

Energy Management Policy (1997 – 2014)

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Background to Energy Policy

Through two oil crises in the 1970s and the Framework Convention on Climate Change in 1992, the world became increasingly interested in energy. Into the 2000s, damage and loss from climate extremes spread across the world, and many countries became actively engaged in discussions, arguing that consumption of fossil fuels should be reduced. This however did not lead to any actual reductions. Not only was it costly to reduce the use of fossil fuel and expand the use of renewable energy, but involved significant conflicting interests.

Many central governments, including South Korea's, had espoused central government-led energy policies. This was mainly due to the fact that energy is closely associated with national industry and economic development and therefore requires prohibitive investment in infrastructure. In the 1990s, the South Korean government began to disperse some of its manpower and financial wherewithal to local governments, leading to the emergence of local energy policies. In 1995, the system of local autonomy was implemented, and local governments planned to manage their own energy supply and demand based on their own energy policies. However, these policies could not unfold, as the manpower and funds necessary were monopolized by the central government. Local energy policies remained in their infancy.

Suddenly, oil prices skyrocketed in 2008, with a nuclear accident in Fukushima in 2011. There were blackouts on a broad scale, and frequent reports of problems and corruption at nuclear plants. Anxiety in the nation grew. Reports were heard of people at risk from high voltage (765kV) power transmission towers, built to send electricity from the nuclear power plants at the shores of Miryang and Cheongdo to consumers in the cities. Whereas people before had limited interest in energy news, they were now paying attention to specific issues, such as the question on discontinuation of nuclear power plants and construction of transmission towers. As circumstances changed, local governments needed to strengthen their administrative influence on energy policies.

Until the late 1990s, even the Seoul Metropolitan Government (SMG) could not easily establish and execute its own energy policies. However, by this time, local energy policies and plans began to emerge and take shape. Through former Mayor Oh Se-hoon and current Mayor Park Won-soon, the SMG gradually instituted its own energy policies and systems for implementation, which today include: distribution and safe management of coal, oil, city gas, LPG, and high pressure gas; expansion of an integrated energy system and unused energy (e.g., wastewater heat); management of electrical product manufacturing and electrical/electrical construction programs; expanded distribution and use of renewable energy (e.g., photovoltaics, fuel cells); and energy saving and efficiency programs.

Seoul's energy consumption is steadily rising, but the rate of growth has recently eased. As of 2012, the

city's final energy consumption was 15,582,000 TOE per annum: oil accounted for 5,822,000 TOE (37%); city gas, 5,127,000 TOE (33%); electricity, 4,062,000 TOE (26%); district heating and other energy, 572,000 TOE (4%). The percentage of oil fell while electricity and city gas rose.

This report is an analysis of how Seoul, a mega city with more than 10 million people, established and executed its own energy policies - the development of independent local energy plans in 1997, the advancement of policy, and what policies were key for each time period, thereby providing a reference for other cities to consider.

Development of Energy Policy

Until the government officially adopted local energy policies in 1996, South Korea did not have any energy policy at the local government level. Local governments touched upon heating fuel management, management of energy safety, permitting and cancellation responsibilities, and energy conservation campaigns, but no more. From 1960 to the mid-1990s, the city's main energy-related responsibilities were to ensure a stable supply and safe management of fossil fuels used for cooking and heating.

In the 1960s, coal briquettes were the main source of fuel for such purposes. Gasoline followed from the 1970s to the mid-1990s, and natural gas was supplied by the late 1980s, with distribution rates soaring 20% per annum by the 1990s. The administrative organization in charge of energy was called the "Fuel Department" until the late 1990s, which was responsible for stability of fuel supply and management of safety. Between 1987 and 1993, a "Gas Department" was temporarily created to focus on the distribution of city gas.

The central government was determined to reinforce local governments' authority in terms of energy, making them energy independent and helping to boost the local economy. In 1996, plans to pursue development of local energy policies were announced. Pursuant to the Energy Use Rationalization Act, local energy plans and programs were established and put into action.

Local energy plans are at least 5 years in duration, with establishment every 5 years led by city mayors or provincial governors, mainly in regard to: trends in and forecasting energy supply and demand; stability of supply; renewable energy plans; plans to reduce greenhouse gas (GHG) emissions and ensure responsible use of energy; plans for supply of integrated energy; plans to develop and utilize waste energy sources; and energy policies. At the local and provincial level, energy programs receive assistance from the central government, mainly in the form of infrastructure building projects, involvement in education, promotion, and feasibility testing, projects that support biotechnology facilities, photovoltaic, solar, and geothermal energy, and policy planning programs (assistance for photovoltaic projects on islands and remote areas, "green villages", etc.) to provide assistance with facilities in specific fields.

