



SDI Review Form 1.6

PART 1:

Journal Name:	Physical Review & Research International
Manuscript Number:	2013_PRRI_3745
Title of the Manuscript:	Form of nonequilibrium statistical operator, thermodynamic flows and entropy production

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PART 2: Review Comments

	Reviewer's comment	Author's comment (if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)
<u>Compulsory</u> REVISION comments	Referee report on 2013-PRRI-3745 "Form of nonequilibrium statistical operator, thermodynamic flows and entropy production", by V.V.Ryazanov, submitted to Physical Review Research International The present paper modifies the well-known non-equilibrium statistical operator for the Liouville equation by introducing the distribution function of the lifetime of a system as a function of two time variables. It allows to describe the non-equilibrium evolution of the finite systems governed by Liouville equation with a source, which is irreversible in time. This study deserves interest. However, from the formal point of view the style of the presentation is very inaccurate. The greatest weakness of this work is the language, as the imperfection of English both lexically and grammatically prevents from understanding of some of the author's ideas. Anyway, all the text should be totally improved. The manuscript is not well structured and, moreover, the formulas are written deprecatingly. It is very difficult to follow. It is abundant with many useless statements and repetitions. I think that the paper cannot be published in the Physical Review Research International. Nevertheless, in the following there are some remarks and suggestions.	



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	1.) The main part of the text and formulas of the Section 2 were copied from the paper [4] quoted in the manuscript. Moreover, the Eqs.(1)-(4) were copied with the misprints from the paper [4]. Such a writing is inadmissible for a scientific paper. 2.) In the present work the exponential function $\varepsilon e^{\varepsilon t}$ from the Abel's theorem was generalized to the arbitrary function $p_q(t)$ (in the author's notations $p_q(u)$), which in the paper is interpreted as a distribution function of the lifetime of a system. It is known that in the non-equilibrium statistical mechanics the Abel's theorem is only a useful tool which is used to prove that in the limit of infinite time $t \rightarrow \infty$ the non-equilibrium statistical operator satisfies the Liouville equation. Thus in the limit $t \rightarrow \infty$ the non-equilibrium statistical operator with the distribution function $p_q(t)$ should also satisfy the Liouville equation (without sources). Therefore, to prove this the author should demonstrate the Abel's theorem for any function $p_q(t)$: $\begin{aligned} &\lim_{T \rightarrow \infty} \frac{1}{T} \int_{-T}^0 f(t) dt = \\ &\lim_{\varepsilon \rightarrow +0} \int_{-\infty}^0 p_q(t) f(t) dt, \quad p_q(t) = \varphi(\varepsilon t). \end{aligned}$ If the function $p_q(t)$ does not satisfy the Abel's theorem then the method of introduction of the distribution function of the lifetime of a system proposed in such a manner as in this paper is not correct.	
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	3.) The main idea of this work is to generalize the distribution function $p_{\{q\}}(u)$ to the function $p_{\{q\}}(u,t)$, where $u=t-t_{\{0\}}$ and $-\infty < t_{\{0\}} < t$. I think that to obtain the correct infinite time limit the Abel's theorem with function $p_{\{q\}}(u,t)$ should be proved as well. 4.) To obtain the explicit expression for the distribution function $p_{\{q\}}(u,t)$ of the non-equilibrium statistical operator the author has used the maximum entropy principle. The Liouville equation describes non-equilibrium processes. However, the maximum entropy principle can be applied only to the equilibrium states. Therefore, I see the principled contradiction in the author's present calculations.	
<u>Minor</u> REVISION comments		
<u>Optional/General</u> comments		

Note: Anonymous Reviewer