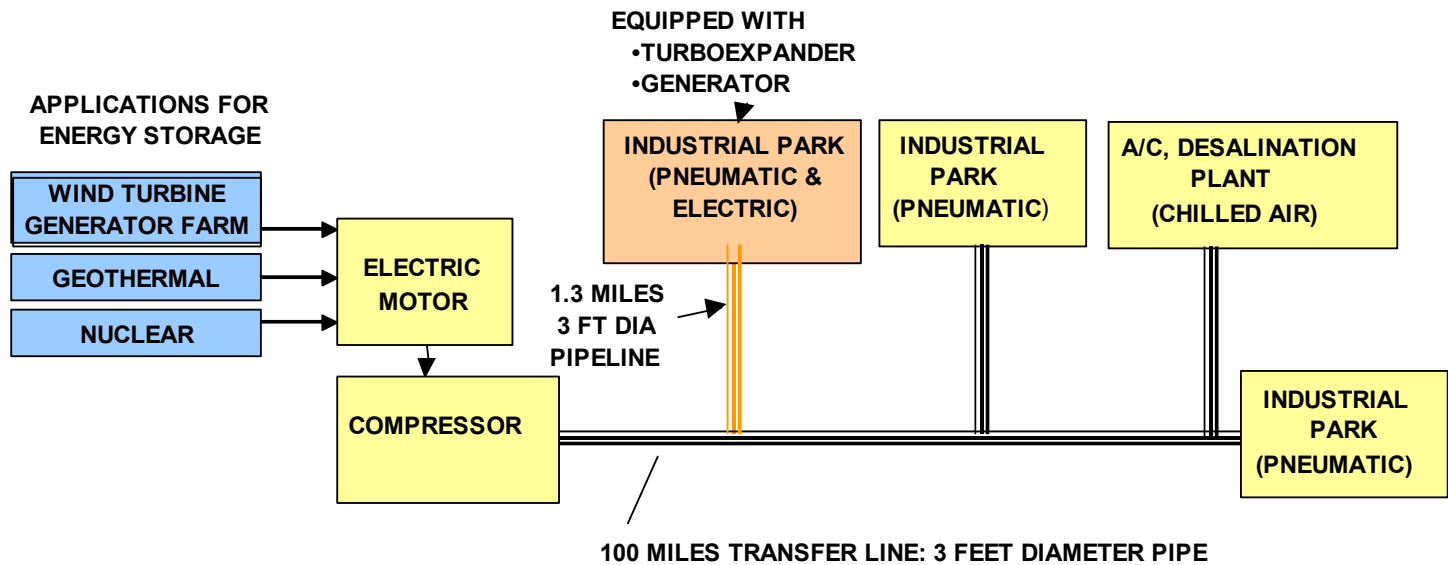


TRANSFER LINE COMPRESSED AIR ENERGY STORAGE (TL-CAES) SYSTEM for an Onshore/Offshore Wind Farm Using 100-mile Long Pneumatic Pipeline