The SMG commissioned the Institute of Industrial Resources with the first local energy plan in 1997, and the Korea Energy Economics Institute with the second local energy plan in 2003. At the time, the SMG established plans in accordance with the central government's policy decisions but did not make efforts to execute those plans. Nevertheless, this move to develop energy plans at the regional level was why the period from 1997 to 2005 (until Lee Myung-bak became mayor) was seen as a step toward development of local energy plans. The Fuel Department was closed down in 1998 and the responsibility for management of gas safety was transferred to the Fire & Disaster Headquarters. The duties of the now-defunct Fuel Department – a stable supply of heating and cooking fuel and electricity-related responsibilities (electrical product manufacturers, electrical works, electrical construction, etc.) – were divided among other departments until June 2006. During this period, plans were established but the execution system regressed. Under Oh Se-hoon (in office between July 1, 2006 and June 30, 2010) who was the 33rd and 34th mayor, the city's energy policy began to mature. After reorganization in 2006, energy-related duties divided among the

departments in the Ministry of Industry were transferred to the Clean Seoul Headquarters, and the English word “energy” was included in the department names. In 2007, the Seoul Energy Declaration was issued, demonstrating the city’s determination to implement energy policies in earnest. In June 2009, the third local energy plan (the 2030 City of Seoul Framework Plan for Environmentally-Friendly Energy) was announced. With an aim to make Seoul an energy-advanced city that recycled more energy and consumed less of it, the third local energy plan presented specific details on mid- to long-term plans for home, commercial, transport and public sector programs.

In 2008, the Energy Policy Division was added to the Clean Seoul Headquarters to ensure development of comprehensive policies, from a stable supply of fuel and the distribution of renewable energy to promoting energy efficiency and response to climate change. Led by Mayor Oh, the framework energy plan was instituted, which enabled the SMG to come up with a platform on which to develop energy policies tailored to the city, and resulted in a reshuffling of its administrative organization. Its governance organization, the Citizens’ Committee for a Green Seoul, heard from the people their views on energy policy.

Seoul’s energy policy took a remarkable leap during the incumbency of the 35th Mayor, Park Won-soon (in office between October 27, 2011 and June 30, 2014), represented by the One Less Nuclear Power Plant initiative. The SMG emphasized the city’s influence and responsibilities as an energy consumer and set out to save 2 million TOE based on using less energy, increasing efficiency, and enhancing production of renewable energy. A Green Energy Department and a Citizens’ Cooperation Team were added to the Climate & Environment Headquarters; a Citizens’ Committee and Implementation Committee were set up for the One Less Nuclear Power Plant initiative as governance organizations. The Green Energy Department itself was made up of 6 teams: Energy Policy, Integrated Energy, Solar Development, Renewable Energy, Energy Efficiency, and Power Management.

Reelected in August 2014, Mayor Park Won-soon announced his “Sustainable Energy Policy” as part of the second phase of the One Less Nuclear Power Plant initiative. While Phase 1 focused on quantitative demand management and reducing use by 2 million TOE, Phase 2 expanded the policy to the energy industry and welfare to provide better quality energy services to city residents. The Sustainable Energy Policy was launched in July 2014, targeting 2020 for completion. This environmentally-friendly policy was set by Mayor Park as one of the city’s core priorities, and it has made considerable progress.

Major Policies by Period

1) Development of Local Energy Plans (1997 – June 2006)

In June 1997, the Institute of Industrial Resources (Head: Yu Sang-hee) released a “Study on Development of the Local Energy Plan for Seoul”. This was a 5-year plan, from 1997 to 2001, and proposed to develop enterprises dedicated to energy conservation and institute a reasonable energy administration system. In accordance with this plan, the SMG implemented 7 projects (including development of energy plans, awareness campaigns, plans for waste energy sources, and feasibility testing of minor hydropower generation at sewage treatment facilities), spending KRW 360 million. Against the total budget, this is a small amount for energy policies that cover all of Seoul for 5 years. After the first local energy plan was developed, the Korea Energy Economics Institute was commissioned in August 1998 to conduct a study on the status and utilization of waste energy sources in Seoul. However, such studies were not translated into policy.

One of the most noteworthy activities of this time was enactment of the City of Seoul Ordinance on Energy in January 2002. On June 26, 2000, the Korea NGO's Energy Network was launched to create energy saving campaigns, relying on the private sector for voluntary and creative activities. The Korea NGO's Energy Network aimed to support the public activities of society in response to the dearth of domestic energy resources and climate change. As part of its work, the Network started a campaign to pass local government ordinances on energy so as to create and support a sustainable energy system. The SMG was the first local government to pass such a city ordinance.

