

Results of engine speed frequency analysis in actual driving around Tokyo metropolitan area

JASIC (Japan)

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Actual Driving Analysis Summary

- 9 vehicles (3 Light-Duty(GVW5t), 3Medium-Duty (GVW8t), 3Heavy-Duty (GVW25t)).
- Rural, urban, urban high-way road driving in Tokyo metropolitan area.
- 5 days total 30 hour driving data for each vehicle
- Every 1 second engine speed data with 0.5Hz filtering.
- Engine torque estimation using vehicle speed and acceleration rate.
- Data in vehicle deceleration and idling excluded in the analysis .

Conclusions

- Engine speed range in actual driving around Tokyo is mainly low speed operation, especially in LDT case.
- 1000-2000r/min range is mostly used for LDT engines of over 3000r/min rated speed.
- 1000-1800r/min range is mostly used for MDT engines of around 3000r/min rated speed.
- 900-1500r/min range is mostly used for HDT engines of around 2000r/min rated speed.
- The range is mostly covered in WHTC operation, but have certain difference with WNTE zone.

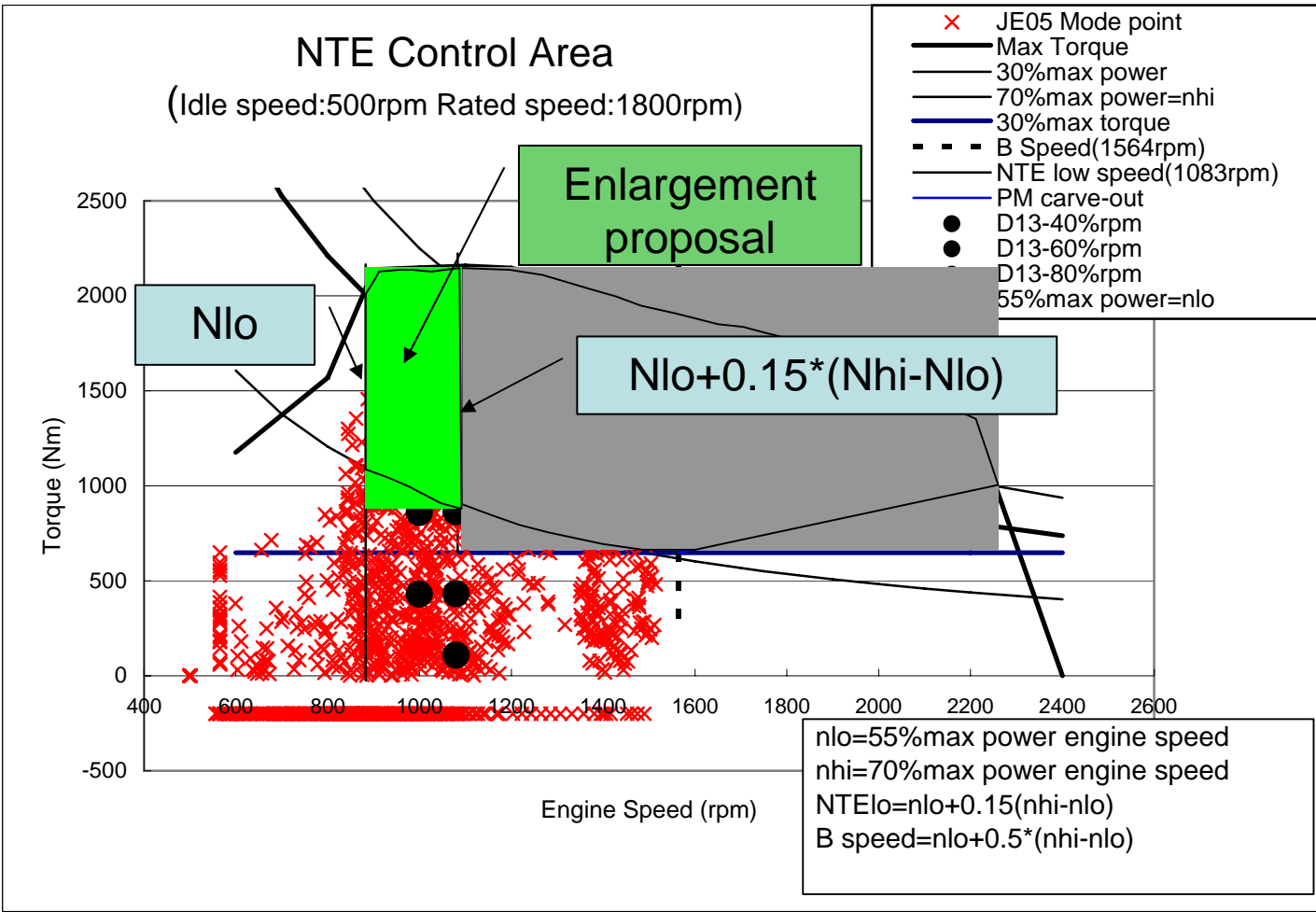
WNTE zone enlargement

- We believe enlargement of WNTE zone is necessary to better reflect actual driving patterns.
- We propose expanding WNTE minimum speed range from $N_{lo} + 0.15(N_{hi} - N_{lo})$ to N_{lo} .

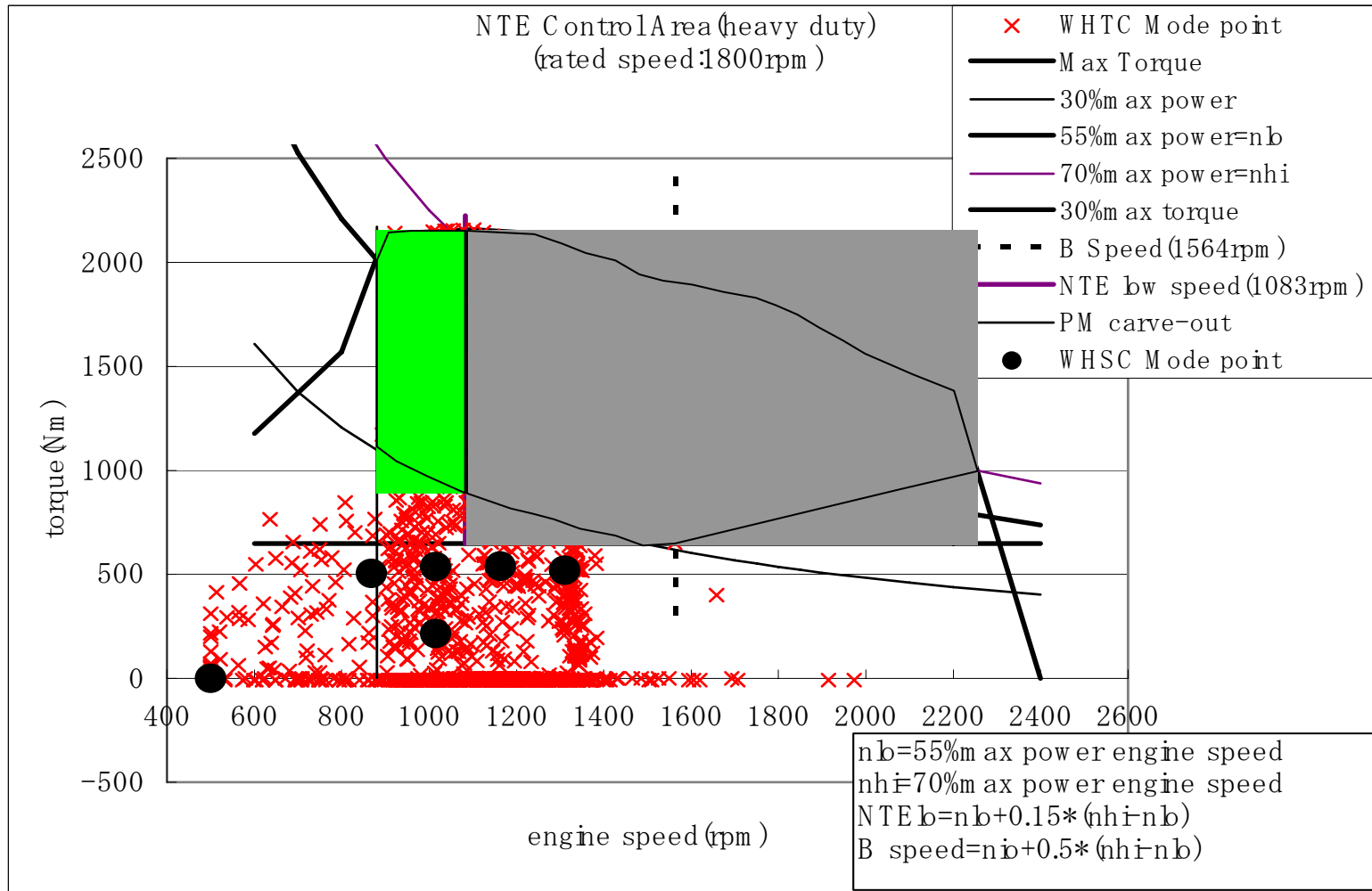
Sources

1. Comparison with Japan JE05 mode operating point vs. WNTE zone
2. Comparison with WHDC mode operating point vs. WNTE zone
3. Results of engine speed frequency analysis in actual driving around Tokyo metropolitan area

Comparison with Japan JE05 mode operating point vs. WNTTE zone



Comparison with WHDC mode operating point vs. WNTE zone



Appendix

Results of Engine Speed Frequency Analysis of
Actual Driving around Tokyo metropolitan area

