

# Input for HEV power determination

## From Japan

guidance material on intake manifold and fuel flow rate

UN-R85

E/ECE/324/Rev.1/Add.84/Rev.1–E/ECE/TRANS/505/Rev.1/Add.84/Rev.1

## 5. Specifications and tests

### 5.4. Interpretation of results

**The net power** and the maximum 30 minutes' power for electric drive trains **indicated by the manufacturer for the type of drive train shall be accepted if it does not differ by more than  $\pm 2$  per cent for maximum power** and more than  $\pm 4$  per cent at the other measurement points on the curve with a tolerance of  $\pm 2$  per cent for engine or motor speed, or within the engine or motor speed range (X1 min-1 + 2 per cent) to (X2 min-1 -2 per cent) (X1 < X2) from the values measured by the technical service on the drive train submitted for testing.

**Following the above Interpretation of results,  
Japan will propose the basic concept about the guideline of engine performance utilization  
of R85 or other certification results in the standard condition .**

**When the Intake manifold pressure of TP1 measurement is within  $\pm 2\%$  of the Intake manifold pressure at the certification in absolute pressure conversion.**

**(Intake manifold pressure in absolute conversion represents the intake air volume or engine performance.)**

**When the Fuel flow rate of TP1 measurement is within  $\pm 2\%$  of the Fuel flow rate at the certification ,**

**Certification results such as R85 can utilized.**

## Concerns

1. **the Intake manifold pressure** decreases from that in the standard condition when evaluating at high altitude location or low pressure.
2. **the fuel flow rate** also decreases as the air volume decreases when at high altitude or low pressure.

**Proposal added to the intake manifold pressure.**

$$\begin{aligned} &| \text{ gauge pressure at TP1 measurement} - \text{ gauge pressure at R85} | \\ &\qquad\qquad\qquad < \text{ Intake manifold pressure at R85} \times 0.02 \end{aligned}$$

**<Confirmation by The case of Yaris HEV >**

At Engine speed: 4800 rpm ,

Gauge pressure is 3.8 kPa and Atmospheric pressure is 101.11 kPa.

**The intake manifold pressure** is  $101.11 - 3.8 = 97.31$  (kPa). thus 2% or , the control range is  $\pm 1.94$ (kPa)

That is,

If The intake manifold pressure at TP1 measurement is within 99.25 and 95.37 (kPa)

If the gauge pressure at TP1 measurement is within 1.86 to 5.74 (kPa),

The Result of R85 can be used.

**The fuel flow rate** is 13.29 kg/ hr of the result of R85, thus 2% or , the control range is  $\pm 0.27$

That is, If the fuel flow rate at TP1 measurement is within 13.02 to 13.56 kg / hr the result of R85 can be used.

If the measurement will be conducted at the high altitude where the amount of intake air decreases by 2% or more, the fuel flow rate will decrease beyond the judgment range.

