Transmitted by the expert from ETRTO

Informal Document No. **GRRF-58-19**
(58th GRRF, 20-23 September 2005
agenda item 5.3.)

Note: This document reports on the status of ETRTO WG on Rolling Resistance and also provide an analysis of Russian Federation presentation to GRRF 57th Informal Document No. GRRF-58-10 on Rolling Resistance.

1. **Current situation for the ETRTO RR measurement method.**

   ETRTO RR WG defined a rolling resistance version, based upon ISO 18164 (combining ISO 8767 and ISO 9948) for PCs, and CV tyres.
   In order to assess its validity and evaluate its accuracy, a round robin test study was carried out by the 5 participating manufacturers' laboratories on 15 different tyre sizes, covering the whole diversity of PCs and CVs tyres.
   This study allowed the definition of an inter-laboratories procedure and the computation of the corresponding coefficients.
   The overall obtained reproducibility standard deviation estimate is 0.22 kg/t, which correspond to a minimum detectable real difference, with α=5% and β=10% of 1.0 kg/t (level of discrepancy of 2 – 5% in general vs actual 20%!).
   (NB some additional statistical analyses should be added to relate the standard deviation as a linear function of actual RR value).

   This method is within the process of approval by ETRTO members by end October 2005 and will be also submitted to ISO.

2. **Current situation for the European market State of the Art for PCs and CVs tyres.**

   The ETRTO RR WG is in the process of building it.
   The results will be obtained and, then, approved by ETRTO members by end June 2006.

3. **Comments on Pr Petrushov document and figures.**

   Informal document N°GRRF-58-10
   They mainly refer to Part C, Justification.

   First of all, the average Earth-Moon distance is 384000 km. In consequence, the "tyre chain" of 2.67 million km represents about 7 times, and not 19 times this distance.

   Secondly, as vehicles are operated a little part of time e.g. 2 to 3% for PCs), we think much preferable to speak of dissipated energy rather than power.
   In this respect, the total Energy consumed on the planet in 2002 is estimated at 10 G toe, or 430 M.TJ.
   In comparison we estimated the total energy consumed by all the tyres operated on the planet to 8 M.TJ (1 for PCs, 2 for LT and buses, 5 for heavy trucks), so less than 2% of the total.
   Of course it does not mean the reduction of tyre RR is not an important target to be achieved.

   Presentation to GRRF 57th and Informal document No.GRRF-58-10

   The document presented at GRRF 57th (not available on UNECE web site) contained 27 slides and some of them are added to the GRRF-58-10:

Considering that about 1.1 billion tyres were built worldwide in 2003, it is likely that the figures are correct and that about 3.9 billion tyres are currently in use on the planet.

2.67 million km for 3.9 billion tyres correspond to a mean tyre diameter of 0.685 m, which seems correct.
Knowing that the Earth to Moon mean distance is about 384 000 km, 2.67 billion km correspond to about 7 times this distance, and not 19 times as written in the document.
Knowing that the Earth equator's perimeter is about 40 000 km, 2.67 billion km correspond to nearly 67 times this perimeter, while the documents quotes 66, which is simply a different rounding.
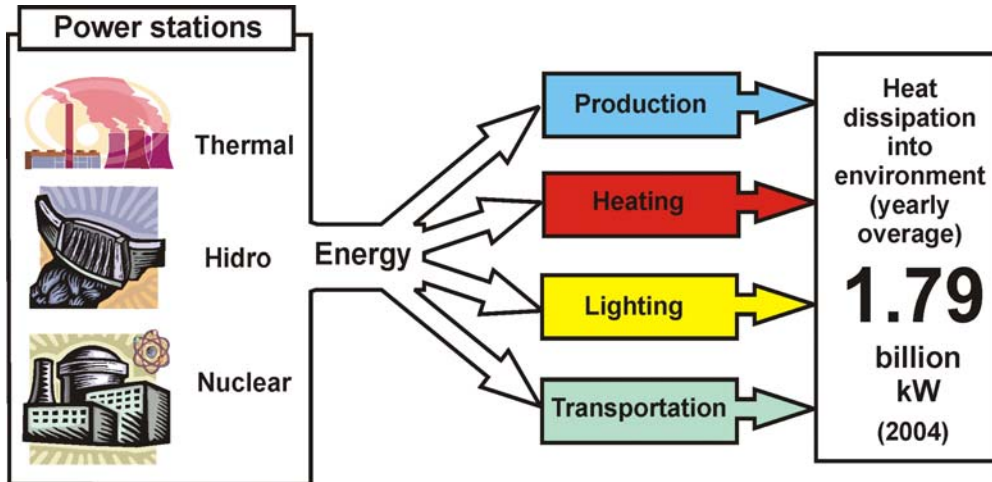
Tyre type	World fleet [billion]	R. R. power at 36 km/h [billion kW]
Cars $C_r=0.009$	2.5	0.68
Light trucks and buses $C_r=0.007$	0.9	0.32
Commercial vehicles $C_r=0.005$	0.5	0.63
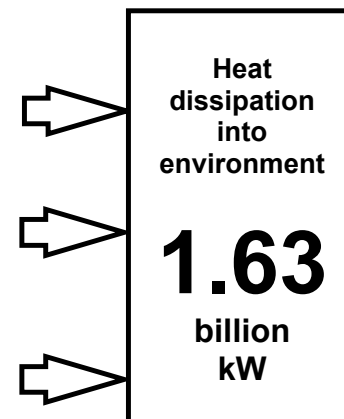
This slide contains a lot of information.

