

Seoul's Energy Transition Experiment: One Less Nuclear Power Plant Initiative



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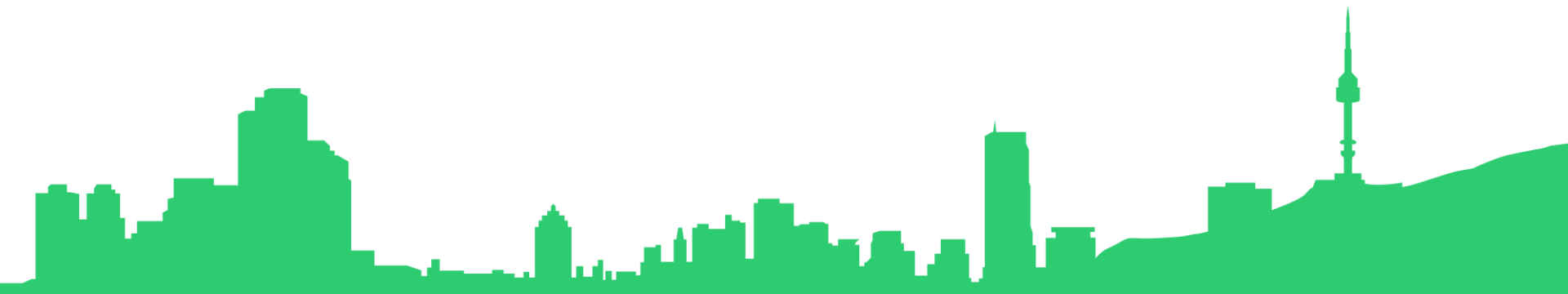
1. One Less Nuclear Power Plant
2. One Less Nuclear Power Plant 2
3. Driving Forces of OLNPP's Success
4. Challenges and Opportunities



01

ONE LESS NUCLEAR POWER PLANT

SEOUL'S ENERGY POLICY FOR FUTURE GENERATIONS



1. One Less Nuclear Power Plant

Seoul's Energy Policy for Future Generations

■ One Less Nuclear Power Plant



Fukushima Nuclear Accident ('11)



Worsening Climate Change



Nationwide Rolling Blackouts ('11)

To proactively respond to energy crisis and climate change,
Produce and save energy
equivalent to the output of one nuclear power plant.

Save 2 million TOE by 2014

Renewable Energy Production

- City of Sunlight project, Waste Heat Recovery, Hydro Fuel Cell etc.

Energy Efficiency

- Energy Cap, BRP, Energy Consulting Service for Buildings, Promotion of LED etc.

Citizen-led Energy Saving

- Eco mileage, Weekly No-driving Day, Energy Guardian Angels, Energy-Independent Communities etc.

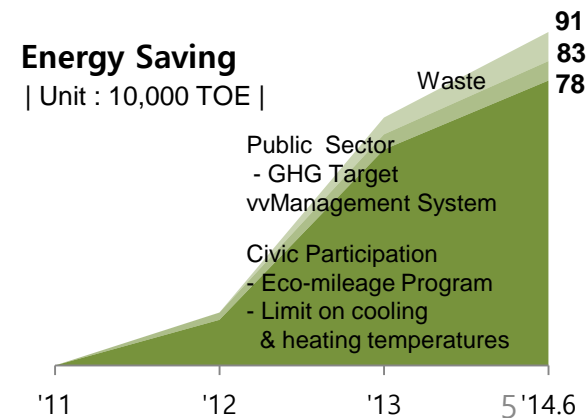
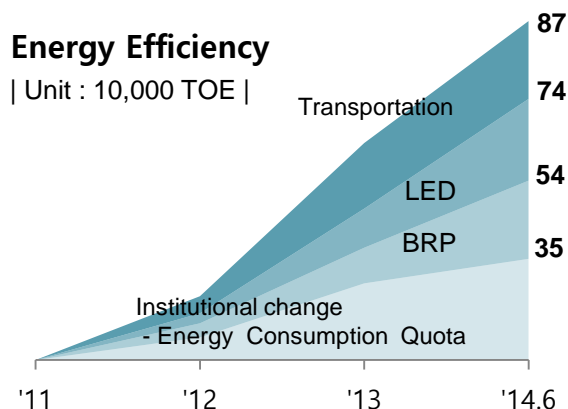
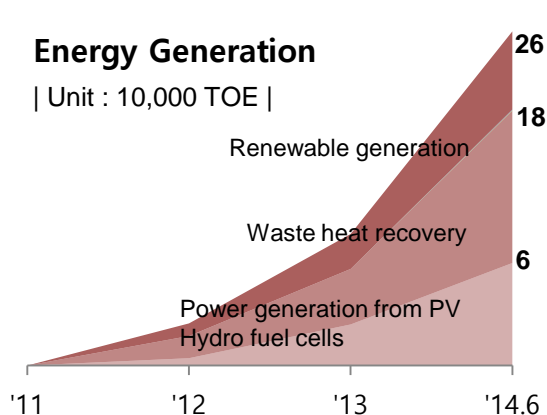
Achievements of One Less Nuclear Power Plant

Outcome :
Save 2.04m TOE

- Met 6 months ahead of schedule

Sector	Goal	Total	2014 performance	Total by end of 2013
Total	200	204	79	125
Energy production	41	26	15	11
Efficient use	111	87	40	47
Energy saving	48	91	24	67

In the first half of 2014, 2 million TOE of energy was saved!

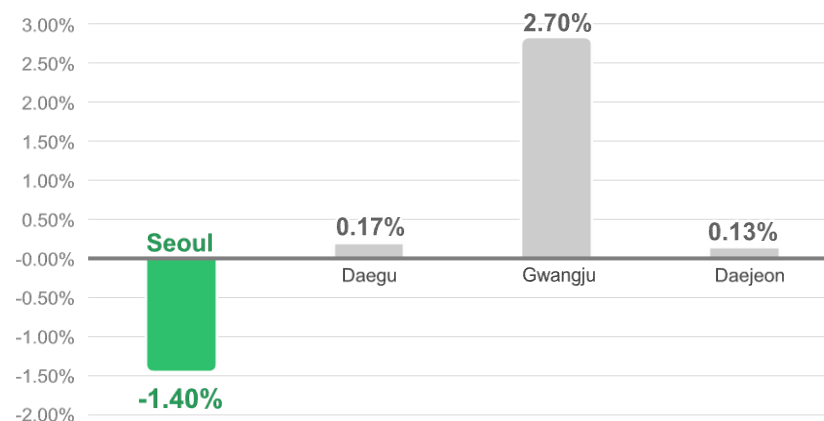


■ Declining Energy Consumption in Seoul

Changes in Total Electricity Consumption
in 2013 vs. 2012

Cities	2012 (GWh)	2013 (GWh)	Changes (2012→2013)
Nation	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%

Consumption by Households and
Offices in 2013 vs. 2012



Changes in Natural
Gas Consumption
in 2013 vs. 2012

Nation	1.43%
Seoul	-3.54%
Daegu	0.45%
Gwangju	-1.5%
Daejeon	-3.2%

Changes in Petroleum
Consumption
(gasoline, diesel, and
kerosene)
in 2013 vs. 2012

