Quantified Energy Labs

HOLISTIC AERIAL SOLUTION FOR PV ASSET MANAGEMENT

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COO & Co-Founder

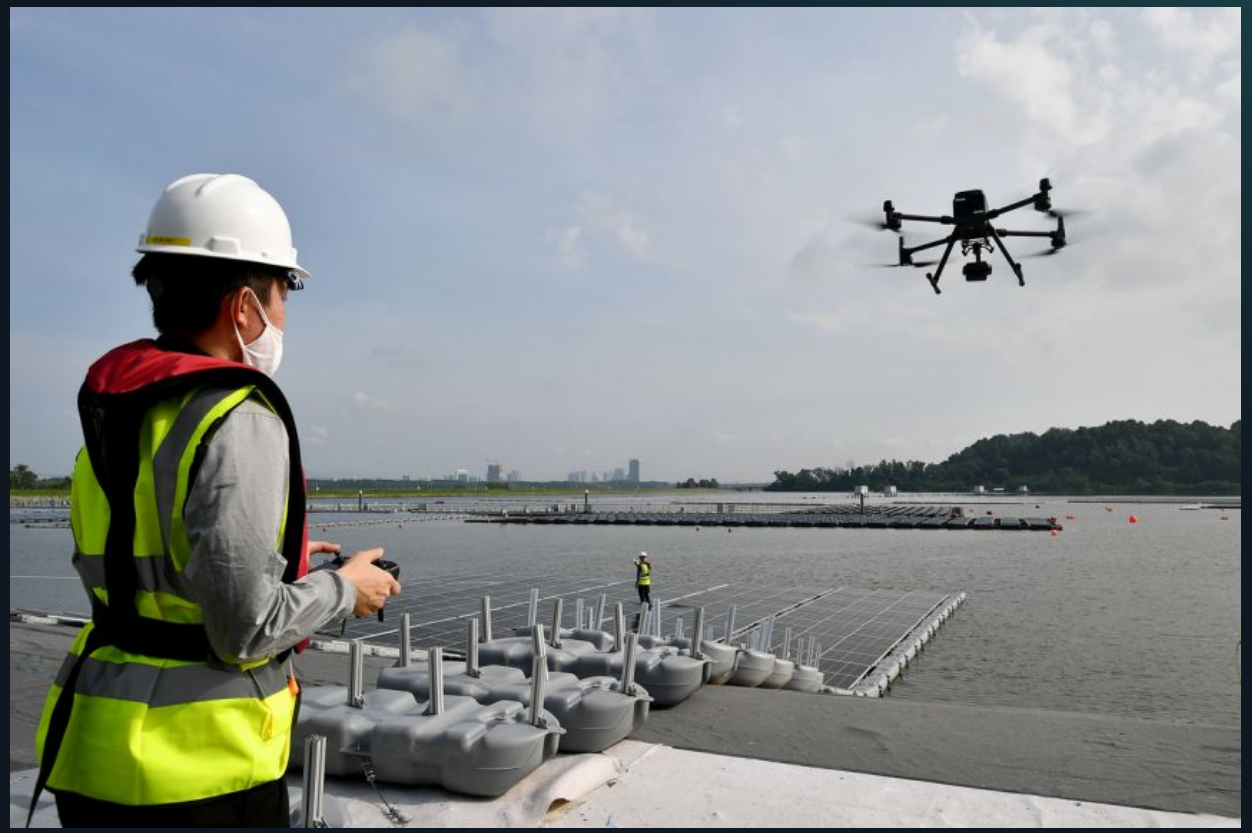
Quantified Energy Labs

GUARDIANS OF SOLAR SYSTEMS

SERIS
Solar Energy Research Institute of Singapore

NUS National University of Singapore

Exceptional Vision, Extraordinary Insights



https://www.straitstimes.com/multimedia/photos/soak-up-the-sun-floating-solar-farm-will-help-spore-achieve-its-clean-energy