In April 2003, the Korea Energy Economics Institute came up with the second local energy plan, and Seoul announced the outcome. This was also a 5-year plan to cover the period from 2002 to 2006, and included: expanding distribution of residential district heating; CES (Community Energy System) for large, energy-inhaling buildings; increased supervision of residential insulation; utilization of ESCOs (energy service companies); transportation demand management; and policies for unused "waste" energy (sewage treatment, heat recovery from the Han River and Cheonggye Stream; methane gas; geothermal energy cooling/heating system; pilot program that powered city parks with waste energy, etc.). The Korea Energy Economics Institute suggested that dedicated teams and personnel were needed for the plan, but this advice was never incorporated as the energy administration functions and programs were transferred from the Industrial Policy Department for Industry and Economy to the Employment Stability Department in 2003 and then to the Living & Economy Department in 2005. The local energy plan remained on paper only.

2) Introduction of Environmentally-friendly Energy Policy (July 2006 – June 2011)

On April 2, 2007, Mayor Oh Se-hoon issued the Seoul Energy Declaration, proposing to reduce the city's energy consumption to 2000 levels (a 12% decrease) by 2010, with a total reduction of 15% by 2020, as well as the city's GHG emissions to 1990 levels (a 20% decrease) by 2010 with a total reduction of 25% by 2020. The plan was to build photovoltaic generators around the city and realize a 10% increase in the use of renewable energy by 2020.

The status of energy use was thus studied, and specific goals were set to enhance energy efficiency of multi-household housing and "office-tel" buildings and to encourage the use of eco-friendly vehicles (hybrid, fuel cell cars etc.). The SMG also worked with Germany's Fraunhofer-Gesellschaft to build a "zero-energy house" (Energy Information Center) and the "Renewable Energy Landmark of Seoul" (photovoltaic power generation facilities) near World Cup Park. The city declared that its new City Hall would adopt diverse environmentally-friendly designs, such as rain and heavy water recycling systems, air curtains, high-efficiency transformers, and a rooftop garden. The building would also use photovoltaic and geothermal energy to enhance energy independence. The city put this plan into action.

Seoul's plan also included building a pilot renewable energy complex in New Town and Magok to take advantage of photovoltaic and geothermal energy, and using sewage heat from 4 water regeneration centers, such as the one for Tancheon, as the source of integrated energy. There were other plans as well, such as utilizing water regeneration centers, water treatment facilities, and subway car depots to install a photovoltaic generator. In Phase 1, the 2MW generators would be built at the Southwestern Water Regeneration Center, Ttukdo Water Treatment Facility, and the Gunja subway car depot.

Floor space ratio incentives were provided when a private structure built pursuant to the district unit plan and/or the urban environment redevelopment program invested 1% of the construction cost in renewable energy or 1% of its total energy consumption came from renewable energy. Dividend and transferred income from the general accounts of the Korea Gas Corporation and the Korea District Heating Corporation – funded by the City of Seoul – were to be used to create the "Seoul Energy Fund" to finance research, technology development, and energy projects.

The "Clean Seoul Energy Team" was created and placed under the Clean Seoul Headquarters. In 2008, Seoul became the first city in the nation to establish a Climate Change Ordinance. This was significant as it was the first low-carbon legal framework in South Korea despite the absence of a higher level law regarding climate change. Based on the Seoul Energy Declaration of 2007, the SMG issued a third local energy plan (the 2030 City of Seoul Framework Plan for Environmentally-friendly Energy) in June 2009.

On August 15, 2008, the administration of President Lee Myung-bak announced its "Low Carbon Green Growth" policy, which the City of Seoul actively embraced. In 2009, the city issued its "2030 Seoul Master Plan on Low Carbon, Green Growth", which consisted of 22 key projects and extended the 2020 plan from the Seoul Energy Declaration (April 2007) to 2030. It also set higher goals, aiming to reduce greenhouse gases (by 40%) and energy use (from 15% to 20%) and encouraging the use of renewable energy (from 10% to 20%).

According to this Master Plan, Seoul will attract private investment and invest some KRW 44 trillion by 2030, to: ▲ Reduce GHG emissions by 40% (to 1990 levels); ▲ Create a million "green" jobs; and ▲ Preemptively respond to climate change. The Clean Seoul Headquarters set up a dedicated management system for the Low Carbon Green Growth policy, and the Headquarters director in charge.