Nation	2.9%
Seoul	-1.7%
Daegu	6.1%
Gwangju	4.2%
Daejeon	5.3%

02

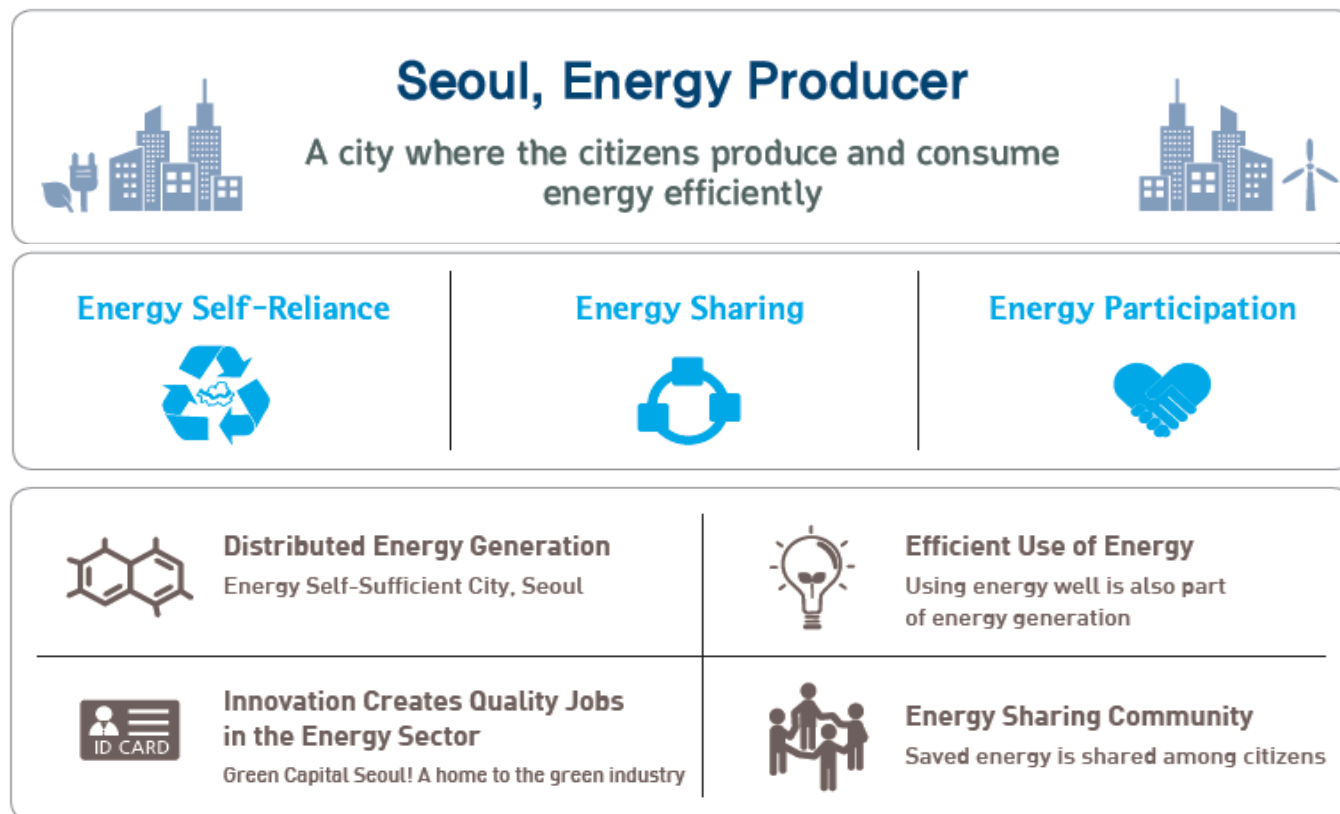
ONE LESS NUCLEAR POWER PLANT 2

SEOUL SUSTAINABLE ENERGY ACTION PLAN



2. One Less Nuclear Power Plant 2

■ One Less Nuclear Power Plant Phase 2



■ One Less Nuclear Power Plant Phase 2

April 2012.

Phase 1.

One Less Nuclear Power Plant

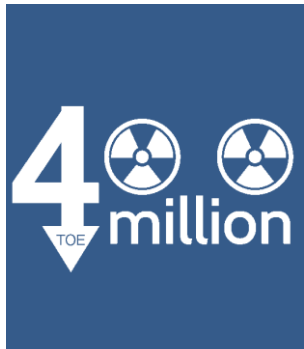
August 2014.

Phase 2.

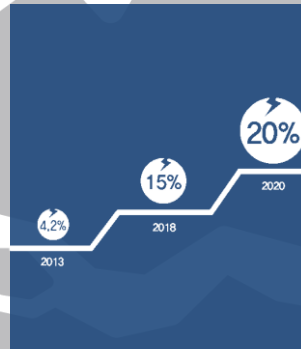
Seoul Sustainable Energy Action Plan

Generation • Efficiency • Saving

4m-TOE cut



Electricity
Self-reliance Rate
20%



GHG Emissions

10m-ton cut



By 2020

Transition to 'Energy Independent City'

- Promote energy-independence, sharing and participation -
- Pursue High energy-efficient Society -

Goal and Key Indicators

Electricity Self-reliance Rate :
20% by 2020

- Aim for an energy producing city
- No blackout even in electricity crisis

2013 4.2%	2014	2015	2016	2017	2018	2020
	5.0	7.0	9.0	12.0	15.0	20%

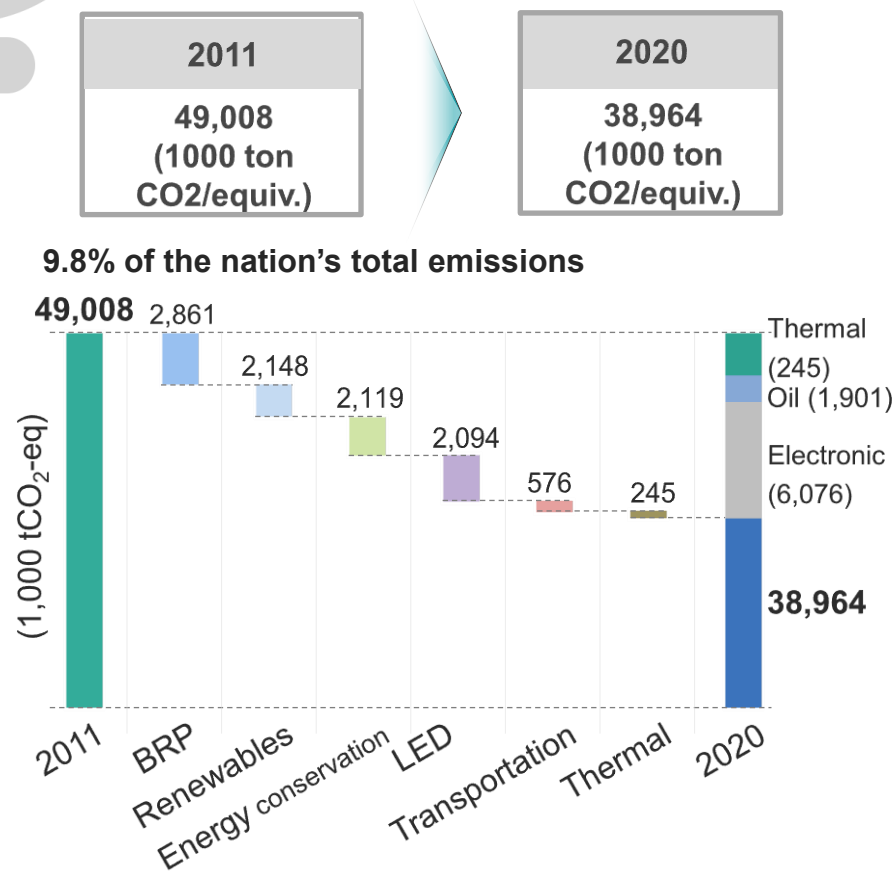
Demand (GWh)	47,076	47,603	48,137	48,676	49,221	50,330
Production (GWh)	2,285	3,137	3,960	5,181	6,344	8,155
Reduction (GWh)	1,382	2,791	4,134	5,505	6,923	9,553



4 million TOE in
renewable energy
production plus
energy conservation

Goal

**10 million-ton reduction in
GHG emissions :**
20.5% from 2011 levels by 2020

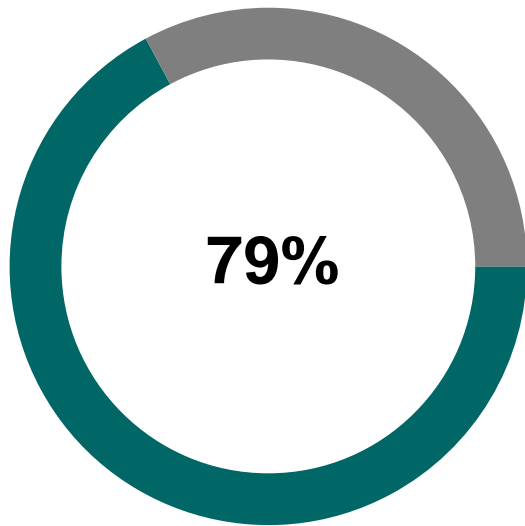


2. One Less Nuclear Power Plant 2

■ Performance by 2015

Power Self-reliance Rate

5.5%



Progress (As of late 2015)



