



Norma Byron

President, Ashlawn Energy

Current and Developing Economics and Impacts
of Energy Storage on Solar + Storage Projects

5th Annual Delaware Energy Conference
October 31, 2018



Topics to be Discussed

- Who is Ashlawn Energy?
- What is Energy Storage?
- Why is Energy Storage Important?
- How does Energy Storage benefit Solar?
- Questions



Norma Byron, President

Ashlawn Energy

Norma Byron has a passion for working to bring innovative and transformative technologies to the world. She has worked with federal agencies, state and local governments, and commercial enterprises who seek to increase resiliency, and reduce their energy costs and carbon footprint.

Ashlawn has patented its VanCharg™ vanadium redox flow battery system and established U.S. manufacturing to deploy the systems in the United States.

Norma has created unique business models and strategic partnerships with communities and businesses to take local control over the availability and the price of power and to reduce their carbon footprint.

Norma has a B.A. from the University of Maryland, College Park; and an MBA from Marymount University, Arlington, Virginia.





Ashlawn Energy: Who We Are

Established in 2008

- Headquarters in Springfield Virginia
- Manufacturing in Northeast Ohio

Grid Scale Energy Storage

- Systems from kilowatts to megawatts

Vanadium Redox Flow Battery Technology

- VanCharg™ Fuel Cell System
- Proven Technology Since 1986
- Licensed to Ashlawn Energy by Australian Inventor
- 4 Patents

Complete Energy Storage System Solution

- Hardware
- Software
- Grid Interconnect
- Business System to Monetize Power



VANCHARG™

VANCHARG™ MODULAR DESIGN

Stack Modules

Power Electronic Building Blocks – 10kW stack
1 Module below 100kW is made up of 10, 10kW stacks

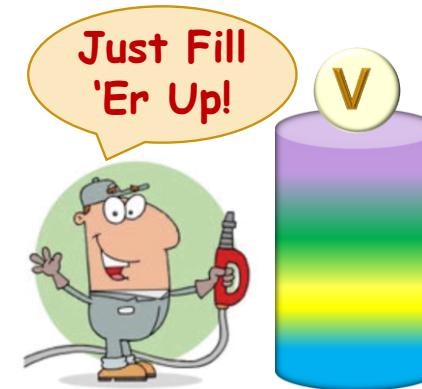
1 Module (100 kW)

2 Modules (200 kW)

8 Modules (800 kW)

Power can be adjusted separately from Energy Storage

Need more Energy?

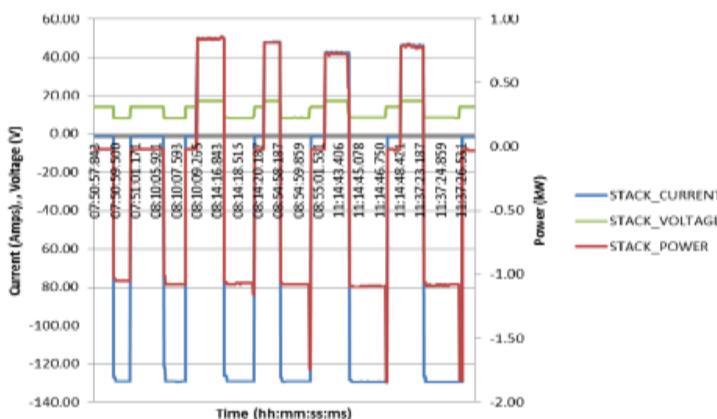


More hours = More Electrolyte



Battery Response Time

- Rapid (<50 millisecond) response time from charge to discharge with no operator interaction



Provides Power on Demand



Why Energy Storage?

