Alternative Energy in Commercial Real Estate
and
Multi-Family Housing

Application of Distributed Resources

Practical and Legal Ramifications

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I. INTRODUCTION

Traditionally, little thought has been given in the real estate planning and development process to energy questions, apart from making sure that there are electric and gas connections nearby. When urban planners, politicians, regulators, lawyers and environmentalists have debated land use and development questions, there has been plenty of talk about scale and dimension and traffic and transportation and environmental impact, but mention is hardly ever made in public discussions of how new buildings and projects are going to get the energy they will need to run all their systems and where that energy will come from, not to mention its relative carbon content. The assumption always has been – if you build it, the local utility will hook it up.

Clearly, there is a growing trend now towards encouraging or mandating developers to meet LEED standards and use other energy-efficient building methods, and a growing willingness on the part of governments to use building codes to reach "greener" results.[1] Indeed, the California Energy Commission has recommended that "net-zero-energy performance" be required in new construction for residential buildings by 2020 and commercial buildings by 2030.[2] To the extent these standards and codes result in the use of less energy by facilities compared to conventional building techniques, this is an important first step towards reducing carbon emissions from power generation, the greatest source of greenhouse gases in the United States today. If the will and financial resources are there, new buildings can be built in the most energy-efficient way.

However, if planners and developers rely on the conventional methods of electricity, gas and fuel delivery for those buildings, the crucial issues of the source of the energy used and what fuels have gone into its production and delivery to the point of use are not addressed. This is important because buildings are the biggest consumers of energy in the United States. In 2005, according to a report from the U.S. Department of Energy, buildings used 72% of all electricity generated and accounted for 80% off electricity expenditures.[3] A 2004 study by the

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1 For a thorough discussion of green building standards, see Mark Bennett & J. Cullen Howe, James L. Newman, *Green Buildings and Sustainable Development*, M. Gerrard, ed., Environmental Law Practice Guide, Ch. 17D (LexisNexis Matthew Bender)

2 California Energy Commission 2007 Integrated Energy Policy Report, www.energy.ca.gov/2020_energypolicy/index.html.

3 U.S. Department of Energy, *2007 Buildings Energy Data Book* (Sept. 2007), available at http://buildingsdatabook.eren.doe.gov/docs/2007-bed-0921.pdf, cited in Bennett, Howe & Newman. 2005 is the most recent year for which these data are available.

U.S. Environmental Protection Agency found that buildings account for 39% of total energy use, 12% of total water consumption, 68% of total electrical consumption and 38% of greenhouse gas emissions.[4] And energy use in commercial and residential buildings is not projected to go down in the near future. On the contrary, it is expected to increase by *annual* average rates of 2% and 1%, respectively, until 2025.[5] Con Edison recently released statistics showing that energy use in New York City has increased about 10% in the last decade due to the greater energy intensity of the workplace and lifestyles, as well as increased population in New York. In other words, it will be a struggle in the coming decade just to hold energy use and greenhouse gas emissions from buildings at their current levels, much less reduce them, especially if the current fuel mix for power generation stays the same.

The purpose of this article will be to discuss what types of alternative energy arrangements are available for commercial real estate and how owners, developers and managers can implement those alternative solutions, with a particular focus on the legal aspects. Many of the methods and issues discussed with respect to commercial real estate also apply to residential real estate, especially multi-unit housing, but residential other than multi-unit will only be discussed in this article only in passing.

With respect to facilities and structures, this article will consider "conventional" to be grid supplied electricity and natural gas and back-up diesel generators for emergency power. "Alternative" will be considered to be on-site or local generation of electric or thermal energy, either though systems using natural gas, fuel cells, solar energy or biomass. These are the most readily available today. Wind, hydro and tidal, while renewable, will not be discussed because they are generally not available in site-specific applications, at least in urban or suburban areas. Geothermal energy is a renewable fuel source that can have application to individual structures, but is still quite expensive in that regard and is most widely used in central station applications.

Also considered to be alternative will be district energy systems where a number of structures are tied together though thermal energy conduits either in campus-style or urban settings, as well as microgrids connecting these same structures. Natural gas-fired cogeneration is the most accessible way to make the thermal energy used by district energy systems, but one can also consider waste of almost any kind to be a potential source of fuel, such that districts or even entire medium-sized cities can be powered by landfill gas, anerobic digester gas, solid municipal waste, biomass and cooling from underground aquifers. These latter techniques, when applied together, present a tremendous potential for larger scale greenhouse gas reduction, as several cites in Scandinavia and Europe have demonstrated.

This article will also describe the practice of energy efficiency or performance contracting, where an energy services company undertakes to reduce the energy usage of a building or series of buildings by making capital improvements and guarantees that the savings achieved will be sufficient to cover the capital cost of the improvements. This will be discussed

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4 Bennett, Howe & Newman, p. 6. The original EPA report, *Buildings and the Environment: A Statistical Summary* (Dec. 2004) can be found at http://epa.gov/greenbuildings/pubs/gbstats.pdf.

5 Larisa Brass, *Part 1: A Glimpse of the Energy Future* (Aug. 15, 2007), available at www.renewableenergyaccess.com. See also U.S. Energy Information Administration, *Annual Energy Outlook 2007 with Projections to 2030 (Early Release) – Overview* (Dec. 2006), available at www.eia.doe.gov/oiaf/aeo/consumption.html.

from the perspective that achieving energy reductions from improvements to existing structures has as great as, if not greater, potential to result in greenhouse gas reductions than the application of alternative energy sources, in that efficiency improvements are more readily accessible to facility owners and managers than larger scale infrastructure improvements. The possibility that energy efficiency contracting techniques can be applied to new construction will also be discussed.

While incorporating renewable energy solutions on a utility scale is certainly part of the approach in reducing greenhouse gases, it is the thesis of this article that, as a policy matter, reducing conventional energy use by buildings and facilities and adapting buildings to use alternative sources of energy form the more direct path towards the reduction of greenhouse gas emissions.

II. THE CONVENTIONAL MODEL – CENTRAL STATION GENERATION

In order to understand what is "alternative", it is best to begin with some description of what is conventional, so the proper contrast can be drawn. When we are talking about electricity delivery, the model that prevails in the United States is known as "central generation:" that is to say large power plants in relatively remote locations due to their size and environmental profile generate the electricity. That electricity is then stepped up in voltage and transmitted long distances over transmission lines to points where the voltage is stepped down for use in local distribution systems. Thus, the three classic components are large scale generation, long distance transmission and local distribution.

A. <u>Fuel and Efficiency</u>

As for fuels, in the United States today, almost 50% of all electricity comes from coal, about 19% comes from nuclear, about 19% comes from natural gas, about 3% from petroleum products and about 10% from all renewable sources combined, including both large and small-scale hydro, wind, and solar.[6] Of the renewable sources, solar comes in at less than one-half of one percent (0.04%). There are regional differences in these figures. For instance, in New York state, about 20% of the electricity comes from large-scale hydroelectric dams on the Canadian border, about 25% from natural gas and about 30% from four large nuclear plants.[7] Comparatively little comes from coal. In parts of California and the Pacific Northwest, almost half the electricity comes from hydro. However, on the average, over the whole of the United States, almost 70% of electricity comes from coal, natural gas and petroleum, all hydrocarbon products whose combustion results in significant carbon dioxide emissions into the atmosphere, not to mention the other main pollutants, sulfur dioxide (SOX), nitrogen oxide (NOX) and mercury (in the case of coal).

The various fuels also have differing efficiencies, which is the rate at which the energy in the fuel is converted to electricity. Most people outside the power business are surprised to

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[6] Based on end of year 2005 statistics, the most recent comprehensive ones available from the U.S. Department of Energy.

[7] U.S. Energy Information Administration, state Energy Profiles, New York (Jan. 24, 2008 update), available at www.tonto.eia.doe.gov/oiaf/state/state_energy_profiles.cfm.

learn that the average efficiency of all power generation in the United States is about 33%, and has been at that level since the 1950s. That is to say that more than two-thirds of the fuel we use in the United States for power generation is wasted. The least efficient conventional fuel also happens to be the one we use the most – coal – whose average efficiency is just above 30%.[8] The average efficiency of steam nuclear reactors (light water) is about the same (30%), The new pebble bed reactors are said to be able to achieve efficiencies of 50%. Single-cycle natural gas plants tend to be in the 30-40% range depending on their age. The most modern combined-cycle natural gas plants reach efficiencies of well over 50%, in some cases close to 60%.

The process of generating electricity creates heat, so-called “waste heat”. While waste heat can be used to make steam for more electricity or to make thermal energy (steam, hot and chilled water) in “combined heat and power” applications for industrial processes or other uses (heating, cooling), by and large, no use is made at all of waste heat in the central generation model because the thermal energy needs to be used close to the source of the waste heat – or because at the time large coal baseload generating stations were built, it was cheaper and easier to build them in single-cycle configurations. Since most central stations are so large and environmentally unfriendly and need so much water to operate (in particular coal and nuclear), not much tends to be near them, and the heat is instead transferred to bodies of water through cooling towers or vented it into the atmosphere.

Further, it takes electricity to transmit electricity. The average transmission loss in the United States is around 10%, but can rise to 20% during peak hours.[9] This means that on average only 85% – 90% or so of electricity generated in central stations gets to the point of use.[10]

Some say that the electric grid was the greatest engineering achievement of the 20th century. The country was outfitted with this vast network of poles, wires, towers, substations and installations that paved the way for all of the things that we take for granted today as being part of modern life. However, the fundamental elements of it were in place by the end of the 1950’s and there has been little improvement in efficiency since then, either in generation or transmission. Only in recent years have utilities been thinking about upgrading their

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8 Newer forms of coal technologies are designed to achieve higher efficiencies. So-called “super-critical” coal plants can reach efficiencies of about 45%. However, they are far more expensive to build than conventional coal plants and more difficult to operate and maintain. Integrated Gasification Combined Cycle (IGGC) coal plants can in theory reach efficiency levels of 60%, like combined cycle natural gas plants, but they are still somewhat experimental and nature and have much higher carbon emissions than their natural gas equivalents.

9 See discussion of transmission system reliability at page 177 in Richard Munson’s book, *From Edison to Enron* (Praeger 2005). For a non-country specific analysis of transmission losses in the central generation model, which are estimated to be “easily” between 8 and 15%, see *Efficient Electrical Transmission and Distribution*, published by the International Electrotechnical Commission.

10 One engineer has estimated the actual transmission loss in the United States in 2005 by comparing the Department of Energy’s net generation statistics against the overall amount of electricity purchased in the same period and determined that the transmission loss in 2005 was 6.1% of all generation. Bob Fesmire, *Energy Efficiency in the Power Grid* (July 9, 2007), available at www.renewableenergyaccess.com.

transmission and distribution infrastructure to incorporate more sophisticated technologies. Today, there are indeed a number initiatives which are revolving around superconductivity, which increase the amount of electricity that can travel over existing lines, broadband over powerlines, which increases the amount of information and improves the utility's ability to control their systems and smart-grid devices, which allow the utility to remotely control power consuming devices on the user's premises.[11] While these technologies are promising, implementing them on a large scale will take time and massive amounts of capital investment. In the meanwhile, companies and real estate projects must rely on the aging existing infrastructure.

In sum, every time you flick the switch today in most places in the United States, it means that you are tapping into a huge infrastructure that, in the end, relies on highly polluting, inefficient and outmoded technology. It works, no doubt, but it is by and large of a 1950s vintage and is the greatest single contribution to the global warming problem in the United States and, were it not for China and its even heavier reliance on coal, the world.

B. <u>Reliability</u>

It is also worth mentioning that another significant issue confronting businesses today is reliability in electricity supply.

Since 2000, a phenomenon that has taken on greater significance in the transmission system is "congestion", which occurs when scheduled or actual flows of electricity are restricted, either by physical capacity constraints or by operational safety constraints to preserve grid reliability.[12] In essence, congestion is electric bottlenecks. Many grid operators impose congestion charges on consumers. PJM, which is the largest regional transmission organization, reported congestion costs of $750 million in 2004, $ 2 billion in 2005 and $1.6 billion in 2006.

Further, the economic costs of congestion are only part of the problem. The bottlenecks often require that grid operators curtail service to consumers to protect the integrity of the grid. These events are called "Transmission Loading Relief Actions".[13] The National Electricity Reliability Council has reported that they have increased by 150% in the period 2001-1005, a significant increase over the previous 5 years. Every grid system has located within it so-called "reliability must run" plants, which tend to be older and dirtier, that don't run most of the year but are called on in times of grid stress. They are being dispatched more and more frequently today, contributing to environmental and efficiency problems.

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[11] American Superconductor has received a contract from the Department of Homeland Security to test the deployment of a technology called "Secure Super Grids" technology in Con Edison's service territory in Manhattan. According to American Superconductor, the technology uses high-temperature superconductor power cables and ancillary controls to deliver up to 10 times more power through the grid while at the same time suppressing power surges and fault currents. Press Release, *American Superconductor Receives Department of Homeland Security Contract for Project HYDRA* (Jan. 24, 2008).

[12] *Id.*

[13] *Id.*

The bulk transmission system, where large amounts of electricity are transmitted in vast regional networks, has capacity and congestion problems, as noted above, but most people outside the energy business don't realize the greatest reliability issue today really is the state of local distribution systems. The problems Con Edison had in Astoria in the summer of 2006 are just one, but they are not atypical, even if similar problems in other places don't get as much publicity. Ironically, Con Edison is considered the most reliable electric distribution company in the United States today, mostly because almost all of its transmission and distribution infrastructure is underground and it is maintained in such a way to work effectively except during times of the most extreme stress (several humid 90+ degree days in a row). Actually, trees remain the single largest reliability issue is the central generation model. A falling tree was the originating cause of the great East Coast blackout in 2003. Further, the electric distribution system in most places in the country uses 1950's vintage electro-mechanical technology (and in some cases equipment) to deliver electricity to users. In some regions, the system is over-taxed and prone to failure. Many of the failures are not spectacular, but they occur frequently in the summer and cause a lot of disruptions to businesses. These distribution problems again speak towards decentralizing power generation, because the power does not have to be transported.

While one distribution problem is failure-prone existing systems, another big economic development issue in some parts of the country is lack of local distribution capacity. Municipal officials and real estate developers are sometimes surprised to discover that utilities actually don't have the distribution capacity to accommodate new infrastructure projects or large scale real estate development. It is not uncommon for utilities to try to force project owners to assume the cost of substation upgrades in order to accommodate the new loads.

C. Cost

For most Americans, it doesn't take a statistician to know that the price of electricity is going up. The Energy Information Agency keeps national statistics that show that the average retail price for all customers rose by 7% in 2005 to 8.14 cents per kilowatt hour. Average industrial rates rose in that same period 9.1% to 5.73 cents per kilowatt hour and average residential prices 5.6% to 9.45 cents per kilowatt hour.[14]

Of course, it is possible to track these issues locally in real time as compared to the national averages. In the New York metropolitan area, the price is edging up to 20 cents a kilowatt hour. Con Edison's most recent tariff included a request for a 17% increase. Connecticut is up around that level as well. Many states have in essence kept electricity prices artificially low by imposing regulatory caps. What electricity prices would be without those caps has shocked consumers, particularly in Illinois and Maryland when attempts were made to release them.

With fuel costs, international commodity prices, construction costs, demand, electricity intensity of life and population growth and other factors tending the way they have since 2005, there is no reason to think that central generation power costs are going to go down anytime soon, unless a recession severely depresses economic activity. However, if I were a facility manager, I would not be betting that on slow-down in economic activity is going to make my

[14] U.S. Energy Information Administration, *Electric Power Annual* (Nov. 9, 2006 revision), available at http://eia.doe.gov/cneaf/electricity/epa/epa_sum.html.

energy costs go down as a medium or long-term energy management strategy. Economic activity is cyclical, even as the population of the United States continues to grow steadily. Even if there is a recession now, in three to five years, growth will resume, if history is any guide, so investment decisions and capital investment now will show begin to show their effects in that time framework. I would instead be thinking of ways to confront and manage costs, with a close eye on how my own distributed resources could provide a hedge against central generation cost increases and inefficiencies.

