Residential Energy Storage: 

The Olive Branch

SC Solar Council Meeting

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The original Challenge
Production and load balancing

“Imagine the simplicity of a flat and predictable load, a ‘block of energy’ if you will, negotiated for a specific sector... Too bad it is not possible.”

Pearl Street Station

Electric pole

Electric light
Fast forward to 2019...

Grid Strain, Wasted Energy
The New Challenge

The unpredictable and intermittent nature of renewables, adds new volatility

"There cannot be a serious discussion regarding the energy transition, without energy storage"

"Energy storage is a key component to a renewable energy future"
Will this be a problem in SC?

- South Carolina House rebuts net metering changes, extending net metering until 2021 for IOU’s, helping solar industry

- SC has additional 25% state tax incentive for residential solar on top of 30% federal ITC

- Energy Storage opportunities exist where net billing reduces value of solar (outside of IOU territories)
## The Four ‘Why’s of Resi Energy Storage

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<td><img src="image1.png" alt="Energy Independence" /></td>
<td><img src="image2.png" alt="Back-Up, Comfort &amp; Convenience" /></td>
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<th>3. Maintaining Our Shared Environment</th>
<th>4. Improving Grid Performance</th>
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<td><img src="image3.png" alt="Maintaining Our Shared Environment" /></td>
<td><img src="image4.png" alt="Improving Grid Performance" /></td>
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Energy Storage Applications

Customer Side
“BTM”

Backup Power
Self-consumption
Time of Use

sub station peak load management
Balance high solar penetration

Utility Side
Improving grid performance?
“self-consumption” and “TOU arbitrage”

• **Dark Blue** = Grid Charge
• **Orange** = Discharge

Grid Load Shift Example 1
aka Grid Load Leveling, Load Balancing

Grid Load Shift Example 2 “solar harvesting”
aka Grid Load Leveling, Load Balancing

consume more during “off peak” and less during “peak”

Solar Time Shifting,
aka Solar Smoothing/Firming
harness the sun for when it is no longer shining
bottle up the sun
The size of the energy storage and energy automation opportunity

Energy Storage Market Growth

• According to Bloomberg New Energy Finance, the global energy storage category is predicted to grow by 700%, over the next 12 years*

• The Environmental Defense Fund predicts 900% growth in the US energy storage industry between 2017 and 2022**

• Employment in energy storage, in 2017, grew by 235%**

• Less than .2% of renewable energy generation is currently stored before consumption. At a certain point, the renewables industry will “hit a wall” and will be unable to grow, without the massive deployment of energy storage assets throughout the grid, for renewable smoothing - both “upstream” and “btm”

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*Environmental Defense Fund (EDF) 1 https://www.edf.org/energy/energy-storage

**Environmental Defense Fund (EDF) 2 https://www.edfclimatecorps.org
The Energy Transition, “The Smart Grid of the Future”

Decentralized – Digitalized – Decarbonized / Bi-Directional, Transactive and Prosumer based / Balanced, Harmonized
This is happening, now.

- Soleil Lofts in Herriman Utah
  - Apartment complex with 600+ apartments, solar on all of the roofs, and sonnen ecoLinx 20’s in each house!
  - Totals 12.6 MWh worth of storage and 5.5 MW of dispatchable power, and more importantly, providing grid services to Rocky Mountain Power
    - $35-$40/month homeowner utility bill.
    - Local utility access + grid services.
  - Apartments are state of the art and affordable, with little burden on the local utility
  - Local electricity rates are ~$0.12/kWh
  - Officially off-setting the need for physical power plant!
What this means:

• Storage is no longer just the future. It is the now, and it is becoming normalized at an increasingly faster rate

• New partnership opportunities

• Think smart homes, “eco” homes and neighborhoods, even offered affordably!

• This is catching the eyes of the utilites-these are grid assets!

• Over 50 Press articles, including: Forbes, Cleantechnia, Greentech Media, Utility Dive, and more.
Sample of BTM VPP Grid Services

A few forums for grid services
ISO and or Distribution Utility

- DR
- NWA (non-wires alternative) contract
- IPP / “generation resource”
  - “Spot market”
  - “Forward capacity market”

Sample of grid service use cases

- TOU (energy arbitrage or demand charge reduction - capacity)
- Grid side peak shaving (capacity)
- NWA decongestion, investment deferral (capacity)
- Frequency regulation (frequency balancing)
- Operating reserve (capacity and frequency)
  - primary and supplemental reserve
  - spinning and non-spinning reserve (aka synchronized and non-synchronized)
  - Including frequency response (often coupled with spinning reserve)
- Voltage support/reactive power
- Grid resiliency
Different forms of Lithium Ion batteries

Lithium Iron Phosphate (LFP)

✓ No risk of fire or explosion, even if cells are punctured
✓ Longer lasting chemistry
✓ Most environmentally friendly
× Heavy, not great for mobile applications
× Not as high of power density

Nickel Manganese Cobalt (NMC)

✓ Lightweight
✓ Discharges rapidly
× Risk of fire and explosion if batteries short circuit (though there are numerous amounts of safety mechanisms in place in order to prevent this)
× Battery chemistry longevity is not as established
Thank You

Our Vision

“Our goal is clean and affordable energy for everyone.”

Christoph Ostermann, CEO sonnen GmbH

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