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Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals

Sub-Committee of Experts on the Transport of Dangerous Goods

Forty-fourth session
Geneva, 25 November – 4 December 2013
Item 3 (e) of the provisional agenda
Electric storage systems: miscellaneous

Classification of Flow Batteries

Transmitted by the expert from Austria[1]

Introduction

1. Applications for flow batteries may be gird connected applications of large size and volume. Grid connected applications include ancillary services, load leveling and **renewable energy stabilization**.

2. These batteries range from 1kW to multiple MW and can discharge over 1 to 10 hours. Unlike many other electrochemical storage technologies, flow batteries can cycle thousands of times without degrading the battery performance.

3. A flow battery is an electrochemical device that converts the chemical energy in the electro-active materials directly to electrical energy, similar to a conventional battery and fuel cells. The electro-active materials in a flow battery, however, are stored mostly externally in an electrolyte and are introduced into the device only during operation.

4. There are flow batteries which have all the reactants and products of the electro-active chemicals stored external to the power conversion device other flow batteries have one or more electro-active components stored internally.

[1] In accordance with the programme of work of the Sub-Committee for 2013–2014 approved by the Committee at its sixth session (see ST/SG/AC.10/C.3/84, para. 86 and ST/SG/AC.10/40, para. 14).

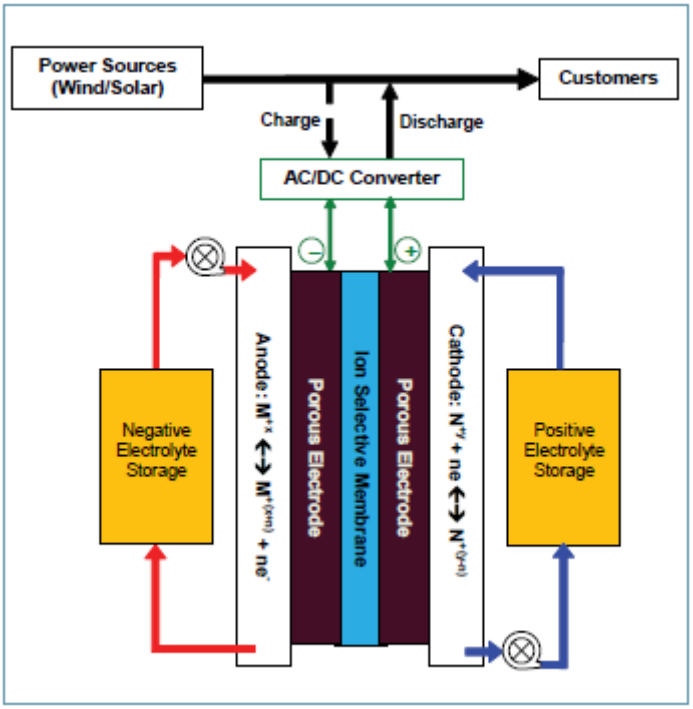

FIG. 2. *Schematic of a redox flow battery system with electrodes shown in a discharge mode.*

Example: Vanadium Battery:
Reaktions: Anode: V^{2+} discharge to V^{3+} and e^-
Cathode: VO_2^+ and e^- discharge to VO^{2+}
Electrolyte: H_2SO_4

Example: Zinc-Bromine Batteries
Reactions: Anode: Zn discharge to Zn^{2+}
Cathode: Br_2 and $2e^-$ discharge to $2\ Br^-$
Electrolyte: ZnBr

Question

Is it possible to transport such a Vanadium-Battery as UN 2794 BATTERIES, WET, FILLED WITH ACID, electric storage or is it UN 3363 Dangerous goods in machinery or dangerous goods in apparatus?