CAREBS Coalition to Advance Renewable Energy through Bulk Storage

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Written Comments for Submission to the California Energy Commission
Docket No. 11-RPS-01 and Docket No. 02-REN-1038
RPS Proceeding
1516 Ninth Street
Sacramento, California 95814-5512

Treatment of Renewable Energy Credits from Compressed Air Energy Storage Facilities

Submitted by:
The Coalition to Advance Renewable Energy through Bulk Storage (CAREBS)

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Abstract

As part of the California Energy Commission's Workshop on the Proposed Changes to the Renewables Portfolio Standard Eligibility Guidebook and the Overall Program Guidebook for the Renewable Energy Program (the "Guidebooks"), the CEC staff requested public comments addressing, for one, the outstanding issue of expanding the discussion of storage facilities. The Coalition to Advance Renewable Energy through Bulk Storage (CAREBS) thanks the commission for the opportunity to submit our comments on this topic.

CAREBS is a policy organization representing project developers, system suppliers, and engineering services firms developing compressed air energy storage (CAES), pumped storage hydroelectric (PSH), and other grid-scale storage technologies.

CAREBS believes that the treatment of renewable energy credits (RECs) from CAES-type bulk storage facilities needs to be addressed immediately as part of California's renewable energy and electricity infrastructure policies. Like PHS (which already qualifies and is included in the Guidebooks), CAES is a large-scale storage technology that can substantially assist California in meeting its Renewable Portfolio Standard (RPS) goal of 33% by 2020. Most economic analyses show CAES to be one of the lowest cost storage alternatives, and, unlike

most other grid-scale storage technologies (with the exception of PHS), it is commercially available today, with fully warranted systems available from U.S. manufacturers.

Our comments here are intended to assist California policy makers and stakeholders in filling this policy gap during this current Guidebooks' revision process.

CAES is unique among storage facilities because it may involve the addition of a supplemental fuel. Other storage facilities, such as batteries and flywheels, do not. As explained here, CAREBS concludes that the "cleanest" way to qualify RECs from CAES facilities within the guidelines set by the California Energy Commission (CEC) is to decouple the renewable portion of the output from the non-renewable portion of the output, consider each MWh of renewable energy input as a MWh of output, and allow a 1:1 REC apportionment. The excess fossil-fueled portion of the output would be treated separately, as if it comes from a natural-gas-fired gas turbine.

Introduction

In the CEC's Renewable Portfolio Standard (RPS) Eligibility Guidebook, issued January 2011, energy storage is identified as an "Outstanding Issue" (pp. 5-8). Only pumped storage hydroelectric and fuel cells using a renewable fuel are eligible for the California RPS, but "The Energy Commission recognizes the importance of storage technologies for renewable resources, and anticipates that new issues may arise or new technologies may develop (such as compressed air storage) that will need to be addressed in future guidebook revisions."

The CEC Guidebook does, however, address RECs for renewable energy facilities using multiple energy resources (referred to as multi-fuel facilities), apparently to address solar thermal facilities that also use natural gas as a backup fuel and fuel cells that are powered by fuels derived from renewable sources (e.g., biogas). Some have suggested that the rules applying to solar thermal with gas backup could serve as a template that illustrates one way to treat RECs from CAES.

During the Staff workshop on the proposed changes to the Renewable Portfolio Standard Eligibility Guidebook and the Overall Program Guidebook for the Renewable Energy Program on October 21, it was suggested by one CEC presenter that storage in all cases represents an inherent loss of RECs. However, unlike batteries and flywheels, CAES involves the addition of enthalpy through the use of a minimum amount of supplemental fuel. CAES therefore does *not* represent a storage system in which electricity goes in, and less electricity comes out, and therefore CAES does not represent an *inherent* loss of RECs.

CAES Background

It is not the intent here to provide a detailed background and descriptions of CAES technologies, but only to point out some relevant technical and commercial issues. The CAES cycle, simply, compresses intermittent renewable energy, stores it in the form of air in an

underground cavern or other storage medium, releases that air into the turbine-generator, along with a minimum amount of additional fuel, and returns that electricity to the grid as a firm, flexible and dispatchable product (Figure 1).

