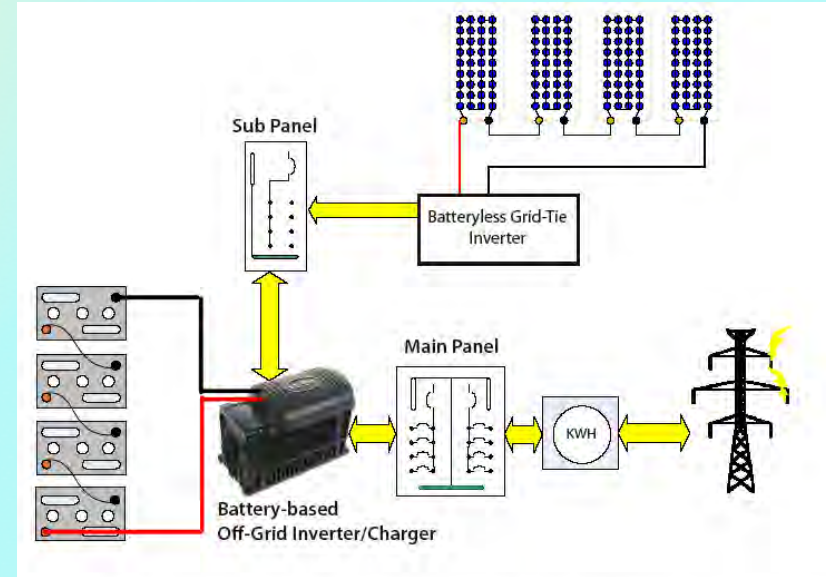


# Solar Electric System Design



Presented for the 2015 Energy Design  
Conference & Expo

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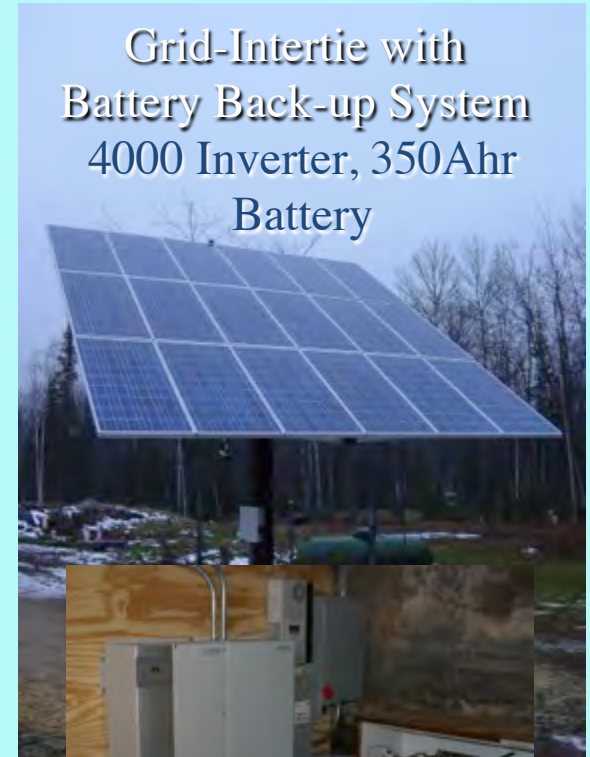


# System Designs Define the Major Markets

Hartley Nature Center, Duluth Minnesota



Grid-Intertie with Battery Back-up System  
4000 Inverter, 350Ahr Battery



SunDance Homestead  
Off-Grid Battery Based Stand Alone System

2400 watt PV Array, 5.5Kw Inverter, 1050Ahr Battery





# Off-Grid Battery Based Stand Alone System Designs are where the industry started..



**SunDance Homestead, Upper Peninsula Michigan  
Off-Grid Battery Based Stand Alone System  
2400 watt PV Array, 5.5Kw Inverter, 1050Ahr Battery**



SunDance Issues: Desire for Clean Electricity  
Very Remote Site  
High cost for utility line extension