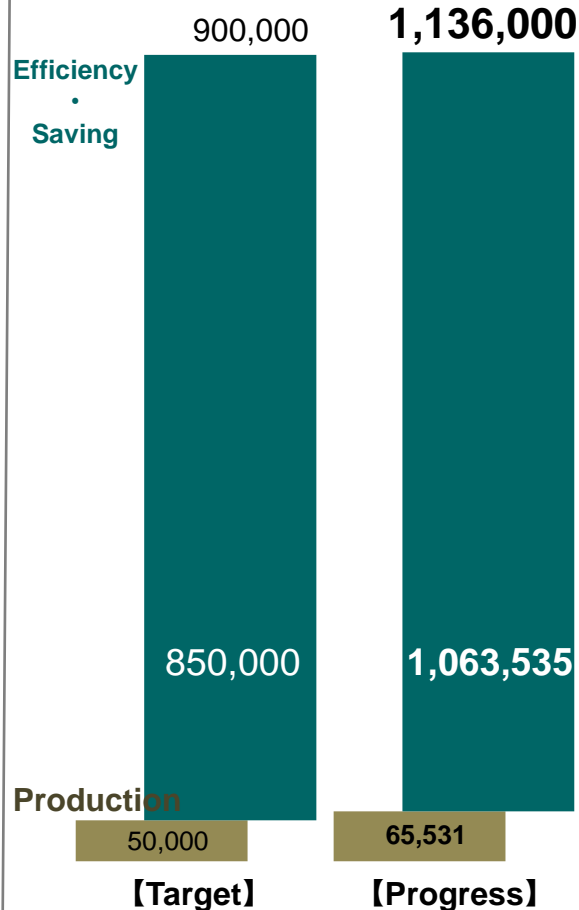
Target

- Power generation : 852GWh
- Energy demand cut : 1,866GWh

Production • Efficiency • Saving

126%

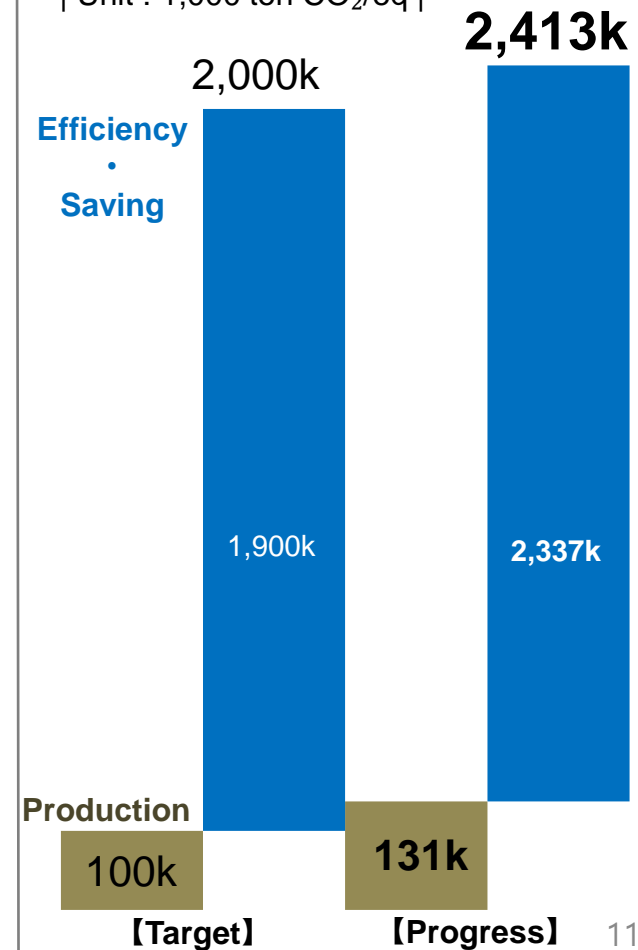
| Unit : TOE |



GHG emissions cut

121%

| Unit : 1,000 ton CO₂/eq |



Improved Energy Use in Seoul

Electricity Consumption

Nation
4.9%

Seoul
-4.0%

City Gas Consumption

Nation
-5.9%

Seoul
-15.5%

Power Self-Sufficient Rate

2.9%

5.5%

11

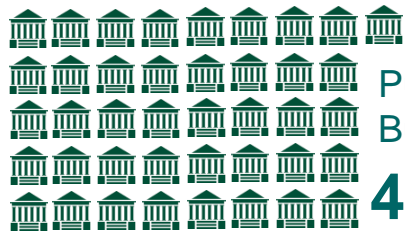
14

15

※ Energy Use in 2015 compared to 2011

Solar City, Seoul Project

Solar Power Capacity of 105.01MW ('03.1 ~ '15.12)



Public
Buildings

43.04



Schools

12.49



Private
Buildings

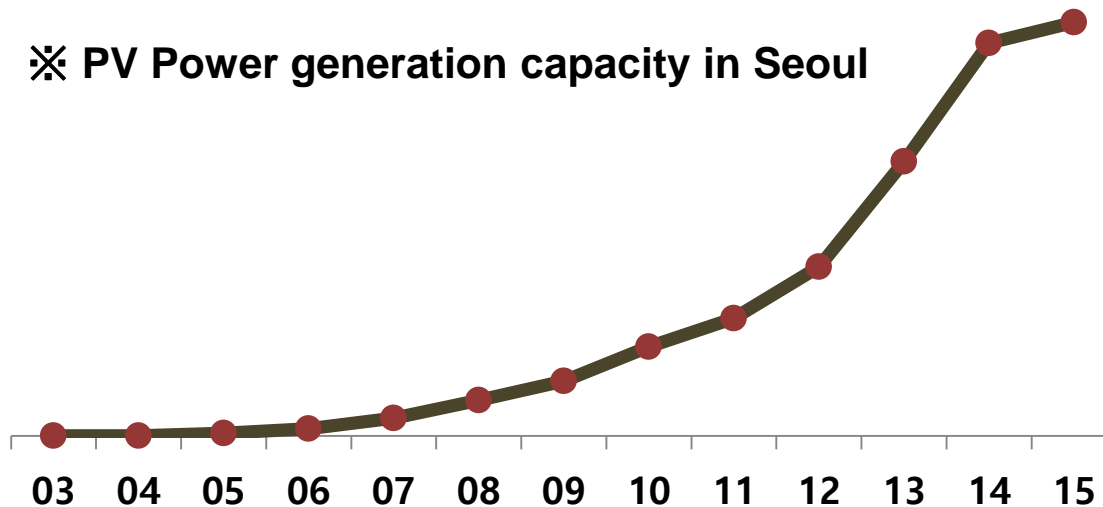
31.74



Micro PV

17.74

※ PV Power generation capacity in Seoul



105.01MW

Enough to power 36,000 households

- Power generated for 3.5 hours per day
- Households with a monthly average power consumption of 312kWh

Expansion of PV installations

10,929 places / 17,740kW ('15.1 ~'12)

Expand PV installation subsidies
(households → all buildings including public buildings)

Build PV landmarks to raise public awareness

<PV on bus stations>



< PV on soundproof walls >



<Hybrid Security Lights>



PR : PV panels on display, pilot PV installation etc.

< Official Solar Map Website >



< Lotte Hi-mart Outlet >

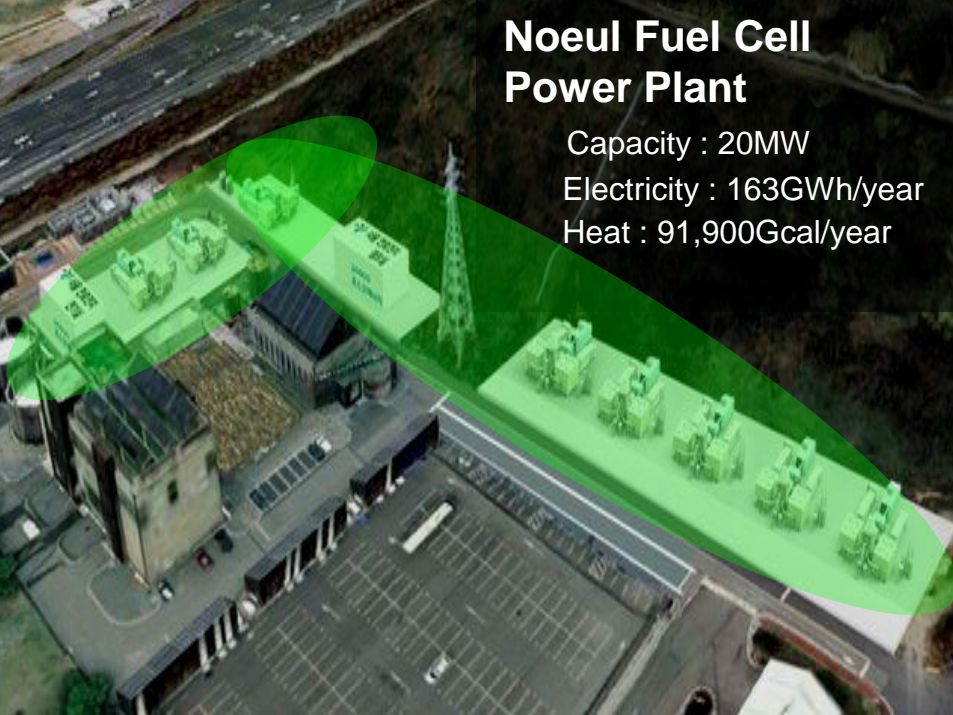


< Street Vendors >



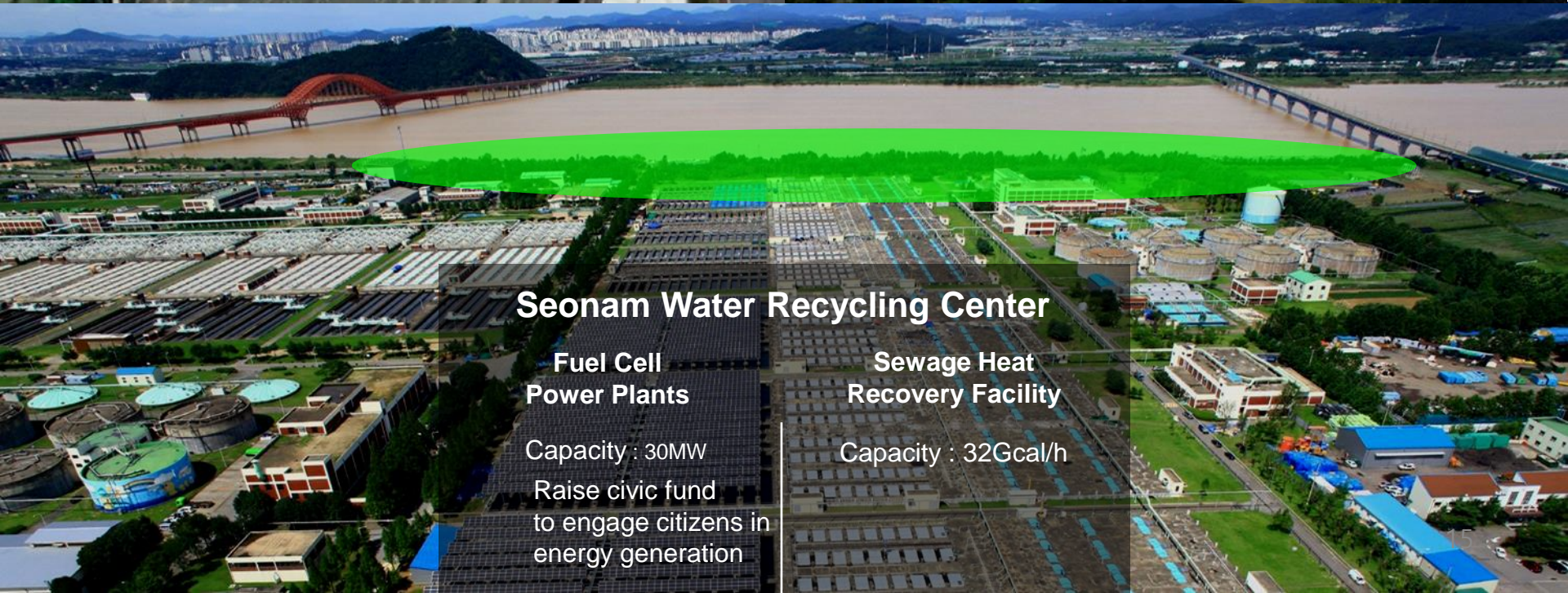
Noeul Fuel Cell Power Plant

Capacity : 20MW
Electricity : 163GWh/year
Heat : 91,900Gcal/year



Nowon Resource Recovery Facility

Recover heat from waste incineration to get heat sources
MOU signed for waste recovery