Main Specifications of Test Vehicles

	Code No	0001	0004	0052	0044	0048	0054	0005	0046	0053
	Model year	1998	1998	2003	1998	2003	2003	1999	1999	2003
	Regulation	long term	long term	new short term	long term	new short term	new short term	long term	long term	new short term
vehicle data	Gross Vehicle Weight(kg)	4,745	4,935	5,145	7,990	7995	7,990	24,930	24,910	24,940
	Weight of vehi(kg)	2,580	2,770	2,980	5,030	5380	5,030	11,220	11,300	11,830
	Amount of the maximum load(kg)	2,000	2,000	2,000	2,850	2450	2,850	13,600	13,500	13,000
	Ride capacity(person)	3	3	3	2	3	2	2	2	2
	No. of gears and Transmission type	5MT	6MT	5MT	6MT	6MT	6MT	7AMT	7MT	12AMT
	Engine data	Engine displ.(L)	4.33	4.90	4.77	7.96	7.16	7.16	21.20	10.52
	Idling engine speed(r p m)	580	650	580	550	530	530	450	450	500
	Max power (kW/rpm)	81/3100	103/3000	103/3000	173/2700	140/2900	140/2900	265/2200	250/2100	272/1750
	Max torque (N·m/rpm)	275/1500	353/1600	333/1500	706/1600	500/1500	500/1500	1255/1200	1412/1100	1814/1200
	Aspiration NA/Tc)	NA	NA	NA	Tc(IC)	NA	NA	NA	Tc(IC)	Tc(IC)
	EGR	w/	w/	w/	w/o	w/	w/	w/	w/o	w/

Driving Conditions

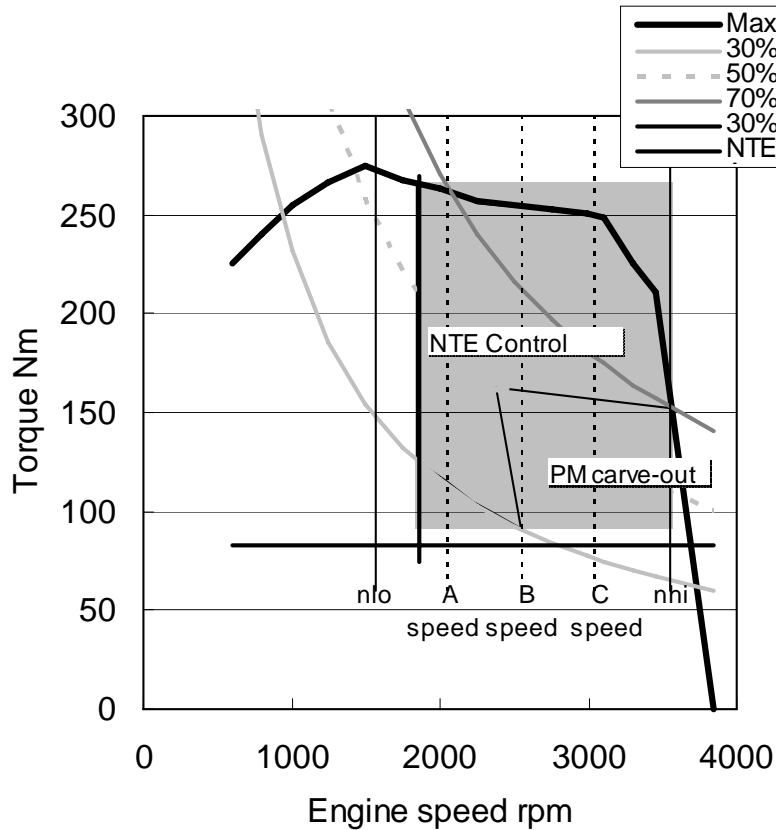
- (1) Urban
- (2) Rural
- (3) Motorway (Tokyo Metropolitan expressway)

Data sources

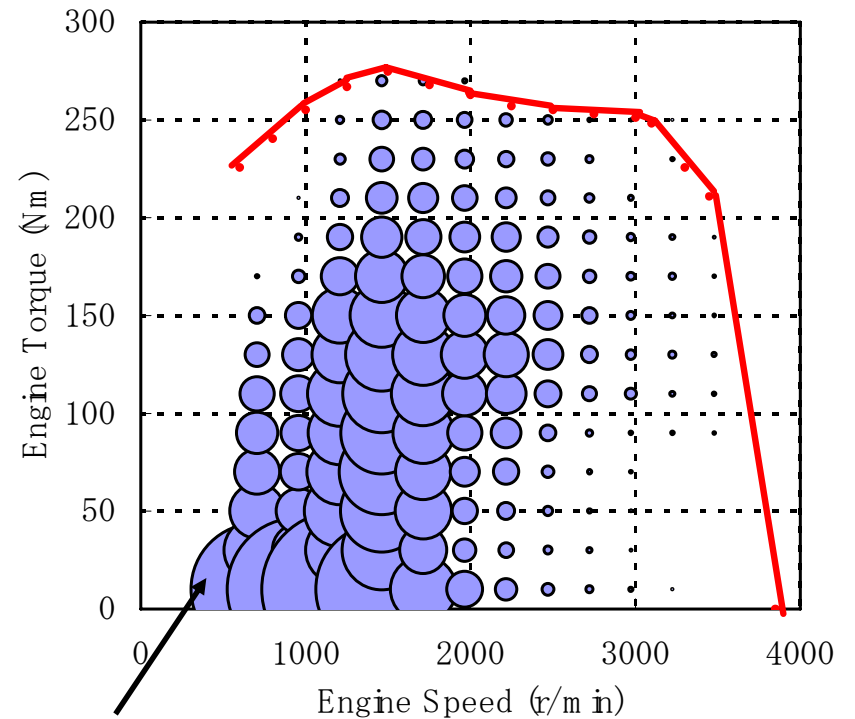
(5days x 6hr) / Vehicle

Vehicle 0001 (GVW 5t)

Comparison with actual driving patterns vs. W/NTE zone



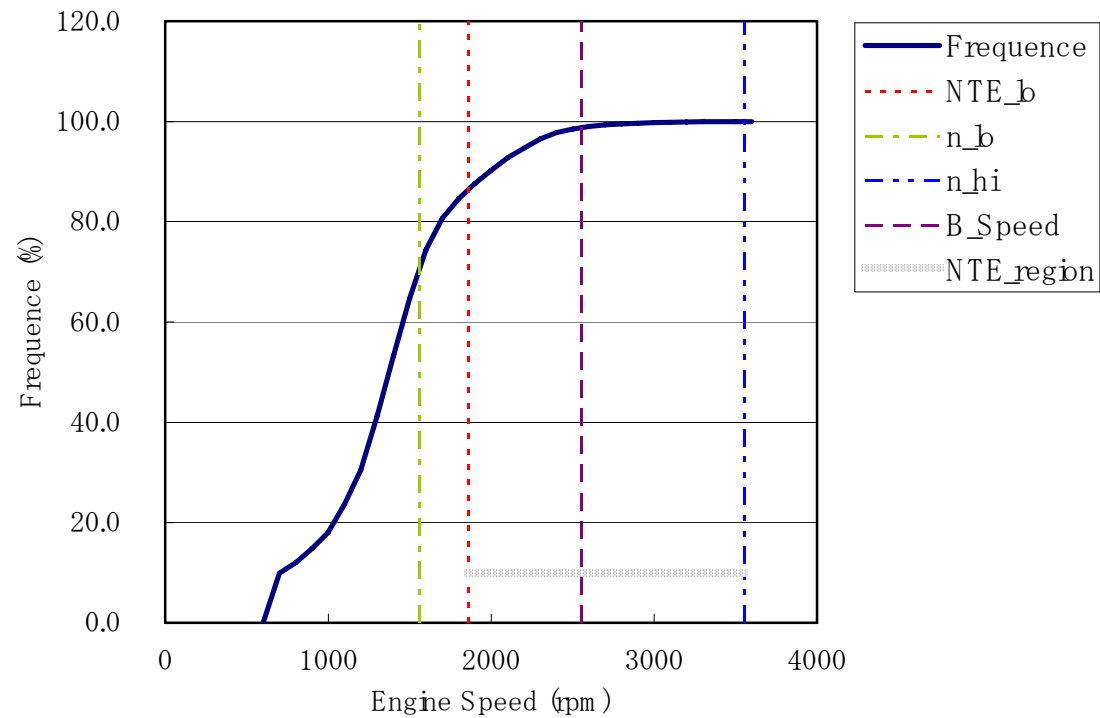
NTE zone



frequency
(5days data)

Vehicle 0001 (GVW 5t)

