TOKYO FORUM FOR CLEAN CITY & CLEAR SKY

FCEV Supplying Project

For A New Phase of Changwon

CHANGWON
ENVIORONMENTAL CAPITAL

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CHANGWON

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City of Changwon

Overview

- **Location**: Southeast area
- **Population:** 1.05m(9th)
- **Area** : 747.67㎢
- **Climate:** Temperate
- **Key Industry**: Mechanic
- **Key Features**
  - Capital of Gyeongnam Province
  - 1st Planned City(modeled after Canberra)

- **Major Events**
  - Jinhae Naval Port Festival(April 1~April 10)
  - K-Pop Festival(September)
  - 2018 ISSF World Shooting Championship
- **Local Professional Sports Teams**
  - Gyeongnam FC(Soccer)
  - Changwon LG Sakers(Basketball)
  - NC Dinos(Baseball)

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Life in Changwon

City Plaza

Yongji Lake

Kpop World Festival

Yeojwacheon Stream

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2018 Visit Changwon Year

International Shooting Range

Gyeongnam FC

LG Sakers

NC Dinos

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Background

I. Air Pollution
II. GHG Emission
III. PM10, PM2.5 Emission from Diesel Vehicles
IV. Achieving Sustainable Development Goal
V. Need for Development of A Major New Industries

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Public Bike - NUBIJA

1 Establishment & Current Status

- The 1st Public Bike in South Korea(Currently over 20 cities running)
- Establishment: 2008(20 Terminals & 500 Nubija bikes)
- Terminals & Bikes: 269 terminals and 6,121 Nubija bikes(As of April 2018)
- Bike Lane: 103.3km(Longest in South Korea)
- Budget: Installation $48,000/terminal Maintenance $4.8m/yr

2 Rental Fee (Comparison with Miami Citi Bike)

Changwon			Miami, FL	
	Period	Fee	Time	Fee
Membership	1 year	$28	30min.	$4.50
	6 months	$17	1h	$6.50
	1 month	$3.75	2h	$10.00
	1 week	$2	4h	$18.00
Non-membership	1 day(90min.)	$1	24h	$24.00

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EV Supplying Project

1 History

- 2011 Public EV supply(140) / 2013 Private EV supply(422)
- 562 Vehicles Total(2011~2017), 55 Public Quick Charging Stations
- Enacted city ordinance for supporting EV(15 May 2014)

2 Benefits

- Subsidy for Purchasing($10,000~$20,000)
- Automobile Tax off
- Highway Toll 50% off
- EV Parking Area / Parking Tower

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EV Supplying Project

3 Satisfaction Survey on EV

Survey Targets (Purchasing)	Survey Period	Satisfied Total	Very Satisfied	Satisfied	Dissatisfied
'14~' 15 (130)	Jan.' 16	86.6% (102)	26.6% (34)	60% (78)	13.3% (14)
'15~' 16 (92)	Jan.' 17	87.0% (80)	21.7% (20)	65.3% (60)	13.0% (12)
'16~' 17 (94)	Jan.' 18	93.6% (88)	52.1% (49)	41.5% (39)	6.4% (6)

- Satisfaction Factors: Vehicle Performance Enhancement, Increased Infrastructures
- Dissatisfaction Factors: Charging Time, Distance to Empty(DTE)

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FCEV Project

1 History

- Changwon – selected as a hub city of Supplying FCEV by the Ministry of Environment(2015)
- Total FCEV in Korea: 170 vehicles(2015~2017) / Changwon: 47 out of 170(28% Total)
- 1st Fueling Station in Changwon: Completion - March 9, 2017
- Capacity of Fueling Station: 5 vehicles in a row, 50 vehicles per day
- Budget(USD): $4.5m(initial budget, 2016), $7.3m(2018 projected)

Budget Details	
2016 initial budget $4.5m	2018 budget
Fueling Station: $2.8m	Fueling Station: $6m
Purchasing FCEV: 3.2m(40)	Purchasing FCEV: $0.68m
Subsidy for Citizens: $0.25m	Subsidy for Citizens: $0.61m

