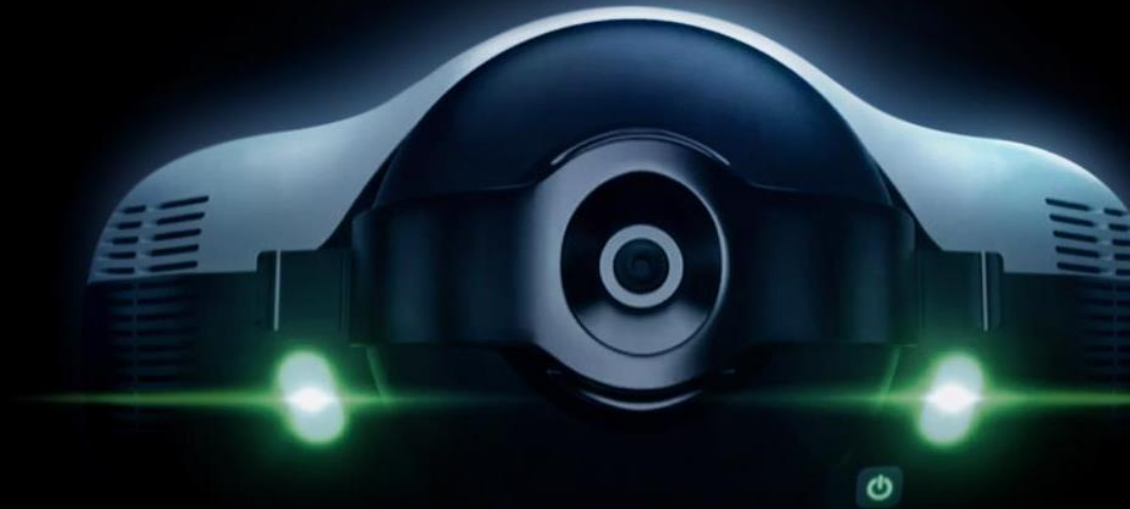

DOOSAN MOBILITY INNOVATION

H2@Airpots Virtual Workshop



Doo Soon Lee / CEO

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US Virgin Island in November 2019



Requirements for emergency delivery in USVI

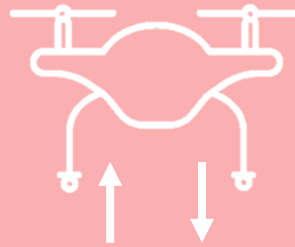
1

Long Distance Flight



2

Multi-copter drone for safe delivery



Vertical
Takeoff/landing

3

Pollution-free
energy source



What Does Doosan Do?

Based on Infrastructure Support Business, Doosan has been transforming its business into New Innovation Industries

Internal Test Bed or
Captive Markets



Power plant
(Nuclear, Coal and Renewable)



Engineering & Construction

Mass-Production of
Industrial Products



Compact Equipment

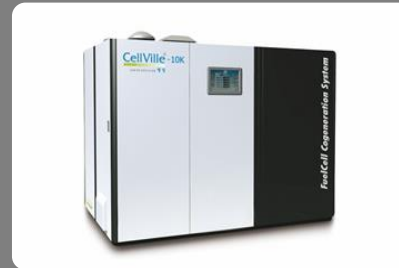


Construction Equipment
(Excavator, Loader, Forklift)

Proven Fuel Cell
Technology



PA Fuel Cell
(50 Years Experience)



PEM Fuel Cell
(30 Years Experience)

Transformation



Digital Transformation



Collaborative Robot



Mobile Fuel Cell

Doosan Mobility Innovation in S.Korea

Jeju Special Self-Governing Province

Emergency drone delivery

✓ Vision

Establish an emergency supplies delivery system

✓ Milestone

- Delivered facial masks to island residents to prevent COVID-19
- Delivered AED to climbers to prevent cardiac arrest



DMI's Role

- Provide an emergency delivery service in areas with little access to existing transportation such as mountains & islands

Next Steps

- Provide a regular emergency delivery service with the Korea Fire Department
- Develop a fully autonomous delivery service

Doosan Mobility Innovation in S.Korea

Ministry of Trade, Industry and Energy

Drone Delivery Pilot Project

✓ Vision

Build a drone delivery service platform in areas lacking infrastructure

✓ Milestone

- '19~'20: Design a drone delivery system & Operate POC
- '21: Enhance the system
- '22: Commercialization



DMI's Role

- Develop an integrated hydrogen drone with the payload of 8kg
- Integrate it with a delivery system (e.g. Precision landing, Intelligent control system)

Next Steps

- Internalize logistics drone technology including swarm flight, sense & avoid, encryption etc.
- Participate in governmental logistics projects