<Table 1> Main Policies of the 2030 Seoul Master Plan on Low Carbon, Green Growth

- ▲ Make 10,000 buildings (2,000 m² or larger) “green”
- ▲ All new buildings to obtain environmentally-friendly verification
- ▲ All public transit vehicles to be switched to “green” technology
- ▲ Modal share of public transportation to expand to 70%
- ▲ Bicycles to have 10% of modal share through construction of 207 km of bicycle paths along arterial roads
- ▲ Create 1 million “green” jobs by developing top 10 green technologies for Seoul (hydrogen fuel cells, solar cells, power IT, “green” buildings, LED lighting, “green” IT, “green” cars, urban environment regeneration and restoration, utilization of waste, and technologies for handling climate change)
- ▲ Establish an urban management infrastructure to respond to extreme heat, water shortages, infectious diseases, and other impacts from climate change
- ▲ Establish an integrated response system based on evaluation of the impact of climate change and vulnerability
- ▲ Develop customized medical protective equipment and gear for extreme heat, yellow dust, etc.
- ▲ Establish urban design and development standards in line with climate change

During this period, The Seoul Institute performed significant research on energy policy and assisted the SMG in creating its long-term energy plans and policies. Mayor Oh helped provide an administrative platform upon which long-term energy plans could be established and put into action to meet the demands of the city. In Seoul, homes and commercial buildings consume a lot of energy. In consideration of this, “Eco Mileage” was introduced in September 2009, successfully helping people save energy on a daily basis. In May of that same year, the “C40 Cities Climate Leadership Group” was hosted, and the Seoul Declaration issued. With its influence as a mega city, Seoul promoted its efforts against climate change to the international community. While Mayor Oh helped Seoul take its energy policy one step forward, critics point out that the execution system was inadequate to achieve the goals he proposed, such as the reduction of GHG emissions and increased use of renewable energy.

Year	Major Studies on Seoul's Energy Policy
2007	City of Seoul Framework Plan for Environmentally-friendly Energy; Seoul's Climate/Energy Map (Year 2); Plans to create a renewable energy community; Research on energy consumption trends in Seoul
2008	Seoul's plan to reduce fossil fuel use; Analysis of changes in CO ₂ emissions by transport sector and potential for reduction; Promotion and monitoring of green rooftops for energy conservation; Feasibility review of a sustainable, environmentally-friendly system in the Magok urban development district
2009	Seoul's Climate/Energy Map (Year 3)
2010	Strategy to reduce energy use in buildings to achieve low carbon emission goals; Evaluation of the program to reduce energy use in buildings; Comparative analysis of "zero energy community" policies of major cities around the world; Plan for renewable energy facilities based on a renewable portfolio standard
2011	Mid- to Long-term Basic Plan for Renewable Energy (2011 – 2015); Energy performance evaluation and utilization for building retrofit; Evaluation of potential and technology trends in use of sewage energy; Development of technology to derive bio-energy from food waste and fecal matter from residential areas; Introduction of the ISO50001 energy management system to improve the system of response to climate change

3) Period of the One Less Nuclear Power Plant Initiative (November 2011 – June 2014)

On April 26, 2012, the City of Seoul announced a comprehensive energy plan titled "One Less Nuclear Power Plant", declaring its intention to reduce energy use by 2 million TOE by 2014, equal to the energy produced by one nuclear power plant. Seoul proposed a vision of "Building a foundation to achieve energy

independence and become a global capital on climate initiatives". It outlined plans to reduce 730,000 of the 2 million TOE goal through energy conservation efforts, 770,000 TOE by improving energy efficiency, and replacing 500,000 TOE with renewable energy sources, sewage heat recovery, and waste heat from incineration. The total budget was KRW 2.784 trillion, 78% (KRW 2.186 trillion) of which would be financed by private capital.

The plan for One Less Nuclear Power Plant began to take form in November 2011, and is noteworthy as it was shaped by the participation of and ideas from residents. From January to April 2012, the SMG, the Policy Advisory Group of Hope, and citizens' organizations prepared a draft plan through 16 meetings. This initial draft was reviewed and revised at the One Less Nuclear Power Plant Initiative Workshop held at Literature House at Nam Mountain (February 21, 2012) and at the Citizen Debate (April 16), the latter of which saw 400 participants hold lively discussions in 22 different groups. The participants contributed valuable ideas, which included suggestions that energy conservation efforts be emphasized through education at home and school, that energy-inhaling buildings should have to disclose their energy consumption, and that some roads should be for public transit and pedestrians only. Some 109 different ideas were reflected in the policy.

The One Less Nuclear Power Plant initiative was first created when the city realized that it needed a plan to respond to energy crisis. Seoul accounted for 10.9% of all power consumption in the nation and yet its power independence was only 2.95% (as of 2011). Moreover, nationwide energy consumption was soaring, a potential cause for a crisis of supply. With the Fukushima nuclear accident in 2011, a series of blackouts on a large scale, and conflicts from the transmission towers in Miryang and Cheongdo, people were very supportive and willing to embrace the energy policy.

