

Public Sector Leadership: Transforming the Market for Efficient Products and Services

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Abstract

The public sector¹ represents a significant share of all economic activity (15-25%) in Europe's industrial and transition economies. Government agencies, often the largest energy users and the biggest buyers of energy-using equipment, have significant potential to reduce energy use in their facilities and operations, while also saving taxpayer dollars and avoiding emissions of air pollutants and greenhouse gases. Public sector leadership can be the first step toward market transformation, as government creates entry markets and sets an example for other sectors to adopt efficient technologies and practices (Van Wie McGrory et al. 2002).

While public sector energy efficiency has not been highlighted in EU or IEA policy compilations, many government agencies from the national to the municipal level have acted to reduce their own energy use, stimulate market demand, and provide an example to others through intergovernmental networking. Several EU projects have addressed the use of government buying power to help commercialize new technologies and to increase the market

share of efficient appliances. However, additional steps are needed in order to establish public sector energy efficiency as a core element of energy and climate change policy in Europe.

Based on a selected review of public sector energy efficiency activities in the EU we define five program categories:

- **Policies and targets** (energy/cost savings; pollution/ CO₂ reductions; measurement and verification; tracking and reporting)
- **Public buildings** (energy-saving retrofit and operation of existing facilities, as well as sustainability in new construction)
- Energy-efficient **government procurement**
- Efficiency and renewable energy use in **public infrastructure** (transit, roads, water, and other public services)
- **Information, training, incentives, and recognition** of leadership by agencies and individuals

We discuss examples of program success, lessons learned, and future initiatives to strengthen these activities through increased recognition of the leadership role of public sector energy efficiency, information-sharing and collaboration, coordinated procurement to aggregate buyer demand, building energy performance benchmarking, and the development of international standards of practice for public sector energy management. The EU can also play an important role, through its foreign assistance activities, in promoting the broader international acceptance of public sector energy efficiency.

Introduction – The Case for Government Sector Energy Efficiency

The public sector represents a significant share of all economic activity (15-25%) in Europe's industrial and transition economies. Within each member economy, government agencies, ranging from schools and municipal water systems to national ministries, are collectively the largest users of energy and the largest buyers of energy-using equipment. There is significant cost-effective potential to save energy in EU government facilities and operations – on the order of 20% or more.² This in turn will save taxpayer dollars and reduce greenhouse gas emissions. Effective and visible actions by the public sector can also trigger a broader market transformation, as others follow the government's example and adopt efficient technologies and practices.

Despite many innovative and effective programs, the policy commitment to public sector energy management varies widely among EU countries and among government jurisdictions within each country. Realizing the full potential for energy, cost, and pollution savings – and market leadership – will require additional steps. This paper highlights both the achievements and the remaining opportunity for public sector leadership, with the aim of encouraging policy-makers to add or strengthen this element within their national energy and climate-change policies.

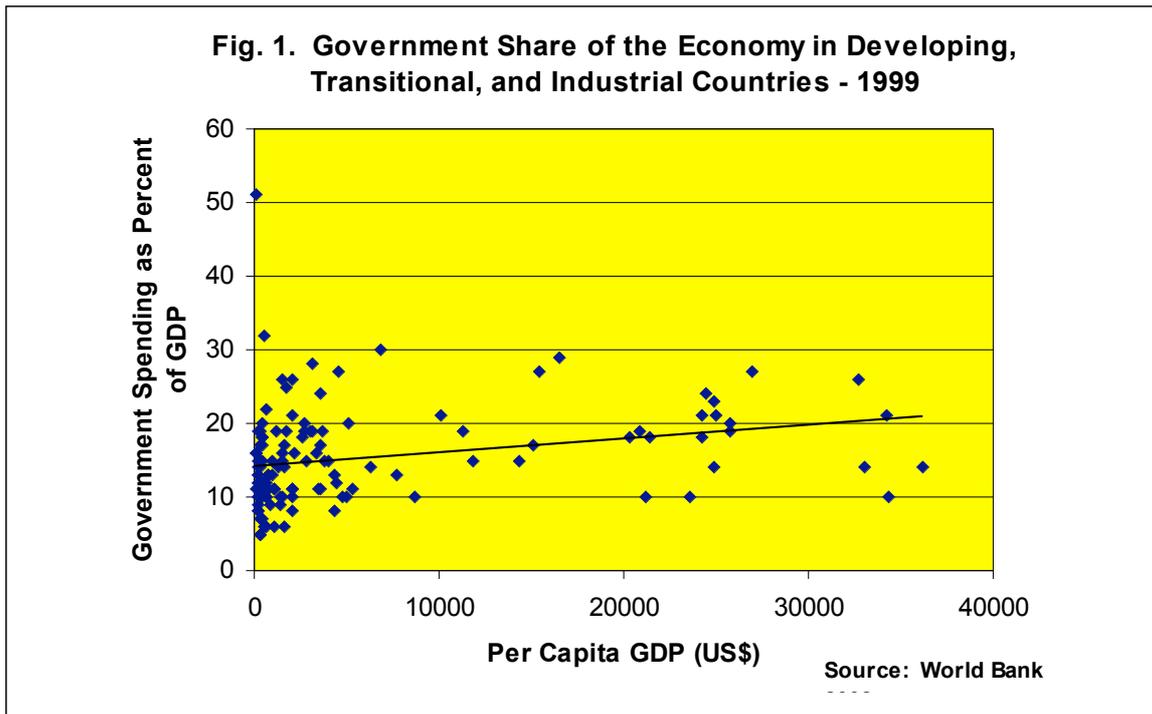
Economic Significance of the Public Sector

How important is the government sector within the total economy? For the EU-15, the average share of GDP represented by government expenditures at all levels (excluding “social protection” transfer payments) was about 18.5% as of 2001; education, health, and general public services each accounted for about one-fourth of this total (Revelin 2003). While the share of GDP varies by EU country, the range is consistent with estimates for many other countries: about 10-20% across a wide range of per capita GDP, from wealthy industrialized countries to less developed economies with very low per capita income (Figure 1).

Other indicators of the government sector's economic significance include the percentage of total building energy use attributable to public buildings, government's share of building floorspace, and the percent of total employment. Government facilities in the EU-15 (excluding vehicle fleets and transit) account for about 10% of total heat and electricity use. This public sector share ranges up to 20% in Eastern Europe due to economic structure and the prevalence of district heat, and about 30% in Sweden because of the significance of public housing (Borg et al. 2003, Chap. 12). Municipal energy use alone is about 3-6% of total energy used in urban areas, while energy bills represent 3 to 5% of a municipality's operating budget (again, higher in Central and Eastern Europe³). Indicators of employment and building floorspace, while not consistently available for all countries, show similar patterns.

