

IMPROVISION OF ECONOMIC AND ENVIRONMENTAL BENEFITS OF A MICROGRID BY CONTROLLING LOADS

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INTRODUCTION

Microgrids are often considered as the next generation solution to our energy crisis. However, study shows, microgrids are yet in research stage. This study suggests a proposed microgrid with a controlled interruptible loads and improvement of overall techno economic and environmental benefits. .

SYSTEM

The proposed system has a 1,450 kW of PV, 1,000 kW of generator capacity, 1,000 kWh of battery capacity and 1,000 kW of wind generation capacity with an operating costs to \$463,375/yr. Project Lifetime is considered as 20 years, expected inflation rate is considered 3.7%, nominal discount rate 8.0%, real interest rate is 4.1%. With an uncontrolled load profile, it has a payback of 10.3 years and an internal rate of return of 8.21% to fulfill the demand. Where the system with a controlled load profile changes the economics significantly as the payback goes down to 8.11 years with an internal rate of return 9.93%. Also, the emission can be reduced by 40% using the controlled load.

INITIAL RESULTS

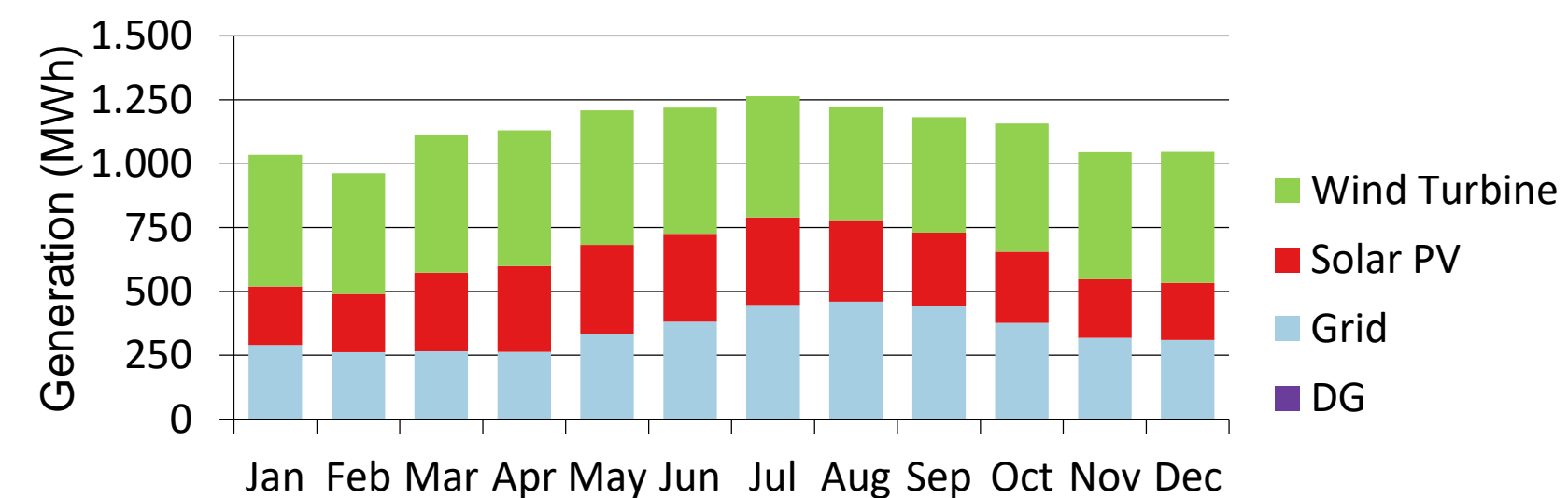


Figure 1. Power consumption by the system with uncontrolled load.