Seonam Water Recycling Center

Fuel Cell Power Plants

Capacity : 30MW
Raise civic fund
to engage citizens in
energy generation

Sewage Heat Recovery Facility

Capacity : 32Gcal/h

Lighthouse Project

Construction of small • medium energy efficient model houses for PR

Model houses that include passive elements, energy production and monitoring systems

Four energy efficient model houses to be built including daycare centers and senior citizen community centers

Develop a manual for the model houses, and share and promote the results

Insulation
Materials



Three-pane
windows



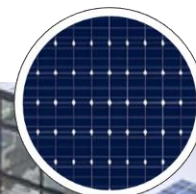
Air tight
construction



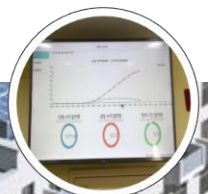
heat recovery
ventilator



PV



Monitoring
System



Building Energy Management System(BEMS)

Introduced at Seoul Seo-buk Hospital on a pilot basis

Reinforced environmental impact assessment requires BEMS on new large buildings

Eco-friendly boilers



Insulation Windows



Energy-efficient LED



Automatically controlled
BEMS



● BRP Target: 90,000 buildings done by 2018

※ Accounting about 20% of above 20 years old buildings in Seoul

BRP Project Objects		Number	Energy Savings (TOE)	GHG Emissions Reduction (tCO ₂)
Total		71,724	124,468	267,771
Public Blds.	Social houses	59	1,436	3,106
Private Blds.	Univ., Hospitals, Offices	2,464	114,114	246,829
Houses	Single, Apts, Multiple	69,201	8,918	17,836

LED Replacement in Public Buildings

Establishment of a Special Purpose Company
for LED replacement,
LED replacement in Public buildings
with private fund

('15.3 ~ 12)

93,000 *units*

LED replacements at subway stations
By Seoul Metro,
Seoul Metropolitan Rapid Transit Corp
(‘15.12)

210,000 *units*

PV-run LED traffic signs
at Children Protection Zones
(‘15.8~12)

1,970,000 *USD*

Improve Eco-mileage Program

1.72M members / 376,496 TOE saving ('14.7 ~ '15.12)

Focus resources on actual energy savers

Link GHG reduction and energy welfare improvement

【Expanded standards for provision of incentives】

※ Incentive beneficiaries 70,000 people(Current) → 120,000 people (Expected)

| Changed Standards |

Energy savings	Incentives
Over 5%, less than 10%	10,000 mileages
Over 10%, less than 15%	30,000 mileages
Over 15% (Same as before)	50,000 mileages

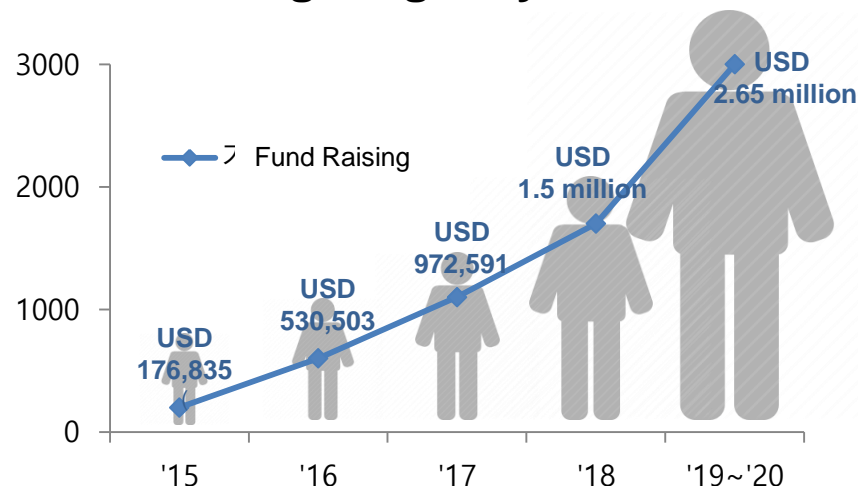
Seoul Energy Welfare Civic Fund

Civic-led Sustainable Fund

Citizens take the rein in mobilization, management and administration of the fund



Fund Raising Target by Year



Fund Raising

Raise funds in ways that spend profits from energy generation, efficiency and saving in improving energy welfare for the poor

Fund Management

'Secretariat'
+
'Decision-making Body'
+
'Volunteer Group'

Allocation • Administration

Promote energy saving by the poor by offering micro-PV panels, LED bulbs, and BRP services instead of monetary support

Fund Expansion

Provisions for the energy-poor will be done under the current system, Fund allocation will be expanded to include those who have been neglected under the present system.



USD 226,000 / 23,605 persons

Amount of fund raised and number of citizens invest in the fund
(June ~ December 2015)

Launch of 'Citizen Board for Seoul Energy Welfare Civic Fund And Youth Volunteer Group

Management Committee consists of 20 experts in energy welfare, law and accounting

Youth Volunteer Group composed of 45 college students promotes the fund

< Launch of Citizen Board (7.15) >



< Onbichumi Street Campaign (7.18) >



< Fundraising March at Mt. Namsan(9.12) >



Energy Independent Villages, living examples of Seoul's Energy Policies

'Increase the number of Energy Supermarkets' to 20

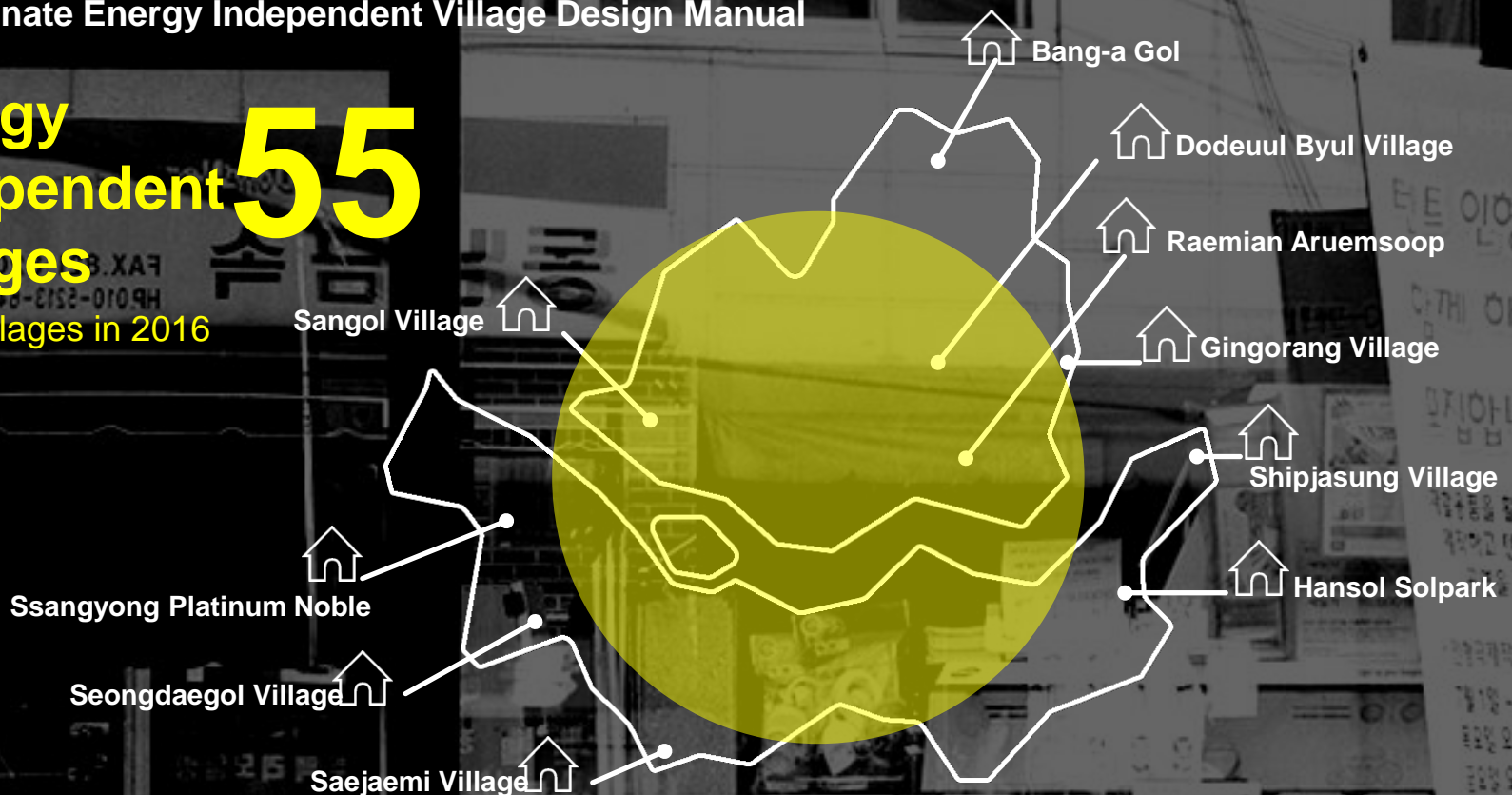
Run 'renewable energy tour programs'

