

Validation 1b

Test Results on Indian Vehicles

WLTP/DHC Teleconference
22nd March 2012

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Introduction of Validation 1b test

- Validation 1b conducted with Japan and Steven 2 Gear shift methodology.
- Total 13 vehicles tested -

	Power Range kW	PMR Range kW/t (on Kerb weight)
Diesel	51.5 to 89.5	46.8 to 49.7
Petrol	35.0 to 66.0	47.7 to 70.6
CNG	29.0 to 63.9	36.4 to 50.2

- All vehicles are Manual Transmission.
- Test Mass = Kerb Weight + 150 kg.
- $PMR = [Power \text{ in kW} / Kerb \text{ Weight in ton}]$
- Speed Tolerance +/- 2 km/h

Vehicle Models for Validation 1b test

Sr. No.	Make	Model	Fuel Type	Kerb Weight kg	Engine CC	Max. Power kW	PMR kW/t	Max. vehicle speed in km/h
1	Tata Motors	Indigo Diesel	Diesel	1100	1405	51.5	46.8	155
2	Mahindra	Scorpio		1820	2198	89.5	49.2	140
3	Mahindra	Xylo		1800	2198	89.5	49.7	150
4	Tata Motors	Indica Xeta	Gasoline	1005	1193	48	47.7	140
5	Maruti Suzuki	Alto		705	796	35	49.0	135
6	Hyundai	Eon		772	814	41	53.1	137
7	Maruti Suzuki	Wagon R		885	998	49.2	55.6	145
8	Honda	Jazz 1.2 X		1090	1198	66	60.55	166
9	Maruti Suzuki	Swift		990	1197	63.9	64.6	160
10	Honda	Brio 1.2 E		920	1198	65	70.65	169
11	Maruti Suzuki	Alto	CNG	795	796	29	36.4	135
12	Maruti Suzuki	Wagon R		960	998	43.4	45.2	140
13	Maruti Suzuki	Sx4		1275	1586	63.9	50.2	160

Test Matrix for Validation 1b

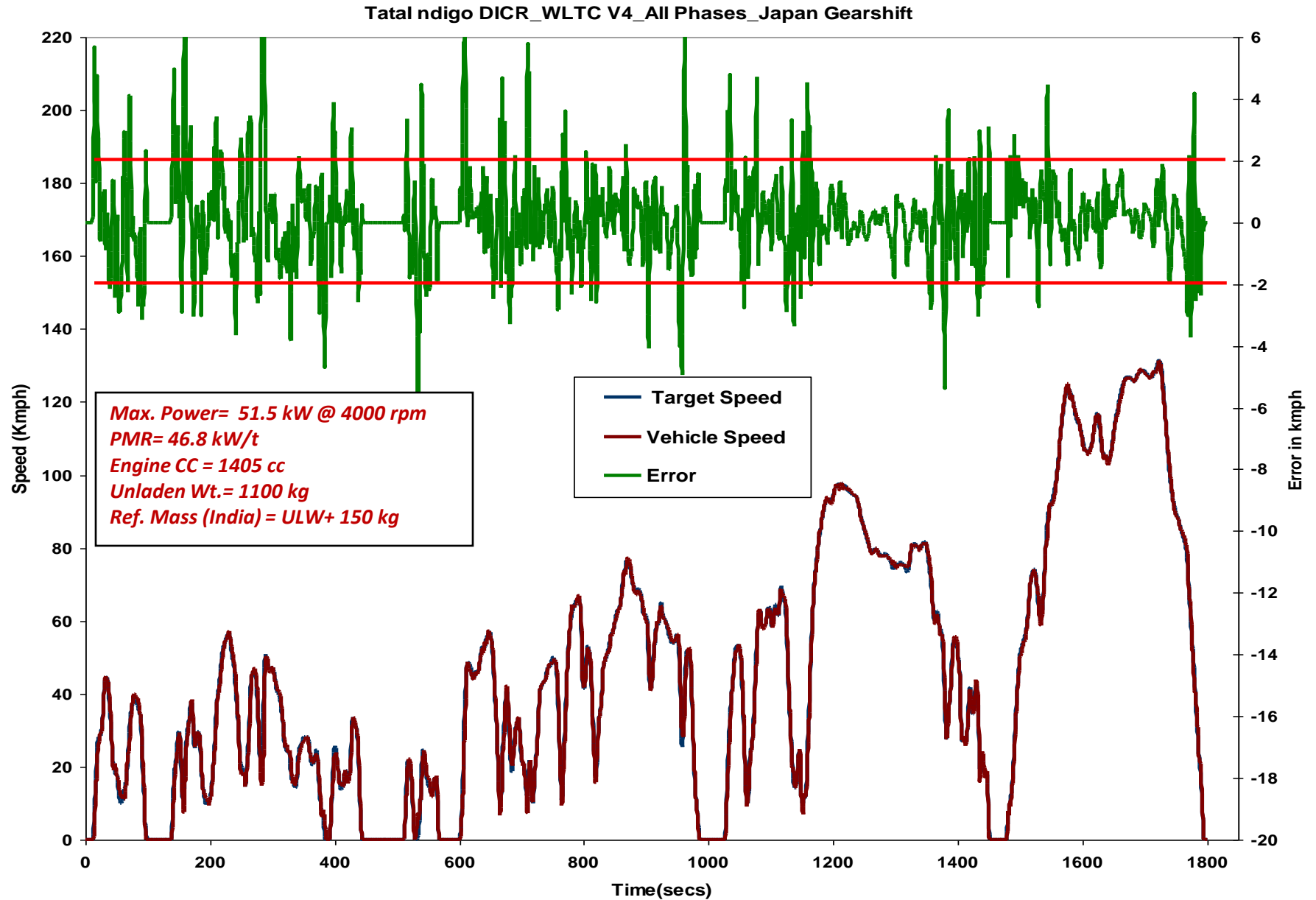
Sr. No.	Make	Model	Fuel Type	No of Tests		Total Tests per vehicle
				Japan	Steven 2	
1	Mahindra	Xylo	Diesel	2	2	4
2		Scorpio	Diesel	2	2	4
3	Honda	Brio 1.2 E	Gasoline	1	-	1
4		Jazz 1.2 X	Gasoline	1	-	1
5	Hyundai	Eon	Gasoline	2	-	2
6	Maruti Suzuki	Alto	Gasoline	2	-	2
7		Alto	CNG	2	-	2
8		Wagon R	Gasoline	2	-	2
9		Wagon R	CNG	2	-	2
10		Swift	Gasoline	2	-	2
11		Sx4	CNG	2	-	2
12	Tata Motors	Indigo	Diesel	2	2	4
13		Indica	Gasoline	2	2	4
Total Tests				24	8	32

* All vehicles are tested with Reference mass = Kerb weight + 150kg

Validation 1b Test Results

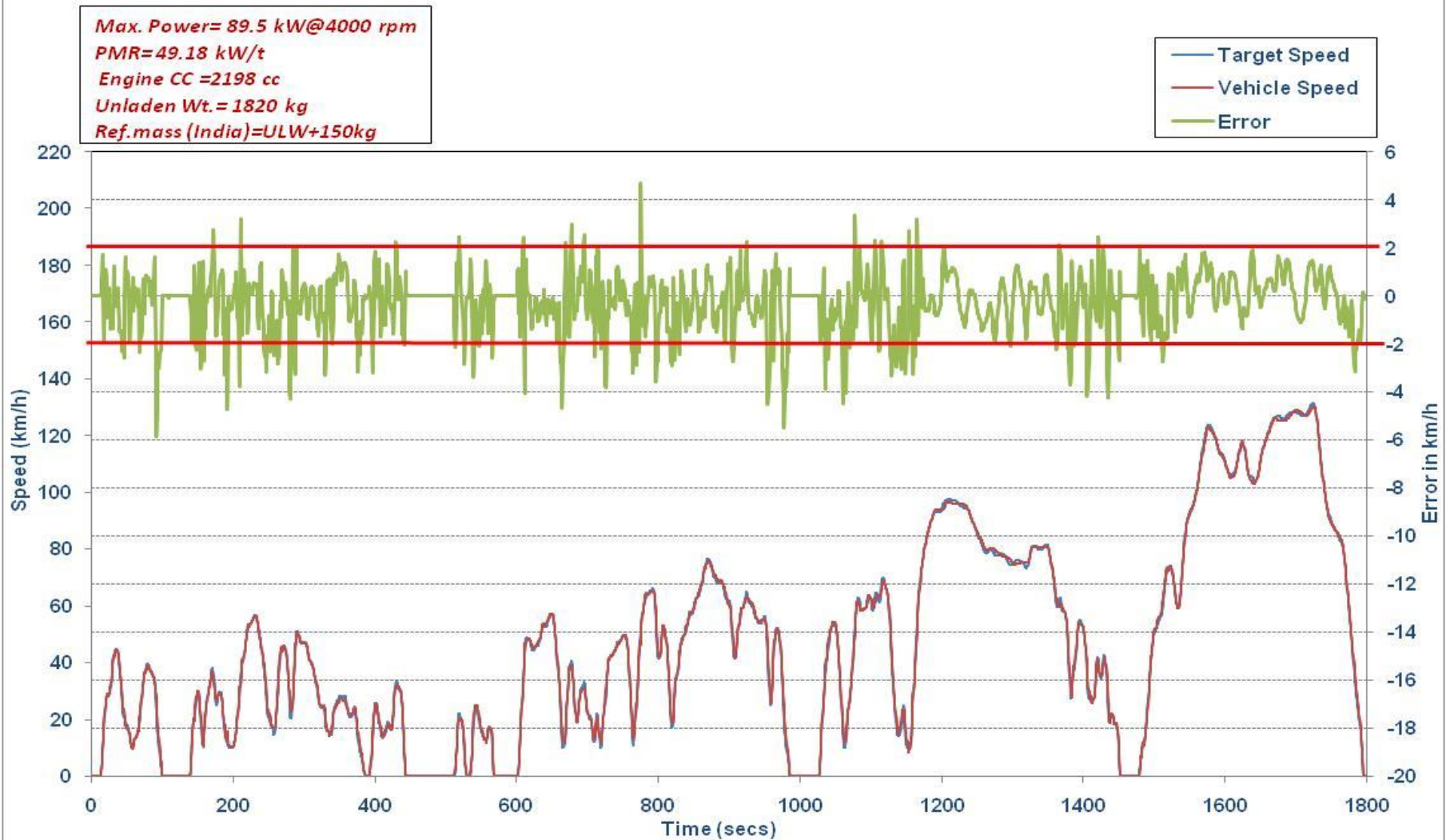
- Actual cycle traced by the test vehicle for the 1800s duration as per WLTC Version 04 Cycle
- The error in maintaining the speed within +/- 2 km/h is shown for entire cycle duration at the top of the Test Result
- Inset shows the details of the Test Vehicle including the Power, PMR in kW/t of Unladen mass.
- Reference mass = Unladen +150 kg as per current Indian regulation.