The pattern is similar in the US, where total government spending (federal, state, local) accounts for 18% of Gross Domestic Product (GDP). Government workers (including military personnel) represent about 16% of non-farm employment, government buildings account for about 21% of floorspace and 25% of energy use, compared to all non-residential buildings (US DOE/EIA 1995, US Census Bureau 2001). Although the US federal government represents only 20-25% of total public sector economic activity, the federal government is also the world's largest buyer of most energy-related products and services, spending more than US\$10 billion/year on energy-using

equipment and making federal policies on energy-efficient purchasing an important force in the market (Harris and Johnson 2000).



Government Leadership and Market Transformation

While the public sector is a significant force in the economy, these indicators (share of GDP, employment, or building floorspace) actually understate the potential for government’s energy-efficient policies and practices to influence the broader market, in both tangible and symbolic ways. Any customer segment representing 15% to 25% of the market will deserve (and receive) careful attention from manufacturers and product or service providers. This customer signal can be further amplified through well-defined government policies, construction specifications, contract provisions, and purchasing criteria that emphasize energy efficiency.

By working together to harmonize purchasing specifications for energy-efficient products, government agencies are even more likely to focus the attention of manufacturers and suppliers, stimulating them to offer new and improved products as well as more competitive prices. As one striking example of how government can help commercialize new energy-efficient technologies, the 1993 Executive Order in the US directed all federal agencies to purchase only energy-efficient computers and office equipment that qualified for the Energy Star® label. Although federal sales amounted to only 2-3% of the market, this policy caused an immediate jump in manufacturers joining the Energy Star program, with most types of office equipment quickly reaching Energy Star penetration rates of 90% or more. Another example of government’s tangible role as a market leader was the introduction of seat belts and later airbags in federal fleet vehicles, well before their widespread popularity in US cars (followed by mandatory regulations). There are numerous other examples of successful innovation through public sector “technology procurement” in Sweden and other EU countries (Westling 2000, Attali 1998).

Finally, when government is among the first to take action, and then widely publicize its experience and resultant energy savings, this can be a powerful motivator for others – private enterprise and individual citizens – to follow the lead. Public sector energy efficiency is good politics as well as good policy, supported both by conservative politicians based on “government following sound business practice” and by liberals who see energy efficiency as a practical way to reduce pollution and greenhouse gases. Little surprise that in every region, from the Asia-Pacific Rim to North America, Africa, and many European countries, one hears the phrase over and over: “Government must lead by example,” or as stated in a recent EU report: “Public buildings [should serve] as shining examples.”⁴

Government Sector Policies and Programs in the EU

Program Categories

Even though government agencies in many countries, from national to municipal levels, are taking action to reduce their own energy use and set an example for others, public sector energy efficiency has not yet been identified as a separate program category in either EU or IEA policy compilations. An exhaustive inventory and assessment of EU

programs for public sector energy efficiency, while beyond the scope of this paper, would be a worthwhile future task. In this section we summarize a very limited set of programs in several EU member countries, in order to illustrate the range of opportunities and to help identify some key features of successful programs. We then discuss ways to further expand and strengthen these activities by encouraging information exchange and increased collaboration within and among EU countries. This is by no means an exhaustive listing⁵; we hope that you, the readers, will help us build on this initial list by contacting us with additional examples to help fill in the picture.

We group public sector energy efficiency programs in five categories:

- **Policies and targets** (energy/cost savings; pollution/CO₂ reductions; measurement and verification; tracking and reporting)
- **Public buildings** (energy-saving retrofit and operation of existing facilities, as well as sustainability in new construction)
- **Energy-efficient government procurement**
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Policies and Targets

Many government entities set specific targets for public sector energy efficiency, often in the context of a broader policy on climate change or sustainability. Ideally, these goal statements are defined at three levels:

- Overall goals - reduced energy intensity by sector, lower carbon emissions, savings on government energy expenditures, etc.
- Specific performance targets for government facilities or activities - reduced building energy use per sq.m., increased share of energy from “green power” or renewable fuels, improved fleet vehicle economy, reduced transit energy per passenger-km, etc.
- Operational objectives for specific government programs or activities - efficiency standards for new buildings and equipment; number of energy audits completed in public buildings; payback criteria for retrofit investments; or participation in certification, metering, or energy management campaigns

Goals and targets should also assign responsibilities and timetables for data collection and progress reporting.

One example of a comprehensive approach is the UK “Framework for Sustainable Development on the Government Estate⁶,” issued in 2002. Specific goals and targets for the government sector include:

- Reduce carbon emissions due to fuel or electricity use in government buildings by 12.5% by 2010-11 (relative to 1999-2000).
- Increase building fuel and electricity efficiency (kWh/sq.m. of floor area) by 15% over the same period.
- By 2010, obtain at least 10% of electricity from renewable sources (purchased or self-generated) by March 2008, and at least 15% of electricity from combined heat and power (CHP).
- Include provisions in estate management contracts for reducing carbon emissions and collecting energy data.

At the level of operational objectives, the UK Framework also directs each department to:

- Inventory the existing building estate to identify opportunities and set priorities.
- Prepare a strategy for achieving the savings targets, including baselines and data collection plans, responsibilities, and resources required.
- Implement environmental management system practices, eventually covering all facilities.
- Issue regular public reports on environmental performance of departmental buildings, compared with targets.

Beginning in 2001, each departments must also reduce its energy use by 1%/year, contribute to the overall UK target of reducing greenhouse gas emissions in 2012 by 12.5% below 1990 levels, and reduce operating costs – of which energy costs are one component – by 3%/year (Borg et al. 2003, Appendix).

The “SwissEnergy” program has a similar set of goals and targets. SwissEnergy was launched in 2001 as a successor to the “Energy2000” program with increased emphasis on climate and sustainability; “Public Sector and Buildings” is one of four program elements. The program emphasizes collaboration among all three levels of government: at the national level the Swiss Federal Energy Office provides overall management and coordination while the cantons (provinces) and municipalities (communes) are mainly responsible for implementation. Non-federal sources (including third parties) contribute about 60% of program funding (Borg et al. 2003, Appendix). Program goals for SwissEnergy identify these public sector targets for 2010:

- Overall, CO₂ emissions 10% below 1990 levels, with a 15% reduction in heating fuels, 8% in motor fuels, and electricity demand growth not to exceed 5% in ten years.
- Ten percent (10%) energy savings in public buildings (all levels of government).
- An increase in the number of cantons earning the “Energy Town” label from 66 to 110 within five years, with associated savings estimated at 5000 PJ. (Not all of this savings would be in public facilities.)
- The Canton of Zurich recently adopted a policy of reducing public building energy use by 2%/year, while 13 local authorities participating in the “Climate Alliance” have committed to a long-term goal of 50% carbon reductions (without a specific timetable).