Cut an average energy consumption by the energy independent villages by 8.5%

Disseminate Energy Independent Village Design Manual

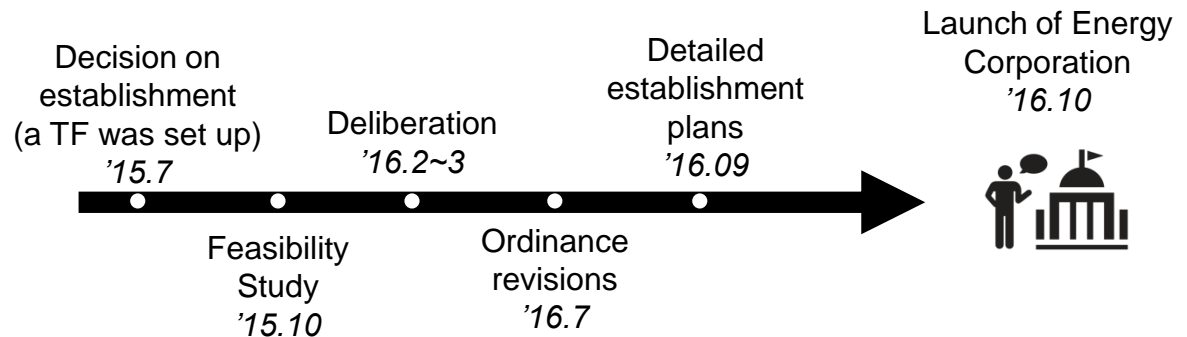
**Energy
Independent
Villages** **55**

24 New villages in 2016



Seoul Energy Corporation

Establishment of Seoul Energy Corporation dedicated to implementation of Seoul's energy policies



Roles and Duties of Seoul Energy Corporation

- Implement energy and environmental policies and projects under On Less Nuclear Power Plant
- Respond to newly emerging demand such as carbon trading scheme, energy welfare etc.
- Manage basic environmental • energy facilities such as district heating resource recovery facilities etc.

Commissioned a study on how to increase efficiency of district energy projects (between July 2014 ~ February 2015)

- Energy policies can secure public good through an energy corporation
- An energy corporation can boost effectiveness of energy policies

■ Global Attention to Seoul's ONLPP



『Earth Hour City Challenge』

WWF

Crowns National Earth Hour Capital

『One Less Nuclear Power Plant』

WGBC

Wins Climate Action Leadership Awards

『Eco Mileage Program』

UN

UN Public Service Awards

『Seoul Powered by Sunlight』

C40-SIEMENS CITY CLIMATE LEADERSHIP AWARDS

Green Energy

Key International organizations & events in Seoul



- Opening of ICLEI East Asia Secretariat
- 2015 ICLEI World Congress

2013 서울 국제에너지컨퍼런스
Seoul International Energy Conference 2013
Energy Transition Towards a Sustainable City - Challenges and Opportunities for Seoul

- Seoul International Energy Conference

■ Global Attention to Seoul's ONLPP



ICLEI World Congress 2015
8 - 12 APRIL 2015 • SEOUL

Seoul is the 2015 Earth Hour City Challenge Capital!



Source: CityTalk, A blog by ICLEI

03

Driving Forces of OLNPP's Success

STORY made by citizens
HISTORY made together with citizens.



■ Citizens' Active Involvement ('12~'14)

Enhanced Perception
& Civic Participation



Practical Local Energy
Policies

Made by Citizens



- Raise USD 388m in private capital
 - Built 3,756 PV Power Systems 22.8MW ('11) → 69MW ('14.6)
 - 46MW Hydro Fuel Cell Systems
- Power generation for 300,000 households from renewable sources

Saved by Citizens



- BRP expansion into houses from buildings

Buildings 2,278	+	Houses 17,284
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- Promotion of LEDs

200,000 ('11)	▶	6,790,000 ('14.6)
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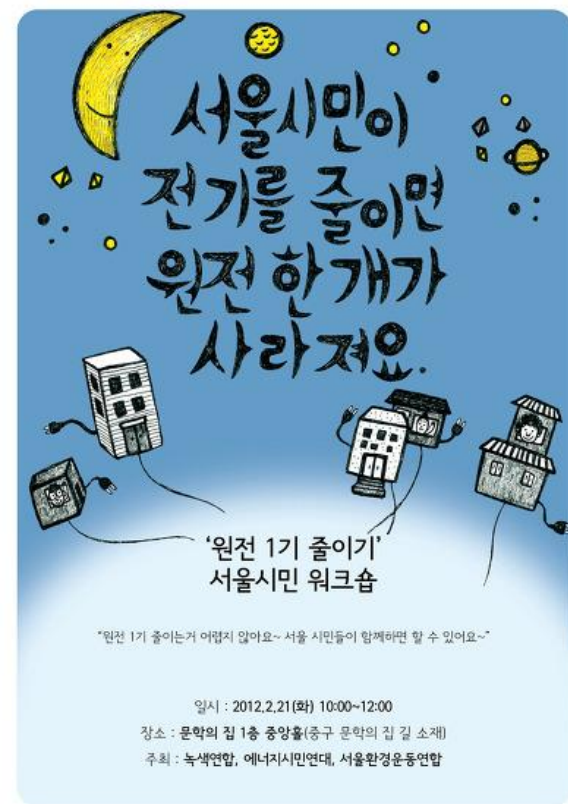
Led by Citizens



- Citizens' direct participation
 - Membership of Eco Mileage Program

500k persons ('11)	▶	1.7m persons ('14.6)
-------------------------	---	---------------------------
 - 20,000 Energy Guardian Angels at 500 schools

■ Citizens' Direct Participation in Discussion



April 26, 2012



원전하나줄이기 2단계 정책토론회

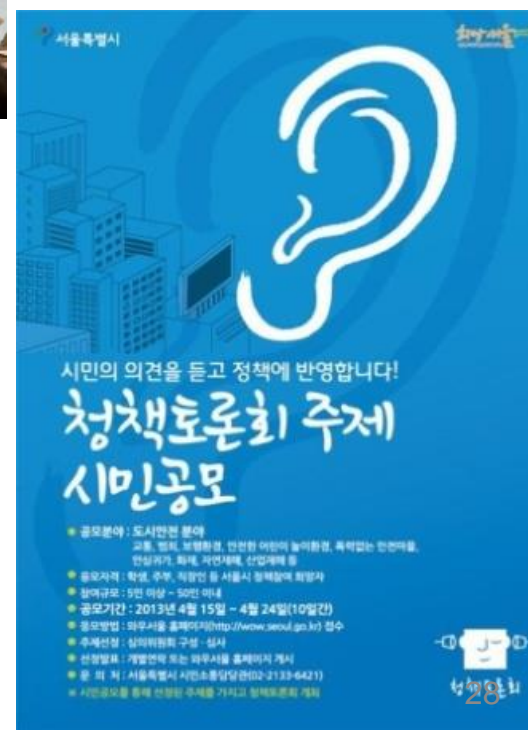
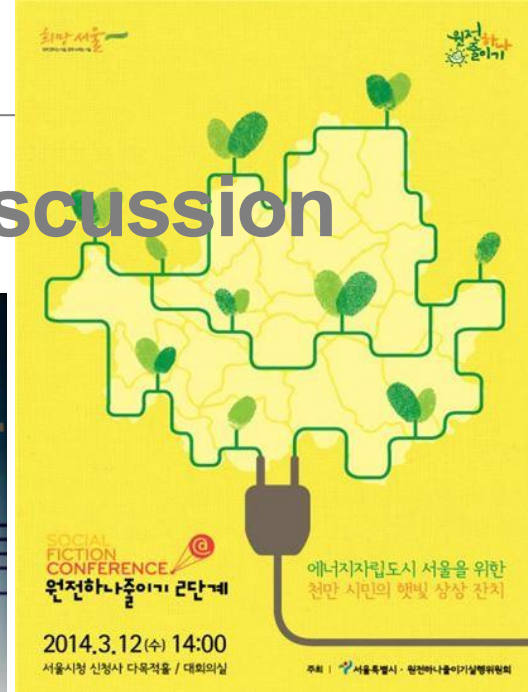
일 시 : 2014. 6. 26 (목) 15:00 ~ 17:00

장 소 : 서울시 시민청 태평홀

주 최 : 서울특별시, 원전하나줄이기 실행위원회

※ 프로그램 (안)

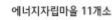
1. 식전행사
2. 개회 및 안내, 국민의례
3. 원전하나줄이기 2단계 계획 소개
4. 전문가 발제 제안
5. 자유토론
6. 마무리 말씀 (서울특별시장)
7. 폐회