Test Results



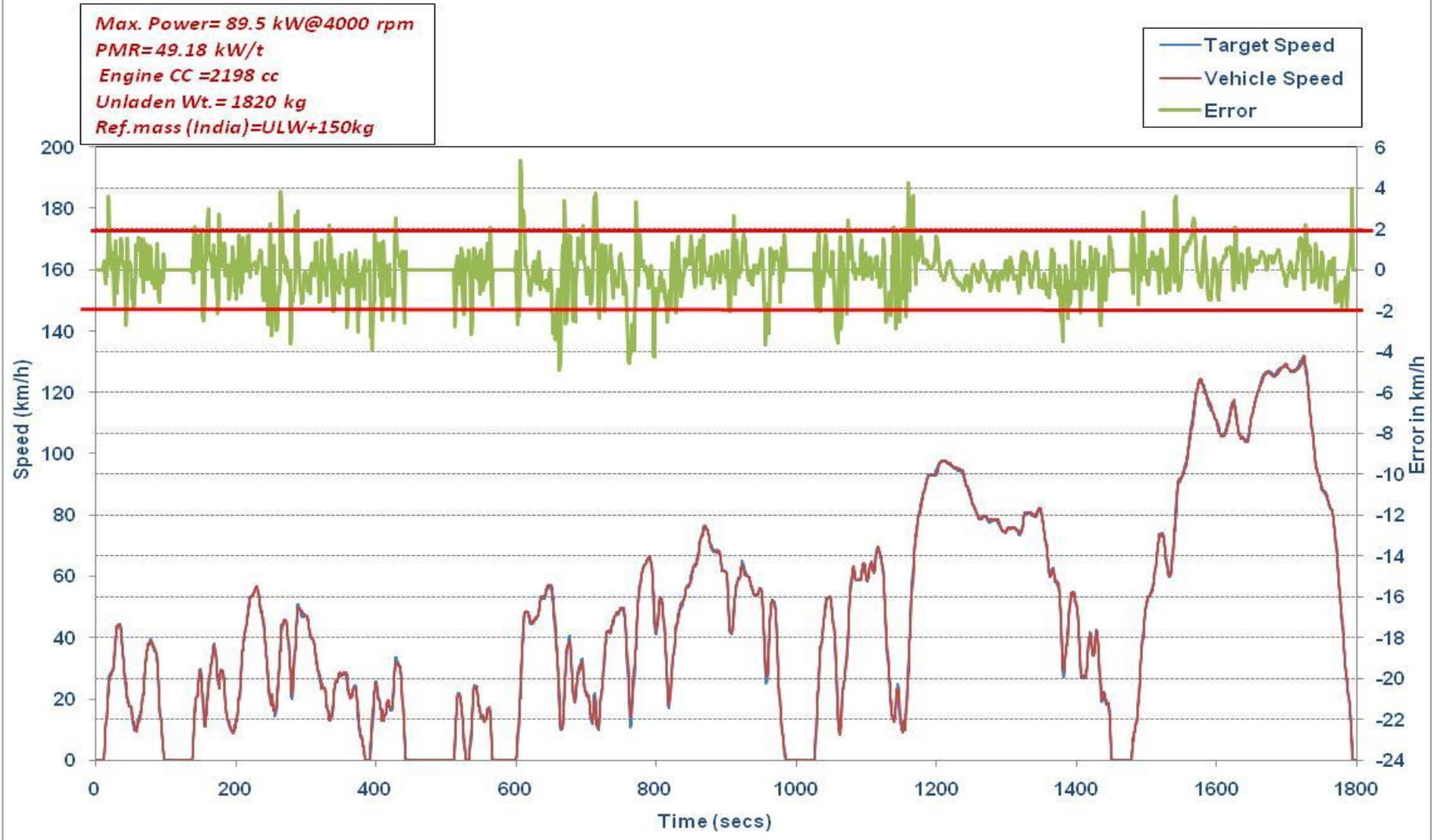
Test Results

Mahindra Scorpio_WLTC v4 _Japan Gear Shift



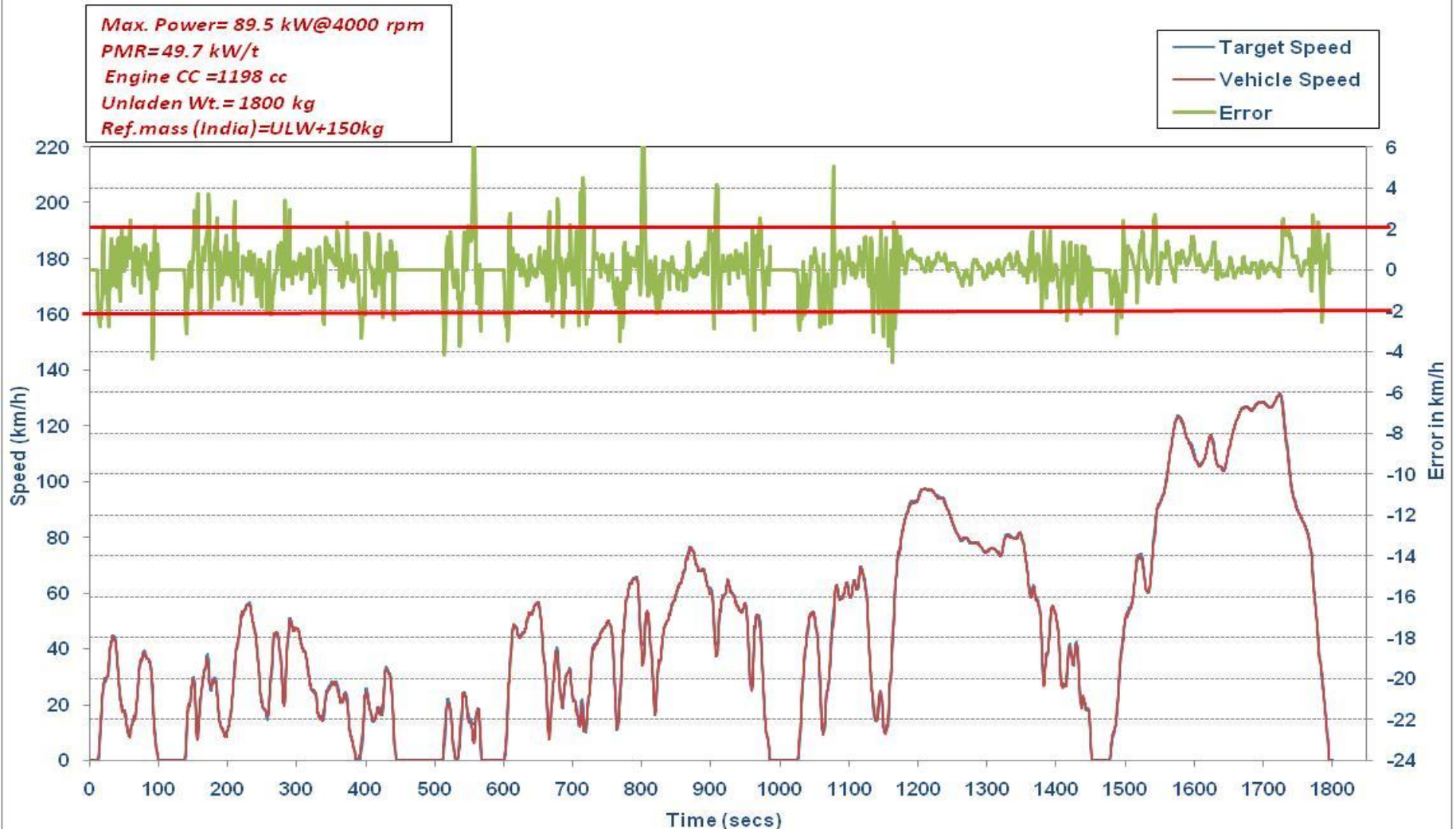
Test Results

Mahindra Scorpio_WLTC v4_Steven Gear Shift



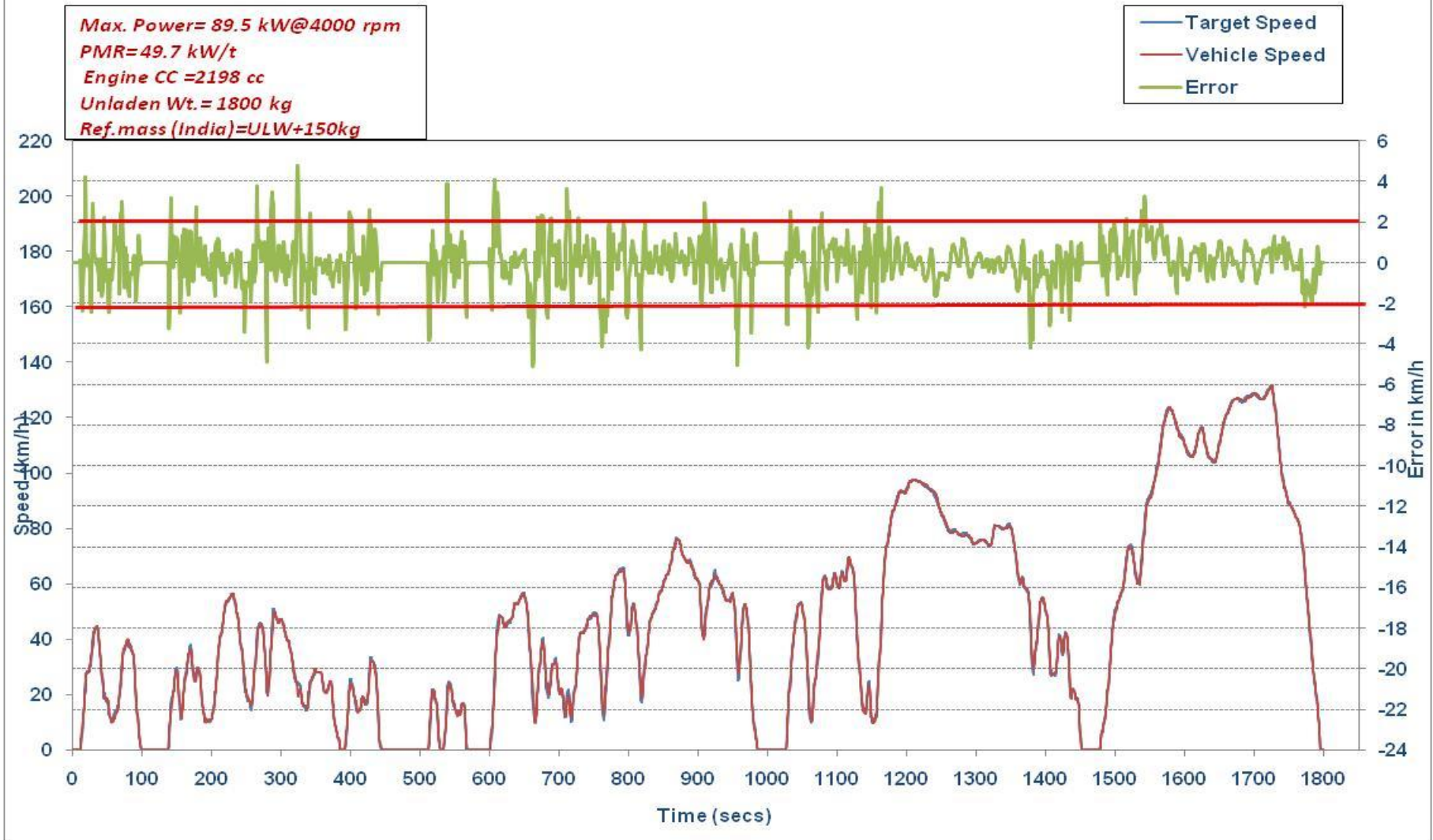
Test Results

Mahindra Xylo_WLTC v4_Japan Gear Shift

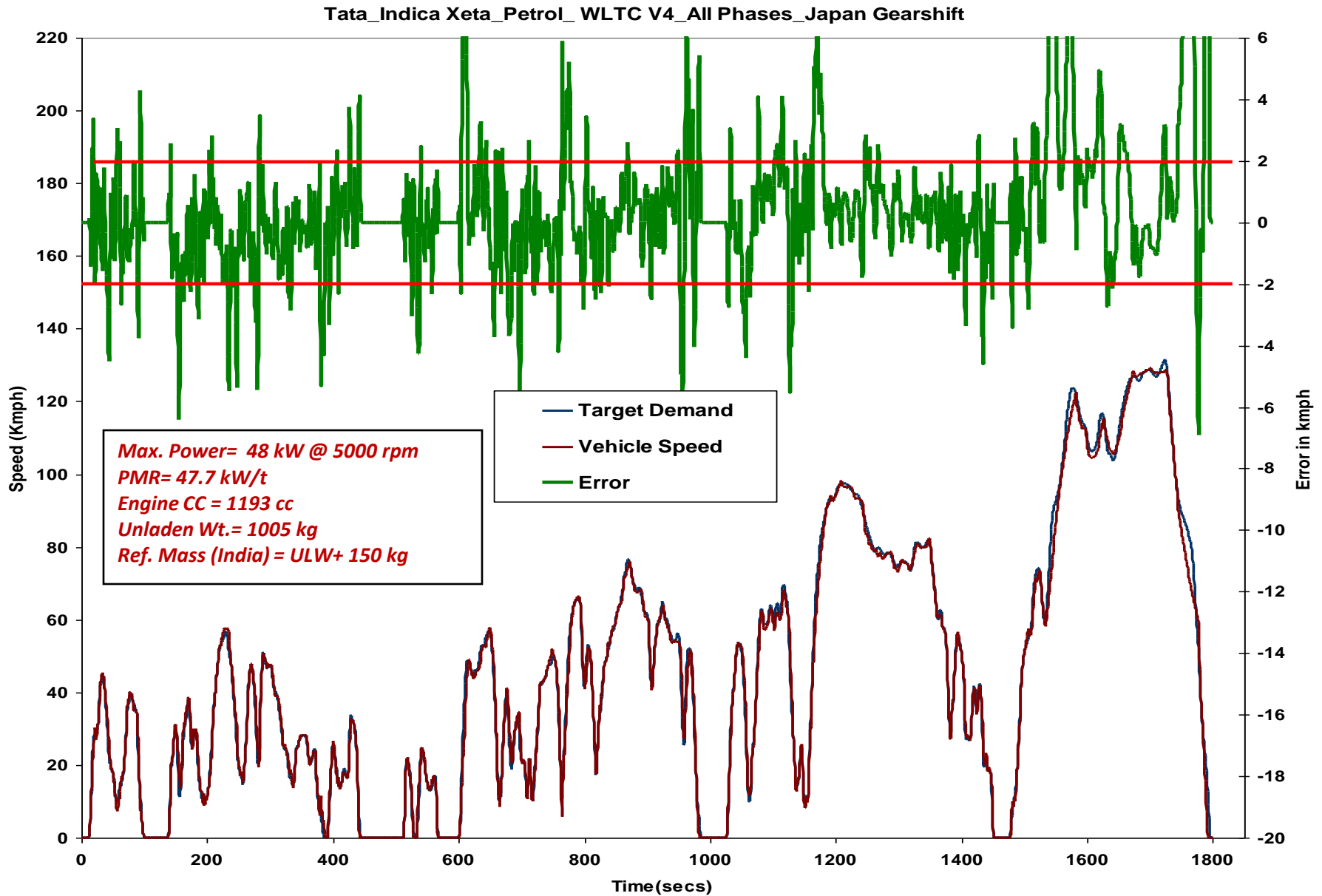


