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June 19-22, 2016 | du 19 au 22 juin 2016

Montréal, Québec, Canada

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DRIVE ELECTRIC INNOVATION
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Vehicle Management and Travel Data Analysis of E-Bus Adopted in JR Kesennuma Line

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1.Introduction

- Introduction e-Bus

The Great East Japan Earthquake of March 11th caused significant damage to coastal railways which run by JR East

Start BRT operations as temporary recovery measure

- ◇Kesennuma Line August, 2012~

- ◇Ofunato Line March, 2013~

Introduction of one Electric bus (hereinafter referred to 「e-BRT」)

- ◇Reduce environmental load at disaster-hit area

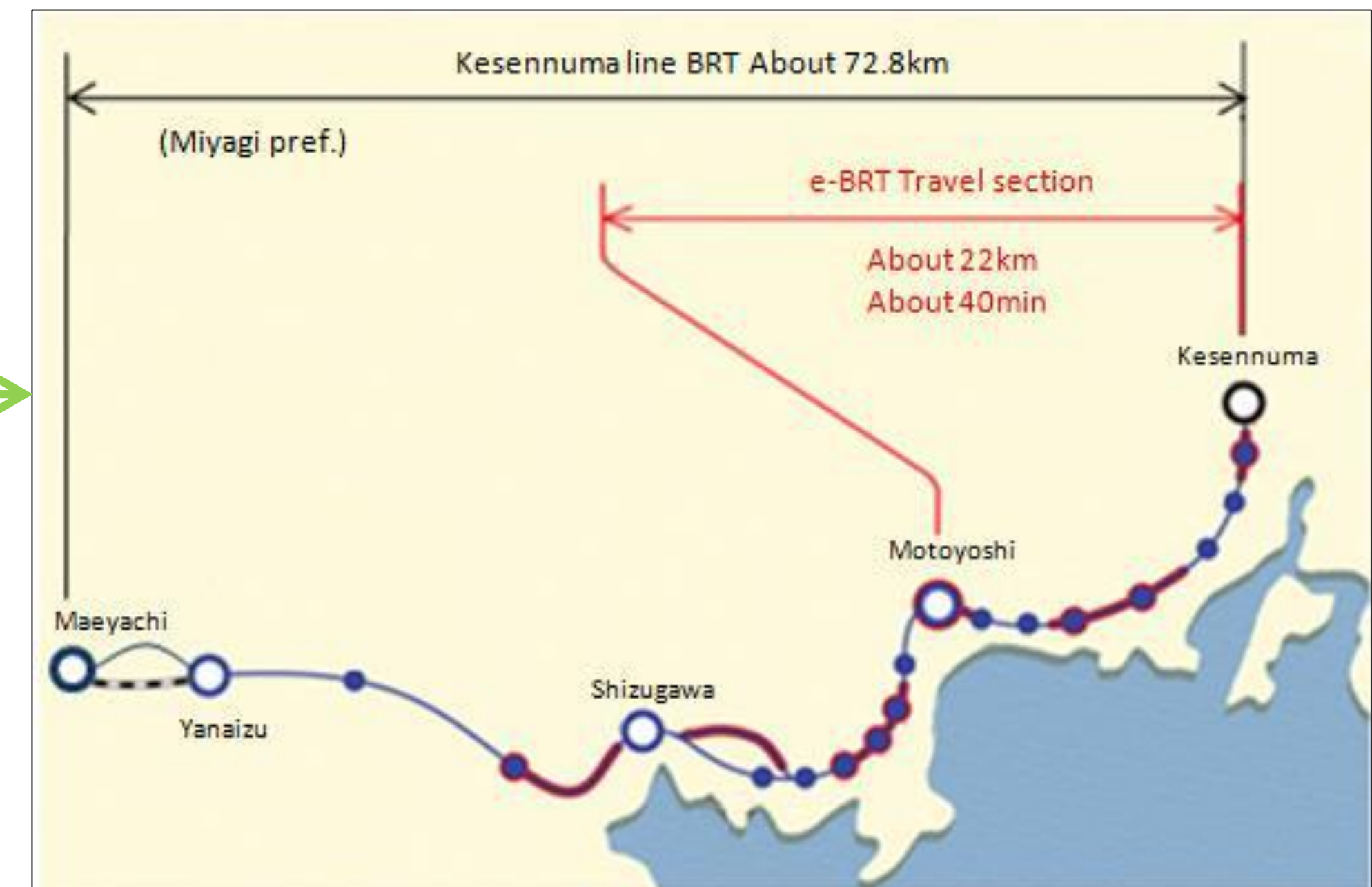
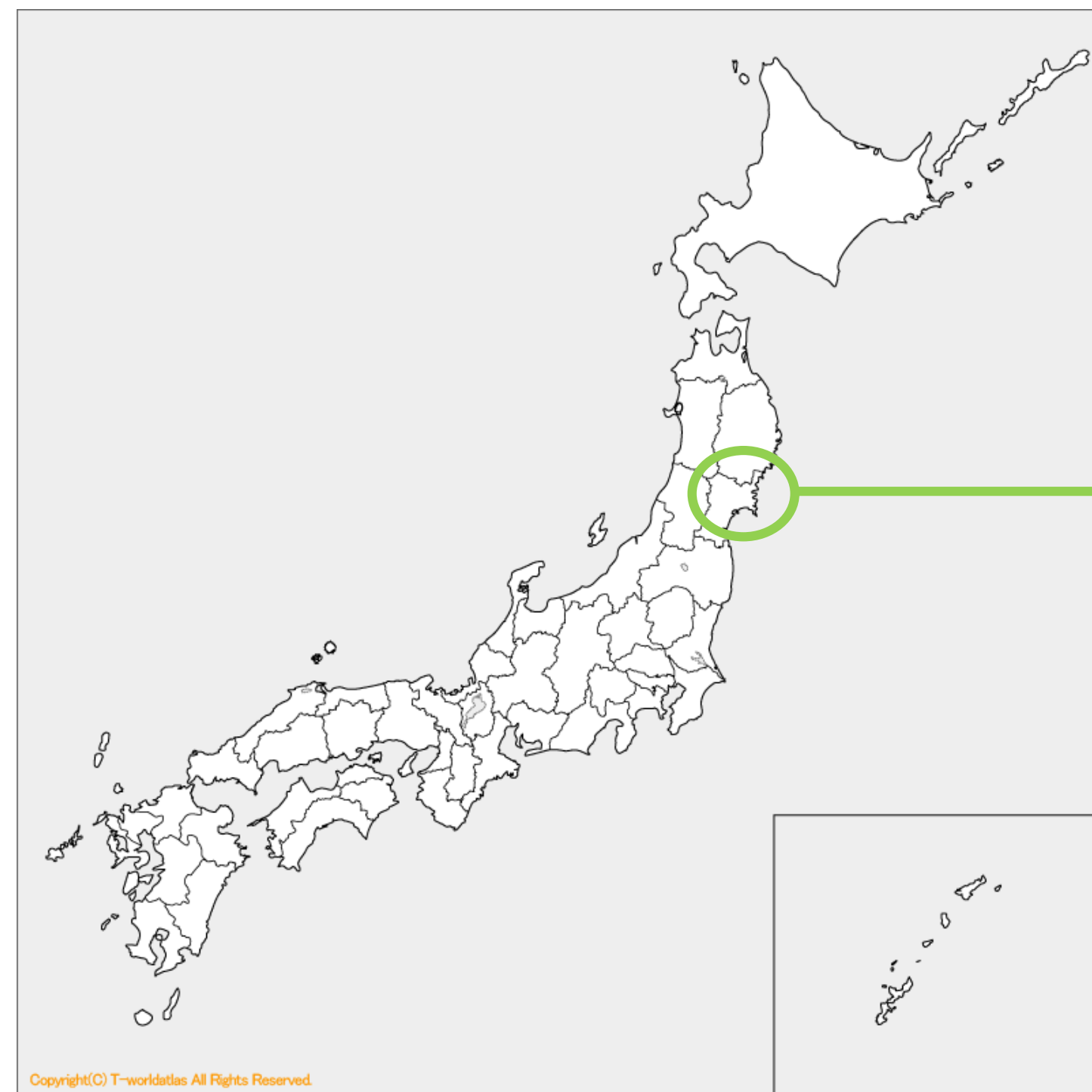
- ◇Support revival by contributing tourism

