities:

There are still 'quick wins' available in most communities in terms of attractive paybacks from energy conservation initiatives and a number of BC Hydro initiatives to support you in attaining them. From there it is a small step to inventorying the energy opportunities in your community and devising a strategy for bringing them on stream. Likely as not, anything that requires a significant capital investment should attract a private sector partner.

3. Get ready to respond to renewable energy initiatives that will continue to come from BC Hydro and other levels of government:

We appear to be entering the third stage in the development of the electrical energy potential of this province that will see the reversal of the trend towards centralization that was necessary to facilitate the development of our large-scale hydroelectric facilities. This third stage will be characterized by more reliance on local initiative, with active central coordination, and likely mandated price and grid access for green renewable energy like those that have just been mandated in Ontario. These challenges will be opportunities for local leaders to increase energy security and the quality of life for the citizens of their communities.

For further information on any number of issues raised in this paper we have prepared the following list of contacts:

Organization	**Contact**	**Website**
Greenlight Energy Consultants	Russ Tyson	www.greenlightconsultants.ca
Green Municipal Fund	Federation of Canadian Municipalities	www.sustainablecommunities.ca/GMF/
Local Government Infrastructure Grants	Provincial Min. of Community Services	www.cserv.gov.bc.ca/lgd/infra/index.htm

BC Hydro	Various	http://www.bchydro.com/info/ipp/ipp956.html
BC Sustainable Energy Assoc.	Guy Dauncy	www.bcsea.org
Independent Power Producers of BC	Steve Davis	www.ippbc.com
BC Hydro Net Metering Program	Laila Bassim	www.bchydro.com

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