Test Results

Mahindra Xylo_WLTC v4_Steven Gear Shift

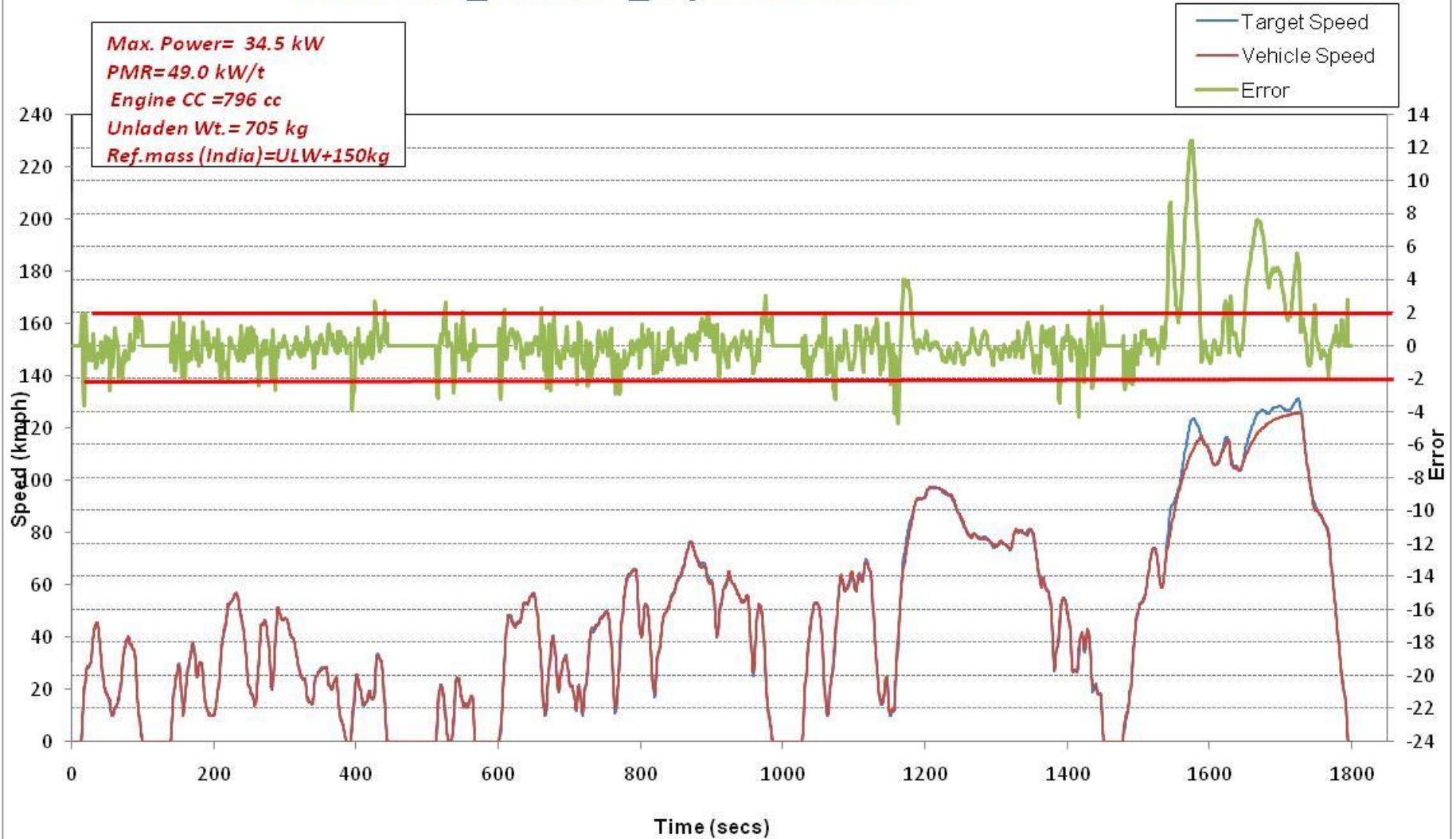


Test Results



Test Results

Alto Petrol_WLTC v4_Japan Gear Shift



Test Results

Hyundai EON_WLTC v4_All Phases_Japan Gear Shift Cold Start

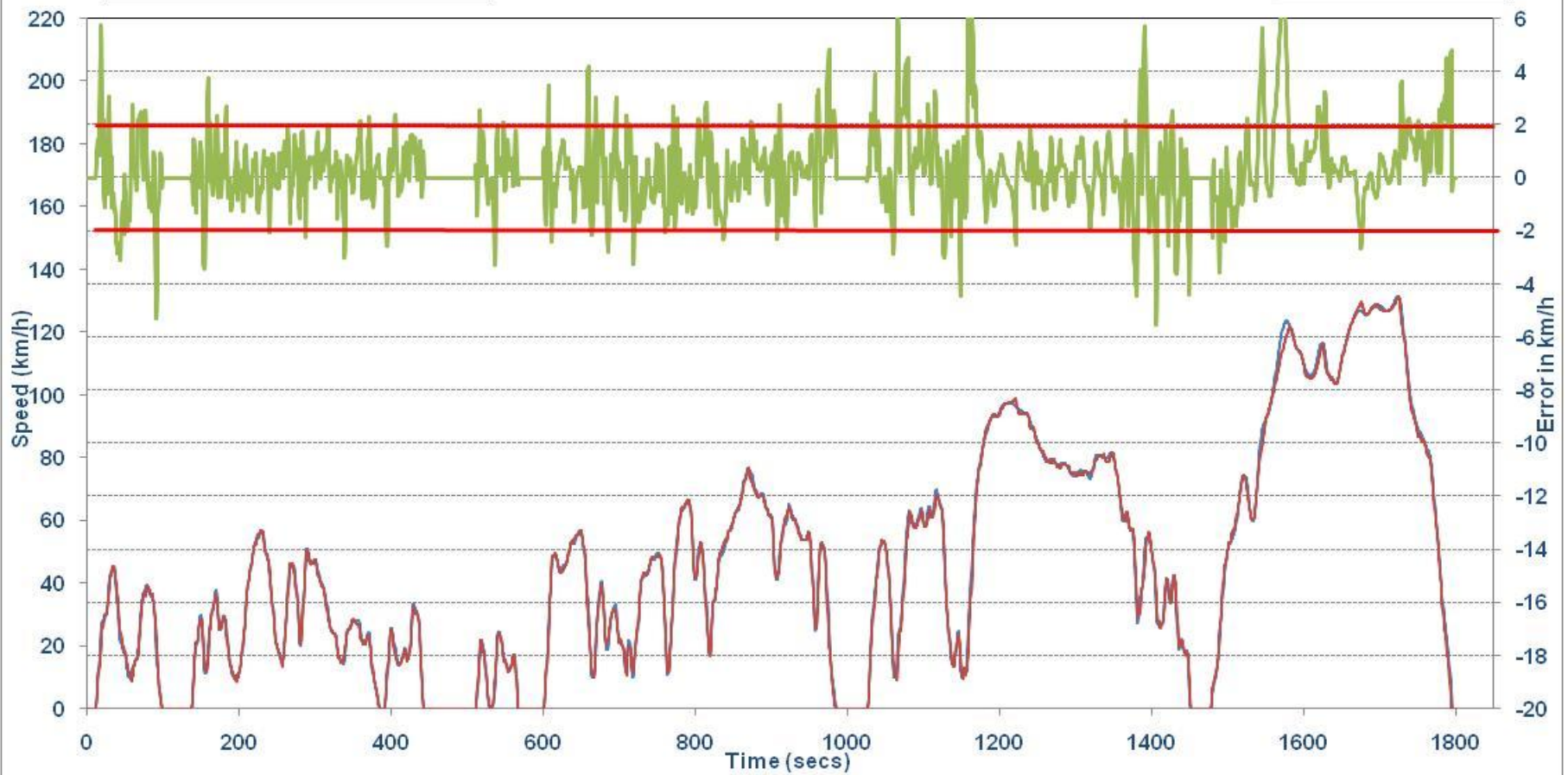
Max. Power= 41 kW@5500 rpm

PMR= 53 kW/t

