

The Slow Pace of Fast Change

The Future of Energy Systems

Designed for



Designed by

Garry Golden

Forward Elements Inc

PDF Copy:

garrygolden.com/Nov9

Start

End



***Warm ups
Foresight 101***



Transitions Ahead

drigo

Scanning Tool



Discussion

Warm up



“That’s Great”

Person 1: (Delivers bad news)

Person 2: “That’s great, positive response”

Person 1: “That’s great, we can also do xyz

Person 2: “That’s great, we can do...”



“That’s Great”

Executives at GM

Person 1: NYC banning human driven cars by 2030

Person 2: “That’s great, we can make money managing self-driving car fleets”

Person 1: “That’s great, we can make money per mile, not per vehicle sold. Our customer is New York City.

Person 2: “That’s great, we can reduce manufacturing footprint and inventory”

“That’s Great”



Find a Partner

Person 1: (Delivers bad news)

Person 2: “That’s great, positive response”

Person 1: “That’s great, we can also do xyz

Person 2: “That’s great, we can do...”

Possible Bad News..

Microgrid

Nebraska passes Retail Choice Bill.

Amazon is going to handle our Billing and Collection through Alexa.

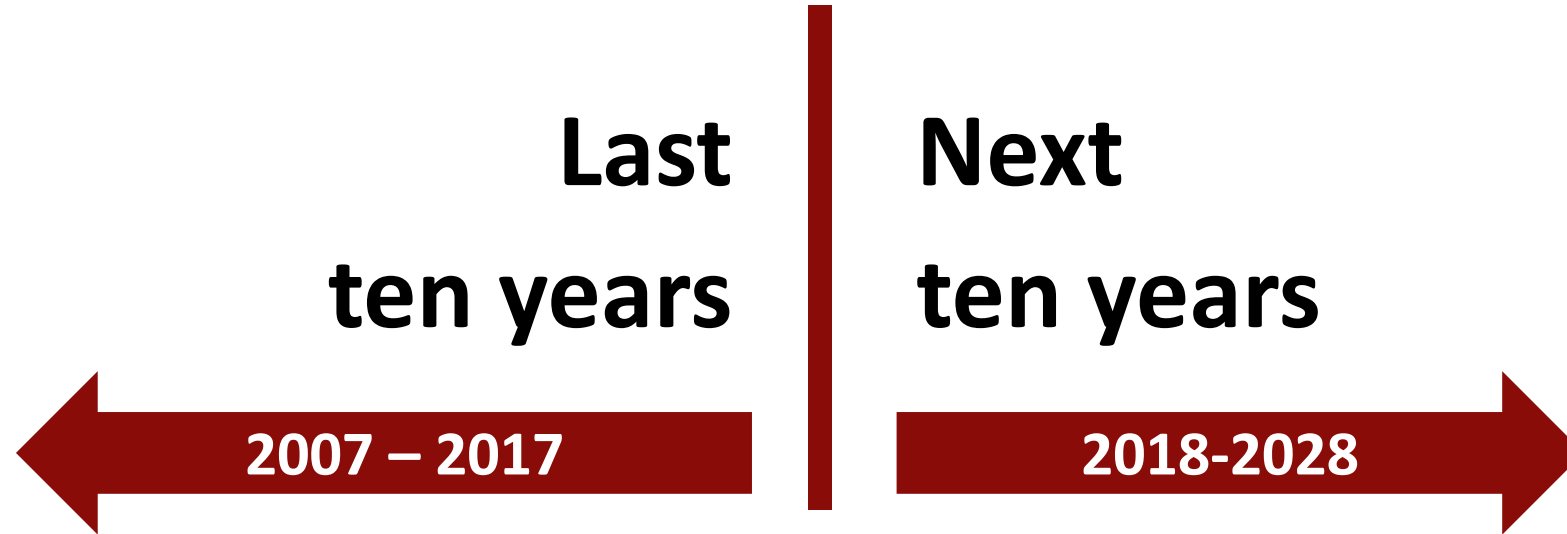
Nebraska is banning Combustion Engine Vehicles in 2040. EVs will be connected to grid.



“That’s Great”

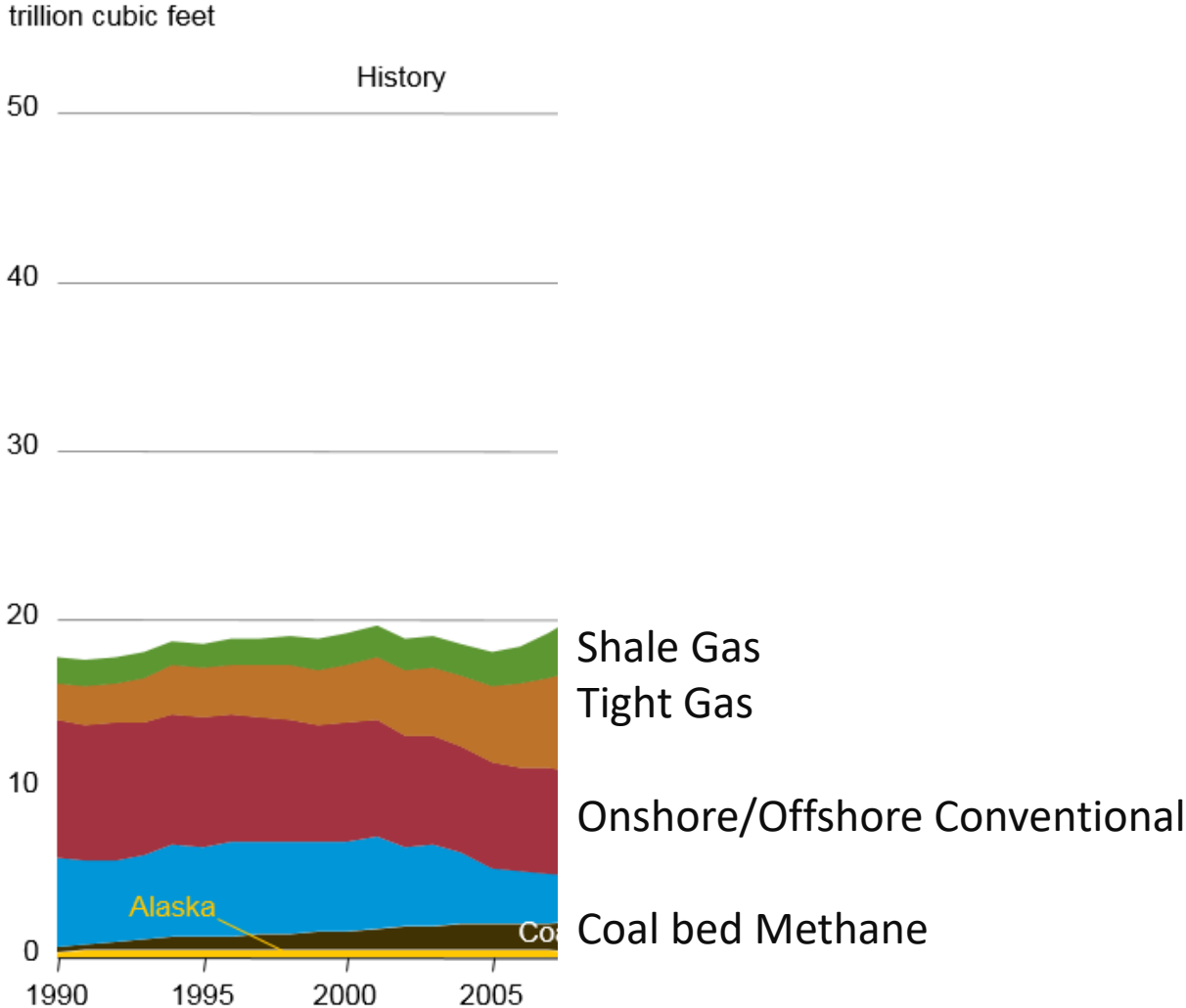
- Fun, high energy
- Builds mental muscles for positive reactions
- Borrows from ‘Improv’ Innovation
 - Yes, and
 - Make Your Partner Look Good
 - Tell a Story with Motivations
- Dynamic: You can come with pre-set starters or let them make it up

More or Less Change Ahead?