*2018 Total Budget for eco-friendly vehicles(EV, FCEV, NGV): $13.6m

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FCEV Project

2 Specification of FCEV & Subsidy

Brand	Model	Specification
HYUNDAI	Tucson IX Fuel Cell	Driving range: 415km(260mi) Acceleration(0 →100km/h): 12.5sec Max. speed: 160km/h(100mph) Fueling time: 3min Fuel cell stack: 100kw Fuel efficiency: 83km/kg

Subsidy: $35,000 out of $80,000(Total Price)

Changwon Hydrogen Fueling Station (Maintenance - $0.11m/yr)

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FCEV Project

3 Major Effect

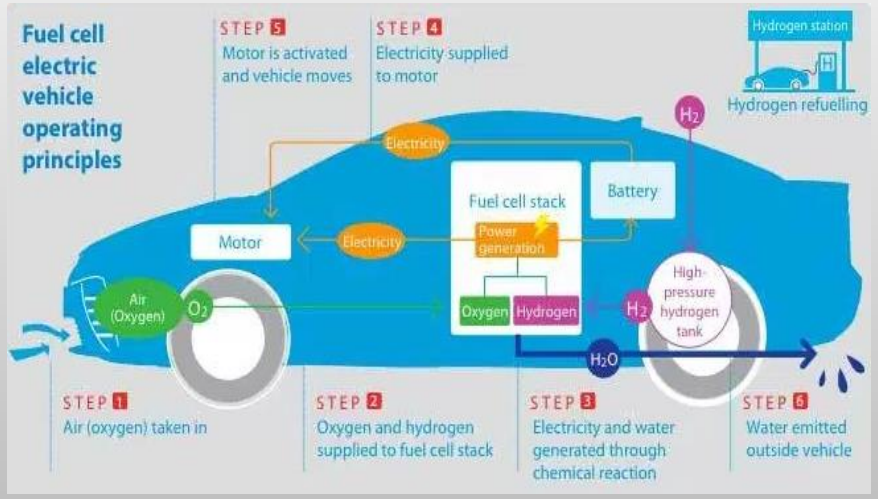
Air Quality Improvement

Total Distance
242,139km
(Daily Avg. Dist. 37km per vehicle)

Total Amount of CO_2
Reduction 47t
until 2017 (192.2g/km)

Total Amount of PM Reduction (20mg/km)
4,840,000mg

※Based on 40 Public FCEVs, As of 18 Jan. 2018



Demonstration – How to Filter PM

Filters

<Before>

<After>

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FCEV Project

4 Comparison – EV vs. FCEV

Hyundai Blueon

Hyundai Nexo

EV 55	Items Fueling(Charging) Stations	FCEV 3(2018 Projected)
Less than 200km	Driving Range	Over 400km
30min.(Quick) 3~5hr.(Charging stand)	Fueling(Charging) Time	3~5min.
Generating electricity (Thermal Power Generation 55%)	CO_2 Emission	Extracting hydrogen gas
$20k~$0.1m	Vehicle Price	$50k~$80k
$10k~$20k	Subsidy	$30k

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H_2 HYDROGEN FUEL CELL

Plan & Vision

Plans in 2018

- Supplying 34 FCEVs
  (Hyundai NEXO – Subsidy $31,000 per vehicle)
- Building 2 New Fueling Stations
  - 1 on-site hydrogen produce available

ELEC CITY
56t GHG mitigation per bus

Plans after 2018

- Introduction of public transportation – ELEC CITY(Bus)
- Investing $85m total for hydrogen industries project
- Building hydrogen energy circulation test site
  *production-storage-transportation-usage
- Promotion of hydrogen energy related industries

Visions

- Growth of hydrogen industries – A new driving force of the city
- Economic effect of $2.8b, over 6,000 employment for 300 companies
- Achieving Environmental Capital 2020
- Liveable & resilient city Changwon

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Conclusions

I. Participation of Citizens – Key to the Success
II. Intercity Cooperation – Share Practices & Policies
III. One Step Closer to A Sustainable City

THANK YOU

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