희망 2기

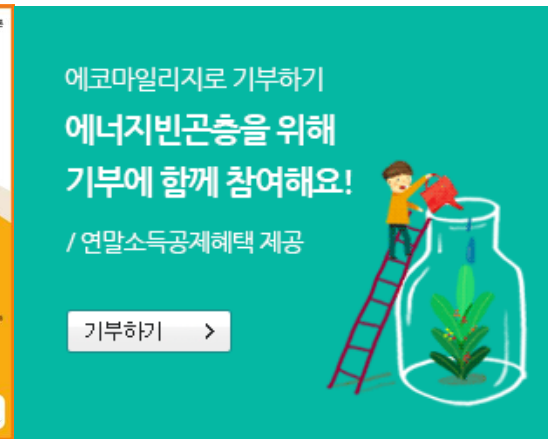
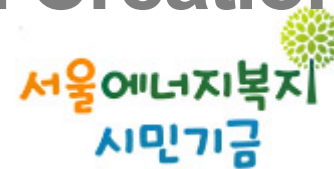
Citizen's Active Participation in Projects

🔴 Energy Self-Sufficient Village



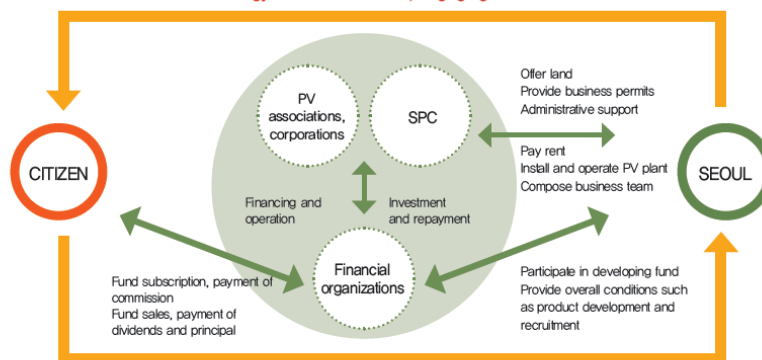
■ Citizens' Participation in Fund Creation

● Citizens' Energy Welfare Fund



● Citizens' PV Fund

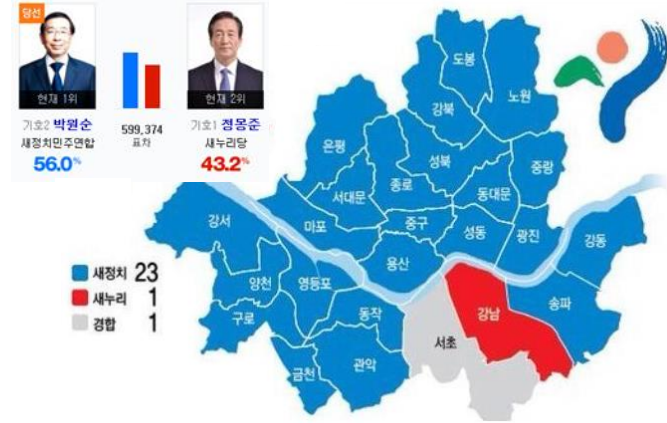
Offer information about fund, induce subscription
Build an energy self-reliant model, engaging the citizens



Participate in energy generation

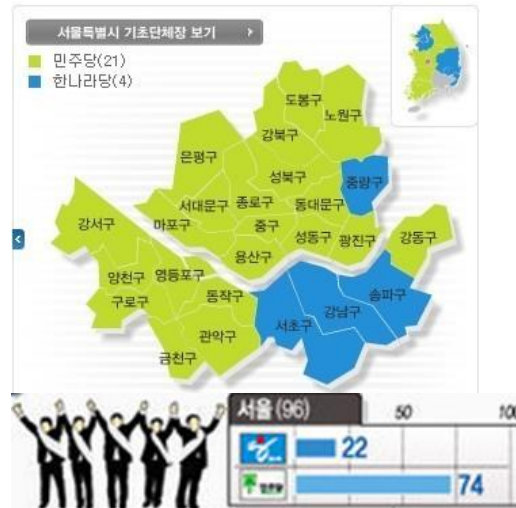


■ Mayor PARK Won-Soon's Will & Leadership



- Human Rights Lawyer
- Founder of Civil organizations: Social designer
- Chairman of Buan referendum on a radioactive waste disposal facility
- President of the World Mayors Council on Climate Change since 2012
- Locating the Secretariat of the ICLEI in East Asia

■ Benign Political Landscape: City Assembly & Districts



● OLNPP Phase 1

- 74 of 96 local assemblymen belonged to the opposite Democratic party
- 21 of 25 District heads belonged to the opposite Democratic party
- 15 District heads of Seoul (total 46 of 227 nation-wide) joined post-nuclear urban declaration

● OLNPP Phase 2

- 77 of 106 local assemblymen belonged to the opposite Democratic party
- 20 of 25 District heads belonged to the opposite Democratic party

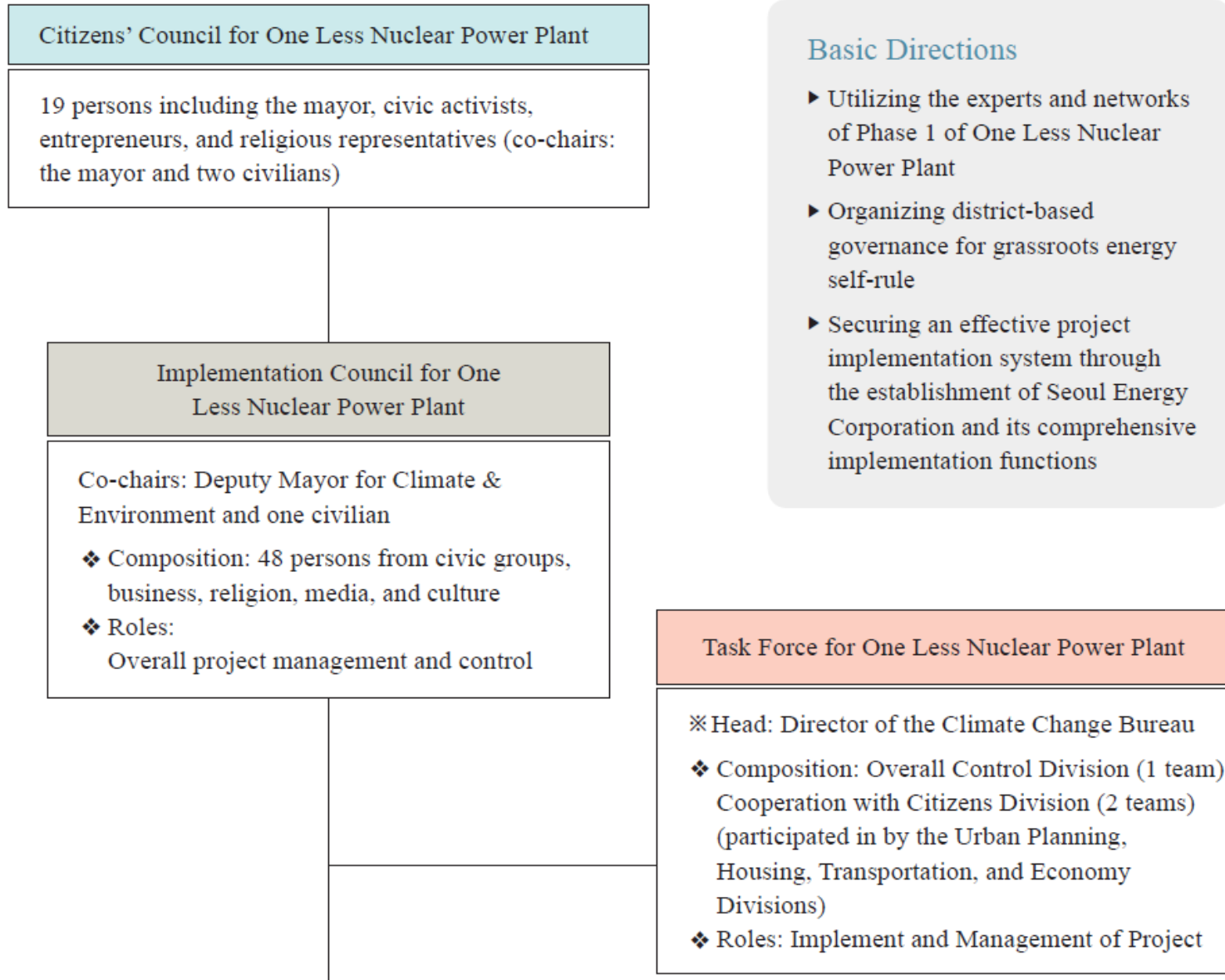
■ Organization, Budgets & the Personnel

Climate & Environment Headquarters

- Environmental Policy Division
- Green Economy Division
- Climate Change & Sustainability Division
- Air Quality Management Division
- Resources Recycling Division
- Living Environmental Division
- Energy Efficiency Promotion Division
- Energy Citizen Cooperation Division



■ Governance System Established & Run



3. Driving Forces of OLNPP's Success

Business Sector's Involvement

ENURI program: Energy Sharing Beneficial Corporates



Good Energy Stores



■ Awarding Nameplates to Energy-Saving Buildings

- Private buildings with BRP in 2013 and 2014 are targeted.
- Around 20 private buildings with excellent energy-saving performance are awarded.
- Best practice cases advertised on- and off-lines.
- Application → Examination → Site Inspection → Selection → Awarding
- Seoul Metropolitan government with Korea Green Buildings Council, Association of ESCO, Korea Appraisal Board

서울시 원전하나줄이기를 위한
에너지절약 건물을 찾아라!
- 인증명패와 상금을 드립니다 -

서울시의 전체 전력 소비량 중 56%를 건물이 차지하고 있습니다.
건물 내 적절한 에너지 관리는 에너지 비용을 절감할 뿐만 아니라,
대기오염과 기후변화도 방지할 수 있습니다.
서울시는 건물에너지효율화 사업을 통해
에너지를 아낀 건물들을 선정하여 인증명패와 상금을 드립니다.
많은 관심과 참여 부탁드립니다.

