



Solar Power in Alaska

Presented by
Alaska Center for Appropriate Technology
www.ACAT.org

Welcome and Introductions

- What is the Alaska Center for Appropriate Technology?
- How does this Workshop fit into ACAT's Mission?
- Other Workshops
- Today's Presenters

Workshop Content

- Focus here is **Solar Electric Systems**
 - Not Solar Thermal or Passive Solar
 - Grid-Tied Solar Electric Systems
 - Energy Production for Net-Zero Energy Home
 - Off-Grid Solar Electric Systems
- Even though this is a Solar Energy Workshop, Energy Efficiency is Important
 - When Contemplating a Solar system to Lower your Home Electric Bill, Efficiency is often Less Expensive
 - When Contemplating an Off-Grid Solar System, Efficient Lights/Appliances make that system More Affordable

Topics

- Do you have a good Solar Site?
- Design of Systems
- How much Energy will you Produce?
- What are the Costs of a System?
- Economic Payback?
- Safety and Maintenance
- Case Studies
- Where can you Get More Information?
- ***Please Ask Questions During Presentation!***

Vocabulary

- **PV System** = Photovoltaic System = Solar Electric System
- **Kilowatts (kW)** measure *How Fast* energy is Used or Produced. A Hair Dryer uses energy at a rate of about One kilowatt. 1 kilowatt = 1,000 Watts
- **Kilowatt-hours (kWh)** measure How Much *Total Energy* is Used or Produced. A 1 kW hair-dryer used for 2 hours uses 2 kilowatt-hours. A 300 Watt (0.3 kilowatt) Solar Panel in Peak Sunlight for 5 hours produces $0.3 \text{ kW} \times 5 \text{ hours} = 1.5 \text{ kWh}$ of Energy

Audience Introductions

- Tell us about Yourself and Why you are Here?
- This Presentation can be downloaded at the ACAT web site: **www.acat.org**

Applications of Solar Electric Systems

- Motivations for Going Solar
- Solar Industry in Alaska
- System Configuration Types
 1. Grid-Tied Systems: Offset a noticeable Part of Your Electric Bill
 - Simple Diagram of System
 - Cost-Effective in Alaska in many Situations
 2. Power an Off-Grid Cabin or Home
 - Simple Diagram of System
 - Economics of Off Grid
 3. Hybrid Grid Tied System with Battery Backup
 - Simple Diagram of System
 - Benefits of Backup
- Financial Incentives
- A Look at Energy Efficiency (LED's, Efficient Appliances, Smart Practices)

Application of Solar Electric Systems

Motivations for Going Solar

- Environmental Impact
- Economical Savings
- Convenience
- Reliability
- Sole Power Supply Option



Application of Solar Electric Systems

Solar Industry in Alaska

- Recreational Use (Cabin, RV, Marine, etc)
- Residential Home
- Commercial Buildings
- State / Federal Projects
- Village / Utility Power