Kesennuma Line Motoyoshi—Kesennuma April, 2014~

2.Operation section of the e-BRT

- BRT operation section : JR Kesennuma Line BRTMaeyachi—Kesennuma
- e-BRT operation section : Motoyoshi—Kesennuma

Operation range: About 22km Duration : About 40 minutes 2 round trips per day





3.Specification of the e-BRT

Vehicle specification

Base vehicle	Manufacturer	Isuzu Motors Limited
	Type / name	SDG-LR290J1 rev, ERGAmio, low-floor bus
Owner		East Japan Railway Company
Dimensions (mm)		8,990×2,320×3,270
Riding capacity		49
GVW (kg)		11,855 kg
Duration (km)		30 (SOC30-80% simulation value)
Motor	Type	Synchronous motor (permanent magnet synchronous motor)
	Max power (kW)	150
	Max torque (Nm)	650
Battery type / capacity		Mitsubishi Heavy Industries' Li-ion battery / 65kWh
Battery charging		200VAC normal charging and rapid charging (CHAdeMO-compliant)
Equipment		450W solar panel, 100VAC sockets, USB ports, diesel combustion heater, heat shield films on cabin windows

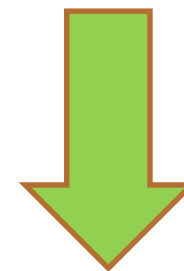


3.Specification of the e-BRT

Battery capacity

Operating Conditions

- ◇ Operation range : About 22km
- ◇ 2 round trip per day
- ◇ Able to operate one way with one charge 5 years later



Calculate battery deterioration and simulate MPGe



Decide to 65kWh battery pack



3.Specification of the e-BRT

- Interior and Exterior design

Design theme

“You can see and feel that BRT runs on electricity! A harmony of environment and near future”

+

“To put fun and excitement into practice (a new purposiveness of BRT application)”





4.Vehicle monitoring system

- 4.1 Vehicle monitoring system summary
 - ◇ Data monitoring system using on-board device for data processing and cloud system
 - ◇ Data acquisition from on-board devices' network
 - ◇ Upload real-time data to cloud server via 3G network
 - ◇ Able to remotely monitor fast-data in real-time
 - ◇ Able to easily visualize necessity item on monitor
 - ◇ Able to analyze time-series data in detail by outputting acquired data in CSV form



4.Vehicle monitoring system

Screen of data monitoring system





4.Vehicle monitoring system

- 4.2 Vehicle management

Support operator and maintainer by using monitoring system for vehicle management