Engine CC =814 cc

Unladen Wt.= 772 kg

Ref. mass(India)=ULW+150kg

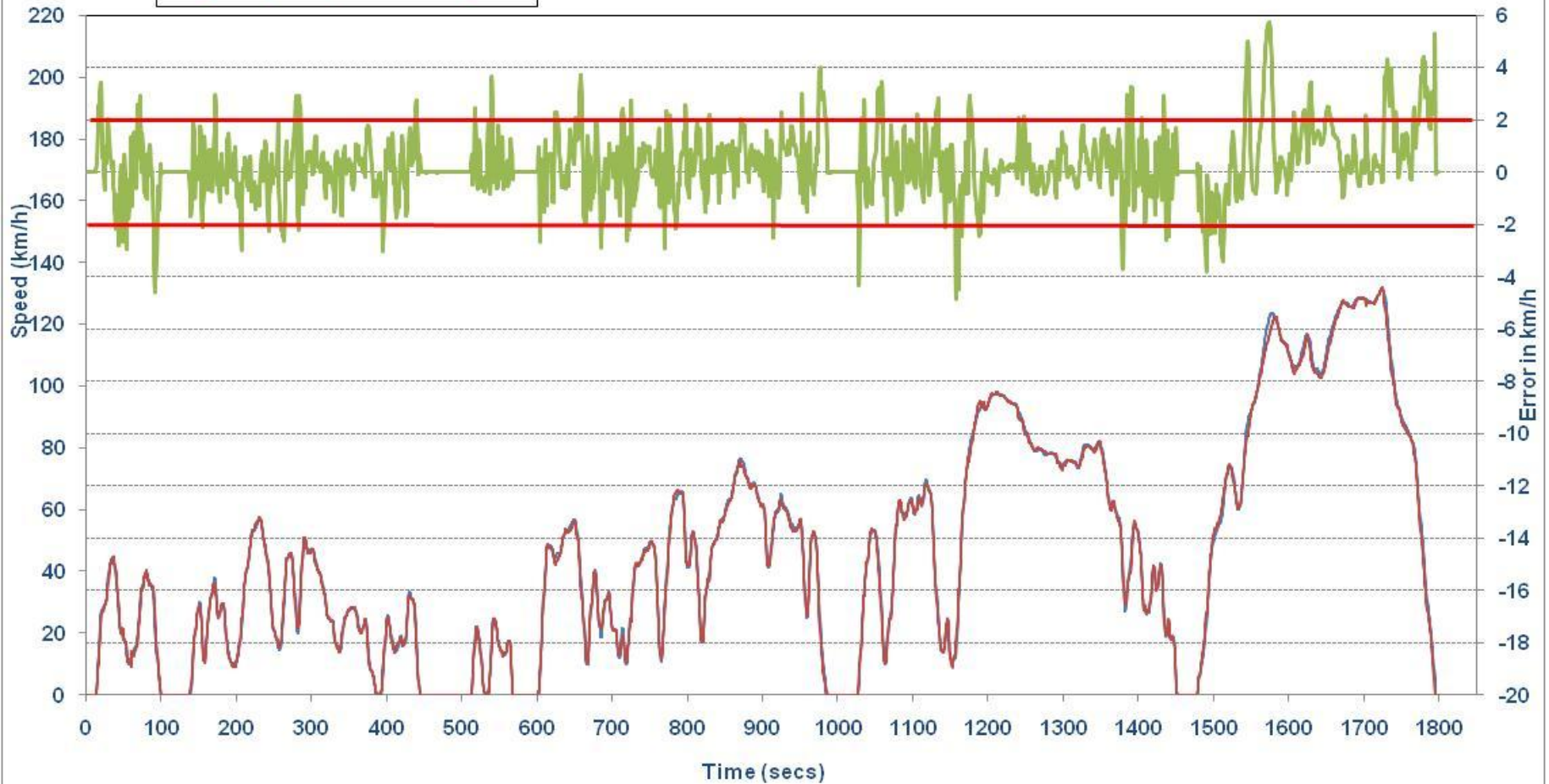


Test Results

Hyundai EON_WLTC v4_All Phases_Japan Gear Shift Hot Start

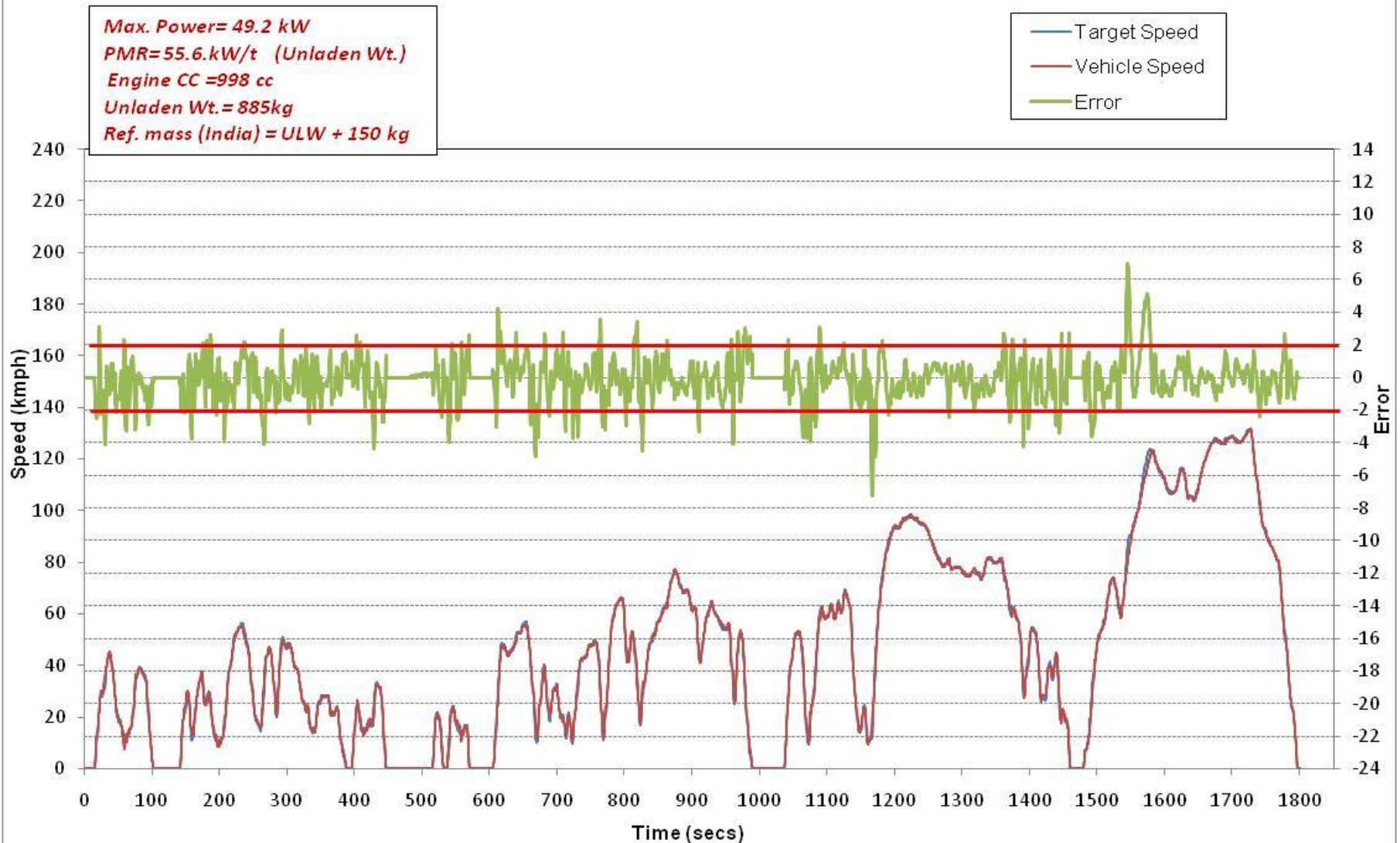
Max. Power= 41 kW@5500 rpm
PMR= 53 kW/t
Engine CC =814 cc
Unladen Wt.= 772 kg
Ref. mass(India)= ULW+150kg

