Green Data Center Hub

Product Proposal Discussion
February 3, 2021

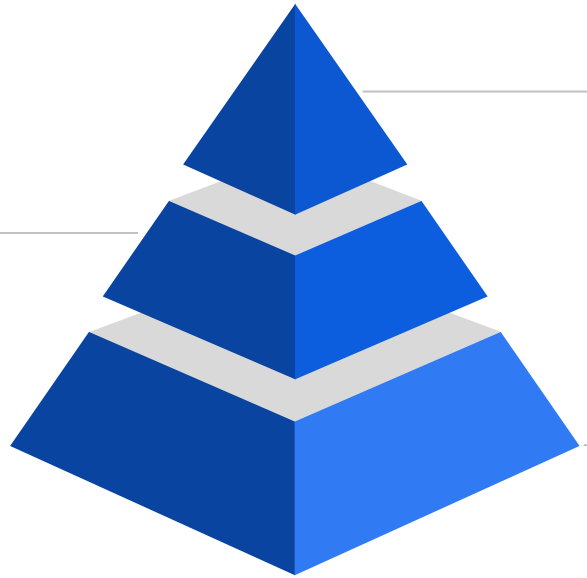
Target: PaaS & IaaS Hyperscale Data Center

PaaS and IaaS Providers are the most attractive quick wins

1 Compared to SaaS, these two segments are growing faster and less fragmented. The top two market players represents a $20bn data center market

Enterprise market is large and growing quickly

2 Although both consumer and enterprise markets are attractive, enterprise are ~3x consumer and growing almost as quickly



Hyperscale Data Center

3 Represent a large and fast growing segment of the data center market. This segment has unique characteristics that make it well suited for a renewables + storage energy product

Target Customer Overview

Hyperscale Cloud Data Center

The future of data centers, the lowest cost

Virtualization through the use of availability zone and clusters

Average utilization driven up, leads to more forecastable energy needs and lower average energy usage

Enterprise

Largest portion of cloud services

While the entire data center workload is expected to rise ~140% between 2016 and 2021, over 75% of that workload is attributed to Enterprise

PaaS & IaaS

High growth, low fragmentation

The top 7 companies make up over 50% of each market

Each of these 7 companies also have ambitious clean energy goals

The Problem

Scale

HSDCs have a substantial impact on local energy load

- Clusters within an availability zone further increases load
- Can be difficult to procure enough clean energy at one time from the local utility

Result

- Limits where you can build
- Increases cost to community
- Adds layer of complexity

Workaround

- Working in tandem with local utilities and communities

Reliability

HSDCs require high degree of reliable energy

- Interrupted energy results in catastrophic downtime
- Historically did not pair well with renewable energy sources

Result

- Limits use of renewables
- A need for backup generator

Workaround

- Utilizing diesel backup generators
- accepting non-clean power from grid

Location

HSDCs want to locate themselves near customers

- Additional factors include:
  - Cheap electricity
  - Real estate
  - Ancillary services

Result

- Cannot locate near customers if no energy supply

Workaround

- Only can build where strategic direction overlaps with energy supply

Solution

Green Data Center Hub

The GDCH would create a behind the meter renewable + storage energy supply for Hyperscale data center clusters within a given activity zone

How GDCH Addresses Problems

Scale

HSDCs have a substantial impact on local energy load

Solution

- Onsite energy generation unlocks HSDC from having to solve for energy supply at scale from utilities

Reliability

HSDCs require high degree of reliable energy

Solution

- Renewables + Storage is reliable enough to overcome the need for backup generators and the reliance on other non-clean energy sources

Location

HSDCs want to locate themselves near customers

Solution

- HSDCs can chose locations with a different set of factors to solve for, unlocking more opportunity

Value Creation for Customer

On Site Renewables

Cost controlled clean energy

Unbound by need to match with reliable grid infrastructure, fewer transmission costs

Storage Maximization

Optimize and match energy demands

Sync the well predicted energy demands with forecasted energy production / storage availability to balance supply and usage

Freedom to Locate

Find customers and build clusters with ease

Identify customer areas of need and locate where you can deliver the most value to end user

Solution Direction Review

		Pros	Cons
A	Develop new sites that have the enabling physical infrastructure for both a data center and behind-the-meter renewable energy	• Coordinate entire effort - better alignment and speed to completion • AES stands to benefit from controlling each aspect of development	• Not an area of expertise • Competing with colocation companies (Equinix, Digital Realty) • Significant risk in undertaking
B	**Lease or sell land, or constructed data center capacity, within the complex to data center operators**	• Ability to partner with experts in data center development • Offload risk of demand by signing leases or agreements for operators to run	• If haven't partnered with data center operator, might not be in most desirable location • Need clusters in AZ for optimization
C	Sign long term energy supply contracts with the data center operators, with guaranteed service levels for reliability and % of renewable energy	• AES area of expertise • Best match with partnering with data center developer	• Less ability to coordinate entire operational process • Depending on data center operator for direction

Market Opportunity

1

	2018				
	Total Market($B)	AWS Market Share %	AWS Rev ($B)	AWS Rev (%)	2020 AWS Rev ($)
IaaS	36.0	45%	16.2	62%	28.0
PaaS	25.0	15%	3.8	14%	6.5
SaaS	121.0	5%	6.1	23%	10.5
			26.0	100%	45.0

2

($B)	2018	2020
AWS Opex	18.4	31.8
% Energy	30%	30%
Energy $	5.5	9.6
PaaS % Share	14%	14%
IaaS % Share	62%	62%
PaaS Energy $	0.8	1.4
IaaS Energy $	3.4	6.0
Total Energy $	4.2	7.3

3

($B)	2018	2020
AWS PaaS Energy $	0.8	1.4
AWS IaaS Energy $	3.4	6.0
AWS PaaS Mkt %	15%	15%
AWS IaaS Mkt %	45%	45%
PaaS Total Mkt Energy $	5.3	9.2
IaaS Total Mkt Energy $	7.6	13.2

Source: BNEF, company filings.

Learning Agenda

Regulatory hurdles and opportunities

- Where is this legal?

New build plans

- Where is there demand?

Colocation vs single tenant build

- Who are the true customers (AWS also uses colocation) ?

Site matching process

- Where do we check all the boxes?

Economics

- What can we build and what can we charge?

Case Study

“A 60-megawatt/240-megawatt-hour Tesla Megapack installation will turn 127 megawatts of solar capacity into a nearly 24/7 power source.”

“Switch was able to subscribe to this project thanks to a Nevada law allowing large industrial customers to source their own power.”

“The challenge in replicating this is finding customers operating in place with similarly liberalized rules for corporate power procurement.”

SOLAR

World's Largest Customer-Sited Solar-Storage Plant Planned for Nevada Desert

Capital Dynamics is building a massive solar-plus-storage plant next to a Switch data center. Is the model replicable?

JULIAN SPECTOR

JULY 27, 2020

Switch's Citadel data center will source power from a next-door solar-storage project. (Image: Switch)