PV in 2025

Chris McArthur
Strategic Account Manager – New Zealand and Pacific Islands
April 2016

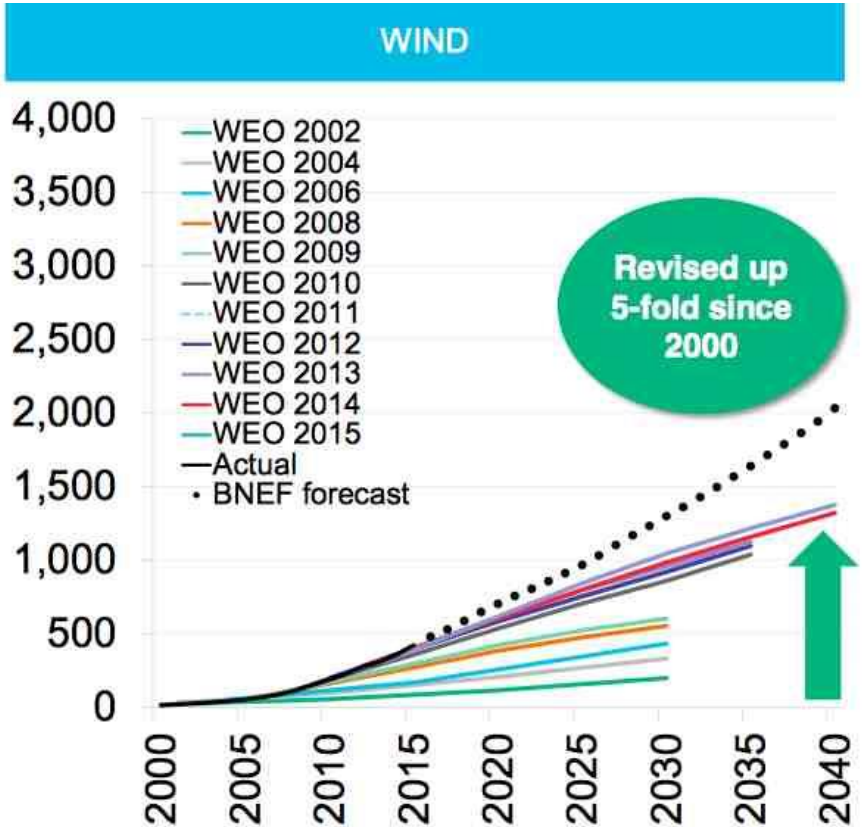
Enphase Leading the Way

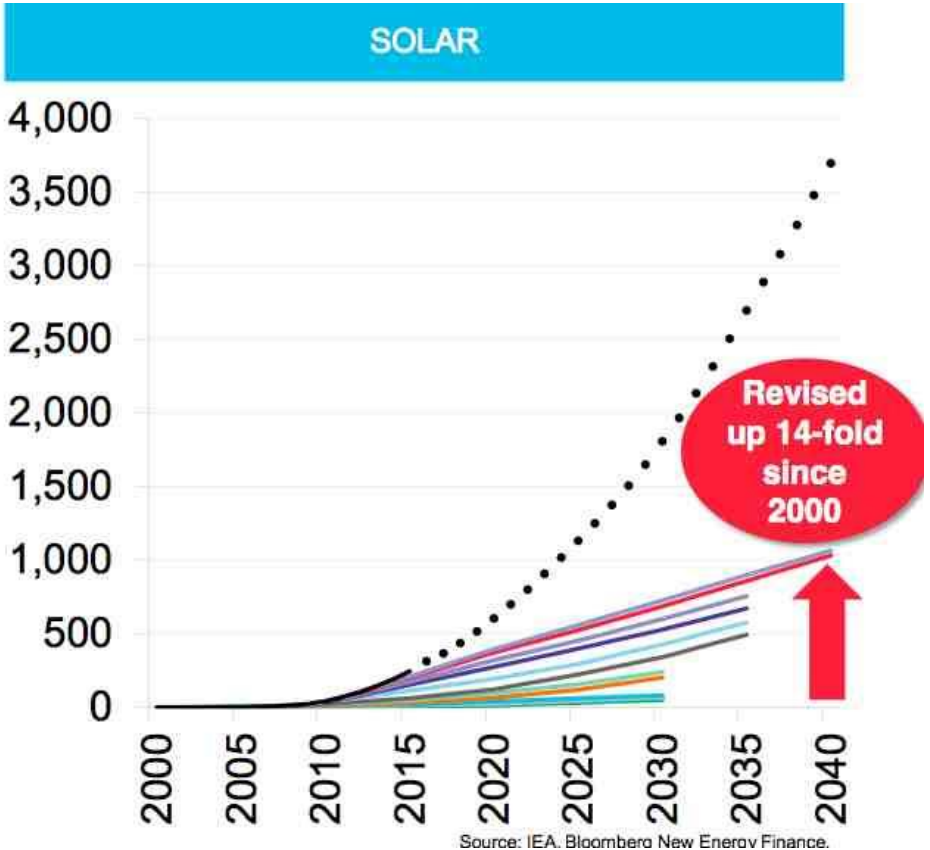
- Established 2006, first commercial shipments 2008
- Headquarters in California, 500+ employees
- Listed on NASDAQ: ENPH
- More than 10.3 million units shipped, representing over 2.5GW
- Shipping fifth-generation microinverter system
- Enphase Home Energy Solution and Enphase Storage System announced
- 141 active patent families
- World-class team from leading technology companies
- Revenue in 2015: $357.2 million
- Largest office outside the US is in Christchurch