Application of Solar Electric Systems

System Configurations for Going Solar

– Grid Tied Systems



– Off Grid Cabin or Home



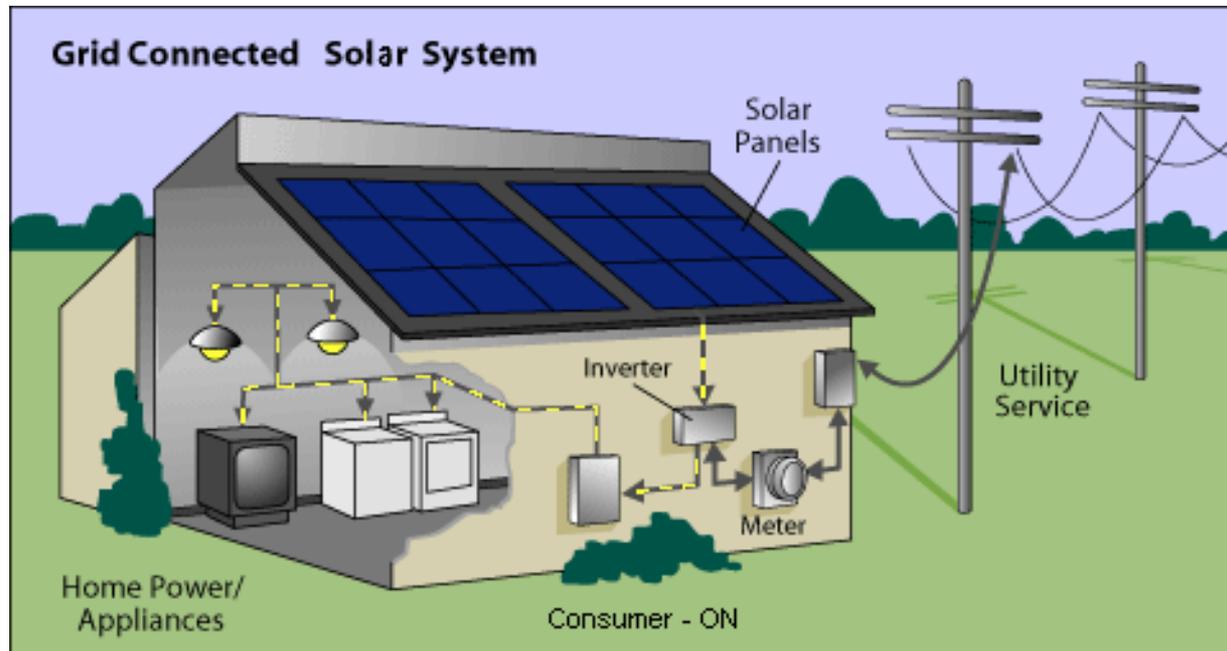
– Hybrid Grid Tied with Battery Backup



Application of Solar Electric Systems

System Configurations for Going Solar

Grid Tied Systems



This type of connection is the Quickest, Easiest, Cheapest option

Low to no maintenance, with the lowest initial cost

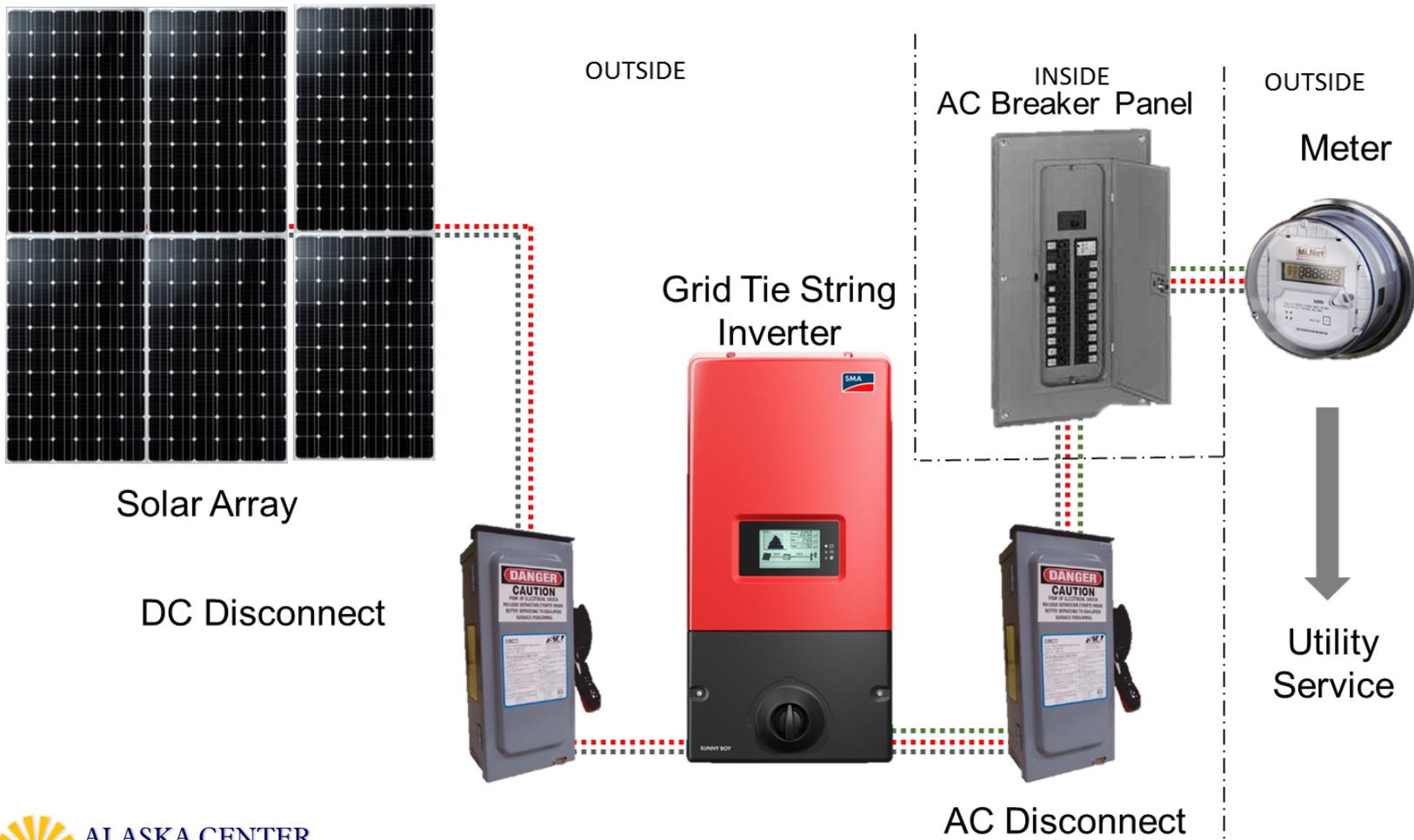
Completely expandable, a system can be added on without having to replace any components

