The Korean 2nd National Energy Master Plan

Executive Summary

2014

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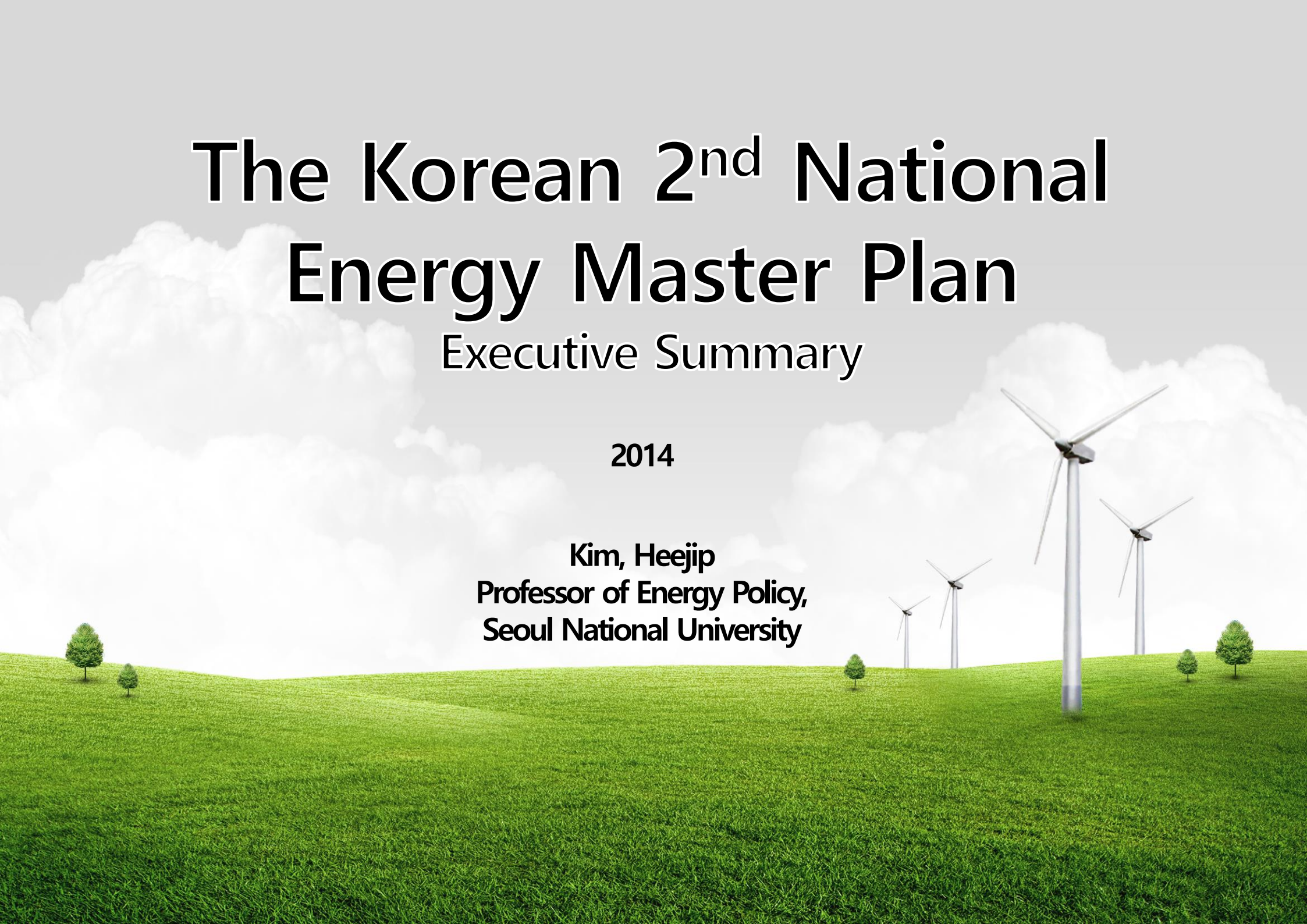


National Energy Master Plan Overview

Objective

Provide Long Term(over 20 years) Energy Policy Direction

Top-Ranked Legal Plan in Energy Sector

→ **Comprehensive Plan systematically integrated with other plans and mediate at the bigger picture**