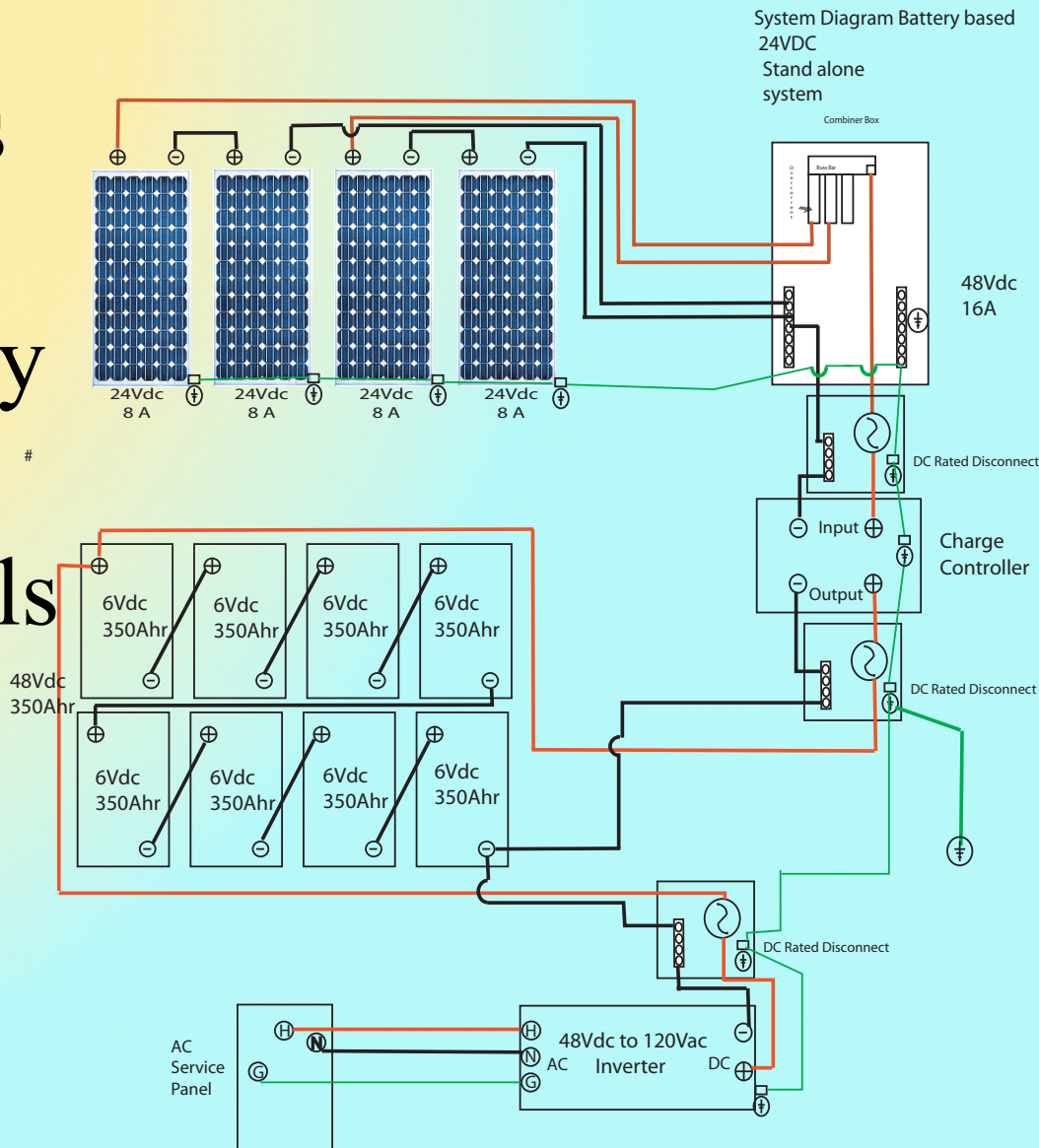


# Off-Grid Battery Based Stand Alone System Designs require more equipment and maintenance...



OutBack's Flexware package provides stand alone battery based off-grid capacity with the ability to grid-intertie when desired

These systems include Their PV Array Disconnects Charge controls Batteries and Inverters...