III. ALTERNATIVE MODEL FOR BUILDINGS – DISTRIBUTED RESOURCES

What do all the issues confronting the traditional, central generation model have to do with real estate? Plenty, because first of all a reliable supply of energy is a prerequisite to every development project and should be taken into account in the earliest stages of the planning process. Secondly, as mentioned in the introduction, buildings are the greatest users of electricity in the United States and thus a significant source of emissions of greenhouse gases, so a considerable effort needs to be made to reduce the amount of energy they consume. More fundamentally, real estate is an important part of the solution because every commercial and residential facility is potentially a small power plant – and this is the real alternative to the central generation model. With existing and readily available technology, every residence, office building, apartment building, hotel, campus, hospital and factory can generate on-site enough electricity and thermal energy to meet its own basic energy needs and export some to the grid. If configured correctly, these on-site systems can also keep the power on when the grid goes down and provide a much higher level of reliability, efficiency and even quality than grid power.

The technique of generating electricity and thermal energy at or near the site where the energy is used is called “distributed generation” because the generation resources are “distributed” around the grid, in contrast to the traditional central generation model.

While it is the most common form of distributed generation in use today, this article will not consider back-up diesel generators to be a potential alternative source. Diesel generators mostly are designed as emergency back-up and don’t have the potential to cover building load over long periods of time. They have many disadvantages, first among which is that volatile diesel fuel must be stored in buildings to keep them running more than one building has burned down when these stores of fuel ignited. Another big disadvantage is that diesel fuel (or fuel oil which is also used) is the dirtiest fuel for power generation by far – and most states and localities have strict rules as to how many hours a year a diesel generator can run for this reason. Finally, since most of the time diesel back-up generators are not running, they need a lot of maintenance and testing to make sure that they do start up and stay on when they are needed. In practice, diesel generators often don’t start up when called on or fail after working for a short period of time, so a high level of redundancy is required if a user has a need for highly reliable power. Thus, given diesel’s environmental profile and the fact that it is the traditional means of back-up power, it will not be considered as an “alternative” source of energy for purposes of this article.

Before getting into the considerations involved in generating power on-site, I will discuss and consider as “alternative” some less complicated measures that reduce the amount of electricity buildings and facilities use. This is of interest not only because these measures drive down the cost of power for the facility owner or manager, but also because, when deployed with on-site generation, they reduce the size and increase the efficiency of the on-site capacity needed. These measures are referred to not as distributed generation, but as distributed "resources" and to extent they reduce the amount of electricity that needs to be delivered at peak times, they are as valuable in economic terms as marginal additions to electric capacity, especially if those additions to capacity are peakers, meaning that they designed to run only periodically at times of peak demand.

A. Demand Side Management / Smart Metering

Demand side management (called "DSM" in the industry) has been gaining increasing attention over the past few years. The basic idea is a fairly simple one: when there is the most stress on the central distribution grid – usually on the hottest summer days – individual facilities can use less electricity or produce more of their own. Demand side management can be a big money saver, particularly in areas of the country that have state or regional power markets. In these power markets, prices tend to spike dramatically during peak usage periods as the system operator calls on more and more inefficient stand-by generation to meet surging demand. When utilities pass these wholesale prices through to customers, there is an appreciable increase in the average price per kilowatt hour.

The most straightforward demand side management program is one where a facility owner or manager enters into an agreement with a utility or a system operator to shed load when called upon. This can be as simple as turning up the temperature on air-conditioning equipment or shutting down the air conditioning system for, say, 20 minutes an hour. In buildings with large elevator banks, one or more elevators can be shut off, another typical measure. For industrial companies and factories, they can even enter into agreements to shut down production lines or processing. Indeed, it is sometimes cheaper for a facility not to produce while paying astronomical power costs than to simply shut down.

The economic benefits of demand side management are augmented when the utility or system operator pays a "capacity" fee to the facility. For the utility or system operator, a megawatt not used at peak times actually has an economic value that is just as high, if not higher, than the marginal cost of an additional megawatt of capacity. Therefore, it makes economic sense to pay facility owners or managers a fee to agree not to use electricity at certain times. Investigating the economic values of these fees where they exist should definitely be a part of every significant facility's energy management strategy.

For facilities that have distributed generation through one of the techniques discussed below, they can earn not only a capacity fee for making their on-site generation available, they can also be paid a good price for the kilowatt hours for putting the power back to the grid or system operator. For instance, the New York Post newspaper has a highly disciplined protocol for powering down its computers and presses during grid events declared by the New York ISO and switching on its back-up generators to cover the load. This earns the company a tidy fee for the capacity and helps relieve stress on Con Edison's distribution system.

A note, though, about self-generation in DSM programs from a policy standpoint. Since most on-site generation capacity in the United States still tends to come from back-up diesel generators, turning them on in the middle of summer is highly undesirable from an environmental standpoint and most grid operators have strict rules about how many hours a year they can run. From a policy and environmental standpoint, it is much better to have this extra capacity come from distributed natural gas combined heat and power (CHP) or renewable resources. However, it is a more complicated question as to whether there is extra power capacity from these resources to put back on the grid. As will be discussed below, most natural gas CHP systems are optimally sized to cover their host's thermal load, which generally speaking means that they can't cover the host's average electric load, let alone a peak summer load. Similarly, for solar, since most on-site solar electric systems can only cover a part of the host's average electric load, the same constraint applies. An owner of natural gas CHP or solar generation needs to look carefully at the terms of the relevant DSM program to see how it can benefit from it.

One solution to this sizing problem for these distributed resources, however, lies in energy storage. Generally speaking, there is no way to store efficiently large quantities of electricity. The basic rule is that an electric distribution system has to have more or less the same amount of electricity going on to it as is coming off to maintain its balance. Today, a tremendous amount of research is going into devising solutions to the electricity storage issue. If, for instance, a distributed solar generator, has a battery back-up system, then conceivably it could put the power in that battery system back onto the grid during peak times, even as its own system is recharging the batteries on a hot, sunny day. Indeed, experiments are beginning to be conducted regarding battery and grid interaction on a larger, utility scale. The company Grid-Point has a pilot program with ConEdison to install batteries in residences. The batteries charge at night or other times when grid power is inexpensive and the facility owner uses the stored electricity or makes it available to the utility when stress on the system is high and power is expensive. A corollary of this theory has to do with plug-in hybrid vehicles. If a car with a battery is plugged into its house system, the battery can store electricity and release it.

Another new technology that works within the demand side management framework is so-called "smart metering". By and large, today, utility meters are "dumb" in the sense that all they are designed to do is measure the amount of electricity the consumer is purchasing. With these dumb meters, it is even a challenge for the utility to run them in reverse for on-site applications. A smart meter can measure many more elements of a facility's electric usage and can serve as a point of interaction between the user and the utility. For one thing, a smart-meter can be connected to particular energy-consuming equipment and appliances on a facility's site. A company like Comverge actually is offering a smart meter and a service whereby it powers down these appliances remotely during periods of high grid demand. By and large, the facility user, in particular a homeowner, doesn't even realize that the temperature on its air conditioning equipment has gone up a few degrees or that it is off 20 minutes an hour (particularly since peak demand time is mid-afternoon when many homeowners are not home), yet this technique relieves a significant amount of grid stress and saves the consumer money.

Another advantage of smart meters is that they have functions that can indicate to a user how much power various types of appliances and equipment are using at a given time, thus allowing users to assess these things separately, as opposed to a dumb meter that you can stand next to and watch spin and have no idea if you are using a lot or a little bit of electricity at a given time except maybe by having an idea of how the speed correlates to usage. In fact, most consumers of electricity really have no idea how much electricity they are using and which appliances are using a lot or a little. Some studies have shown that if consumers actually know how much electricity they are using they will use less. More advanced smart meters can be hooked up to computers where there are graphic illustrations of power usage according to appliance and a control mechanism.[15] Some have posited that every new house should have something like this.

Finally, insofar as multi-family housing is concerned, many buildings still don't have submeters. If a multi-unit building is submetered, this alone will save a significant amount of electricity, once a resident makes a direct correlation between his or her own usage and the cost of power.

B. Performance Contracting / Reducing Energy Use in Existing Facilities

Several studies have shown that reducing energy use in existing buildings is the easiest, least expensive and most direct way to reduce greenhouse gases, given the dominant role buildings play in the energy usage profile in the United States.

It is interesting to consider in respect of energy efficiency and fuel choices the conclusions of a report released early in 2007 by a group of DOE scientists called *Tackling Climate Change in the U.S.* The report concluded that "aggressively" deploying currently available energy efficiency technologies can keep U.S. emissions at ***current*** levels for the next 24 years, while broad deployment of six renewable techniques (wind, concentrating solar power, photovoltaics, biomass, biofuels and geothermal power) can make deep cuts in U.S. emissions over the same time period.[16] The report goes on to conclude that, in combination, energy efficiency and the deployment of those six renewable energy technologies can displace about 1.2 billion tons of carbon emission per year by 2030. According to the report, energy efficiency accounts for about 57% of the displacement, while the six renewable energy technologies account for 43%.[17] I'm sure one can quibble with these authors' methods, or question their motives, but even discounting error or exaggeration, that statement is an astounding one – energy efficiency can reduce greenhouse gas emissions by more than all the main renewable techniques combined at their current levels of technological advancement.

Since half of all the electricity used in the United States comes from coal and coal-fired power generation is the biggest source of greenhouse gas emissions, it bears repeating that each unit of electricity saved or avoided reduces immediately the amount of greenhouse gases emitted. Therefore, the third main section of this article will consider the practices and techniques of energy efficiency contracting.

Finally, it should be noted that even if a developer or owner has completed construction drawings or has started construction, it is not too late to make energy efficiency improvements to a facility. Energy services companies (ESCOs) can look at an existing design and propose changes to it that in the end will pay for themselves though energy savings.

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[15] A year-long study by the company GridWise concluded that smart grid technology saved consumers in Seattle about 10% on their power bills and did ease strain on the power grid. Martin LaMonica, *GridWise trial finds 'smart grids' cut electricity bills*, c/net news.com (Jan. 9, 2008).

[16] Synopsis in *The Energy Daily*, February 1, 2007 – "Efficiency, Renewables Can Power U.S. Greenhouse Strategy."

[17] *Id*.

C. Combined Heat and Power / Cogeneration

After diesel generation, the second most common form of on-site energy is combined heat and power ("CHP"), or cogeneration, that is power generation equipment, usually fired by natural gas, whose waste heat is captured to make thermal energy (steam or hot water) to be used by the host facility. When the waste heat is also captured to make chilled water for air conditioning, either through an absorption chiller or a steam driven system, the process is sometimes referred to as "trigeneration". While CHP also not new as a technology (it is as old as power generation itself) and while the fuel is not renewable if it is natural gas, combined heat and power in small applications creating electricity and thermal energy for host facilities is still uncommon enough in building and facility-specific applications to be considered "alternative" for purposes of a discussion of energy and real estate. It is also "alternative" in the literal sense of the word because even though these systems can provide almost all of a commercial real estate project's electricity on an on-going basis, they are still an "alternative" choice as compared to simply hooking up grid power and receiving gas from the local gas utility. For the reasons discussed further on, on-site CHP systems tend not to be simple to put into place, which is one reason why they are still not as widespread as they should be, at least in commercial real estate. They are in wider use in industrial facilities, in particular ones that have production processes where steam can be used. They are virtually non-existent in single family residences.

If a CHP system is configured correctly, meaning that the electric output is sized so that the waste heat creates the right amount of thermal energy for the host facility, they have many benefits. They can be very efficient – 80% or more can be achieved. This is dramatically better than the average efficiency of power generation in the United States and somewhat better than the most efficient and modern combined cycle gas plants, not to mention the lack of need to transmit the electricity since it is generated on site. They also can result in significant savings as compared to grid power (more than enough to pay for the system over some period of time) and can serve a back-up function as well, displacing the need for most diesel generation. The following is a summary of the potential benefits of a correctly configured CHP system.

- Distributed generation resources can serve as back-up power, ensuring continued operations during grid failures and avoiding economic losses.

- Distributed generation can save the owner of the facility money on power. Since a big part of the cost of utility power is the demand charge, that is to say pricing designed to cover the facility's peak load, simply reducing the peak demand by installing on-site generation during periods of peak usage (a technique called "peak-shaving") saves money. Distributed generation also saves money because utility power includes the costs of transmission and distribution, which do not exist when power is generated on site. Finally, since CHP applications can be more efficient compared to the large-scale sources of utility power, the fuel component of the utility bill can be used far more economically.

- The thermal energy or steam is very useful, either for running industrial equipment, supplying hot water and providing heat in winter and chilled water for air conditioning in summer.

- If a facility needs more power, distributed generation is a comparatively inexpensive and rapid way of adding capacity without having to deal with utility service upgrades in most cases. The cost, depending on the size of the plant, ranges from under $1.00 / watt for larger plants (20-50 MW) to $1.70 / watt for CHP applications in 100-500 kW range (typical for building applications where 400kW systems are scaleable) and $2.70 / watt for the smallest microturbines (30kW).[18]

- Energy savings realized from distributed generation and other energy efficiency measures can cover the capital cost of the new equipment and upgrades within a few years. In successful DG projects, the capital cost of the equipment can be recovered through energy savings in 3-7 years, a much shorter period than the useful life of the equipment.

- Many states and some municipalities have programs in place that provide cash subsidies and other incentives to cover a significant part of the capital cost of the equipment (30-60%), making the payback period of the investment shorter.

- Distributed generation can provide an owner with an opportunity to make money because generally speaking the owner can sell excess power back to the grid or into an organized market (like the local ISO) or even the utility, depending on whether the plant is interconnected to the grid, what fuel it uses, and how it is sized.

- Owners of distributed resources can join the demand reduction programs of the local ISO, which means regular cash payments to the owner for agreeing to make power available to the system operator during peak load periods, plus payments for the power when called on by the ISO.

Since most CHP or cogeneration systems use natural gas as a fuel, there is something of a difference of opinion among power industry experts and environmentalists over whether on-site CHP should be included in the renewable portfolio standards that thirty states have now adopted.[19] Only a few states include natural gas-fired combined heat and power applications in their renewable portfolio standards.[20] Most states do give incentives for these systems, however, depending on how efficient they are and the use to which the thermal energy is proposed to be put.

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[18] Larger plant figures based on statistics compiled by Citi Investment Research for combined cycle natural gas power plants (North America Energy Merchants, Replacement Cost Analysis – Jan. 13, 2008). Source of smaller system statistics is Danny Harvey, *Clean Building – Contribution from Cogeneration, Trigeneration and District Energy* in COGENERATION AND ON-SITE POWER PRODUCTION (Sept.-Oct. 2006), p. 110. Note, however, that the cost of materials for all sorts of power plant and other construction has been rising rapidly due to heavy demand in international commodity markets, so the figures cited can be considered as only approximations.

[19] Renewable portfolio standards are state-imposed requirements that electric distribution companies derive a certain percentage of their electricity from renewable sources.

[20] As of the end of 2007, they were Colorado, Connecticut, Hawaii, Maine, North Carolina, North Dakota, Nevada, Pennsylvania and Washington. Depending on the state, some restrictions apply, such as a minimum total efficiency and/or thermal threshold. See in general U.S. EPA, *Energy Portfolio Standards and the Promotion of Combined Heat and Power*, last update Aug. 28, 2007.

If a CHP system meets certain efficiency and thermal output thresholds, the environmental benefits regarding emissions are significant. Even though the combustion process has the same input-based emission rates as conventional equipment, NOx emissions of a CHP system are lower because a CHP system uses less fuel and displace higher emitting generators on the grid. In case studies conducted by the EPA, use of a CHP system amounts to about half of the emissions of a central generation system.[21]

D. Fuel Cells

Fuel cells are making important inroads into the distributed generation market today. For a long time, they were considered to be too expensive to be a practical solution and mostly were installed at government facilities as types of demonstration projects. More recently, commercial applications are being demonstrated where they appear to be viable alternatives. They are still far more expensive than most other types of power, so most commercial applications rely on government incentives and subsidies for their installation.

Fuel cells use an emissions-free chemical process to make electricity, even though they do need some sort of fuel to run. Most of the prototypes and systems in use today use natural gas, but they can also be run off of other types of gas, in particular the anerobic digester gas that is a byproduct of the wastewater treatment process. Hydrogen is also being developed as a fuel source for fuel cells and some installations are using hydrogen now.

Since fuel cells are quiet and have no emissions other than some water, they are well-suited for installation inside of buildings. Fuel cells can be configured in combined heat and power applications, particularly in on-site or campus type situations. In this regard, they have all the advantages of combined heat and power from natural gas combustion.

There are several types of fuel cells and the differences between the technologies are complex for people who are not power engineers. The following is a very brief explanation, with a few notes about efficiencies.[22]

- ***Phosphoric Acid Fuel Cells (PAFCs)*** – considered the first generation of modern fuel cells with the most examples in use commercially – typically used for stationary power generation. Efficiency is 37 to 42% when generating electricity alone, up to 85% when used in combined heat and power applications.