Doosan Mobility Innovation in S.Korea

Solaseado 100MW Solar Power Plant

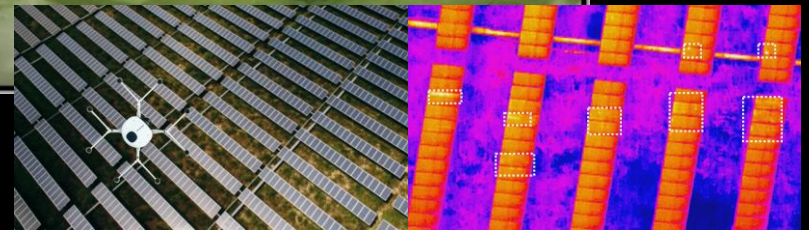
Solar Farm Inspection Solution

✓ Vision

Autonomous inspection and analysis
S/W solution for large scale solar farm

✓ Milestone

- '19: Development of Operational Service Design & AI Model
- '20: POC & S/W Release
- '21: Commercialization



DMI's Role

- Develop total Solar Farm inspection solution including thermal image mapping flight mission & AI image analysis model

Next Steps

- Stability Check for inspection solution
- Conducting POC and Commercialization in US
- S/W Release date: Nov. '20

Doosan Mobility Innovation in S.Korea

Korea Electric Power Research Institute

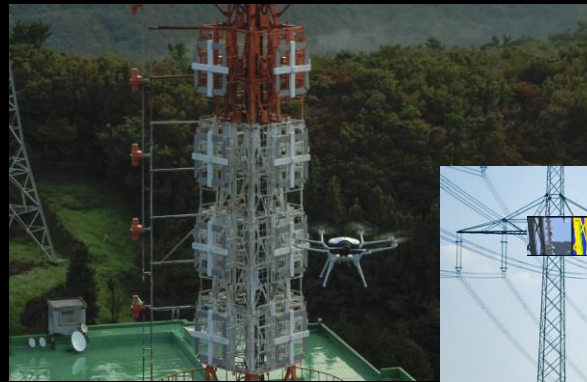
Transmission Tower & Line Inspection

✓ Vision

Develop power tower & line inspection using HFC drones with automatic flight & analysis

✓ Milestone

- Automated mission planning (safe distance & line following)
- Video & Image analysis



DMI's Role

- Provide hydrogen fuel cell drones enabling over 7 miles round trip for inspection

Next Steps

- Applying AI Model for automated image analysis
- Integrating solution for US market (Target POC: 2021 1Q~)

Doosan Mobility Innovation in S.Korea

Korea Gas Corporation

Oil & Gas Inspection Project

✓ Vision

Build drone monitoring service to prevent major accidents or illegal construction

✓ Milestone

- '20: Service design & 25 miles pipeline POC
- '21: System enhancement
- '22: Commercialization nationwide



DMI's Role

- Supply periodic drone monitoring services with long flight time drones and the data management server using LTE

Next Steps

- Integration of Swarm flights & Obstacle Avoidance functions
- Development of AI Model for detecting sink holes or pipeline cracks

Doosan Mobility Innovation in S.Korea

UAM Team Korea

K-UAM Road Map

- ✓ Vision
: New Paradigm of Time and Space by Transportation Innovation
- ✓ Milestone
 - ~'24: Laws and Regulation Setup Pilot Project
 - ~'29: Commercialization of initial routes at the major base points
 - ~'35: Expansion of flight routes in urban areas
 - '35~: Realization of autonomous flight and full commercial operation

DMI's Role

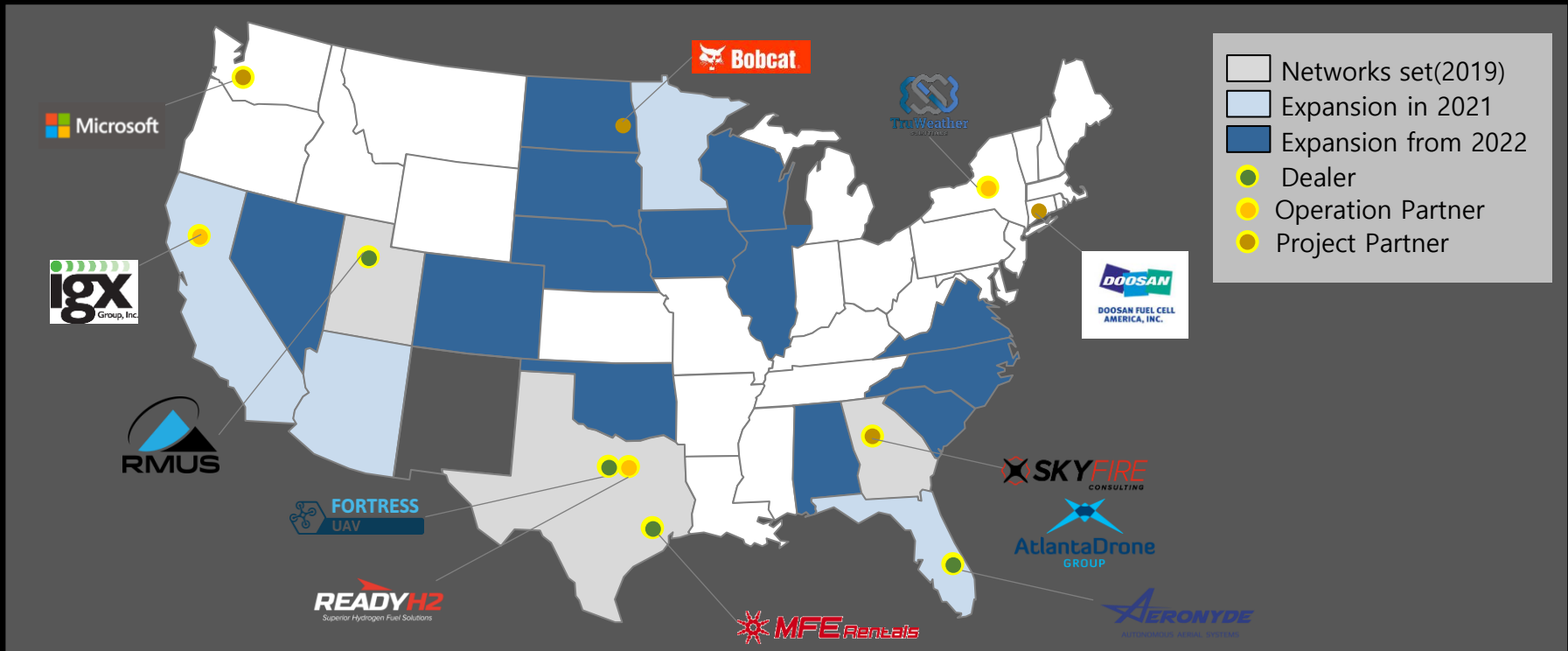
- Member of industrial stake holder w/Hyundai Motors, Hanwha systems and KAL
- Aircraft Design and its Cost Modeling