Swiss strategies to achieve these public sector goals include: professional education and training, voluntary programs (like the “Energy Town” label), and energy management and Energy Service Company (ESCO) funded retrofits in public buildings and other facilities (sewage treatment, water supply, waste incineration). Other programs emphasize tighter energy specifications for new construction and refurbishment (“MINERGIE”), solar photovoltaic panels and micro-cogeneration for schools and sports centers, and energy-efficient government procurement of office equipment and white goods. And, of course, the assertion that “Cantons must lead by example ... through demonstration programmes on their own buildings.”⁷

Public Buildings

A variety of strategies are used to address the energy-savings opportunities in both existing and new public buildings. Based on their experience with more than 500 municipal programs, Energie-Cités⁸ estimates that energy savings of 40% or more are achievable in municipal building heating and public lighting. Key strategies for municipal buildings include:

- Building monitoring, benchmarking, and energy “certificates” (the DISPLAY campaign⁹) to provide meaningful feedback to agency managers and on-site personnel, as well as competitive pressures to improve performance because each building’s energy use data are available to public officials and the general public.
- Energy audits and feasibility studies, followed by installation of cost-effective measures such as insulation; timers and other controls; separation of circuits; boiler, ventilation system, and air conditioner maintenance or replacement; and improved lighting efficiency and controls.
- Project financing through ESCO or third party contracting, “intracting,” and equipment leasing. When soliciting bids from energy services companies, cities such as the Berlin and Graz energy agencies have found it advantageous to pool several municipal buildings under a single ESCO contract (Energie-Cités 2002).
- Energy-efficient and green procurement for both products and services.

The following examples illustrate these strategies for saving energy in public buildings (procurement is covered in the next section).

Building Certificates in the UK and Denmark

A number of initiatives, for both public and privately owned buildings, have been launched in response to the energy certification requirements of the EU Directive on Energy Performance of Buildings.¹⁰

“Public authority buildings and buildings frequently visited by the public should set an example by taking environmental and energy considerations into account and therefore should be subject to energy certification on a regular basis. The dissemination to the public of this information on energy performance should be enhanced by clearly displaying these energy certificates.” (Directive 2002/91/EC)

The UK is very active in public building energy rating and certification, with on-line benchmarking tools and associated Best Practice Guides for public buildings, offices, and sports centers.¹¹ UK policy now requires all new and refurbished government buildings to be rated under the British Research Establishment Environmental Assessment Method (BREEAM), which includes significant credits for energy efficiency and reduced CO₂ emissions. Government buildings must achieve a rating of “Excellent” for new construction or a “Good” rating for major refurbishments.¹²

As part of the Energie-Cités DISPLAY campaign, the city of Odense (DK) incorporates building energy monitoring and labeling into a broader energy management program initiative.¹³ The city first addressed municipal building energy management in 1979, in response to a sharp rise in district heating prices. Today a staff of 5 are responsible for energy management in over 625 municipal buildings (950,000 sq.m. heated), including 35 schools that account for one-third of total energy use. The 100 largest buildings receive annual inspections and an annual energy performance rating based on the Danish “Energy Mark” m certification scheme. The Danish building label closely

resembles the EU appliance label, with an A to M scale representing a standardized rating of the building's energy and water use and CO₂ emissions compared to other similar buildings (14 building types).

A key feature of the program is the installation of 2600 energy meters in these 625 municipal buildings, many of them read manually (e.g., by school personnel) but some connected by phone or internet for remote reading on a daily basis. The city also emphasizes energy management training, user awareness, and investment in retrofit projects with up to 6-year paybacks, but 15% of all energy savings are attributed to consumption monitoring alone. Odense had targeted 15% savings of energy and water use in municipal buildings by 2005 (compared with 1988); many buildings had already met this goal by 2003. The city's long-term commitment has paid off: from 1981 through 2002 Odense invested a total of €16 million and saved €48 million (€2.4 million/year), out of a total municipal building energy bill of about €15 million for heat, diesel oil, natural gas, electricity, and water.

Existing Buildings in Switzerland – the “Energho” Model

The Swiss program “Energho” offers an innovative approach to a public-private partnership, illustrating the strong emphasis on intergovernmental coordination in Switzerland.¹⁴ Energho, a non-governmental “partner-organization” created by SwissEnergy in 2001, was specifically designed to provide energy management services for public buildings at the federal, cantonal and communal levels and achieve at least 10% energy savings within five years. Energy savings potential for cantons alone was estimated at CHF 200 million/year.

Energho itself is a non-profit organization, led by a consulting company and affiliated with private consulting engineers around the country who have been certified under the program. Energho and its affiliated firms perform some of the functions of a heat service company (“exploitant de chauffage”), mainly operation and maintenance of heating systems in public buildings, but also offer training and experience-exchange among facility managers in the government agencies they serve. They do not sell fuel oil or electricity as a “full-service” heating company might, although they do guarantee energy savings – concentrating mainly on heating systems and in some cases ventilation and air conditioning. Other end-uses, such as lighting in public buildings, can also be addressed.

The financing model is one of the most interesting aspects of Energho. The building owner pays a fixed amount annually for 5 years (roughly CHF 5000 for an office building with 100 employees, or comparable amounts per 100 beds in a hospital or 100 students in a school). Energho receives a similar amount from the canton or municipality, and from SwissEnergy. Energho guarantees 10% energy savings over 5 years, and gets to keep 20% of the energy cost savings during that time. At the end of early 2003 there were 30 subscriber agencies under contract; that number rose sharply to 89 within one year but still fell short of the targeted 140 subscriptions.¹⁵ The federal contribution of CHF1.3 million that year was more than matched by CHF1.9 million in non-federal and third-party funding.¹⁶ Even though some of the subscriptions were less than a year old, energy savings for heating and electricity averaged 4%, at a cost of 0.36 centimes/kWh saved. Although the program is still relatively new and continues to evolve, there has been discussion of extending Energho's services beyond public buildings to other large energy users.

Energy Management in German Public Buildings¹⁷

In Germany energy management for public buildings is rooted in a response to the second oil crisis of the early 1980s, further accelerated by the environmental and climate protection policies adopted at both federal and local levels in the 1990s. Most of the states have installed energy management systems in public buildings; in the case of North Rhine-Westphalia this was a major contributor to a 26% reduction in heating energy between 1980 and 2001. Almost three-fourths of municipalities also have energy management systems and programs for their public buildings, including schools, and 60% of federal facilities have designated on-site energy managers.