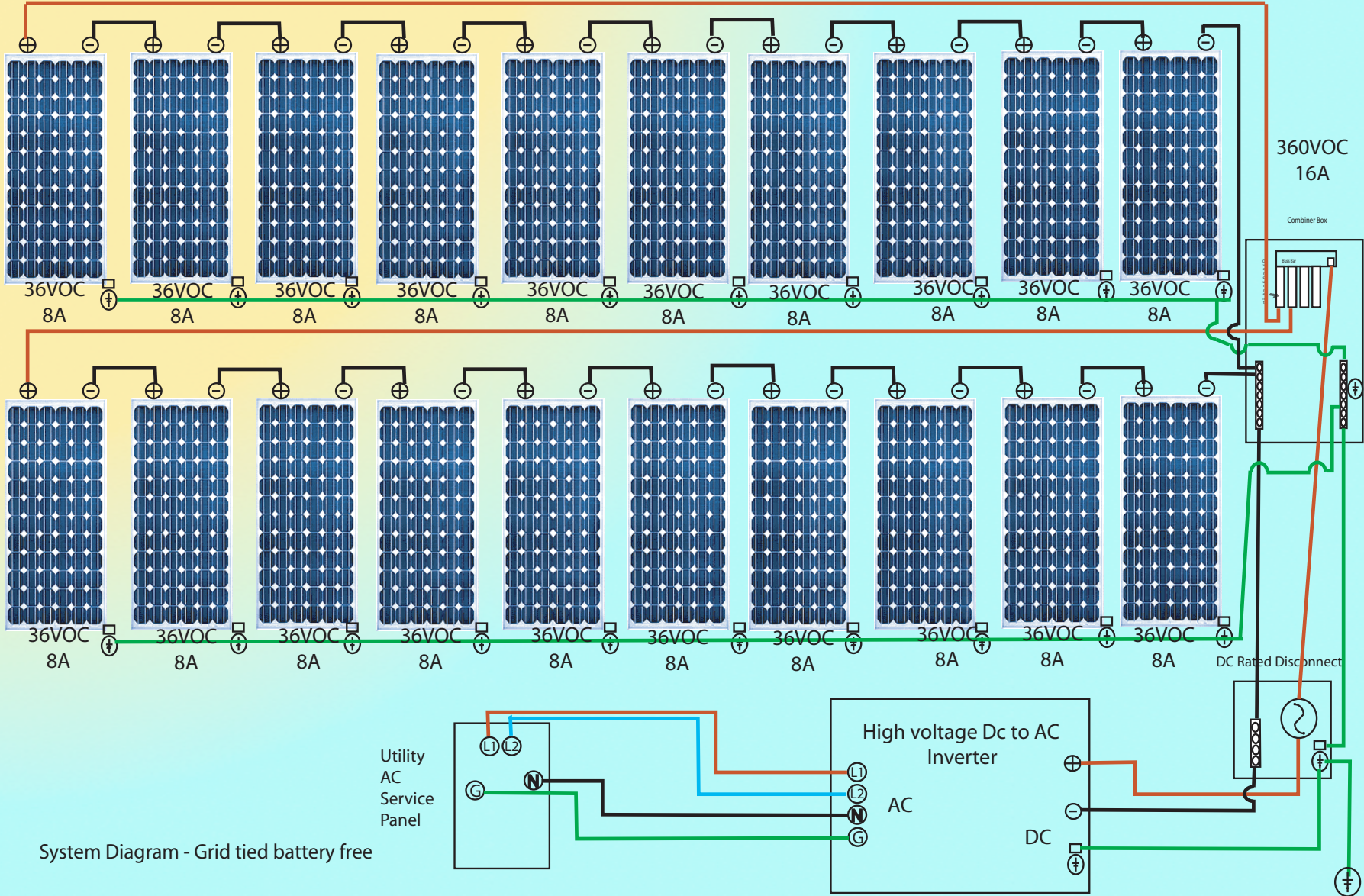


# Grid-Intertied Battery Free Systems dominate the Photovoltaic (PV) market

Organic Valley goes solar with 3 - 2.8Kw Wattsun Trackers



# Grid tied battery free system designs are simple, elegant and low cost -



System Diagram - Grid tied battery free



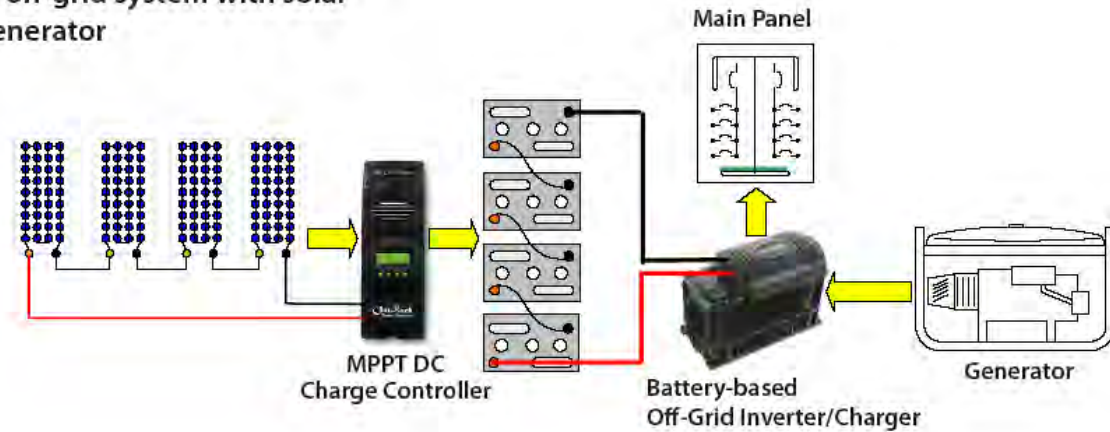