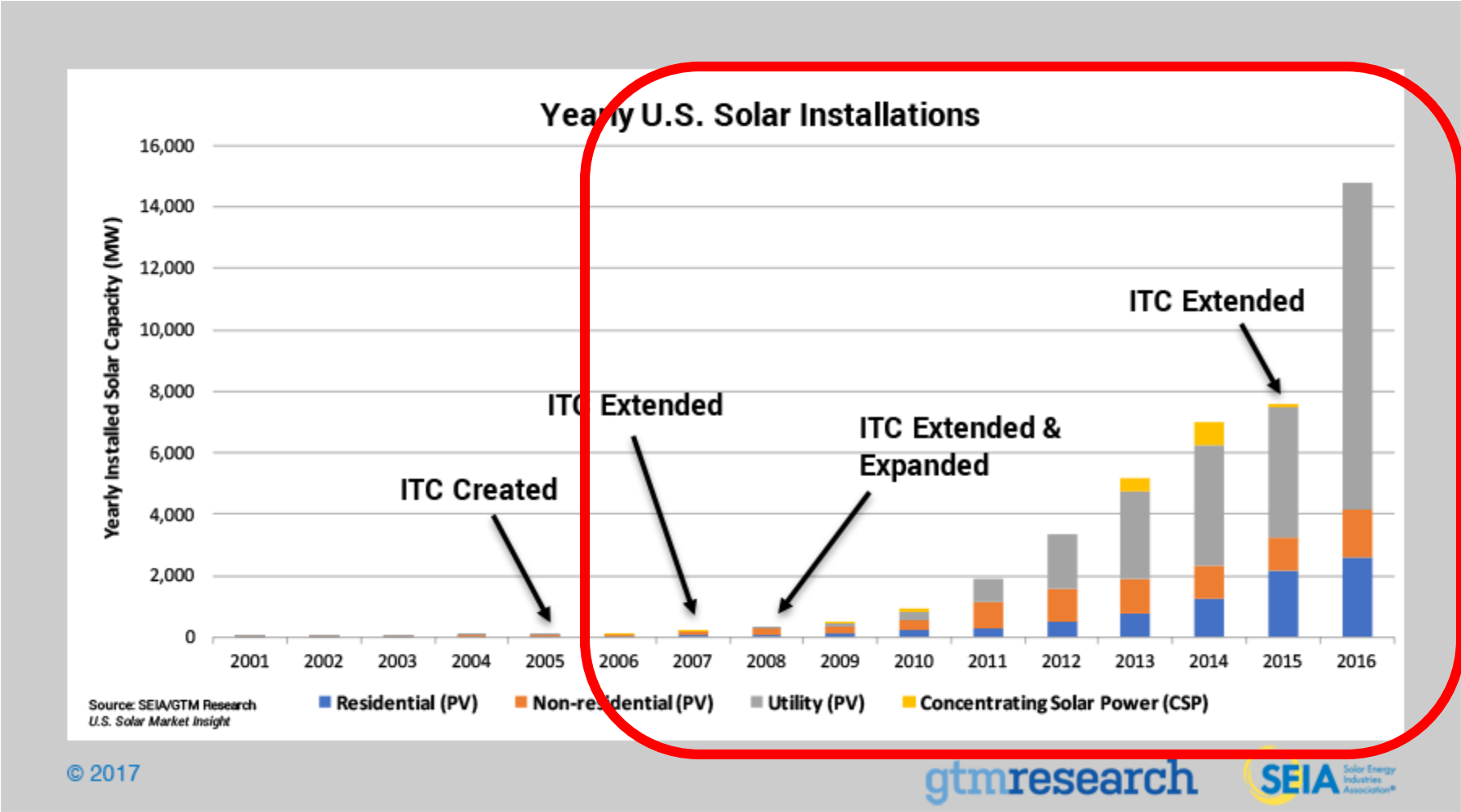


Fuel Source Uncertainties

Figure MT-46. U.S. dry natural gas production by source in the Reference case, 1990–2040



Policy Uncertainties



'Player' Uncertainties

TESLA



Alphabet

Bloomberg

Microsoft Is Getting Hungry
for Fuel Cells

By Anna Hirtenstein
October 31, 2017, 1:00 AM EDT

'Technology Breakthrough' Uncertainties

One week battery life on an iPhone 6? It's possible

POSTED 1:49 PM, AUGUST 28, 2015, BY CNN WIRE



What if residents bought fuels to power homes off a retail shelf?

An Apple iPhone and a quadcopter, both retrofitted with hydrogen fuel cell batteries, and a hydrogen fuel cell are displayed by Intelligent Energy at ShowStoppers. Photo by Ann Singer.

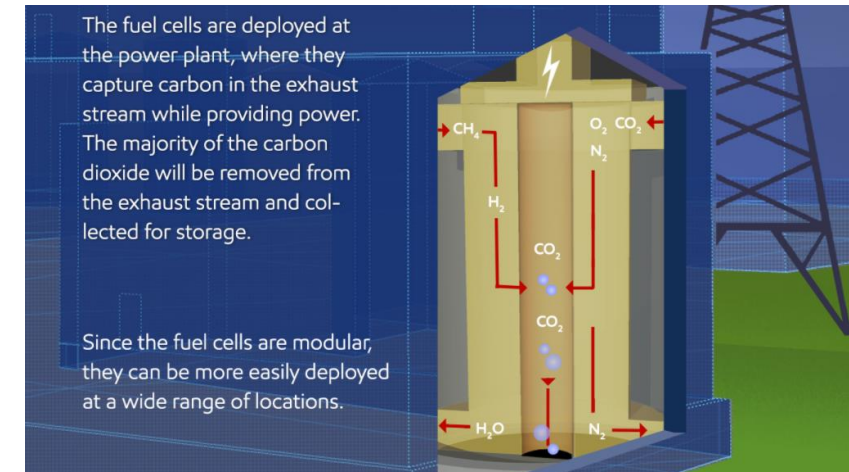
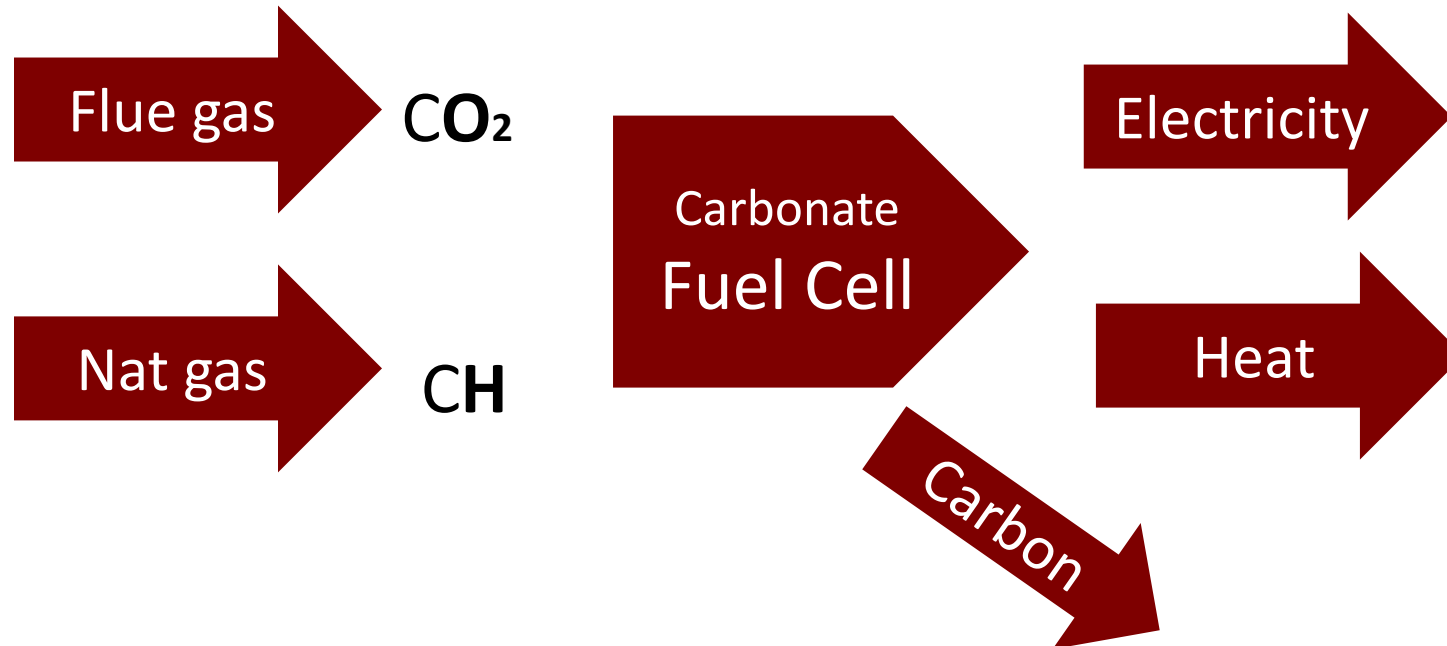