The municipality of Frankfurt/Main has a very comprehensive energy management strategy, led by a five-person staff. Achieving a 16% reduction in CO₂ emissions over 10 years (despite an increase in floor area) has required actions on a number of fronts:

- Energy monitoring and benchmarking - Energy use data are reported each month as a basis for tracking operation and maintenance effectiveness and prioritizing future investments. The majority of building meters are read manually; less than 20% of floorspace is served by automated (remotely read) meters.
- Investment funds - The city's maintenance fund includes a specific amount set aside for energy efficiency (€7 million/year), but actual investments may exceed this minimum amount. For example, a total of €23 million was invested in energy-saving projects in 1999, leading to annual savings of €1.4 million.¹⁸
- Efficiency requirements and retained-savings - The municipality has adopted building efficiency specifications for all new construction and equipment purchases; any exceptions to the energy requirements must be justified based on a lower life-cycle cost. A detailed life-cycle cost analysis, required for all energy-related investments above €250,000, can include an externality-cost premium of €50 for each ton of avoided CO₂. Finally, the

Frankfurt City Council decided in 1996 that each municipal facility would be able to retain 50% of the energy cost savings achieved, compared to the baseline 1996-98 period.

- Training and information - Training seminars are provided to an on-site “energy watcher” (Energiebeauftragte) in a number of schools; these individuals are expected to provide local training and guidance for other on-site staff and help to educate students and other building occupants.

Danish Energy Management – Setting an Example

In Denmark, improved energy efficiency in public buildings is supported by both the Danish Energy Authority (DEA) and the Danish Energy Saving Trust (DEST), an independent agency funded by a surcharge on electricity use. Both DEA and DEST have increasingly emphasized voluntary, market-based programs; DEST also makes use of Internet tools as well as access to funding for subsidies targeted to both consumers and public agencies (but not private enterprise). The recent “Energy Savings Action Plan” includes a number of requirements for all agencies:

- Implement all energy-saving measures in existing facilities with payback times of 5 years or less.
- Using the DEST “Watch Electricity Consumption” site, track electricity use for each public building and publish the results on-line. This system shows hourly electricity consumption, uploaded daily, for comparison with past records of that building and with other buildings. The data are made available to the public.
- Ventilation system efficiency is addressed through technical information, a certified energy audit for a fixed low price, installation of internet-compatible meters, and subsidies for three standard retrofit packages.
- For lighting systems there are published lists of recommended lighting equipment with specially negotiated prices, subsidies for replacing older, less efficient systems, and arrangements with qualified installers.
- DEST provides a subsidy for conversion of electric heated public buildings to district heating. The district heating utility provides a discounted connection fee.
- “The Office Campaign” targets both public and private offices; in addition to the activities mentioned above (and procurement of efficient office equipment) the focus in 2005 will be on ways for employees to help reduce electricity use.

Other Danish policies regarding government procurement of white goods, office equipment, and low-standby products are discussed in the section on “Procurement.”

Public Internal Performance Contracting: A New Twist on ESCO Financing

While many municipal, state, and national agencies in Europe are familiar with energy performance contracting using private energy service companies (ESCOs), a more recent innovation is the “PICO” or Public Internal Performance Contract (also called “intracting”) promoted through a series of EU-funded projects. As described on the ICLEI website:

“Very similar to performance contracting, public internal performance contracting (PICO) represents a way to enable energy efficiency investments by a kind of in-house ‘third-party’ financing or energy performance contracting scheme. One unit of the public authority, e.g. the technical department of a municipality, delivers the financial and technical energy efficiency service to another unit, and the remuneration takes place through cross payments of budgets between the two separate organisational units of the same public administration.”

The PICO approach has been used successfully by the cities of Stuttgart, Kiel, Wuppertal, Dresden, the Schwalm-Eder and Rheingau-Taunus districts, and Frankfurt/Main (Borg et al 2003, Chapter 7). Seven municipalities have EU-funded demonstrations underway to apply the PICO concept to lighting and other end-uses in public buildings: Stadt Salzburg, Austria; Université de Bordeaux, France; Bau-und Liegenschaftsbetrieb NRW, Germany; Ospedale Niguarda Ca’ Granda and Provinciale di Bologna, Italy; Miasta Jordanowa, Poland; and Malmö, Sweden.¹⁹

Public Leadership for Effective Regulation

Some municipalities have achieved notable success with carefully designed energy-efficiency standards for new buildings – especially when government itself assumes the role of “early adopter” to encourage others to comply.

One example is the Barcelona Solar Thermal Ordinance.²⁰ The municipal requirement to install a specified amount of solar hot water collectors or other solar technology applies to all buildings – including municipal facilities – at the time of construction or major renovation. As a direct result, for the city’s municipal buildings alone total installed solar systems grew from about 600 to 2,400 sq.m. between 2000 and 2003; this helped set the pace for citywide growth of solar collector installations from 1,600 to 19,600 sq.m. during the same period.

In Finland, the Ministry for Trade and Industry and Ministry of Finance have established guidelines for the management of public properties.²¹ The guidelines specify energy efficiency and sustainability requirements for

both new construction and renovation projects. The administering agency for public buildings, Senate Properties, has developed target values to be met; for example, a new building must typically use 50% less energy than the average for existing buildings of the same type. Heat demand in new public buildings is approximately 15 kWh/m³/year, compared to an average of 45 kWh/m³/year in the existing public buildings stock. Use of life-cycle cost criteria in both procurement and commissioning of new buildings has also been a major factor:

“Senate Properties has also unique experience within the public sector in Europe by introducing lifetime costs into the building commissioning process. Two recently finished university buildings were partly tendered based on life-cycle costs: in addition to general investments 5 years of full operational costs (including energy) were included [in the bid price]. Senate Properties is also planning to introduce life-cycle tendering to elevators and lighting systems.” (Borg et al. 2003, Chapter 4, p. 24)

Government Procurement

One highly effective way for government agencies to institutionalize energy-saving practices in their day-to-day operations is by establishing energy-efficient criteria for the purchase of appliances and other energy-using equipment, ranging from consumables like light bulbs, to office equipment and white goods, to large boilers, motors for ventilation fans or pumps, and fleet vehicles. Unlike larger, capital-intensive projects, energy-efficient procurement offers a means to achieve energy savings that add up significantly over time, simply by redirecting the funds that will be spent anyway to buy or replace essential equipment. Energy-efficient procurement is also a potent way aggregate public buying-power to stimulate broader market change. The Johannesburg World Summit on Sustainable Development, in its *Plan of Implementation*, called for:

“Promote public procurement policies that encourage development and diffusion of environmentally sound goods and services.” (WSSD 2002)

In many EU countries, as well as the US and others, energy-efficient government purchasing is becoming common – though far from universal – practice.²² However, realizing the full market impact of public procurement policies will require harmonization of energy efficiency specifications in order to send the clearest possible market signal to the private sector (manufacturers and distributors). This key point was emphasized in the EU-funded “PROST” study, “Harnessing the Power of the Public Purse,” an assessment of policies and prospects for energy-efficient government purchasing in 7 EU countries, with 12 others reviewed as examples (Borg et al. 2003).²³ The study concluded that, for the EU as a whole, public sector investments of about €80 million/year in program management and incremental purchase costs could lead to government energy cost savings of up to €12 billion annually.