There is no need for a battery, the utility grid acts as your battery.

Unfortunately, if power goes out, your system does too

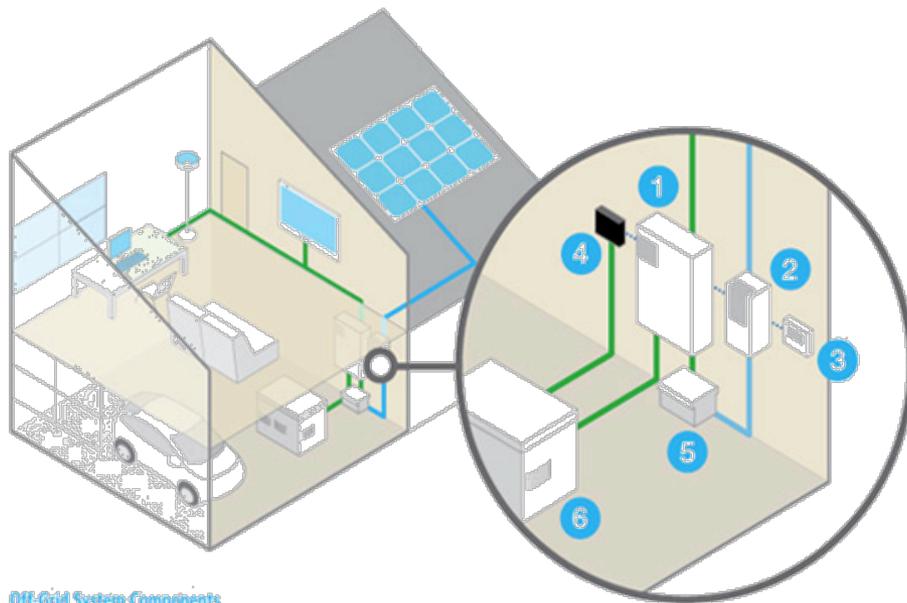
Application of Solar Electric Systems

System Configurations for Going Solar Grid Tied Systems



Application of Solar Electric Systems

System Configurations for Going Solar Off Grid / Cabin Systems



Off-Grid System Components

1. Solar PV Inverter/Charger
2. MPPT Solar Charge Controller
3. Battery Bank
4. Automatic Generator Start (AGS)
5. Battery Bank
6. Generator