In case of break-down

Detect problem

Check vehicle's conditions
by monitoring system

Contact to operator and
maintainer for support



4.Vehicle monitoring system

- Other functions

◇ Deliver mail everyday which contain designated items as operation summary

◇ Able to understand bus condition by checking delivered operation summary

2015.02.15

【Today's operation summary】

Accumulated traveling time 12:26:06

Accumulated mileage 85.8km

Accumulated power consumption 84.0kWh

Accumulated charging energy 82.0kWh

Final SOC 92%

Max battery temperature 24°C

Max current 37.6A

Number of rapid charging 6 times

Number of normal charging 1 time

【Start / end history】

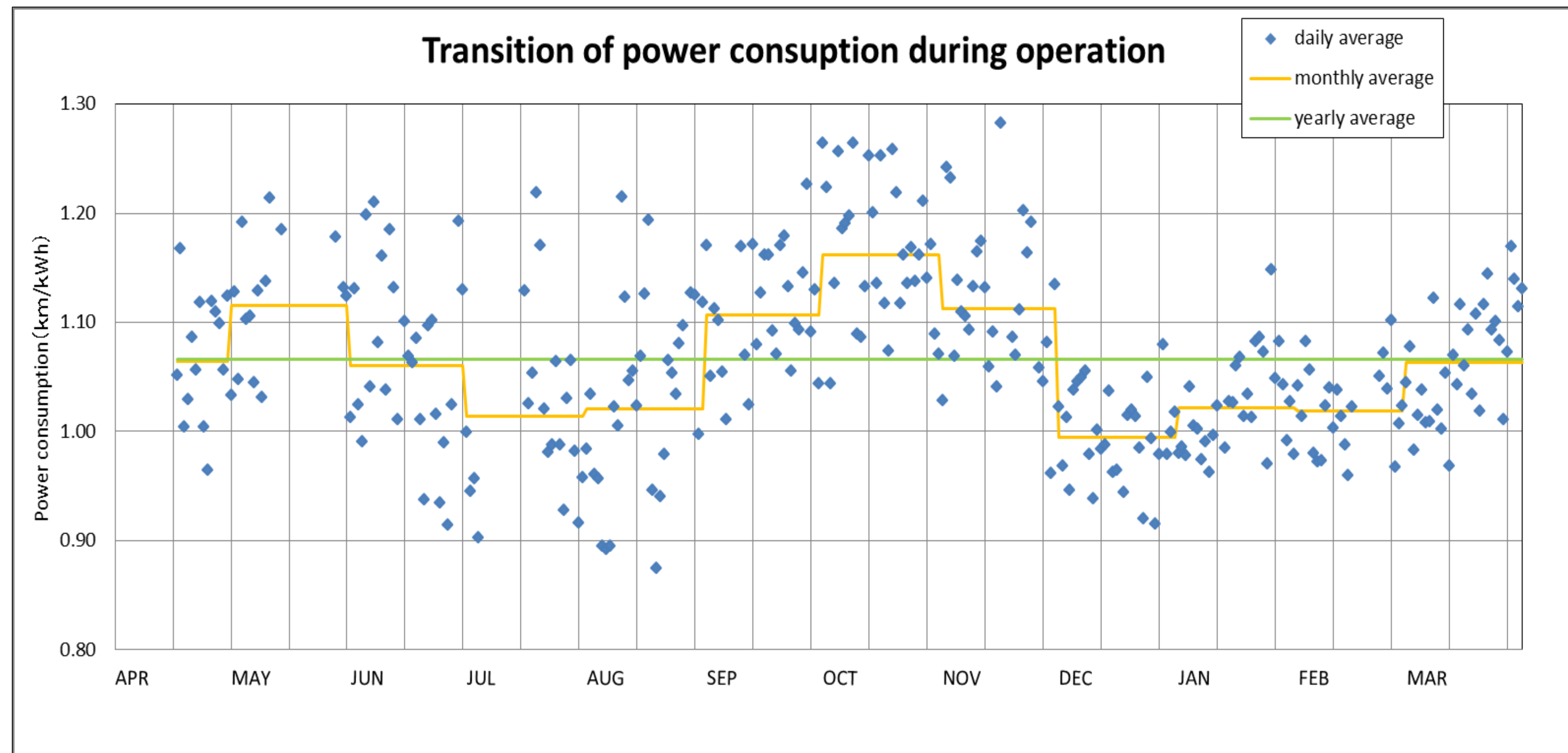
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2015/02/15 11:13:32 - 2015/02/15 16:35:15

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4. Vehicle monitoring system