'Technology Breakthrough' Uncertainties

Could Coal see a comeback?

Coal plant – no CO₂ capture	500 MW	.06 (\$/kWh)
90% amine capture	400 MW	.11 (\$/kWh)
90% CO₂ capture with fuel cell	900 MW	.08 (\$/kWh)
5% CO ₂ capture with fuel cell	522 MW	.06 (\$/kWh)

(Source: Fuelcell Energy & ExxonMobil)



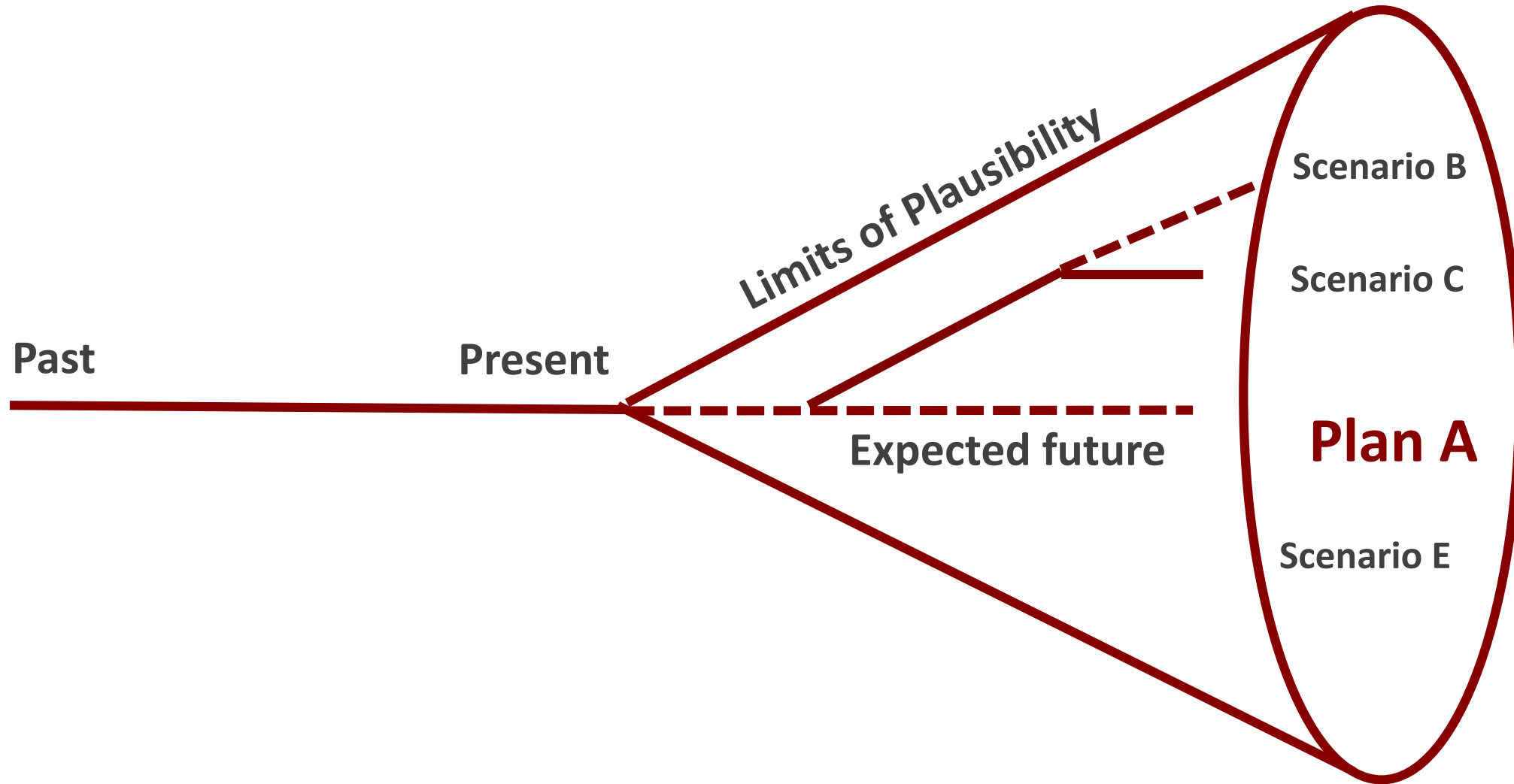


Thinking Like a Futurist?



Foresight 101: Cone of Plausibility

Multiple Outcomes, Multiple Time Horizons



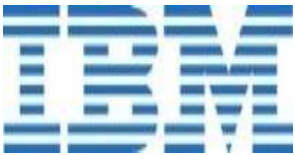
Four Futures Thinking



**Continued
Growth**



**Disciplined
Constrained**



Transformed



**Decline
Collapse**

Foresight Activity:

Write a Story on the Four Futures of LES?

LES

**Continued
Growth**

LES

**Disciplined
Constrained**

LES

Transformed

LES

**Decline
Collapse**

Anticipating Transitions & Shifting Expectations



- 1) *Consumerization*
& *Data-driven Innovation***
- 2) **Distributed Energy Resources****
- 3) **Electrification of Vehicles****
- 4) **Blockchain Energy Applications****

Shifting Expectations for Utilities & Solution Providers

Legacy Phase...

**Build out Access
to Infrastructure**



Consumerization Phase...