NEW INNOVATIVE ENERGY STORAGE AND TRANSFER CONCEPT

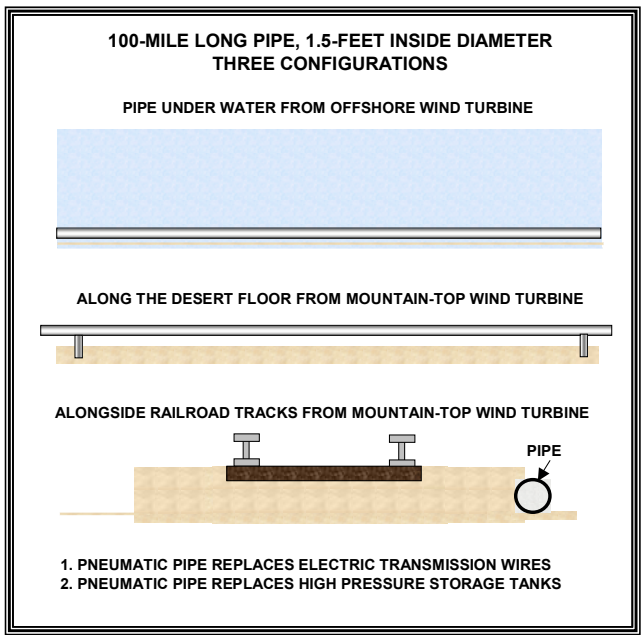
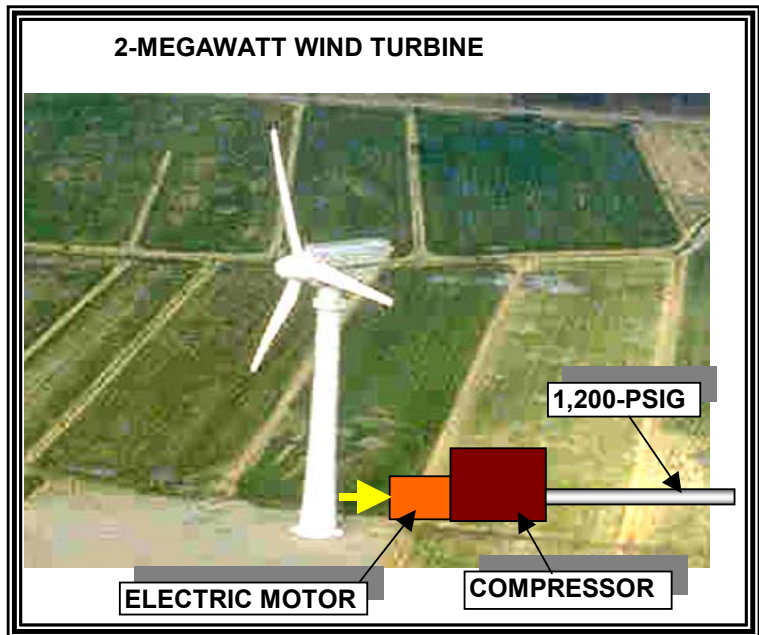


EXAMPLE OF WIND TURBINE APPLICATION:

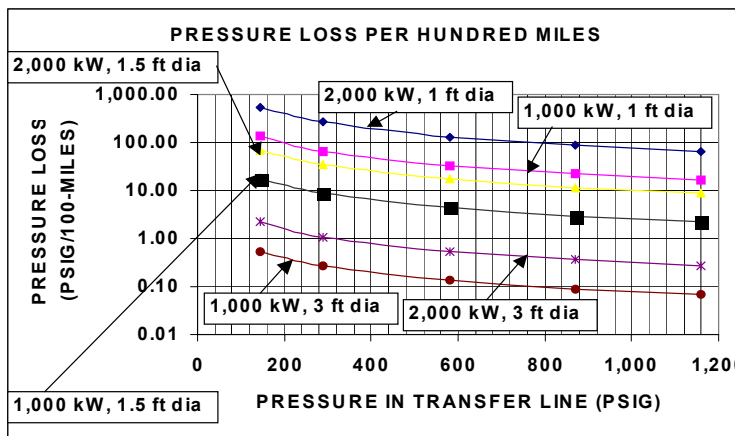
- ▶ Wind Turbine Generator In Mountain Region (Tehachapi, Ca)
- ▶ Long Pipeline, Containing Pressurized Air Across Desert
- ▶ Industrial Park In L.A. using Pneumatic and Electric Equipment
- ▶ TL-CAES System With Turboexpander Generator Attachment produces electricity, with highly chilled air as a free byproduct
- ▶ Chilled air can be used for desalination, air conditioning and/or cold storage

EXAMPLE OF GEOTHERMAL APPLICATION:

- ▶ Geothermal Power Plant operating at constant electric power output
- ▶ Excess generated electric power (at night, when consumption is low) is used to compress air in energy storage pipeline and deliver stored energy to remote user on demand
- ▶ User may be an Industrial Park using Pneumatic and Electric Equipment
- ▶ TL-CAES System With Turboexpander Generator Attachment produces electricity, with highly chilled air as a free byproduct
- ▶ Chilled air can be used for desalination, air conditioning and/or cold storage

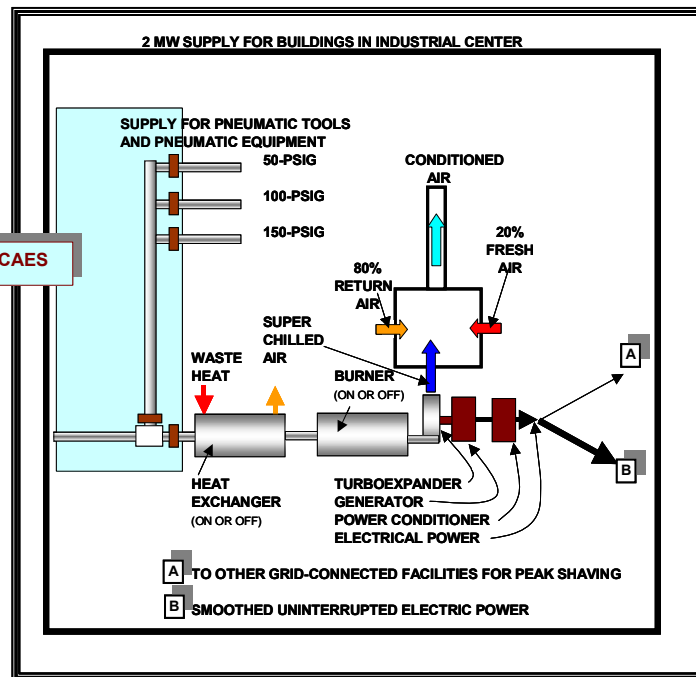


PRESSURE DROP CONSIDERATIONS



FEATURES & BENEFITS OF THE TL-CAES SYSTEM

- ▶ Replaces Electric Transmission Lines With a Pneumatic Pipeline, with the added benefit of energy storage
- ▶ The Pneumatic Pipeline provides both, an efficient energy delivery system to a remote site, and a high-volume capacity storage vessel
- ▶ The System is cost-competitive when ~2,000 kW of Power is demanded
- ▶ Pipeline is at Ground Level and Unobtrusive, and can be placed along
 - Railroad Right-of-way
 - Above Ground Pipeline
 - Underwater Pipeline
- ▶ System operates in the following modes:
 - Pneumatic
 - Pneumatic and Electricity Generation for Peak Shaving
 - Power Smoothing
 - Chilled Air Cogeneration
- ▶ Pneumatic Mode has High System Efficiency
 - No losses due to conversion of Pneumatic to Electrical Power
- ▶ Wind Turbine Operation
 - When Wind is Present, there is continuous power delivery
 - When Wind is Not Present, Days to Weeks of stored power is still delivered
- ▶ Geothermal Well Operation
 - * Shift unused Night Power to Day Power by means of energy storage, and deliver it to remote user.



PERFORMANCE

Electrical	Pneumatic
528,000 FT LONG	528,000 FT LONG
3 FT DIA	3 FT DIA
3,732,212 CU FT	3,732,212 CU FT
1214.67 PSIA	1214.67 PSIA
214.67 PSIA	214.67 PSIA
14.67 PSIA	14.67 PSIA
254,411,184 SCF	254,411,184 SCF
9.9 SCFM/HP	4 SCFM/HP
10,000 KW	10,000 KW
13,404.8 HP	13,404.8 HP
132,707.8 SCFM	53,619.3 SCFM
32.0 HRS	79.1 HRS
8 HRS/DAY	8 HRS/DAY
5.0 DAYS/WEEK	5.0 DAYS/WEEK
0.80 WEEKS	2.0 WEEKS

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