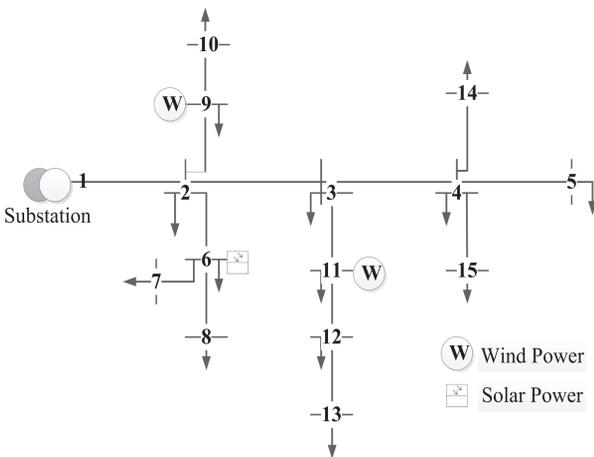
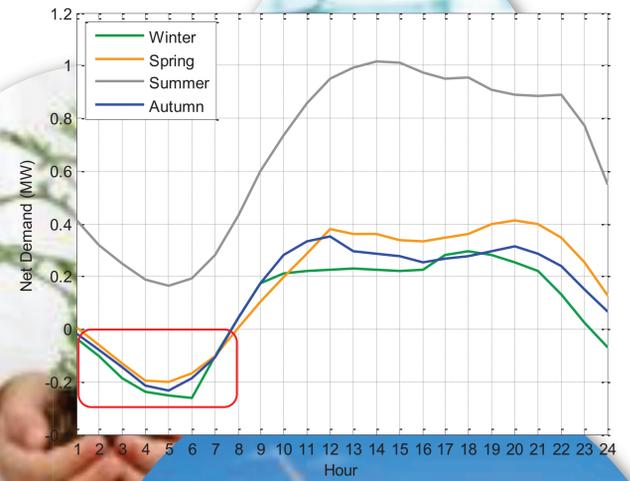
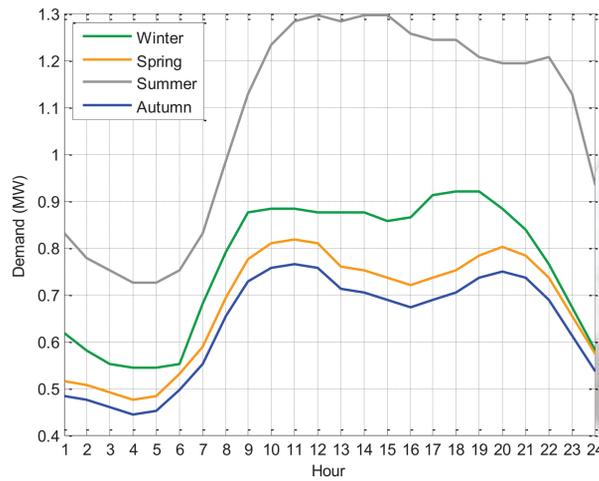
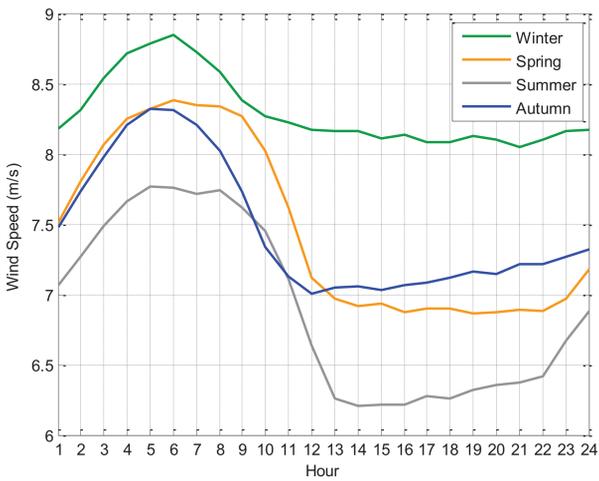


Background: Recently, many countries have placed great pressure on energy industry to incorporate renewable energy into their energy mix in the form of wind, solar, and etc. Governments are promoting the construction of renewable energy projects with generous subsidies and with regulatory support. The cumulative installed capacity has increased markedly since the last decade.

Challenges: Although these types of power generation is more environmentally sustainable, large-scale integration of renewable energy in power distribution systems may significantly alter network power flow in terms of direction and magnitude, which will impose direct impacts on power quality, protection settings, and etc., making delivering reliable power, on demand, a major challenge. Therefore, with the advent of renewables, distribution companies (DISCOs) are facing emerging challenges.

Research: A novel battery energy storage system (BESS) based energy acquisition model is proposed for the operation of DISCOs. Based on this new model, a new battery operation strategy is proposed for better utilization of energy storage system (ESS) and mitigation operational risk from price volatility. Meanwhile, optimal sizing and siting decisions for BESS is obtained through a cost-benefit analysis method, which aims at maximizing the DISCO's profit from energy transactions, system planning, and operation cost savings.



Item	Optimal Plan I Lithium-ion Battery			Optimal Plan II Lead-acid Battery		
	1	4	6	1	6	9
Location						
Capacity (MWh)	0.22	0.5	0.32	0.45	1.02	0.67
Population/Iteration	200/200			200/200		
Elapsed (hrs)	11			11		
Life cycle (years)	3.5			6.0		
Power loss (\$)	62,468			62,215		
Penalty (\$)	19,992			1,529		
Potential benefits (\$)	22,776			23,433		
Battery cost (\$)	312,000			171,200		
Residual value (\$)	212,245			135,873		
Weight (kg)	5,040			44,667		

No Technology is Superior in All Functional Categories

- Technology readiness, safety and durability
- Improved cost economics and understanding of benefits
- Demonstrations of emerging technologies
- Development of integration and wide area control techniques
- Funding for basic research in innovative theory and new materials
- Market rules and policy recognition of storage