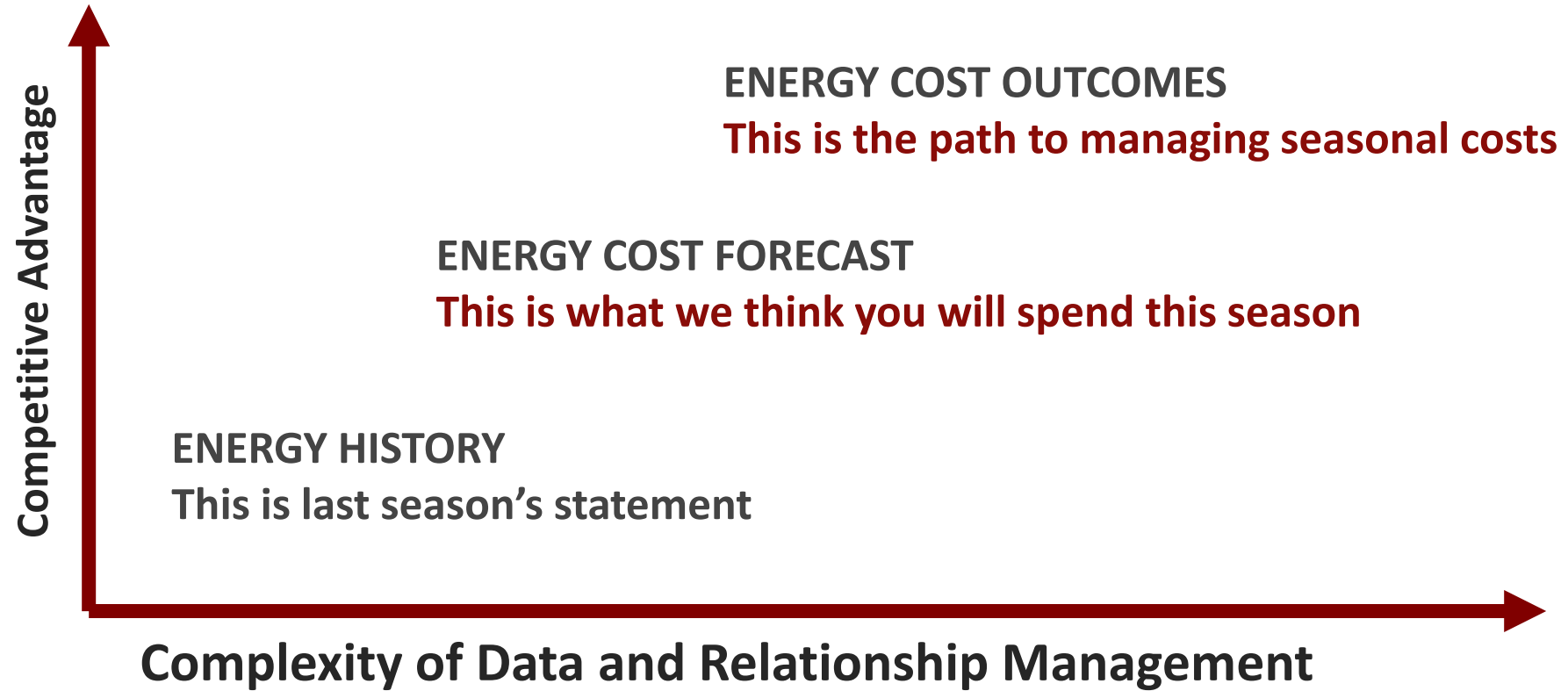
**Managed Services,
Transactions &
Behavior Change Solutions**

Consumerization & Service + Experience Design

Data + Behavior Change to Guide Outcomes?



Guided Utilities Experiences





Focus on Integration
Plug + Play Energy
Management Solutions



Anticipate Need for Strategic Partnerships

Prepared if major players dominate connected home + work experience and service models

Ecobee3 Thermostat Can Be Controlled By Amazon Echo

By Tyler Lee on 02/12/2016 15:12 PST



Tipping Point for Home-Life Management Systems?

How might data from Connected Devices and Homes transform the LES experience?

Opportunities

- Align with Disintermediation
- Transform Service Model

Challenges

- Business Model
- Privacy and “Creepy Line”
- Motivation in low-rate environment



Shifting Expectations for Distributed Energy Resources



Embracing Policy Reform + Consumer-driven Dynamics of Solar



Community Storage: Aggregated System level Solutions

The Community Storage Initiative

[Join Our Email List](#)

The co-founders of the community storage initiative ask for your support:

- Click on the link above to join the Initiative's email list to receive information about the Initiative and upcoming events
- Promote an "above the baseline" approach to electric water heating, electric vehicle charging, and residential battery use marketed as "Community Storage"
- Share your business model and best practices around "Community Storage"

We ask you to follow the Guiding Principles of The Community Storage Initiative:

1. Voluntary Participation (by the utility, home, business or individual)
2. Education & Training (information resources, program templates, quick-start guides, etc.)
3. Market Acceptance (locally, regionally and nationally)



Regulation	Zone	Jan	Feb
Locations	RTO	414	428

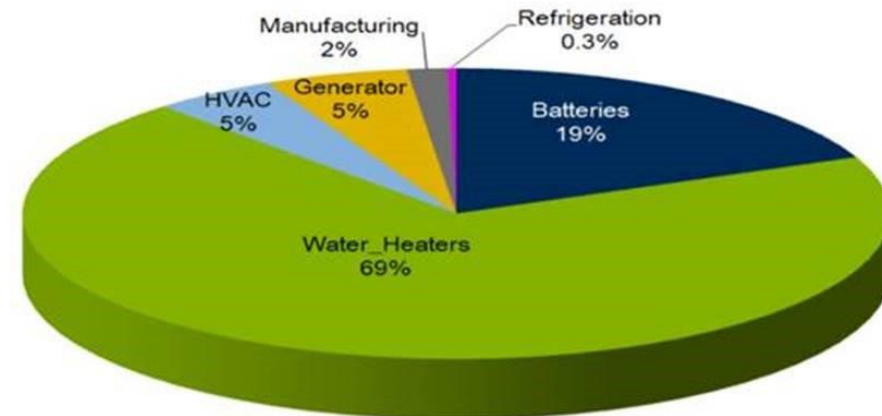
Average Number of Unique Participating Locations per Month: 421

MWs	RTO	64	65
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Average MWs per Month: 65

Capability represents total amount that may be offered. Actual offered and cleared volume may be significantly lower and is represented in subsequent figures/tables in report

Figure 10: 2017 PJM Demand Response Confirmed Regulation Registrations Load Reduction Methods

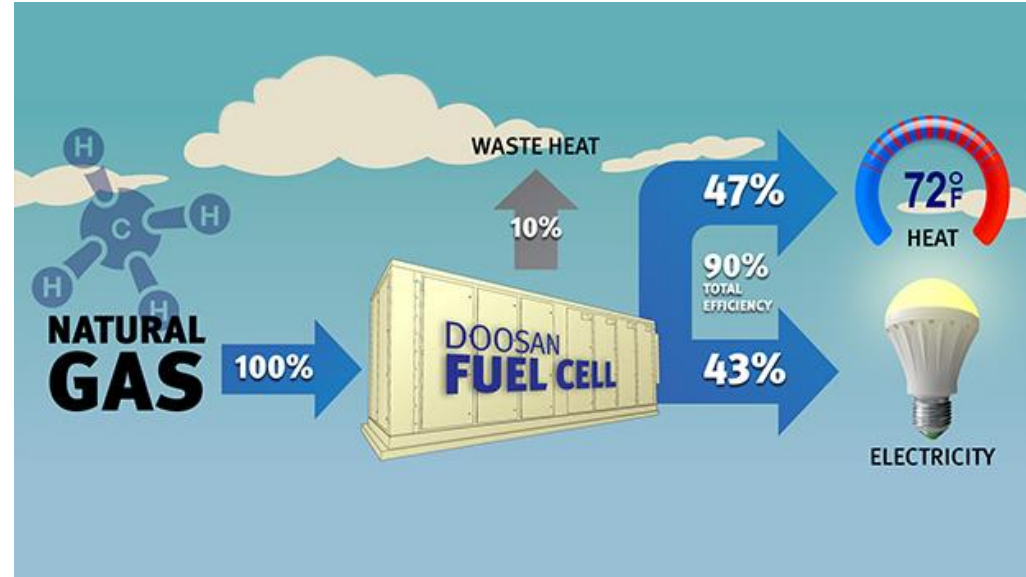


Strengthening Signals but Lingering Scars

NatGas Friendly Vision: Fuel Cells as base of Micro Grids



Bloomenergy



How might Distributed Energy Resources transform LES?