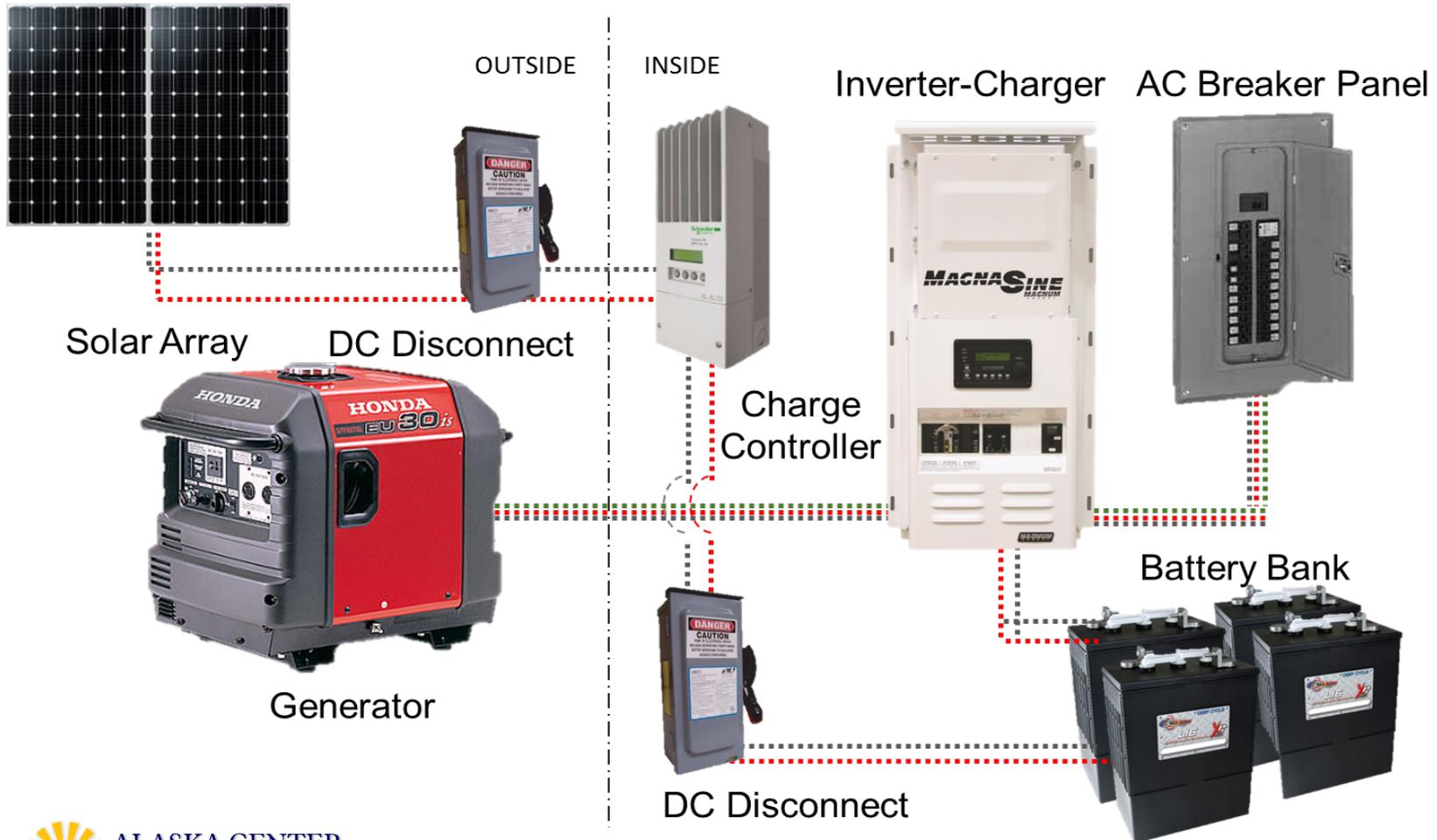
Ideal for locations not currently connected to the utility grid