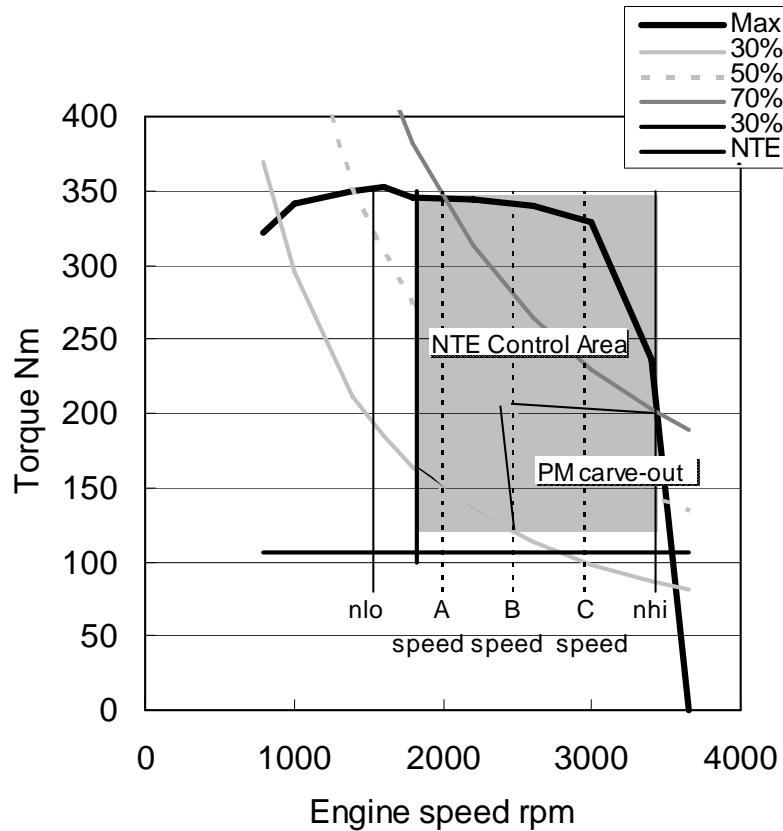
Engine Speed accumulation frequency (5days data)



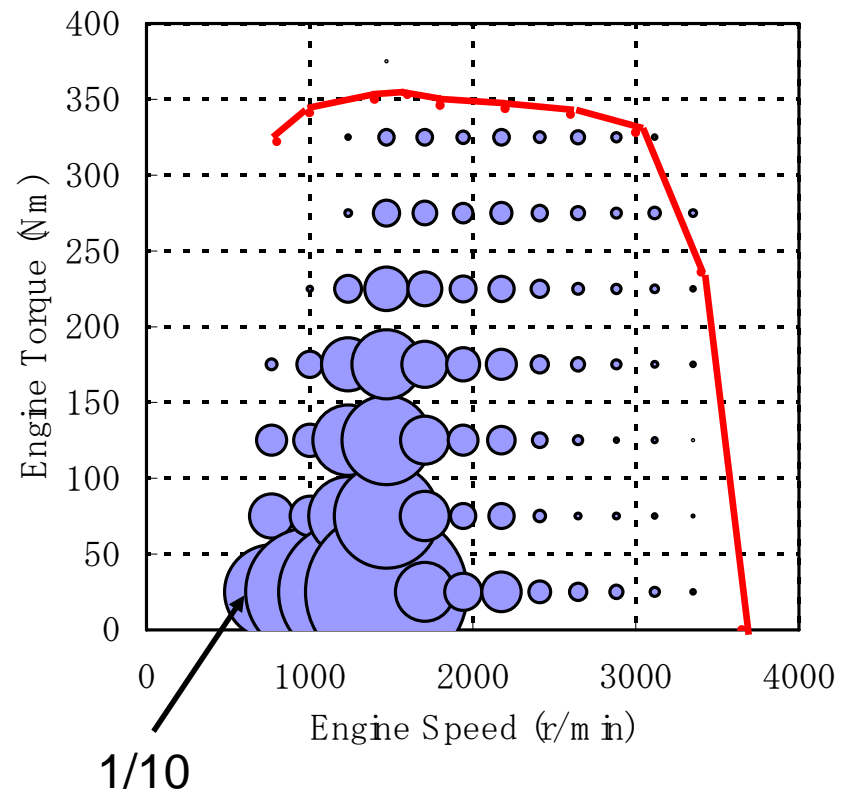
note: except Idling and deceleration

Vehicle 0004 (GVW 5t)

Comparison with actual driving patterns vs. WNTTE zone



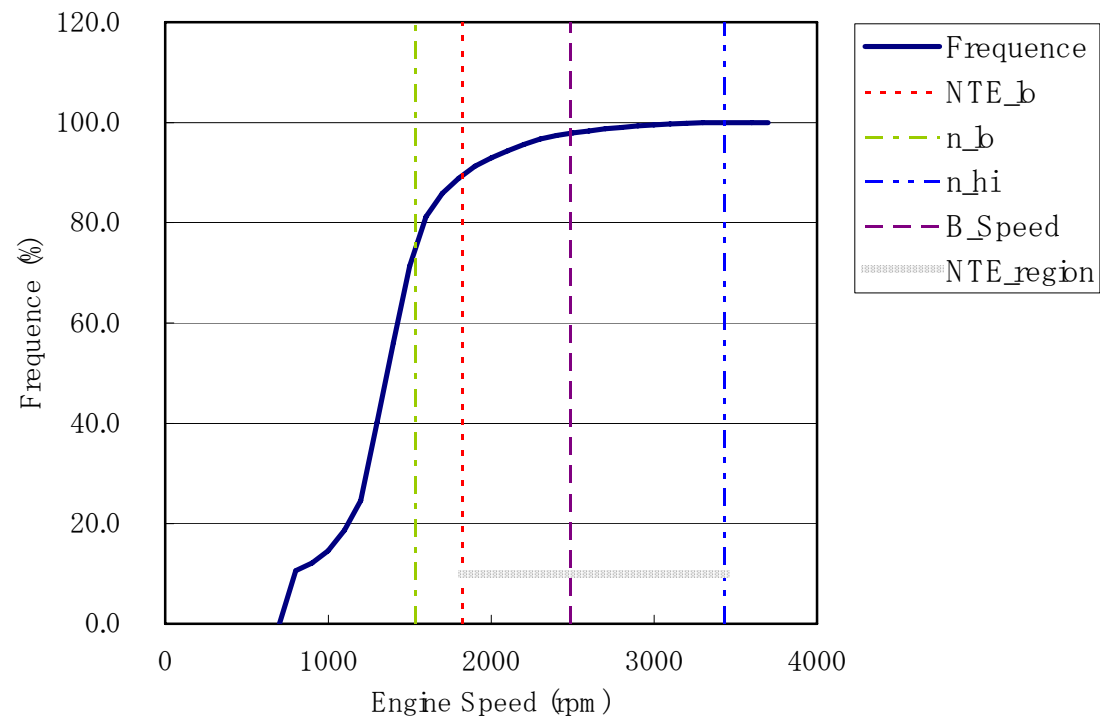
NTE zone



frequency
(5days data)

Vehicle 0004 (GVW 5t)

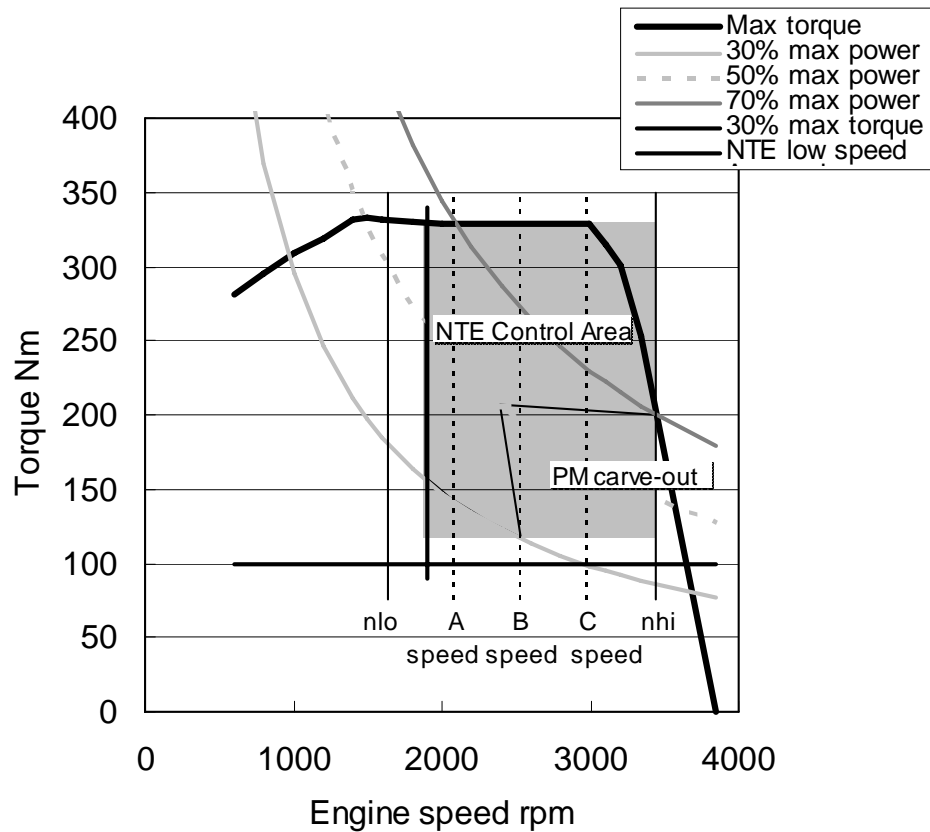
Engine Speed accumulation frequency (5days data)