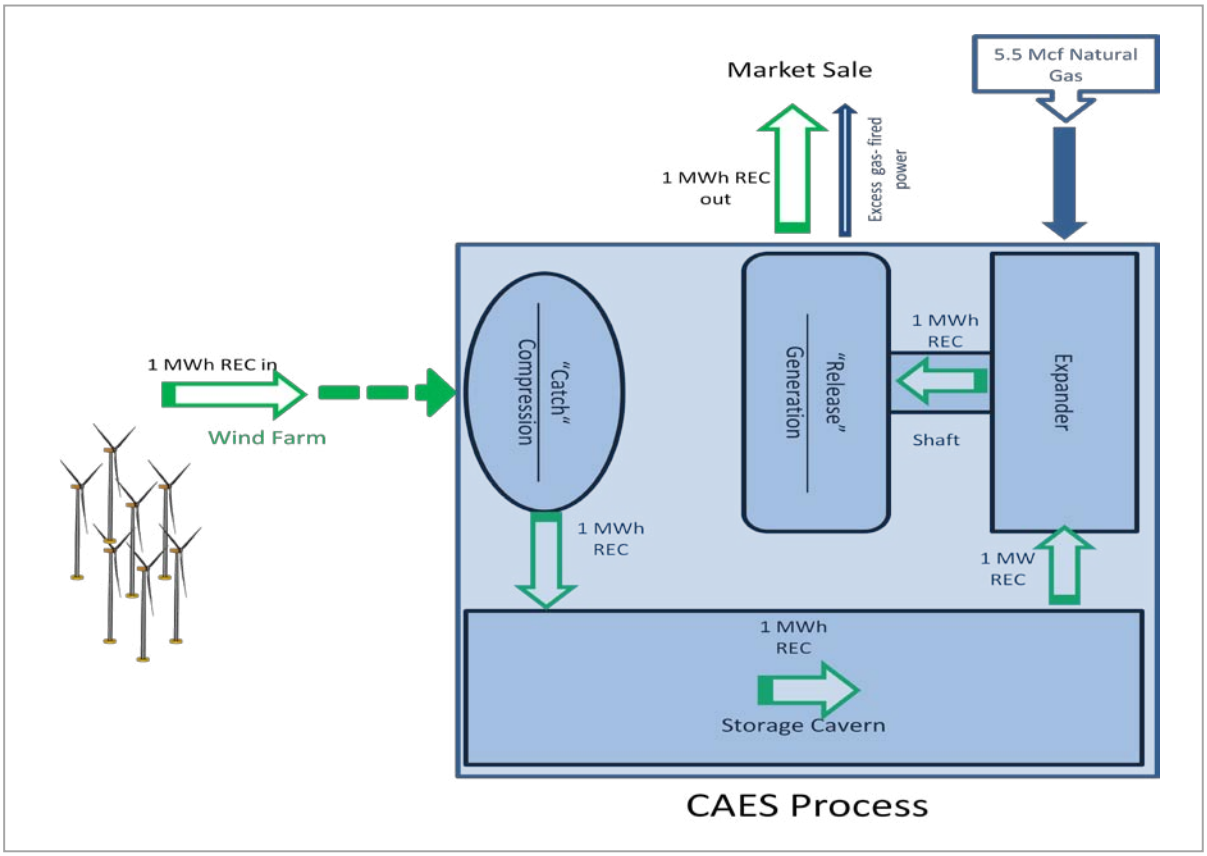

Figure 1 – RECs flow through CAES Process

Also critical to note: CAES is a proven technology (with 50 unit years of operation between two commercial plants, one in Europe and one in Alabama), *but only for underground salt-dome-type geologies and natural gas as supplemental fuel*. All other storage media, supplemental fuels, and advanced CAES cycles have yet to be demonstrated at commercial scale.

RECs for Multi-fuel Facilities

Eligibility for RECs from multi-fuel facilities is clearly spelled out in the Handbook, and a similar approach could be considered a template for CAES. The Handbook also describes an approved method for combustion technologies and fuel cells. Thus, one aspect of the

problem is to apply a method that is similar to one of these methods, or a new one that is better suited to a CAES facility.

Relevant CAES attributes

Obviously, a CAES facility is different from geothermal, fuel cells, solar PV, solar thermal, wind, and biomass combustion facilities covered as multi-fuel facilities. Some of the CAES attributes important to the REC discussion are the following:

- A CAES facility captures intermittent renewable electricity from the grid and typically it will have contracts with multiple parties to "park" the electric energy. When later dispatched, the facility releases this firmed and shaped renewable energy to customers throughout the grid.
- The electricity that is "parked" is converted into compressed air and stored in a salt cavern or a storage medium of some sort.
- When the CAES facility is dispatched, this compressed air is mixed with a minor volume of natural gas and processed through an expander turbine to release about 1.33 MWh of electrical energy for every 1.00 MWh of renewable energy that is originally compressed. The excess 0.33 MWh is deemed to be the fossil fuel component.
- CAES not only can "store" renewable-sourced electricity, it also expands the transmission capacity, allowing several times more renewable energy MWhs to be delivered through existing transmission systems by removing the intermittent nature of the raw energy.
- CAES will reduce the cycling of 100% fossil fired units, improve operating efficiencies, reduce emissions and minimize other environmental impacts.

Options

California can consider several options for treating RECs from CAES facilities:

(1) Taking the simplest case as an example of a CAES facility storing only electricity from wind, the "renewable" portion can be considered a separate and distinct input and output from the non-renewable portion. In other words, each MWh into the CAES facility could be considered a MWh out of the CAES facility, and therefore be entitled to the "non-discounted" associated RECs. The excess non-renewable portion of the

output that is dispatched would be treated as exactly that. This approach is very similar to the "multi-fuel" concept described in the CEC Guidebook.

(2) It seems reasonable to assume that a CAES facility should receive REC credit for additional renewable energy that can be delivered to CA load-serving entities because of the optimization of existing and proposed transmission lines. Utah and Ohio law appreciates this "value add" and awards RECs to all the generation dispatched from a CAES facility as an incentive to add CAES driven reliability and efficiency to their electric grids.

(3) From a REC perspective, avoiding a "dirty" MWh should be just as good as delivering a "clean" MWh. If it can be established that the operation of a CAES facility avoided a "dirty" MWh, then it seems reasonable to assume that some additional REC value should be credited to the CAES facility.

Conclusion

CAREBS concludes that the "cleanest" way to qualify RECs from CAES within the guidelines set by the California Energy Commission (CEC) is to decouple the renewable portion of the output from the excess non-renewable portion of the output, consider each MWh of renewable energy input as a MWh of output, and allow a 1:1 REC apportionment. The fossil-fueled, or non-renewable energy portion of the output, would be treated similarly as if it came from a natural-gas-fired turbine. CAES also brings other benefits to the California system in terms of reliability, transmission congestion relief, and a reduction in the use of older fossil-fuel power plants to "fill in" around intermittent renewable energy resources.

Reference

1. Renewables Portfolio Standard Eligibility, Fourth Edition, California Energy Commission (CEC-300-2010-007-CMF), January 2011