The non-governmental organization ICLEI has been active on environmental purchasing at the municipal level, sometimes including energy-efficient purchasing. ICLEI’s Eco-Procura campaign (later Procura-plus) began in 1996, with a series of European conferences on environmental purchasing (Hanover 1998, Bilbao 1999, Lyon 2000). ICLEI has encouraged networking among public procurement specialists in the EU through the Buy It Green Network (BIGNet) and published a Good Practice Guide. However, in common with many other “Buy Green” initiatives, these campaigns have often paid less attention to energy-efficiency (with the exception of office equipment) than to other environmental attributes such as recycled, locally produced, and biodegradable products. One ICLEI Experts Workshop, however, focused specifically on energy-efficient purchasing (ICLEI 2000).

Examples of other active programs include²⁴:

- **Austria:** The EU-sponsored Check-It campaign includes energy-efficient specifications for office equipment and white goods (along with environmental specifications for interior furnishings, office supplies, and cleaning products).
- **Finland:** The Ministry of Trade and Industry issues procurement criteria to be followed by all government purchasers, who collectively represent about €19 billion in annual purchasing (though only a portion of this is spent on energy-using products). Energy efficiency criteria apply to lighting, heating and cooling equipment, office equipment, white goods (A-rated), and vehicles. The HYMONET database provides on-line product information and guidelines on energy-efficient and green products.²⁵
- **UK:** Beginning in 2002, the UK government adopted a policy of purchasing “sustainable” products, with energy efficiency as one element of sustainability. New, more specific procurement requirements were adopted in November 2003. The Office of Government Commerce works with the Department of Environment (DEFRA) to identify energy efficiency specifications and product sources for several product categories.²⁶

Overall policy on public procurement in the UK emphasizes “Value for Money” (VFM), or life-cycle costing; energy costs are one important element for many types of equipment. A recent report extended the VFM theme with specific criteria for energy-efficient purchasing (“Quick Wins”) to be used by all government purchasers. Quick Wins specifications cover Energy Star® office equipment, A-labeled white goods, high-efficiency

boilers, lighting, motors, and other equipment (Sustainable Procurement 2003). Agencies can purchase complying products from OGC Buying Solutions, a buying agency functioning under the Treasury.²⁷

There is also “Greening Government Operations” guide for buyers and a separate “Guide to Choosing Environmentally Preferable IT Equipment; both documents include information on energy savings from efficient office equipment. The “Greening Government Operations” guide directs buyers to “...specify the highest ratings under the mandatory EU energy labelling scheme and take account of the EPA’s Energy Star.”²⁸

- **Denmark:** The Danish “A-Club” is a very successful procurement initiative established in 1999, mainly as a service to public organisations but with private firms also allowed to join. A-Club members enter a four-year agreement with the Danish Energy Savings Trust (DEST), with each member committing to buy only products that meet the energy efficiency criteria. These include A-rated household appliances and light bulbs, along with office equipment and consumer electronics that meet GEEA (Group for Energy-Efficient Appliances) criteria.

The A-Club provides technical specifications and models for members to use in procurement, as well as special offers and brand-specific information on efficient models through a Website (Danish only). Public agencies are also eligible for occasional DEST subsidies, such as the campaign in Fall 2004 to promote A+ or A++ rated fridges and freezers through a 500 DKK subsidy (≈€ 67.00). When a public agency joins the A-Club, the agreement is seen as a serious policy commitment, typically signed by the relevant minister, mayor, or agency director. Currently, 190 organizations are A-Club members with another 40 considering membership. Public members include the Danish Parliament, 9 government ministries and agencies, 7 county administrations, and 71 municipalities. In total, the A-Club’s government members account for over 20% of public sector electricity sales in Denmark.

According to an agreement signed in September 2004 between DEST, a national buyers organization (SKI), and several information technology (IT) suppliers, all future government purchasing will use new, stricter energy efficiency specifications for PCs and monitors, including low levels of standby power as well efficient operation in “sleep” and active modes. A nationwide marketing campaign will encourage non-government buyers to use the same criteria.

“e-Parliament” Network²⁹: The e-Parliament was formed in 2002 as a voluntary international network of elected government officials who communicate mainly on-line, share ideas on legislation to advance sustainability. The “Action Network on Climate and Energy” includes a strong emphasis on energy efficiency. One key policy recommendation is that governments should use their buying power to encourage a market shift toward energy efficiency. Part of the e-Parliament Toolkit addresses low standby power, with specific reference to the US government Executive Order in 2001, directing federal agencies to buy low standby products.³⁰

Joint Purchasing: As one outgrowth of their participation in the Eco-Management and Audit Scheme (EMAS),³¹ a number of municipalities in the UK, Sweden, Spain, Greece, and Portugal have joined together under the auspices of ICLEI-Local Governments for Sustainability³² on an EU-funded joint purchasing project, LEAP (Local Authority EMAS and Procurement).³³ While a survey of the environmental priorities of local procurement officials identified only a few related to energy efficiency, LEAP members launched one energy-related initiative to combine their buying-power in order to obtain more competitive prices for efficient flat-panel computer displays (ICLEI 2004).

After the Purchase: Opportunities to save energy do not stop at the point of purchase. One example is the “Campaign for No-cost Measures in Offices,” a collaborative, EU-funded effort led by the Berlin State Senate Department for Urban Development and involving agencies in the UK, Germany, Austria, France, and Spain.³⁴ The campaign emphasizes both energy-efficient procurement and energy-saving behavior by office workers. Since the program was only started in early 2005 the level of participation and resultant savings are not yet clear, but this is an example of a campaign that public agencies could follow both for their own benefit and to set an example for others.

Public Infrastructure

Opportunities for saving energy in public infrastructure – ranging from public lighting and traffic signals, to transit and bus systems, to water pumping or treatment plants and vehicle fleets – all share some characteristics with strategies for energy savings in public buildings, as outlined above. Examples include:

- cost-effective design criteria for new installations;
- operator training and technical guidelines for efficient installation, operating, and maintenance practices;
- applying life-cycle cost criteria to investments in energy-saving retrofit measures, through either budgeted or third-party (“off-budget”) loans, leases, or ESCO funds; and
- using energy-efficient criteria when purchasing or replacing equipment.

Transit

Within the European transit sector there are some important initiatives for improving the fuel efficiency of public transit fleet and to reduce carbon emissions through means other than vehicle efficiency: reduced vehicle use, bio-fuels, or lower-carbon fuels such as natural gas. In the late 1990s ICLEI sponsored a “Green Fleets” project, aimed at building awareness among municipalities and implementing a range of carbon-saving measures through vehicle operations, as well as vehicle efficiency and fuel choice.³⁵ Beginning in 2000, the EU CIVITAS program funded demonstration projects for clean (public and private) vehicle fleets. Other EU campaigns (ENERGIE, CUTE) provided support for fuel cell bus demonstrations, initially in Berlin, Copenhagen, and Lisbon with later expansion to 10 cities.³⁶ Municipalities in countries such as Switzerland, Austria, and Greece have enrolled their public transit drivers in the “Eco-drive” training course.³⁷ There are still other transit-related opportunities, such as upgrading lighting efficiency in public transit stations and maintenance facilities, or the use of combined heat and power.