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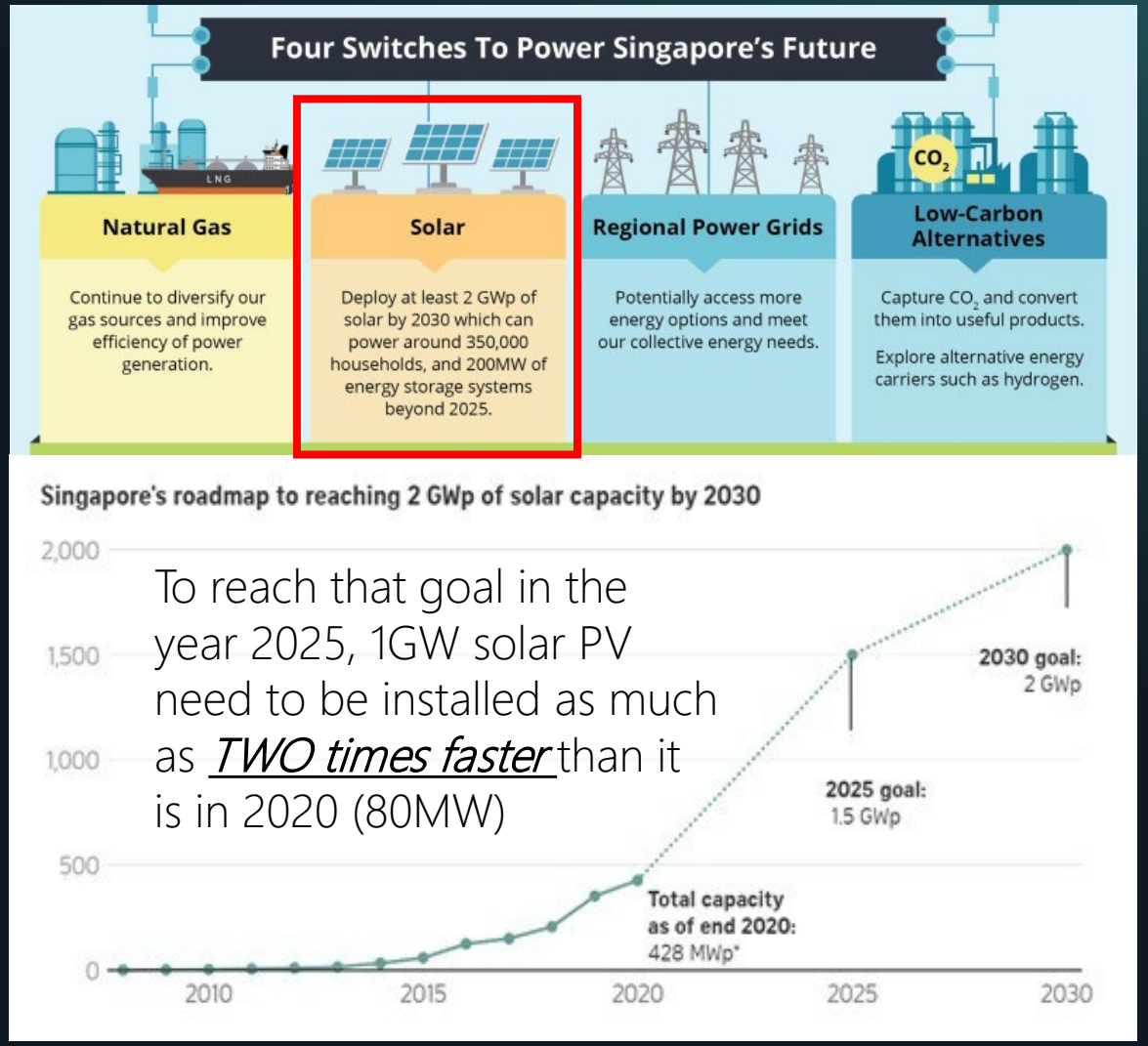
PV INSTALLATION MUST BE ACCELERATED → BUT HOW?

