



# **Energy Flow and Compensation in Systems with Nonsinusoidal and Asymmetrical Voltages and Currents**

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## **Short description of the lecture:**

The lecture would be focused on energy flow phenomena in electrical systems with distorted and asymmetrical voltages and currents and on the power factor improvement in such systems by compensation of the reactive and unbalanced currents and the current harmonics.

The need for comprehension of energy flow phenomena is an outcome of the developments in power electronics, which causes voltage and current distortion, as well as the development of micro-grids, which are saturated with power electronic converters. The lecture will include discussion on various approaches to definition of powers in single-phase and in three-phase systems developed over more than a century long studies on power properties of such systems. A number of major misconceptions on these properties disseminated in the electrical engineering community by various concepts of the power theory will be demonstrated. The main focus of the lecture would be on the Currents' Physical Components (CPC) – based power theory developed by the candidate. It is currently the most fundamental approach to explanation of energy flow phenomena in electrical systems and to compensation in such systems. The CPC –based power theory provides fundamentals both for reactive compensators design and for switching compensators control.

## **Contents:**

1. History of various approaches to power definitions.
2. CPC-based power theory of single-phase systems.
3. Reactive compensation in single-phase systems.
4. CPC-based power theory of three-phase systems.
5. Reactive and switching compensation in three-phase systems.
6. Working active power and reflected active power concept.
7. Energy flow in systems with semi-periodic voltages and currents.



<b>Terminy wykładów</b>			
<b>Data</b>	<b>Dzień tyg.</b>	<b>Godzina</b>	<b>Sala</b>
2015-05-19	Wt	9.15-13.00	EiA E28
2015-05-20	Śr	9.15-13.00	EiA E28
2015-05-21	Cz	9.15-13.00	EiA E28
2015-05-22	Pt	9.15-12.00	EiA E28