# Grid-Intertie with Battery Back-up Systems are starting to rise in popularity



Xantrex's XW series inverter packages provide good working clearances in disconnect containments...Apollo Solar's T80 charge controller offers standard and High voltage options...

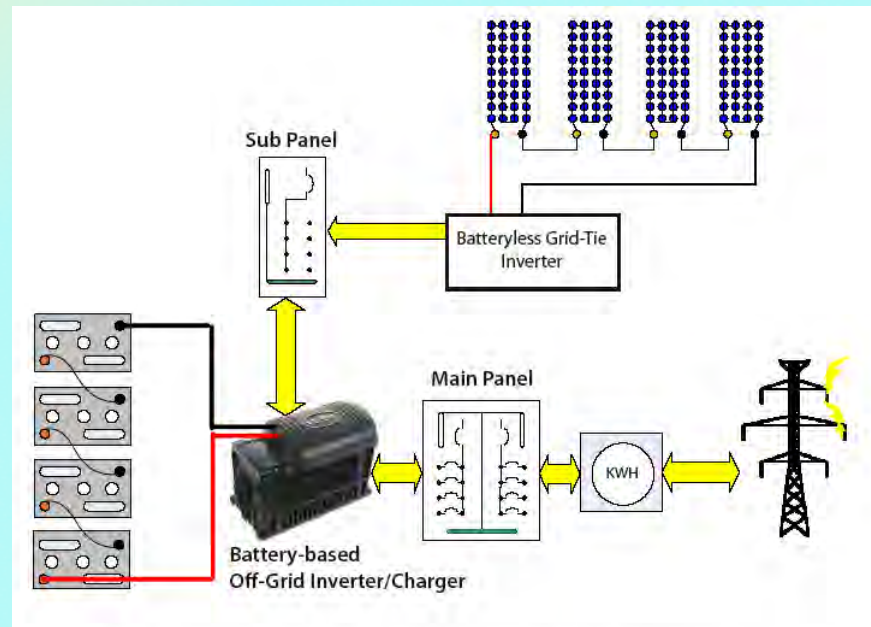
# Two system designs allow for backing-up the grid during power outages-