Opportunities

- Resiliency & Community Spirit
- Expand Service Area
- Reduce Long-term Expenditures
- Empower Commercial Clients

Challenges

- Balancing Motivation + ROI
- Understanding Grid + Gas Dynamics



Tapping Inner Futurist

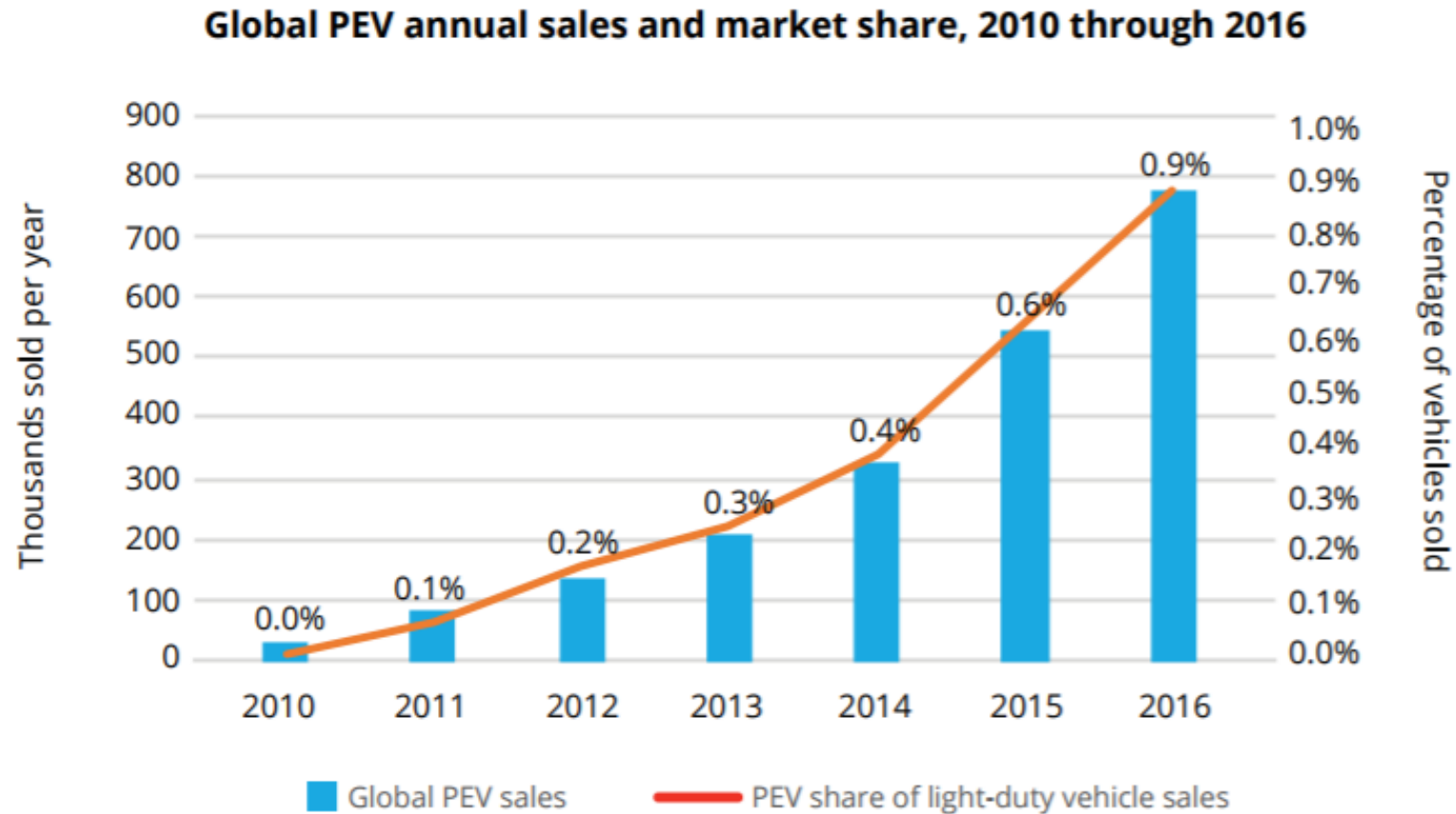
The Slow Pace of Fast Change: 2017 – 2027



Transitions Ahead

- 1) *Consumerization
& Data-driven Innovation*
- 2) Distributed Energy Resources
- 3) Electrification of Vehicles**
- 4) Blockchain Energy Applications

Electrification of Vehicle Fleet

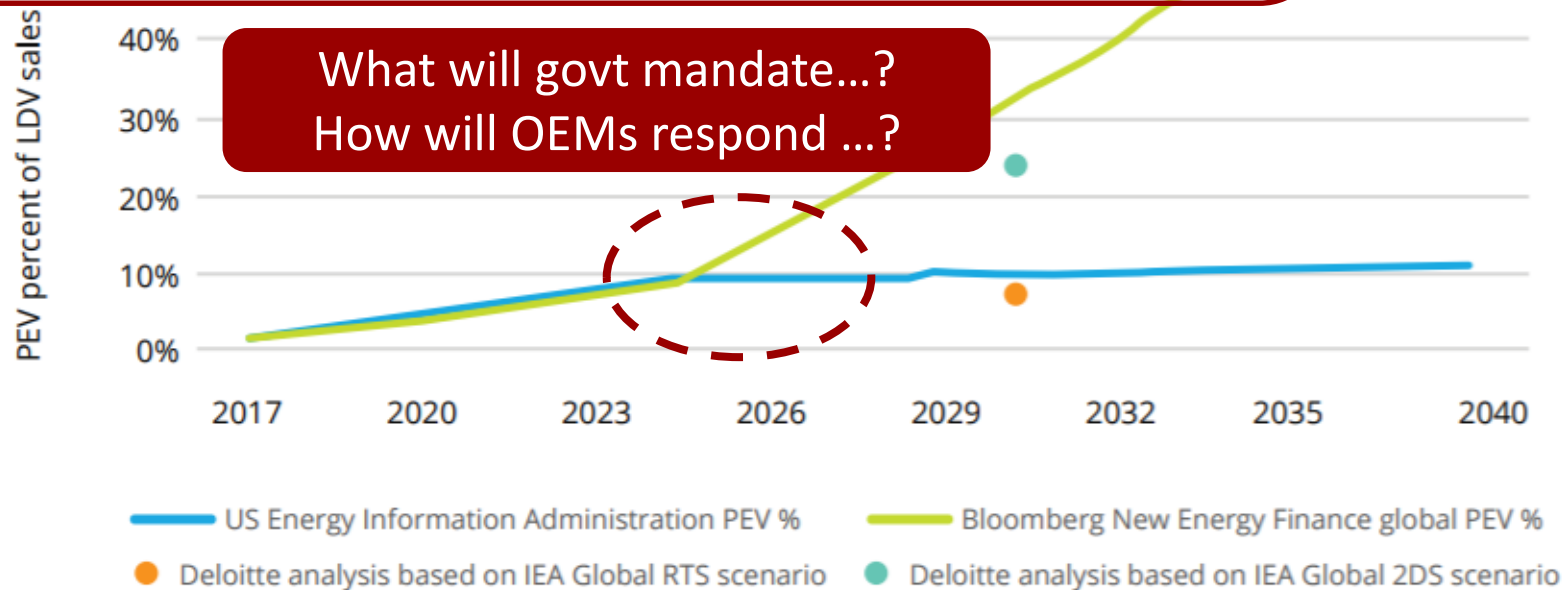


Source: Electric Drive Transportation Association, "Electric drive sales dashboard," and Jeff Cobb, "Top ten plug-in vehicle adopting countries of 2016," HybridCars, January 17, 2017.