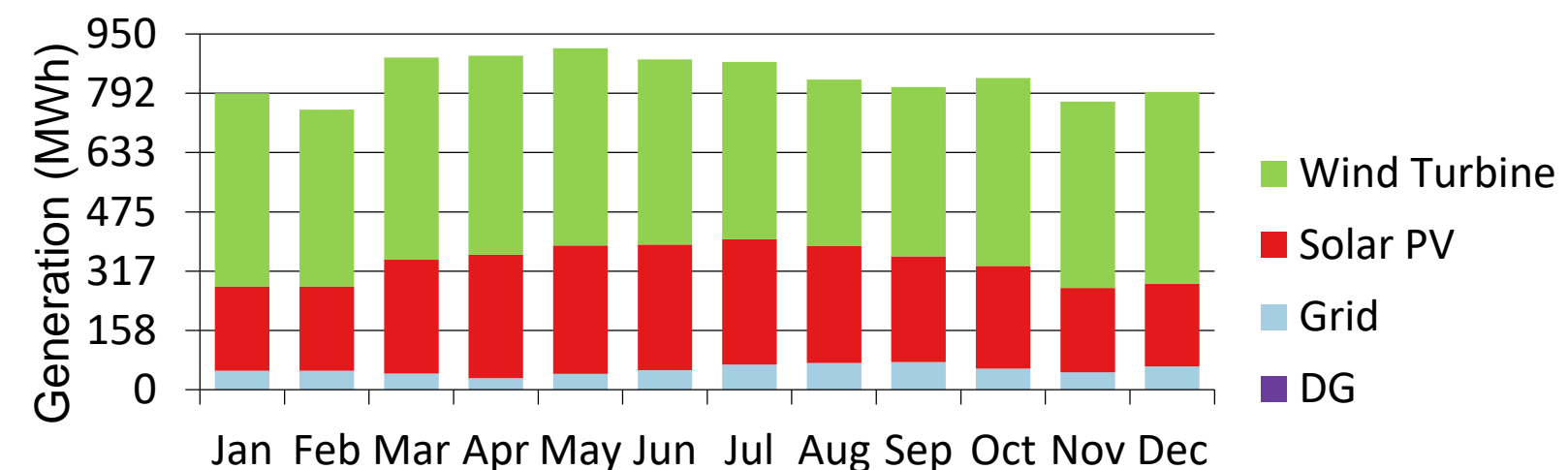


Figure 2. Power consumption by the system with controlled load.

Table 1. COMPARISON OF ECONOMIC WITH UNCONTROLLED AND CONTROLLED LOAD.

	System with uncontrolled load	System with controlled load
Annualized Savings:	\$692,132	\$868,117
Return on Investment:	13.91%	16.90%
Internal Rate of Return:	8.21%	9.93%
Simple payback:	10.3 Years	8.11 years

EMISSION PROFILE

Table 2. SYSTEM EMISSION WITH UNCONTROLLED LOAD.

Carbon Dioxide	2623249	kg/yr
Carbon Monoxide	78863	kg/yr
Unburned Hydrocarbons	24904	kg/yr
Particulate Matter	8301	kg/yr
Sulfur Dioxide	11373	kg/yr
Nitrogen Oxides	5562	kg/yr

Table 3. SYSTEM EMISSION WITH CONTROLLED LOAD.

Carbon Dioxide	1435487	kg/yr
Carbon Monoxide	45621	kg/yr
Unburned Hydrocarbons	15576	kg/yr
Particulate Matter	5321.8	kg/yr
Sulfur Dioxide	7645.4	kg/yr
Nitrogen Oxides	3828	kg/yr

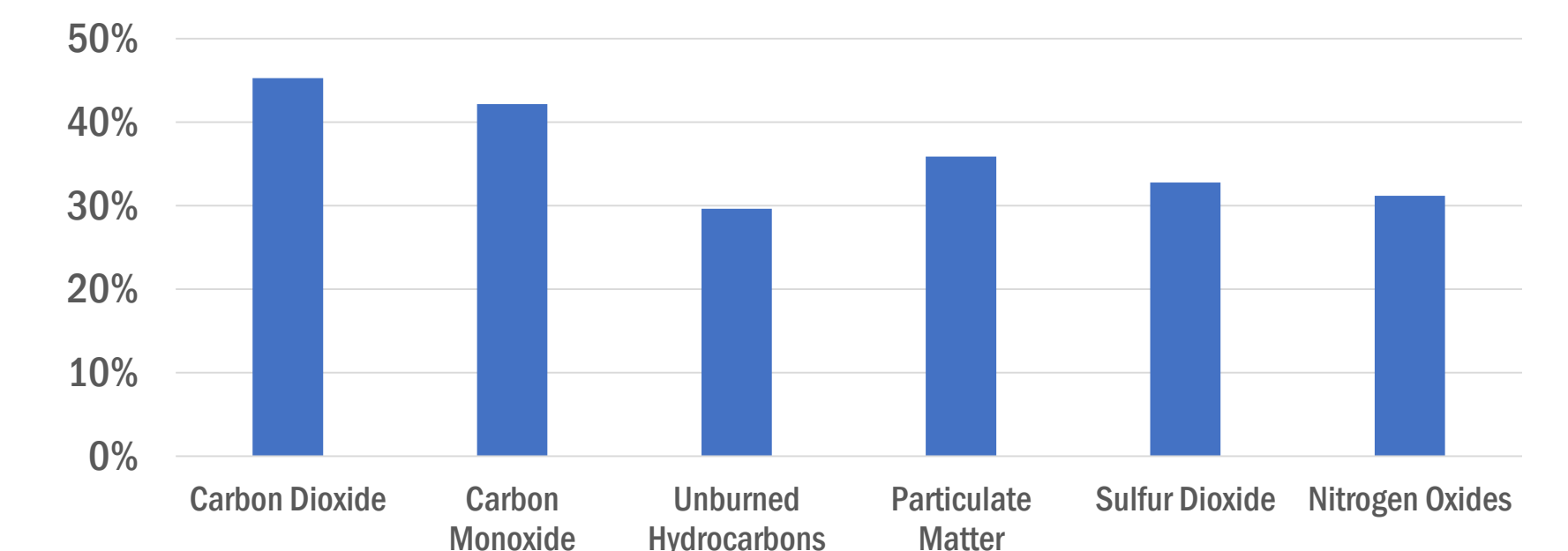


Figure 3. Percentage reduction of emission with controlled load profile.