ENPHASE.

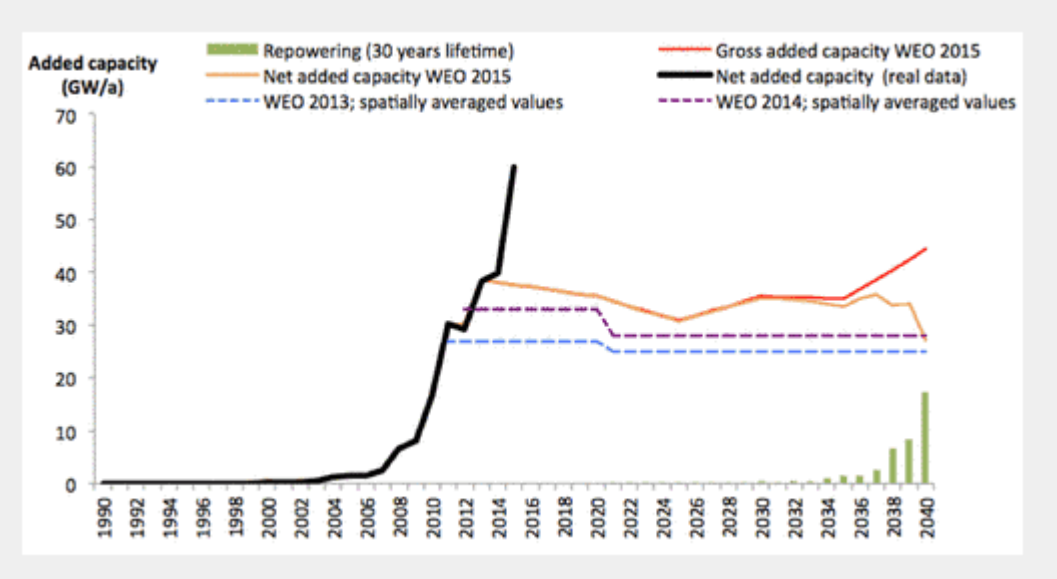
"It's hard to make predictions - especially about the future."
Allan Lamport, former Toronto Mayor.

ENPHASE.


WIND
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2000
2005
2010
2015
2020
2025
2030
2035
2040
WEO 2002
WEO 2004
WEO 2006
WEO 2008
WEO 2009
WEO 2010
WEO 2011
WEO 2012
WEO 2013
WEO 2014
WEO 2015
Actual
BNEF forecast
Revised up 5-fold since 2000


SOLAR
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2000
2005
2010
2015
2020
2025
2030
2035
2040
Revised up 14-fold since 2000
Source: IEA, Bloomberg New Energy Finance.

