

Power Plant Design Using Allam Cycle CCS  
(Technical Report)

Agricultural Demand and Water Sustainability: Responsible Use of the  
Ogallala Aquifer  
(STS Research Paper)

An Undergraduate Thesis Portfolio  
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by

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## Preface

Humans are seeking ways to meet their economic needs more sustainably. Processes requiring natural resources, for example, must be reengineered for sustainability. Therefore, how may the sustainability of production processes be improved?

Carbon capture systems may improve the sustainability of power generation. Through the Allam power cycle, large-scale power generation with zero emissions may be feasible. A process flow diagram of a conceptual scaled-up natural gas facility applying the Allam cycle was designed and modeled in AspenPlus. Material, energy, and capital designs were developed; the plant design was then evaluated in terms of economics, safety, social implications, and environmental impacts. The researchers concluded that the scaled-up design of the Allam cycle would not operate economically without subsidies or other redesigns and should not be pursued until these obstacles are overcome.

Social groups disagree about how sustainable resource consumption is best pursued. Agribusiness, independent farmers, energy companies, residential water consumers, conservationists, and advocacies are competing to determine the aquifer's future. The case offers lessons for global conservation efforts.

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