OCC-IGS / STABLE GRID AS A SERVICE (SGaaS) - GREECE

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I. GENERAL BACKGROUND/OCC-IGS

II. WHY GREECE?

III. BUSINESS MODEL

IV. BENEFITS

V. IMPLEMENTATION/TIMELINE

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I. <u>GENERAL BACKGROUND/OCC-IGS</u>.

1. Greece has decided to aggressively transition from fossil fuels to solar and wind as energy sources.

2. To achieve this transition, transmission and distribution operators will invest billions of Euros to accommodate more than 13 GW of renewable energy by 2030.

3. To finance this investment, plus the one under way to interconnect the Greek islands to the mainland grid, electricity tariffs will go up.

4. The existing grid is at risk of failure from increased use of RES, specially in the case of islands with isolated electrical systems. The Hawaii experience shows how serious this problem can be.

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I. **GENERAL BACKGROUND/OCC-IGS**. (Cont.)

5. The preceding presentations from Drs. Greg and Dr. Keyue Smedley described this problem and how the use of the OCC Dynamic Var Compensator (DVC) mitigates expected restrictions on RES penetration and efficiently helps to stabilize the grid.

6. The aforesaid at a cost substantially less than the expansion and reconstruction of the transmission and distribution infrastructure and consequently at lower electricity tariffs.

7. OCC-IGS, Inc. is a subsidiary of ONE-CYCLE CONTROL, Inc. (OCC)

8. OCC-IGS has been set-up to market and promote the use of the OCC DVR on a worldwide basis to provide grid stability and permit the increased use of RES.

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I. **<u>GENERAL BACKGROUND/OCC-IGS</u>**. (Cont.)

9. OCC-IGS together with OCC, and using the resources of the Power Electronics Laboratory of the University of California – Irvine, will work with public utilities, grid operators and regulatory authorities to design and implement the best solution to the problems associated with grid instability and/or increased use of RES.

10. The basic stages are simulation, testing and roll-out (rapid implementation).

11. The services provided by OCC-IGS were traditionally considered as ancillary services for the power sector.

12. Ancillary services are services necessary to support power or grid operation in maintaining power quality, reliability and security of the grid. Two approaches have been followed to secure the provision of ancillary services: compulsory provision or the creation of a market for ancillary services.

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II. WHY GREECE?

1. Government has adopted policies, pursued actions and enacted legislation to become a regional energy hub and transform the energy matrix.

2. In June 2022, the Ministry of Energy and Environment stated that 44 billion Euros would be dedicated to the structural transformation of Greece's energy sector which would include increasing renewable energy capacity to 25 GW and tripling the volume of LNG storage.

3. Electricity transmission and distribution system operators are investing billions of Euros to be able to accommodate more than 13 GW of renewable energy by 2030.

4. Greece is a country with many islands. Their total area represents about 15% of the total area of the country (not including Euboea) and their total permanent population represents approximately 12% of the population of the country. However, the islands of Crete, Rhodes, Corfu and Lesvos accumulate 70% of the islands' population.

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II. **WHY GREECE?** (Cont.)

5. One regulatory authority (Regulatory Authority of Energy – RAE) and one single distribution company (Hellenic Electricity Distribution Network Operator S.A. – HEDCO).

6. Many of the islands are far from Greece's mainland and are electrified by autonomous electrical systems and grids. These islands are denominated Non-Interconnected Islands(NII).

7. According to HEDCO the main characteristics of the NII are:
   a. They have abundant renewable energy potential;
   b. As isolated energy systems they don't have the ability to exchange electricity with other electrical systems. This affects the reliability and security of energy supply;
   c. Because they are not interconnected with electrical systems that have high inertia they face serious problems of voltage and frequency stability;

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II. **WHY GREECE?** (Cont.)

d. They have significant differences in size and population and distance form the mainland and cannot be easily accessed all the time, especially by sea; and,

e. Electricity to support peak demand is mainly generated using diesel generators.

8. The preliminary simulations undertaken by OCC indicate that the use of the OCC DVC can delay or ultimately make unnecessary the interconnection of NII to the mainland, to solve the problems with voltage and frequency stability that NII have.

9. It has been estimated that expanding the grid to interconnect the NII has a cost of approximately 1,000,000.00 Euros/Km.

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III. BUSINESS MODEL.

1. OCC-IGS proposes to supply, install, maintain and operate all the DVCs necessary to achieve agreed to grid stability parameters under a long-term Build, Own and Operate exclusive concession contract (BOO). Alternative arrangements will be considered.

2. Design and engineering of the respective electrical system will be carried out by OCC in collaboration with the University of California at Irvine Power Electronics Laboratory.

3. Term of BOO Contract shall be agreed to by the parties.

4. Provision of grid stabilization services can occur through compulsatory provision or the creation of a market for the provision of these services.

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IV. BENEFITS.

1. Much lower tariffs for electricity available to consumers.

2. Rapid implementation when compared to the interconnection to the main grid and/or traditional upgrade of existing transmission and/or distribution infrastructure.

3. System can quickly adapt to growth in demand and supply.

4. Eventually, OCC-DVDs can be manufactured in Greece.

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V. IMPLEMENTATION.

Expected period of implementation from contract award to commercial operation is 12 to 18 months.