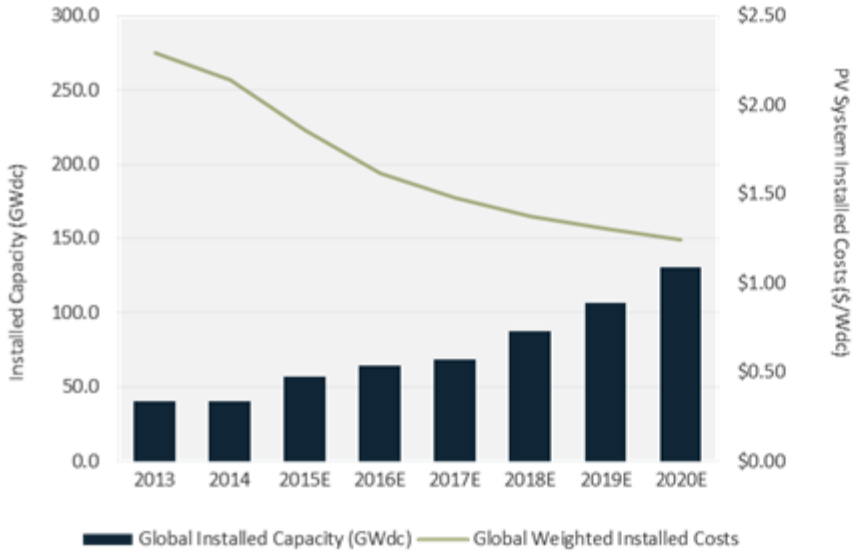
ENPHASE.



 |

ENPHASE.

FIGURE: Global Installed Capacity and Average PV System Installed Costs, 2013-2020E

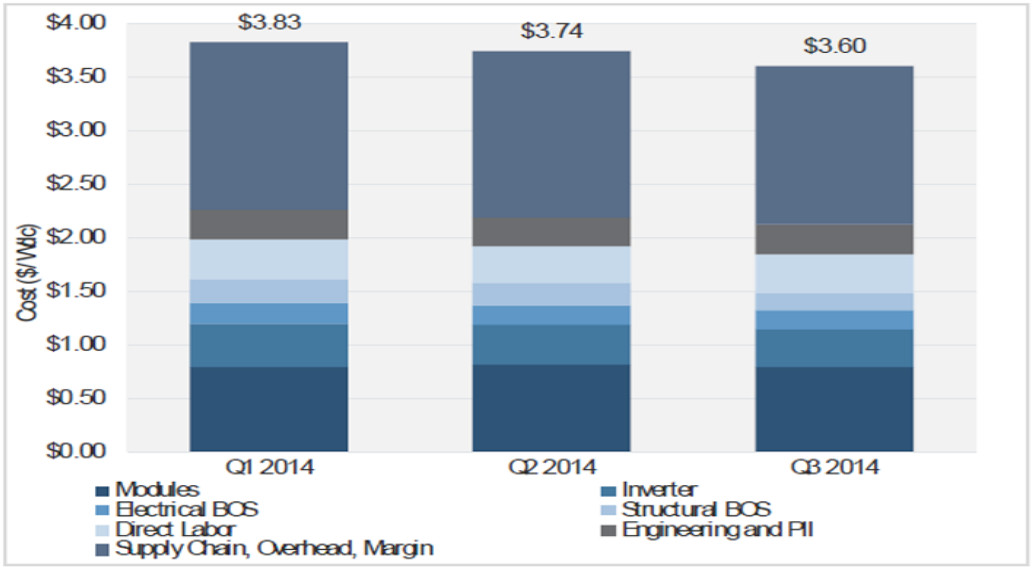


Source: GTM Research's PV Balance of Systems 2015

 |

ENPHASE.