Basic DC Coupled off-grid system with solar and backup AC generator



DC Coupling -

AC Coupling -

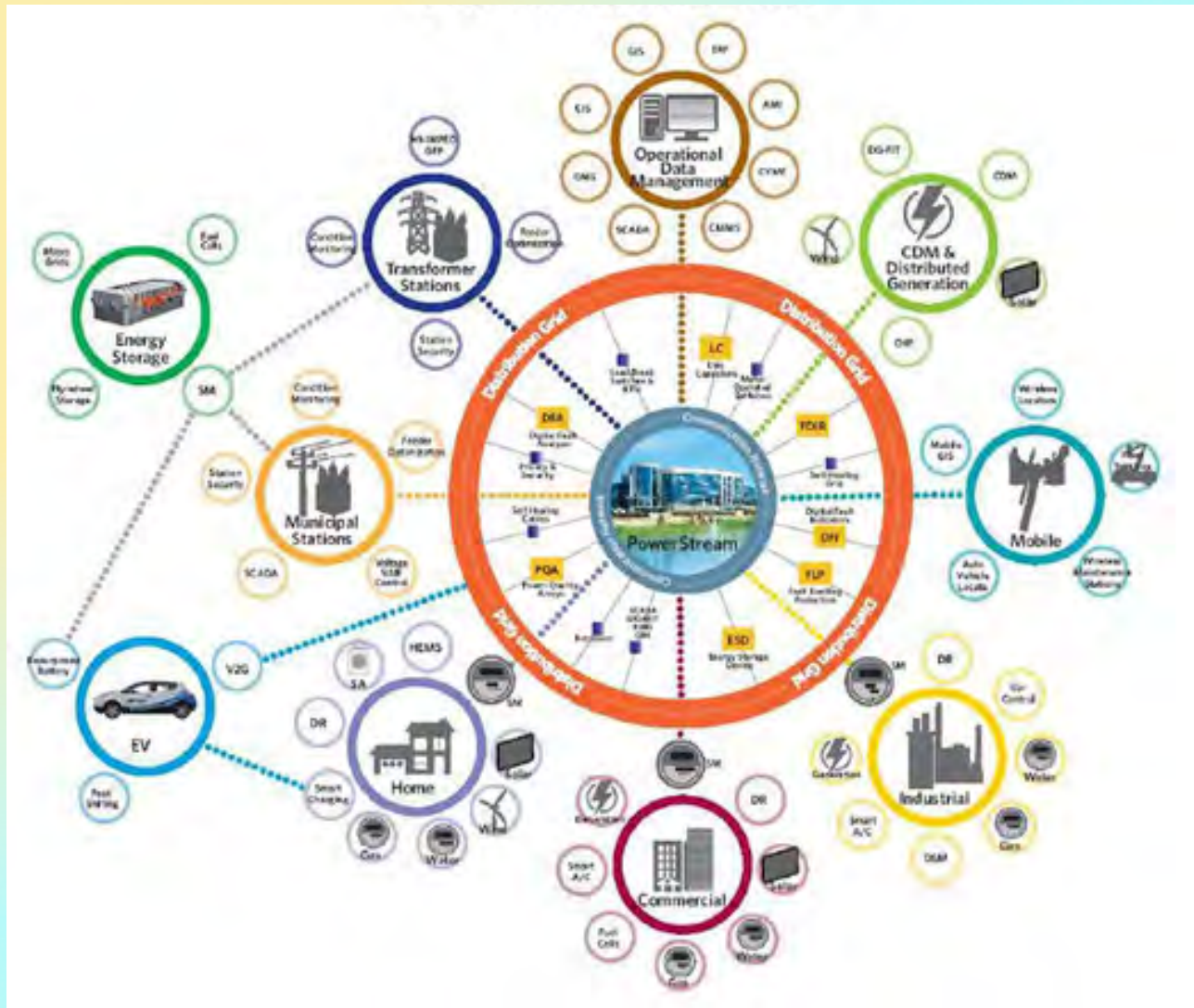




