SPECIAL MAINTENANCE INSTRUCTION No. RDSO/2008/ EL/SMI/0250, Rev. '0', Dated 22.01.2008

1.0 TITLE:

Monitoring of energy regenerated during braking in WAP5/WAP7/WAG9 electric locomotives for Clean Development Mechanism under Kyoto protocol.

2.0 OBJECT:

To capture and store data for energy consumption and regeneration for WAG9/WAP5/WAP7 locomotives for the purpose of CDM project.

3.0 INSTRUCTION:

One AEE(TRS)/Shed, nominated by Shed incharges (where locomotives are housed), shall be responsible for ensuring that the procedure laid down for capturing and storing of energy consumption/regeneration for the purpose of CDM Project, is followed.

3.1 METHOD OF DATA CAPTURE/RECORD/ANALYSIS:

The data of energy consumption and regeneration shall be captured by the nominated supervisor (JE and above) during visit of the locomotive in shed for scheduled inspection i.e. IA, IB, IC, AOH, IOH and POH. The data shall be recorded for the period between each inspection before the start of the respective inspections in **Energy Usage Register**. The data shall be recorded in the following proforma for each locomotive.

- *Loco Details :*

Loco No:	Date of initialization of Regeneration counter :

SN	SHED IN DATA			SHED OUT DATA			PERIOD (IN DAYS)	NETT ENERGY		CUMMULATIVE ENERGY	
	DATE	REGN	CONSM	DATE	REGN	CONSM		REGN	CONSM	REGN	CONSM
	(a)	(b)	(c)	(d)	(e)	(f)	(a-d)	(e-b)	(f-c)		

- *Executive Summary : Year wise consumption:*

Year	Regenerated Energy
2007-08	
2008-09	
2009-10	

3.2 FREQUENCY OF MONITORING OF ENERGY

The energy consumption and regeneration figures shall be captured during scheduled inspection of the Locomotive: Frequency of such schedules has been specified by Railway Board enclosed as ANNEXURE-A.

3.3 DATA STORAGE OF ENERGY USAGE

The data shall be recorded and maintained by the Section In-charge nominated by Sr. DEE (TRS) of the Shed. A separate register shall be maintained by Section In-charge. The energy consumption and regeneration data shall be stored Locomotive wise. Each entry of the register shall be signed by the Section In-charge and countersigned by AEE(TRS)

The data shall also be stored in soft version on computer of the section

3.4 DATA PROTECTION

For ensuring protection of data, the energy consumption and regeneration figures shall be maintained in hard copies as well as in soft copies. Section In-charge shall maintain register having the details of energy consumption and regeneration recorded for each Loco in the prescribed proforma. Soft copies shall be maintained in the computers (password protected by nominated AEE/TRS of the shed) available in the Section and in the Technical Section of the Electric Loco Shed. The data shall also be recorded on CDs on monthly for each locomotive and transmitted to nominated Director/Electrical in RDSO through e mail. In normal course the energy counters shall be reset automatically after attaining reading of 50,000,000 kwh. If, however, need for resetting the counters arises, the same should be done as per the procedure laid down in ANNEXURE-B

3.5 CALIBRATION OF ENERGY METERS

The system of energy measurement in Locomotive is through voltage sensor/potential transformer, current sensors / current transformer and software. Software does not require any

transformer, current sensors / current transformer shall be carried out during IOH of the Locomotive i.e. approximately every six years. Section In-charge shall maintain record of calibration of the energy meters in separate register maintained in the Section. The calibration will be witnessed by AEE (TRS).

3.6 JOINT REVIEW MEETINGS

Review meeting shall be held at the level of AEE/TRS and AEE/Operation quarterly to review the system of energy monitoring as above. The periodicity of the review meeting can be increased/decreased based on experience during the first few meetings. Any anomaly such as defects in the energy meter etc. observed during the period shall be brought out during the meeting and corrective action taken. Minutes shall be drawn for each meeting and copy forwarded to RDSO.

3.7 BASELINE DATA:

The base line figure for energy consumption for WAG9 locomotive, obtained from actual running of trains, from various railways, is as under:

Section	*SEC without regeneration		Section	*SEC without regeneration	
	4700T @	1365 T @		4700T @	1365T @
Badnera-Nagpur	#	17.4	Nagpur-Badnera	7.9	$
Mughasarai-Gomoh	#	18.6	Gomoh-Mughasarai	7.1	$
Godhra-Ratlam	#	21.2	Ratlam-Godhra	6.2	$
Tundla-Kanpur	#	17.3	Kanpur-Tundla	7.6	$

*SEC i.e. Specific Energy Consumption = kwhr/ 1000 GTKM
GTKM· Gross Tonne Kilometer
 # Normally loaded trains do not run in the sections.
$ Normally empty trains do not run in the sections.
@ Approximate train load.

The energy consumption data has been compiled for various section as above. It is observed that the energy consumption depend on a number of factors, including actual run curve profile, driving technique etc. The actual energy consumed by individual trains, therefore, may not match due to the factors mentioned above. The figures given above indicate representative figures of energy consumption of trains. Approximate saving on account of regeneration is 15% of the consumed energy.

The data stored in the format given above shall be e-mailed to RDSO at cdmloco@yahoo.co.in on or before 5th of every month indicating SEC with as well as without regeneration.

3.8 VALIDATION OF SIMULATION SOFTWARE:

Trials were conducted during 2002-03 on WAG9 loco hauling loaded/empty trains in MGS-GZB section and it was observed that the Specific energy Consumption figures (and hence the energy consumption) of actual trial run and ones obtained through software simulation were comparable.