Target

- to reduce commuting time and related social cost by 70%
- to create \$1.3 billion worth in market, 160K jobs and added value of \$1.1 billion

Business Plan in USA



Networks Set
(2019)

Target states to be expanded
(2021)

Further Expansions
(2022~)


Regions

- Three(3) primary states
– TX, UT, GA

- Recruit more dealers in four(4) targeted states
– FL, CA, AZ, MN

- States expected to be expanded through existing dealers
– NV, CO, OK
– ND, SD, WI, IL, IA, NE
– AL, SC, NC, VA

Hydrogen Supply Network for HFC Drones in USA

Type	Description	Supply Options
Delivery Type	"Charged drone cylinders drone are delivered to customer sites"	<ol style="list-style-type: none"> 1 <u>ReadyH2/Industrial Gas Company charges drone cylinders</u> 2 <u>ReadyH2/Industrial Gas Company delivers charged cylinders to customer sites</u> 3 <u>Customers store and use cylinders on demand</u> 4 <u>ReadyH2/Industrial Gas Company collects empty cylinders</u> 
On-site Type	"Cylinders for drones are charged on customer sites"	<ol style="list-style-type: none"> 1 <u>Hydrogen charging system providers install equipment on customer sites</u> 2 <u>Customers produce, compress and dispense hydrogen on demand¹ or</u> <hr style="border-top: 1px dashed black;"/> <ol style="list-style-type: none"> 1 <u>Mobile refueling trailer(MRXL) arrives at customer sites</u> 2 <u>ReadyH2 charges cylinders at the site for customers</u>

Potentiality of HFC Drones in US

HFC Drones can be a new solution for large scale infrastructures in the energy sector in the US.

At long-linear and/or large sites such as...

Oil & Gas Pipeline



Transmission Tower & Line



Solar/Wind Power Plant



Doing various missions such as...

Regular Inspection



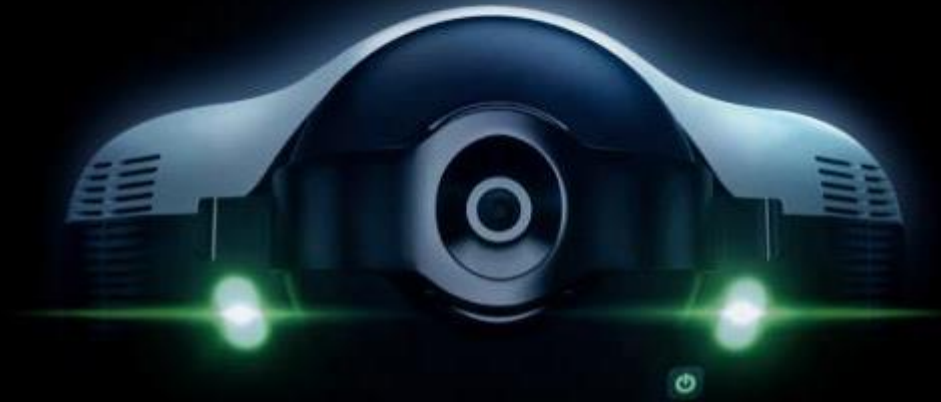
Emergency Response



Real-Time Surveillance



Power for Tomorrow



Doosan Mobility Innovation