- ***Polymer Electrolyte Membrane (PEM)***, also known as proton exchange membrane fuel cells, need only hydrogen, oxygen and water to operate and are usually fed with pure hydrogen supplied from storage tanks.

- ***Molten Carbonate Fuel Cells (MCFC)*** operate at high temperatures and are most suitable for utility and industrial applications. Can be up to 60% efficient for electric generation alone and up to 85% efficient in combined heat and power applications.

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21 *Id.*

22 Description of technologies and efficiencies derived from Justin Smith, *Hydrogen: the fuel of tomorrow?* In ENERGY CURRENT (Feb. 7, 2008), available at www.energycurrent.com.

- ***Solid Oxide Fuel Cells (SOFC)*** are more experimental, operating at even higher temperatures than MCFCs, with similar efficiencies.

Up until now, fuel cells have been thought of mostly for site-specific distributed applications, but at least one state, Connecticut, has gone a step further and actually required per legislation passed in July 2007 that electric distribution companies enter long-term contracts with power producers using renewable resources, including fuel cells,[23] meaning that the higher cost will be spread over the ratepayer base. At the end of January 2008, the Department of Public Utility Control issued an order approving power sales agreements covering about 16 MW of power generated from fuel cells. One of them, the proposed Stamford Hospital Fuel Cell CHP Project, would consist of 4.8 MW of Fuel Cell Energy DFC 3000 units with thermal application to provide heating and cooling to the hospital and have electricity left over to sell to the grid.[24]

Their big drawback is their cost. They cost between $3.6 and $5.5 a watt, depending on the model.[25] They are also usually not as robust as engine generators or even microturbines, and for that reason require more frequent and more expensive maintenance. Many models do not have long operating histories. However, being a practically emissions-free resource and having the potential to run on hydrogen, many states provided generous incentives to purchasers and users of fuel cell systems.

E. Solar Energy

In the public's imagination, solar is the most widely known source of alternative energy for buildings and facilities. The most widespread application of solar energy is by means of photovoltaic panels on buildings and residences. Also well-established as a technology is solar thermal, which provides for hot water. New applications are also being put on line, such as a concentrating solar technology that focuses sunlight by mirrors onto an element to make steam for a conventional engine generator (concentrating solar). Google has famously invested in eSolar, a company that is making a more utility scale application in 25 MW modules.

Large scale application of photovoltaics has been the dream of many an environmentalist for some time now. Everyone who follows energy issues is well aware of the main impediment to the larger scale application of the technology, namely its high up front cost (approximately $8.50 / watt without tax credits or government incentives) compared to conventional sources and even most other alternative sources. Also, the intermittency of the resource, or the fact that it is not available all the time, is another traditional obstacle. Photovoltaics requires direct sunlight. Any shading at all prevents the affected area of a PV system from working. Of course, little power is produced when there is cloud cover.

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[23] An Act Concerning Energy Electricity and Energy Efficiency, Public Act 07-242, § 124, modifying Connecticut General Statutes § 16-244c(j)(2).

[24] state of Connecticut, Department of Public Utility Control, Docket No. 07-04-27, DPUC Review of Long Term Renewable Contracts – Round 2 Results, January 30, 2008.

[25] Sources cited in Danny Harvey, *Clean Building: Contribution from Cogeneration, Trigeneration and District Energy*, Cogeneration and On-Site Power (Sept.-Oct. 2006), p. 107.

Regrettably, little progress has been made in the other main drawback of solar, its low efficiency. There really are no commercially available solar technologies today where the efficiency is greater than 20%. Many people are devoting considerable research dollars towards crossing this barrier, but without an apparent breakthrough so far that can be applied on a large commercial scale. One new development, "thin film" technology, actually has even lower efficiency (around 9%), but is attractive because it can work in diffuse light, without dead-on sunlight. The U.S. Department of Energy has been sponsoring research towards getting solar cells past the 40% efficiency barrier, which would bring the cost to about $3.00/watt). Indeed, Boeing Spectrolab claims to have developed a solar cell that achieves almost 41% efficiency.[26] Sharp has demonstrated a solar cell offering 36% efficiency. If these efficiencies can be sustained on a commercial scale, solar technologies will clearly become the alternative power source of choice for buildings and the industry will take off.

Even with today's technologies, and in spite of the high cost, solar systems do have many attractive features. Of course, the energy has no cost and there are absolutely no emissions of any kind to generate electricity. For another thing, PV systems work best when energy is needed the most, during the hottest periods of the year. While no one is seriously claiming today to be able to power entire commercial buildings or multi-family residences on solar power alone, an application of solar power sized to cover a portion of summer peak load can relieve stress on the grid and actually serve to lower a user's energy costs appreciably due to the decrease in the demand charge.

Secondly, depending on the interconnection procedures of the local utility, solar systems can be configured with battery storage to provide back up power, at least for some critical loads in commercial buildings and for a residence's entire load.

Another promising development lately is that there is a growing awareness that the roofs of commercial buildings, warehouses, big-box stores and other buildings that have large surfaces are a power generation asset. One of the biggest hurdles in the wider use of solar applications is misconceptions and lack of knowledge. As more and more of these systems go in, the more people are saying that it must be possible. Several companies have devised legal and financing structures to make these projects work and to minimize the involvement of the host owners (see discussion below).

Finally, to overcome the high costs, many state governments have chosen to subsidize the installation of solar systems. These are cash reimbursements, tax credits and other forms of incentives to encourage owners of property to install them. There are also significant federal tax credits (see discussion below).

Having observed the solar industry for a long time,[27] it really seems as if solar is starting to gain serious traction. First of all, more and more people are coming to the realization that the technology really does work and is reliable. This has been known for years, but has been

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[26] Michael Kannelos, *Solar Cell Breaks Efficiency Record*, c/net news (Dec. 6, 2006).

[27] I remember promoting the federal incentive program for solar thermal on my college radio station during the Carter administration and being crestfallen when it was eliminated in the early part of the Reagan administration. One can only imagine how many BTUs of energy would have been saved and tons of carbon emissions avoided, not to mention the technological innovations that would have occurred, if this short-sighted decision had not been made in 1981.

obscured by the debate over the price and the intermittency problem. Secondly, there are a number of projects where the scale of solar is really starting to get interesting. It used to be that photovoltaics and solar thermal were thought of as very small scale applications suited mostly for individual residences. Now, solar providers are putting together distributed systems that are starting to take a real bite out of grid demand. For instance, Chevron Energy Solutions has just completed the installation of 2.65 MW of photovoltaic panels on parking canopies on the campus of three installations of the Contra Costa Community College District in California, with another 534 kW to be added in 2008, bringing the total to about 3.2 MW.[28] Another solar provider, REC Solar, has just finished two installations at Costco stores in Hawaii. They are 680 kW each.[29] Last year, Kohl's Department Stores initiated a program with SunEdison to put solar installations on 63 of its 80 California locations which, when finished will total about 25 MW, or systems of something under 500 kW per store.[30] And you don't have to be in California or Hawaii for solar to work. A food distributor located in Dayville, Connecticut dedicated a 550 KW system in December 2007, claiming it is the largest solar electric system in New England.[31]

California has big plans for solar. Under the 2007 California Solar Initiative program, the goal is to have solar system totaling 3000 MW of capacity by 2017.

However, in spite of all of solar's promise, there does not seem to be any immediately accessible technology that will create enough power from the sun to provide all the power buildings need, except for individual residences. There is also the intermittency problem, i.e. the sun doesn't always shine, so facilities need access to other sources of electricity (assuming the current level of battery storage technology). As a result, solar can by no means under today's state of affairs be considered a substitute for grid power. All of the applications that can be considered today have to work in conjunction with the traditional grid or with other distributed resources.

F. <u>Biomass</u>

Biomass is an alternative fuel that is gaining wider use. Agriculture and by-products of industrial processes (such as sawmills) create a lot of biomass that in many cases is not only wasted, the producers of it have to pay to have it taken away or landfilled. Biomass can be burned in power plants, either in dedicated stations or mixed with other fuels. For site-specific applications relevant to real estate, biomass can also be used to fuel boilers in buildings and, at present market conditions, is considerably less expensive than fuel oil. Facility owners who ordered biomass boilers before petroleum prices began spiking to over $100/barrel are very glad in the winter of 2007-2008 that they did so. Biomass can also be used as a fuel for the same type of combined heat and power applications in generators running on natural gas.

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28 Press Release, January 31, 2008, *Chevron Energy Solutions Completes First Phase of North America's Largest Solar Power Project in Higher Education*.

29 Press Release, January 30, 2008, *REC Solar Unveils Hawaii's Solar Electric System*.

30 Press Release, Sept. 26, 2007, *Kohl's Activates Largest Rooftop Solar Rollout in US History*.

31 Press Release, December 13, 2007, *United Natural Foods Extends Environmentally Responsible Initiatives with Installation of Largest Solar Electric System in New England.*

G. **District Energy**

When the heat from combined heat and power plants that run either on conventional natural gas or biomass or gas from some type of waste is used to make thermal energy, that thermal energy can exported through pipes within in a defined geographic district and used by buildings and facilities in that district. These systems are called district energy systems. They have been in use in Europe for many years, particularly in Eastern Europe and Scandinavia. Although the first such systems were demonstrated in the United Sates, they are not in such wide use today in North America, although they do exist in some places, most notably New York which has a district steam system run by Con Ed from lower Manhattan to 96th Street. These district energy systems are very efficient because they make nearly full use of the waste heat. As discussed in the last section of this Article on district energy, they should in principle always be considered in campus type developments and in large-scale urban planning.

H. **Waste**

Waste in almost all forms can be considered as an alternative fuel. The methane gas produced in the decomposition of organic materials in landfills can be refined to run power plants, as well as the anerobic digester gas from the treatment of sewage at wastewater treatment plants. There are even ways to turn human waste (euphemistically called bio-solids) into a type of pellet than can be gasified and used to run power plants. Also solid municipal waste can be burned and used as fuel. These applications are not particularly relevant to residences or individual commercial buildings, but they can be attractive sustainable energy options for campus-type applications and large scale urban development projects.

Indeed, when the power generation equipment is run on fuel derived from waste and biomass, entire cities or sections of cities can run on clean sustainable fuels that emit dramatically lower amounts of greenhouse gases than conventional power generation with practically no transmission loss. If this sounds fantastic, it is not. It is actually happening in many places, most particularly Copenhagen, Malmo Sweden and other cities in Scandinavia. There is even a city in Austria that has reduced its greenhouse gas emissions by 90% by employing such a system.

I. **Minigrids**

There are also new technologies in power distribution, so-called mini-grids that use modern digital control technology to run electric distribution systems. These are far more efficient than conventional electric distribution systems, which, setting “smart metering” aside, rely on electro-mechanical technologies to “push” electricity to the user. Mini-grids can gather and process much more information and send signals to users that let them control their power usage or control power usage according to defined factors. They also make it easier for power to be shared among users within the mini-grid, something which favors the optimization of distributed resources.

While mini-grid technology is still somewhat experimental, more and more of them are springing up around the world and experience is being gained in how they operate.

J. Interaction of Distributed Resources with Central Generation

In the discussion of the various alternatives above, mention has been made of the fact that most distributed energy solutions cannot cover all of the energy needs of their host facilities for a variety of technological and practical reasons. Therefore, the term "alternative" should not be understood to mean a way of replacing or ignoring the traditional electricity grid and natural gas distribution system. On the contrary, distributed generators need to remain connected to the grid and to rely on it to cover for the capacity, reliability and intermittency problems of the distributed resources themselves. The issue of interconnection to utility grid systems will be discussed in more detail below, but as a policy matter it is well to note here that the future wide-scale use of alternative energy solutions depends on finding a way to make them interact well with the traditional utility distribution infrastructure – or at least to make sure that they don't interfere with those systems.

IV. INSTALLING ON-SITE GENERATION

Accepting then the premise of the first part of this article that self-generation of electricity is alternative, this section will discuss the practical and legal issues associated with putting a distributed generation (or "DG") system into place, whether it is a combined heat and power (CHP) system running on natural gas, a fuel cell or a solar system.

A. Energy Services Agreement

While a facility owner with the in-house financial, engineering and technical resources can simply purchase and run its own on-site generation system, most companies and real estate developers are not expert in energy issues and choose to confront the prospect of on-site generation by working with an intermediary, usually called an energy services company, or "ESCO". The contractual document linking an owner and an ESCO is called an "energy services agreement" or some variant thereof, and is the blueprint for how an alternative energy system can be implemented. A successful project depends a lot on having a strong and well-drafted energy services agreement where the parties' expectations and the main allocations of risk are well spelled out. The key elements of the agreement are discussed below. Certain of the steps outlined below can be done by separate contracts or they can be all rolled into one agreement with stages or phases of performance.

If self-generation is being considered, the first step is to study the facility's existing or projected electrical usage, loads, current needs and potential, as well as the cost of power and potential financial incentives in the particular area where the facility is located.

If the facility's load profile looks promising, the ESCO can put together a preliminary system design. ESCOs are also equipped to run financial scenarios that can indicate what the owner's cost of power would be with DG, what the savings might be compared to simply using grid power and how long the owner will take to cover the capital cost of the equipment (the pay-back period).

At this point, the owner and the ESCO have to come to a decision about how they want to do business together. It may be advantageous for an owner simply to purchase the equipment by itself, in which case it can deal directly with equipment manufacturers. While there are few owners who would want to do this for a complicated CHP installation, this might be a much more viable choice for solar photovoltaic systems. They are not especially complicated and don't need a lot of maintenance. Some manufacturers give fairly long warranties (up to 25 years is not unusual), so if the manufacturer is substantial, there is someone to stand behind the product. Further, the owner receives in this case the electricity "for free" and also enjoys all the incentives, tax benefits and carbon credits associated with ownership.

Assuming, however, that the owner does not want to procure the equipment directly, there are fundamentally two choices about how to proceed – as explained below, the Design-Build and the Energy Sales models.

B. Design-Build Model

The first is for the ESCO to act in essence as a general contractor, an intermediary who is expert in energy issues. In this regard, the ESCO arranges for the design and installation of the system and delivers title to the equipment to the owner at the end of the construction period. I will call this the "Design-Build" model. Afterwards, the Owner owns and operates it. From the owner's point of view, this also has the advantage of allowing the owner to capture all of the financial incentives and tax and carbon credits that are offered by self-generation of electricity. It should be noted, however, that, while many owners prefer to purchase the equipment and own it themselves, few of them actually want to operate and maintain it on their own. If the owner wants to own the equipment, but not operate and maintain it, the owner can contract with an ESCO or special service contractor to maintain, repair or even operate it.

C. Energy Sales Model

The other widely used model, which I will call the "Energy Sales" model is that the ESCO retains ownership of the equipment on the owner's premises and runs and maintains it during the length of the contract. In this scenario, the ESCO sells to the customer the plant's output in electricity and thermal energy – at a price that usually is discounted from what the customer would have to pay to the utility for the energy delivered. In many cases, the customer asks for a guaranty from the ESCO or its parent that some level of savings will be achieved. The term of an energy services agreement is usually in the range of 10 years, although arrangements between 5 and 15 years are not uncommon. At the end of the term, the owner either takes title to the equipment or the ESCO has the right to remove it. Another structuring option is for title to go to a finance company either at the end of the construction period or at some defined point during the term. If it goes at the end of the construction period, a sale-and-leaseback arrangement is entered into. As discussed below in the financing section, there may be a "tax-flip" at some point where the benefit of the tax credits goes from the ESCO to the financial intermediary or the owner.

Many energy services agreements have some "shared savings" aspect to them where the owner and the ESCO negotiate as to how much the owner will save off grid power and what percentage of savings beyond that the ESCO can keep. This arrangement gives the ESCO an incentive to achieve the maximum possible energy savings. Another variation on the theme is an energy services agreement where the ESCO undertakes to provide the owner at the utility rate it was paying, but makes a rent payment to the owner for the use of the space where the DG system is placed. The rent represents in this scenario the owner's energy savings.

Yet another structure variant on the tariff is that the owner pays the ESCO the normal utility tariff for some period of time until the financing of the equipment is paid off.

This energy sales model is the norm in solar installations (so-called "Solar PPAs"), while in combustion CHP projects, both models are used depending on the owner's preferences.