Figure 2.5 Modeled Residential Turnkey Rooftop PV System Pricing With Cost Breakdown, Q1 2014-Q3 2014



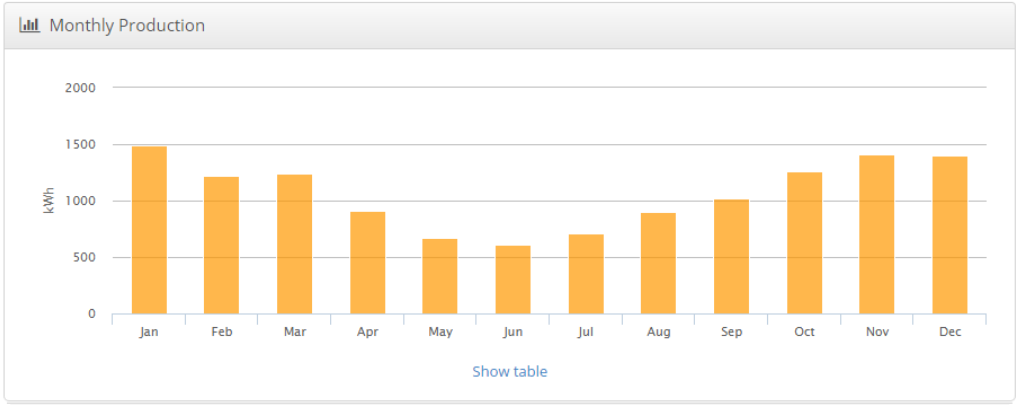
Note: Assumes a 5-10 kW_{dc} rooftop system, standard crystalline silicon modules, blended string and microinverters average inverter loading ratio (ILR) of 1.15.

GTM RESEARCH

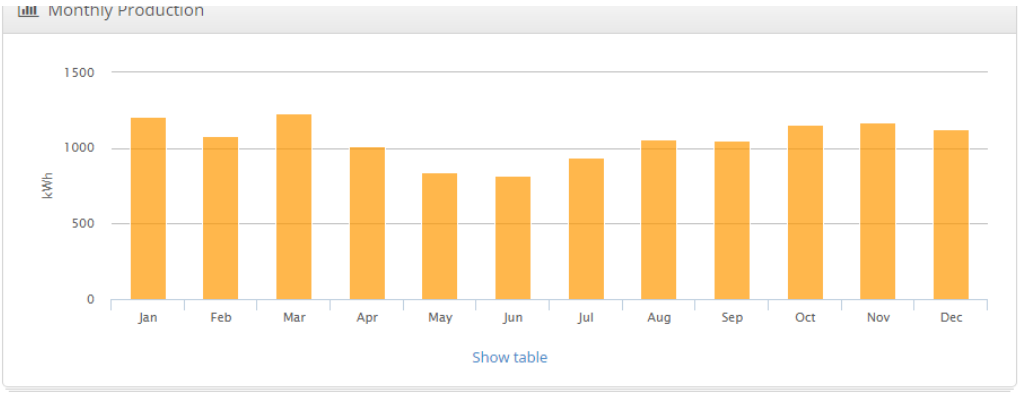
40 YEARS SEIA Solar Energy Industries Association®

ENPHASE.