The comprehensive One Less Nuclear Power Plant initiative was made up of 10 key programs in 6 areas, 21 policy tasks and 78 projects. The 10 key programs were designed to: 1) make Seoul a "sunlight city", a city that is a photovoltaic generator in itself; 2) help major facilities achieve energy independence through hydrogen fuel cells; 3) implement plans to improve building energy efficiency; 4) find innovative ways to encourage the use of LED and smart lighting; 5) build a compact city to allow for a low energy urban space; 6) reinforce design standards for new buildings (e.g., total energy use requirements); 7) encourage car sharing; 8) create "green" jobs in the energy sector; 9) promote grassroots energy-conservation campaigns; and 10) install and operate an "Energy Foundation".

Since launching the One Less Nuclear Power Plant initiative in 2012, many steps have been taken to save energy and enhance efficiency. In 2 years, the city has reduced its energy use by 2 million TOE. Moreover, Seoul's electric power, city gas, and oil consumption are on the decrease. Up to the first half of 2014, some 1.7 million residents were participating in the Eco Mileage program, where incentives are given for saving energy. At 500 schools, 20,000 students took part in Energy Guardian Angels groups, saving energy at home and school. Some 20,000 buildings participated in the energy efficiency programs, and 6.79 million light bulbs were replaced with environmentally-friendly, high-efficiency LED lights. In July 2014, the City of Seoul announced the successful completion of its goals for Phase 1 of the One Less Nuclear Power Plant Industrial Policy Department at Industry and Economy, and announced a Phase 2.

<Table 3> Phase 1 Achievements for the One Less Nuclear Power Plant Initiative

Photovoltaic Power Generation (MW)	Building BRP (No. of Buildings)	LED Re-placement (10,000 LED lights)	Eco Mileage Members (10,000 persons)
22.8 → 69 (2011) (June 2014)	475 → 2,111 (2011) (June 2014)	20 → 679 (2011) (June 2014)	50 → 168 (2011) (June 2014)

Photovoltaic Power Generation / Building BRP (No. of Buildings) / LED Replacement (10,000 LED lights) / Eco Mileage Members (10,000 persons)

<Table 4> Major Energy Sector Studies by the Seoul Institute during the One Less Nuclear Power Plant Initiative Period (2012)

<p>Model for Estimated Energy Consumption by Residential Buildings in Seoul</p> <p>Development of Evaluation Index for Seoul's Greenhouse Gas & Energy Reduction Program, and Performance Assessment</p> <p>Development of Techniques for Analysis of Seoul's Energy Policy Impact on Energy Conservation</p> <p>Analysis of Energy Consumption by Residential Housing in Consideration of Seoul Resident Lifestyles</p> <p>Study on Measures to Introduce the Solar Energy Generation Assistance Program for Seoul (in Response to Mandatory Supply of Renewable Energy)</p> <p>Plan to Promote Improvement of Heating Energy Efficiency in Detached Housing in Seoul</p> <p>Strategy to Achieve Energy Independence for Basic Environmental Facilities & Infrastructure in Seoul</p>
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4) Seoul's Sustainable Energy Action Plan (One Less Nuclear Power Plant, Phase 2) (July 2014 – 2020)

In July 2014, Phase 2 of the One Less Nuclear Power Plant initiative began. This phase was also shaped by residents from the beginning. Led by the Executive Committee of the One Less Nuclear Power Plant Initiative, opinions were collected for 6 months through surveys and discussions, etc. The official name for Phase 2 is "Seoul's Sustainable Energy Action Plan", which seeks energy independence, sharing, and participation in generation of energy, and aims to increase the city's energy self-sufficiency to 20%. This will help it to reduce 4 million TOE in energy consumption and 10 million tons of greenhouse gas.

Policy details will include:

1) distributed energy production; 2) an efficient, low-consumption social structure; 3) creation of quality energy jobs through innovation; and 4) friendly, energy-sharing communities. For distributed production of energy, photovoltaic (250W) generators will be distributed, which can easily be installed on apartment balconies, with 10,000 units to be distributed each year, for a total of 40,000. In addition, the "Citizen Fund, Seoul Solar Power Generator" project will be launched, granting a guaranteed interest rate of 4% per annum on investments in the fund, which the city expects to reach KRW 100 billion by 2018.

To enhance energy efficiency, buildings will be subject to intensive management as they account for 56% of the city's total energy use. Loans at 1.75% interest will be provided to improve building insulation. Environmental impact assessment standards will be more stringent for large new buildings. Energy saving technologies and facilities will be improved so that zero-energy design standards can be applied from 2023. As for lighting, all 2.2 million lights used by the public sector, including traffic lights and street lamps, will be replaced with LED lights by 2018. For the private sector, 29 million LED lights – about 65% of the total – will be distributed.