First of all, the title speaks about the industry and the figure shows only power stations. But industry also uses energy of other kinds than electricity. So it is a bit difficult to understand what lies exactly behind the figures.

On the second hand, the compared figures are power magnitudes, expressed in Watts. But what warms the planet is not power but energy, which is power multiplied by time.

Even we admit the data here both for power station and tyres, vehicles are operated a small proportion of time : about 2 or 3% for passenger cars, for instance, while nuclear power stations are operated nearly 100 % of time. This makes a 30 to 50-fold difference.
In this way of thinking, I found the total energy produced/consumed in 2002 : 10 G toe or about 430 million TJ (source : Pocket Book Energy and Transport in figures - DGTREN 2004 – page 2.8.1).

I then computed the energy dissipation by the tyres with the Russian figures for CRR and tyres numbers and the following other estimates :
PC tyres : mean load : 300 kg ; mean annual distance : 15000 km
LT tyres : mean load : 1000 kg ; mean annual distance : 30000 km
CV tyres : mean load : 3000 kg ; mean annual distance : 70000 km.

The total annual energy dissipated by the tyres is then about 8 million TJ, less than 2% of the energy produced.

In consequence, the warming effect of rolling tyres and industry are not, and by far, comparable.

Region/Country	Annual Average Electric Power (E)	Rolling Resistance Power (T) at Speed 36 km/h	Rolling Speed of parity [km/h]: T=E
North America	537	910	21
Europe	531	514	37
US	392	726	19
Japan	122	198	22
RF	100	59	61
Germany	64	76	30
France	62	72	31
UK	41	50	30
Italy	31	74	15

As shown above, this comparison has no sense since the vehicles are operated only a small part of time while most power plants are operated a much more significant fraction of time.

Previous presentations and informal document:

Typical energy diagram for region/country
Power of automobile fleet action on environment.
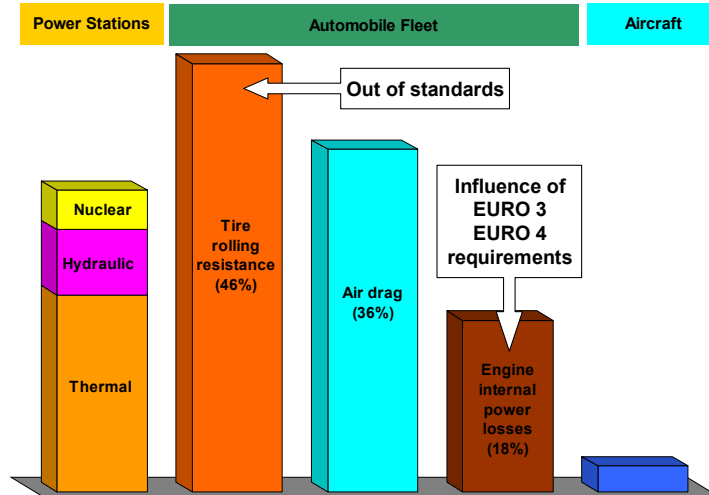
The main uniqueness of the situation in this field is unbalanced
requirements for energy parameters of automotive tyres and engines

In this slide, the power dissipated in tyres is roughly 30% higher than the electricity produced, which does not seem consistent with the content of previous slide.

In addition, the aerodynamic drag is much lower than the influence of RR. This corresponds to a very low vehicle speed. We do not know its representativeness.

Moreover, the EURO engine requirements apply to all the energy consumed by the vehicle, including engine and transmission frictions, aerodynamic drag and tyre RR.

Finally, the thermodynamic yield of an engine is, at best, 30 to 40% according to its technology. The 18% quoted in the slide must correspond to transmission losses while engine losses are much higher.

Even if ETRTO agrees that RR has only negative effects and, as stated in Dir 2001/43 CE, it is in the process of being regulated, with the related information provided to the consumers, the reasons given by the Russian Federation document are by far over-estimated and, unfortunately, if RR regulation will contribute to reduce CO_2 emissions, it will not dramatically slow down climate changes.

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