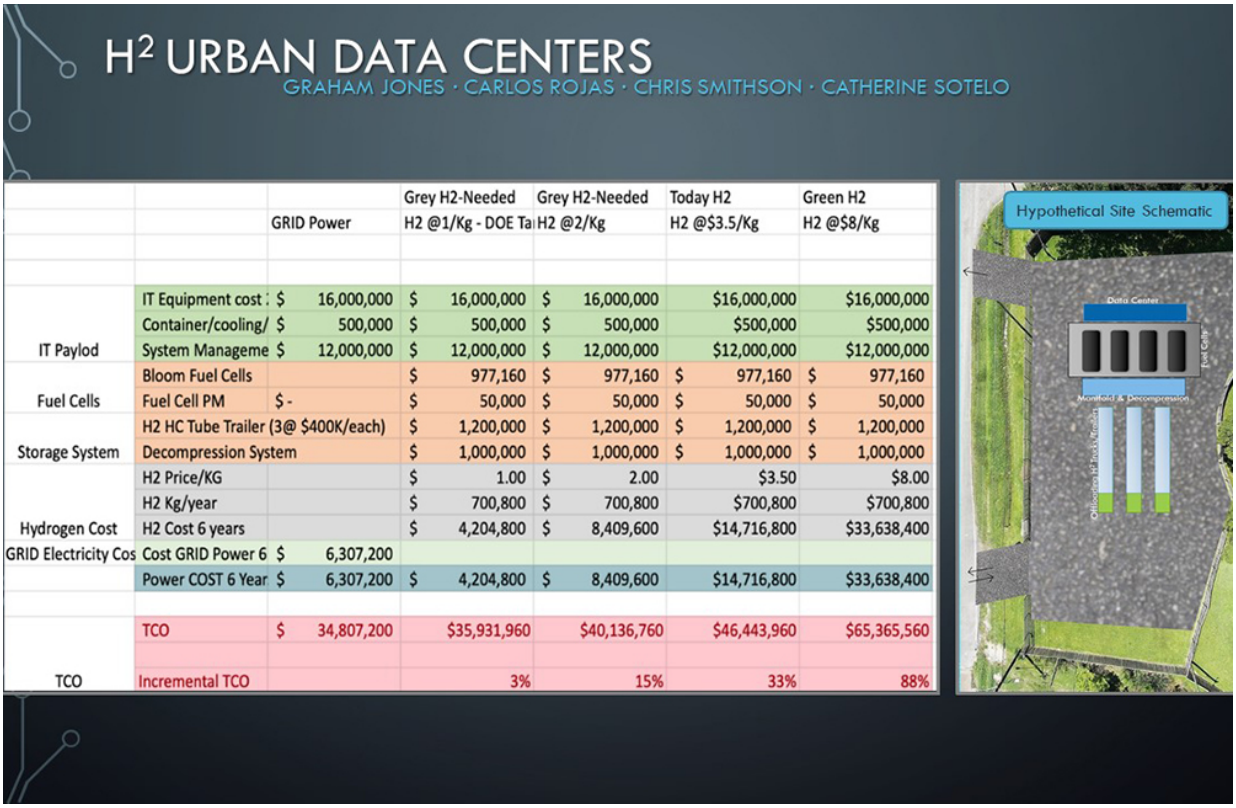
Datacenters consume more than 1 % of global electricity and demand keeps increasing. As such, it is increasingly important to decarbonize this consumption vector. In this project we concentrated on mid-scale datacenters that for varying reasons: must be located in close proximity to the customer within urban locations, have inadequate land access for renewable energy generation on-site, and where powering with traditional energy sources (diesel generators) is not an option.
Our project was based on a Total Cost of Ownership methodology considering a 1 MW datacenter footprint. Our baseline calculates the cost of such a datacenter powered by a traditional grid (majorly fossil-fuel energy) in addition to multiple scenarios where the datacenter is powered via clean energy (H2).
We explored three different topics for our project:

- H2 Turbines and Fuel Cells as electricity generation options.
- H2 Storage and supply strategy.
- Physical footprint and safety concerns.

All these considerations were included in our Total Cost of Ownership analysis. We concluded that there was not a current economical path for a fully H2 powered datacenter; however, two tracks for future exploration were established:

- Sensitivity analysis to the cost of H2 showed our project could be viable as the DOE targets for H2 cost ($1/kg) are met in the future.
- Potential for hybrid sites where a portion of the energy comes from a renewable source, is supplied via grid electricity, or the customer has staged emission reduction goals.



		GRID Power	Grey H2-Needed H2 @1/Kg - DOE Ta	Grey H2-Needed H2 @2/Kg	Today H2 H2 @$3.5/Kg	Green H2 H2 @$8/Kg
IT Paylod	IT Equipment cost :	$ 16,000,000	$ 16,000,000	$ 16,000,000	$16,000,000	$16,000,000
	Container/cooling/	$ 500,000	$ 500,000	$ 500,000	$500,000	$500,000
	System Manageme	$ 12,000,000	$ 12,000,000	$ 12,000,000	$12,000,000	$12,000,000
Fuel Cells	Bloom Fuel Cells		$ 977,160	$ 977,160	$ 977,160	$ 977,160
	Fuel Cell PM	$ -	$ 50,000	$ 50,000	$ 50,000	$ 50,000
Storage System	H2 HC Tube Trailer (3@ $400K/each)		$ 1,200,000	$ 1,200,000	$ 1,200,000	$ 1,200,000
	Decompression System		$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000
Hydrogen Cost	H2 Price/KG		$ 1.00	$ 2.00	$3.50	$8.00
	H2 Kg/year		$ 700,800	$ 700,800	$700,800	$700,800
	H2 Cost 6 years		$ 4,204,800	$ 8,409,600	$14,716,800	$33,638,400
GRID Electricity Cos	Cost GRID Power 6	$ 6,307,200				
	Power COST 6 Year	$ 6,307,200	$ 4,204,800	$ 8,409,600	$14,716,800	$33,638,400
	TCO	$ 34,807,200	$35,931,960	$40,136,760	$46,443,960	$65,365,560
TCO	Incremental TCO		3%	15%	33%	88%