Public Lighting

Public lighting for roadways, parking garages, parks, and other public spaces offers many opportunities to upgrade energy efficiency. Many municipalities have achieved significant reductions in street lighting energy use (and/or improved night-time illumination) with attractive payback periods.³⁸ However, this technical potential may be hampered by ownership patterns or lighting service agreements (i.e., payment based on a fixed cost “per light pole per month”), which do little to encourage cost-effective management or retrofit. This excerpt from an Energie-Cités case study illustrates both the problem and possible solutions:

“Jyväskylä [Finland] restructured its energy service in preparation for liberalisation, separating the energy works into a separate energy company, taking back in hand the public lighting stock formerly managed directly by the energy works, and introducing a clear contract framework designating responsibilities. Within four years three quarters of the street lights had been replaced by more efficient ones. Similar benefits were found in Stockholm following liberalisation. The abandonment by the municipal energy service of the free supply of energy for local authority functions resulted in true costs being appreciated.” (Energie-Cités 2002)

Traffic Signals

In 1996 the City of Stockholm was the first in Europe to consider replacing all of its existing traffic signals, then using incandescent lamps due to cold-temperature start-up requirements, with 100% LED (light-emitting diode) signals.³⁹ Energy savings were over 90%, or 5800 MWh/yr., worth about €285,000/year. When combined with the maintenance costs saved from avoiding the replacement and disposal of 80,000 burned-out lamps annually, this resulted in a 4.2 year payback.

Information and Training, Incentives and Recognition, Networking

Many public agencies, lacking the private sector’s strict accountability of bottom-line profits, find it useful to institute regular awards programs to recognize those individuals or agencies that are doing the best job in implementing energy efficiency policies and programs. Award and recognition programs, which may take a variety of forms, can have a surprisingly strong and lasting effect in motivating public employees and top governmental officials alike – especially if the awards are presented in a public ceremony by senior management or by elected public officials, as is the case with the US Department of Energy’s Secretarial Awards and Presidential Awards.⁴⁰

A partial parallel might be found in the European Energy Award (EEA),⁴¹ although it is not clear to what extent this is based on actual improvements in a municipal government’s own energy use. This award scheme, based on earlier programs in Switzerland and Austria (Energierstadt Schweiz and e5 programs), involves:

- Establishment of a total quality management (TQM) system for communal energy-related activities
- Certification and award for energy-related achievements in two award categories and verification through regular audits
- Establishment of a network within the community and between communities to increase co-operation and communication

Both negative and positive publicity can be strong motivators, as in the case of openly publishing rankings that compare agencies or individual buildings on their relative performance in efficient use of energy (see the earlier discussion of new EU requirements for Building Certificates). As mentioned above, other examples of the variety of recognition and incentive programs are the Swiss “Energy Town” designation, and policies in the City of Frankfurt that allow individual agencies to retain 50% of energy cost savings for their own use, rather than returning these savings to the common treasury.

Networking Resources

A number of existing EU mechanisms encourage networking on public sector energy management; these include periodic conferences, workshops, and on-line resources for case studies and partner-searching. The EU ManagEnergy website⁴² includes a partner-search capability for energy management projects. A common entry might be from a municipality seeking partners to apply jointly for EU funding. Others might seek an exchange of information, while some entries represent commercial firms seeking clients. Recent examples from the PartnerSearch page illustrate the broad range of activities:

- Creation of new energy agencies at the municipal or regional level (France, Spain, UK, Italy, Slovak Republic, Finland)
- For smaller cities and towns, public sector energy management (Spain) and district heating/cogeneration (UK)
- Financing schemes, building certification, savings measurement and verification (M&V) and emissions trading for municipal projects (Bulgaria)
- International experience exchange on building energy benchmarking, certification, and occupant feedback (Spain, Germany, Sweden, Denmark)
- Efficiency and solar measures in municipal buildings (Portugal, Germany)
- Energy manager training (Germany, France)
- Web-based real-time energy and water monitoring of public buildings (Denmark, UK)
- Energy auditing (Latvia)
- Social housing retrofits (France, Germany, Bulgaria, Italy, Latvia)
- Hybrid and alternate-fuel public fleet vehicles, including H₂ street-sweepers (Switzerland, UK, Netherlands)

While already a useful resource to link existing programs or help spark new initiatives, further changes in this EU website would make it a more valuable tool for public sector energy efficiency. Organized mainly around EU programmatic themes, the site does not provide an easy way to search case studies or partners for “public sector energy efficiency.” This would be a logical addition, since one can already search under “Energy Efficiency” for industry, education, transport, and communities, and also search under “Target Audience” for health organizations, schools/colleges, and utilities.

The Energie-Cités NGO has been very active in organizing conferences and documenting case studies of energy management and performance contracting in municipal buildings, street lighting, and related topics. Annual ICLEI conferences and other co-sponsored meetings, often with non-EU participants, include:

- “Sustainable Energy Management in Municipal Buildings and Equipment” (Krakow 4/03) - 250 participants from 25 countries
- “Local sustainable energy policies: Working in synergy with the private sector?” (Martigny 4/04)
- “European Conference of Municipal Energy Managers” (Stuttgart 7/04,⁴³ with a follow-on meeting scheduled for Poland in early 2006)
- “Annual Conference on Local Energy Action” (Brussels 10/04)⁴⁴
- “Local Authorities as Energy Consumers” (Grenoble 2/05) - 800 French attendees expected

Another UK-based partnering resource, the Local Government International Bureau,⁴⁵ has the potential to reach a broad community but is not focused on energy management. Conversely, the UK GovEstate Network,⁴⁶ while well targeted to the energy management community, is accessible to members only. Similar restrictions apply to key parts of the ICLEI -Energy and Environment website.⁴⁷

As a future task, it may be useful to study how much each of these networking systems is currently used, by whom, which potential target groups may not be participating (why?), and last, how effective these resources are in providing information and contacts that in turn contribute to new or improved programs with demonstrated results.

Findings and Recommendations

The preceding sections describe only a few of the many ongoing activities on public sector energy efficiency in the EU. And, while we have seen examples of a variety of innovative individual programs, there are far fewer instances of efficiency programs – at any level of government – that are truly comprehensive. This suggests an opportunity to build on existing programs by extending them either laterally (among agencies within a government jurisdiction) or “vertically” (i.e., transferring successful models from municipal to national governments, or vice-versa). What more

can be done to build on this experience, creating synergies among projects (nationally or internationally) that will lead to sustainable market changes? In this concluding section we suggest specific action on several fronts.