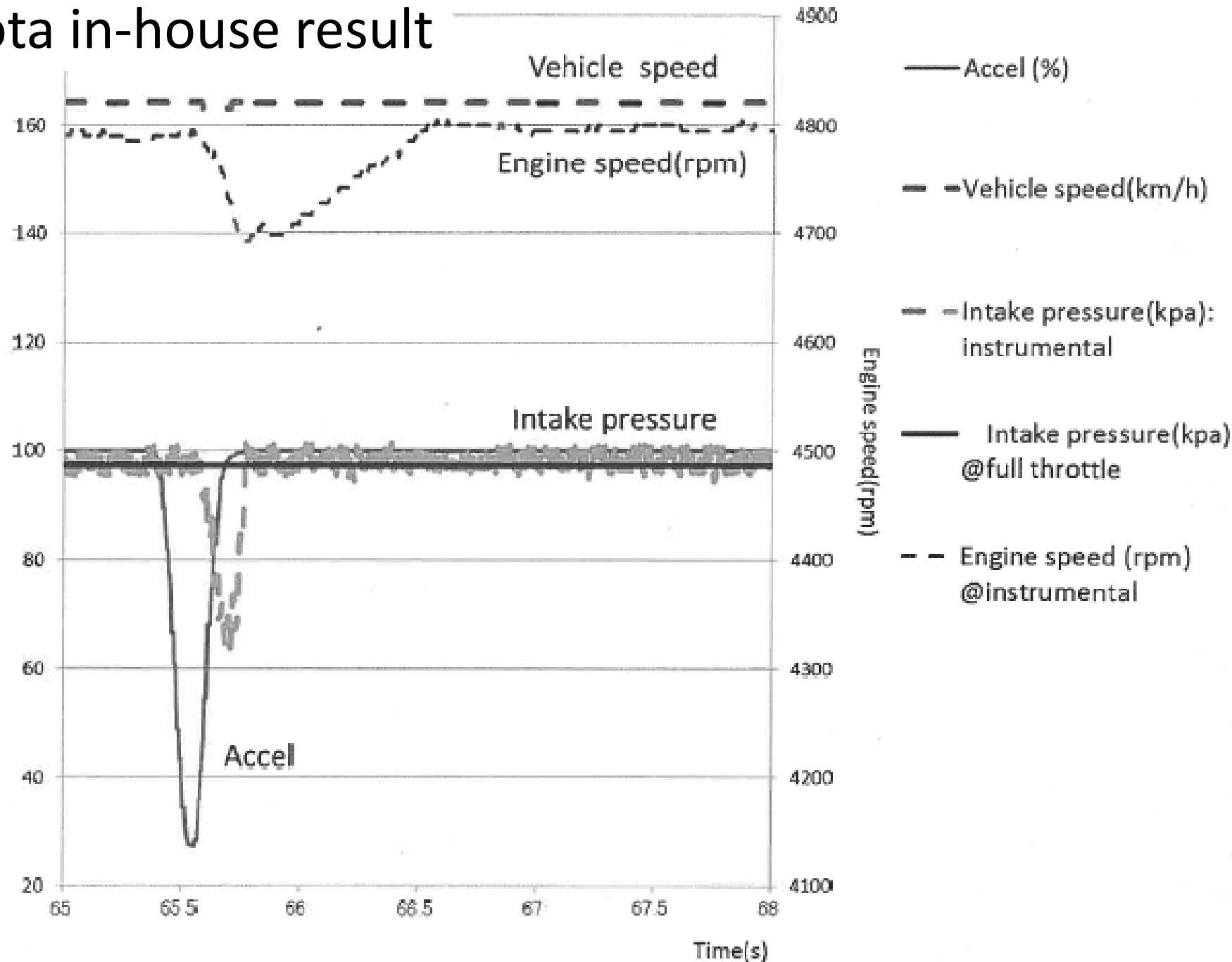
In principle, **the high altitude compensation have to be necessary for fuel flow rate.**