— Target Speed
— Vehicle Speed
— Error

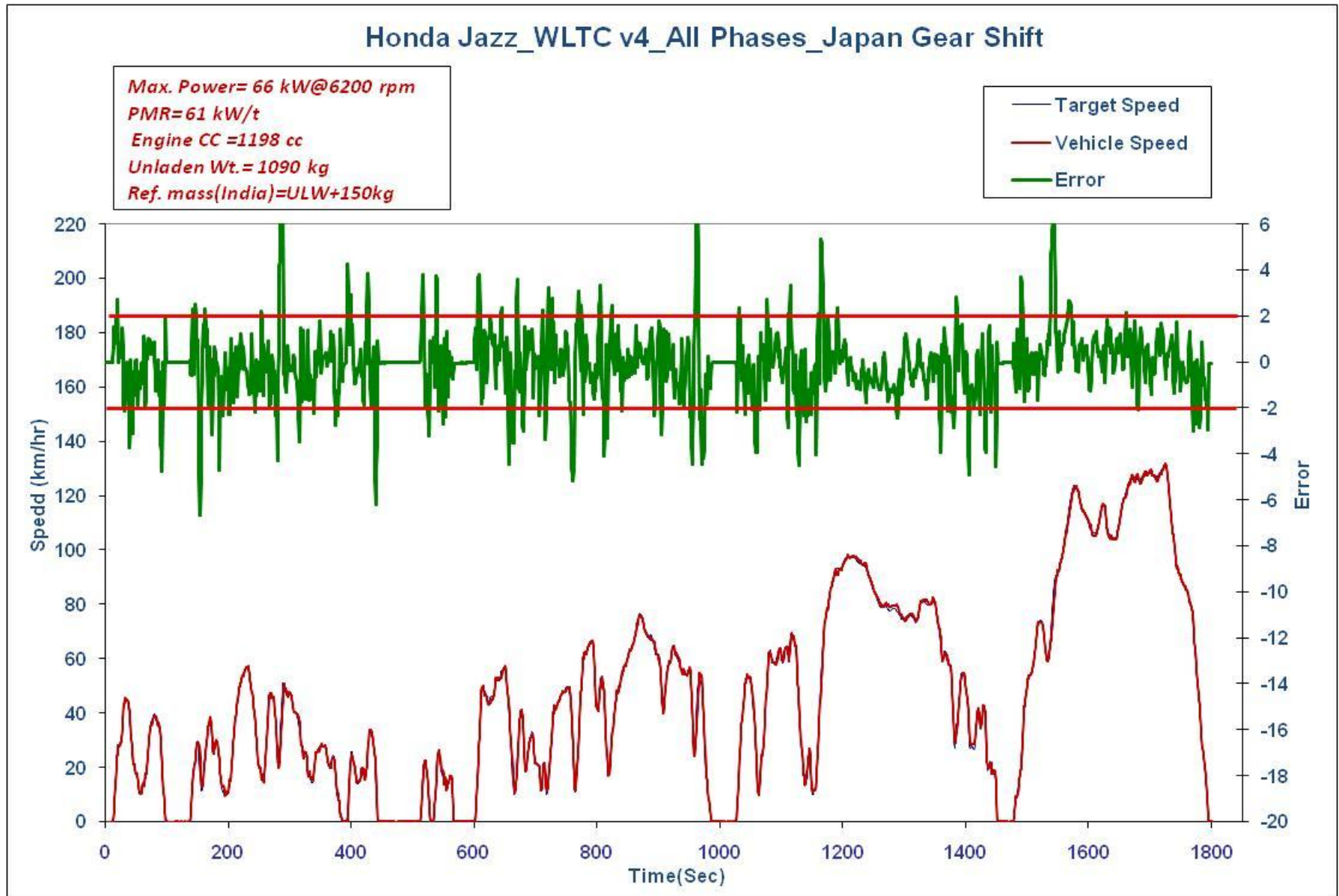


Test Results

WagonR Petrol_WLTC v4_Japan Gear Shift

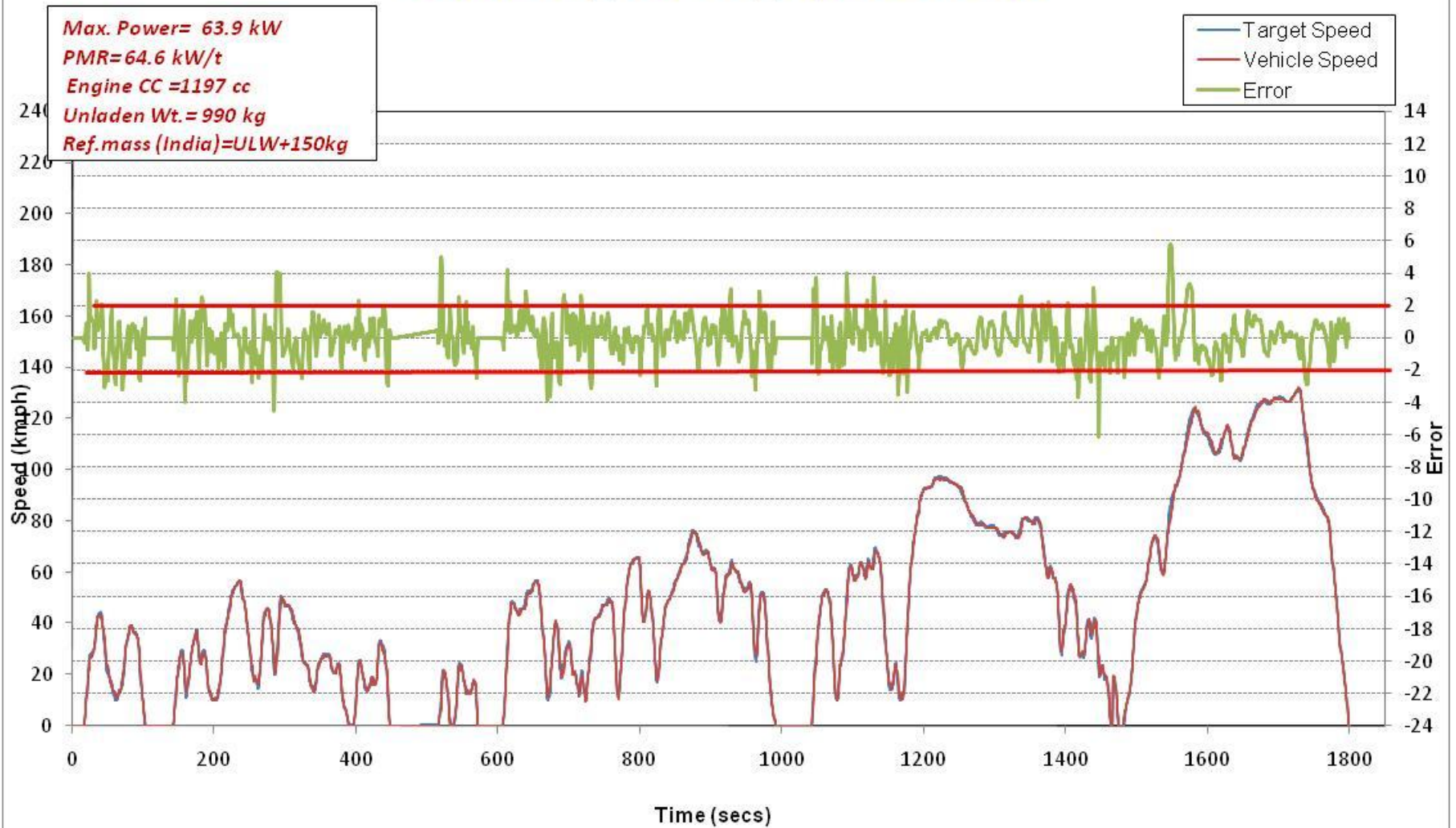


Test Results



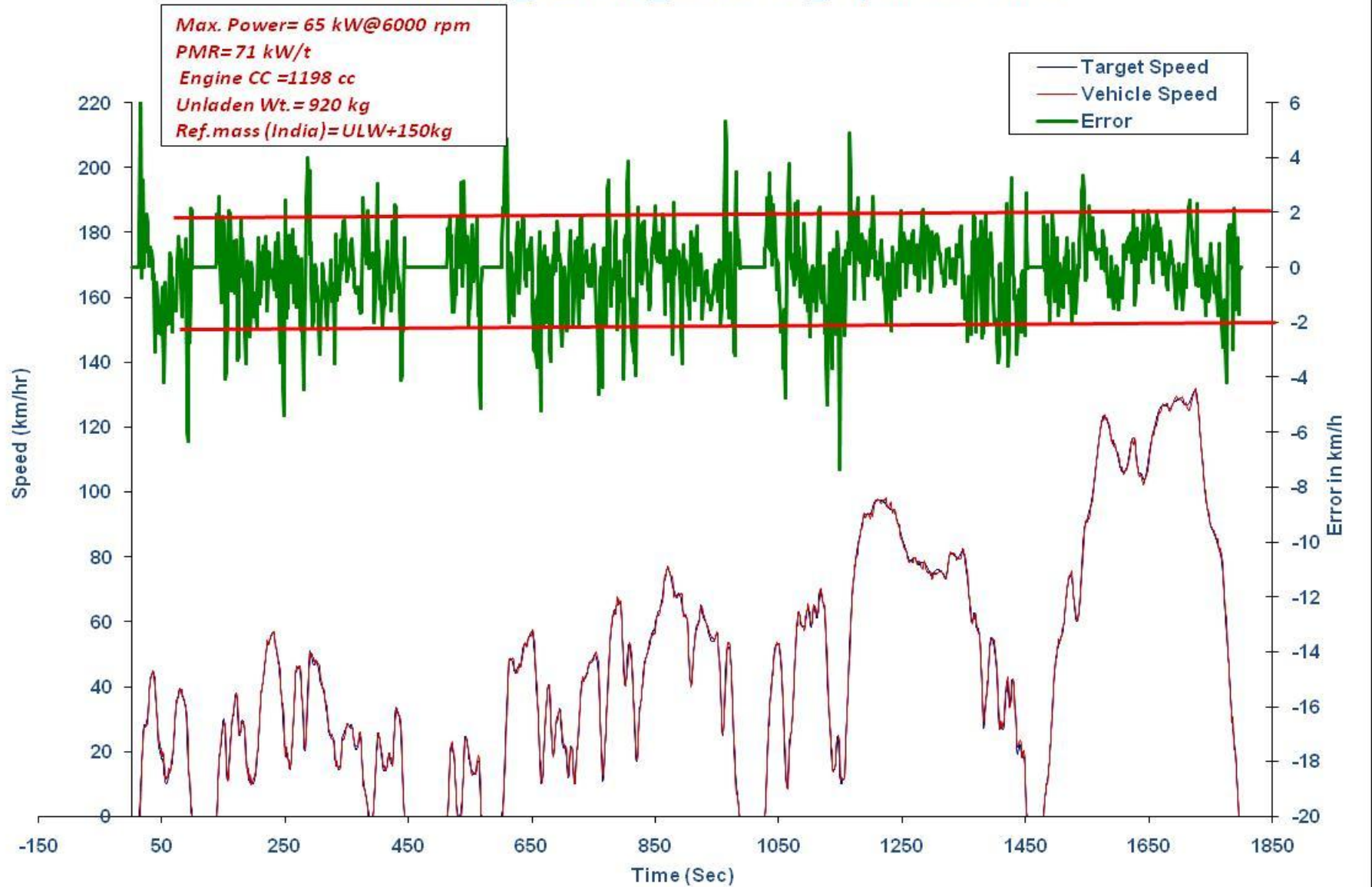
Test Results

Swift Petrol_WLTC v4_Japan Gear Shift



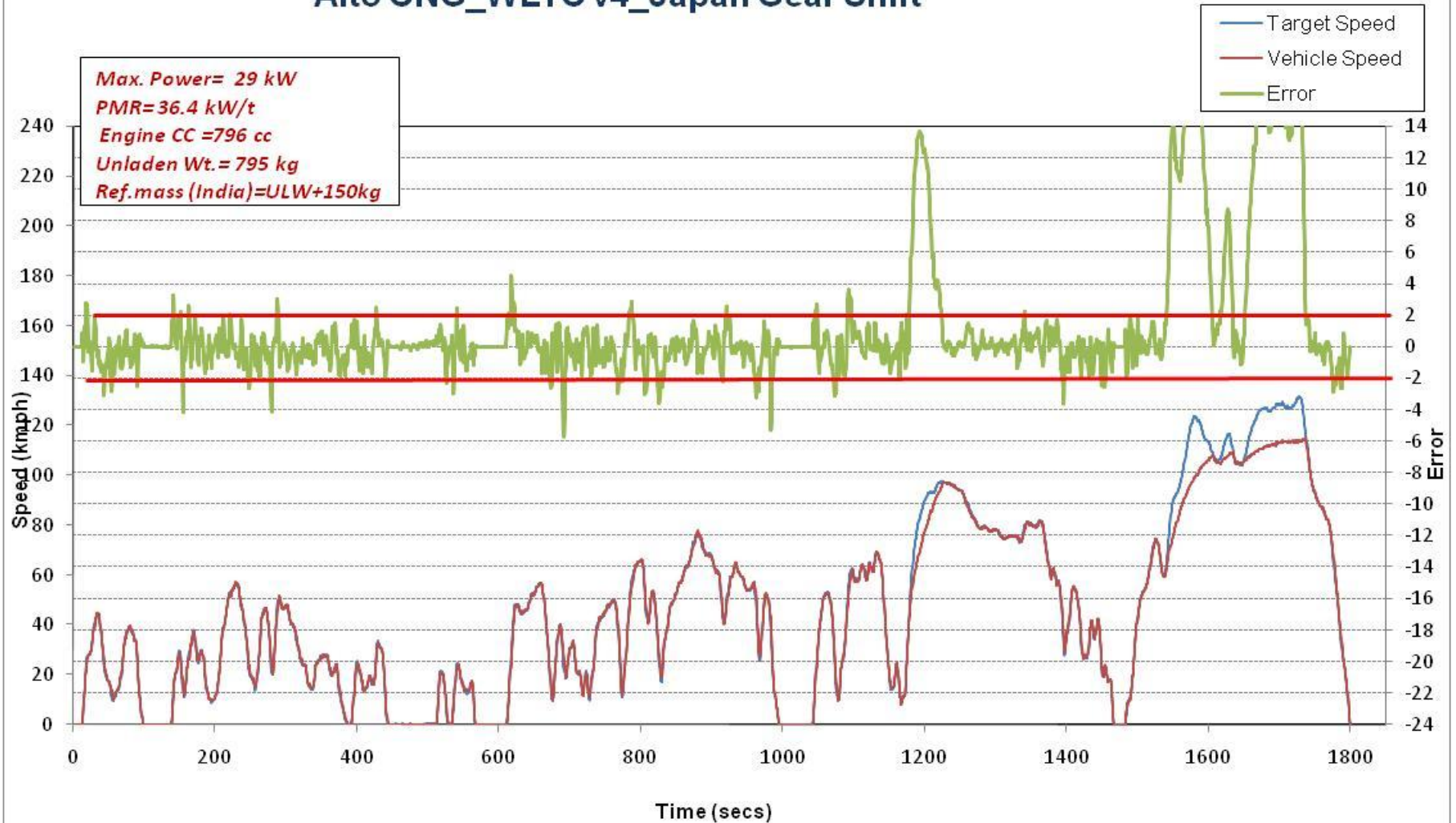
Test Results

Honda Brio_WLTC v4_All Phases_Japan Gear Shift



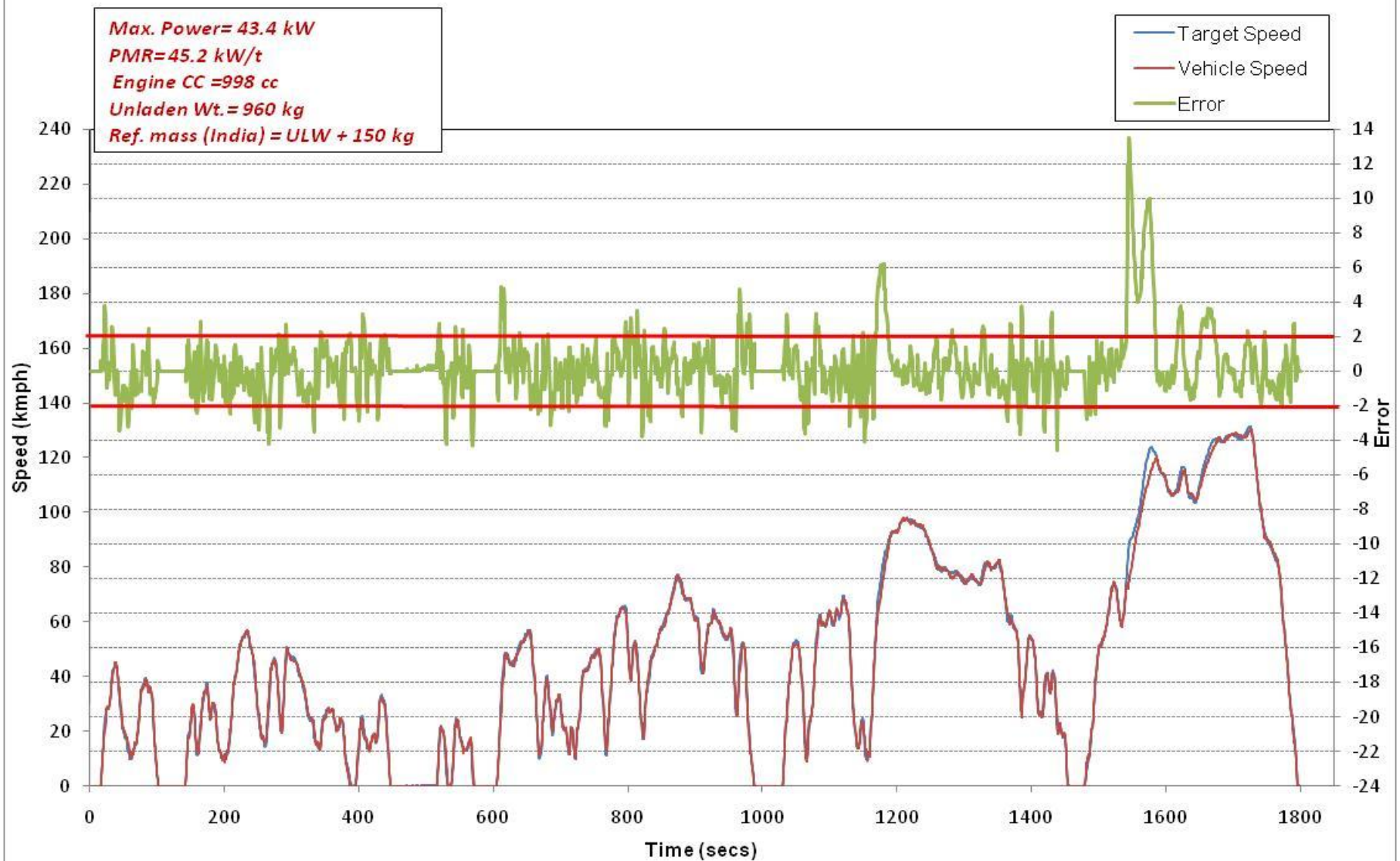
Test Results

Alto CNG_WLTC v4_Japan Gear Shift



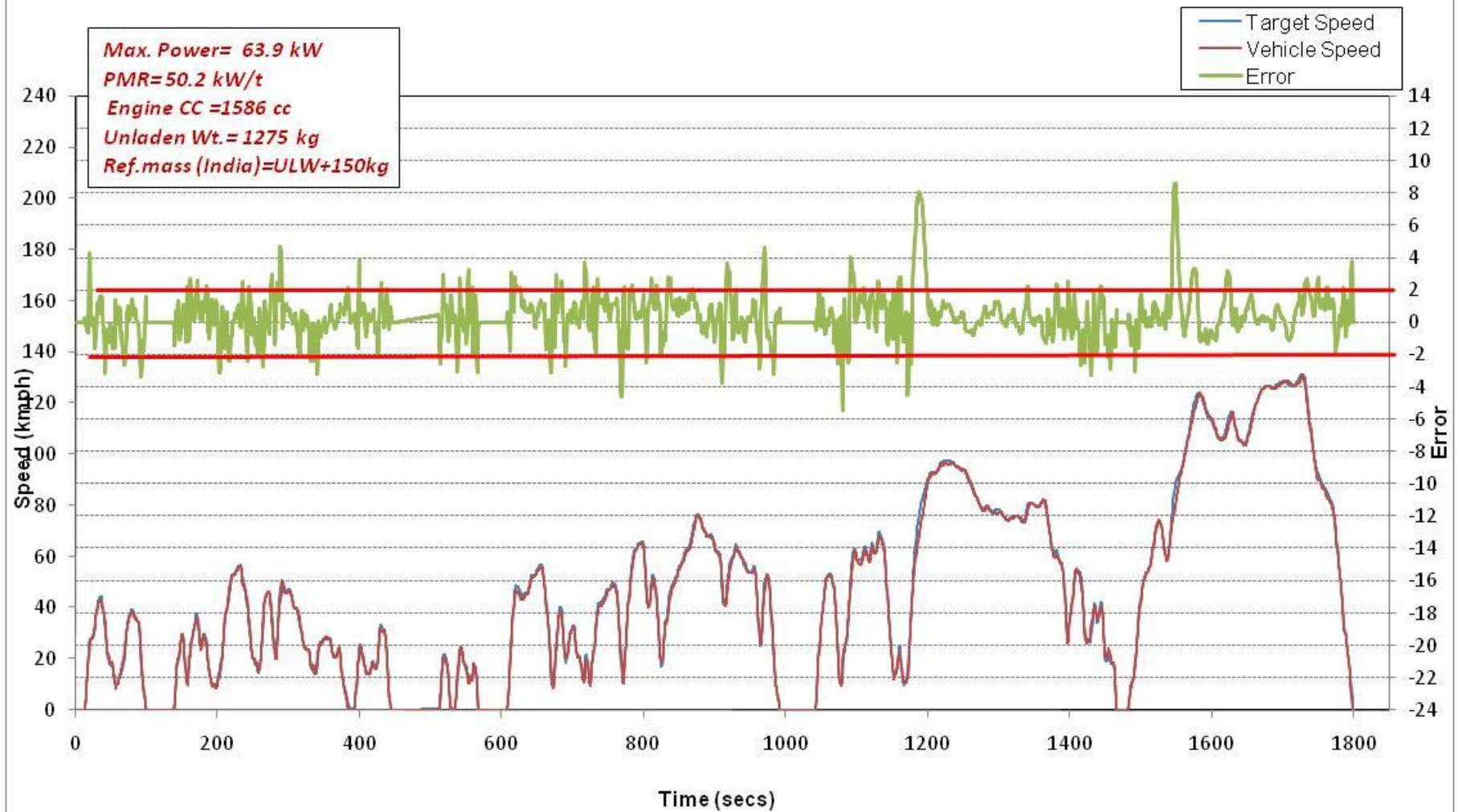
Test Results

WagonR CNG_WLTC v4_Japan Gear Shift

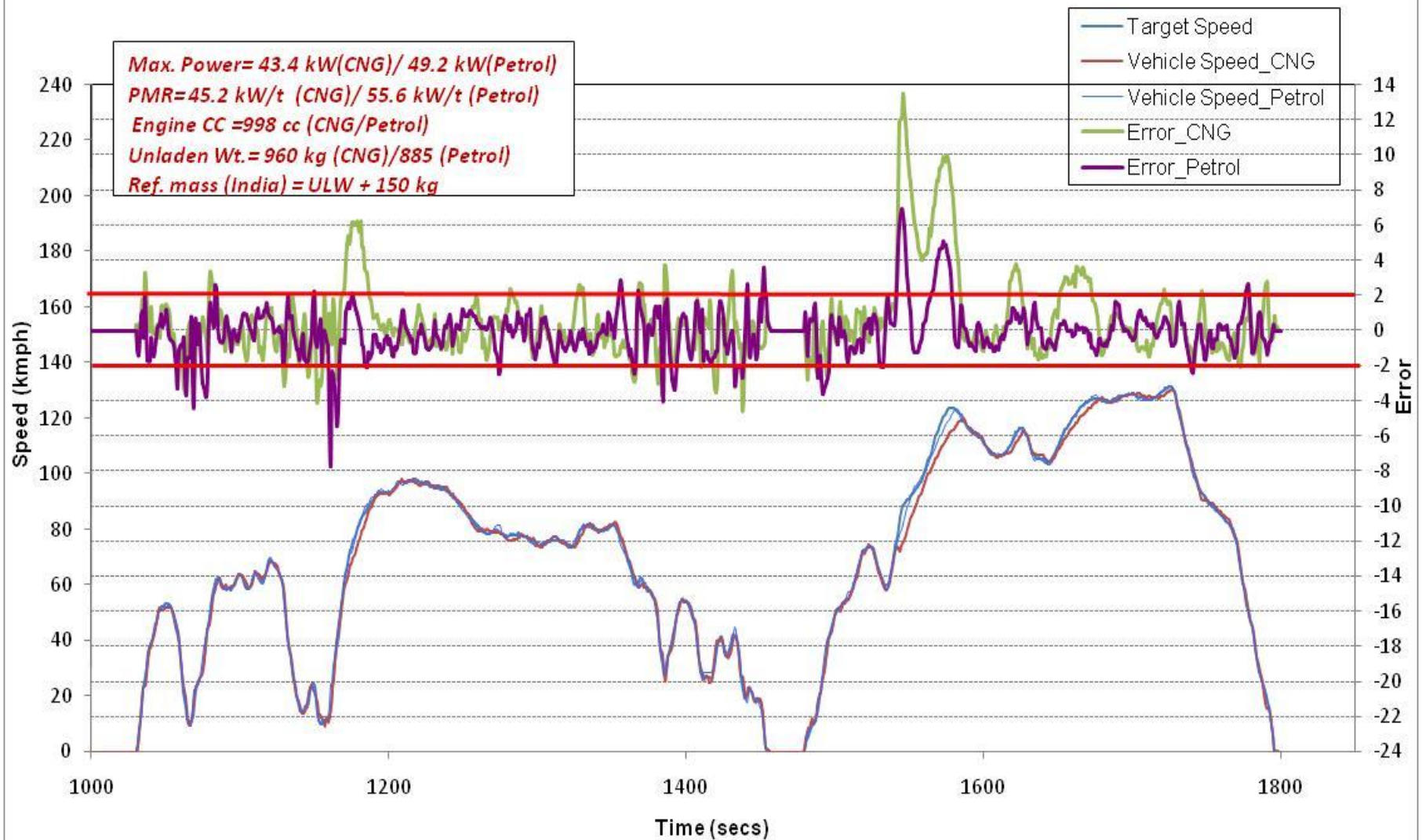


Test Results

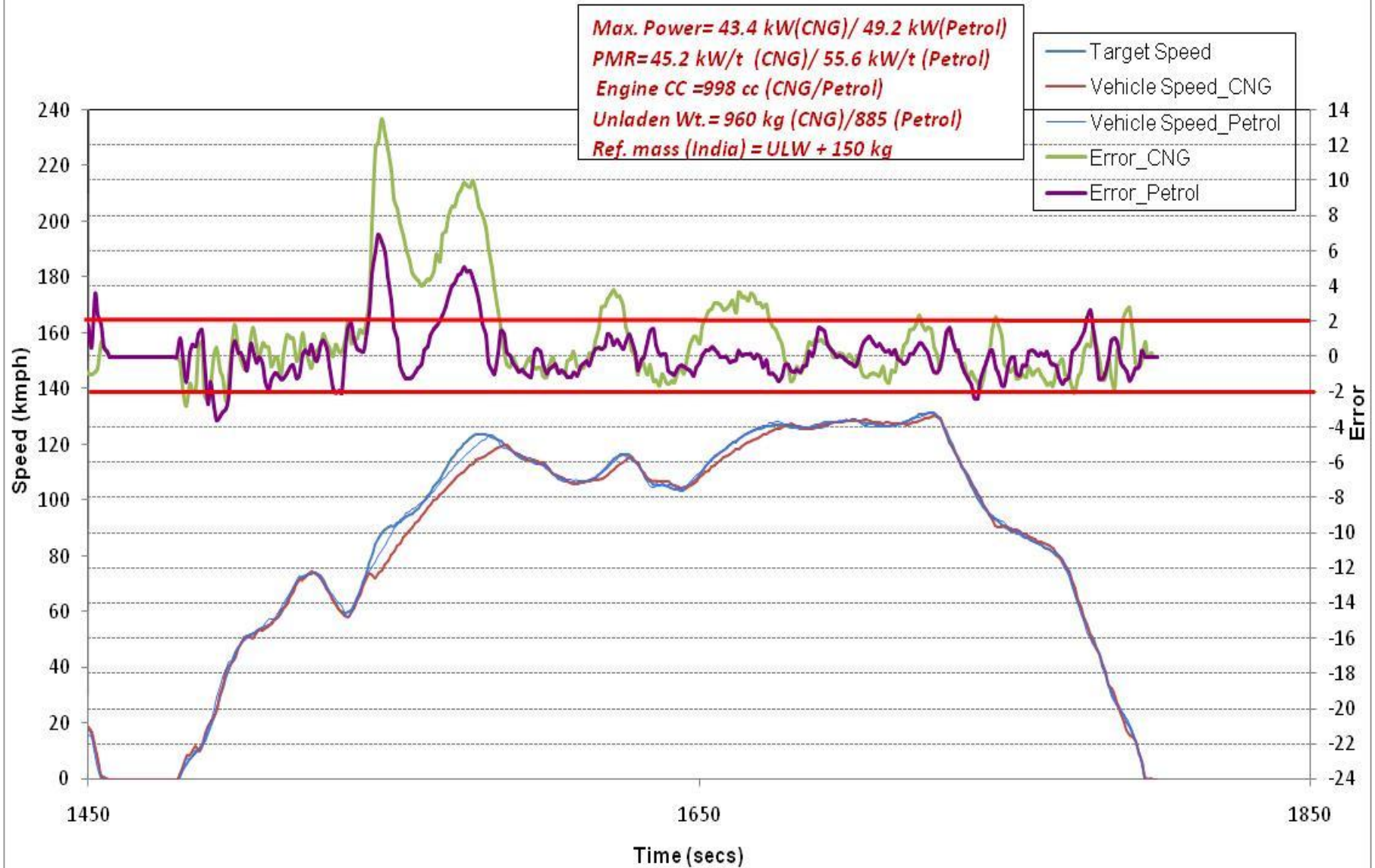
SX4 CNG_WLTC v4_Japan Gear Shift



Comparison of Petrol & CNG Vehicle Sr.No.7 and 12-High & Ex High

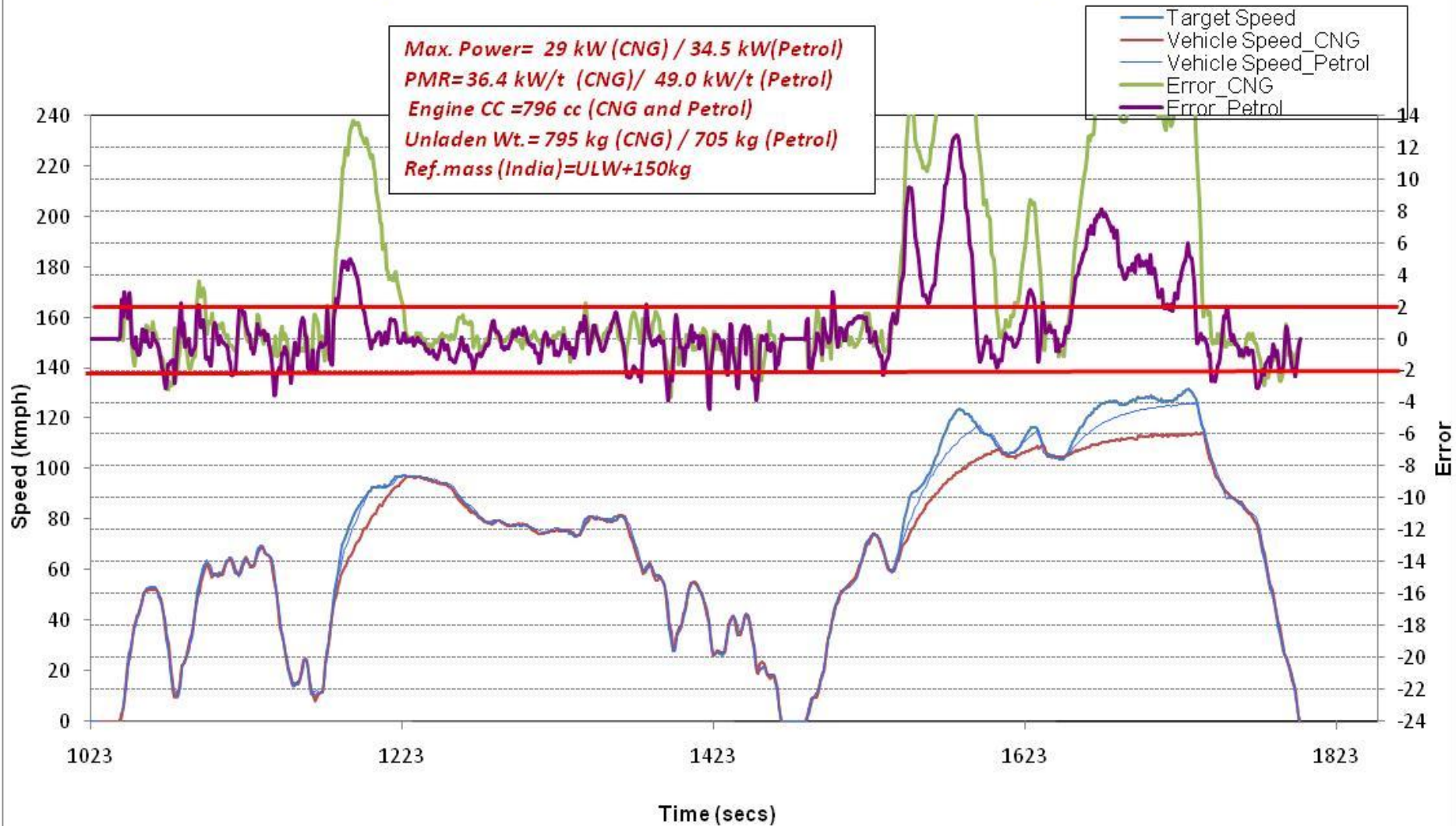


Comparison of Petrol & CNG Vehicle Sr.No.7 and 12-Ex High