Strategic Visibility for Public Sector Energy Management

Public sector energy management, while often mentioned in passing as a useful element of energy policy, has yet to attain “full recognition” as equal in importance to other widely accepted strategic approaches: information, incentives, mandatory efficiency standards, and cost-based pricing of electricity and fuel. For example, after reviewing two recent energy policy compilations, by the International Energy Agency (IEA)⁴⁸ and the World Energy Council (WEC),⁴⁹ we find that neither one specifically addresses a role for government role in improving its own energy efficiency – nor how government actions can lead to market transformation. In contrast, these documents offer many examples of programs and policies for utility market reform, cost-based pricing, appliance standards and labels, and energy-efficient building codes.

Proposed Action: Inventory of Public Sector Energy Efficiency Programs, Potentials, and Best Practices

One way to begin filling this gap would be an international review and assessment, perhaps sponsored by the IEA or EU, of policies and program experience with energy efficiency in the public sector. This might include three elements:

- An inventory of existing programs, including a framework to categorize them, drawing on existing case study materials such as the EU ManagEnergy website, Energie-Cités, and ICLEI case studies.
- A critical review of the program examples, with emphasis on completed evaluation studies, would provide a basis to identify models of best practice in each component program.
- Finally, a meta-evaluation of this collected program experience could be used to estimate the aggregate savings already achieved by government-sector energy efficiency as well as the range of potential savings still available – with results measured in terms of energy and cost savings, avoided carbon, and reduced pollutant emissions. Even more detailed indicators of government sector buying-power and market influence, by country, could also serve as a guide to future policy development.

Proposed Action: ECEEE Panel on Public Sector Energy Efficiency

Another way to help focus attention on past successes and future opportunities would be for the next ECEEE Summer Study to establish “Public Sector Energy Efficiency” as a distinct panel topic. This would help stimulate more thinking, discussion, and documentation of successes and lessons learned within the ECEEE community.

Increased Information-Sharing and Collaboration

To complement this improved program and framework for categorizing public sector energy efficiency programs and policies, there is a need for further information-sharing and collaboration efforts at the regional, national, and international levels. Increased hot-links among the key Websites might also be of value, even if the ideal of a single, “one-stop” Website might remain an elusive goal.

In an earlier section we introduced several existing networks and on-line resources within the EU. One useful step would be a systematic review of the reach, impact, and degree of common ground among these existing resources. This would help determine who is already being reached, to what effect, and whether some important target groups may be missed.

Proposed Action: Experience Exchange and Capacity-Building

It is important to test and disseminate effective mechanisms for regular information exchanges both across national borders and among levels of government – as the “Energho” network does among Swiss municipalities. While organizations such as Energie-Cités and ICLEI offer valuable forums for peer-exchanges at the municipal level, there seem to be fewer counterparts to help states or provinces work together on public sector energy efficiency. The positive examples of cooperation among levels of government, in Switzerland, Denmark, Germany, and to some extent other countries deserves closer attention and emulation.

Energie-Cités also encourages exchange-visits among officials and staff in its member municipalities. To carry this idea further, a program offering professional exchanges among other government agencies might help spread new ideas and bring new attention and excitement to the field of public sector energy management.

Coordinated Procurement

As noted earlier, one of the most important opportunities related to energy-efficient government purchasing is the *aggregation of market demand* for energy-efficient products and services, as one means of increasing the market-transforming impact of government procurement. Government procurement can be a powerful tool for accelerating

the market entry of new energy-saving technologies, expanding the market to competitively drive down costs of available but under-used technologies, and helping to set the stage for periodic upgrading of appliance efficiency standards.

Proposed Action: Market Aggregation

Several EU countries have years of experience with market-aggregation and joint purchasing by the central buying agencies that serve general government or the social housing sector. One or more of these experienced procurement organizations, perhaps with encouragement and funding from the EC, could take the lead in convening a group of public procurement organizations interested in energy-efficient and green procurement. The aim would be to identify specific opportunities for joint action, such as:

- information-exchange on products and specifications,
- harmonization of energy testing/rating methods (where not already achieved),
- shared efforts to develop new, common technical specifications for the purchase of energy-efficient products, or
- cooperative procurement of existing or near-commercial energy-saving technologies, products, and services (such as ICLEI's "LEAP" project on high quality flat-panel displays, discussed above).

Building Performance Benchmarking

There is already a good deal of government-sector activity in response to the EU Buildings Directive, especially for building energy certification and displaying the rated performance of public buildings. Public buildings can again play a key role, as examples to other building owners, as test-beds for new certification methods, perhaps as sites to test and demonstrate new management approaches with continuous feedback to building operators and occupants.

Proposed Action: Information-Sharing and (Eventual) Harmonization on Building Benchmarks

Much of this effort by EU countries represents a "natural experiment" in testing alternative approaches to building benchmarking and certificates, so it is important to have an ongoing forum for sharing results and lessons learned. At some point, it may make sense to push for a harmonized approach to building benchmarking and certification, even though buildings – unlike appliances – are not marketed across borders. The logic for harmonizing benchmarking tools may be more evident for large commercial buildings, which are part of an increasingly integrated EU-wide market for capital assets. But the value in harmonizing benchmarking methods for public buildings, as well, is that the larger the comparison pool, the more valid and convincing the benchmarks or certificates will be for any one building.

International Leadership on Public Sector Energy Management

Proposed Action: International Standards of Practice

As government entities at all levels continue to gain experience with what works best to efficiently manage energy in public buildings and other operations, it may be time to consider codifying this knowledge in the form of standards of good practice. Some starts have been made along this line, as with the UK Best Practice Guides, but much remains to be done to extend this concept to all types of government facilities and operations. Along with international standards of practice, an appropriate form of recognition (i.e., a label or certificate) could be offered – one that would be meaningful to public employees, their contractors and vendors, and elected officials alike. Existing international models, such as EMAS or ISO, may provide one point of departure.

Proposed Action: EU Leadership for Developing and Transition Economies

Attending to opportunities on the home front for making government more energy efficient is an obvious place to start, but not necessarily the place to end. The EU and its member countries are often dominant players in international programs and major providers of foreign assistance. As such, they can play an important role in gaining international acceptance of public sector programs within the energy efficiency and sustainable development policies of many developing and transition-economy countries. This could be done by emphasizing the market leadership role of the public sector in EU foreign assistance programs, by exerting influence on multilateral institutions, and by initiating collaborative efforts with other countries such as the US, Canada, Australia, and Japan – all of which have their own active programs to promote public sector energy efficiency.