# Yaris HEV 1. 5L ECE—R85 certification test sheet

Engine Speed	rpm		1200	1600	2000	2400	2800	3200	3548	3598	3999	4299	4449	4748	4798	4847	4947	
Indicated torque	Nm	1.	91.0	99.4	103.9	108.1	110.8	112.4	114.5	115.0	114.5	114.5	112.5	110.8	110.9	109.0	105.4	
		2.	91.3	99.4	104.2	108.4	110.8	112.6	114.6	115.3	114.4	114.2	112.2	110.9	110.5	108.8	105.4	
Indicated Power	kW		11.48	16.68	21.80	27.21	32.49	37.70	42.56	43.39	47.93	52.68	52.81	55.12	55.62	55.28	54.60	
Fuel consumption	kg/hr	1.	2.79	3.89	5.02	6.14	7.30	9.05	10.17	2.79	11.23	12.45	12.63	12.20	13.20	13.31	12.18	
		2.	2.78	3.88	5.02	6.14	7.30	9.04	10.16	10.29	11.22	12.40	12.62	13.22	13.29	13.33	12.18	
Temperature at injection pump	°C																	
Temperature at fuel measurement	°C		26.3	26.0	26.0	26.8	26.5	26.3	26.1	26.0	24.8	24.8	24.7	24.6	24.6	24.7	24.7	
Temperature of Coolant	°C		88.6	88.7	88.5	88.6	88.7	88.5	88.4	88.6	88.8	89.1	88.0	88.7	88.6	88.5	88.6	
Oil temperature @ Gallery	°C		86.2	89.2	90.1	97.1	101.0	105.2	106.4	106.6	106.4	106.4	106.4	106.7	106.7	106.7	106.7	
Air Intake temperature	°C	1.	24.7	25.6	25.4	24.5	24.9	25.6	25.4	24.5	25.8	25.6	24.9	25.3	25.5	25.5	24.6	
		2.	24.7	25.9	25.0	24.5	25.3	25.7	24.9	24.8	26.1	25.1	24.8	25.7	25.6	26.0	25.0	
Intake depression	kPa (X)		7.8	7.5	7.6	4.8	2.6	2.8	2.6	2.6	2.9	3.4	3.6	3.8	3.8	3.8	3.8	
Temperature after turbo-charger	°C																	
Pressure after turbo-charger	bar																	
	kPa																	
Temperature at intercooler outlet	°C																	
Pressure at intercooler outlet	bar																	
	kPa (Y)																	
Exhaust temperature	°C		577	639	689	720	758	832	863	859	868	883	887	896	897	897	899	
Exhaust pressure	mbar		26.0	30.0	64.0	75.0	101.0	149.0	187.0	190.0	226.0	270.0	275.0	301.0	306.0	304.0	302.0	
	kPa		2.6	3.0	6.4	7.5	10.1	14.9	18.7	19.0	22.6	27.0	27.5	30.1	30.6	30.4	30.2	
Barometric pressure(H:72306)	mbar		1011.1	1011.1	1011.1	1011.1	1011.1	1011.1	1011.1	1011.1	1011.1	1011.1	1011.1	1011.1	1011.1	1011.1	1011.1	
			101.11	101.11	101.11	101.11	101.11	101.11	101.11	101.11	101.11	101.11	101.11	101.11	101.11	101.11	101.11	
Humidity	%																	
Vapour pressure	kPa		1.68	1.70	1.68	1.66	1.67	1.67	1.66	1.67	1.67	1.67	1.66	1.65	1.65	1.68	1.64	
Dry atmospheric (ps)	kPa		99.43	99.41	99.43	99.45	99.44	99.44	99.45	99.44	99.44	99.44	99.45	99.46	99.46	99.43	99.47	

IF the intake manifold pressure at TP1 measurement is within 99.25 and 95.37 R85 result can be used.