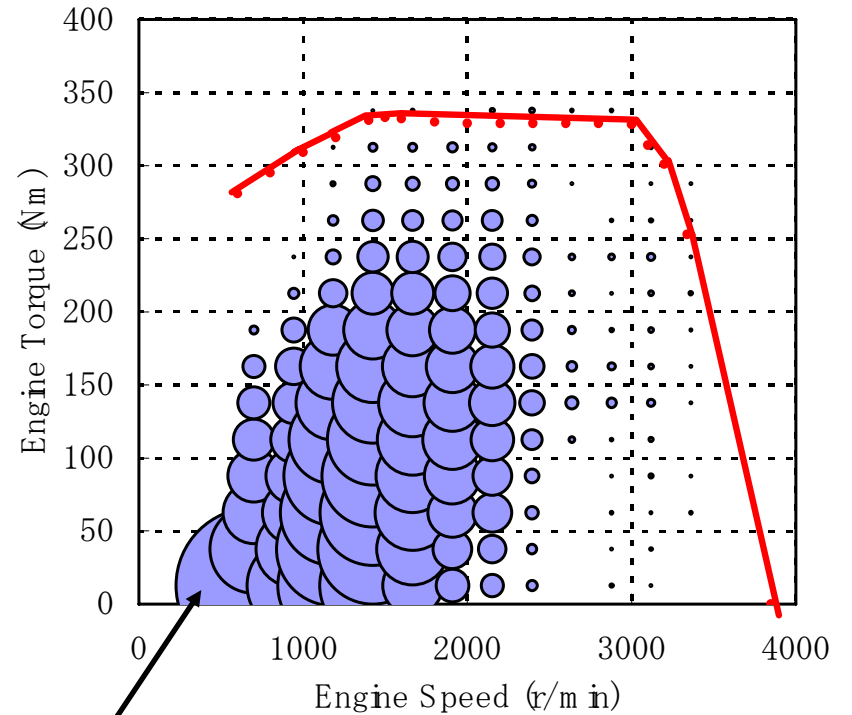
note: except Idling and deceleration

Vehicle 0052 (GVW 5t)

Comparison with actual driving patterns vs. WNTTE zone



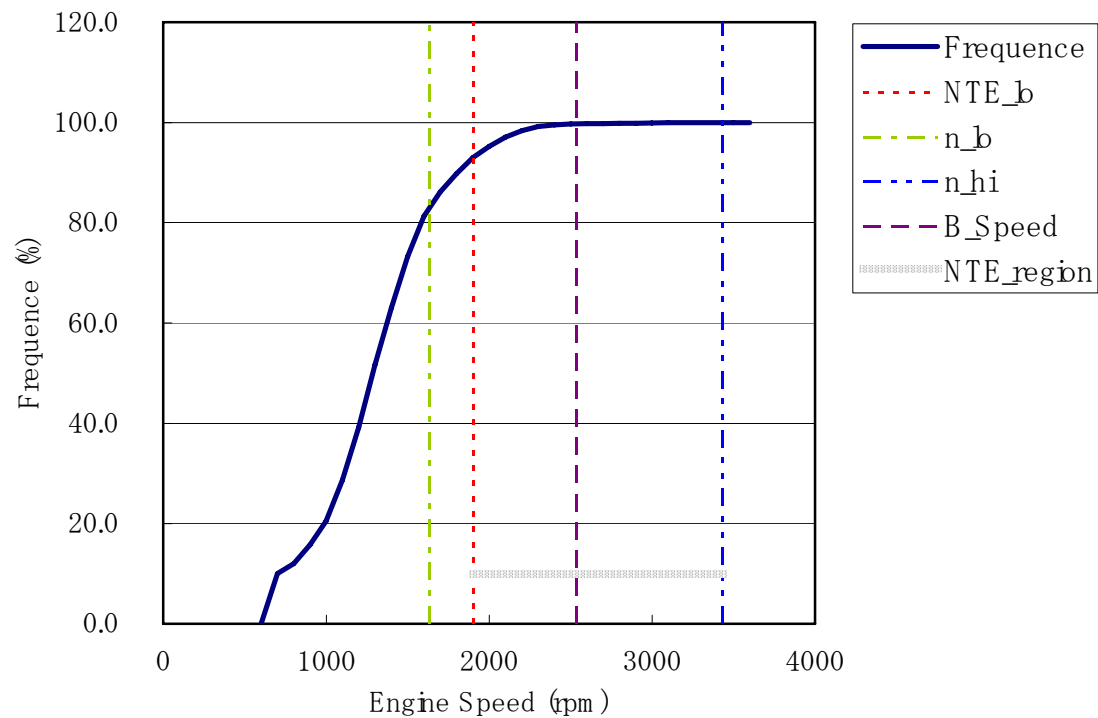
NTE zone



frequency
(5days data)

Vehicle 0052 (GVW 5t)

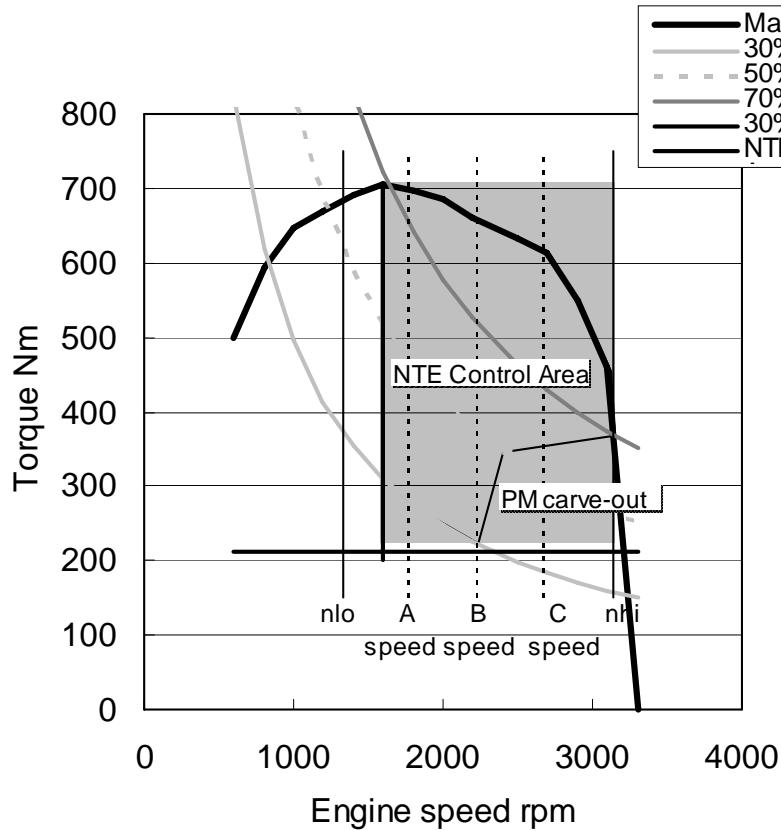
Engine Speed accumulation frequency (5days data)



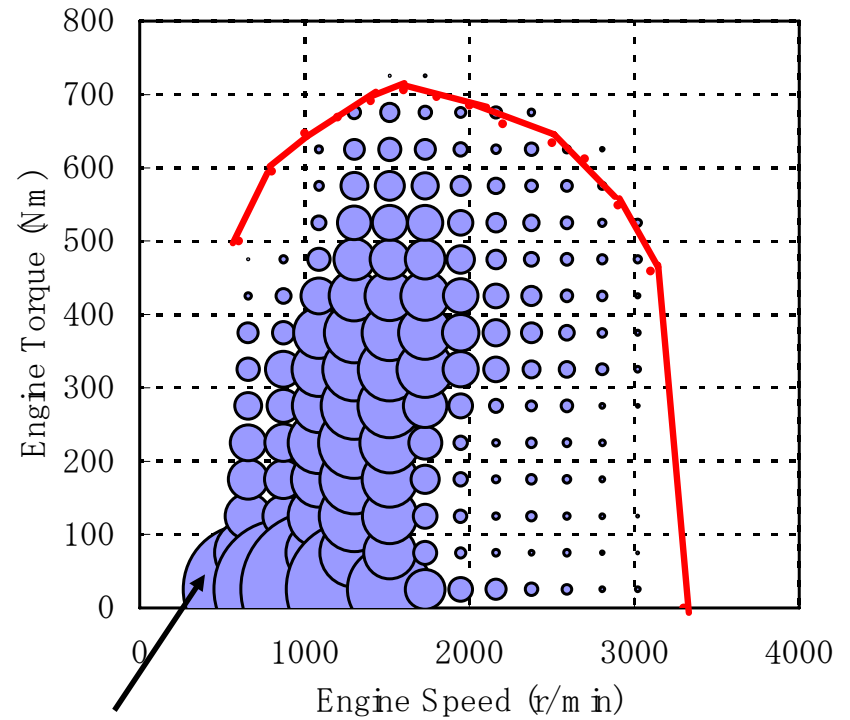
note: except Idling and deceleration

Vehicle 0044 (GVW 8t)