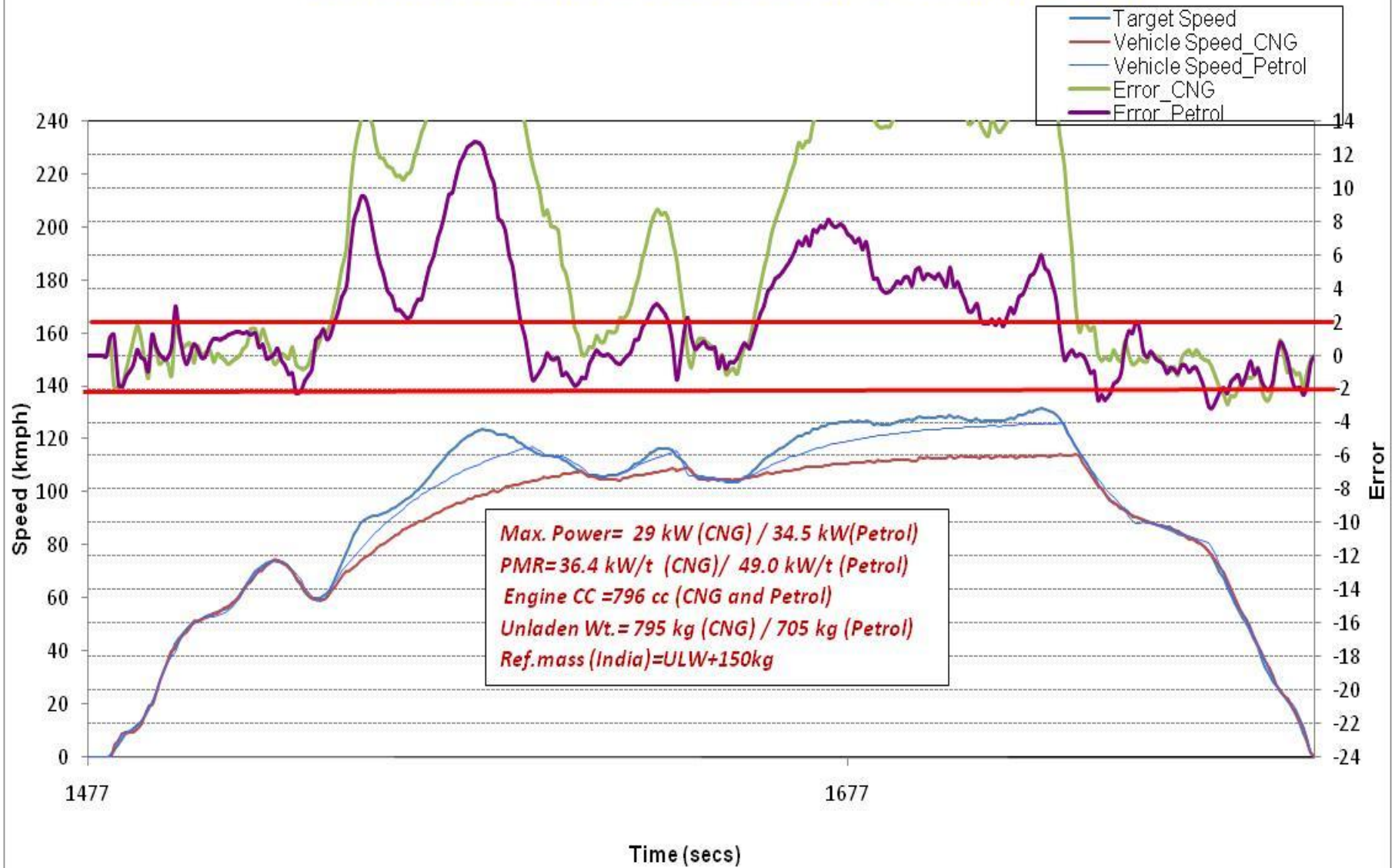


Comparison of Petrol and CNG Vehicle Sr No. 5 & 11 on High & Ex-High

Max. Power= 29 kW (CNG) / 34.5 kW(Petrol)
PMR=36.4 kW/t (CNG)/ 49.0 kW/t (Petrol)
Engine CC =796 cc (CNG and Petrol)
Unladen Wt.= 795 kg (CNG) / 705 kg (Petrol)
Ref.mass (India)=ULW+150kg



Comparison of Petrol & CNG Vehicle Sr No. 5 & 11 on Ex-High



Observations and Suggestions

- Many vehicles above PMR 35 kW/t to 71 kW/t and max. engine power of 90 kW show difficulty in following the cycle. This will be more pronounced with proposed GTR test mass for passenger cars . For Light Duty Vehicles the situation would be further worsened.
- The dynamic characteristics of the driving cycle makes the cycle difficult to be followed in certain portions – these include regions in;

Low speed – 48 – 67s, 140 – 160s, 250 – 265s, 275 – 295s