While Phase 1 mainly focused on conservation, efficiency, and production, Phase 2 focuses on jobs and welfare. The city will subsidize building energy management systems (which are useful in large cities), smart grids, and other power-related IT, while supporting and developing some 70 social enterprises and cooperatives in the green energy sector. Each *dong*-district will have a local energy hub that provides comprehensive energy services from installation of energy equipment to monitoring and follow-up. There will be emergency assistance programs, an energy welfare platform, and city ordinances targeting the energy poor. The SMG will also support energy-independent communities as part of its local energy community program. As of 2015, Seoul is in the process of developing the fourth local energy plan, which will include the plans proposed by the One Less Nuclear Power Plant initiative as well as long-term plans that look ahead as far as 2035.

Distributed Production	Low Energy City	Good Energy Jobs	Welfare & Sharing
<p>5 Tasks, 19 Programs</p>	<p>9 Tasks, 34 Programs</p>	<p>4 Tasks, 17 Programs</p>	<p>5 Tasks, 18 Programs</p>
<ul style="list-style-type: none"> - Seoul: A Sunlight City! Project - Distributed energy production at buildings - Integrated energy to 60,000 households, saving up to 20% in heating costs - Identify waste energy sources across the city - Support energy independence through institutional innovation 	<ul style="list-style-type: none"> - Zero energy at new buildings - A healthy, pleasant city with accurate energy analysis and efficiency - Increased responsibilities of the public sector in improving energy efficiency - Seoul: A City of LED Light! - Urban restructuring towards low energy consumption - Encourage the use of "green" cars - Energy saving streetlight - Encourage energy saving lifestyles - Make the city a global leader in recycling 	<ul style="list-style-type: none"> - Work with citizens to create "green" energy jobs - Customized assistance for "green" energy companies by lifecycle - Build infrastructure for "green" energy industries and technologies - Foster innovative "green" energy IT 	<ul style="list-style-type: none"> - Create a Citizen Fund (platform) for energy welfare - Ensure basic right to energy - Efficiency programs to reduce energy costs - Special measures for disadvantaged households - Community energy programs

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Policy Outcomes

The period of Seoul’s environmentally-friendly energy policy (July 2006 – June 2011), led by Mayor Oh Se-hoon, was important in that it was the time when energy plans were established, providing a framework in which the needs of Seoul would be met. The fact that Mayor Park Won-soon, elected in by-elections, could draft the One Less Nuclear Power Plant initiative in a relatively short period of time was because of the foundation formed by the environmentally-friendly energy policy. Before Oh Se-hoon took office, the first and second local energy plans were established (1997 – June 2006), but these were done only to comply with the law, which stated that local energy plans were to be developed at the local government level every 5 years.

Mayor Oh emphasized the significance of energy efficiency and focused on the Eco Mileage, BRP, and LED programs. Long-term GHG reduction and renewable energy plans were also developed at the city level. Nonetheless, administrative focus and funding did not follow through to put plans into action. As a result, Seoul’s energy use continued to grow, and the distribution and use of renewable energy remained the same. However, the Energy Dream Center – a zero-energy building – and the environmentally-friendly energy construction of the new City Hall that he promised were completed.

Mayor Park Won-soon invested the city’s manpower and funds in energy policy – a decision rarely made by any local government in South Korea – and pushed ahead with the One Less Nuclear Power Plant (November 2011 – June 2014) initiative. The One Less Nuclear Power Plant Team was created and added to the Environmental Policy Department at the Climate & Environment Headquarters, with the addition of the Green Energy Department and the Citizens’ Cooperation Team to create a system for implementation. The new governance included the Citizens Committee and the Execution Committee on the One Less Nuclear Power Plant Initiative. Through these specific details and institutional improvements, One Less Nuclear Power Plant was a success, and had the necessary organizational support and funding.

This success manifested itself in several ways: 1) a local energy policy vision was presented and translated into action; 2) BRP loan conditions were improved (up to KRW 2 billion for buildings, KRW 10 million for houses at a 2% per annum interest rate), allowing for profit from private power generation (capacity lower than 50kW; KRW 50 per kWh) and small photovoltaic generators, and developing successful policies such

as the integrated management of photovoltaic power in the public sector; 3) citizens participated in improving public awareness; 4) a successful demand management system was realized at the local government level; 5) space was secured for energy education and development of energy-related content/data; and 6) the name of the program itself became an official brand: “One Less Nuclear Power Plant”.