Comparison with actual driving patterns vs. WNTTE zone



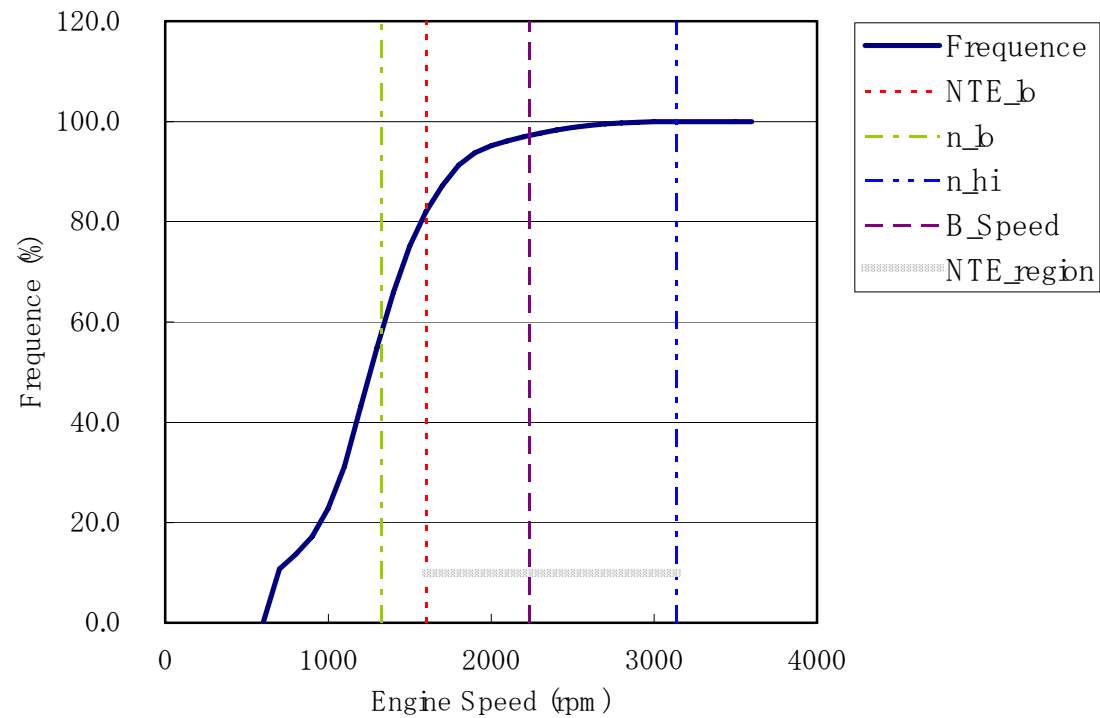
NTE zone



frequency
(5days data)

Vehicle 0044 (GVW 8t)

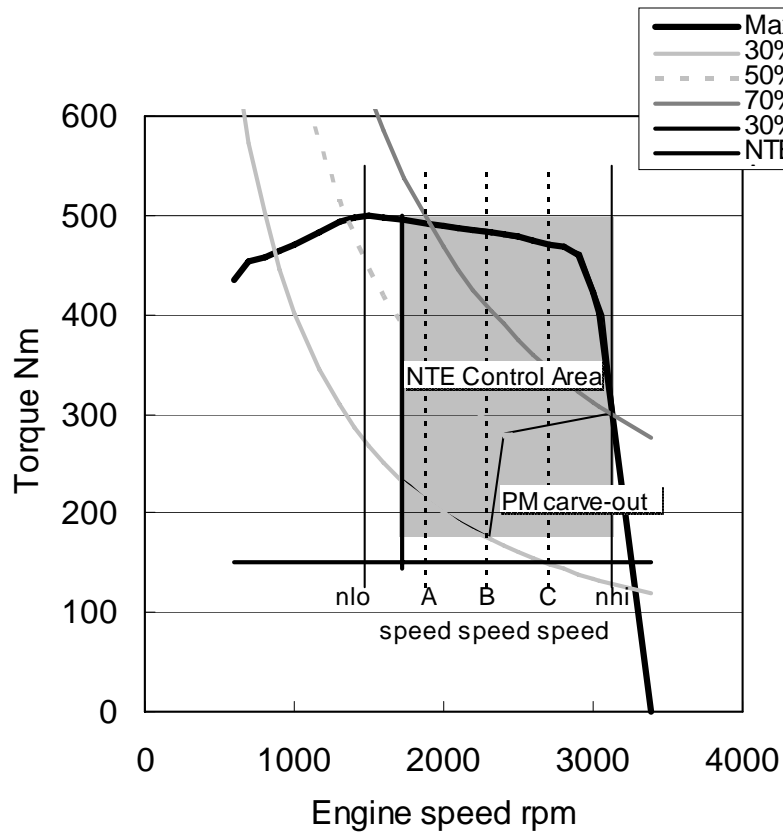
Engine Speed accumulation frequency (5days data)



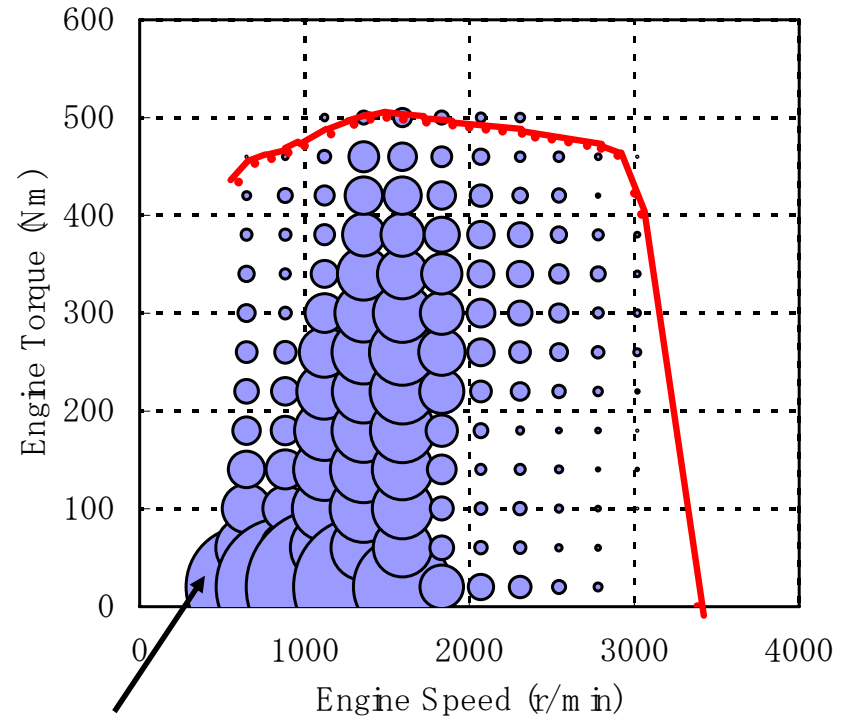
note: except Idling and deceleration

Vehicle 0048 (GVW 8t)

Comparison with actual driving patterns vs. WNTTE zone



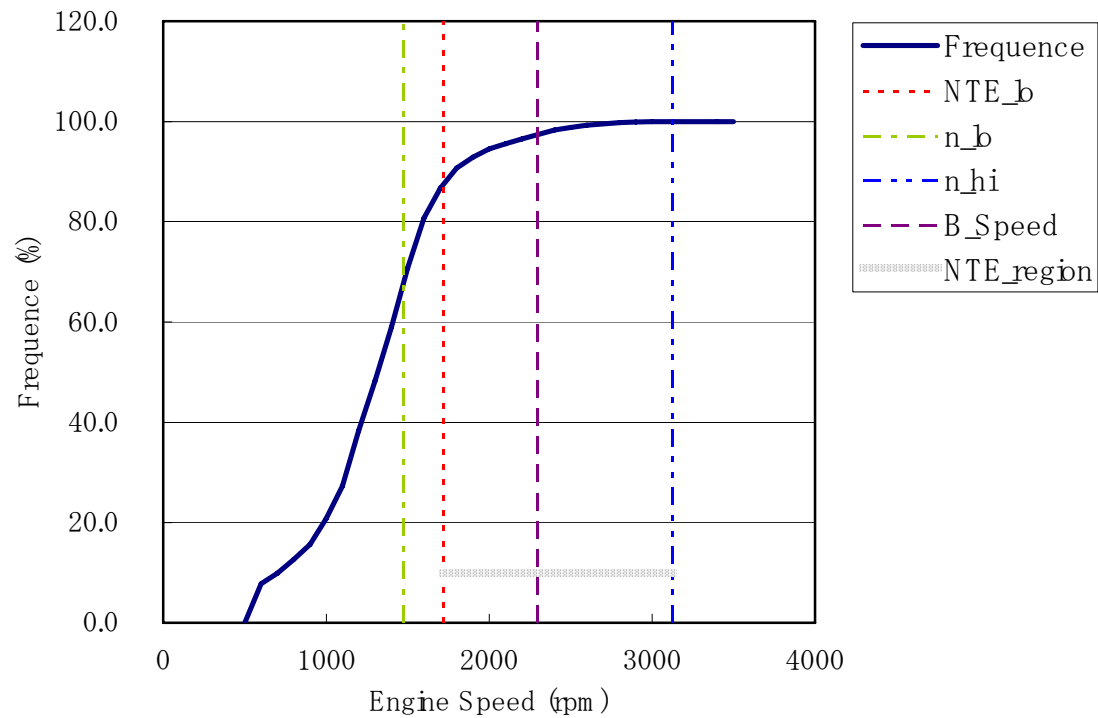
NTE zone



frequency
(5days data)

Vehicle 0048 (GVW 8t)