Energy Services Agreements can be quite complicated documents, particularly for CHP projects where a combustion turbine is making the electricity. While everyone in the industry tends to want standardized documents, and solar PPAs have achieved some level of standardization for certain companies, most energy services agreements for CHP tend to be heavily negotiated because, for the owner, having electricity generation on-site is a crucial element of its operations and productions and owners tend to want them customized to their needs.

This being said, a few key factors should be kept in mind. One is who bears the risk of fuel price increases. If the ESCO is guaranteeing a certain price for the sale of electricity and the price of natural gas spikes, the contract will be uneconomic for the ESCO unless the fuel cost is passed through – or the effect of fuel prices is neutralized in the savings formula. Another element that should be kept in mind, particularly if the ESCO is financing the contract, is that the ESCO will need a minimum amount of cash flow every month to meet debt service. In this regard, the ESCO should receive what is in essence a capacity payment, i.e. a payment to install the generation whether it is producing electricity or not. As mentioned below in the discussion of sophisticated energy services, there may be reasons why the parties choose not to run on-site generation. If the Energy Services Agreement is used as collateral for financing, there are a number of other typical lender issues that should be dealt with, such as lender step-in rights in case of ESCO default, lock-box or escrow arrangements and limitations on the owner's right to terminate.[32]

Further, since an ESCO will be owning and maintaining equipment on another company's premises, the Energy Services Agreement should deal with this legal relationship. The ESCO will want to ensure that there is sufficient access at the time it needs. In this regard, it is advisable from the ESCO's point of view to have an access right that is akin to a leasehold right that can be recorded, rather than just a contractual right. This has implications in the event of a change in control of ESCO or its insolvency. Also, in this regard, liability and insurance questions take on a greater importance than normal. If the ESCO owns the equipment, the owner may well want to see boiler and machinery insurance that covers the replacement cost of the equipment so that it can be replaced, because the output of plant is important to the owner. From the point of view of the ESCO, business interruption insurance might be a good idea, because the unavailability or breakdown of the on-site equipment may disrupt the owner's business and this eventuality may or may not be covered by the terms of the agreement or may or may not be considered a consequential, as opposed to a direct damage – with the allocation of liability repercussions that this implies. Finally, the terms of the owner's property insurance should be investigated to see who is responsible for damage to the owner's property beyond a casualty to the equipment itself.

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[32] For a fuller description of these, see Jon Norling, *Legally Bound – The Top 10 Contractual Issues in Cogeneration Energy Services Agreements*, COGENERATION AND ON-SITE POWER PRODUCTION (Jan.-Feb. 2007), p. 31.

D. Construction Contract Characteristics

Particularly in the Design-Build model, the Energy Services Agreement is in many important respects a construction contract: indeed, a fairly involved one because an on-site cogeneration plant is not a simple piece of equipment – and it has to hook into and work in tandem with the host facility's systems. As a result, both the owner's and the ESCO's counsel should be well-versed in construction contract practices and the risk allocations typically made in construction contracts. Some Energy Services Agreements simply refer to standard construction contract terms and conditions, while others have customized provisions. A detailed discussion of construction contracting is beyond the scope of this paper,[33] but mention should be made of some of the main issues and what to be aware of, since an owner's counsel is usually not expert in construction matters.

- **Scope and Testing:** It's an obvious point, but an owner needs to make sure that the ESCO is actually building what it has promised to build and that the equipment actually works before it is deemed substantially complete and accepted. In this regard, an owner should hire its own engineers to observe the construction and witness performance tests.

- **Warranty:** The industry norm is one year after substantial completion, although in some circumstances and with respect to some equipment it may be longer. From an owner's point of view, it should ensure that there are no unusual provisions for the ESCO to avoid its warranty obligations, which typically are to repair or replace defective equipment during the warranty period. From an ESCO's point of view, it normally will seek to limit the owner's remedies for defective or non-performing equipment to those specified in the contract for breach of warranty, which is the norm in construction contracting. Attention should also be paid to warranties given by the various underlying equipment manufacturers and suppliers, the benefit of which should be assigned to the owner in case the ESCO is unable to perform itself, a concern in an industry where there are a lot of new entrants who may not be well-financed and able to stand behind their projects.

- **Payment:** The method of payment chosen in a contract can make a big difference in how smoothly a project proceeds. The two basic methods in construction contracting are progress payments (i.e. monthly invoicing for the cost of work actually performed) based on a schedule of values and milestone payments. Both are widely used, although I have something of a preference for milestone payments when representing owners or even ESCOs with respect to their equipment suppliers and subs because it gives the contractor more of an incentive to move towards completion, provided it's not too front-end loaded.

- **Schedule:** How the risk of delay is allocated is a key part of a construction contract. Normally, a contractor should be entitled to both extra time and costs when it cannot complete on time due to the owner's act or omission or events beyond the control of the parties. Extra time is not a big issue usually, but the costs aspect is often heavily negotiated because owners fear that if a cost-adder clause is too broadly drafted, the price will increase in ways they can't control. More on utility interconnection below, but foot-dragging by local utility companies on the interconnection of the on-site resource is a very common cause for delays in distributed generation projects. Construction contracts typically have liquidated

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[33] Indeed, just a week before the course for which this paper is part of the materials, PLI put on an entire day's program on construction contracting and risk allocation.

damages for late delivery. These clauses can be controversial because contractors dislike them and try to avoid them.

- **Changes:** The key things that cause change orders in construction contracts are subsurface conditions that are different than expected and hazardous conditions on site. Since most DG systems don't require much excavation, the subsurface issue is not as big of an issue as it is in typical process plant construction, although for larger systems site borings should be made to determine what sort of platform the plants should be mounted on. The strength of roof structures is an important issue in solar transactions. While working inside of existing structures, hazardous materials on site (asbestos, lead etc.) are a much more frequent problem in distributed generation projects. With respect to change orders, an Owner will usually want to retain as much control over the process of issuing change orders as possible, while a contractor will usually want to have a contractual right to obtain change orders if certain events happen or situations arise.

- **Security:** Both owners and ESCOs can have performance and payment concerns regarding the other. If an ESCO is concerned about the ability of the Owner to make payments when due, some underlying payment support such as a letter of credit or an escrow fund can be put into place. This is fairly rare in on-site generation projects, but ESCOs should check to make sure that the owner is a substantial entity with the financial resources to make sure that the complete system can be paid for. Many times facility owners have complicated arrangements with special purpose vehicles owning structures or land. These special purpose vehicles should not be the contracting party. From the owner side, if the owner is concerned that the ESCO may not be able to carry out the project, it can seek to obtain performance and payment bonds or parent guarantees. Performance bonds carry an extra cost and the parties will negotiate over who bears it.

- **Limitation of Liability:** It is not unusual for construction contractors to limit their liability to some part of the contract price or seek to put some other cap into place, but careful attention should be paid to these and other clauses purporting to limit the liability of a party and to how these work together with the insurance policies contractors should be required to maintain. For instance, overly broad limitations of liability could in fact pose a contractual obstacle to recovering under certain policies, such as errors and omissions and professional liability.

- **Insurance:** Probably nothing is more tedious than reviewing the insurance provisions of a contract, but an owner is well advised to have an insurance expert examine an ESCO's policies to make sure that they really do provide the coverage promised and that they don't have overly broad exclusions. It is important to note whether the ESCO's policies allow naming the owner as additional insured and to follow the process that the policy lays out.

- **Dispute Resolution:** As in any contract, an efficient dispute resolution mechanism should be provided. I tend to prefer some sort of alternative dispute resolution, such as an initial mediation and then arbitration over simple submission to court jurisdiction, but many factors can influence this choice.[34]

[34] For a more complete discussion of the factors that go into choosing different methods of dispute resolution, see a paper I delivered in November 2007 at the International Chamber of Commerce's

Footnote continued on next page

E. Operations and Maintenance ("O&M") / Performance over Period of Contract

Once the equipment is installed, it will have to work (as it is supposed to) over a long period of time for the energy benefits of the contract to be realized. As mentioned above, in the Design-Build Model, the owner may contract directly with the O&M service provider or the installing ESCO or contractor may subcontract the O&M work to a service provider. In the Energy Services model, the ESCO continues to own the equipment and either provides the O&M service itself or subcontracts with a service provider. Either way, the terms of the O&M arrangement merit careful attention.

While distributed generation O&M and equipment servicing contracting is not a particularly glamorous practice specialty, the service provided is crucial to the success of a project, and a well-crafted O&M agreement is a key component of that process.

The starting point of the discussion is the basic statement that most original equipment manufacturers (OEMs), whether they are making combustion turbines, boilers, fuel cells or photovoltaic equipment, provide only a one-year warranty for the equipment.[35] During that one-year period, the equipment must meet all performance specifications and work as promised. If it does not, the warranty provider will, at its own cost, repair or replace the defective equipment. Once that one-year period is over, the owner or ESCO recipient of the warranty will typically have no recourse against the OEM.

Combustion turbine systems have particular performance parameters that are quite important to their continued effectiveness. The two most important are the output (how much power and thermal energy they produce) and the heat rate (the efficiency with which fuel is converted to electric and thermal energy). All power generation systems, including fuel cells, solar and wind turbines, also have a measure of availability, i.e., what percentage of the time they are producing the required amounts of power. Something like 90% is expected, since equipment must be taken down for scheduled maintenance and there are times when unexpected outages and breakdowns will occur. For combustion generation, the availability of equipment is largely in the hands of the operators. For intermittent resources, like solar and wind, the operator can't control the weather, but the equipment should nonetheless be available to produce when the resource is available.

If an owner or an ESCO wants to ensure that certain levels of performance will be maintained over a period of years, it can contract for that. This is in a sense the highest level of performance and in essence amounts to an extended warranty. There is a price associated with this.

Certain lesser levels of service can also be obtained. For instance, an owner or ESCO might contract with a service provider just to carry out certain defined maintenance tasks on a periodic scheduled, without the service provider committing to any particular level of

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conference on Arbitration in Latin America, *Getting Transactional Lawyers Thinking About Dispute Resolution*, available at www.arnoldporter.com.

[35] Some solar panel manufacturers provide longer-term warranties.

performance. This is less expensive to the owner or ESCO, but gives less contractual comfort of long-term performance. It is not uncommon, though, because for certain types of equipment, the maintenance parameters are well-known and the parties expect that if the periodic maintenance is indeed carried out, the equipment will perform in a certain way.

Some mention should be made of what is meant by the term "operation" when speaking of distributed generation equipment. Most DG systems are designed to be running all of the time, so they don't really need to be turned on and off (i.e., dispatched, but see below) and have load-following characteristics, meaning that if the load of the host goes down, the equipment ramps down, and if it goes up, the equipment ramps up. Further, most DG equipment under a certain size (say, 5 MW) does not need a full-time on-site operator, especially fuel cells and solar systems. Almost all systems use internet based monitoring and control systems such that all the various operating parameters (output, heat rate, efficiency, steam pressure, etc.) can be monitored remotely by the ESCO or maintenance contractor. If there is some anomaly, it is flagged and then either it can be corrected remotely or a technician can be dispatched to inspect. If equipment does need to be turned on and off (dispatched), this can be done remotely as well. In sum, the term "O&M" is something of a misnomer, but it is the common usage.

While solar panels require a lot less maintenance than combustion CHP systems or fuel cells, they still require some, such as regular cleaning of the panels, preventative maintenance of the electric equipment and the inverter (and especially batteries, if there is a battery bank) and repair of any faults.

If the Design-Build model is used, the owner may commit to perform some service and maintenance obligations itself. The owner may want this because by having its own personnel perform certain basic inspection and regulation tasks, it can lower the cost of the service contract. These should be spelled out in detail in a schedule and the contract should provide that if the owner does not perform the tasks, the service contractor should be relieved of the relevant performance obligations.

For combustion generation and natural gas fuel cells, the O&M agreement should also specify who is responsible for fuel procurement. The fuel procurement may be as simple as the owner simply buying however much is needed under the gas utility tariff in effect, or the ESCO may choose to supply it and thus more actively manage fuel costs in natural gas markets.

Whatever the level of service to be provided, it is important that these provisions of the contract relating to allocation of tasks and performance be clear so that all parties are aware of what is expected of them and what the consequence is of non-performance.

Beyond that, the obvious should be pointed out as well, that an O&M agreement is a contract too, so that all of the various risk allocations that go into any contract apply. In O&M contracting, the exculpatory clauses and limitations of liability should be given particularly careful scrutiny. Since the owner is relying on the O&M service provider to make sure that a crucial piece of equipment runs and works well, there should be few reasons why the O&M service provider is excused from that obligation. Overly broad force majeure clauses should be watched. As for limitations of liability, it is also common for O&M contractors to want to limit their liability to the owner to the amount of fees they earn for the service, either on a yearly basis or subject to some more general cap. While this is generally the market, as with construction contracts, limitations of liability should not be so broad that the owner will not have the benefit of the O&M contractor's professional liability or errors and omissions coverage, notwithstanding any cap. The limit of liability should refer to the O&M contractor's uninsured exposures.

F. Sophisticated Energy Management Services

The foregoing discussion has focused on relatively straightforward operations and maintenance practices. ESCOs are also able to provide much more sophisticated energy management services. For instance, depending on market conditions, it may not always be cheaper to run an on-site CHP system than simply to buy electricity from the local distribution utility. This depends on the price of natural gas and other market conditions. For instance, if a natural gas-fired DG system is located in an energy market that is unbundled, i.e., the generation, transmission and distribution functions are carried out by separate companies, chances are that the cost of natural gas is passed through in a utility bill. As a result, if the price of natural gas rises, distributed generation will still save money because the host would have had to pay higher electricity prices anyhow even if it didn't have DG. If the host is not in an unbundled market or there are utility tariffs with regulatory caps, then it will become relatively more expensive to run the distributed generator on natural gas and it will be cheaper to buy electricity from the utility. Further, an ESCO may have a sophisticated fuel procurement strategy and engage in hedging transactions. In these cases, the ESCO will want to have the right to remotely dispatch the distributed generation resources when it is advantageous to be running the on-site system and will ramp it down when it is not.

In some energy services agreements, the ESCO does not simply guarantee the price of electric or thermal energy sold to the host, but it also guarantees a certain level of savings from what the host would have paid had no on-site generation be put into place. If this is the case, the energy services agreement will include some sort of formula for calculating the energy savings. This formula needs to be scrutinized to determine the elements that went into it and to what extent these vary over time or are stipulated.

It also bears mentioning that many types of distributed generation entitle the owner to renewable energy credits or carbon credits, depending on what ISO covers the host or what other regional regime might be in place (e.g., the Regional Greenhouse Gas Initiative, or RGGI, which is coming on line soon in the Northeast). In the Energy Services model, the ESCO will be entitled to these credits since its main obligation is to sell electricity at a certain price to the owner. In the Design-Build model, the ESCO may be obligated to apply for and obtain these credits. The financial benefit associated with the credits is negotiated between the ESCO and the owner. This aspect of the equation merits more attention, as more and more significant carbon reduction credit schemes are being contemplated, including on the level of federal legislation.

Another way for an ESCO to derive a financial benefit from a distributed generator is to participate, either directly or on behalf of the host, in ISO emergency call programs. In that regard a dispatchable distribution generation resource can be a real asset. This does not necessarily apply as much to solar, since most solar installations are designed to deliver to the host all the electricity they can produce, but if a combustion DG system can be ramped up to produce more electricity to deliver to the system operator in a peak demand period, or otherwise sold through an aggregator, a financial benefit can be obtained. Again, the allocation of that benefit is a matter of negotiation between the ESCO and the owner.

G. Financing

Combustion DG plants generally cannot be financed according to the limited recourse project model because they are too small. As a result, the credit of the owner will usually have to be tapped in some way to make the project happen. As pointed out above, in many cases, the owner purchases the equipment from either the manufacturer or an ESCO under the Design Build Model. In this case, the owner simply has to arrange its own financing. Another choice would be for the owner to enter into a type of sale and leaseback arrangement if it identifies a financing company willing to do that.

If the owner does not want to use its own credit resources, then it should look to an ESCO willing to own the equipment on the owner's premises. Under that model, the ESCO uses its own resources to purchase and finance the equipment and relies on a long-term energy services agreement where the owner purchases power from the ESCO, such that the ESCO's financing also relies in an important sense on the financial strength and credit of the owner. Many owners find these arrangements attractive because they do not require an up-front outlay from the owner or utilization of the owner's balance sheet.