Let’s look closer at Seoul’s successful demand management system at the local government level. Because the local government does not have the right to determine or supervise energy prices, Seoul was limited in terms of what it could do independently with its energy policy. Even so, the city was able to institute independent policies and some unique institutional improvements during the process of expanding the use of renewable energy. The power generation profit system had vanished at the national level, but Seoul introduced its own system to encourage the distribution of photovoltaic power generators. City ordinances were revised to improve the rent system (5% of the official land price of KRW 25,000/kWh) to assist owners of small photovoltaic power generators and this change influenced other local governments to revise their own ordinances. Encouraged by such revision in the capital, people ready to form solar power generation cooperatives were able to urge their local governments to revise the necessary ordinances. Some of the outstanding policies in terms of citizen participation include the Energy Designer program that employs people dedicated to energy conservation, and the Energy-Independent Community program.

<Table 7> Examples of Outstanding Policies Identified during the One Less Nuclear Power Plant Initiative

Policy	Description
Install LED First, Pay Later	Existing lights are replaced with LEDs first and paid for with the power bill savings from LED use. Seoul established an SPC (special-purpose company) to help replace lights with LEDs in the subway system.
Improvement of Loan Conditions for the Building Retrofit Project (BRP)	This program seeks to save energy at houses and other buildings by reinforcing insulation, replacing regular lights with LEDs, and regular heaters and air conditioners with high-efficiency devices. Seoul expanded its long-term, low-rate BRP loan program, eased eligibility requirements, expanded the scope, and reduced the interest rate.

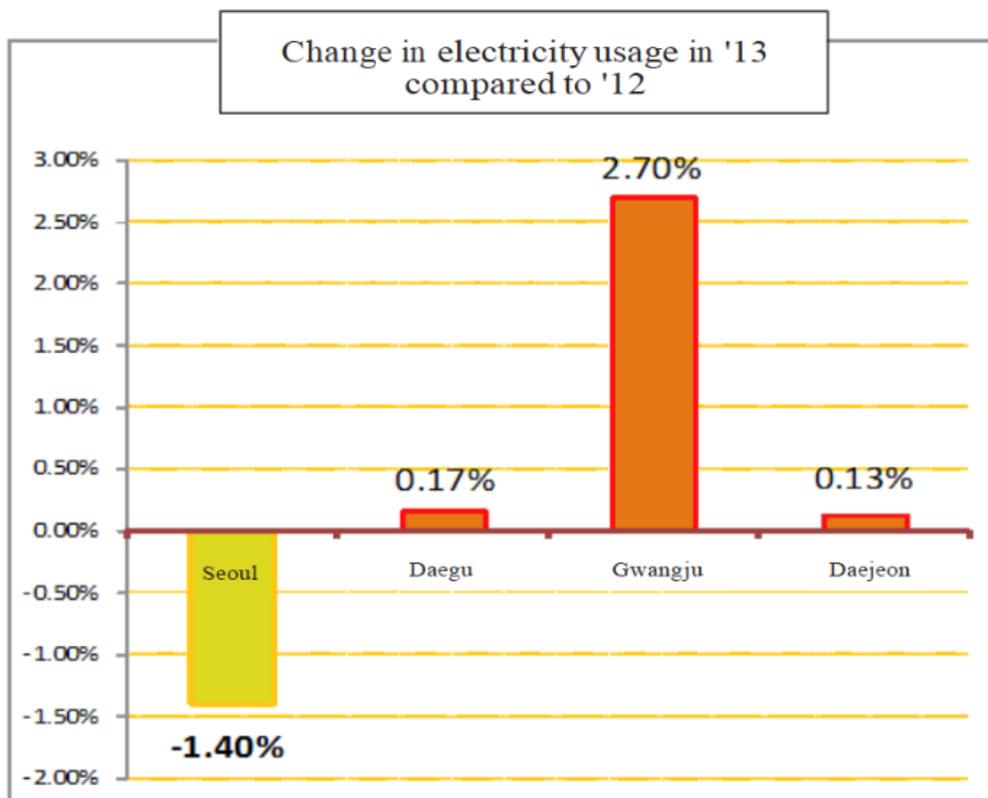
Policy	Description
Sunlight Map	<p>The map provides information to residents interested in photovoltaic power generation and simulates the amount of power that a photovoltaic power generator on the roof can generate. Local potential for natural energy is identified and disclosed online to allow residents to discover the benefits of installing a generator (New York's Solar Map, Seoul's Sunlight Map).</p>
Seoul's Power Generation Profit System	<p>Under the RPS (Renewable Portfolio Standard) system, it is difficult to invest in small-scale photovoltaic power generation facilities. In Seoul, existing profit potential and the amount of daylight are insufficient. To address this issue, Seoul introduced a power generation profit system in 2013. The city instituted an assistance program for solar power generation with photovoltaic power generators (50kW or less) to provide KRW 50/kWh for 5 years, considering the amount of electricity they sell to KEPCO. The city helped secure sales channels by supporting sales agreements between the mandatory supplier and investors in small-scale photovoltaic power generators.</p>
Distribution of Small Photovoltaic Power Generators	<p>Small photovoltaic power generators (less than 250W capacity) are distributed to households, with installation costs (approximately KRW 600,000) covered by the city.</p>
Integrated Photovoltaic Power Management (Public Sector)	<p>Photovoltaic power generators installed at public organization buildings in Seoul are managed through an integrated system, with collected data used to shape photovoltaic power-related policy.</p>