- 4.3 Driving data logging
- 4.3.1 Power consumption characteristics





4. Vehicle monitoring system

◇MPGe : About 1.07km/kWh

◇MPGe tends to get worse between July and September, December and February

▪ Cause

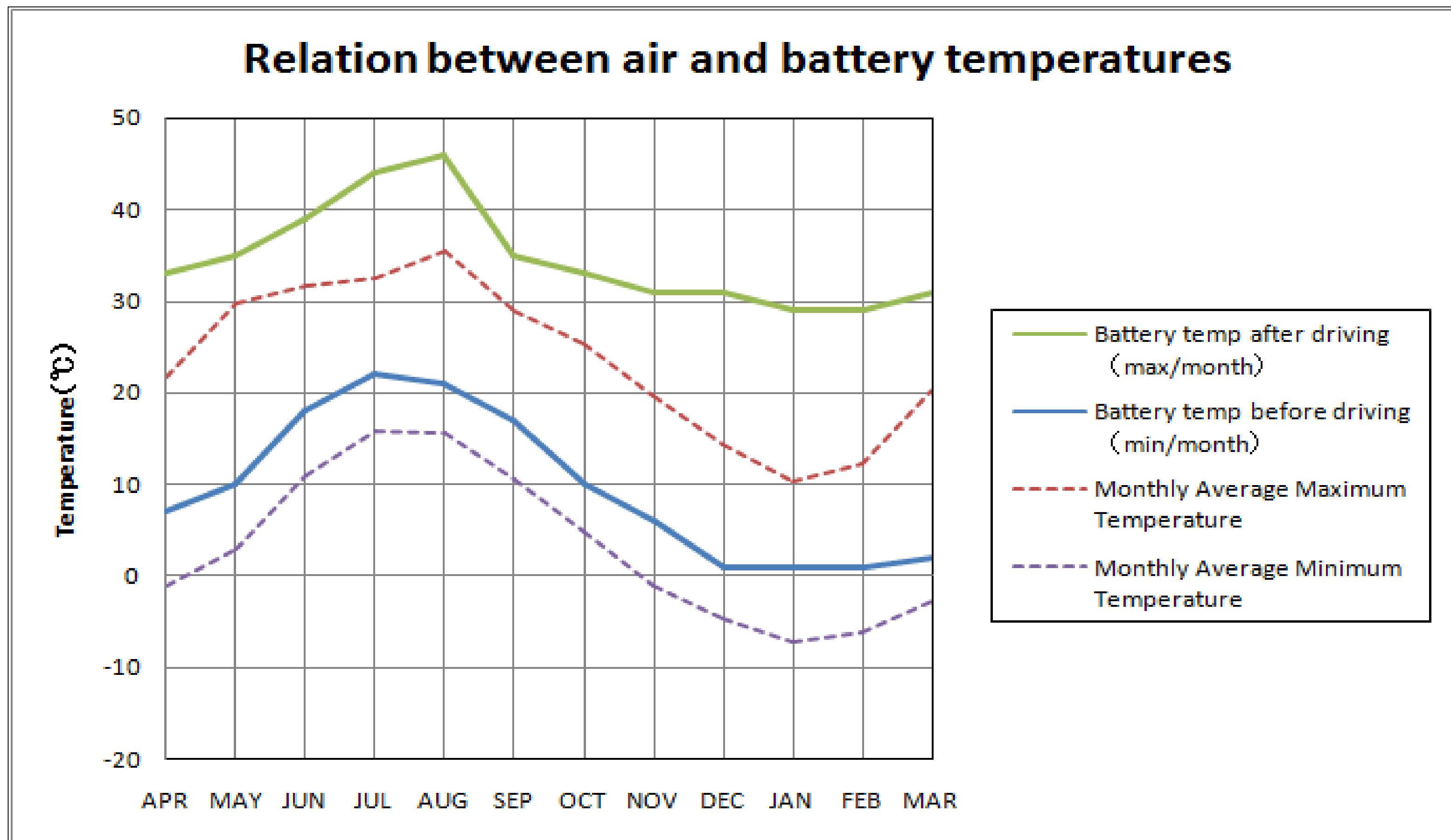
◇July to September : Air conditioner is used very often due to high temperature (Above 30 degree)

◇December to February: Deteriorate battery efficiency due to low temperature (under 15 degree)

Traffic condition affected by snow

4. Vehicle monitoring system

- 4.3 Driving data logging
- 4.3.2 Relation between air temperature and battery temperature