Can offer the greatest pay back, if the system is 100% on generator production

Relies heavily on batteries. This system balances production-storage-and consumption

Application of Solar Electric Systems

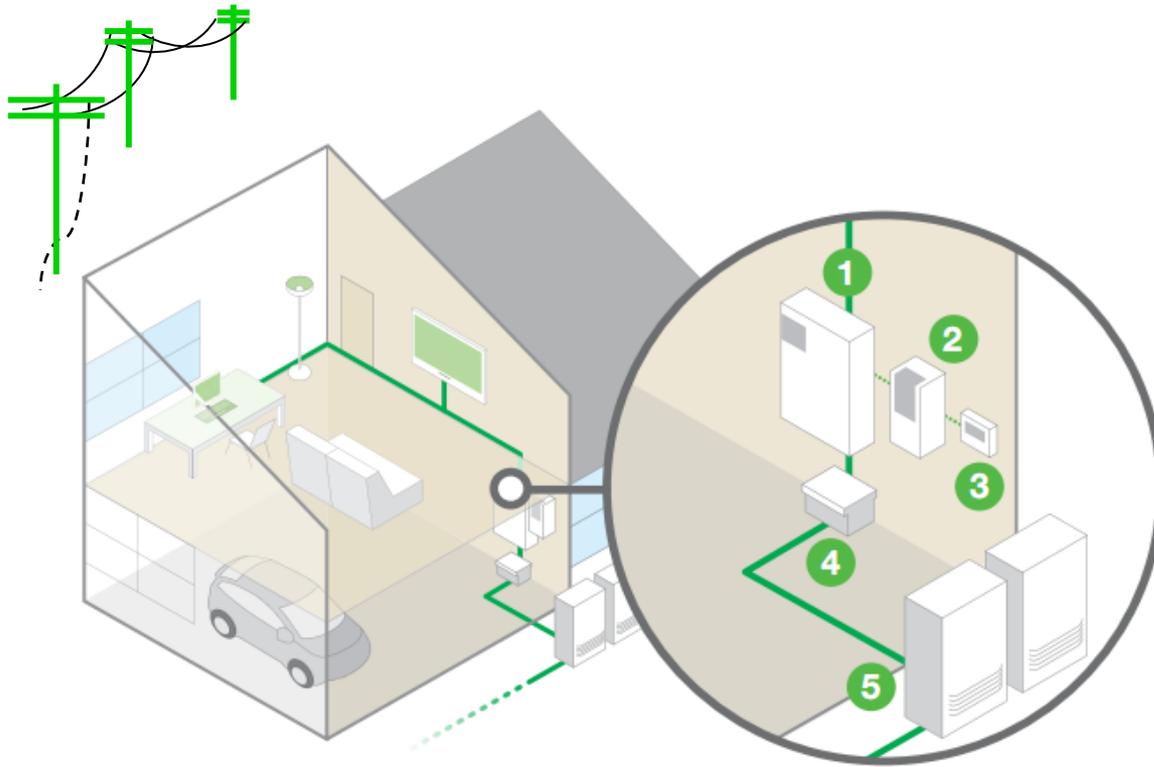
System Configurations for Going Solar Off Grid / Cabin Systems