Policy	Description
Improvement of Rent for Photovoltaic Power Generators	The basis for calculating the rent for rooftop space for photovoltaic power generation has been switched from official land prices to generation capacity. This significantly reduces the burden of rent in Seoul where official land prices are high.
Long-term, Low-interest Loans for Photovoltaic Power Generation Facilities	For small to medium facilities with a capacity of 150kW or less, assistance is provided through loans, with an annual interest rate of 2.5%, to be repaid in installments over 8 years. Half of the installation cost is covered by the city, to a maximum of KRW 150 million per generator. As of 2013, Seoul has provided assistance worth KRW 6.3 billion.
Energy Designer Program	Seoul directly employs staff devoted to energy conservation and efficiency.
Energy Independent Community – Energy Community Assistance	This is a campaign for community energy, with a focus on phased-in participation in energy conservation, efficiency, and production.

<Table 8> Comparison of Power Usage (2012 & 2013) (Units: GWh/%)

	2012	2013	Change
Nationwide	466,593	474,849	1.76%
Seoul	47,234	46,555	-1.4%
Daegu	14,955	15,080	0.8%
Gwangju	8,131	8,274	1.8%
Daejeon	9,160	9,225	0.7%

<Figure1> Seoul vs. 3 Cities with Similar Socioeconomic Structures & Power Consumption Patterns: A Comparison



Individually, Koreans are steadily using more energy over time. There is a strong tendency to lean heavily on electricity due to the inversion of the price of oil versus the price of electricity. It is commendable that the city has achieved an actual reduction in energy use under these circumstances. However, improvements are needed for the current structure where more than half of the energy reduction is due to individual residents saving energy. While instilling a culture with daily energy-saving habits is important, it is now time to look toward qualitative change: saving energy through innovative energy infrastructure and services.

Phase 2 of the One Less Nuclear Power Plant – Seoul’s Sustainable Energy Action Plan (July 2014 – 2020) – is ongoing. There is yet time to see what will become of Seoul’s policy to increase energy independence to 20% and be a city where people produce their own energy and use it efficiently.

Suggestions & Implications

In a centrally-controlled system where the Ministry of Trade, Industry & Energy sets the course for and implements energy policy, Seoul’s environmentally-friendly energy policy period (July 2006 – June 2011) and the One Less Nuclear Power Plant period (November 2011 – June 2014) laid the foundation for local energy policy to take root. In February 2012, 46 district governments, led by Nowon Gu District Office, issued the No Nuclear Energy City declaration. In April 2015, a second Declaration is scheduled. This demonstrates that more lower-level local governments are demanding their energy policies be localized. Seoul has had difficulties with its energy policy, encountering central government institutional stumbling blocks. First of all, the city does not have any right to adjust energy rates as part of demand management or impose fines on companies using excessive amounts of energy. Secondly, the central government’s RPS (Renewable Portfolio Standard) restricts the amount of RECs (Renewable Energy Credits) available for bidding and the REC prices have also dropped by a significant margin, making it more difficult to encourage the use of renewable energy. In the first half of 2013, the size of the REC bidding market open to power generating companies was 63MW, but Seoul’s photovoltaic power generation goal for 2013 was 180MW. Even if all RECs were combined, it would not have accommodated the needs of the city. Thirdly, the central government’s regulation of potential renewable energy sites is prohibitive. For energy policies from Seoul and other local governments to be effective, the central government needs to change its own energy policy. In the meantime, Seoul’s energy policy needs to be connected to climate change policies. At the UN Climate Summit 2014 in New York on September 23, a Compact of Mayors was announced. The key to this Compact is for local governments to register their GHG reduction goals and outcomes on the cCR (carbonn Climate Registry) and disclose this data every year, which was an expression of the determination of local governments to make systematic efforts to reduce GHG emissions and have their performance assessed. It is meaningful that cities, producing 70% of the world’s greenhouse gas emissions, are taking the lead to

reduce these emissions in line with the UN's IPCC guidelines.

Against this background, Seoul's proactive energy policy measures will provide a useful model to other cities in South Korea and the world. With the cooperation of the central government, the influence will be far-reaching. Seoul will need to work on systemizing its energy policy even further to help local energy policies take effect across Korea, while pressing the central government to make institutional improvements to national energy policy.