- Challenges in solar PV adoption in Singapore
  - Land scarce → Efficient use of building roof space
  - Tropical climate → Higher PV system degradation → Need improved O&M
  - Subsidy free electricity market → Cost competitive → Further reduce solar PV cost
- QE-Labs develops and commercializes technologies that could solve above three challenges



https://www.straitstimes.com/multimedia/graphics/2021/05/singapore-largest-solar-farm-water/index.html?shell

SOLUTION: END-TO-END AERIAL PV DIGITAL-TWINS

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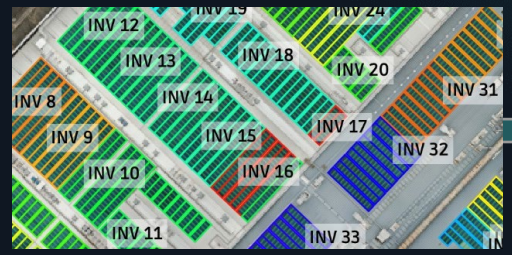
1 Design

Drone LiDAR is used to generate point cloud 3D model of the site as an input for solar potential analysis and accurate PV system design

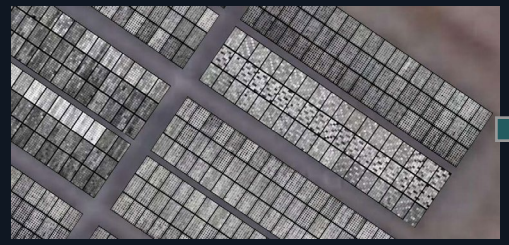
2 Build

Monitoring actual site work progress and verify with the original design based on exceptional high-resolution drone visual 2D orthomosaic map



3 Commissioning

QE-Labs' unique drone QELA™ technology is a quantitative key performance indicator (KPI) analysis of PV systems can be used in SAT



4 Operate

Drone thermography as a qualitative tool for detection of hotspot of PV modules to guide ground team for maintenance, i.e. cleaning panel

Integrated PV System Asset Lifecycle Management Platform

- Asset Owner
- Asset Manager
- Business Analyst
- Performance Engineer
- Field Technician
- Banker and Insurer