Particularly with respect to solar installations, a certain practice has developed regarding the structure of projects. One basic structure that is being used increasingly for an energy services company to form a special purpose company, usually a limited liability company (LLC) with pass-through tax characteristics, to do one or several solar installations. This company will purchase and own the equipment and enter into a solar PPA with the owner to sell the electricity at a negotiated price. One solar company finances the equipment purchase and installation cost and then sells the system to a leasing company, which then leases it back to the LLC. This is another possible structure.

After the system is commissioned, the LLC will then be entitled to whatever incentives are available, such as a renewable energy credit based on the number of kilowatt hours of electricity generated (New Jersey is one state with a strong program), any other rebates or offsets against the purchase price (e.g., those offered by NYSERDA in New York), the federal tax credit that is available (for now, 30% of the out-of-pocket cost after rebates and then accelerated depreciation of the rest over as little as a five-year period). This adds up, to pretty favorable package from the point of view of the ESCO, which receives these benefits, since the LLC is a pass-through. The LLC sells electricity at a more or less fixed rate over the term of the solar PPA, thus providing cash flow to repay any debt obligations undertaken to purchase the equipment.

From the point of view of the owner, it can be desirable since all the owner really has to do is pay a set price for electricity from a defined period of time, which will in any case be at or lower than current grid rates, and will be set for the term of the agreement, thus protecting against rate hikes for the portion of its load generated by solar.

Of course, it is possible for the owner to negotiate with the ESCO for some sharing of the tax benefits. Some deals have so-called "tax-flips," patterned after wind project finance structures, where the LLC receives the tax benefits for some defined period of time and then they evert to the owner. Similar arrangements can be made for title, after a set period of time, the owner might have the right to purchase title at a nominal price, after which the owner receives the benefit of the "free electricity" for the rest of the useful life of the equipment.

Beyond the solar PPAs, some venture capitalists and funds are looking at more innovative structures for DG finance. The goal is to try to obtain a portfolio of DG projects with comparatively standardized energy services agreements so that the revenues can be pooled and interests in the revenue flow can be sold to investors.

H. Incentives

Another economic issue is the type of incentives that might be available for a particular project. In some states and municipalities, there are tremendous incentives for DG, including tax breaks, subsidies for building demonstration projects and other rebates and credits that can make a project economically worthwhile. These are local in nature and can vary even by municipality to municipality within the same state, so they have to be studied carefully on the most local level.[36]

On the federal level, the most well known incentive for solar in distributed applications is the 30% business and residential tax credit (with a $2,000 limit on the residential credit). Under the terms of the Energy Policy Act of 2005, these are set to expire at the end of 2008. The solar industry is seeking an eight-year extension of these credits.[37] It should be noted that if a company or an individual is an alternative minimum tax (AMT) payer, the credit is currently treated like any other tax deduction or credit, so that the credit's effectiveness is limited by the AMT. Solar industry lobbyists are now also pushing to allow corporate and individual taxpayers to claim it against the AMT.

Another significant federal incentive is accelerated depreciation for certain eligible renewable and other distributed generation technologies discussed in this article, principally the main solar applications, fuel cells, geothermal electric and microturbines. This can be claimed for commercial and industrial applications under the so-called Modified Accelerated Cost Recovery System. The solar applications have benefited from this regime for many years. The Energy Policy Act of 2005 extended the definition of eligible technologies to fuel cells and microturbines.[38]

As to state incentives, California, New York and New Jersey have among the most generous programs in the country for renewable and combustion distributed generation. Just to pick New York as an example, since that is where this PLI program is being given, New York offers a photovoltaic incentive program that provides between $3-5/watt in rebates for eligible systems (capped at 10 KW for residential and 50 kW for non-residential and multi-family). That means that if a system is specified correctly to fit the published guidelines, almost half the equipment purchase cost can be subject to state rebate. For non-residential buildings, the incentive is $4.00/watt up to 25 kW and then $3.00/watt for additional capacity up to the limit.[39] The New York state Energy Research and Development Authority (NYSERDA), the state agency that administers the rebates, may waive the caps on a case-by-case basis.

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36 The Solar Center at North Carolina state University has a program that tracks these state incentives carefully and updates them on a website – the Database of state Incentives for Renewables & Efficiency at www.dsireusa.org.

37 Jan Pierobon, *US Renewables Groups on the Offensive*, Renewable Energy Focus (Feb. 13, 2008).

38 Energy Policy Act of 2005, § 48, modifying 26 U.S.C. § 168 and § 48(a)(3)(A).

39 The rebate for Building Integrated PV systems starts at $4.50 / watt up 25 kW.

The timing of payment of the incentives is something that needs to be taken into account in the planning of a project. The first 75% is paid when all the system components have been delivered to the site and the appropriate paperwork is submitted to NYSERDA and approved, and the remaining 25% when the system is connected to the grid or inspected by NYSERDA (again with the appropriate paperwork). This means that the system acquisition cost must be financed up-front by the ESCO or qualified installer or paid for by the facility owner.

There are also New York state tax credits for photovoltaics and fuel cells. Regarding this tax credit, a significant anomaly was corrected last summer. The residential tax credit for solar applies up to 10kW, which does not take into account the potential size of solar systems that can be installed in multi-unit apartment buildings. The law was changed to allow up to 50 kW for apartment buildings. If the building is a cooperative, the shareholders can claim a proportionate share of the credit.[40] If the building is a condominium, the law contemplates that the "condominium management association" is purchasing and installing the system and allows a "taxpayer who is a member of the condominium management association to claim a proportionate share of the credit."[41]

Without getting into the details of them, New York has a whole slew of other incentives and payments related to distributed generation in a larger sense, particularly if the distributed generation results in a permanent load reduction. In the Con Edison service territory, these payments, which are administered by the New York ISO, are especially generous – the lesser of 65% of project costs of $200 / kilowatt of summer peak load curtailment (lesser of 65% or $50 / kilowatt outside the Con Edison service territory).

V. THINGS TO WATCH OUT FOR IN DG PROJECTS

After the review of the benefits of distributed generation and described the financial incentives that governments are willing to apply to assist projects, some cold water has to be thrown on the discussion. To engage in a bit of understatement, distributed generation projects are not simple to implement. Once an owner determines it wants some form of alternative energy, both the owner and the ESCO need to bear in mind several factors to make sure the potential benefits of DG are realized.

A. Interconnection

An issue in every project is interconnection to the local utility distribution grid. First of all, many on-site generation systems are not sized to cover all of the facility's electric load; rather, they are optimally designed to cover a facility's thermal load. In the case of photovoltaics, it is rarely the case that the on-site systems can cover a facility's load given the output possibilities and the intermittency of the resource. Secondly, on-site systems have to be taken down for

[40] Chapter 128, Laws of New York, signed into law on July 3, 2007.

[41] It is unclear why the credit is able to be claimed only by the members of the "condominium management association". If a solar system is feeding in behind the main meter, the electricity savings, especially for common building systems, inure to the benefit of all unit owners. The management association might be an outside independent contractor or the board of managers of the condominium, which consists typically of only a few of the many unit owners.

maintenance periodically and also can fail unexpectedly. In that case, the host will want to revert to grid power immediately, so as to avoid interruptions.

If an on-site generator is interconnected, the interconnection can be one of two kinds – either an induction or a synchronous generator. Induction generators cannot work without the grid – they need it to be "excited," as the engineers say, to start up and continue firing. Synchronous generators run "in parallel" to the grid and don't need the grid to work (although they still need gas delivery if they are natural gas plants). If a DG plant has induction generators, the owner may lose one of the main potential benefits of DG – back-up power. Unfortunately, some utilities make it virtually impossible to synchronize a DG plant, due to grid stability concerns – or they allow synchronization only with the installation of expensive protective relaying (to prevent fault current from going onto the grid), which makes the project uneconomic. This problem is particularly acute in cities that have so-called "network" distribution systems as opposed to "radial" distribution systems that are common outside of urban areas.

As a result, owners need to be well-informed about how grid interconnection of DG plants is treated by their local utility company and what types of protective relaying schemes utilities have allowed in past interconnections. This will drive the type of equipment used. If synchronization is not a practical option, induction equipment can be outfitted with black-start batteries to ensure start-up in the event grid power is lost and provide the back-up needed, even if this process is not instantaneous. This could be an issue for certain kinds of industrial processes. Owners also need to know as a practical matter how long the utility approvals for interconnection tend to take, as this will drive the schedule for ordering equipment and projecting a start-up date. Sometimes they take a very long time and this becomes an issue in the timing of the project. It is not unheard of for a DG plant to be built and then have to wait to be tested properly because the utility is still reviewing and commenting on an interconnection application.

B. Relationship with the Local Utility – Standby Tariffs

Assuming the interconnection approvals are obtained, once a facility begins to generate a part or all of its own electricity, its relationship with the local utility changes. While it is possible for a facility to be an "island", with no flow of power to or from the grid, for the reasons explained above facility owners invariably wish to keep a utility service agreement in place. This changes the type of utility tariff that applies to the owner. In some places, utilities charge exit fees or impose stand-by tariffs. Owners need to take into account what these might be to make sure the project makes economic sense. The ESCOs should be able to analyze this aspect. In some states, owners who install generation technologies using renewable fuels or fuel cells are exempt from exit fees or have to pay less significant stand-by charges.

Applicable standby tariffs need to be studied carefully. Most of them are based on the idea that the distributed generator and the utility are agreeing to a type of maximum demand that the facility might need if the on-site generation is unavailable. If this demand is exceeded for some reason, the tariffs include penalties, so-called "rachet" provisions where some multiple of the demand charge will have to be paid. Further, in some places, the new demand is set at a higher level if this happens, such that the owner has to pay more going forward. In other places, like Con Ed's service territory, the facility owner can agreed to pay a somewhat higher standby tariff on a steady-state basis, but will not be subject to the rachet charges. It is in essence a type of insurance policy.

One interesting approach some solar installers are using is to go behind the utility meter. In a large multi-family building, for instance, it is unlikely that solar can supply more than a certain fairly low percentage of the average load - 10 to 40%. In this case, the inverter can be put on the customer side of the utility meter so that the AC power goes directly to the residents' submeters. No power ever goes back on the grid, so there is no need for a costly and time-consuming interconnection exercise with the utility. From the utility's point of view, all it really notices that that a certain customer is using less electricity which, depending on how stressed its local distribution grid is, may be fine with it. In any case, the customer will not have to go into a standby tariff category.

C. <u>Regulatory Concerns</u>

If a distributed generation system provides only power to the host facility and there is otherwise no sale of power to a third party off-site, the state and federal regulatory issues are not significant. If, however, the facility owner generates more electricity than it needs, which can happen, then a facility owner becomes a participant in today's complex local and regional power markets and enters the Byzantine netherworld of state and federal power law and regulation.

For the historical record, the issue of selling power back to the grid or in an organized market was, until the fairly recent Energy Policy Act of 2005, a potentially thorny one. This law repealed the Public Utility Holding Company Act of 1935 (PUHCA), under whose terms a facility owner ran the risk of being of being regulated like a utility by the federal government if it sold any power at all, even though its core business might be entirely unrelated. The way to avoid this was for the owner to obtain an exemption from the application of the PUHCA. The exemption took one of two forms – certification as a qualified facility (QF) under Public Utility Regulatory Policies Act of 1978 (PURPA) or obtaining the status of an exempt wholesale generator (EWG). QF certification was the more typical route if waste heat was being used.

Many states conferred particular benefits to facilities that were certified as QFs, so it was quite important for a DG project to meet the PURPA criteria, which mostly had to do with the efficiency of the project and the use to which the thermal energy was being put. Since the repeal of PUHCA, this is less important, but it still makes sense for projects to be certified as QFs, since some states continue to confer some benefits on QFs. If maintaining QF certification is desirable in the particular jurisdiction, the host will have to ensure a certain level of thermal energy offtake and that this thermal energy be put to use in some way that is considered beneficial. The Energy Policy Act of 2005 provisions amending PURPA made these more strict due to a view prevailing among investor-owned utilities that the thermal energy was an afterthought in a project designed in fact to sell electricity back to the utility, which it often did not want.

Regarding electricity sales, most states have statutes that prohibit in one way or another a sale by a non-utility generator of electricity to another customer. This prevents a distributed generator from entering into private contractual arrangements to obtain the best price for excess electricity.

Given the constraints of these laws, distributed generators have only certain options as to sale of excess electricity they might generate. If a system is small enough, such as residential solar, the utility has to buy back excess power at an established price, a process known as net metering. These net metering laws do not apply, however, to installations large enough for multi-family housing, commerical buildings or industrial facilities. Therefore, depending on the amount of extra electricity, it can either (a) enter into a power sales agreement with the local utility (which may or may not have to do so depending on how PURPA is interpreted in the relevant state or regional market), (b) sell into the applicable local or regional power market (NYISO, ISO New England, PJM, MISO etc.) or (c) enter into an agreement with an intermediary known as an "aggregator." Agreements with aggregators are used when the unit of power a distributed generator might have for sale is smaller than the minimum allowed by the market (e.g. 1 MW in NYISO). The aggregator goes around to the distributed generators within a certain market and bundles together the power available so that the unit minimums (for example, one megawatt) are met.

Finally, there are financial advantages to a distributed generator in participating in ISO demand response programs. To use New York as an example, the ISO enters into agreements with owners of distributed generators so that the distributed generators are available at the days of highest demand during the summer. If a distributed generator has such excess capacity, or can shed load on its own site so as to make excess power available, the ISO will pay the owner an annual fee to make this capacity available and also pay for the power when delivered by the distributed generator.

D. Land-Use / Permitting Issues

Land use and permitting issues can loom large in a distributed generation project. A threshold land use issue is whether the DG equipment is placed inside or outside of a structure. A typical natural gas CHP system is such that it can fit inside of a standard ship container. When these are placed outside, which is the preferred method for many types of owners such as big-box department stores and other sorts of industrial facilities, most local land use rules consider them to be structures for which a building permit is required. Projects can be held up by issues raised by local building departments, particularly since some kinds of CHP systems can be very noisy, so the level of sound attenuation becomes an issue.

For systems designed to be placed inside buildings, owners should be aware that they will be combusting fuel in their basements, and that the local fire department will be interested in this. Many projects in New York City were held up recently when the Fire Department began objecting to the size and pressure of the gas connections. As a result of these objections, a process was launched under the direction of the Fire Commissioner to propose revisions to the New York City Building Code. The amendment were adopted in October 2007 to specifically address on-site power systems. The size of these projects was limited to 2000 kW or 2 megawatts, which is not that large. A large commercial office building in New York can use a lot more power than that during peak demand times.

The larger issue in distributed generation projects is that, as in all projects, owners should look carefully at all potential permitting issues, beginning with the most local level and working up, because a serious land use issue can hold up a project for a long time. I have even seen local building permit issues kill otherwise attractive DG projects.[42]

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42 For an interesting discussion about how local building codes and restrictive covenants in developments can inadvertently or deliberately frustrate residential photovoltaic projects, see Edna Sussman, *Reshaping Municipal and County Laws to Foster Green Building, Energy Efficiency and Renewable Energy*, 16 N.Y.U. ENVIRONMENTAL LAW JOURNAL, 1 (2008).

For DG plants that use combustion technologies, owners will have to comply with federal and state clean-air and local emission standards. Regarding emissions, natural gas CHP plants actually don't have such low SOX and NOX emission profiles. Their desirability from an environmental standpoint really has to do with their greater efficiency than central station generation and the lack of transmission losses. This being said, they generally fit within federal clean air guidelines even in non-attainment areas and federal clean air permits rarely hold up projects. Certain states have adopted or are considering specific combustion DG air permitting rules which have to be complied with.

V. ENERGY EFFICIENCY

The focus of the discussion so far in this article has been new buildings and real estate developments with their own alternative energy sources. However, a key economic and environmental issue confronting facility managers today is how to use less energy in existing buildings.

The concept of facility energy management has been attracting more widespread attention in the past few years. For instance, in 2007 the City of New York published a report about New York's carbon footprint in which it was quite clearly stated that the greatest source of greenhouse gas emissions in the City is its buildings. The publication of this report was followed only a couple of months later by a major conference hosted in New York on cities and climate change. At this conference, former President Clinton described how the Clinton Climate Initiative had recruited several major financial institutions to arrange financing of $1 billion each to cities and building owners for the purpose of conducting energy audits and undertaking retrofits.[43] The Clinton Climate Initiative estimates that one percent of the potential market for retrofits is being tapped at this time.

Indeed, it is time. In the United States, every year, day in and day out, buildings, industrial sites, offices, campuses and government facilities (not to mention residences) waste a colossal amount of energy.

