Emerging Technologies & Benefits of Solar PV
In our last section of the presentation, we are going to talk about:

- Emerging technologies
- Benefits of solar PV
- Wrap-up for the day
Emerging Technologies

ADD the debunking MYTHS
The list of top 10 emerging technologies of 2016 includes two solar technologies:

- #2 - Next Generation Batteries
- #7 - Perovskite Solar Cells

According to the World Economic Forum’s latest report on Emerging Technologies, two of the top ten are solar PV related. Number 2 being next gen batteries which will make our lives easier when we lose utility power. And number 7 is a new PV material called Perovskite Solar Cells which is flexible, easier to make, and are more efficient than silicon cells.

SOURCE: https://www.weforum.org/agenda/2016/06/top-10-emerging-technologies-2016/
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Energy storage is a technology that is capable of absorbing energy, storing it for a period of time, and dispatching the energy at a later time.

It is a good way to mitigate time-of-use utility rate schedules and demand charges.

Energy storage can be accomplished via a variety of different technologies and processes. Batteries are a common form of energy storage.

Storage typically connected to the system through an inverter that's listed for battery connection. The battery and PV system may have the same inverter, or have separate inverters.

In addition, there are a growing number of facilities that use seasonal thermal energy storage.

Also, Graphene batteries may replace Lithium Ion – they can store twice the energy and charge in 1/5 the time.
Here is an example of a residential storage system, Tesla’s Powerwall. How much does the Tesla Powerwall cost? The new Tesla Powerwall 2.0 will cost around $5,500, with twice the storage capacity of the original Powerwall battery (@$3,500). Source: EnergySage
A ready-to-install energy storage system with all components inside a single box. Y.Cubes consists of two sub-enclosures, one each for the power conversion system and DC battery block. The Y.Cube’s compact size allows for easy installation. No on-site crane is needed; installation can be done with a forklift, saving considerable time and money. For ease of shipping, the Y.Cube can be split into its two sub-enclosures – one containing either one or two 250 kVA power conversion systems and the other housing the selected battery array.

Example: The Denver International Airport (DIA) will install 1.6 MW of solar panels on the roof of a car park. (Panels will be owned by Xcel Energy, which will lease them back to DIA). And Panasonic will install a 259 kW solar system at Panasonic’s operations center in the Denver Peña facility (near Denver airport), a 400-acre transit hub that will include commercial, retail and residential space.

SOURCES:
The Center for Electronics and Microtechnology (Centre Suisse d’Electronique et de Microtechnique: CSEM) is a private, non-profit Swiss research and technology organization. It is developing solar PV for customizable design applications, such as building facades.

These white (and other colors as shown) solar PV modules allow designers to add solar to non-traditional locations on the exterior of buildings. The downside: they don’t convert as much of the sun’s energy as traditional darker panels do. But from a design perspective, they are a great option for using solar wherever a structure is exposed to sunlight.

Source: http://newatlas.com/csem-white-solar-panels/34463/#p298619
New research is ongoing to make solar PV panels fit into regular architecture facades and for use on other parts of buildings, to give designers more design flexibility. For example, the company – Solaxess – is developing a white PV modules that can be used on building sides.
Tesla also recently released a solar roofing tile. It is more economical for new construction than retrofit, and is primarily for the residential sector. Four different tempered glass roof tile styles currently available, giving design professionals options for integrating this technology.

Photo credit: http://buffalonews.com/2016/11/06/teslas-solar-roof-may-hefty-price-tag/
Tesla’s Long-lasting Tempered-glass Roof Tiles

Anatomy of the Solar Roof

Color louver film
Allows cells to blend into the roof while exposing them to the sun above.

High efficiency solar cell
Produces energy even during high temperature days.

Tempered glass
Extremely durable and impact resistant.