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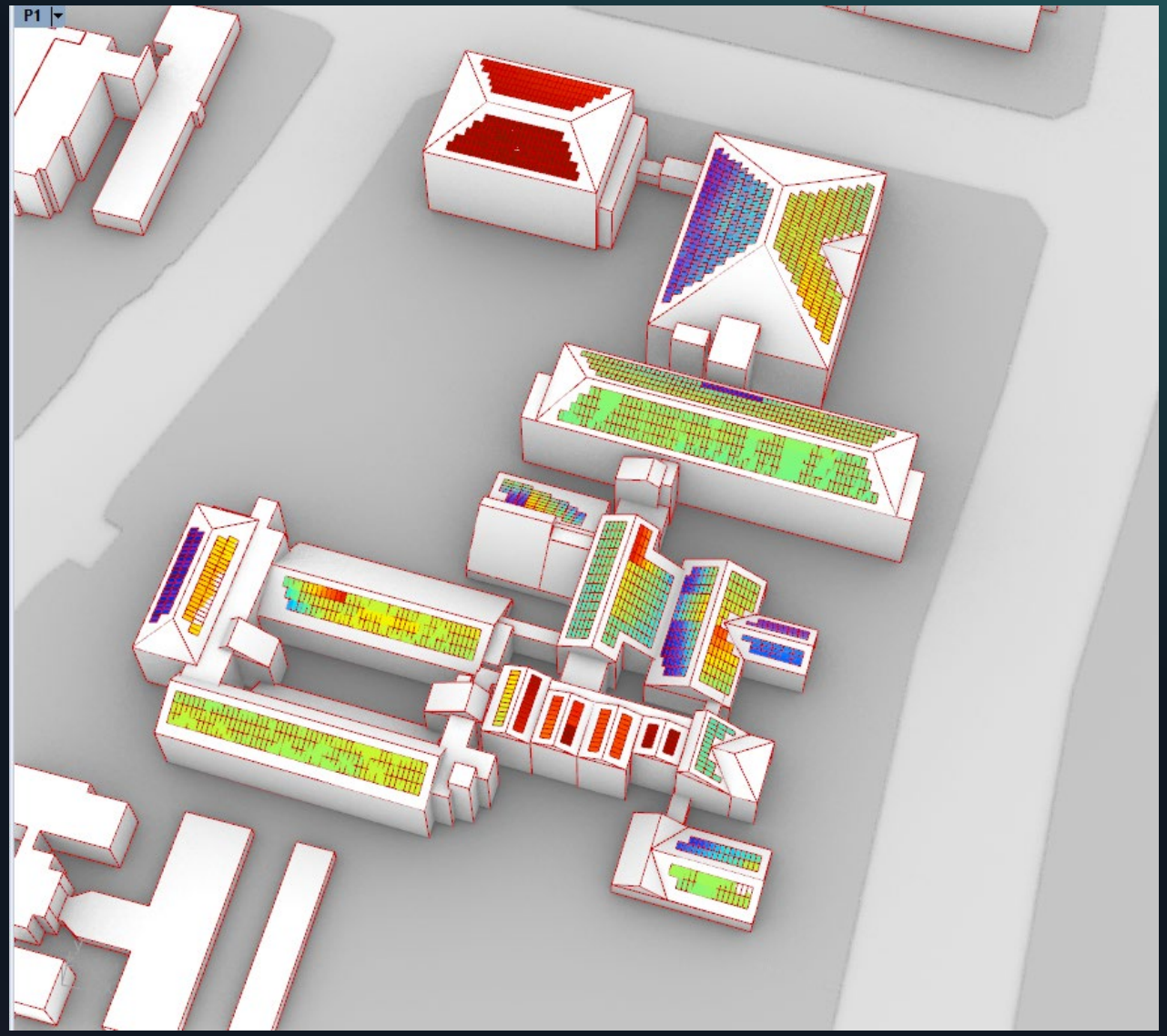
PRODUCT 1: DRONE 3D PV SYSTEM DESIGN

- Proper PV system design ensure lifelong operation of the system
- Accurate: Drone 3D model + detailed physics-based simulations
- Fast: Parametric modelling techniques and automated workflow



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PRODUCT 2: CONSTUCTION MONITORING

- Monitor construction progress without entering the premise (COVID-19 restrictions)
- Logistic & resources planning
- Automated As-build vs. As-design verification