3.9 SYSTEM DATE/TIME MONITORING:

The system date/time should be checked in all schedule inspections with regards to its accuracy. Battery should be replaced if required. In case of any hardware/software defects, which may affect the regeneration counter reading, it should be ensured by the maintainer to initialize the regenerated energy counter. The entry in this regard shall be entered in energy usage register.
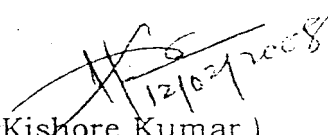
4.0 Application to:

WAP5/WAP7/WAG9 locomotives.

5.0 Agency of Implementation:

Electric loco sheds homing WAP5/WAP7/WAG9 locomotives and POH shops carrying the schedules.

(Kishore Kumar)
for Director General/Elect.

Encl: NIL

Copy to: As per Standard Mailing List No. EL/M/0019

(Kishore Kumar)
for Director General/Elect.

Encl: NIL

ANNEXURE - A

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(RAILWAY BOARD)

No.97/Elect(TRS)/440/18/44(3-phase)　　　　New Delhi, dated 23.02.07

Director General (Electrical),
R.D.S.O,
Manak Nagar,
LUCKNOW

Sub: Maintenance Schedules/practices for WAP-5/WAP-7/ WAG-9
　　and WAG-9H 3-phase Electric Locomotives.

Ref:　(i)　Railway Board letter No. 97/Elect(TRS)/440/18/44
　　　　　　(3-Phase) dated 20.6.2005.
　　　(ii)　RDSO's letter No. EL 3.1.35/16 dt. 23/30.10.06
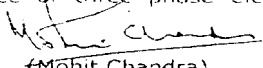　　　(iii)　RDSO's letter No. EL 3.1.35/15 dt. 08.01.07

　　　　Recommendations of the Committee, comprising of Director/RDSO,
Sr.DEE/GMC & GZB and Dy.CEE/EL/POH(BSL), nominated to review the periodicity of
various maintenance schedules, their duration, work contents, toolings and test
equipments required and the list of must change items for major schedules furnished
by RDSO vide letters under reference have been accepted by Board (ML).

　　　　The revised periodicity/duration for various schedules will be as follows:

Maintenance schedule	WAP5 / WAP7 locos		WAG9 / WAG9H locos	
	Periodicity	Time taken*	Periodicity	Time taken*
Trip Inspection	3000 kms. or one trip, whichever is later	2 hrs	45 days	4 hrs
IA	90 days	6 hrs	90 days	6 hrs
IB	180 days	6 hrs	180 days	6 hrs
IC	270 days	8 hrs	270 days	8 hrs
MOH	18 months	6 working days	18 months	6 working days/ 8 working days for 2nd MOH
IOH	4½ yrs ± 6 months or 12 lakh kms, whichever is earlier.	11 working days(WAP7)/20 working days(WAP5)	6 yrs±6 months or 12 lakh kms. whichever is earlier	11 working days
POH	9 yrs ± 6 months or 24 lakh kms, whichever is earlier	28 days	12 yrs ± 6 months or 24 lakh kms. whichever is earlier	28 days

* Time required for pre & post testing and unscheduled repairs and wheel profiling will be
extra. These timings are to be allowed after placement of locos in shed.

　　　　RDSO should advise Zonal Railways accordingly which should include
periodicity/duration, Work content of each schedule, List of Must change items for
MOH/IOH/POH, Special Tools, Test equipments, Jigs and Fixtures required in
sheds/outpits/trip sheds and workshops for maintenance of three phase electric
locomotives.

　　　　　　　　　　　　　　　　　　(Mohit Chandra)
　　　　　　　　　　　　　　　　　　Dir. Elect. Engg. (RS)
　　　　　　　　　　　　　　　　　　Railway Board
　　　　　　　　　　　　　　　e-mail : deers@rb.railnet.gov.in

ANNEXURE- B

Resetting of Counters of Energy Consumption & Regeneration

There are 8 digit in display counters of energy consumption and regeneration and read upto 50,000.000 units, after with the counters are automatically reset to 00 000 000.

However, in case resetting of counters is required, which is normally not recommended, the same shall be done with approval of Sr. DEE/TRS and following procedure shall be followed :-

Step A :   I. Connect diagnostic tool box with loco.

Step B :   I. Power ON of Locomotive & diagnostic tool box.

Step C :   I. The programme is started in diagnostic tool box from DOS level C:/> write 'MWD' then (ENTER)

Following menu will appear:

```
C :
Drive    Vehicle    Function

  ┌──┐    ┌──┐       ┌────────────────────────────────────┐
  │  │    │  │       │ AWD  Evaluation of diagnostic raw data
  │  │    │  │       │ KON :
  │  │    │  │       │ KOM: Communication with destination
  └──┘    └──┘       │ EDI :
                     └────────────────────────────────────┘
```

Step D : select " KOM : Communication with destination", function from the menu, then (ENTER)

ZED file will appear as follows :-

C:		KOM	EDIT	
Computers No.			Parameter type	Number
20			21-MLOC Number 1 (for loco no. editing)	
			56- X Energy KWH + (for energy consumption)	
			56-X Energy MWH + (for energy consumption)	
			56-X Energy GWH + (for energy consumption)	
			56-X Energy KWH + (for energy saving)	
			56-X Energy MWH + (for energy saving)	
			56-X Energy GWH + (for energy saving)	
32			-------------------------------------	

Step E :   KWH & MWH will have 3 digits and GWH has two digits for energy consumption as well as energy regeneration. The energy counter reading can be edited both for consumption and regeneration by selecting appropriate MWH/MWH/GWH digits and saving (by pressing F8) after altering/resetting the data.