Store electricity for use at a later time

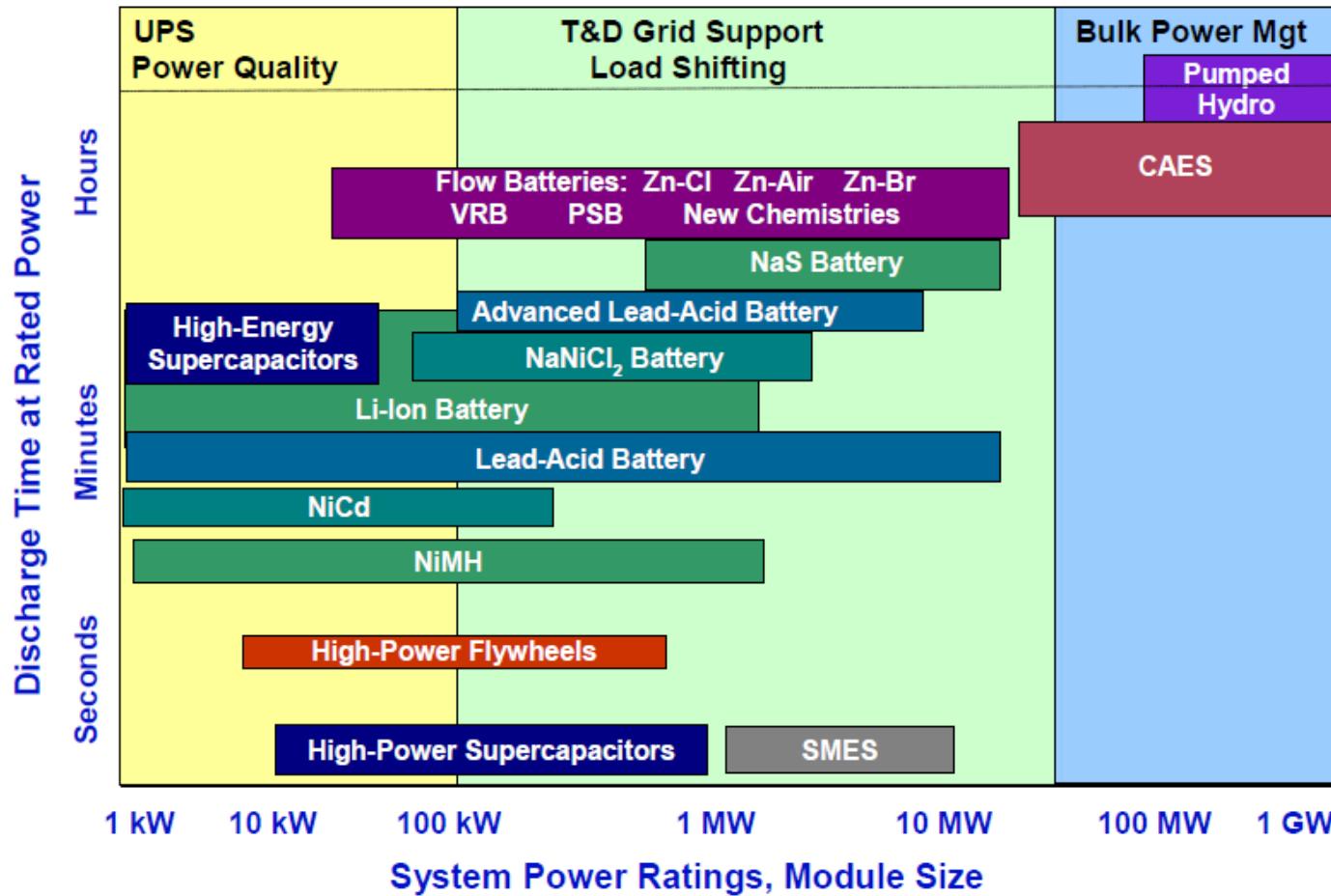
- Demand Management & Demand Response
- Demand Charge Reduction
- Peak Shaving
- Voltage and Frequency Regulation
- Incorporating Renewables (Solar, Wind) & CHP
- UPS
- System black start



Revenues for Energy Storage

- **Compatible with Performance Contracting (Shared Savings):**
 - Peak shaving
 - Integrate with other energy efficiency solutions
- **Revenues from utility and grid (ISO)**
 - Demand Response/Curtailment
 - Demand Charge Reduction
- **Frequency Regulation**
- **Renewables Integration**

Types of Energy Storage



Source: U.S. Department of Energy



IN CONCLUSION:

**Pairing energy storage improves solar project
output, and revenues.**

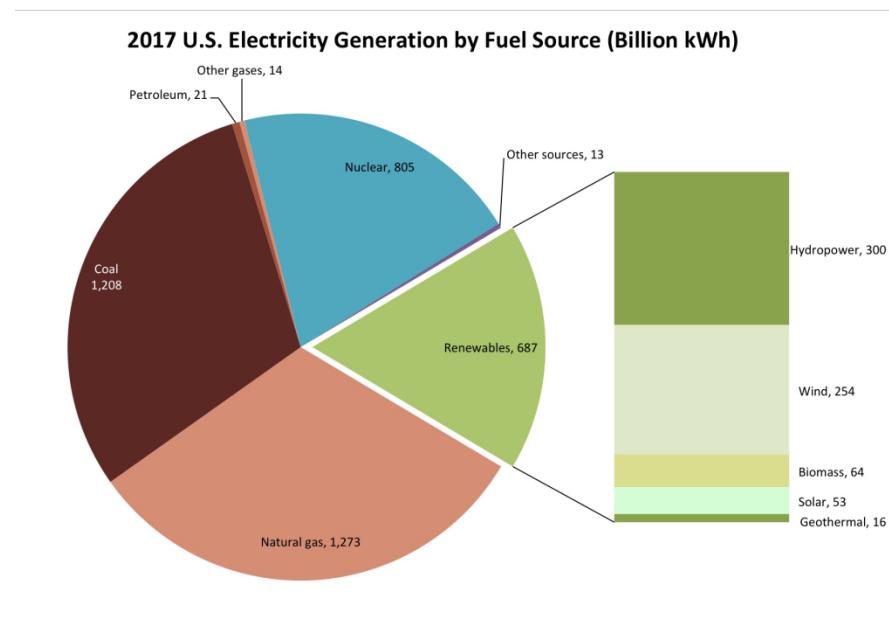


HOW DOES ENERGY STORAGE BENEFIT SOLAR PROJECTS?

Contains Ashlawn Energy competition
sensitive information

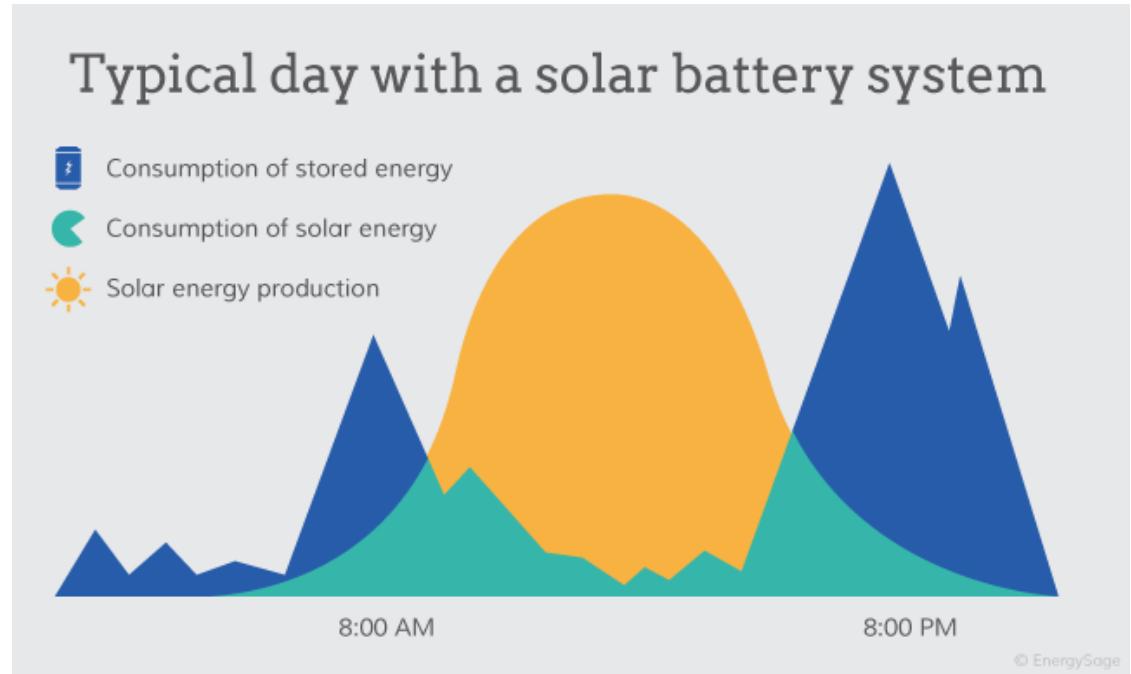
Solar Energy and the Electric Grid

- The cost of solar continues to decline and is cost competitive with fossil.
- Solar penetration into the electric grid continues to grow – 15% of electricity generation by 2030 (SEIA)