접수기간: **2015년 7월 1일 ~ 8월 31일** (2개월간)

신청자격: 서울시 소재 '13~'14년 건물에너지효율화사업을 완료한 건물의 소유주,
해당 건물 담당 ESCO사업자, 시공업체 또는 관리소장

접수방법: 온라인 접수(원전하나줄이기 홈페이지(energy.seoul.go.kr)
→ 공모전 게시판 → 에너지절약건물 인증명패 → 공모전 접수)

구비서류: 신청서 및 건물에너지효율화사업 관련 증명서류

평가기준: 효율개선 실적(80) + 에너지절약 실천 성과(20)

특전: 명패 수여 및 상금 제공

대상(1팀) 500만원
최우수상(3팀) 300만원
우수상(3팀) 200만원

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energy.seoul.go.kr

Fostering Green Interior Enterprises

- Training green interior technics and skills
- Free education
- Making the importance of building energy efficiency improvement
- Preparing village A/S



2015 하반기 '그린인테리어 가게 육성교육'

사)한국그린빌딩협의회와 서울시는 지역경제 활성화 및 주택BRP사업의 인식확산의 계기를 마련하고 인테리어 사업자의 전문성과 서비스수준을 높이며, BRP 시장 확대를 통해 인테리어 사업자들의 자생력을 강화하기 위해 아래와 같이 '그린인테리어가게 육성 교육'을 진행합니다. 교육과 평가를 통해 우수업체를 선정하여 인증마크를 부여하므로 업체 경쟁력을 강화 할 수 있는 기회가 될 것입니다. 관심 있는 분들의 많은 참여 바랍니다.

교육일정: 총 2회 진행

교육회차	교육일정	교육장소
1회	10월 08일(목) 09:30~18:30	서울시청 서소문청사(별관) 1동 13층 대회의실
2회	10월 29일(목) 09:30~18:30	서울시청 서소문청사(별관) 후생동 4층 강당

교육대상: 서울시 소재 실내건축 업체, 그린빌딩협의회 회원사, 인테리어업체, 그린인테리어에 관심 있는 모두
 교육 비: 무료, 교재 제공 (필기구는 개인별 지참)
 신청방법: 그린빌딩협의회 홈페이지 **[교육신청]** 메뉴에서 신청가능 (홈페이지 www.koreagbc.org)
 신청기간: 1회 (10월 7일까지), 2회(10월 28일까지) 선착순 마감으로 서둘러 신청해주세요
 문의: (사)한국그린빌딩협의회 사무국 070-7734-4134, 02-558-3013
 교육내용

교육시간	교육명	교육내용	강사
09:30~11:30	BRP 창호시공법	BRP에 적합한 창호공법과 시공사례를 통한 효과분석	정도갑
11:30~12:30	패시브하우스 시공사례	난방에너지 절약형 인테리어 및 고효율 자재적용 사례	조종선
13:30~15:00	건축물 에너지 성능평가	에너지성능평가의 원리와 ECO2 프로그램 평가방법 및 사례	안형준
15:00~17:00	고효율 단열시공법	결로방지를 위한 단열시공법/고효율 단열재의 종류	권영철
17:00~17:30	국내 친환경 건축물 인증제도 소개	국내 녹색건축 인증제도 및 시공사례	백종근
17:30~18:30	서울시 BRP 소개	수료식 / 주택 BRP 용자 신청 서류, 방법 등 안내	서울시

교육장 오시는 길

◆서소문청사 1동 오시는 길 (10/8 교육장)
 -시청역 12번 출구 나오자마자 좌측 골목으로 80m 직진
 -덕수궁 돌담길 따라 좌회전 하면
 -바로 보이는 건물(안쪽으로 들어감)이 서소문청사 1동임 (입구에 해치상 있음)

◆서소문청사 후생동 오시는 길(10/29 교육장)
 -서소문청사 1동 정문 맞은편의 2동 뒤에 후생동 위치

■ Green Campus Council

- MOUs between Univ. & the Seoul Metropolitan government
- 83% of universities in Seoul (35. among 42) joined
- Green campus leaders' activities

- | | | | | |
|-------------|--------------|------------|-------------|------------|
| 1 덕성여자대학교 | 11 이화여자대학교 | 21 건국대학교 | 28 한국예술종합학교 | 32 고려대학교 |
| 2 서울과학기술대학교 | 12 서울과학기술대학교 | 22 성공회대학교 | 29 경희대학교 | 33 성신여자대학교 |
| 3 평운대학교 | 13 서강대학교 | 23 한영신학대학교 | 30 한국외국어대학교 | 34 동국대학교 |
| 4 서경대학교 | 14 숙명여자대학교 | 24 중앙대학교 | 31 동덕여자대학교 | |
| 5 국민대학교 | 15 성균관대학교 | 25 홍익대학교 | | |
| 6 상명대학교 | 16 한국방송통신대학교 | 26 서울대학교 | | |
| 7 서울기독대학교 | 17 한성대학교 | 27 서울교육대학교 | | |
| 8 그리스도대학교 | 18 서울시립대학교 | | | |
| 9 홍익대학교 | 19 한양대학교 | | | |
| 10 연세대학교 | 20 세종대학교 | | | |



■ Honorary Ambassadors and Apts' Energy Sheriffs

● Honorary Ambassadors for OLNPP2

- Appointment criteria: personal example for energy-saving
- Activities: Actively advertising Seoul's OLNPP2, advertising best practices
- Activity Examples: Public appearance on TVs and Radios, Interviews, Writing Columns, Production of on-line contents including SNS

● Apartments' Energy Sheriffs

- Appointment criteria: Those who are awarded Mayor's citation and promise voluntary and continuous activities
- Participating energy workshop and education programs
- Joining eco-mileage program, energy leader in their apartments



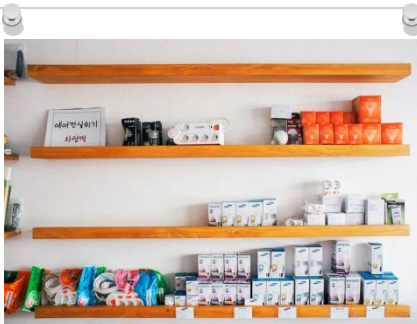
3. Driving Forces of OLNPP's Success



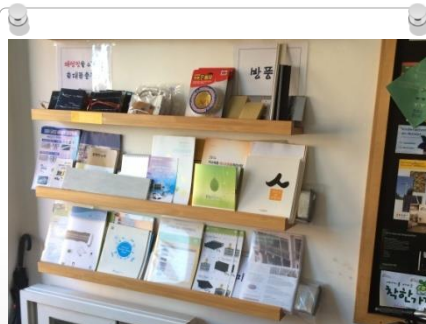
Energy Hub Center Energy Supermarket



Services in Supermarket



Buy power-saving goods



Join energy training program

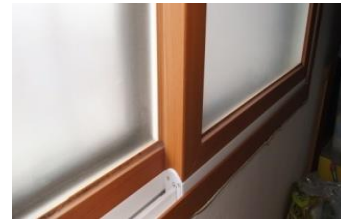
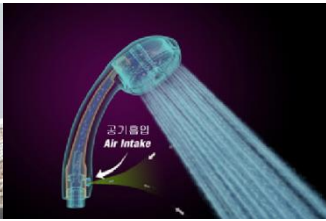
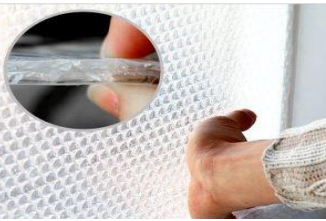


Receive energy consulting



Experience
bicycle power generator

■ Job Creation in the Energy Field



- Energy Supermarket
- Green interior experts
- New and renewable energy equipment technicians
- Energy planners
- Energy sharing educators
- Energy consultants



Energy and Climate Change Education

Various Educational Programs



Utilizing Educational Facilities



Experts' Involvement and Advices

Holding International Energy Conferences since 2013

2015 서울
국제에너지
컨퍼런스

Seoul International Energy Conference 2015

“ 도시에너지 그 미래를 보다 ”

2015. 11. 11(수), 10:00 - 17:30
서울특별시청 8층 다목적홀 | www.siec2015.co.kr

등록사무국 Tel. 070-8255-5440, E-mail. siec2015@pod-pco.com

기초연설 I
2052년을 향한 도시의 에너지 활용방안
요르겐 렌더스 [노르웨이 미래학자]

기초연설 II
에너지 사고전환 - 지역에서 찾는 세계 미래의 해법
윌트 페터슨 [영국, 서울국제에너지문단 단장]