Legal Basis

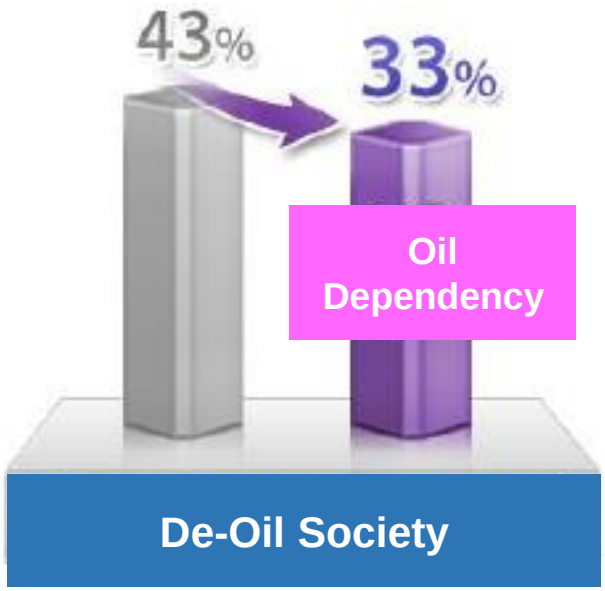
The Fundamentals of Low-Carbon Green Growth Act
The First Clause of Article 41

"Government should develop and enforce 5 year energy master plan with 20 year planning term based on basic principle of Energy Policy"

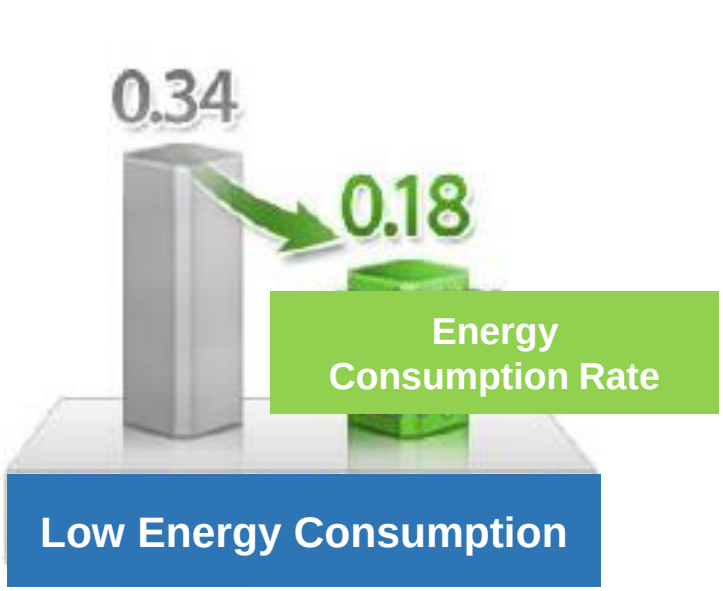
Key Targets of the 1st National Energy Master Plan(2009)