Middle speed – 660 – 670s, 760 – 770s, 815 – 825s,

High speed - 1060 – 1065s, 1080 – 1123s, 1140 – 1180s, 1375 – 1385s, 1420 – 1450s,

Extra High - 1530 – 1585s, 1640 – 1675s

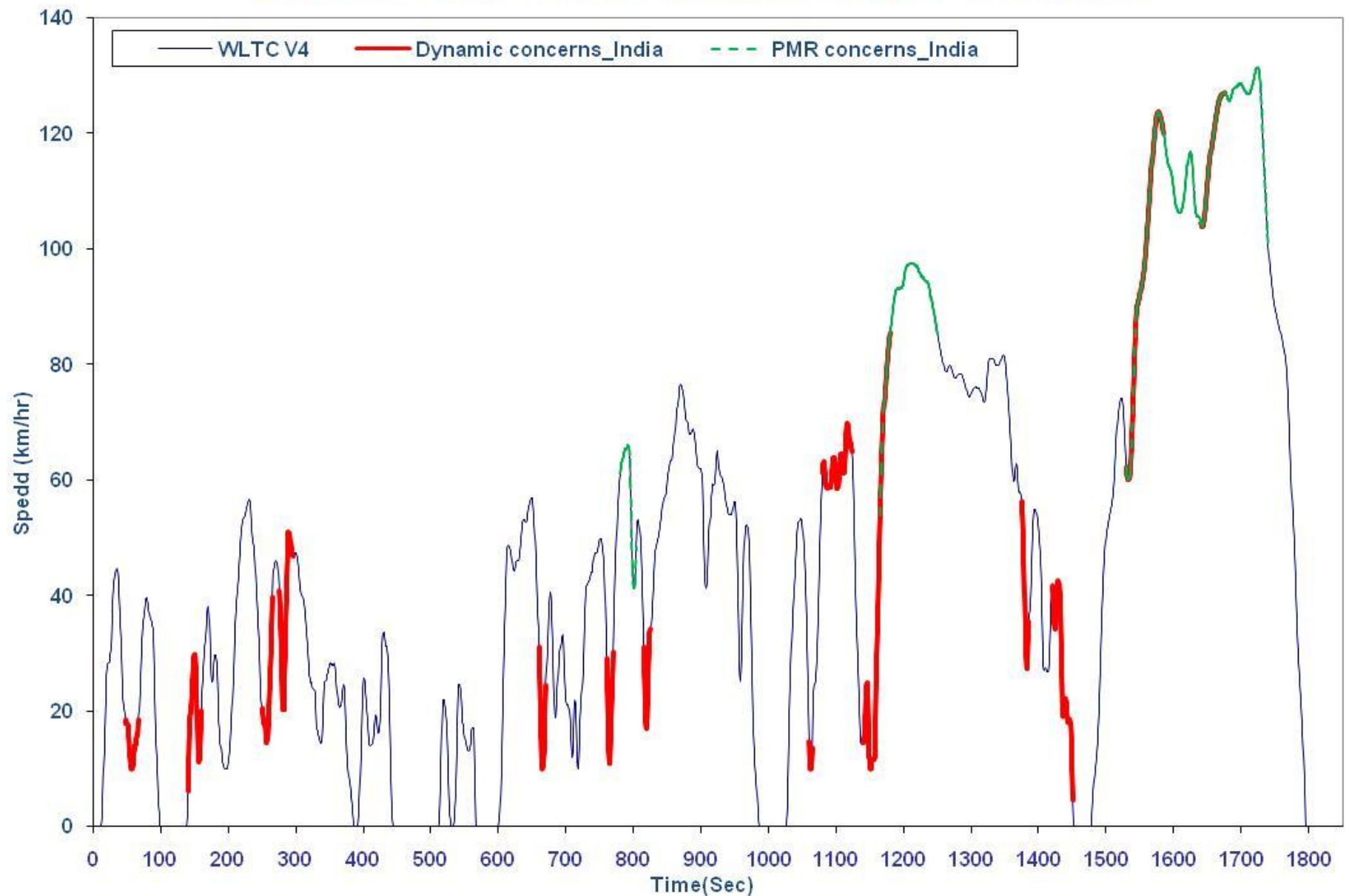
- Vehicle models with high power engines and high PMR still have difficulty to follow L & M particularly at the lower speeds of 10 km/h. The H & ex Have some difficulty in the acceleration portions .
- Vehicles in PMR range of **35 to 65 kW/t** have difficulty in all phases particularly at :

Middle speed – 780 – 804s

High speed- 1165 – 1210s, 1180 – 1250s

Extra High – 1530 – 1740s

Area of concern in WLTC Ver4 based on Validation 1b tests India



Observations and Suggestions

- Vehicle models with petrol and CNG engine versions , especially with lower end of the PMR show greater difficulty to follow L & M particularly at the lower speeds of 10 km/h. The H & ex H have pronounced difficulty in the acceleration portions
- Use of increased GTR test mass would make the condition more severe. This would need to be considered by WLTP Group prior to Validation 2 stage and guidelines need to be evolved.
- WLTP Group will have to tone down the driving cycle as well as consider keeping the same reference mass as in current European Regulation
- WLTP Group would have to consider that the proposed GTR mass in combination with the higher dynamic driving cycle could possibly need vehicles to have higher powered engines and this may cause increase in fuel consumption and CO2 emissions.
- Many high volume Compact cars and pickup trucks including those tested in Validation 1b would need to be upsized for engine capacity and engine power solely to meet WLTC Ver 4,0 with GTR test mass, whereas the customer preference would be towards fuel economy.

Thank You