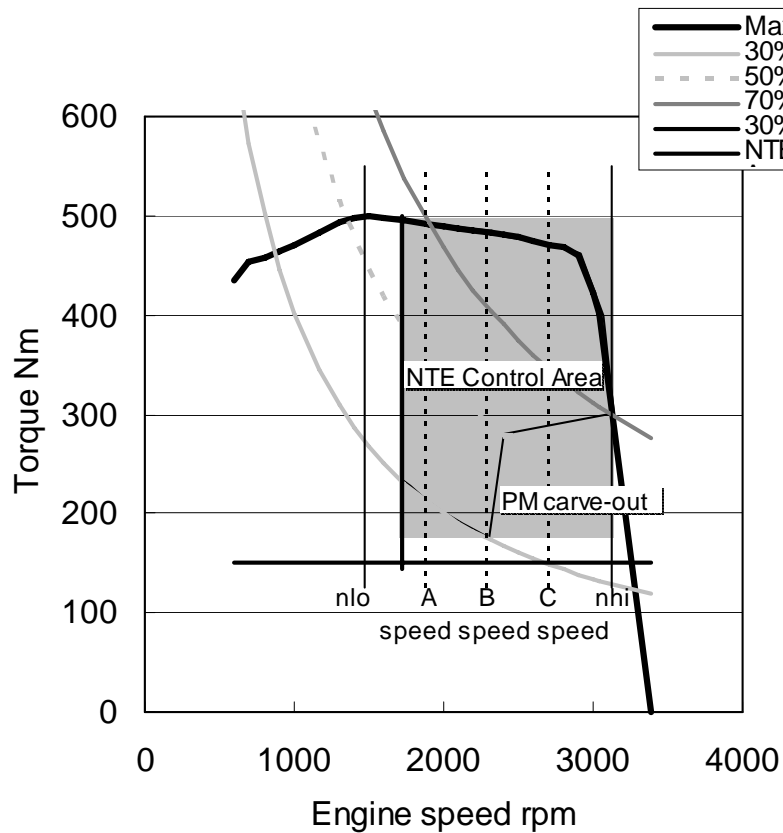
Engine Speed accumulation frequency (5days data)



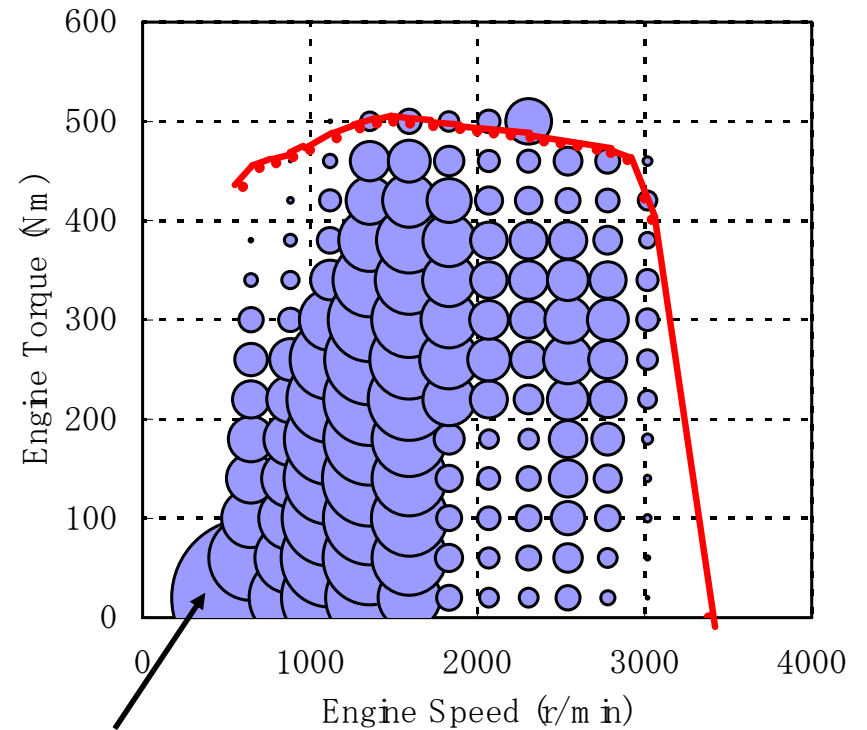
note: except Idling and deceleration

Vehicle 0054 (GVW 8t)

Comparison with actual driving patterns vs. WNTTE zone



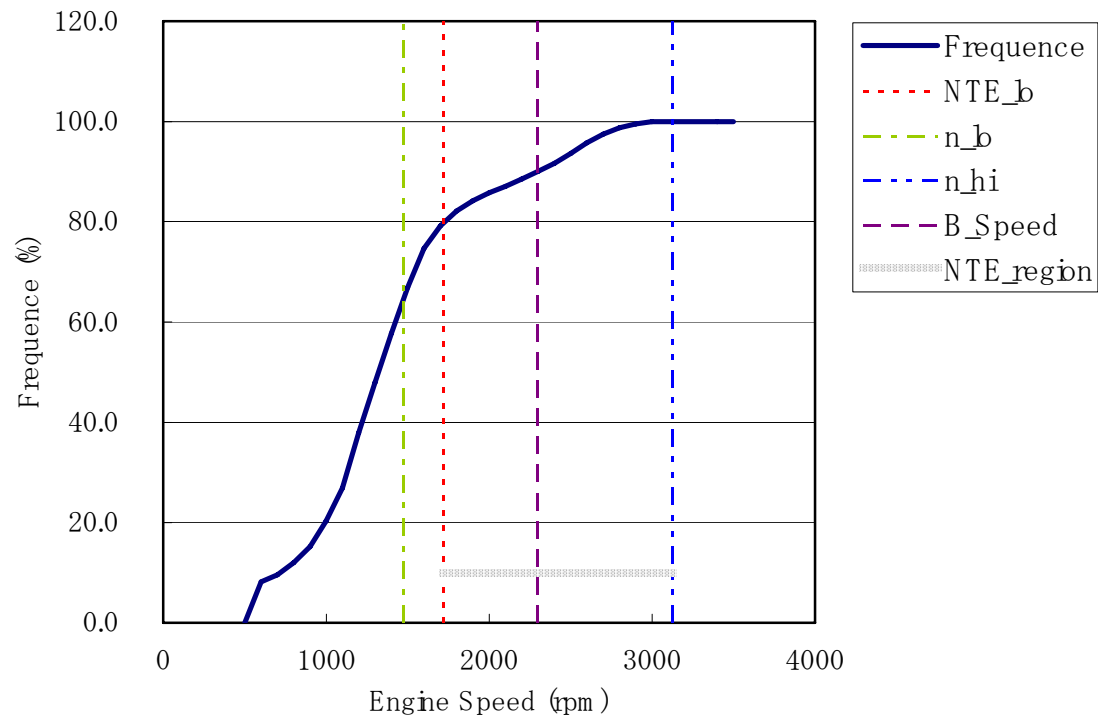
NTE zone



frequency
(5days data)

Vehicle 0054 (GVW 8t)

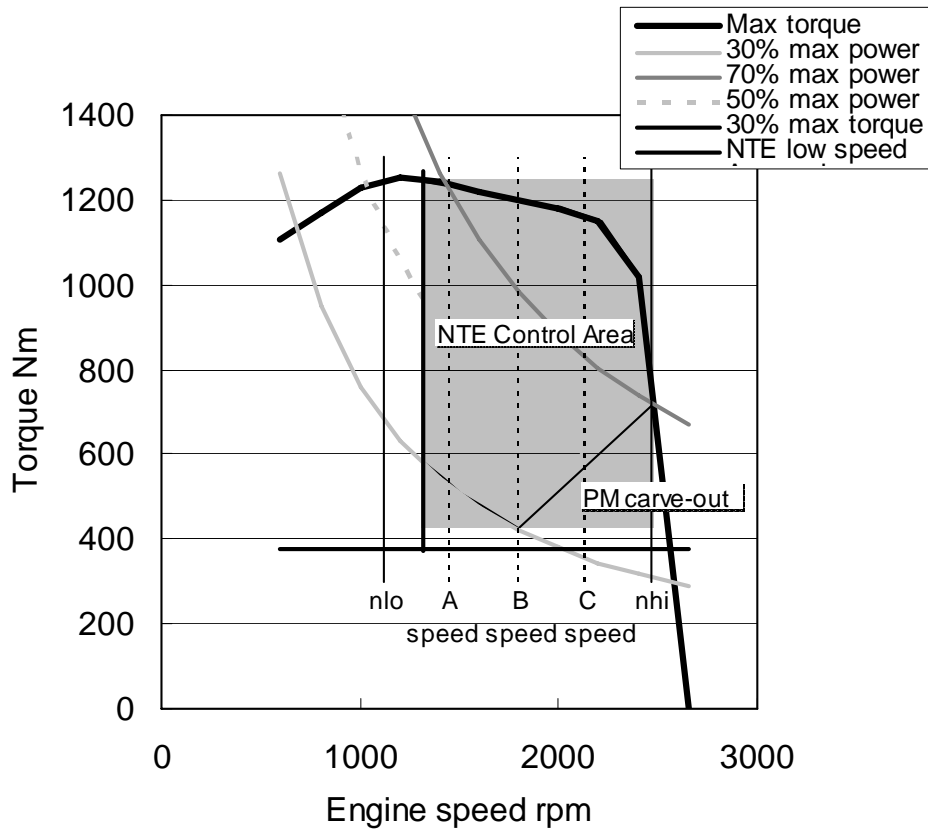
Engine Speed accumulation frequency (5days data)