France to Ban Sale of Gas Vehicles by 2040

Britain to Ban New Diesel and Gas Cars by 2040

China moves towards banning the internal combustion engine



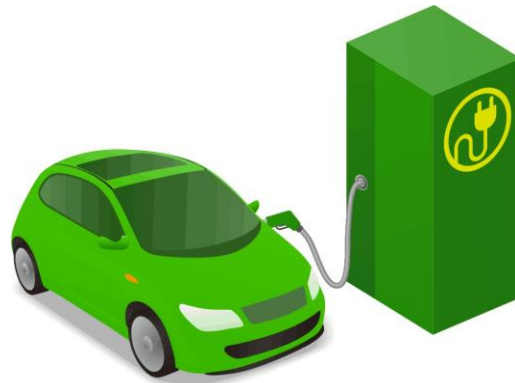
The IEA's Reference Technology Scenario (RTS), projecting 56 million electric cars in circulation by 2030, reflects projections that respond to policies on energy efficiency, energy diversification, air quality, and de-carbonization that have been announced or are under consideration. The IEA's 2DS scenario, projecting 160 million EVs in circulation by 2030, occurs in a context consistent with a 50% probability to limit the expected global average temperature increase to 2°C. We estimated annual sales required to meet IEA's EV stock projections for 2030 and then calculated the EV share of sales as a percent of total light-duty vehicle sales projected by Bloomberg New Energy Finance for 2030.

Source: Deloitte analysis.

Electrification of Vehicle Fleet



Hybrid ICEs

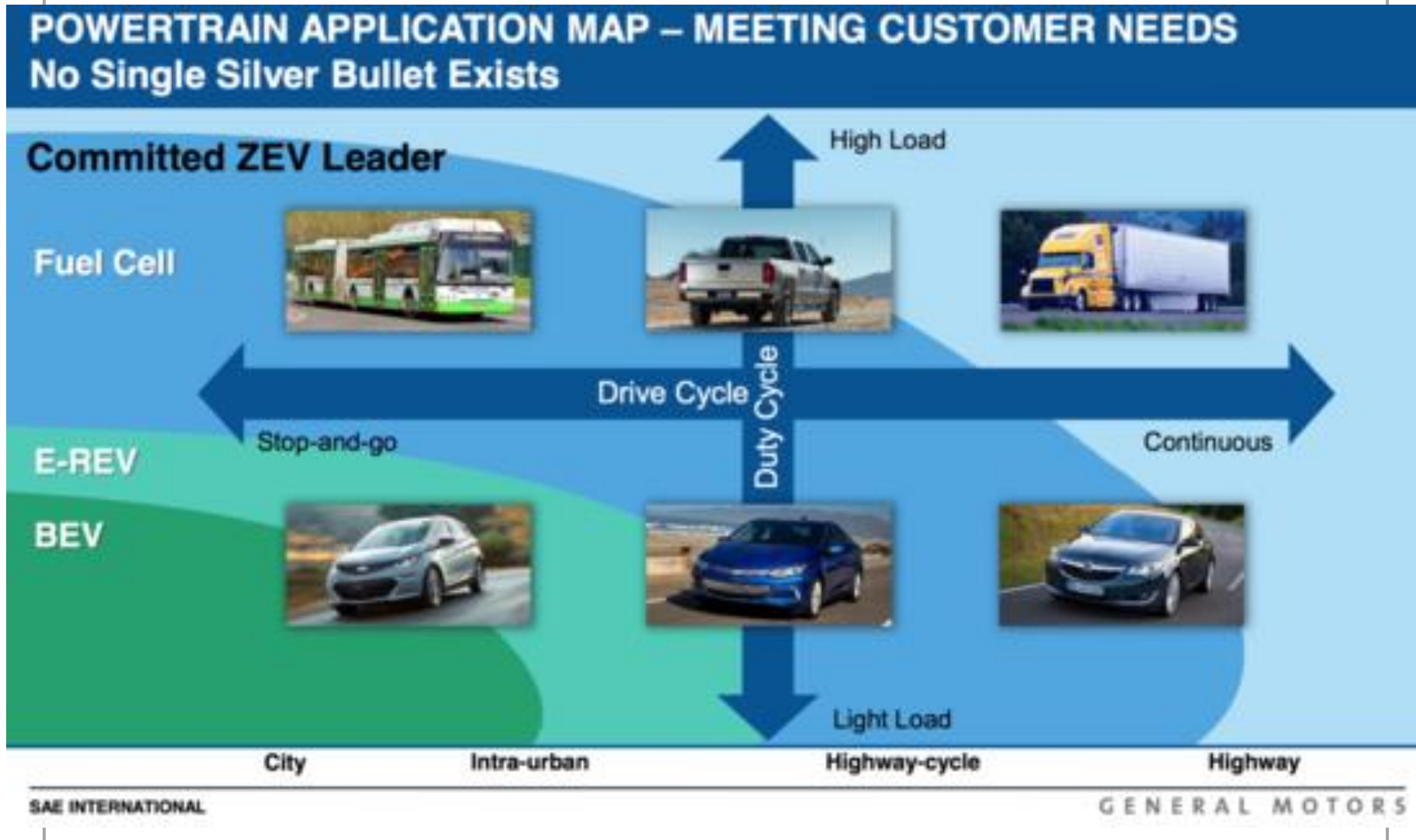


Plug-in EVs



Fuel-based EVs
Hydrogen Rich Fuels

Caution on Early Bets with Electric Vehicle Transition



How might Vehicle Electrification transform LES?

Opportunities

- Vehicle to Grid Service Model
- Managed Fleet Services
- Transform Excess Electrons to Higher Value H2 Fuel

Challenges

- Viability & Sustainability
- Regulatory Certainty
- Business Model & ROI



Tapping Inner Futurist:

The Slow Pace of Fast Change: 2017 – 2027



Transitions Ahead

- 1) *Consumerization
& Data-driven Innovation*
- 2) Distributed Energy Resources
- 3) Electrification of Vehicles
- 4) **Blockchain Energy Applications**



World Economic Forum Survey Projects Blockchain 'Tipping Point' by 2023

**“By 2025, 10% of Global GDP will be
orchestrated by blockchain applications.”**

Implications of the blockchain cannot be understood... yet



1994: "Today Show": "What is the Internet, Anyway?"

Evolution of the Web-based Capabilities & Solutions



***Access to
Digital Files***



***Access to
Social Networks***



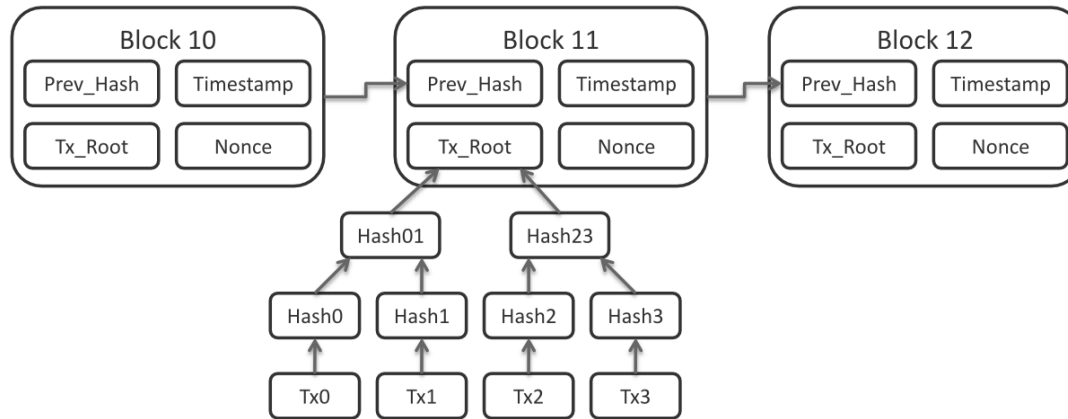
***Access to
Trusted Transactions***

It's just Decentralized Databases + Process Automation!