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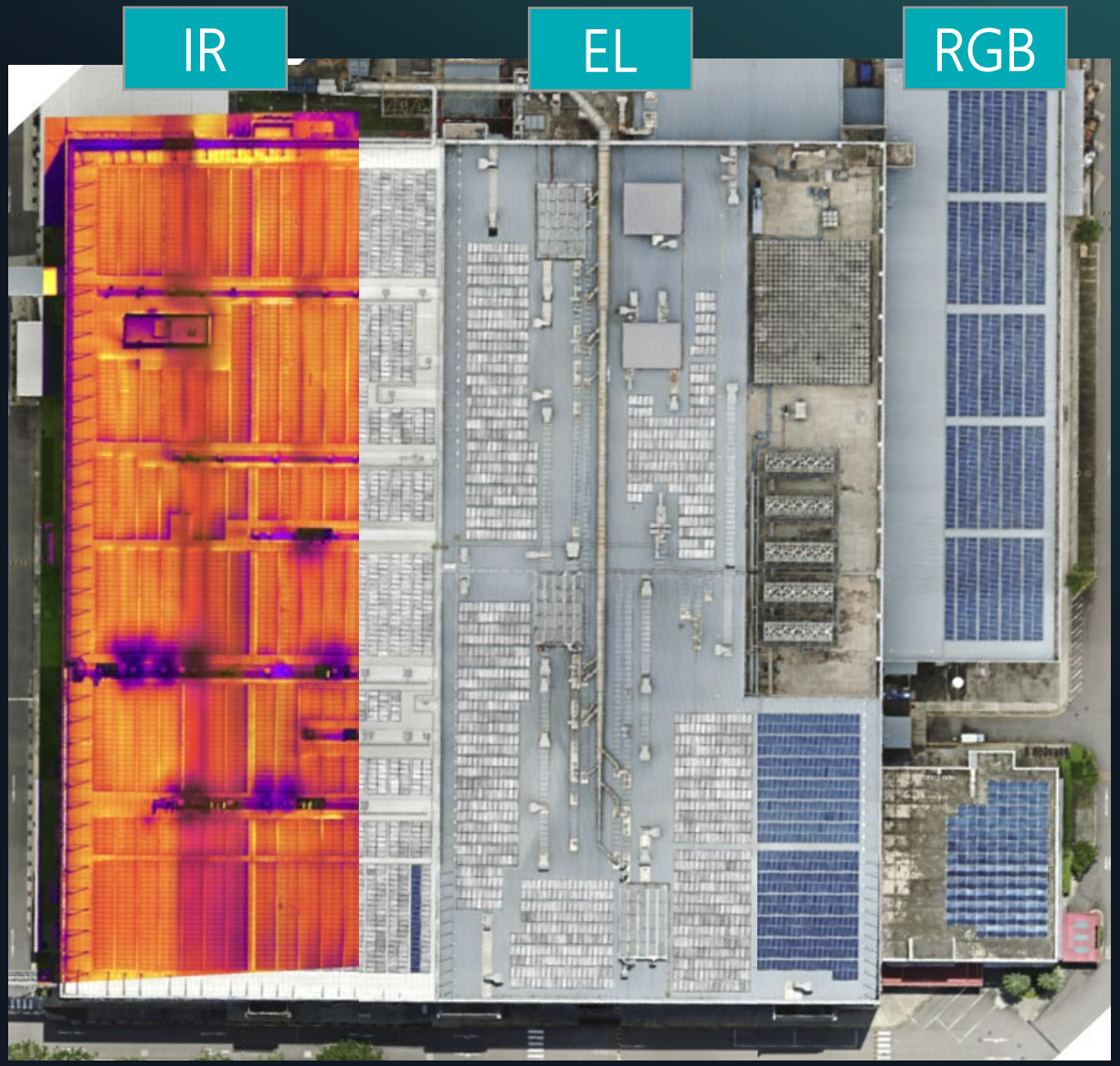
PRODUCT 3: COMPREHENSIVE INSPECTION

- Drone inspection using visible (RGB), thermal (IR), and electroluminescence (EL) imaging
- A.I. for automated defect identification