# Toyota in-house result



Measured intake  
Manifold pressure

**ECE-R85 Result**

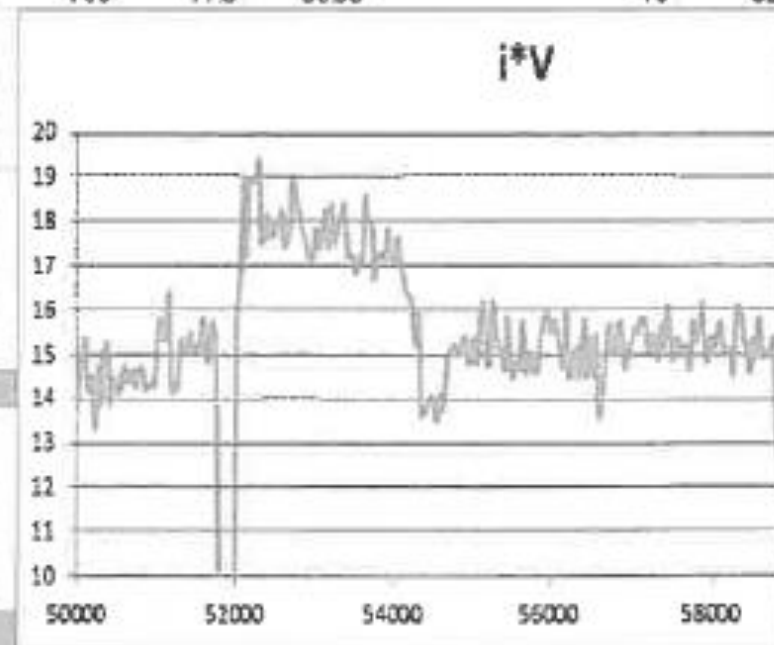


# Toyota in-house result

Accelerator

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	TIME	エンジン回転	アクセルセンサ	アクセルセンサ	アクセルセンサ	アクセルセンサ	アクセルセンサ	エンジン出力	全電池容量	電池電圧	電池電流	MV	エンジン負荷	スロットルセンサ	電池電流(1)	電池電流(2)	電池電流(3)
2	40556	1632	16.8	33.7	28	3.25	0	0	67.4	171	-8.79	-1.50309	29	17.2	-9.06	15	32
299	51849	4768	47.4	64.7	96	-30.88	30	16540	62.7	162	-59.82	-9.65844	100	71.3	108.54	15	32
300	51890	4768	67.4	84.3	93	-30.13	51.5	32270	62.7	169	-78.68	-13.2969	100	71.3	30.53	15	32
301	51931	4736	69.4	86.6	77	-23.25	80	47240	62.7	175	-88.94	-15.5645					
302	51973	4736	69.4	86.6	77	-18.38	96.5	54000	62.7	166	-27.36	-4.54176					
303	52016	4672	69.4	86.6	64	-22.13	99	54000	62.7	140	110.96	15.5344					
304							99.5	54000	62.7	139	120.24	16.71336					
305							99.5	54000	62.7	136	139.3	18.9448					
306	52135	4672	69.8	86.6	97	-29.13	99.5	54000	62.7	132	130.51	17.22732					
307	52174	4672	69.4	86.6	97	-28.25	100	54000	62.7	133	142.73	18.98309					
308	52212	4640	69.4	86.6	97	-27.88	100	54000	62.7	133	142.24	18.91792					
309	52265	4640	69.4	86.6	97	-27.88	100	54000	62.3	129	147.12	18.97848					
310	52292	4672	69.4	86.6	96	-27.88	100	54000	62.3	132	146.64	19.35648					
311	52330	4704	69.4	86.6	97	-28	100	54000	62.3	130	134.91	17.5383					
312	52368	4704	69.4	86.6	97	-28.63	100	54000	62.3	133	133.44	17.74752					
313	52406	4736	69.4	86.6	97	-28.75	100	54000	62.3	133	136.37	18.13721					
314	52446	4736	69.4	86.6	97	-28.63	100	54000	62.3	130	135.88	17.6644					
315	52485	4736	69.4	86.6	97	-29.13	100	54000	62.3	133	133.44	17.74752					
316	52513	4768	69.4	86.6	96	-28.38	100	54000	62.3	134	134.42	18.01228					
317	52554	4768	69.4	86.6	96	-29.25	100	54000	62.3	131	137.35	17.99285	100	80	135.58	15	32
318	52580	4768	69.4	86.6	96	-29.13	100	54000	62.3	133	137.35	18.26755	100	80	135.58	15	32
319	52619	4768	69.4	86.6	96	-29.13	100	54000	62.3	134	130.51	17.48834	100	80	132.91	15	32
320	52667	4768	69.4	86.6	96	-29.63	100	54000	62.3	130	134.91	17.5383	100	80	132.91	15	32
321	52703	4768	69.4	86.6	96	-29.5	100	54000	62.3	133	136.37	18.13721	100	80	132.91	15	32
322	52728	4800	69.4	86.6	97	-29.13	100	54000	62.3	133	143.21	19.04693	100	80	133.66	15	32
323	52785	4800	69.4	86.6	97	-29.5	100	54000	62.3	130	140.77	18.3001	100	80	133.66	15	32

the intake manifold pressure



“intake manifold pressure at TP1 measurement is within 99.25 and 95.37”