5 Key Initiatives

Energy Self-Reliant Society

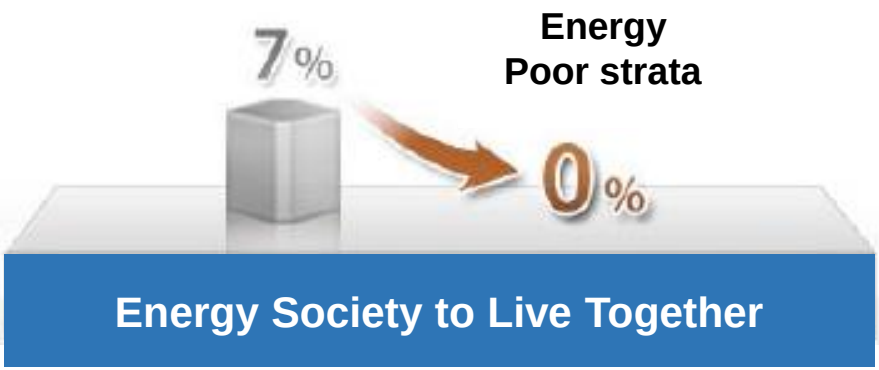


De-Oil Society



Low Energy Consumption

New Growth and Job Creation with New Green Technology

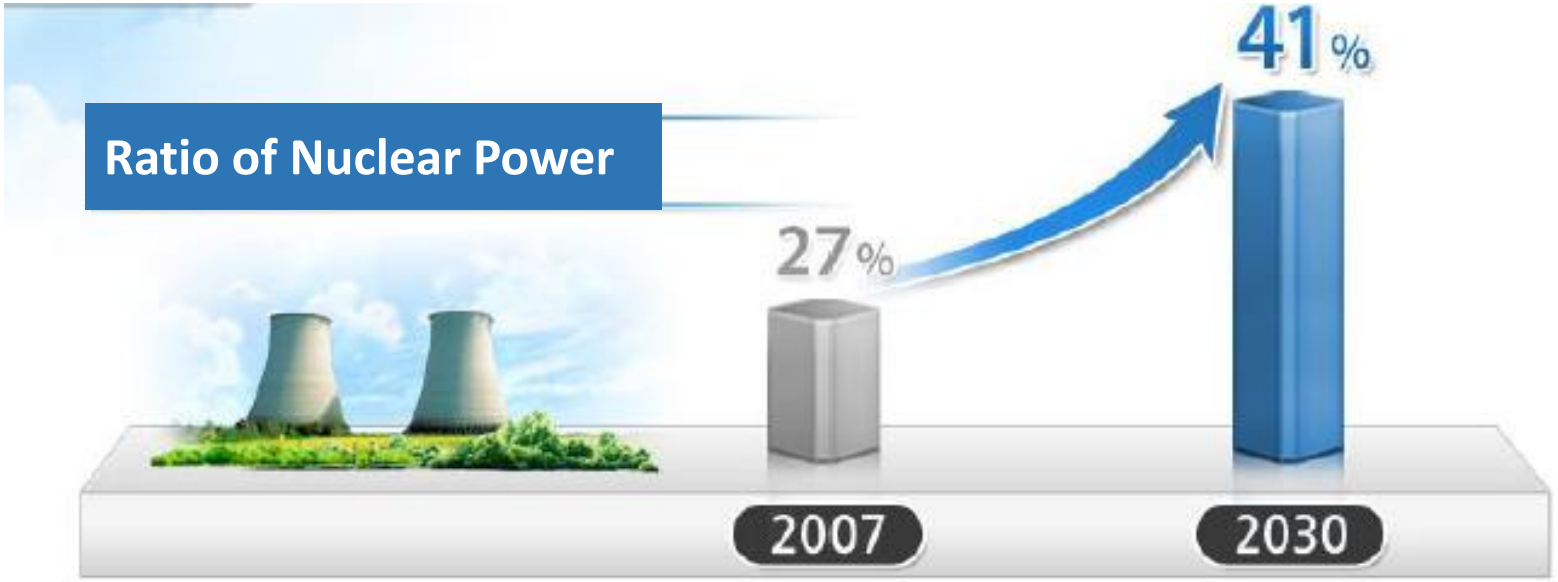


Energy Society to Live Together

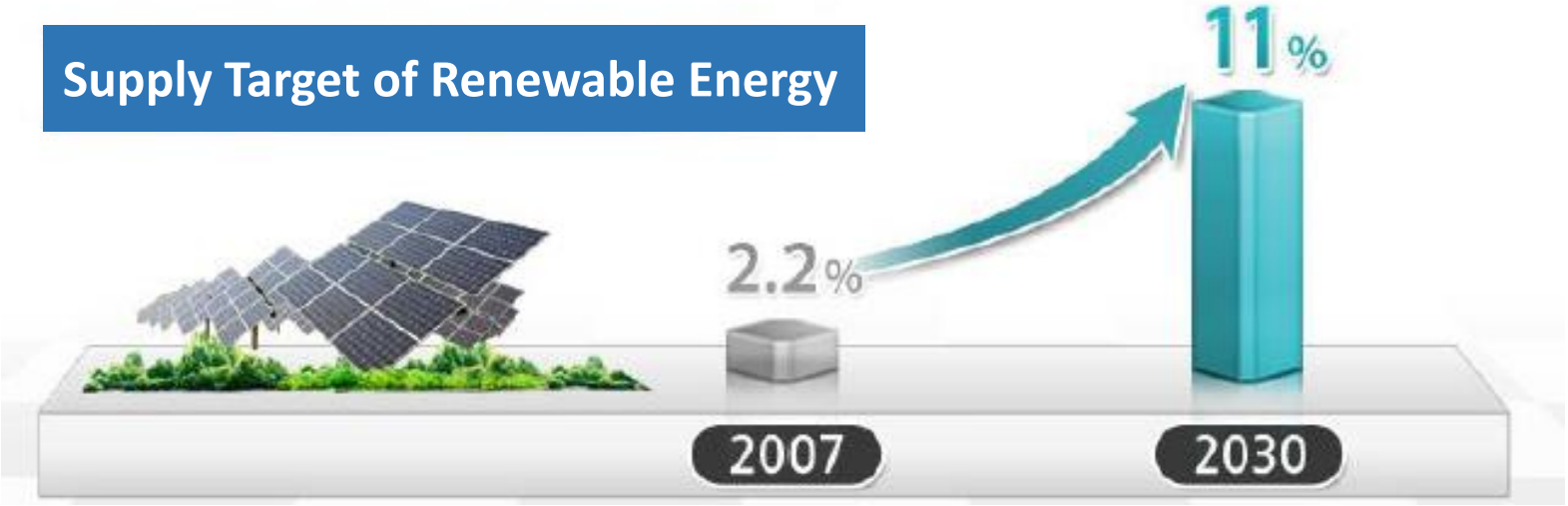
Key Targets of the 1st National Energy Master Plan(2009)