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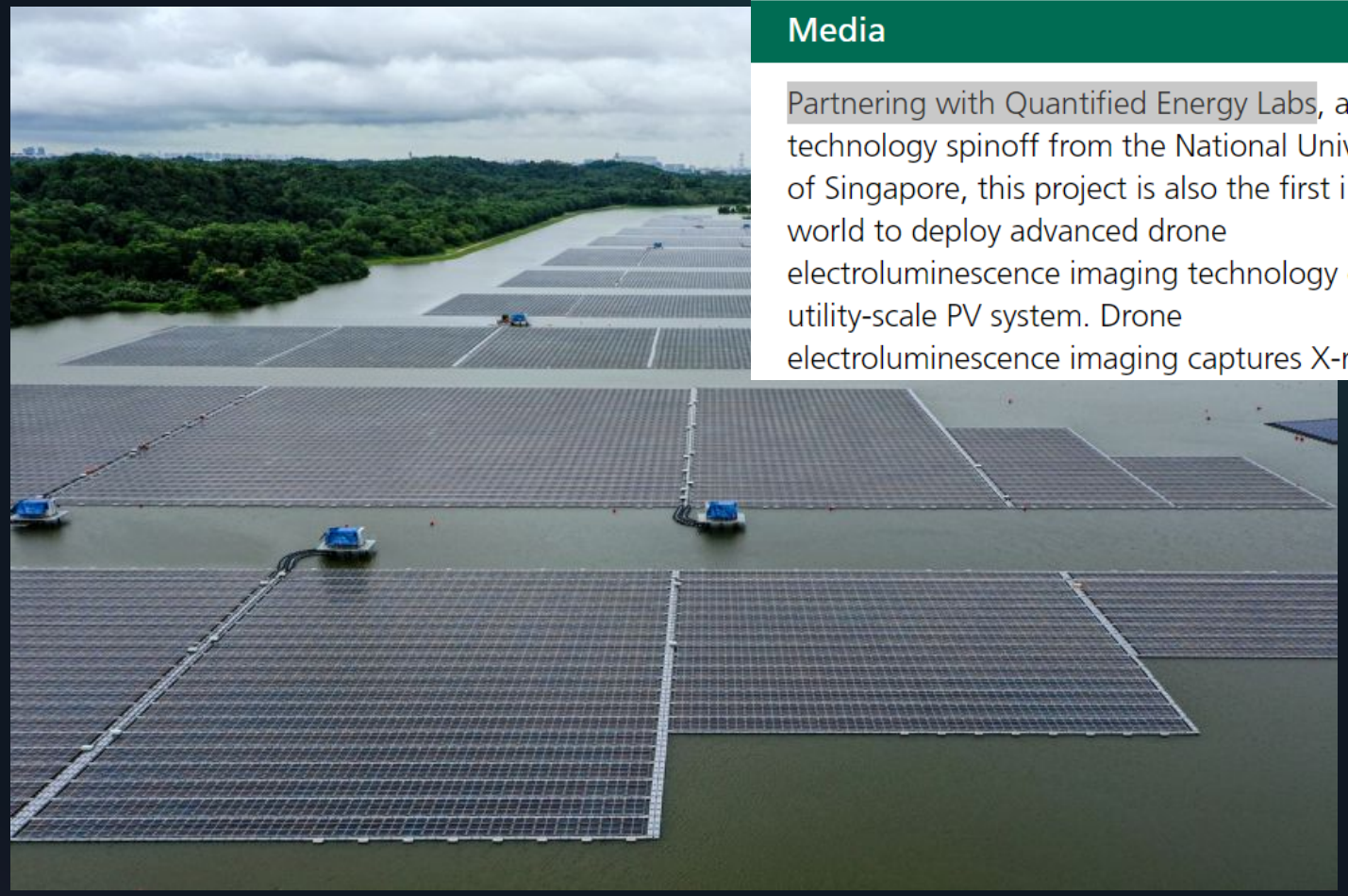
PROJECT 1: FLOATING PV

- Large scale PV plant in reservoir
- Full site drone RGB/IR/EL with individual PV module inspection to minimize risk



sembcorp

Media

Partnering with Quantified Energy Labs, a technology spinoff from the National University of Singapore, this project is also the first in the world to deploy advanced drone electroluminescence imaging technology on a utility-scale PV system. Drone electroluminescence imaging captures X-ray-

https://www.straitstimes.com/multimedia/photos/soak-up-the-sun-floating-solar-farm-will-help-spore-achieve-its-clean-energy

https://www.sembcorp.com/en/media/media-releases/energy/2021/july/sembcorp-and-pub-officially-open-the-sembcorp-tengeh-floating-solar-farm/

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PROJECT 2: SOLAR NOVA

- PV systems distributed over multiple sites
- Automated PV system design to reduce cost

https://www.straitstimes.com/business/companies-markets/sembcorp-snags-solar-energy-contract-from-hdb-edb-to-add-over-400-jobs