본과세션 I
에너지정책과 거버넌스_다목적홀(8층)

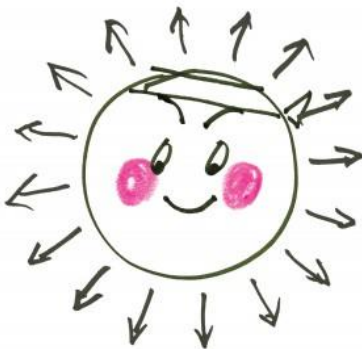
본과세션 II
도시재생과 에너지_대회의실(3층)

본과세션 III
교통수단과 에너지_태평홀(지하2층)



Communication with Citizens

● Noticeable Character, BI and Posters

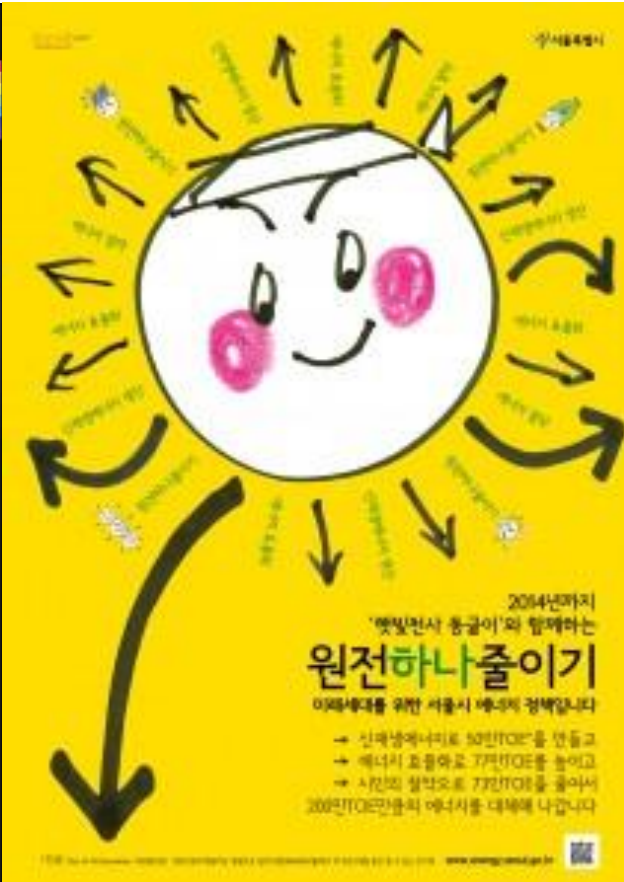


시민과 함께 만드는 '원전 하나 줄이기'의
BI와 슬로건을 만들어주세요.

BI & 슬로건 공모전

· 원전 하나 줄이기, 알고 계세요?
지구를 덮게 만드는 온실가스 배출의 90%가 에너지 소비에서 발생되고 있습니다.
서울시는 뜨거워지는 지구의 열을 식혀주고, 건강하고 안전한 도시 서울을 만들어
나가기 위해 '원전 하나 줄이기' 사업을 추진하고 있습니다.

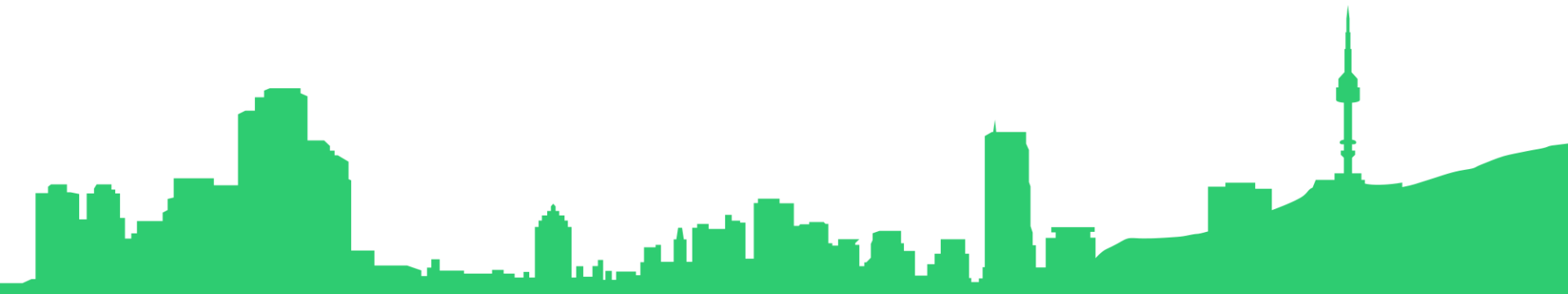
· '원전 하나 줄이기'란?
시민이 자발적으로 참여하는 에너지 절약, 고효율 LED 조명 보급 등으로 에너지 효율화,
태양광 등 친환경적인 신재생에너지의 생산 확대를 통해 원전 하나에 해당하는 200만
TOE의 에너지를 절감해 나가는 서울시의 정책을 말합니다.



04

CHALLENGES AND OPPORTUNITIES

Tasks Remained



Diffusion of Seoul's Experiment and Experience

- Cities' Announcement for a Society toward Post-Nuclear and Energy Transition (Feb. Feb. 13, 2012, 46 local governments)

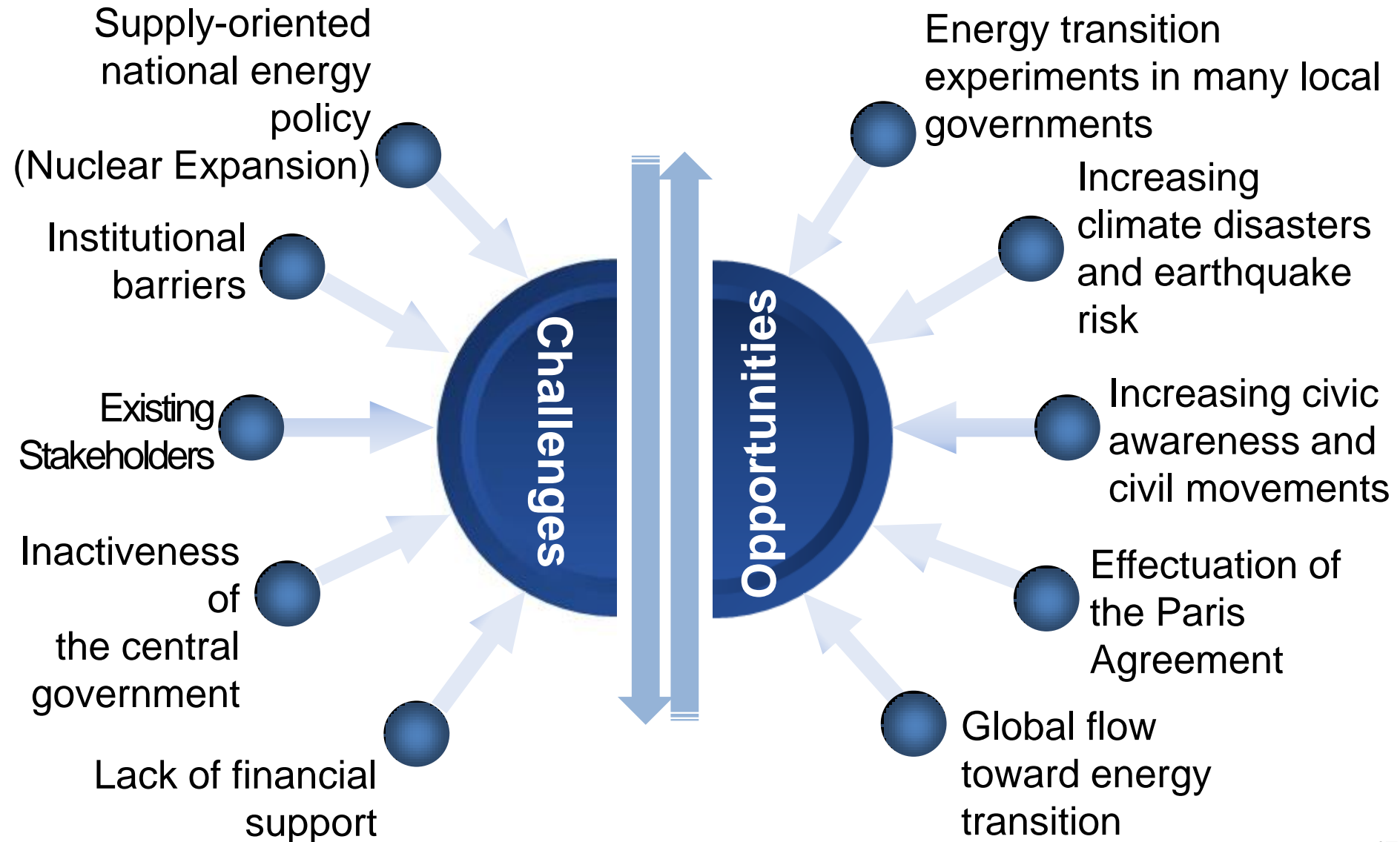


- Gyeonggi-Province, Energy Vision 2030 (June 25, 2015)



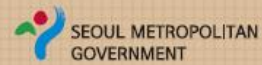
- Joint announcement for local energy transition (Nov. 24, 2015)

■ Challenges vs. Opportunities





THANK YOU!



Seoul

One Less Nuclear Power Plant, Phase 2

Seoul Sustainable Energy
Action Plan