Energy Mix

Ratio of Nuclear Power



Supply Target of Renewable Energy



Results of the 1st National Energy Master Plan(2009)

Outcome

- **Propose Direction of Policy for Low-Carbon Green Growth**
  - Maximize Low-Carbon Energy Source, such as Nuclear/Renewable Energy
  - Control Energy Demand and Improve Energy Consumption Rate
  - Generate New Growth Engine w/ Green Growth Tech. at the level of advanced countries

→ **Foundation of Green Growth;**
Legislate The Fundamentals Act, Country Greenhouse Gas Reduction Target

Limitation

- **Demand management policy without appropriate pricing**
  → **Sudden Increase of the Electricity and rise in instability of supply and demand**
- **Energy Mix focusing on Nuclear and Coal**
  → **Transmission Network Saturation and Social Conflicts**
- **Target Setting focusing on Quantitative Growth**
  → **Debt increase due to Overseas E&P, Low Renewable Penetration Rate**

→ **Needs for including different values;**
Communication, Safety, Environments needs to be considered

Changes for the 2nd National Energy Master Plan (2014)

Fluctuation of Oil Prices

- International Oil prices to be consistently around $100
- Price will continue to fluctuate in the foreseeable future

Emergence Of Unconventional Energy

- Shale Gas, Oil Sands etc.,
- Increase in unconventional gas and oil production

Rise In Energy Demand

- Energy demand to rise 33% until YR2035 (In comparison to YR2011, IEA)
- The increase in demand caused by increase In energy demand in non-OECD countries

Changes In Nuclear Policies

- Expand/Maintain Nuclear Power:: USA, U.K.., China, Russia
- Reduction/Withdrawal from Nuclear Power: France, Japan
- Gradual Reduction in Nuclear Power: Germany, Switzerland, Belgium

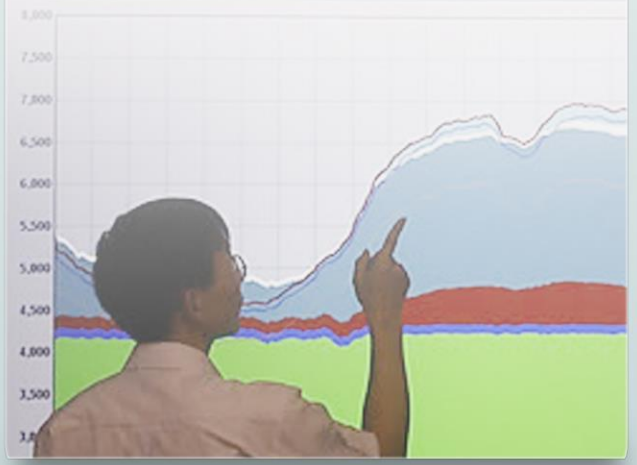
Domestic Environment Changes and Challenges

Reduced Credibility

- Shutdown of Nuclear Power Plants
- Increase in discomfort due to unstable electricity supply

Increase in Demand

- High proportion of heavy energy consumption Industry (Steel, Petrochemical)
- Demand for lower Electrical Bills



Conflicts on Energy Policies

- Nuclear Policy/Waste
- Transmission line
- Conflicts w/ local community

Demand Forecast and Targets

Demand Outlook

1.3% Average annual increase in total energy. Electricity has the fastest average annual growth outlook of 2.5%

Final Energy Demand Forecast (Mil. TOE, %)

Year	Electricity	Oil	Coal	City Gas	Heat Energy	Renewable	Sum
2011	**39.1** (19.0%)	**102.0** (49.5%)	**33.5** (16.3%)	**23.7** (11.5%)	**1.7** (0.8%)	**5.8** (2.8%)	**205.9** (100%)
2035	**70.2** (27.6%)	**99.3** (39.1%)	**38.6** (15.2%)	**35.3** (13.9%)	**3.3** (1.3%)	**7.4** (2.9%)	**254.1** (100%)