Assets get entered onto the ledger and generate keys

Network Consensus on who did what...

Smart Contracts execute legal agreements + business processes



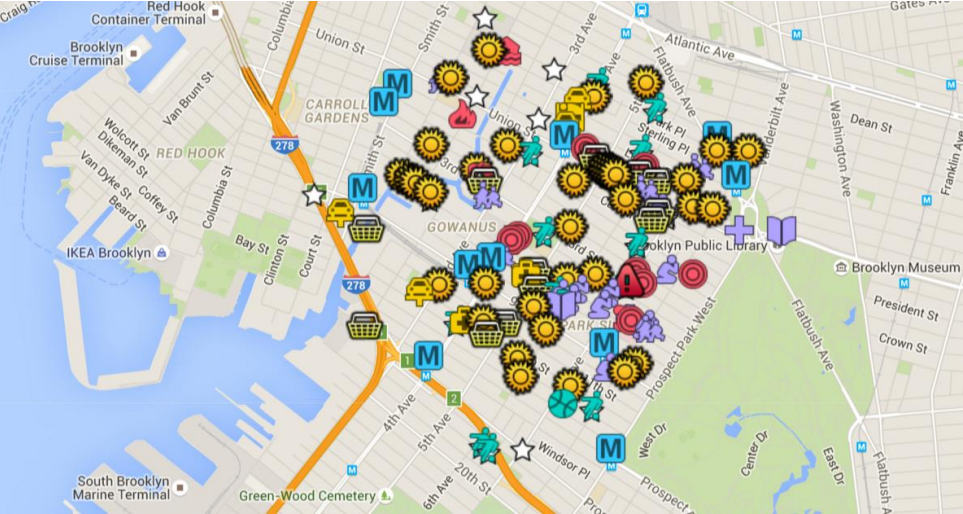
A sample of EtherScript

```
note: ""An Ethereum smart contract to sell website for "5000 by March"
note: First, store buyer's ethereum address:
put: 6af267736363738ghgs7726337373737 in storage slot BUYER
note: Then, store seller's ethereum address:
put: 6af267736363738ghgs7726337373737 in storage slot SELLER
note: April 1, 2014 is 13929839948 in "computer time"
put: 16365437465 in storage slot DEADLINE
note: If the agreed amount is received on time...
When: transaction value >= 50000 ether
and: block timestamp <= storage slot DEADLINE
then:
note: ... then designate the buyer as the new website admin and pay the seller
put: storage slot BUYER in storage slot WEBSITE_ADMIN
Spend: contract balance to storage slot SELLER
```

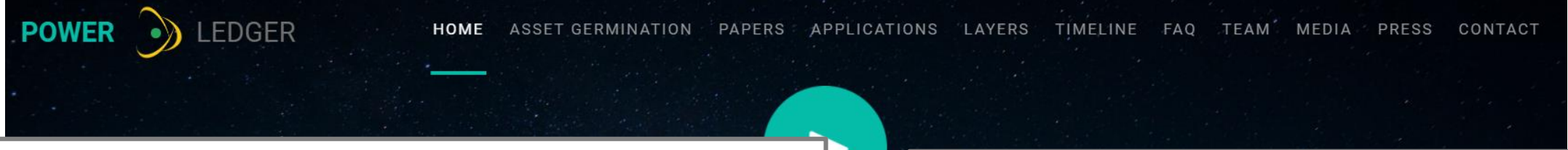
'Assets' for Utilities, Businesses and Residents=
Energy Usage Data, Bills, Appoints, Crew Field Notes
Identity, Credit Card Information, Equipment Repairs, et al

Authorization for Data use;
Revenue Cycle Management;
Front-end Compliance Walls

Micro Grids: Neighbor-to-Nighbor Energy Sales



Hype Phase for Blockchain Energy Platforms



The benefits

- 1 Improved economics for solar PV and battery storage
- 2 Fixes the spilt-incentive problem with multi-tenanted properties
- 3 Increases the utilisation, and therefore, value of network assets
- 4 Easier access to low-cost renewable electricity
- 5 Decreases wastage of electricity in transmission
- 6 Provides platform for community-owned generation or storage



Products



Fully Developed



P2P Trading

Built & Being Tested



Electric Vehicle Trading



Neo-retailer



Autonomous Asset Management



Embedded Network/Micro Grid Operator

Under Development



Carbon Trading



Power Port



Distributed Market Management



Transmission Exchange



Wholesale Market Settlement

Check your POWR tokens here

Hype Phase for Blockchain Energy Platforms



Meet your new agent

The Grid+ Smart-Energy Agent is an always-on device that pays for your electricity in real time and always finds the best price available.

RESPOND TO DEMAND

The intelligent agent can help balance load on the grid by controlling smart devices, such as a NEST thermostat or a Tesla Powerwall, to generate extra revenue.

ARBITRAGE ENERGY

Your agent can leverage energy storage, such as the Tesla Powerwall, to purchase energy when it is cheap and sell it when prices peak.



Innovative Proof of Concepts... Shared Infrastructure

Germany's Energy Giant Launches 100s of Ethereum Based Electric Cars Charging Stations



SHARE & CHARGE



Charging Station Finder



Tariff self-determination



Family & friends fare



donations function



Full cost control

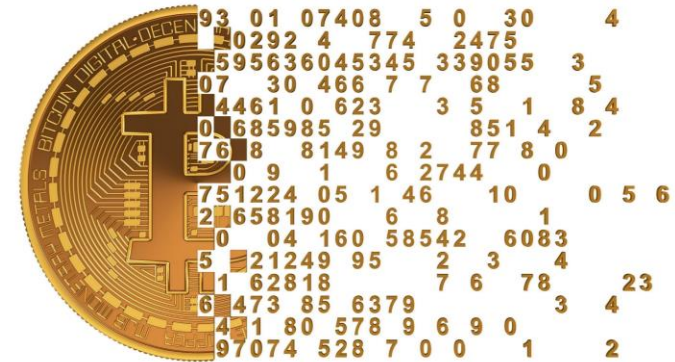


No billing stress

Radical Idea: Crypto Currencies Tied to Behavior Change

Crypto Currencies + Smart Contracts

**Automate Incentives for
Energy Demand Management**



Utilities Issue

Negawatt Currency

2018-2030

Possible Slogans in Age of Energy Blockchain Services

*“Sell More of
What you Produce”*

*“Our DApp Devices will
Drive Down Energy Costs”*

*“The Network is Your
Energy Company”*

End



drigo



Scanning Tool

Discussion

Habit: Seeking Signals of Change

Signals

A signal is a small or early step innovation, disruption or constraint that could grow into something larger across society, business or government.

A signal can be a news event, a new service, product, technology, policy, social movement, or conversation stream on Twitter!

Signals grab our attention but can also be easily dismissed as noise.