Energy is wasted first of all in the way structures are constructed, without simple but efficient insulation techniques, such that far too much hot air enters structures in the summer and cool air in the winter. This means that air conditioning and heating systems have to be sized larger than they otherwise would be and thus consume much more energy to keep comfortable temperatures. Many existing structures have old, inefficient boilers and heating and cooling equipment. Lighting is largely through the use of incandescent bulbs, which, more than 100 years after being invented by Thomas Edison, still are essentially small fires within a globe, consuming large amounts of electricity and throwing off heat – incidentally heat that warms up buildings in the summer, increasing cooling loads during peak electric demand times. Even the way structures are oriented is generally with complete indifference to natural factors, such as the arc of the sun. With proper orientation and building techniques such as passive solar design

[43] The four participating ESCOs are Honeywell, Johnson Controls, Siemens and Trane. The five banks are ABN AMRO, Citi Deutsche Bank, JP Morgan Chase and UBS. William J. Clinton Foundation, Press Release, *President Clinton Announces Landmark Program to Reduce Energy Use in Buildings Worldwide*, May 16, 2007.

and overhangs, many structures can have some free lighting and heat and reduce the amount of heat gain in the summer, thus further reducing heating and cooling loads.

As mentioned above, the central generation model results in tremendous waste of energy since no use is made of waste heat and as a result of transmission losses.

Energy is wasted further in existing structures by poor insulation, old and inefficient heating and air conditioning equipment and inadequate operations and maintenance programs.

In sum, there is a lot of energy to be saved – but all of the techniques that can be deployed cost money to implement. Facility owners are confronted with potentially significant capital costs to make the most efficient use of energy. As a result, they are looking to ESCOs to advise them on how to carry out these measures and to provide or channel financing. The vehicle for doing this is an energy performance contract.

A. Energy Performance Contracting

In general, an energy performance contract is one between a facility owner and an energy services company (ESCO) to reduce energy usage in buildings in which the ESCO guarantees to the owner that energy savings achieved will be greater than the capital cost of the equipment being installed.[44]

From the deceptively simple statement that the amount of energy saved from improvements will cover their capital cost arises a complicated contract that encompasses many elements – from designing the improvements and systems, to their installation on schedule and on budget, to making sure they work as specified, to measuring the savings and ultimately proving or disproving the ESCO's calculations of how much energy is being saved. An energy performance contract is in fact a complex hybrid of engineering services, equipment supply, construction, measuring, maintenance and monitoring contracts. It is performed over a period of years (a typical length is 10-15 years), so it is a long-term contract with all that implies in terms of risk allocation. The key element is the ESCO's guarantee to the owner that the improvements will result in savings. What goes in this contract, and how it addresses the elements described, will determine whether a facility owner's expectations are be met or, from the point of view of the ESCO, whether the ESCO will be protected from, or exposed to, significant liability.

B. Energy Performance Contract Customers

Probably the most important energy performance contracting customer today is the federal government. It has had various types of energy efficiency programs in place for over two decades. The most recent pronouncement of federal policy regarding the energy usage of federal buildings is an Executive Order dated January 26, 2007 in which President Bush ordered that the heads of federal agencies step up energy efficiency over and above the Energy

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[44] New York is one of the few states around the country that has a statute devoted specifically to energy performance contracts, Article IX of The New York state Energy Law. Energy Performance Contracts are defined in N.Y. Energy Law, § 9-102(4). Regarding the federal Government, which has been a leader in promoting energy performance contracting for over two decades, these contracts are known as "energy savings and performance contracts" or ESPC.

Policy Act of 2005's goals so that they reduce the "energy intensity" of their buildings by 3% annually through 2015 or 30% in a cumulative way in the same time period, relative to the 2003 baseline.[45]

Many states are also pursuing aggressive energy reduction targets. To talk about New York, only because it provides a good example, Governor Spitzer announced a wide-ranging energy program in April 2007 which included a goal of reducing electricity consumption in New York by 15% of its projected levels to 2015, a target he described as being the "most aggressive in the nation."[46] As a means of towards achieving this goal, Governor Spitzer cited the energy bill of New York state government agencies as being $700 million per year and set a goal of reducing this amount by 15% as well.

Energy performance contracting is also something that many local government entities are pursuing. All over the country, municipalities, school districts and universities, for instance, are evaluating the energy usage of their facilities and asking for proposals from ESCOs to make them more efficient.

Further, the owner of any private building or facility can consider having its energy use evaluated and then decide whether efficiency measures and capital improvements should be implemented. Industrial processes lend themselves in particular to the potential for significant savings, as many processes were developed without regard to energy intensity or before more modern control and other technologies were developed.

C. <u>Components of an Energy Performance Contract</u>

There are five basic phases in the performance of an energy performance contract, as follows. This article will go through them in the chronological order presented:

I. The Initial Energy Assessment (IEA)
II. Investment Grade Audit (IGA)
III. Procurement / Installation Phase
IV. Performance Period – M&V and O&M

Regarding each of the phases, I will point out the particularities of either federal or state practice, to the extent one is able to generalize about state practices, with the understanding that in private facility contracting, the owner and the ESCO are free to strike whatever bargain they choose.

a. Initial Energy Assessment (IEA)

The first step of any energy performance contract is a simple assessment of how a facility is using energy and what steps could be taken to realize efficiencies. The ESCO's engineers will made a visual observation of the facility. They will also make a rough calculation

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[45] Executive Order 13423 – *Strengthening federal Environmental, Energy and Transportation Management* (Jan. 26, 2007).

[46] Tom Fredrickson, *Spitzer Outlines Aggressive Energy Plan* in New York Business.Com (Powered by Crains) (April 19, 2007).

of the amount of energy – in the form of electricity, natural gas, fuel products and water – the facility is using; in other words, they will establish a baseline. To do this, the ESCO looks basically at the facilities' utility bills.

With a visual inspection and a review of the facility's utility bills, the steps to be taken to reduce consumption often are quite obvious to engineers trained in energy conservation. A good list of typical measures, based on suggestions made in a manual developed by the Department of Energy's federal Energy Performance Program (FEMP), is as follows:

- Boiler and chiller plant improvements
- Building automation and energy management control systems
- HVAC upgrades
- Lighting improvements
- Building envelope modifications
- Chilled/hot water and steam distribution systems
- New or upgraded electric motors and drives
- More efficient refrigeration
- Distributed Generation
- Renewable energy systems
- Energy/utility distribution systems
- Water and sewer conservation systems
- Electric peak shaving/load shifting
- Energy cost reduction through rate adjustments
- Energy-related process improvements
- Commissioning

In the industry, the most commonly used term to describe each of these is an energy conservation measure or "ECM."

From the contractual standpoint, the IEA could be done according to a simple standalone contract akin to a consulting agreement or the IEA could be the first phase in an umbrella energy performance contract that provides that the ESCO will proceed to the next phase (the IGA, see below) if the customer accepts the ESCO's preliminary recommendations.

In terms of state and local government performance contracting, the IEA often is not done as a formal step. Since so many energy performance contracts are procured following responses to Requests for Proposals (RFP), what state and local government agencies do in practice is allow ESCOs to inspect the facilities and ask questions as part of the RFP process. The ESCO's response to the RFP is really the IEA, in that the ESCO sets out to show the government entity what it can propose as ECMs.

b. Investment Grade Audit (IGA)

The next step after the IEA is the Investment Grade Audit an in-depth study of the ECMs that could be implemented, how much they would cost, how much energy the customer stands to save and how the project would be carried out.

The report produced by the ESCO after the IGA is a very detailed document that includes the establishment of the facility's baseline energy usage based on more detailed observations than those carried out during the IGA stage, specifications of the ECMs proposed and the equipment to be installed, the cost, the amount of energy in units of energy that should be saved and the ESCO's estimate of the monetary savings that should be realized. The IGA Report also includes the detailed methodologies and breakdowns used to arrive at the estimate of energy savings. Typically the ESCO preparing the IGA Report will state in it the percentage of the estimated energy savings it is prepared to guarantee – and how those savings will be measured.

The IGA Report should also include a detailed financial pro forma that takes into account the financing costs in projecting out the energy savings. As with the Initial Energy Assessment, the IGA Report can be done under a separate agreement where the ESCO is paid a fee for its services (usually tied to the delivery of the report) or it can be included in an umbrella energy performance contract that provides for the cost of the IGA and the report produced to be rolled into the overall project cost if the customer decides to go ahead with all or part of the ECMs recommended.

c. Procurement / Installation Phase

As mentioned above, one of the peculiarities of an energy performance contract is that in important part it is a construction contract. Certain of the form energy performance contracts available give fairly short shrift to the construction provisions. While this is understandable in fairly simple performance contracts where the ESCO is replacing lighting, upgrading insulation or otherwise installing off-the-shelf products like windows, having poorly formed construction clauses is risky when the ECMs are more complicated or involve equipment that will have to meet performance parameters, such as biomass boilers or combined heat and power (CHP) plants. This is true whether one is approaching the question from the point of view of the ESCO or the owner. Indeed, on-site generation with the use of waste heat for thermal applications creates the potential for significant energy savings, but it also means that a complex piece of equipment has to be designed, procured, installed and connected to the host facility so that it works as specified and does not run the risk of damaging the host facility.

Energy performance contracts involving more complex ECMs should definitely be reviewed by an attorney experienced in construction contracting. If on-site generation is involved, an attorney familiar with state and federal energy regulatory law should also provide input due to the complex issues surrounding interconnection of the on-site generation to the local electric distribution system and how the on-site system and the electric grid work in parallel.

The main construction risks and regulatory points are addressed above in the discussion of Energy Services Agreements in distributed generation projects, since the considerations involved are essentially the same.[47] It should be noted, however, that when dealing with any agency of the federal Government, certain standard clauses from the federal Acquisition Regulation (FAR) will be included in the contract and that they contain risk allocations that can be somewhat different from what is typically the case in private construction contracting.

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[47] For a discussion of these issues, see a previous paper by the author entitled *Distributed Generation in the U.S. – Practical Issues in Project Development* presented to International Bar Association Section of Energy & Resources Law Conference, May 11, 2004.

Once all of the ECMs are installed, they will go through a series of tests to make sure they are functioning as planned. This is in essence the same thing as testing for substantial completion in a construction contract. The main thing about this phase that is somewhat unique to energy performance contracts, however, is that often ECMs are designed so that a number of them work in conjunction with one another. The energy savings are not realized, or only partially realized, if an element is missing. Since different ECMs have different lead times, sometimes the testing can be held up for quite a while until everything is in place and measurements can be taken of savings with all ECMs functional.

d. *Performance Period – M&V and O&M*

The most complex aspect of an energy performance contract is in fact the key one – how to measure the savings that the ESCO is promises will be produced as a result of the capital improvements and to verify them over the long term of the contract. This is known as the "measurement and verification" phase of the project, or "M&V", in industry parlance. Most customers tend to approach the proposed guaranteed savings in dollar terms – if they enter into an energy performance contract with an ESCO, they will save X dollars in energy costs every year. Although it is certainly intuitive, unfortunately this is not really the right way to look at it. The reason for this is that the amount of the various types of energy used by the facility – electricity, natural gas, water, heating oil, etc. – and their cost – are influenced by many factors unrelated to the ECMs installed by the ESCO, or otherwise beyond the control of both the customer and the ESCO.

Energy prices in today's deregulated markets vary constantly, usually towards being more expensive, but there can be all kinds of fluctuations. If, for example, having more efficient HVAC equipment and motors results in electricity savings, the facility will use fewer kilowatt hours over time. However, there is no way for the ESCO to know or be able to predict how much a kilowatt hour of electricity will cost five years after the improvements are made. So, the relevant factor for the owner to be able to assure itself that it has made a good investment in entering into the energy performance contract is a comparison of the number of kilowatt hours used before the ECMs were installed and after. In fact, its electricity bill may be higher after installation of ECMs if the price of electricity has gone up enough. Nonetheless, the improvements made should be considered a success, particularly since the owner's electricity bill would have been a lot higher five years later had the improvements not been made. Similar considerations apply to natural gas, petroleum products and water and their units of measurement and costs. Conversely, from the point of view of the owner, the ESCO should not get credit for producing energy savings merely because the base unit prices of energy go down fortuitously after the improvements are made.

Another element to be taken into account is facility usage. If the facility is an industrial site, its output may vary over time. Likewise, a commercial building may be fully occupied or it may lose tenants. School districts may add students and expand, or they may close down programs and buildings. The list of potential variations for all the different types of facilities is long. Variations in facility usage are also things that the ESCO cannot control, but could have a significant impact on the amount of energy used by the facility and thus how much it spends on energy over time. As a result, it is not fair to try to hold the ESCO responsible for variations in usage, as compared to the baseline, in its guarantee of energy savings.

Finally, in evaluating the energy savings projected by the ECMs, the customer needs to take into account that certain aspects of its own behavior will affect the amount of money it ultimately saves. This is particularly the case with air conditioning, heating and ventilation systems. The IGA Report will indicate what assumptions the ESCO is making about the temperature settings at which the air conditioning and heating systems will run. If the Customer insists on having cooler air in summer or warmer air in winter, it will use much more energy than the ESCO has projected and the savings in units of energy will be less.

There are two basic philosophies for how to deal with the inevitable long-term fluctuations in energy costs and facility usage over the length of the performance period. One is called the "adjustment to baseline" approach and the other the "stipulated savings" approach. In the first, all of the elements of baselines established in the IGA Report that could affect energy usage (facility capacity, temperature, humidity, set points for air conditioning and heating and energy prices) are measured frequently by the ESCO after installation of the ECMs. The data are entered into mathematical formulae that adjust the new conditions to simulate those in the baseline case.

In the second philosophy, the various elements that can vary are in fact assumed for the length of the contract, "stipulated" in the industry parlance, so that apples-to-apples comparisons can be made later. As an example, when the ESCO measures electricity savings five years after installation, it will use the same kilowatt hour price used in the baseline case, no matter what a kilowatt hour of electricity costs five years into the contract. In that way, the real differences in electricity usage can be measured no matter how the cost of electricity has fluctuated over the period of measurement specified in the contract.

Expanding on these two basic themes, most Energy Performance Contracts make reference to M&V protocols established by the Department of Energy's federal Energy Management Program (FEMP).[48] Another choice is a set of international protocols.[49]

The four basic M&V protocols established in the FEMP guidelines for energy performance contracts are the most widely used. They are summarized in the chart below, taken from the FEMP guidelines.

M&V Option	**Performance and Operation Factors***	**Savings Calculation**	**M&V Cost****
Option A—Stipulated and measured factors	Based on a combination of measured and stipulated factors. Measurements are spot or short term taken at the component or system level. The stipulated factor is supported by historical or manufacturer's data.	Engineering calculations, components, or system models.	Estimated range is 1%-3%. Depends on number of points measured.
Option B—Measured factors	Based on spot or short-term measurements taken at the	Engineering calculations, components, or system	Estimated range is 3%-15%. Depends

[48] *M&V Guidelines: Measurement & Verification for federal Energy Projects*, latest version at www.eere.energy.gov/femp/financing/superespcs_mvresources.cfm.

[49] *International Performance Measurement & Verification Protocol (IPMVP)*, at www.ipmvp.org.

M&V Option	Performance and Operation Factors*	Savings Calculation	M&V Cost**
	component or system level when variations in factors are not expected. Based on continuous measurements taken at the component or system level when variations are expected.	models.	on number of points and term of metering.
Option C—Utility billing data analysis	Based on long-term, whole-building utility meter, facility level, or sub-meter data.	Based on regression analysis of utility billing meter data.	Estimated range is 1%-10%. Depends on complexity of billing analysis.
Option D—Calibrated computer simulation	Computer simulation inputs may be based on several of the following: engineering estimates; spot, short-, or long-term measurements of system components; and long term, whole-building utility meter data.	Based on computer simulation model calibrated with whole-building and end-use data.	Estimated range is 3%-10%. Depends on number and complexity of systems modeled.

While there is a lot of jargon in these concepts, basically A and C are the stipulated savings measures and B and D are the adjustment-to-the-baseline measures. In sophisticated energy performance contracts, it's not entirely all "adjustment-to-the-baseline" or "stipulated savings". The ESCO may well specify that different FEMP protocols apply to different ECMs, so that the M&V philosophies that apply to a particular energy performance contract can be a mixed bag.