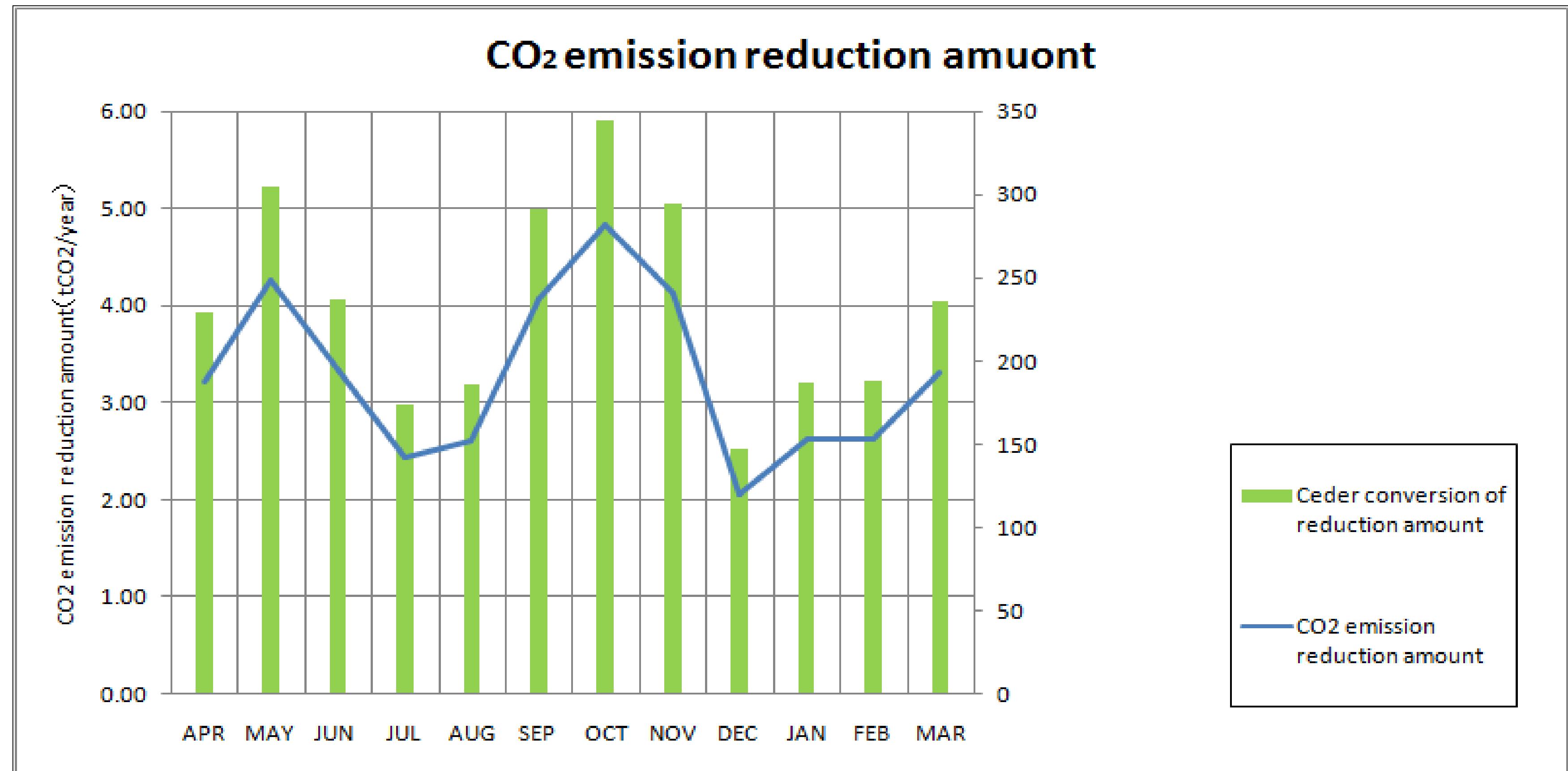


4.Vehicle monitoring system

- ◇Kesennuma city is a place that have drastic climate change through a year
- ◇ Air temperature affect battery temperature transition
 - 1.Air-cooling battery
 - 2.Use outside air for cooling
- ◇Get closer to outside air temperature is important for stable operation
- ◇Need to pay attention to battery's charge/discharge specification in area that have big climate change
- ◇Possibility that unable to charge because of low battery temperature , especially outside temperature is extremely low.

4. Vehicle monitoring system

- 4.3 Driving data logging
- 4.3.3 Estimation of carbon dioxide reduction





4.Vehicle monitoring system

- ◇Amount of CO2 reduction since start operation is 3.3t per year. ※
- ◇Confirmed that introduction of e-BRT have some effect on reducing environmental load
- ※Use approved method by Japan domestic credit certification committee for trial calculation
CO2 reduction amount



Thank you for listening