Target Demand

Reduction of Final energy by 13.3% from demand forecasts,
Reduction of Electricity by 15%

Key Changes in Energy Mix

Proportion of Nuclear Power

Primary Plan	Maximum Expansion of low-carbon Green Growth, 41% by 2030
Private working Group Recommendations	Considering social acceptance and grid conditions, 22~29% by 2035 was proposed
Final Proportion	Review to about 29% by comprehensively taking into account greenhouse gas reduction, industrial competitiveness, energy security

Proportion of Renewable Energy

Primary Plan	Expand to 11% per First energy by 2030
Recommendation	Maintain 11% Target by Re-calculating diffusion potential
Final Proportion	Accepted recommendation considering the importance of renewable energy expansion and diffusion limitations

2 Vision and 5 Strategy

2 Visions

Sustainable Energy Industry and Policy

Improved confidence and quality of life

1. **Emphasis on Demand Management**
2. **Distributed Power Generation**
3. **Improved Environment & Safety**
4. **Energy Security & Stable Supply**
5. **Public Consensus on Energy Policy**

Changes from previous energy policies

	Previous Policies	Current Policies
Direction of Policy	Focus on Supply Growth to Meet Demand	Proactive Demand Management
Energy Pricing	Priority on containing energy price for economic growth	Correct valuation of Energy Price for Market Mechanism
Nuclear Power	Efficiency perspective	Balance between safety and efficiency
Renewable Energy	Government driven domestic market	Private-led domestic and overseas market
E&P	NOC driven overseas expansion	Private-led profitable growth

5 Initiatives

1. Emphasis on Demand Management(1)

Current Status and Issues

- Paradigm shift: From supply perspective only to Balance between supply and demand
- ICT Application to Energy for enhance efficiency

Direction Creation of Energy Demand Management Market utilizing ICT

1 Energy Storage System : ESS

o Promote expansion in power generation operators, and high electricity consumers

2 Energy Management System : EMS

o Priority Implementation in heavy electricity-use buildings and factories

3 Enable demand management market

o Market creation for managed energy demand

1. Emphasis on Demand Management(2)

Current Status and Issues

- Electricity Abuse due to relatively low electricity rates
- Need for new incentive system to rationalize electricity usage

Direction Changes of Electricity Rates

1 Cost Reflected Electricity Pricing

o Reflect rational cost based pricing to encourage reasonable consumption of electricity

2 Modify distorted residential electricity rates

o Rationalize it to reflect changes in the residential electricity use

3 New Pricing promoting Energy Demand management

o Expand pricing that encourages rational energy consumption and investments in demand management

1. Emphasis on Demand Management(3)

Current Status and Issues

- Further distortion of energy consumption due to relatively low electricity rates
- Provide incentives to encourage reasonable power usage

Direction Strengthen demand management by industry

1 Transportation Sectors

o Enhance fuel efficiency,
o Increase supply of eco friendly vehicles such as
Hybrid/Clean Diesel, Electric/Hydrogen Fuel cell vehicles

2 Building Sector

o Achieve zero-energy concept for all new buildings by '25

3 Equipment Sector

o Maintain 20% Grade 1 Efficiency on heating and cooling equipment, appliances, and electric motors

2. Distributed Power Generation

Current Status and Issues

- Difficulties in Large power plants and transmission
  (Grid Construction conflicts, plant construction delays)
- Needs for Distributed Power Generations in spite of High Cost

Direction

1 Power System stabilization through distributed plant location

o Establish plant construction and transmission construction plan simultaneously and propose a location guideline to power providers (Transmission Map)

2 Expansion of distributed power

o Encourage self-power generation for high demand companies and industrial districts

o Reformation of pricing/tax/subsidies

o Increase distributed renewable energy for families, villages, and schools

5 Initiatives

3. Improved Environments & Safety(1)

Current Status and Issues

- Energy increase which accounts for more than 80% of greenhouse gas emissions
- Needs for actions to achieve green house gas reduction commitment

Direction Responding to Climate Change

1 Reduce greenhouse gas emission in the power sector

o Apply the best available technology (USC, CCS etc,) to new thermal power plants

2 Promote Effective Reduction in Greenhouse Gas

o Support reduction technology development, Share/ Proliferate industry best practices, Propose reduction guidelines