Source: https://www.tesla.com/solar
Perovskite cells are made from a relative of the perovskite mineral found in the Ural Mountains. Perovskite is flexible, easier to manipulate, it is also easy to fabricate using liquids that could be printed on substrates like ink in a printing press, or even spray on applications.
Benefits of Solar PV
Benefits to Your Practice

• Competitive edge in your marketplace
• Offer clients lower operating costs
• Provide expertise in your community
The property owner will realize benefits from lower and stable electricity prices over the life of the system, particularly for all electric appliance homes.
A study by the Lawrence Berkeley National Laboratory showed home buyers consistently have been willing to pay more for a property with PV across a variety of states, housing and PV markets, and home types. As energy prices rise over time (and they always rise over the long-term, even if they go up and down in the short term), properties that are energy efficient become more valuable.
Average market premiums across the full sample of homes analyzed were about $4/Watt or $15,000 for an average 3.6kW system. (PURCHASED residential systems)

That is, if a home has a 3.6 kW system, and all things are equal, the home is likely to sell for about $15,000 more.
You can receive up to 7 LEED points for renewable energy for the site.

US Green Building Council publishes LEED – *Leadership in Energy and Environmental Design*
ANIMATION SLIDE

In addition to the individual benefits, the community will benefit as well:

1. Cleaner air – Lower your greenhouse gas emissions with solar from your home or business. Cleaner air means fewer kids and adults with asthma and lung cancers, and lower stress on our healthcare system to treat these illnesses. Cleaner air helps children do better in schools, and leads to greater community health overall.
Community Benefits

Lower grid usage
• Helps avoids peak power days
• Reduces stress on aging grids

ANIMATION SLIDE

In addition to the individual benefits, the community will benefit as well:

1. Lower grid usage which helps avoids peak power days (resilient and stable)
2. When energy is pushed all the way from the power plant to the end-user, it often times travels a long distance. The longer it travels the more likely there is to be problems... efficiency losses due to transmission over long distances, and more wear and tear on the grid itself (the power lines that carry the electrons). When solar is installed, it delivers energy at a much closer range – and if it’s installed ON THE BUILDING, the range is extremely close, avoiding the efficiency and transmission losses that would otherwise occur. This puts less pressure on the entire grid, which means less work to repair the wear and tear / preserving the old power lines for longer, saving all power company customers money by reducing repair and replacement costs.
In addition to the individual benefits, the community will benefit as well:

1. **Diffusion of solar** – According to a study by a Solar Energy Evolution & Diffusion Studies (SEEDS) project, as more homes and businesses adopt solar within a region, natural forces of pressure are placed upon non-adopters to quickly conform.

When more and more homes and businesses install solar in an area, it becomes more common-place, and it transforms the market.
ANIMATION SLIDE

In addition to the individual benefits, the community will benefit as well:

1. Jobs – According to the solar Foundation, the solar industry has created nearly 115,000 jobs in the past six years.
1. When we use solar instead of traditional fossil fuels, we reduce the need to import fossil fuels from other countries, which is a good thing. Because importing fossil fuels can be risky business... devastating environmental accidents sometimes occur when fossil fuels are moved from one place to another. In addition, becoming more energy independent as a nation reduces our dependence on foreign sources of energy.
Becoming more energy independent as a nation reduces our dependence on foreign sources of energy, and the political issues that can arise. It leads to America becoming more self-reliant overall.
What is the energy payback for PV?

The best way to define this is; how long does a PV system have to operate to recover the energy—and associated generation of pollution and CO2—that went into making the system, in the first place?
According to NREL (http://www.nrel.gov/docs/fy04osti/35489.pdf), Energy payback estimates for rooftop PV systems are 4, 3, 2, and 1 years:
- 4 years for systems using current multicrystalline-silicon PV modules
- 3 years for current thin-film modules
- 2 years for anticipated multicrystalline modules
- 1 year for anticipated thin-film modules
Your Thoughts...

• Your take-aways from presentation?

• Do you feel confident in adding solar?

• What else do you wish we had covered?
THANK YOU!