JARI Result

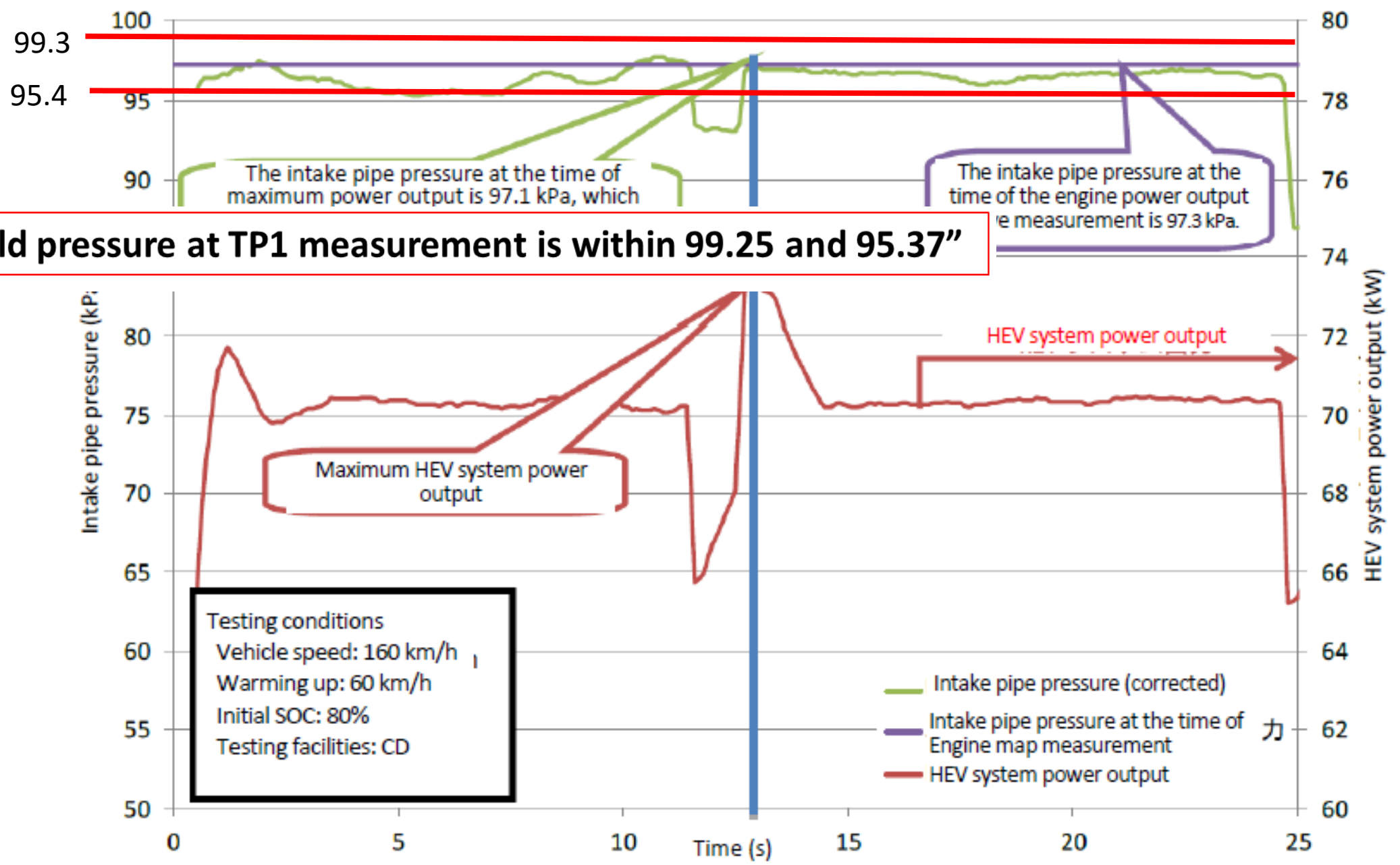


Figure 5.40 Intake pipe pressure and HEV system power output of testing vehicle A