# Portable systems allow for mobility and rapid deployment. . . Kentucky Solar Partnership(KSP) – Portable SunCatcher



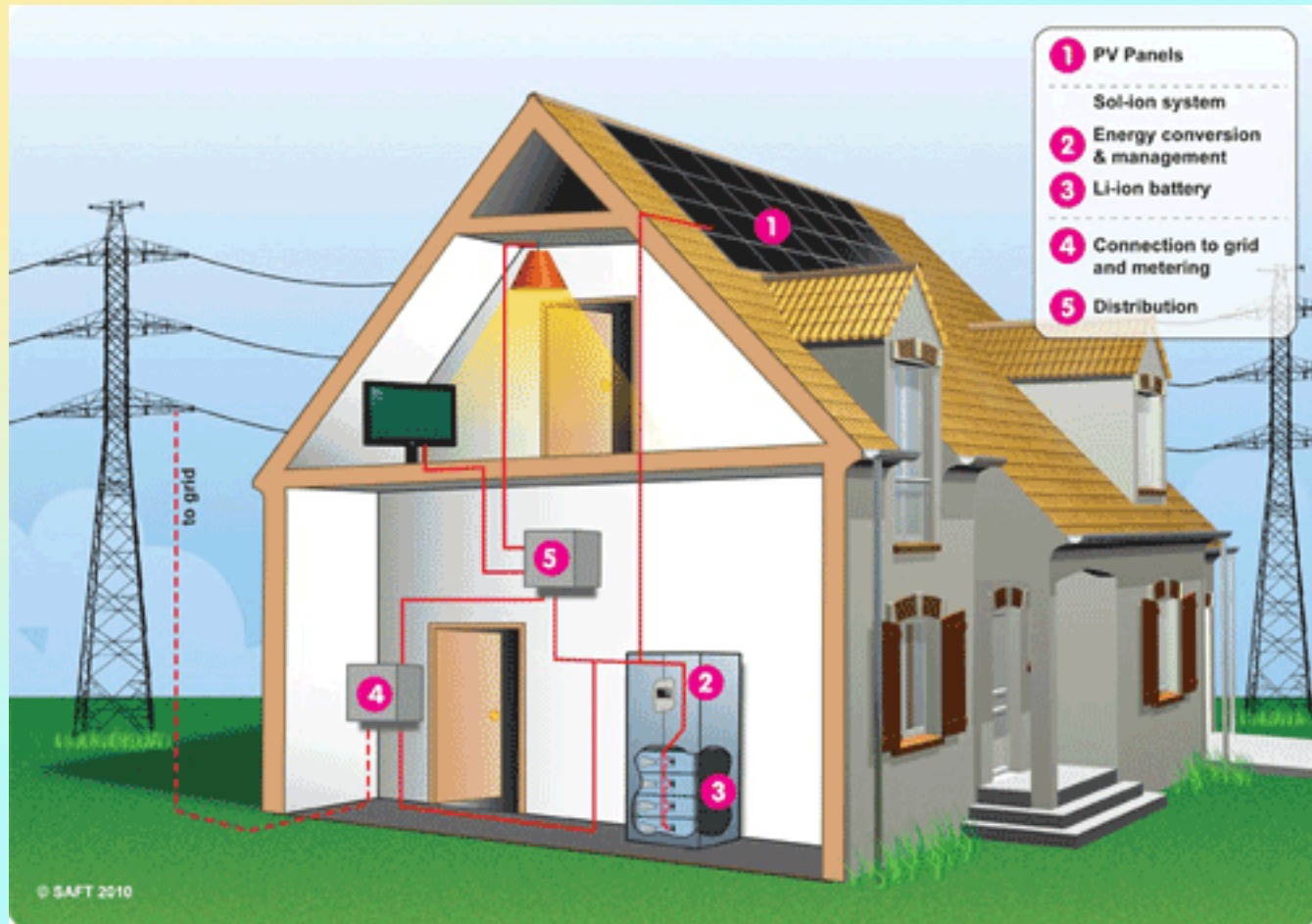
# Smart Grid Designs...