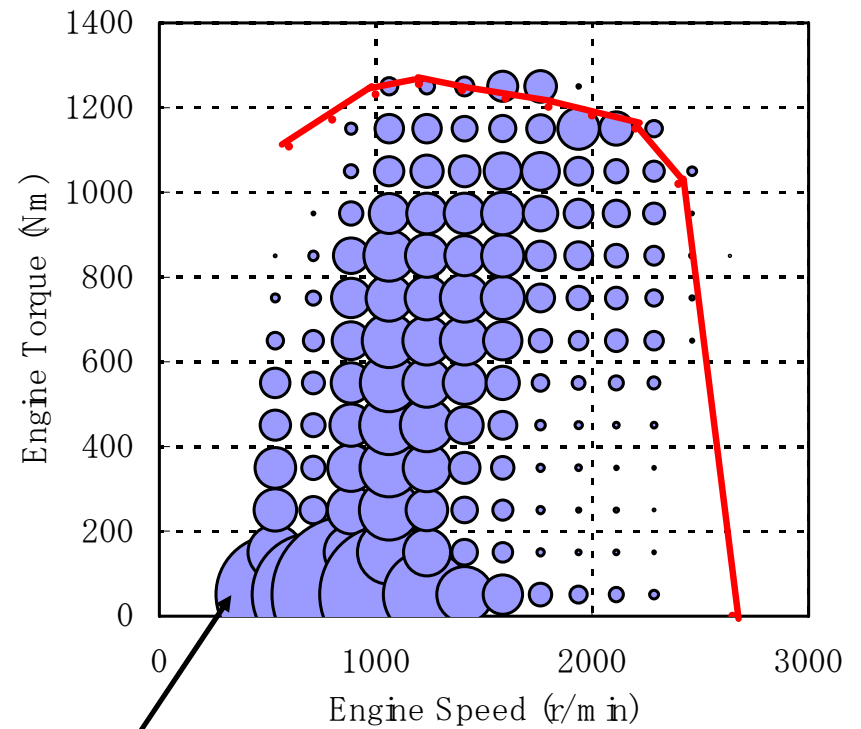
note: except Idling and deceleration

Vehicle 0005 (GVW 25t)

Comparison with actual driving patterns vs. WNTE zone



NTE zone

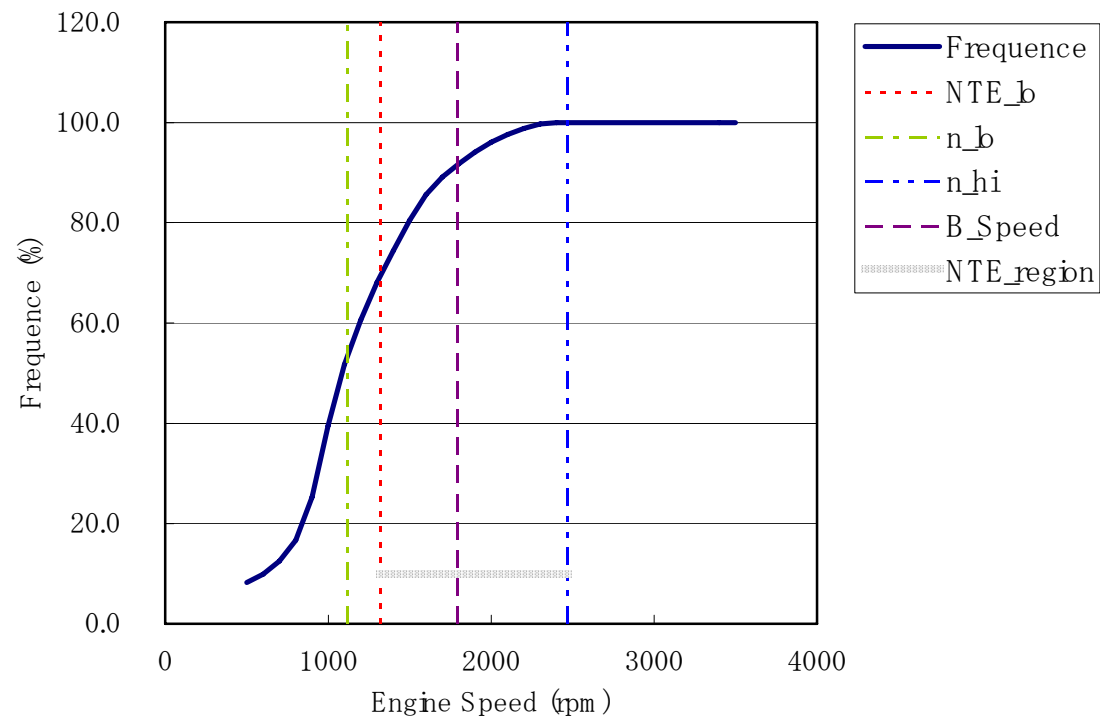


1/10

frequency
(5days data)

Vehicle 0005 (GVW 25t)

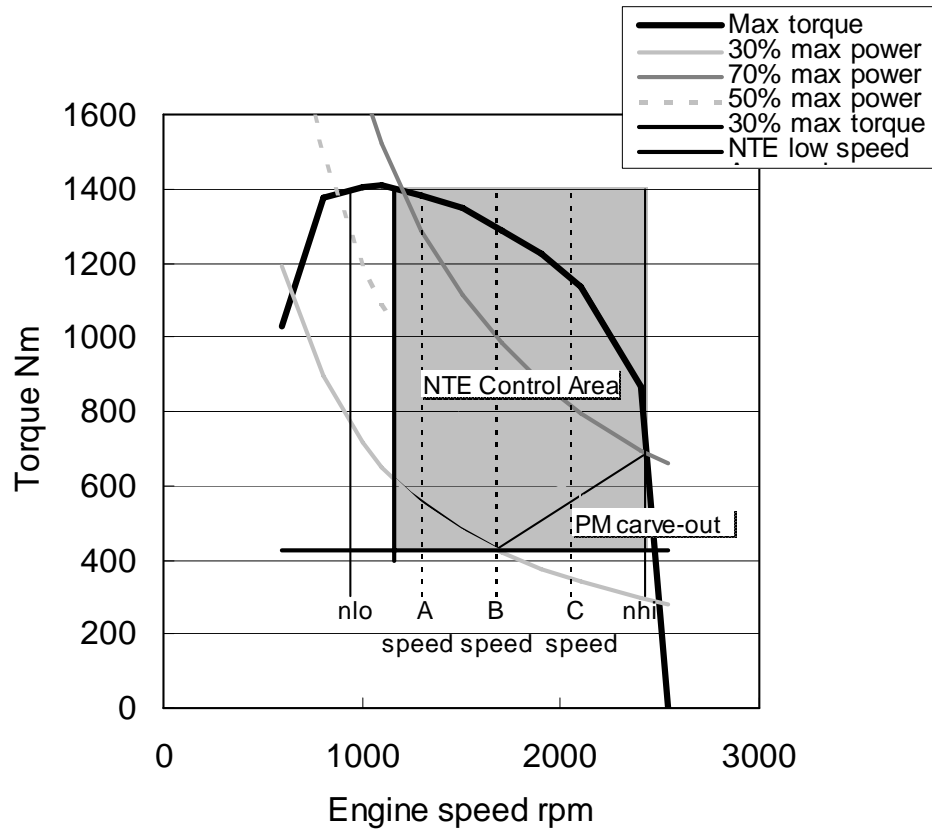
Engine Speed accumulation frequency (5days data)



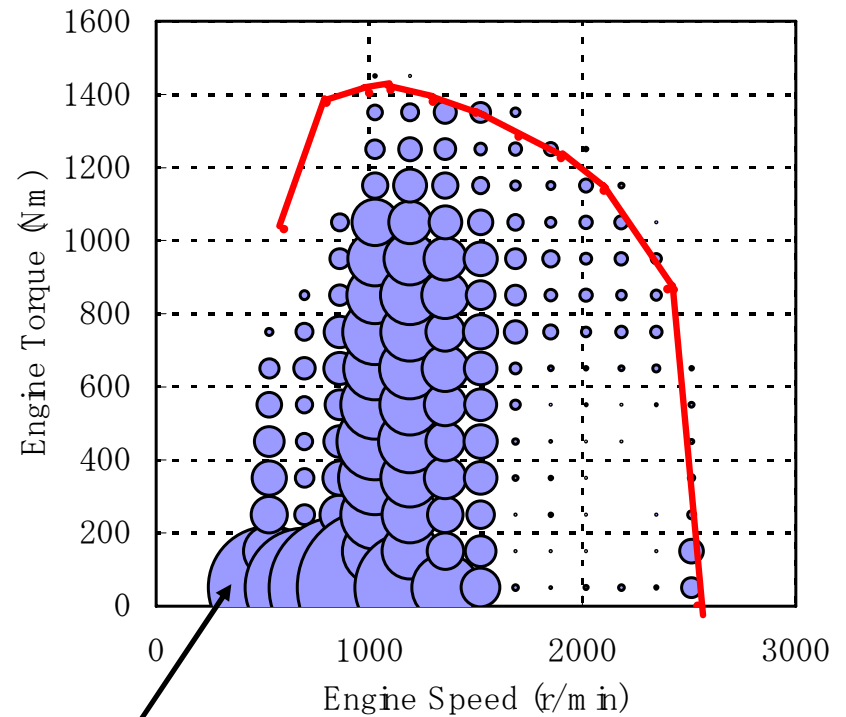
note: except Idling and deceleration

Vehicle 0046 (GVW 25t)