3 Improve corporate response to climate changes

o Expand Emission Trading Scheme (Green Credit)

o Provide institutional basis for training for professionals and companies

5 Initiatives

3. Improved Environments & Safety(2)

Current Status and Issues

- Social demand for safe operation of nuclear power after Fukushima
- Need to improve transparency of nuclear industry

Direction ‘Safety First’ Nuclear and Innovation

1 Strengthen Nuclear Safety

o Sustained implementation of safety measures
o Implementation of ‘Safety First’ Nuclear Plan Operation

2 Innovation of Nuclear Industry

o Implement Checks and Balances and competitive system within the Nuclear industry
(Short-Term) Transparency, Improve procurement, Strengthen quality management
(Mid-Long Term) Standardize Parts, Cost-Based Pricing, Integrated information system

3 Establish Policy on Nuclear Waste Management

o Establish control measures led by nuclear waste speculation committee (YR2015)

3. Improved Environments & Safety(3)

Current Status and Issues

- Priority change to public safety over supply and efficiency

Direction

Enhance safety management for Energy facilities

1 Expansion of Safety Policies and Safety technology development

o Strict Safety Management on Consumer products such as LPG & City Gas
o Improve corporate and public safety management capability by safety technology R&D

2 Industrialize Safety Services for global market

o Provide safety certification, diagnosis/consulting support for domestic power plant companies operating in South-East Asia and Iraq

4. Energy Security & Stable Supply(1)

Current Status and Issues

- Short-term and quantity focused overseas energy development policy
- Lack of capabilities such as professionals, R&D ,and Government support structure

Direction

Substantiate Overseas Resource Development

1 Strengthen Overseas resource development capabilities

o Secure exploration, operation rights
o Improve debt to equity ratio
o Improve investment process, human resource, and R&D capabilities

2 Divide the role of public and private sectors

o Public sector to focus on fields that are high risk and need long term investments, Private sector to focus on big market potential related investments
o Strengthen support for resource development investments

4. Energy Security & Stable Supply(2)

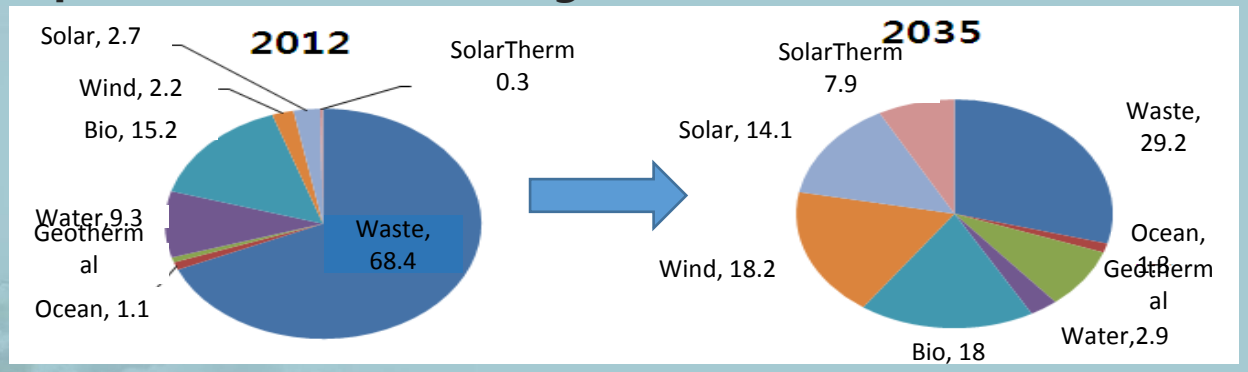
Current Status and Issues

- Less than expected adoption of renewable energy in spite of Government's strong drive
- Needs to increase domestic track records for global market

Direction Expand Renewable Energy : ('12) 3% → ('35) 11%

1 Diversification of Sources :

Expand natural resource usage such as Solar, Solar Thermal, Wind



2 Market Creation and Policy Improvement

o Revise implementation plan of new policies

o Integrate PV and Non-PV market to promote diversification of suppliers

5. Public Consensus on Energy Policy

Current Status and Issues

- Relatively limited access to energy of the low income households

Direction — Reformation of Energy Welfare

1 Introduction of energy vouchers

o Integrate support to provide one universal welfare method for energy
o Provide Heating Assistant to low income house holds

2 Restructure Energy Efficiency Program for Low Income Households

o Provide optimized welfare for low income households such as lighting, insulation, boiler replacement etc.,

3 Expand Energy Welfare Infrastructure

o Precisely identify residential energy usage of welfare beneficiaries
o Construct Integrated Data Base in conjunction with social welfare system

Questions