A 10 kW array in Hamilton

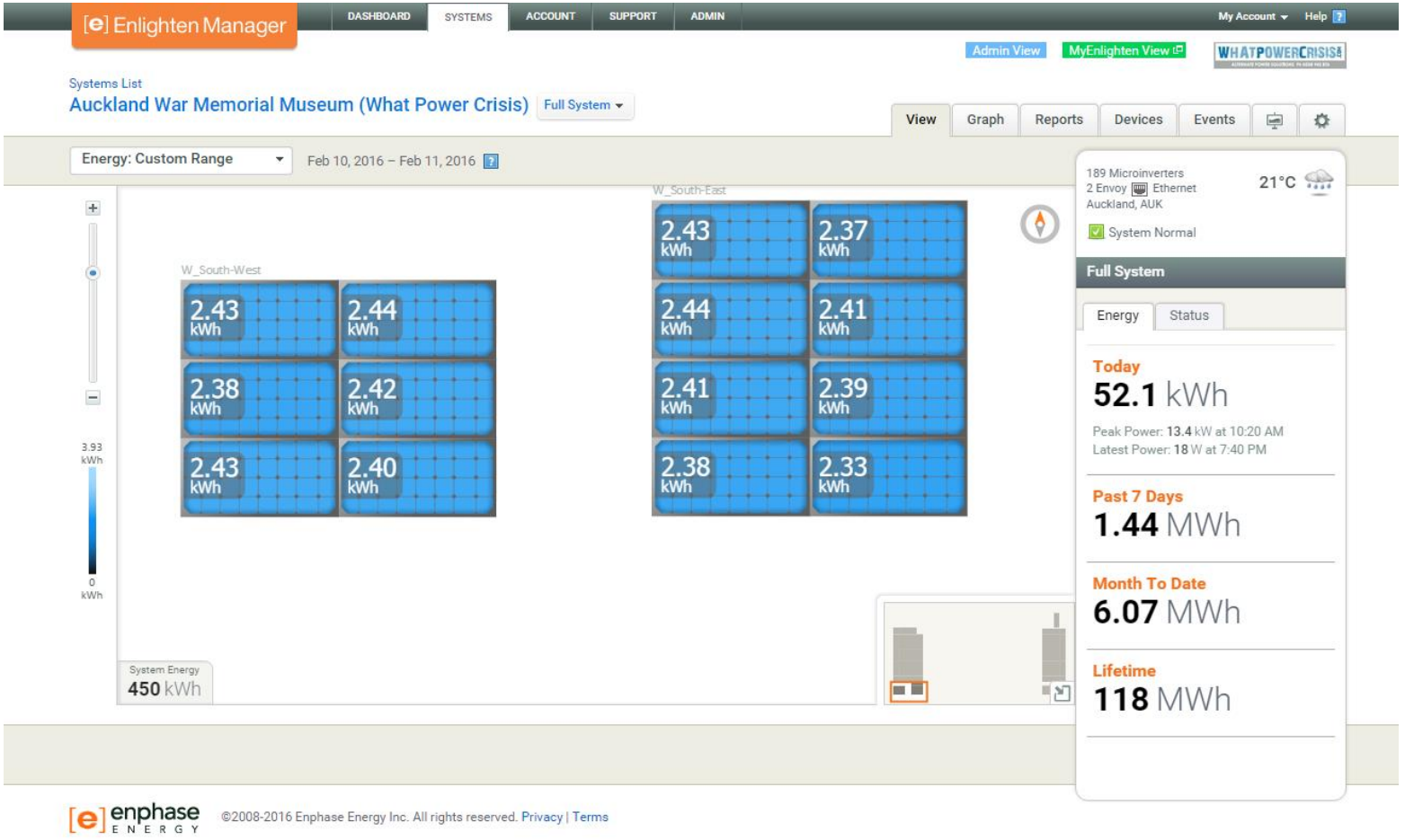


15° tilt
12,838 kWh/yr

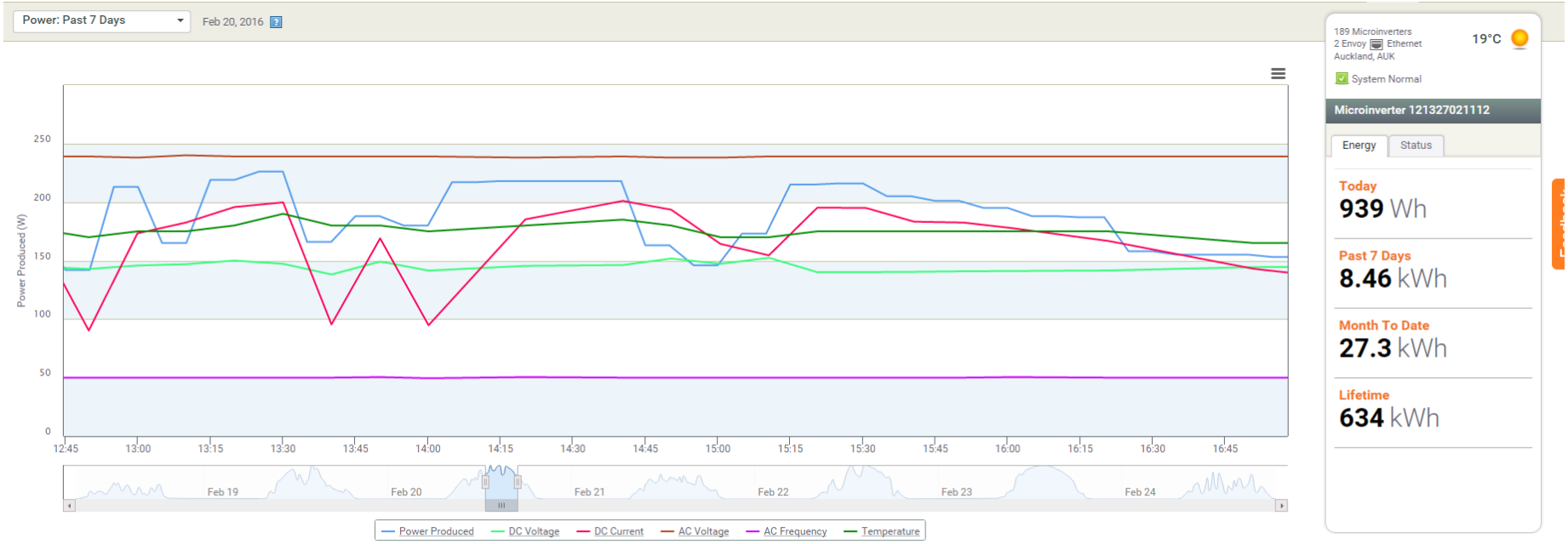


55° tilt
12,684 kWh/yr

ENPHASE.


[e] Enlighten Manager
DASHBOARD
SYSTEMS
ACCOUNT
SUPPORT
ADMIN
My Account
Help
Admin View
MyEnlighten View
WHATPOWERCRISIS?
Systems List
Auckland War Memorial Museum (What Power Crisis)
Full System
View
Graph
Reports
Devices
Events
Energy: Custom Range
Feb 10, 2016 – Feb 11, 2016
W_South-West
2.43 kWh
2.44 kWh
2.38 kWh
2.42 kWh
2.43 kWh
2.40 kWh
W_South-East
2.43 kWh
2.37 kWh
2.44 kWh
2.41 kWh
2.41 kWh
2.39 kWh
2.38 kWh
2.33 kWh
3.93 kWh
0 kWh
System Energy
450 kWh
189 Microinverters
2 Envoy Ethernet
Auckland, AUK
21°C
System Normal
Full System
Energy
Status
Today
52.1 kWh
Peak Power: 13.4 kW at 10:20 AM
Latest Power: 18 W at 7:40 PM
Past 7 Days
1.44 MWh
Month To Date
6.07 MWh
Lifetime
118 MWh
[e] enphase ENERGY
©2008-2016 Enphase Energy Inc. All rights reserved. Privacy | Terms

ENPHASE.



Maximum Produced
226 W

ENPHASE.

Adaptability example – Voltage ride through settings change

- **Background**
  - KIUC and HECO requested extended trip-point settings to accommodate grid instability
- **Solution**
  - Custom settings with extended ranges
  - Automated updating process to push settings to field
- **Result**
  - ~800,000 units updated in a day
  - No service technician deployments required

Enphase Energy and Hawaiian Electric Collaborate to Improve Stability of the Grid

Enphase's software-defined microinverters and remote upgrade capability save tens of millions of dollars in potential upgrade costs

Enphase Energy
February 03, 2015

Print Email Share 0 LinkedIn 0
Facebook 0 Like 1 Tweet 1

Enphase Energy has successfully upgraded the operating behavior of approximately 800,000 of its smart microinverters installed in Hawaii, better integrating the PV systems into Hawaii's changing island grids. This unprecedented technological accomplishment is a result of ongoing collaboration between Enphase, Hawaiian Electric and other industry partners to find technical solutions for integrating high levels of PV in Hawaii at a low cost to end-customers.

With the highest level of solar PV penetration in the country, Hawaii poses a unique challenge. Over 51,000 customers—12 percent of all residential customers—have rooftop solar. More than 60 percent of these systems are equipped with Enphase microinverter systems. Hawaiian Electric and Enphase have been working closely with other industry partners to determine new frequency and voltage ride-through settings that would allow rooftop solar installations to be more tolerant when a problem occurs on the grid, which in turn helps improve the stability of the overall grid. Because Enphase's microinverters are software-defined, Enphase was able to make these updates remotely and quickly, saving tens of millions of dollars by avoiding the need to send personnel out in the field to update the settings manually.