Comparison with actual driving patterns vs. W/NTE zone



NTE zone

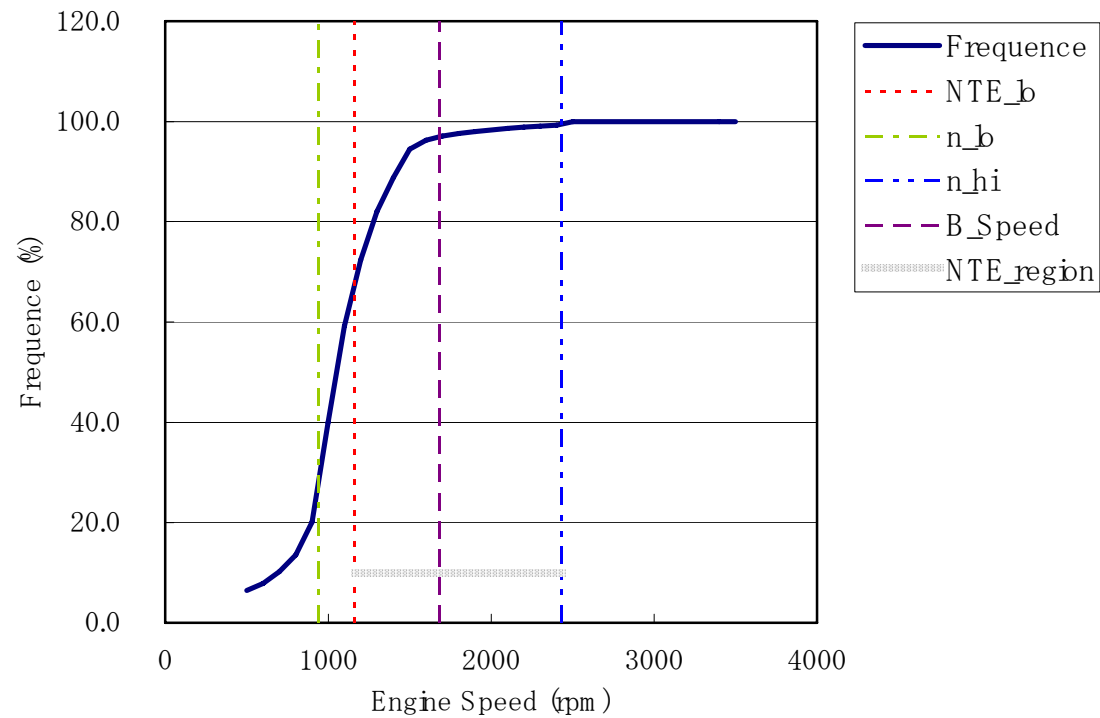


1/10

frequency
(5days data)

Vehicle 0046 (GVW 25t)

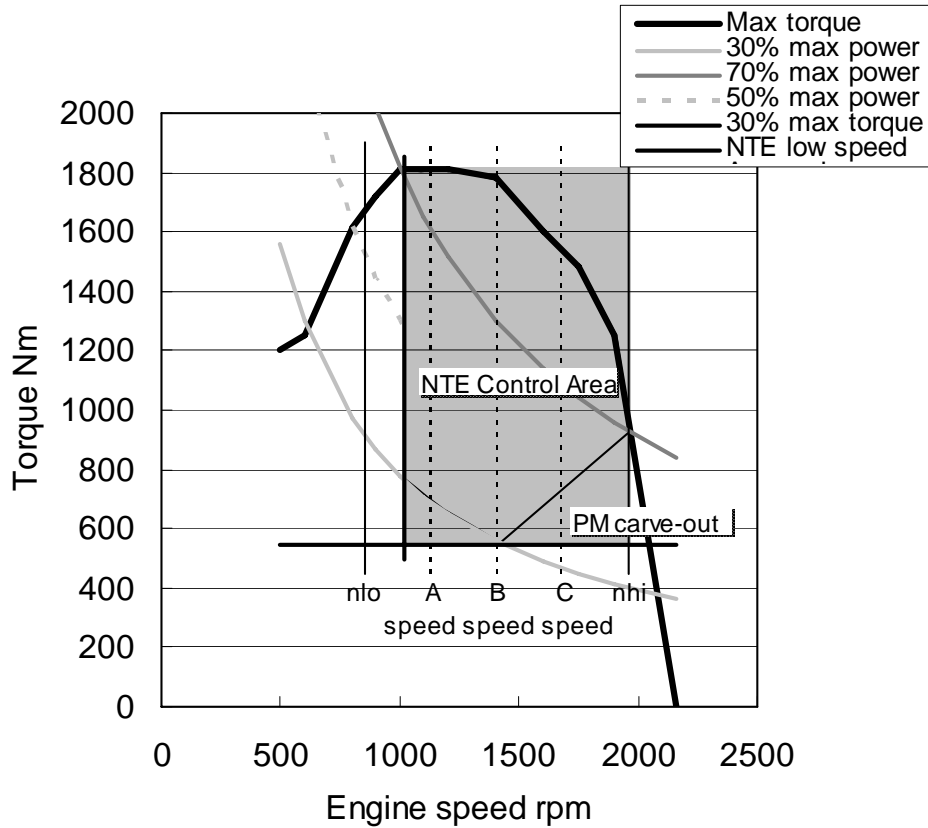
Engine Speed accumulation frequency (5days data)



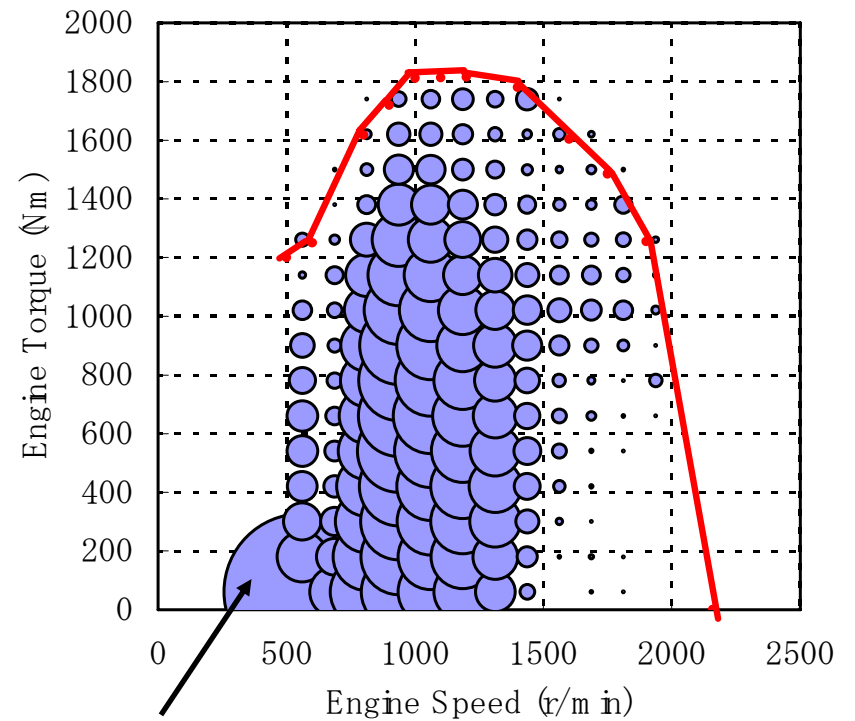
note: except Idling and deceleration

Vehicle 0053 (GVW 25t)

Comparison with actual driving patterns vs. WNTE zone



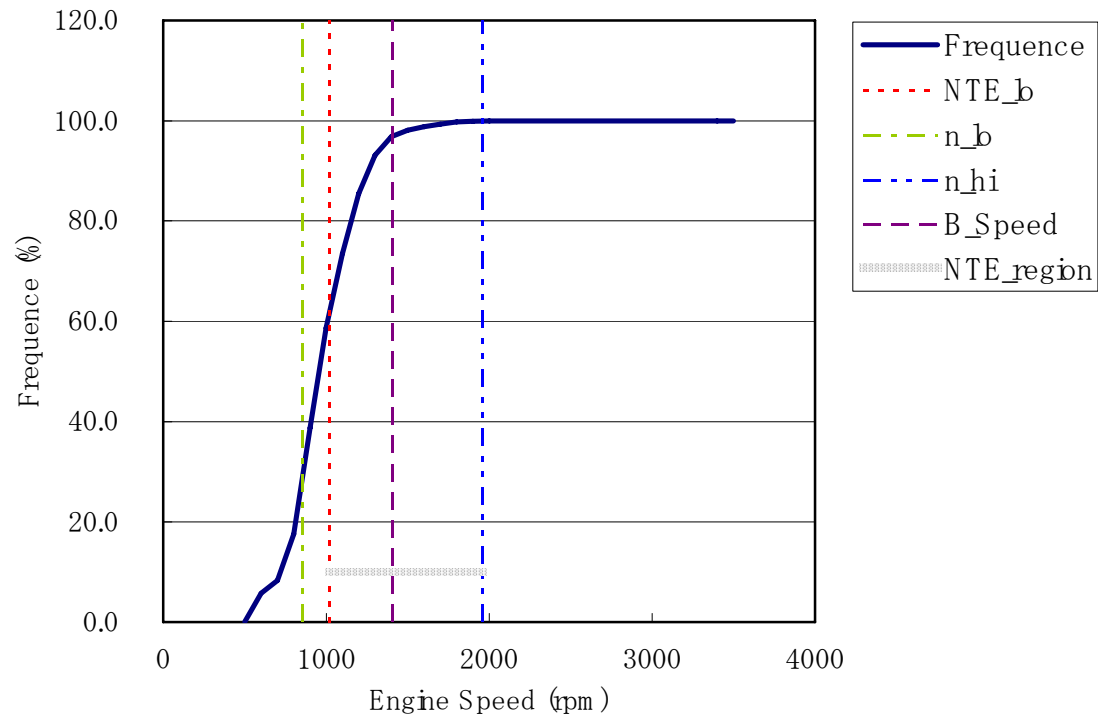
NTE zone



frequency
(5days data)

Vehicle 0053 (GVW 25t)

Engine Speed accumulation frequency (5days data)



note: except Idling and deceleration