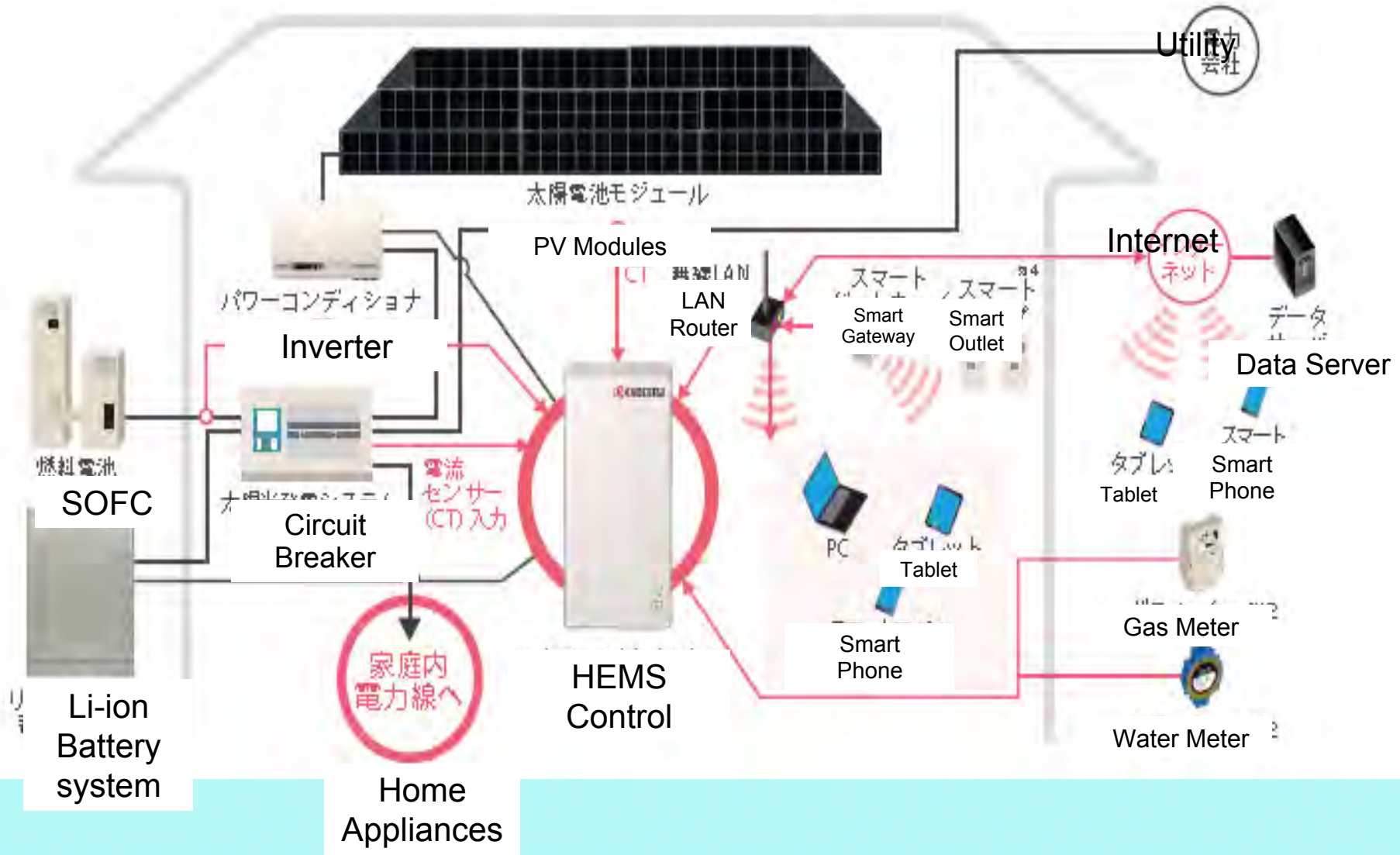
The Planning is underway...



# Smart Grid -Designs have been developed over the last several years...



Today Kyocera is deploying units in Japan as we speak - the value to Home owners is fantastic...