Key Challenges and for Solutions Solar Energy

- Solar power creates a challenge for grid integration – peak demand doesn't coincide with daytime hours.
- How can this challenge be addressed:
 - Incorporating energy storage
 - Incorporating the 'Internet of Things'
 - Encouraging Community Shared Solar Projects



Source: EnergySage



State Initiatives

New York

- 40% reduction in greenhouse gas emissions from 1990 levels
- 50% of electricity must come from renewable sources
- 600 trillion Btu increase in statewide energy efficiency (at source)
- *"As renewable power sources like wind and solar provide a larger portion of New York's electricity, storage will be deployed to store and dispatch energy when and where it is most needed. Storage will also allow New York's peak power needs to be met with cleaner electricity generation."* – New York State Energy Research and Development Authority

Delaware

- 25% of electric power must come from renewable resources by 2025.
- SREC Market established.

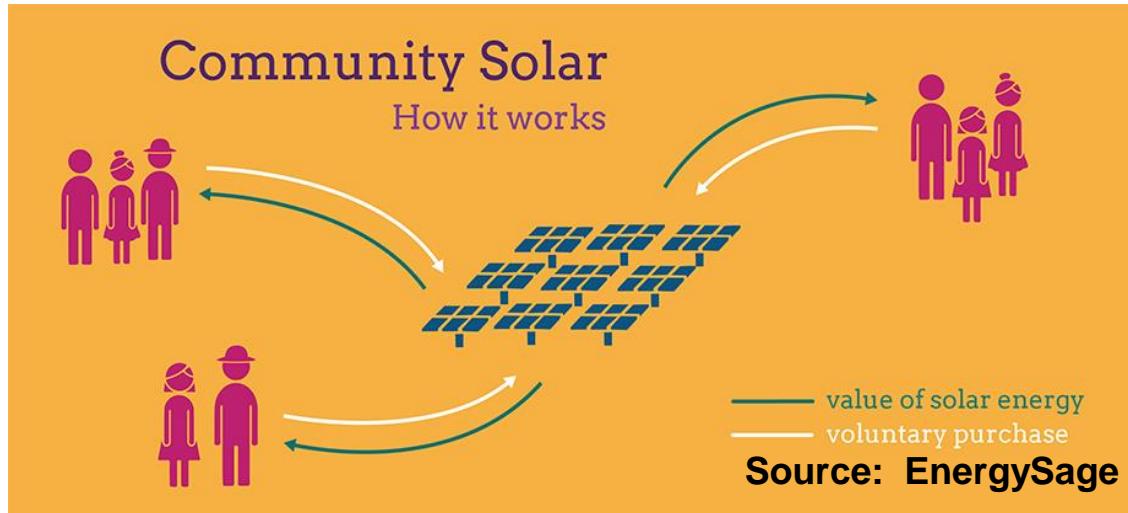


The Benefit of Adding Storage to Solar Projects

- Power generated by solar is saved in battery and used during peak demand time
 - Allows solar to participate in Demand Management and Demand Response programs
 - Can reduce utility and grid peak demand charges
- Provides backup power
- Integrates with other energy efficiency solutions
- Can participate in Frequency Regulation Markets
- Encourages more solar Community Shared Solar projects



What is Community Shared Solar?



*Also known as a
'Solar Garden' or
a **shared**
renewable
energy project.*

- A community solar project is a solar power plant whose electricity is shared by more than one household.
- Community solar allows businesses and families to go solar even if they do not own property on which to put their own solar system.
- 'Offtakers' include homes without sufficient sun or apartment dwellers. A portion of offtakers' bill is decreased by share they are offtaking.
- Facilitates financing of solar projects.