ENPHASE.

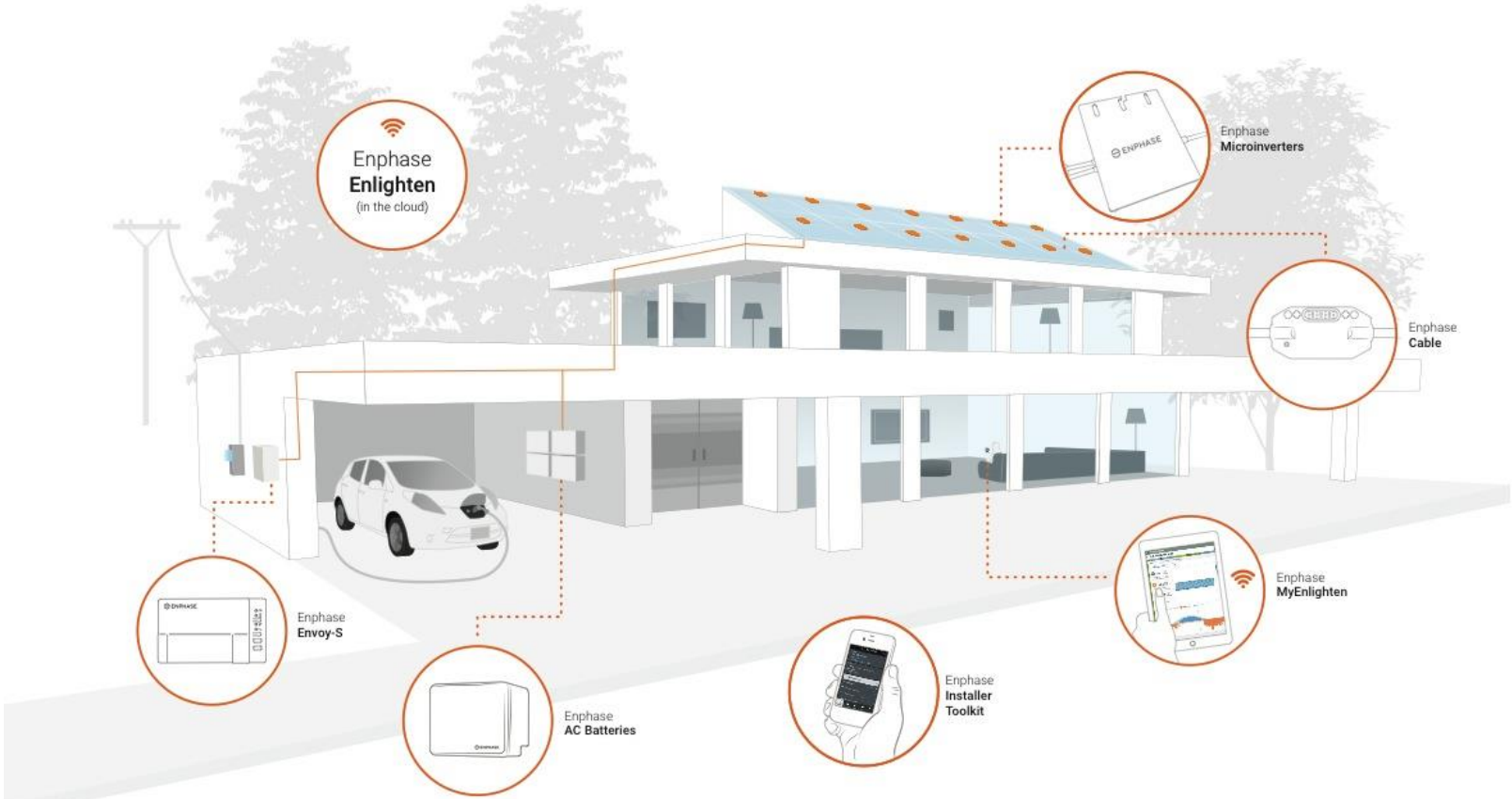
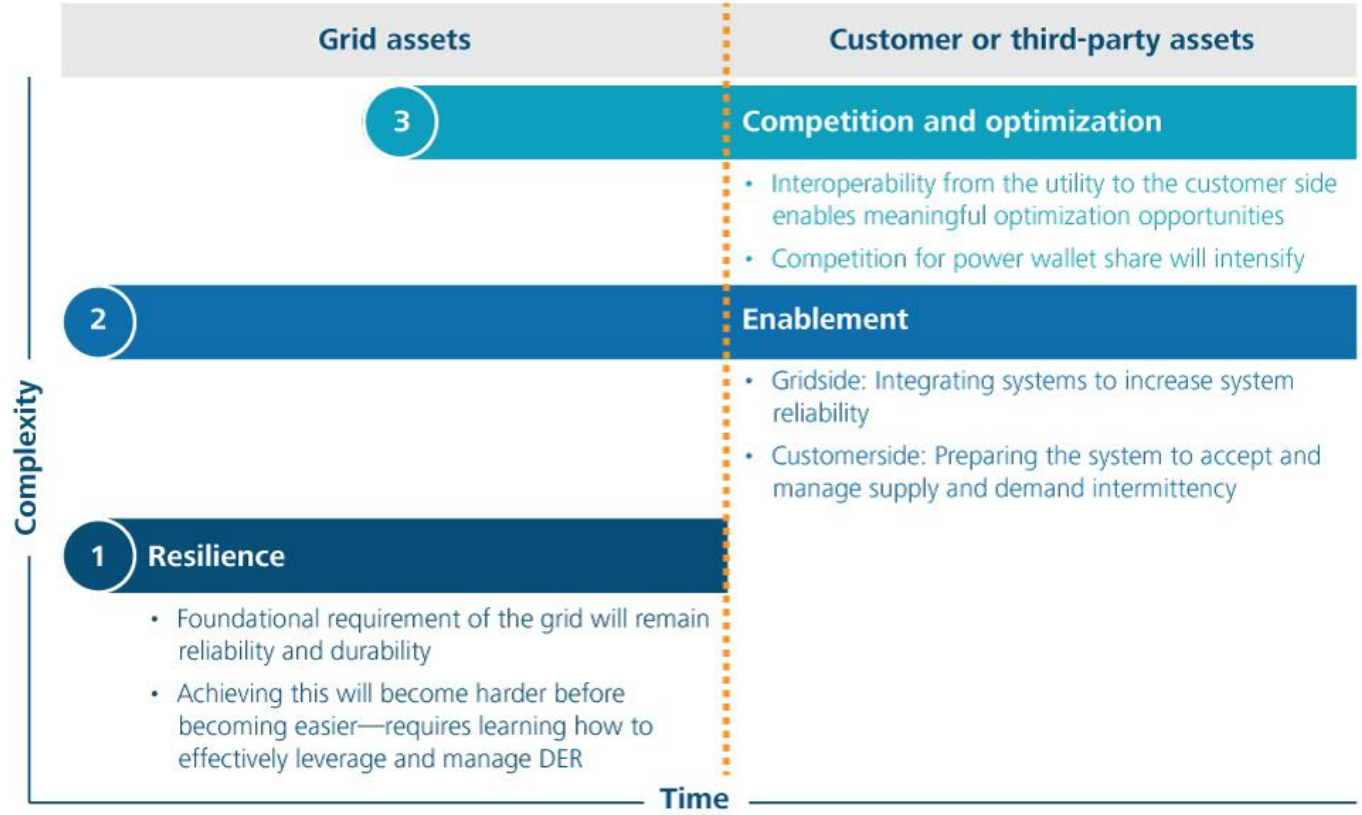

Enphase
Enlighten
(in the cloud)
Enphase
Microinverters
Enphase
Cable
Enphase
MyEnlighten
Enphase
Envoy-S
Enphase
AC Batteries
Enphase
Installer
Toolkit

Figure 2. The three phases of grid modernization



Graphic: Deloitte University Press | DUPress.com

ENPHASE.


ENPHASE.