From a contractual standpoint, a facility owner or operator should work with a consultant experienced in the field to make sure that its expectations as to energy savings will be met in the light of the way an ESCO is proposing to apply the standard M&V protocols. Again, owners should temper their expectation that hiring an ESCO and entering into an energy performance contract will necessarily mean that they will be saving X dollars every year. They should be oriented towards thinking of an energy performance contract as a vehicle for saving units of energy over time, with the understanding that since energy prices are tending to rise, they will necessarily realize dollar savings, in any case enough to cover the cost of whatever financing they have taken out.

Another nitty-gritty aspect of energy performance contracting is how the operation and maintenance of the ECMs installed will affect the savings achieved. If on-site generation of electricity, the considerations related to operations and maintenance are similar to those discussed above with respect to energy services agreements. With regard to most other ECMs, facility owners or managers will want to use their own personnel to operate and maintain them, so it should be specified as far as possible what those O&M protocols are. In all fairness to the ESCO, if the owner or facility manager does not hold up its end, the promised levels of savings will not be achieved. It is good practice, therefore, for the ESCO to conduct periodic site visits to make sure that the agreed O&M practices are being carried out and otherwise to exert agreed-up O&M oversight. The ESCO should be paid a fee for this service.

D. Government Contracting Aspects

While an energy performance contract between an ESCO and a private facility owner follows entirely the general principles of private, commercial contracting, such an important part of the energy performance contracting market is with government entities as the customer – either federal, state or local – that a legal discussion of the various aspects of an energy performance contract necessarily involves many government contracting issues – and the considerations are certainly not uniform from one level of government to the other. While the federal government practices have become something of a reference point for the industry, state and local government procurement and contracting practices are by no means identical to federal practices, and state and local practices not only vary from one state to another, they vary as between different counties and municipalities within the state.

This article will emphasize the common threads of state and local practice, but in the end the particular rules and regulations need to be examined in every case. Indeed, it is my philosophy when dealing with a local government entity, such as a school district, as a customer to start from the bottom up, to check the procurement rules at the most local level at which they exist so that unpleasant surprises about the authority of the local government to procure the contract and enter into it are avoided after much effort has been invested by one or both parties. For municipalities, this means checking the town charter or the organic documents of the government entity. They will normally have some provisions regarding the authority of the local government or school district to expend funds for capital projects or to borrow money. Different municipalities or school district may view the cost of procuring ECMs as either an upfront capital expense or a recurring operating expense when a lease is entered into and the lease payments are made over time, in theory from the amount of money saved from the ECMs.

The local procedures must be followed in the end. In many places in New England, one can be surprised to learn, as I was in one case, that the quaint tradition of the town meeting actually means that the expenditure of funds for the capital cost of an energy performance contract cannot occur until a majority of the voters approve it at a town meeting.

Most municipalities also have local procurement and government contracting regulations. It used to be rather difficult to run these down, but today most municipalities have websites where they are posted and readily accessible for anyone with an interest in knowing.

Having run down the most local rules, one also has to consider the interplay between state law and local regulations. Many states have rules that override to some extent the local practices. For instance, New York has a short chapter on energy performance contracts in its Energy Law (Article IX), but the provisions of that chapter have important practical consequences on the way in which energy performance contracts are procured and carried out. The following is the law's main statement of policy:

> Notwithstanding any other provision of law, any agency, municipality or public authority, in addition to existing powers, is authorized to enter into energy performance contracts of up to thirty-five years duration, provide that the duration shall not exceed the

> reasonably expected useful life of the energy facilities or equipment subject to such contract.[50]

The key phrase in this provision is the lead-in, "notwithstanding any other provision of law," which means that all other competing or inconsistent provisions of local law are overridden by the policy statement in favor of energy performance contracting. This is significant in New York, which has elaborate municipal finance and public procurement laws.

Another key point in New York is that local government entities do not need to follow the strict competitive bidding requirements that are otherwise required in public procurements. The usual rule is that local governments have to solicit bids for service and equipment purchases and award the contract to the lowest competitive bidder. Under Article 9, an energy performance contract can be procured by a request for proposals.

> In lieu of any other competitive procurement or acquisition process that may apply pursuant to any other provision of law, an agency, municipality, or public authority may procure an energy performance contractor by issuing and advertising a written request for proposals . . . .[51]

The words of the lead-in – "in lieu of any other competitive procurement or acquisition process that may apply" are – a strong statement of policy and mean that the lowest bidder need not be chosen,[52] which is an important consideration when many proposals with different energy conservations options are being evaluated by a local government entity. Another important consequence of these Article 9 provisions is that they can be read to exempt energy performance contracts from the most troublesome aspects of a particular law in New York known as the "Wicks Law", which in public contracting requires separate specifications for plumbing, mechanical and electric work and separate bidding for each of these "trades". This means that an ESCO can in effect serve as a general contractor and subcontract out the various elements of the work under an energy performance contract, instead of having to comply with the cumbersome process of obtaining separate bids by trade. This represents a significant streamlining of the process in a public entity's implementation of an energy efficiency program.

While the foregoing represents a relatively clear path towards the award of an energy performance contract in New York, Article 9 still does not allow local governments and ESCOs to completely ignore the local procurement requirements, as the same section that permits a local government to procure an energy performance contract by a request for proposals also requires that the request for proposals be issued and advertised in accordance with the procurement and internal control policies that the applicable agency, municipality or public

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50 New York Energy Law, § 9-103(1).

51 *Id*., § 9-103(6).

52 Article 9-103(7) – "Sections one hundred three and one hundred nine-b of the general municipal law shall not apply to an energy performance contract for which a written request for proposal is issued pursuant to subdivision six of this section."

authority has established under the various New York state laws that apply to government subdivisions.[53]

If all this sounds confusing, that's because it is. Most local government officials in New York have no clue how to put together and issue an RFP for an energy performance contract, and the same can be said for practically everywhere else in the country. As a result, local government officials hire advisors and consultants to help. New York State also has an agency known as the New York State Energy Research and Development Authority (NYSERDA) that offers advice to local government officials in procuring energy performance contracts. Some years ago NYSERDA published a guide to energy performance contracting in New York State, which set out guidelines that can help public officials. While it is somewhat out of date today, it does provide a good framework for a local public official to follow in launching the process. If the local authority is asking for NYSERDA funding, NYSERDA's procedures have to be followed.

E. <u>Financing Energy Improvements</u>

Once a facility owner or user decides it wants to save energy, the first question becomes how to finance the cost of the capital improvements that will have to be made. Methods used by the federal government and state and local governments provide an interesting contrast, and thus two basic models that can be considered and followed entirely or to some extent by private facility owners.

The basic federal model is that no payments at all are made to the ESCO until all energy efficiency measures are installed and tested to show that they are producing the energy savings promised. Then, payments to the ESCO are made only over the term (15 years, typically) of the contract from energy savings actually realized, as determined by the measurement techniques methods specified in the contract.[54] This means that the ESCO must find a way to finance all of the construction and capital costs itself, and is not assured of any payments at all if the improvements don't work as specified. While this sounds scary, the practice is quite well accepted by ESCOs who do business with the federal government, partially because they realize that most energy efficiency measures, if installed correctly, will necessarily result in savings, partially because of the way in which the measurement techniques work, and partially because the federal government is a good credit – if the efficiency measures are indeed installed correctly, the federal government is good for the money over time. As a result, there are financial intermediaries who will finance the up-front costs of a federal energy efficiency project for ESCOs who have a good track record.[55]

Of course, some ESCOs have significant financial resources of their own and are able to finance the capital costs of the efficiency measures from their own resources, or the financial resources of other companies within their corporate families. They may prefer to do this if they

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[53] E.g. the state Finance Law, the Executive Law, the General Municipal Law or the Public Authorities Law, as the case may be. Energy Law, § 9-103(6).

[54] See discussion, *infra*.

[55] One company that specializes in financing energy performance contracts is Hannon Armstrong, based in Maryland. Hannon Armstrong is one of the approved financial providers in the Clinton Initiative.

have working capital or other lines of credit at interest rates lower than what is offered by the houses that specialize in federal government performance contracting.

On the state and local government level, the norm is that the government entities provide their own financing. The reason for this is that many state and local government entities have access to some form of tax-advantaged municipal finance that results in lower interest rates than on the private market. Although this sounds less advantageous than requiring the ESCO to finance its own up-front costs, so that the state or local government entity doesn't have to borrow and is not out of pocket, it is actively not, because the cost of capital is factored into the prices charged by the ESCOs – the lower the cost of capital for the owner, the greater the potential savings. The most typical forms of state and local government financing are municipal bonds and tax-advantaged equipment leases.

Typically, the disbursement of the proceeds of the municipal bond issuance or the lease financing is made into an escrow account at the outset of an energy performance project. Funds are then disbursed from the escrow account to the ESCO much as progress payments are made in a private construction contract – as different phases of a project are completed, payments are made. Since the installation period for the efficiency measures can be spread out over several months – up to one year is not uncommon for larger projects requiring the installation of more sophisticated equipment – the escrow account is interest-bearing – and the interest proceeds on the escrowed funds are taken into account in the overall economics of the project, i.e. the decision about what the principal amount of the initial loan should be. With respect to the decision to disburse the funds to the ESCO, often the lender insists that an engineer evaluate whether the ESCO's requests for payment are justified by the state of progress of installation.

One thing that tends to make ESCOs nervous in dealing with state and local governments, particularly when the capital costs of an efficiency project are financed through some sort of municipal finance, is the practice in municipal finance of making loan servicing "subject to appropriation" of the relevant state or local government entity. In other words, when a state or local government borrows money, their agreements with their lenders provide that debt service need not be made if the relevant government entity does not appropriate sufficient funds to pay principal and interest. Again using New York as an example Article 9 of the Energy Law also requires that a so-called "non-appropriation" clause be inserted in every energy performance contract entered into by a state government agency or a municipality;[56] in other words, in a long-term energy performance contract, the implication is that the customer need not make payments to the ESCO if sufficient funds are not appropriated.

While this also sounds scary, in practice the nonappropriation risk is one that the ESCO is willing to bear when entering into a relationship. For one thing, if the proceeds of a municipal financing are disbursed into escrow and then paid to the ESCO as the installation of the efficiency measures progresses, the ESCO is more or less fully paid by the time installation is

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56 "Any energy performance contract entered into by any agency or municipality shall contain the following clause: 'This contract shall be deemed executory only to the extent of monies appropriated and available for the purpose of the contract, and no liability on account therefore shall be incurred beyond the amount of such monies. It is understood that neither this contract nor any representation by any public employee or officer creates any legal or moral obligation to request, appropriate or make available monies for the purpose of the contract.'"

complete from funds that are already available to the customer – and presumably approved by whatever processes are necessary. This does not take into account long-term M&V and O&M payments, discussed in more detail below, but this does mitigate the lion's share of the ESCO's financial exposure.

For another thing, even without disbursement into escrow, if energy efficiency measures work as they should, and underlying energy prices do not spike, the state or local government entity should be realizing fairly significant savings over time in the form of lower energy bills. Therefore, even if its appropriations are not increased from year to year, it should still have some extra cash to make payments to the ESCO.

Further, defaults on municipal finance instruments are quite rare in the United States, precisely because state governments and local entities realize that not appropriating sufficient funds to make debt payments or to fund long-term contractual obligations will be very badly perceived in the municipal finance markets – and that any such incident will result in higher borrowing costs or lack of access to fresh capital.

Finally, there has developed a body of case law in some states to the effect that state or local government entities cannot use non-appropriation of funds as an excuse to get out of otherwise legitimately incurred contractual obligations. Again to use New York as an example, the New York state constitution restricts expenditures of state and local government entities to money from current revenues. Expenditures must be appropriated though legislative action or public referendum.[57] However, courts in New York have found that a non-appropriation clause cannot be used as a "sword to divorce the state, for purposes of its own convenience, from a contract fairly entered into and honestly performed."[58]

The leading case in New York involved a lease between a private landlord and a division of the state University of New York (SUNY) for a commercial property in Manhattan.[59] The lease contained a nonappropriation clause (or "executory" clause, as they are called in New York). Before the end of the lease, the SUNY division wanted to relocate, but the landlord would not let it out of the lease. The New York state legislature went so far as to pass a law eliminating all appropriations for rental payments under the unexpired lease. The court did not allow this, finding that the primary objective of the statute was for the government to impair its own contract for convenience, which was not an important public purpose, and that the impairment of contracts clause of the state constitution "bars such expedient *post hoc* changes in contract obligations."[60]

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[57] N.Y. Constitution, Article 7.

[58] *Green Island Contracting v. State of New York*, 458 N.Y.S.2d 828 (1983).

[59] *TM Park Avenue Associates v. Pataki* (1987).

[60] In this case, the Court set out a three-part test for determining when a failure to appropriate is sufficient to allow a state or local government entity to avoid a contractual obligation: (1) The decision to withhold monies must have its sources in a "legislative or budgetary" determination; (2) a determination has to be made to withdraw all funding from a particular activity, branch, agency, office or operation; and (3) even when a budgetary determination has been made that funds are not "available", an executory clause will not excuse non-performance of the state's contractual obligations when funds continue to be received for substantially the same substantive purpose."

A private facility owner has the choice then of either using the “federal” model (no payments to the ESCO at all until all efficiency measures are installed) or the “state/Local” model (progress payments like in private construction contract) – or a private owner can simply choose to bear the up-front costs itself.

F. Contract Models

As a facility owner and an ESCO contemplate entering into an energy performance contract, they must consider what form of contract document to use. As mentioned above, energy performance contracts are complex documents, incorporating many specialized legal and technical terms from a variety of different contract types. On the federal level, a clear model has been developed over the years. On the state and local government level, as well as in private contracting, there is no dominant model, and the parties are left to consider several different alternatives.

On the federal level, the most comprehensive model is the “Indefinite Delivery / Indefinite Quantity Contract” (IDIQ) that is used in the FEMP.[61] It is a very comprehensive document that covers all of the phases of an energy performance contract discussed below. It also includes a number of federal Acquisition Regulation (FAR) clauses that cannot be varied or negotiated. The main interplay between the ESCO and the relevant federal agency is in the attachments related to the specific measures that need to be filled out and agreed to.

Another helpful federal model is one that was developed starting in 1995 by the Air Force, the Army, the Navy, the Department of Defense, a number of electric utilities and the Edison Electric Institute for use in implementing energy efficiency measures on military installations as part of the “Areawide” program, a program authorized by law to allow federal government agencies to enter into sole source contracts with the local franchised utility for efficiency measures.[62] This model is known as the “DOD/EEI Model Agreement for Energy Conservation and Demand Side Management Services.” It was published along with a commentary that gives some explanations as to why certain provisions were drafted in the way they were. Given the input of the electric utilities, who worked with government attorneys, contracting officers, engineers and other personnel from the agencies mentioned, this model is rather less bureaucratic than the IDIQ contract and somewhat more commercial in the way it allocates risks. However, by its own terms it applies only to contracts under the utility areawide programs and other federal government agencies are not required to follow its terms.

On the state and local level, there is no single model that has developed as the norm. Even if one does a very comprehensive search on the internet and in legal databases, the only fully formed model that comes up is one developed a few years ago by a non-profit organization based in Colorado called the “Energy Services Coalition”, and updated in 2005. This model is imprecisely drafted in certain key provisions and has many aspects that need to be considered carefully by ESCOs and owners alike, and should be used with a certain amount of caution. Nonetheless, since there are not many readily available models, the Energy Services Coalition form has gained some currency in the industry among consultants, and it has been adapted by some state governments for use in their programs. As a result, the discussion of the various

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[61] The most recent version of the IDIQ is dated November 1, 2006.

[62] 10 U.S.C. § 2865.

stages of energy performance contract performance will make reference to this model. New York state also has different model contracts put together by NYSERDA, including a "Fixed Price Energy Performance Contract with Guaranteed Savings." It is comparatively straightforward and simple, but does contain fairly significant inconsistencies and provisions on the construction/installation aspects that are truncated and in some instances quite, and unnecessarily, unfavorable to the ESCO.

Something that should be emphasized when either a customer or an ESCO is considering using one of these forms to implement a project is that none of them is really the norm and, since the contracts cover so many types of legal disciplines, none of them is really well-drafted and succinct in laying out the parties' obligations and risk allocations. This is unfortunate because a well-drafted model would no doubt speed up the process of entering into an energy performance contract and keep transaction costs down. However, as things stand today, both customers and ESCOs and their counsels are well-advised to consider carefully the terms of the contracts they will be using because a lot could be at stake, particularly in a large project, and a poorly drafted provision could result in unintended consequences.