Homeowners get the best cost source and maximization of their production in real time choosing from:

PV Array

Solid Oxide Fuel cell

Li-Ion Battery Storage

Utility Grid Power



# Large Scale Deployments are Current on Either Coast



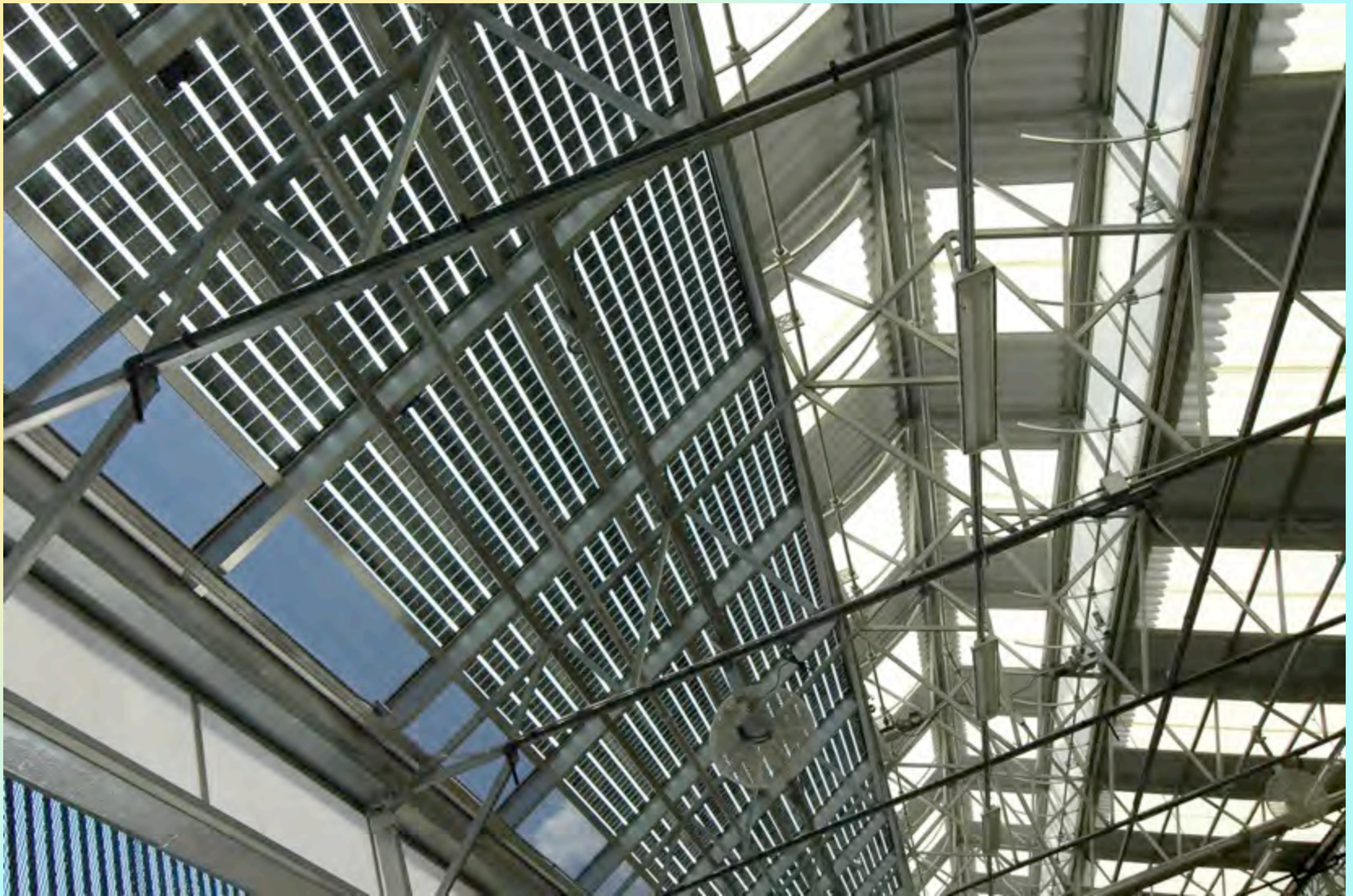
...They are headed to the Mid-west



Building integration is the current  
design Buzz-word for PV...







New Product Lines such as this PV Glazing are changing  
Our Design Palettes...



Building integration designs broaden our commercial applications...



This PV Sky-light helps to power a Wal-Mart in McKinney Texas

# Questions?

Thank you for your interest in Solar Energy!





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