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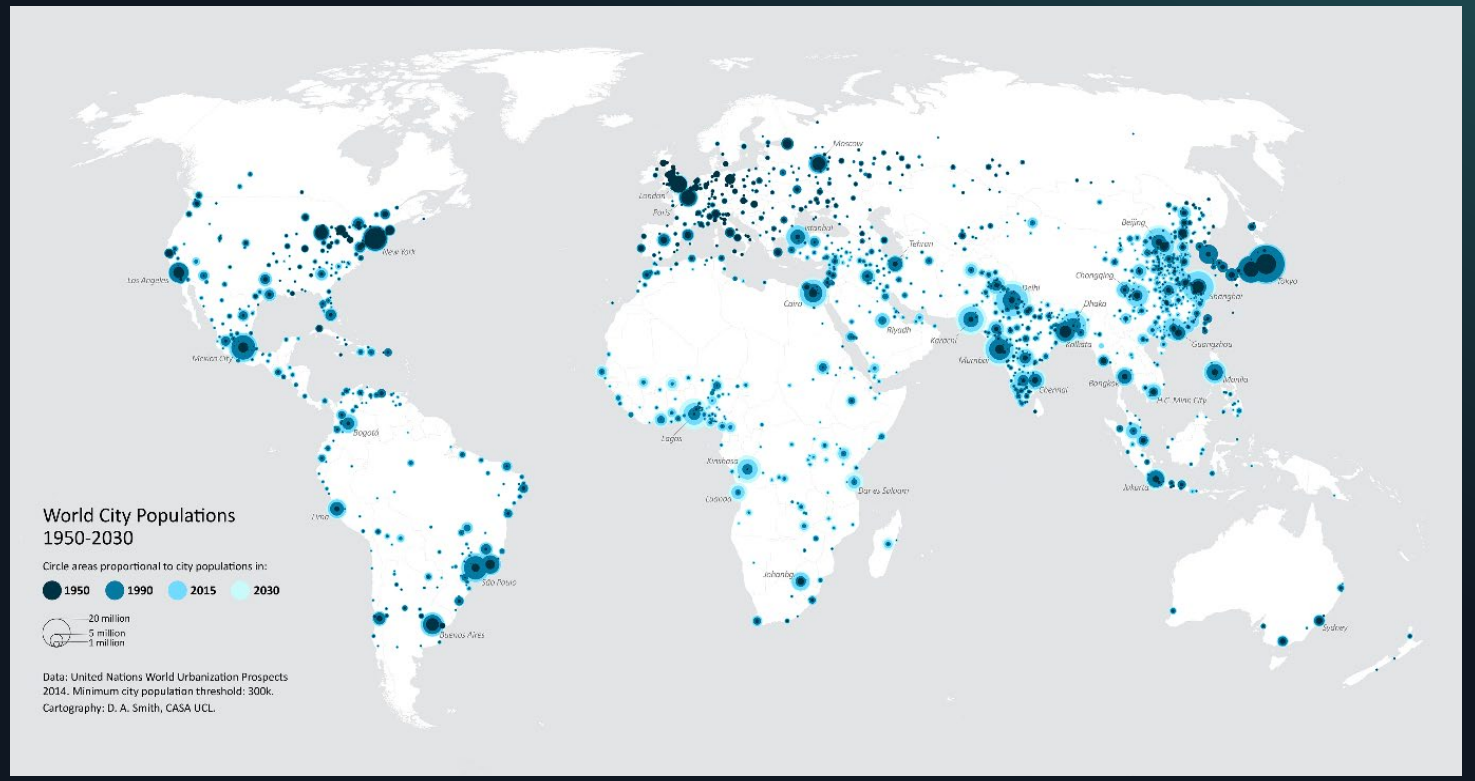
SOLUTIONS FOR MEGA CITIES

- In 2018, 55% of the world population lives in urban cities
- By 2050, the city population will double



Estimated **300GW** of solar deployment in the urban cities worldwide is required to meet the energy demand of the cities

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THANK YOU!

Flying closer to the sun with QE-Labs in search of a sustainable future!

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