Compressed Air Energy Storage
Theory, Resources, And Applications For Wind Power

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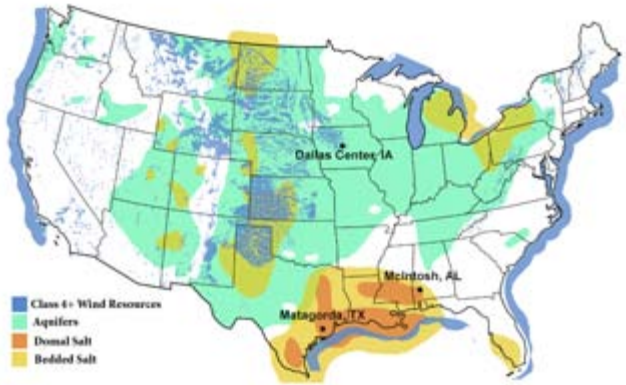
Traditionally, CAES technology has been used for grid operational support applications such as regulation control and load shifting. But a new major possibility that is especially relevant for a carbon constrained world is to enable exploitation at large intermittent wind resources that are often remote from major electricity demand centers. CAES appears to have many of the characteristics necessary to transform wind into a mainstay of global electricity generation.

The wide availability of potentially suitable geology in wind-rich areas points to CAES as a technology well-suited for making baseload power from wind—thereby making it feasible to provide wind power at electric grid penetrations far greater than 20%+ penetration rates that are feasible without storage. And, to the extent that wind-rich regions are remote from major electricity markets, such baseload power can often be delivered to distant markets via high voltage transmission lines at attractive costs.



Previous studies on the combination of wind and CAES have focused on economics and emissions. This report highlights these aspects of baseload wind/CAES systems, but focuses on the technical and geologic requirements for widespread deployment of CAES, with special attention to relevant geologies in wind-rich regions of North America.

Large penetrations of wind/CAES could make substantial contributions in providing electricity with near-zero GHG emissions if several issues can be adequately addressed. Drawing on the results of previous field tests and feasibility studies as well as the existing literature on energy storage and CAES, this report outlines these issues and frames the need for further studies to provide the basis for estimating the true potential of wind/CAES.


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Table of Contents

ACKNOWLEDGMENTS 2
TABLE OF FIGURES 5
PREFACE..... 6
EXECUTIVE SUMMARY..... 7
1. BACKGROUND..... 11
1.1. EVOLVING MOTIVATIONS FOR BULK ENERGY STORAGE..... 12
1.2. CAES OPERATION 15
1.3. SUITABLE GEOLOGIES FOR CAES..... 17
1.3.1. Salt.....18
1.3.2. Hard Rock 19
1.3.3. Porous Rock..... 21
1.4. EXISTING AND PROPOSED CAES PLANTS 22
1.4.1. Huntorf 22
1.4.2. McIntosh 23
1.4.3. Norton 24
1.4.4. Iowa Stored Energy Park..... 25
1.4.5. Proposed Systems in Texas 26
2. CAES OPERATION AND PERFORMANCE.....27
2.1. RAMPING, SWITCHING AND PART-LOAD OPERATION..... 27
2.2. CONSTANT VOLUME AND CONSTANT PRESSURE 29
2.3. STORAGE VOLUME REQUIREMENT 30
2.3.1. Case 1: Constant Cavern Pressure 32
2.3.2. Case 2: Variable Cavern Pressure, Variable Turbine Inlet Pressure 32
2.3.3. Case 3: Variable Cavern Pressure, Constant Turbine Inlet Pressure..... 33
2.3.4. Cavern Size 33

2.4. PERFORMANCE INDICES FOR CAES SYSTEMS.....36
2.4.1. Heat Rate 37
2.4.2. Charging Electricity Ratio..... 37
2.4.3. Toward a Single CAES Performance Index.....37
2.4.3.1. Primary Energy Efficiency..... 38
2.4.3.2. Round Trip Efficiency..... 38
2.4.3.3. Additional Approaches..... 39
3. AQUIFER CAES GEOLOGY AND OPERATION..... 42
3.1. MOTIVATIONS 42
3.2. APPLICABILITY OF INDUSTRIAL FLUID STORAGE EXPERIENCE 44
3.2.1. CO2 Storage 44
3.2.2. Natural Gas Storage 44
3.2.2.1. Site Characterization and Bubble Development..... 44
3.2.2.2. Applicability to CAES 46
3.2.2.3. Differences 47
3.3. GEOLOGIC REQUIREMENTS 47
3.3.1. Porosity, Permeability and Thickness.....48
3.3.2. Reservoir Dimensions 49
3.3.3. Pressure Limits and Caprock Characteristics 51
3.3.4. Residual Hydrocarbons 52
3.4. OXIDATION CONSIDERATIONS.....53
3.5. CORROSION 54
3.6. FLOW IN AQUIFERS 56
3.7. PARTICULATES 57
4. WIND/CAES SYSTEMS IN BASELOAD POWER MARKETS 58
4.1. METHODOLOGY..... 58
4.2. GENERATION COSTS FOR ALTERNATIVE BASELOAD POWER SYSTEMS OPERATED AT SPECIFIED CAPACITY FACTORS 61
4.2.1. Dispatch Competition in Baseload Power Markets 62
4.2.2. Dispatch Duration Curves 63
5. ADVANCED TECHNOLOGY OPTIONS 66
6. A WAY FORWARD..... 69
7. CONCLUSIONS..... 71
8. REFERENCES 73
APPENDIX A THEORETICAL EFFICIENCY OF COMPRESSED AIR ENERGY STORAGE FOR ALTERNATIVE CONFIGURATIONS 80

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