Seeing Futures Across STEEP Categories

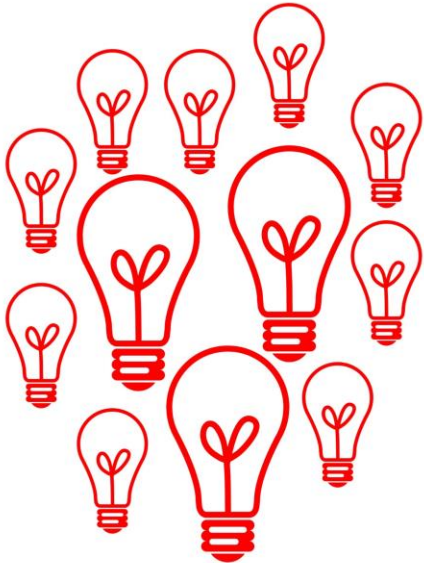
Society

Technology

Environment

Economy

Politics



**Collect & Share Signals
as Social Bookmarks**

Scanning Tool
diigo



Edit bookmark

🔗 **Utilities Should Charge Into Electric Vehicles - Bloomberg Gadfly**
Add a description...

🏷️ bloomberg utilities EVs case+for

Recommended: hydrogen hydrogen-storage research utilities
electric vehicles bloomberg

Add to an outliner

Share to a group

Private Read Later Advanced Cache

ENERGY

Oct 3, 2017 1:33 PM EDT



Liam Denning

Liam Denning is a Bloomberg Gadfly columnist covering energy, mining and commodities.

While Big Oil frets about the potential for peak demand, Big Utility must be tempted to roll its eyes and say: Been there, done that.

It should also be thinking: "Ah-ha!"

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- + company (48)
- + debate (15)
- + electricity (21)
- + energy (74)

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https://dupress.deloitte.com/content/dam/dup-us-en/articles/3851_FoM-Power-and-

about 24 hours ago

dupress.deloitte.com PDF energy EVs deloitte

The Energy Transition is Amongst Us: UK Road Fuel Demand Peaks | dollarsperbb

Nov 01, 17

www.dollarsperbbl.com EVs oil forecast UK energy policy

Electric Vehicles Have an Energy Problem—Hydrogen May Be the Answer

Oct 30, 17

www.texasmonthly.com EVs fuelcells battery debate automotive

Zooming Toward An Electric Car Future | On Point

Oct 29, 17

www.wbur.org EVs podcast interview tolisten automotive

Garry's **diigo** Tags (Social Bookmarks) on:

Energy

<https://www.diigo.com/user/garrygolden/energy>

Energy + Data

<https://www.diigo.com/user/garrygolden/energy%20data>

ExperienceAPI(xAPI)

<https://www.diigo.com/user/garrygolden/xAPI>

Getting
Started



Information + Inspiration



Twitter is
Your Friend

Create Lists to Follow a Spectrum of People
(Sector leaders, Entrepreneurs, Agitators)

Periodically search by keywords or hash tags
(e.g. #energy, #microgrid, #designthinking)

Twitter Habit:

- Twitter Twice a Day
- Open up ten tabs for possible tags!

Conferences



The banner features a dark blue background with a network of white nodes and lines, overlaid on a cityscape. On the left, there is a white hexagonal icon containing a padlock. The main text is in white, bold, sans-serif font.

Blockchain in Energy & Industry

Boston | November 9, 2017

Featured Speakers

<  Jeffrey Katz
CTO, Energy & Utilities Industry, IBM

 Mark D'Agostino
Co-Founder, Grid+

 Ranga Krishnan
VP Technology, Skuchain

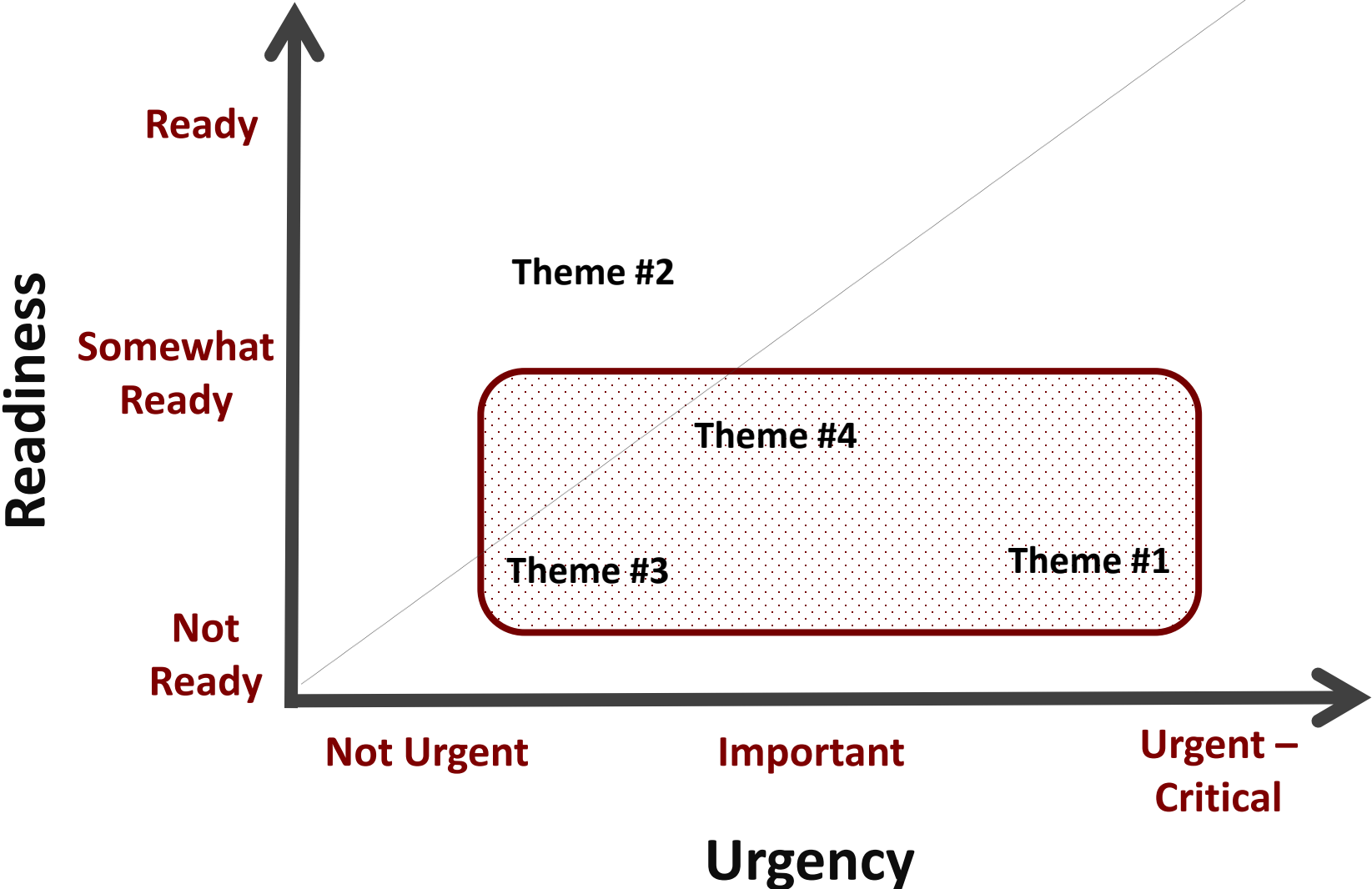
 Dominik Schiener
Co-Founder, IOTA >

End



Discussion

Take a Pulse Check on Emerging Trends vs Organizational Appetite



Find the Right 'Killer Questions' to Brainstorm Ideas

Following the success of HP's Chief Innovation Officer Phil McKinney, generate a weekly 'Killer Question' email message or 'Twitter' conversation that spurs conversation about energy experiences.

What is a job (or skill set) that does not exist today but will be our most innovative lever of change in five years?

Which popular consumer brand today could make LES irrelevant (or more relevant than ever!) in five years?

What is the biggest risk we should take over the next five years to align LES with possible futures?



Thank you!

Garry Golden

garrygolden@gmail.com (Two Rs)



Learn More...

garrygolden.com/November9