Apart from the federal models, the state forms and the Energy Services Coalition form, one can find and obtain copies of actual executed contracts by judicious use of freedom of information act requests. Since a lot of energy performance contracting is between ESCOs and some sort of state or local government entity, the freedom of information laws of that state will apply. As a result, it is often possible to contact the relevant government entity and obtain a full copy of a performance contract by following the state freedom of information guidelines. This provides a treasure trove of useful information, since it shows what ESCOs and their customers are actually willing to agree to, in particular on the key provisions such as the energy savings guarantee.

G. Performance Contracting for New Buildings

Most of the discussion of energy performance contracts has to do with existing buildings. It is possible, however, to enter into a type of performance contract for new buildings. If a building is still in the design phase, or even if construction is starting, an ESCO can examine a conventional design or construction and incorporate EEMs into it. Normally, this would be perceived as a change under the existing Design-Build or construction contract and require payment by the owner of the additional capital costs. However, this can be done in a "performance contract" way, namely where the ESCO makes an assessment of the convention technique energy baseline and calculates the energy savings that will occur with the incorporation of certain EEMs. The greater capital cost is then justified by lower operating costs afterwards. If the ESCO is willing to finance or arrange financing of the up-front costs, this provides an even greater benefit to the owner.[63]

From a contractual point of view, the arrangement between the ESCO and the owner is not a simple one. It starts out as a type of owner's engineer arrangement, where the ESCO is advising the owner regarding the implementation of the EEMs. In one project I worked on, the ESCO was not itself installing the EEMs; rather it was specifying them and having the original

63 For a theoretical discussion of how performance contract techniques can be applied to new buildings, see *Energy Performance Contracting for New Buildings*, a report prepared by the Energy Foundation (Eley Associates).

construction contractor do the installation, but nonetheless guaranteeing savings after the installation. The contract was a complex tri-partite agreement.

Further, whether the ESCO or the original contractor is doing the installation of the EEMs, it is important to review the savings calculations carefully, since there is no real measured baseline to start from, unlike in a project for an existing building. Both the baseline and the projected savings are thus, in a sense, imaginary.

These things being said, it can definitely be worthwhile for an owner in the process of designing or constructing a building to subject the design to an energy efficiency review and make changes to incorporate EEMs.

VII. DISTRICT SYSTEMS AND MINI-GRIDS

A district energy system is another alternative to the traditional electric utility model available to owners of real estate and developers. Even though it is being considered "alternative" for purposes of this discussion, district energy is by no means a new idea. Its feasibility was in fact first demonstrated in the 19th Century. Basically, the way the system works, as in a facility specific combined heat and power or cogeneration application, is to make use of the waste heat from power generation for the production of thermal energy. The thermal energy can be in the form of steam or hot or chilled water. The thermal energy is then pumped through a series of pipes and conduits in a defined geographic area (the "district") to users. The thermal energy can be used for heating, air conditioning and even industrial processes. If this is the case, users do not need to have their own boilers and air conditioning equipment inside their facilities. This saves not only space but also the energy needed to fire those boilers and run those air conditioning systems, thus resulting in a far more efficient conversion of the energy for power generation than in the traditional central generation model.

The widest application of district energy systems in the United States today is in campus style systems because a single anchor plant can generate enough thermal energy for all of the buildings in the campus. While they are not unheard of in urban areas (I have counted about 50 of them around the United States), they are not in particularly wide use. Curiously, however, the world's largest district energy system is in New York. Almost all of Manhattan below 96th street is connected by a huge network of steam pipes that carry steam manufactured by Con Edison to customers all around Manhattan. Some of New York's most iconic buildings – the UN, the Waldorf-Astoria Hotel and, Rockefeller Center -, are customers.

District energy systems have been in much wider use in Eastern and Northern Europe for many decades. They were particularly favored in the former Soviet bloc due to their efficient use of energy. East Berlin, for instance, had a large system whose pipes were above ground and run across some streets in trellis-like structures. Moscow still has a very large system today that provides hot water to large sections of the city. More recently, some cities that have had large systems for quite some time have undertaken to covert the power generation stations to run on renewable fuels. Copenhagen, for instance, has a system that was started in the late 19th century based on the burning of municipal waste. Over time, the power generation installed used mostly coal and fuel oil. After the 1973 oil crisis, city planners in Copenhagen began changing out the power generation infrastructure, going back to municipal waste and also moving to natural gas. Today, there are also biomass resources. As a result of these improvements, Copenhagen has achieved very significant reductions in carbon emissions since the beginning of the 1990s. Several other cities in Scandinavia have similar systems, particular in certain places in Sweden and Finland where large amounts of biomass are available from the timber and wood processing industry.

One city in Austria called Gussing has actually succeeded in cutting its carbon emissions by more than 90% compared to a 1995 baseline by installing a district heating system running off biomass and then adding power generation using gas derived from waste lumber products, with a large scale solar installation due to come on line in 2008.[64] Before the solar capacity additions, it is producing about 22 megawatt hours of power a year, enough to power about 2,200 homes at U.S. average annual residential usage (about 11,000 kilowatt hours a year), all with minimal carbon emissions.

In New York, NYSERDA has funded a feasibility and engineering study due to be completed in July 2008 for a district energy plan for the town of Hudson, New York fueled by biomass obtained within a 50-mile radius of the town.[65] A preliminary analysis carried out by the developer, a company called Eco-Grid, found that a 5 MW biomass-fired plant can provide enough hot water and heating for the entire town and generate about 18 megawatt hours per year of electricity, enough to power about 1,800 homes if the generator were allowed to sell directly to town residents. Instead, due to the legal and regulatory restrictions discussed below, most likely it will have to sell that electricity into the New York ISO if the project does go forward.

District energy definitely is an alternative that owners and developers of real estate can consider in large urban renewal projects, multi-unit housing or campus-style developments. The legal regime associated with generating and distributing thermal energy is not especially complicated. Once a distributed generation resource is sited and obtains the required environmental and interconnection approvals, it is then mostly a question of obtaining the necessary rights of way and easements to install the thermal energy conduits under city streets. This may or may not be easy, but there is generally speaking no state or federal prohibition on the sale of steam or thermal energy to customers outside of the facility where it is generated. This is in sharp contrast to the sale of electricity, which, as discussed below, is subject to an elaborate array of laws and regulations, both on the state and federal level. For a district energy system, the main legal instruments are a service agreement among the operator of the system and the participants and the associated thermal energy sales arrangements.

Microgrids

Microgrids are another alternative energy technique of interest to owners and developers of real estate that is attracting more and more attention today. In its simplest form, a microgrid is an electric distribution system that ties together two or more distributed generation resources. It relies on its own wires, but is designed to interconnect to the traditional electric distribution grid at at least one point of common coupling. In this regard, it operates in parallel to the existing grid under normal conditions, but in the event of an outage or disturbance on the grid, a microgrid ideally is designed to isolate itself almost immediately, such that the facilities on the microgrid should experience no interruption in power and can rely on their distributed resources

[64] Jonathan Tirone, *'Dead-end' Austrian Town Blossoms with Green Energy*, Bloomberg News (Aug. 28, 2007)

[65] Larry Rulison, *Green Light for Power Alternative*, Times Union Albany (July 18, 2007)

to continue to generate and receive power. The most common example of a microgrid is a campus-style system, but certain energy developers are now promoting applications in urban areas, either for a defined zone or even for buildings that are not in a confined area, but just connected by electric feeders that are not controlled by the local distribution utility. One can even think of a microgrid on as small a scale as a single building.

A microgrid, which is essentially a new electric distribution system on a small or customized scale, also offers the benefits of the most modern load control and switching technologies. Rather than having to cobble smart grid solutions onto the traditional electro-mechanical systems that are prevalent today, a microgrid can be designed from scratch to optimize smart grid technologies. Certain companies are developing energy management software programs that are designed to allow a microgrid manager to control loads, store energy and produce power through an intelligent network of distributed energy resources, which are not only the disbursed generators, but also energy storage (large-scale batteries, for example) and load control devices.[66] These types of load management technologies are particularly attractive in districts where there are users with different peak load profiles, such as office buildings, light industry, residences and hotels. Electricity can be stored when it is least expensive to produce and then released when it is needed most.

Microgrids are potentially attractive solutions for real estate developers confronted with the technical and financial constraints of the local electric distribution infrastructure today. Rather than having to negotiate with traditional utilities over who will be responsible to pay for the upgrades in transmission and distribution infrastructure necessary to bring power into a real estate development, which is a different way of saying that private parties are being asked to subsidize infrastructure that is going into utility rate bases, real estate developers can spend these funds instead to develop their own modern distribution infrastructure that can produce long-term cost and reliability benefits to their buyers and tenants.

While microgrids show tremendous promise for addressing the environmental and capacity constraints facing real estate developers, they are not yet in wide use and are constrained by a legal and regulatory regime that was put into place many years ago to favor local electric distribution monopolies. Due to the operation of federalism concepts, the law relating to electricity distribution and sales is primarily within the domain of the states. While each state has a different statutory scheme addressing electric distribution, there are a number of common themes to be noted.

First of all, it should be said that generally there is nothing to prohibit a property owner from installing electric distribution infrastructure on its own property. That is why campus style applications are the most prevalent and the easiest to install. Also many states, including New York, have so-called "landlord-tenant" exceptions, meaning that land owners can sell electricity to their own tenants.

Things become much more complicated when the distribution or sale of electricity is desired outside the confines of an owner's property. In most states, electric distribution companies operate under franchises granted by either state legislatures or municipalities. In some cases these franchises are exclusive and in some cases they are not. Since a microgrid

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[66] See discussion of microgrids at nw current.com, Current Commentary, Philip Bane, "Looking Beyond Hydroelectric Energy," Nov. 28, 2007.

is in some sense a redundant electric distribution system, their development is constrained by these laws. In the case where the franchise is exclusive, they are essentially prohibited. In the case where a franchise is not exclusive, they are constrained to the extent the developer of the microgrid has to demonstrate the public convenience and necessity of the new and potentially redundant infrastructure to a state public service commission. Since in most states incumbent utilities have great influence over public service commissions, obtaining a favorable determination is an uphill battle.

In order to determine the legal feasibility of a microgrid project, one also has to drill down to the state and municipal laws and ordinances governing which level of government ultimately has the right to grant easements and rights of way to utility companies. There are as many variations on these themes as there are levels of government in the United States.

Another complication is an unintended consequence of the efforts beginning in the 1990s to introduce competition into electricity distribution. Many states introduced laws "unbundling" generation, transmission and distribution of electricity, meaning that the same company cannot both generate and distribute electricity, except franchised utilities that have "provider of last resort" obligations. These laws constrain the development of microgrids because the participants in the microgrid are in most cases both generating electricity with their own distributed resources and also wishing to sell or exchange it with other members. Further, in some states, once a generator of electricity sells electricity to a customer it becomes subject to regulation by the state public service commission as a public utility. This is of course undesirable for the participants in a microgrid, who are looking to regulate the economics of the transactions among themselves.

In order to assess the feasibility of a microgrid, a developer can also look beyond the traditional public utility type structures and determine what state law provides as to public and cooperative power arrangements. Most states have municipal utility statutes, such that a municipality can contemplate sponsoring a microgrid, depending on the particular provisions of the state's law. Many states also have laws allowing electric cooperatives, which give the members the right to generate and sell electricity to one another. Again, the laws in each state are different on these matters and need to be studied in detail with respect to the feasibility of a particular project.

Since generally speaking it is not desirable for either a distributed generator or a microgrid to operate in isolation from the local electric distribution system, developers of these resources have to deal with the issue of interconnecting to the utility's system. Most jurisdictions have regulations or procedures governing this process. By and large, the regulations are directed towards interconnecting individual distributed generators, rather than small parallel distribution systems, so there is something of a legal gray area in most states about what exactly the interconnection rights are. Irrespective of the details of interconnection regimes from one jurisdiction to the other, they do have the common theme of tending to make it very difficult and expensive for the distributed resource.

Finally, as with distributed generation itself, the economics of the resource are also influenced by what happens under the local utility tariffs when a facility goes from taking all of its power from the local utility to little or none of it. In this case, the facility switches to a so-called "standby" tariff, which may or may not favor the economics of the transaction. In many places, the utilities have gotten public service commissions to approve tariffs that have punitive aspects to them if a facility's own generation assets are taken down either for maintenance or go down unexpectedly and the facility must take more power during a peak-demand time that expected. In other states, these standby tariffs have been designed to be "revenue-neutral" to the utility so that the facility pays a certain fee to the utility to be able to make use of it when needed, but is not obligated to pay punitive "rachet" tariffs if demand is exceeded.

A full discussion of the issues mentioned above would make for a very long paper and as such is beyond the scope of this contribution. Suffice it to say that a real estate or power developer contemplating the feasibility of a microgrid is confronted with a crazy-quilt of antiquated and inconsistent state laws and regulations put into place years ago in order to stack the deck in favor of investor-owned utilities. To say the least, legal counsel with a sophisticated knowledge of these matters is needed to navigate through the obstacle course that is the current American legal framework of electric distribution and sales in order to promote the development of a microgrid in a particular location.

On the positive side of the equation, in some states public utility commissions and legislatures are waking up to the environmental and capacity benefits that distributed resources and microgrids offer and are passing laws and putting into place incentives that are designed to favor these applications. However, the new technologies have for now outpaced the regulatory regime in most places. Anyone wishing to enter this field has to be both well-informed about the current regulatory regime and prepared to participate in an iterative process with the state and local authorities having jurisdiction in order to put into place a framework that favors distributed resources, or at least does not inhibit the development of them.

In sum, combining traditional district energy systems with renewable fuel resources, including various types of municipal waste, and cutting-edge microgrid and load management platforms has the potential for achieving very significant reductions in greenhouse gas emissions, as well as badly needed additional capacity and reliability improvements. Such has been the experience of some cities in Europe such as Gussing, Austria on a small scale and Copenhagen on a large scale and there is no reason in principle why these advances should not be learned from and implemented here in the United States.

VIII. REAL ESTATE CAN BE PART OF THE SOLUTION

It is axiomatic that real estate developers have a distinct aversion to doing anything too complicated about energy issues. The goal of a real estate developer is to plan, get the permits, construct and make ready for use in the quickest and least-expensive way possible, and if thinking about alternative energy methods for powering buildings has any chance of slowing down the process or imposing higher costs than conventional methods, traditionally they have not wanted to hear about it.

This attitude is dying hard, but there is no denying that there are many energy alternatives in real estate development, whether it is residential, commercial, industrial or large-scale mixed-use projects, to the conventional energy model, and more and more developers, especially the larger or more forward-thinking ones, are embracing these options. Indeed, the planning documents for the largest projects under consideration today in New York City make mention not only of building to LEED standards, but also of distributed generation and district energy applications. The owner of the Freedom Tower project at the World Trade Center intends to build it to LEED gold standards and to incorporate 4.8 MW of fuel cell power generation capacity.[67] Each of the proposals for the large Hudson Yards development zone make mention of LEED standards, on-site generation and/or energy storage and some kind of district energy application. Similarly, Columbia University's redevelopment plan for parts of Harlem contemplates a central boiler and steam plant for a portion of the area, which may or may not be powered by some sort of on-site cogeneration.

Beyond the nuts and bolts of issues of source of energy, efficiency in conversion and connection to existing utilities, the real estate community must also brace itself for some sort of carbon legislation that may have a significant impact on the cost of the materials it uses and the planning/permitting process. The day probably is not too far away when some statement of a building's compliance with carbon disclosure or management regulations is an integral part of the permitting process.

In sum, it is a brave new world out there in real estate development. What used to be a fairly simple process with regard to electricity and natural gas, is now presenting real estate developers with many choices that require weighing complex technological, legal and risk factors. Implementing these alternatives gets real estate developers, owners and tenants into contractual and legal processes to which they may not be accustomed. This article has sought to make real estate developers as well as other stakeholders aware of some of the key practical and legal issues that arise when alternative energy is considered, but it has presented only an overview. Most of the issues raised present far more complex and detailed considerations than this article has been able to address. However, it should be emphasized that the legal process, while complicated, can be managed with the help of experienced attorneys to overcome the obstacles that present themselves. Indeed, since building energy usage is at the crux of the greenhouse gas emission problem, one can think of every building, whether it is new or old, as an opportunity to make a difference towards reducing those emissions and the various stakeholders can resolve to make a concentrated effort to turn that opportunity into reality.

[67] *World Trade Center Complex Will Include 4.8 MW of Fuel Cells*, COGENERATION AND ON-SITE POWER PRODUCTION (Nov.-Dec. 2006), p.12.