Application of Solar Electric Systems

System Configurations for Going Solar

Hybrid System- Grid Tie with Battery Backup



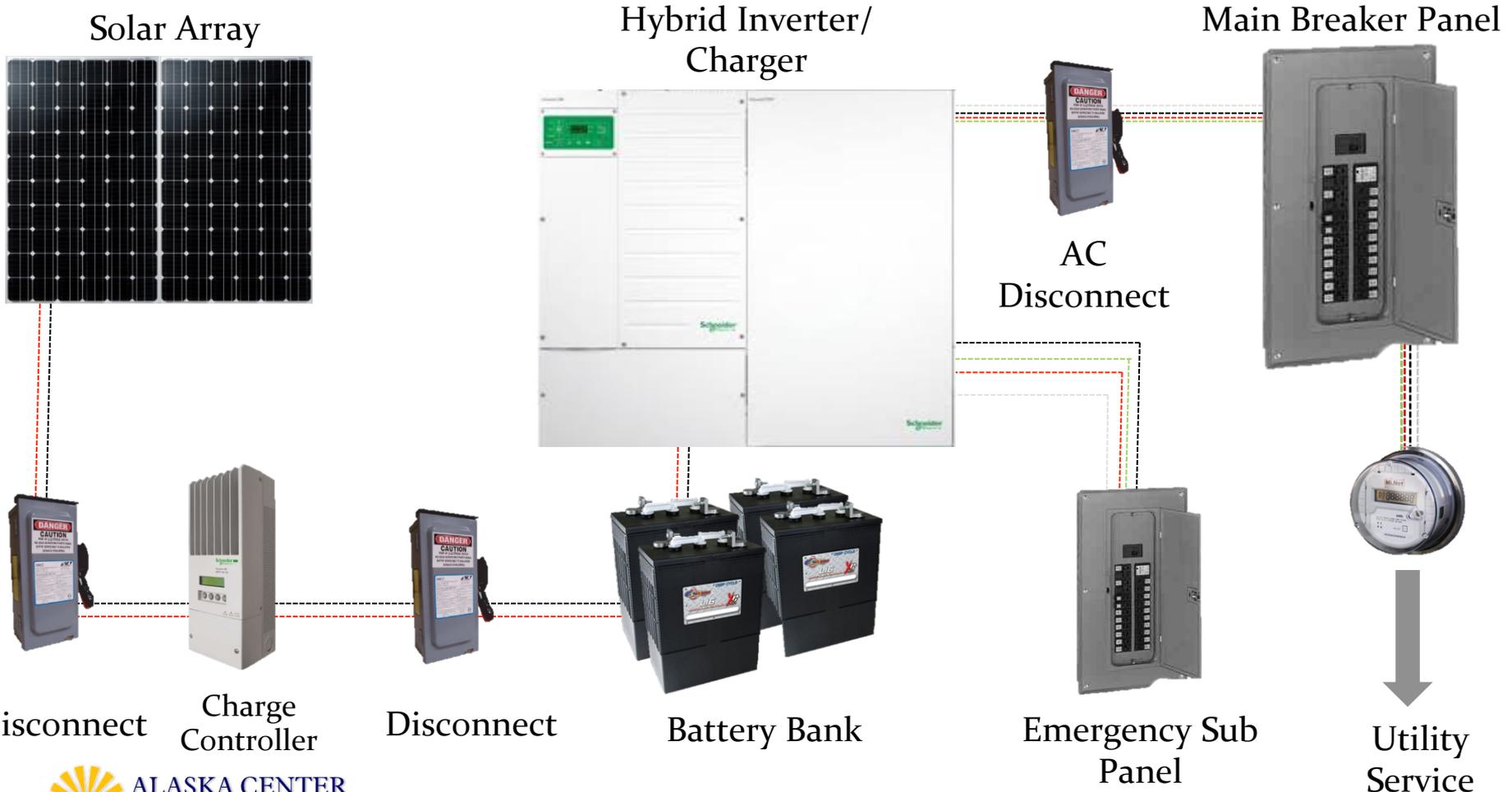
Ideal for locations when the power is down frequently and for long periods of time

Adds a lot of complexity to the system, but also offers reliability

It is not the most cost effective solution, so you have to ask yourself “Is it Worth It?”

Application of Solar Electric Systems

System Configurations for Going Solar Hybrid System- Grid Tie with Battery Backup



Application of Solar Electric Systems

Financial Incentives



Application of Solar Electric Systems

A Look at Energy Efficiency

Consumption \implies Energy Efficiency

The process of consuming energy. In order to cut down the need for production, it is often necessary to come up with a more energy efficient option. This is where the power goes.

Use Efficient Loads: LED's, Appliances

Reducing Wasted Energy: Phantom Loads, Timers

Power down system when not in use