Conclusion

As we have seen, in every country from advanced industrial economies and transition economies to less-developed regions there are major opportunities to improve energy efficiency in government facilities, operations, and public infrastructure and services. Benefits include lower government energy bills, reduced greenhouse gas emissions, less

demand on electric utility systems, and reduced dependence on imported oil – as well as the broader benefits of using targeted government purchasing power to lead the market and by creating an example that spurs others to act.

While municipal, state, and national governments throughout the EU have taken some important steps in this direction, there remains much untapped potential – including opportunities for more collaboration and sharing of information, until we reach the point that public sector energy efficiency is recognized, in its own right, as one cornerstone of a comprehensive energy policy.

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Endnotes and Internet References

¹ We use the terms "public sector" and "government sector" interchangeably throughout this paper, to refer to government entities at all levels. We focus on a subset of government energy efficiency policies and programs that address *government's own use of energy*, generally paid from tax revenues. The main public sector energy uses include: administrative, educational, cultural, sports, and health care buildings; social housing in many cases; public lighting and traffic signals; car and truck fleets; public transit (rail and bus); and water pumping and treatment. This paper focuses more on energy efficiency than on renewable energy sources, and does not address energy use or savings potential in publicly owned electric utilities or other public enterprises (but does include district heat).

² This same order of magnitude of savings potential has been estimated by the PROST study (Borg et al. 2003, Chap. 12 and by Energie-Cités. A more detailed analysis would also be of value, as recommended below.

³ In Russia, for example, water and heating bills for public buildings is estimated at 7 % of agencies' total budget, with readily achievable savings of 30% (Chandler et al. 2004).

⁴ EU-SAVE initiative "Multiplying Success in Buildings," http://www.eva.ac.at/publ/pdf/eie_wp_2003.pdf.

⁵ For example, we did not able include a number of interesting public-sector projects supported by the Municipal Network for Energy Efficiency (MUNEE, <http://www.munee.org/>) in Central and Eastern Europe and the Former Soviet Union, a discussion of the active ESCO initiatives in schools and district heating systems in the same region or the federal energy management initiatives, many emphasizing hospitals and public university facilities, in Russia and the Ukraine (Chandler et al. 2004).

⁶ UK Framework: <http://www.sustainable-development.gov.uk/sdig/improving/targetset.htm>

⁷ Excerpt from <http://www.energieschweiz.ch/internet/energie/index.html?lang=en>.

⁸ Energie-Cités case studies and other information: www.energie-cites.org

⁹ The Energie-Cités DISPLAY campaign, providing an on-line tool for energy benchmarking of public buildings, is widely used by EU municipalities, but less by other levels of government. This represents an important future opportunity. See <http://www.display-campaign.org>.

¹⁰ The EC Directive also establishes minimum energy performance standards for new buildings and renovations over 1000 sq m. (including public buildings), and requires inspections of boiler systems over 20 kW and air conditioning systems over 12 KW (http://europa.eu.int/eur-lex/pri/en/oj/dat/2003/l_001/l_00120030104en00650071.pdf).

¹¹ UK benchmarking tools and Best Practice Guides: <http://projects.bre.co.uk/gpg286/>

¹² UK requirements for public buildings: <http://www.sustainable-development.gov.uk/sdig/reports/ar2003/partg.htm>

¹³ Odense case study: http://www.energie-cites.org/db/odense_564_en.pdf

¹⁴ Energgho program (mostly in French and German): www.energho.ch

¹⁵ Energgho Annual Report, 2004. Higher targets announced for 2004 were 190 subscriptions (60% of Cantons).

¹⁶ This is still a modest share of total cantonal spending on energy management reported as CHF 20 million in 2003.

¹⁷ Much of the information in this section was drawn from the country-study for Germany as part of the PROST project (Borg et al. 2003, Chapters 4 and 7 and Appendix).

¹⁸ This suggests that the municipality of Frankfurt is willing to accept paybacks longer than the 3-5 years expected in some other public agencies and many private enterprises.

¹⁹ PICO case studies: <http://www.iclei-europe.org/index.php?casestudies>

²⁰ Barcelona Solar Thermal Ordinance: http://www.barcelonaenergia.com/document/OST_Explicac_eng.pdf

²¹ This example draws heavily from the PROST study discussion of Finland (Borg et al. 2003, Chapter 4).

²² Other countries with specific policies for energy-efficient government procurement include the US (at federal, state, and municipal levels), Japan, Korea, China, and Mexico. See www.pepsonline.org, <http://www.eere.energy.gov/femp/technologies/eeproducts.cfm>, Van Wie McGrory et al. 2002, Harris et al. 2004.

²³ PROST Study and Appendices: http://www.eceee.org/library_links/prost.lasso

²⁴ Again, many of these are drawn from the Appendix of Borg et al. 2003.

²⁵ For a demonstration version, go to <http://www.hymonet.com/> and click on "English version" at the left.

²⁶ UK "Quick Wins": http://www.ogcbuyingsolutions.gov.uk/environmental/downloads/quick_wins.doc

²⁷ UK list of efficient products: http://www.ogcbuyingsolutions.gov.uk/environmental/downloads/quick_wins.doc

²⁸ UK "Greening Government Operations Green Guide for Buyers":

<http://www.defra.gov.uk/environment/greening/greenpro/greenbuy/index.htm>

²⁹ e-Parliament, including Toolkit: <http://www.e-parl.net/energy/policy/markets.htm> and <http://www.e-parl.net/energy/campaign/toolkit-summ.htm>

³⁰ US Executive Order 13221: www.ofee.gov/eo.eo13221.pdf

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- ³¹ EMAS (Eco-Management and Audit Scheme; http://europa.eu.int/comm/environment/emas/index_en.htm) is an EU-sponsored program to get all levels of government involved in environmental management, including but not limited to the government sector or to energy efficiency. The German Federal Environmental Agency made an agency-wide commitment to EMAS (http://europa.eu.int/comm/environment/emas/news/index_en.htm) while the London Borough of Sutton has adopted a policy on energy and water conservation in Council buildings (<http://www.sutton.gov.uk/Sutton/Our+Environment/LEAP+Project/The+Leap+Project.htm>).
- ³² Also see the “Procura+” and BIG-Net pages at <http://www.iclei-europe.org/index.php?procurement>.
- ³³ Local Authority EMAS and Procurement (LEAP): <http://www.iclei-europe.org/?leap>
- ³⁴ Campaign for No-Cost Measures in Offices: <http://www.energyoffice.org/english/index.html>
- ³⁵ Green Fleets: <http://www.greenfleets.org/>
- ³⁶ Along with Perth, Australia – see <http://www.fuel-cell-bus-club.com/index.php?module=pagesetter&func=viewpub&tid=1&pid=9>
- ³⁷ Eco-Drive: <http://www.ecodrive.org/project/pilots.html#p7>
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- ⁴⁰ US DOE Energy Awards: <http://www.eere.energy.gov/femp/services/awards.cfm>
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