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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 29840-2013

Vanadium flow batteries - Terminology

全钒液流电池 术语

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009. This standard was proposed by China Electrical Equipment Industry Association. This standard is under the jurisdiction of the National Fuel Cell and Flow Battery Standardization Technical Committee (SAC/TC342). The main drafting units of this standard. Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian Rongke Energy Storage Technology Development Co., Ltd., Mechanical Engineering Industry Beijing Institute of Electrical Technology and Economics, China Electric Power Research Institute. Participated in the drafting of this standard. Beijing Puneng Century Technology Co., Ltd., China Electrical Equipment Industry Association, Tsinghua University, Chinese Academy of Sciences Research Institute, State Grid Electric Power Research Institute, Chengde Wanlitong Industrial Group Co., Ltd., etc. The main drafters of this standard. Zhang Huamin, Lu Chenyu, Wang Xiaoli, Chen Chen, Li Ying, Lai Xiaokang. Participating drafters of this standard. Yin Haitao, Wang Baoguo, Liu Zonghao, Yang Qiming, Tian Chaohe, Yan Chuanwei, Li Aikui, Zhang Yuxian, Chen Jizhong, etc. Terminology of all vanadium flow battery

1 Scope

China's national terminology standard for all-vanadium flow batteries. It specifies the terms and definitions used for vanadium redox flow batteries and their systems. A flow battery is not a battery in the way the word is normally used, and that is why it needed a vocabulary of its own before anything else could be standardised. In a conventional cell the energy is stored in the electrodes, so the capacity and the power are properties of the same object and cannot be chosen separately. In a flow battery the energy is stored in two tanks of electrolyte that are pumped through a stack of cells: the stack determines the power and the tanks determine the energy, and the two are independent. A system can be built with four hours of storage or with twelve simply by changing the tank size, which is the property that makes the technology interesting for grid storage and useless for a vehicle. The all-vanadium chemistry adds a second unusual feature. Both half-cells use vanadium, in different oxidation states, so the crossover of active material through the membrane that

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ruins other flow chemistries merely reduces the efficiency here and can be recovered by remixing the electrolytes. The electrolyte does not degrade and has an indefinite life, which changes what a warranty means. None of that maps onto the vocabulary of a lead-acid or lithium battery: state of charge, capacity, cycle life, efficiency and self-discharge all mean something different or are measured differently, and terms like stack, electrolyte volume, flow rate, shunt current and state of charge imbalance have no equivalent at all. Fixing those definitions is what allows the performance, safety and test standards for the technology to be written consistently. Issued on 12 November 2013 and in force since 7 March 2014.

This standard specifies the terms and definitions of all-vanadium redox flow battery terms. This standard applies to all vanadium redox flow batteries.

2 Terms and definitions

2.1 Vanadium flow battery; VFB An energy storage device that realizes the mutual conversion of electrical energy and chemical energy through the electrochemical reaction of vanadium ions in different valence states in the anode and cathode electrolytes. also It is called the all-vanadium flow battery system.

Note: All vanadium redox flow batteries are mainly composed of power units (stacks or modules), energy storage units (electrolyte and storage tanks), and electrolyte delivery units (pipes, valves, pumps, heat exchange) And battery management system.

2.2 Ion conductive membrane Separate the positive and negative electrolytes and selectively conduct ions.

2.3 Electrolyte An ionic conductivity solution containing vanadium ions of different valences.

2.4 Bipolarplate A conductive separator that collects conduction current and separates the positive and negative electrolytes.

2.5 Collector A conductive plate that is connected to an external circuit and leads or leads current.

2.6 Electrode The place where the electrochemical reaction occurs.

2.7 Endplate Located at both ends of the stack, it is used to fix the components required by the single cells stacked together.

2.8 Celreaction The total reaction of the positive and negative reactions occurs inside the battery.

2.9 Opencircuitvoltage The battery has no voltage when the external current flows.

2.10 Charge The working process of the battery receiving electrical energy from an external circuit and converting it into chemical energy.

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2.11 Discharge The working process of the battery converting chemical energy into electrical energy and outputting electrical energy to an external circuit.

2.12 Electrodearea The geometric area of the electrode where the electrochemical reaction occurs.

2.13 Active area activearea The geometric area of the electrode perpendicular to the direction of current flow.

2.21 Battery structure

2.21.1 Single cell singlecel The basic unit of an all-vanadium flow battery is mainly composed of a set of positive and negative electrodes and an ion-conducting membrane that separates the electrodes.

2.21.2 Stack A combination with multiple tubes and uniform current output fastened by multiple single cells in a superimposed manner.

2.22.10 Battery system energy efficiency systemenergyefficiency When the battery is charged and discharged at a constant power, the energy output to the inverter accounts for the percentage of the energy input to the battery.

2.22.11 Battery system rated energy efficiency systemratedenergyefficiency The energy efficiency of the battery system measured when the battery is running at rated power.

2.22.12 Electrolyteutilization Under specified conditions, the ratio of actual discharge watt-hour capacity to theoretical discharge watt-hour capacity when the battery is working.

2.22.13 Chargeterminationcondition The conditions specified by the manufacturer to characterize the termination of the battery charging process, such as 100% SOC or maximum voltage.

2.22.14 Discharge termination condition The conditions specified by the manufacturer to characterize the termination of the battery discharge process, such as 0% SOC or minimum voltage.

2.22.15 Self-discharge A phenomenon in which the energy of the battery does not enter the external circuit through discharge but is lost in other forms.

2.22.16 Overloadability The ability of a battery to discharge multiple times the rated power under specified conditions.

2.22.17 Response time The time for a battery to change from a stable state to another stable state under normal operating conditions.

2.22.18 Auxiliary energy consumption parasiticloss The energy that must be provided to auxiliary machinery and equipment in order for the battery to work continuously under stable operating conditions.

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Note. It mainly includes circulating pumps, electric control equipment, ventilation equipment, etc.

2.22.19 Overcharge The charging continues after the battery is charged to the charge cut-off condition.

2.22.20 Overdischarge The discharge continues after the battery is discharged to the discharge cut-off condition.

2.23 Battery working mode

2.23.1 Constant current charge The charging current is maintained at a constant value.

2.23.2 Constant voltage charge The voltage between the battery collector plates is maintained at a constant value for charging.

2.23.3 Constant power charge The power is maintained at a constant value for charging.

2.23.4 Floatingcharge A charging mode where the battery is connected in parallel with a constant voltage DC power supply and a load to maintain the battery close to a fully charged state for ready use.

2.23.5 Pulse currentcharging The mode of charging with pulse current.

2.23.6 Quickcharge Use a current or voltage larger than the rated value (for special designs) to accelerate the charging mode in a short time.

2.23.7 Constant current discharge The current remains constant discharge.

2.23.8 Constant resistance discharge constantresistancedischarge The load resistance maintains a constant discharge.

2.23.9 Constant power discharge The power remains constant discharge.

2.23.10 Alternate discharge Discharging with different current (or load resistance) values alternately.

2.23.11 Pulse current discharge The mode of discharging with pulse current.

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