APPENDICES:
LONG TERM

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APPENDIX: LONG TERM

CARIBBEAN ENERGY CHAMBER

Option of Small Modular Nuclear Reactors (SMR) For Electrical Power Generation in the Caribbean

LONG TERM: SMALL MODULAR NUCLEAR REACTORS

SMR TECHNOLOY NOT WIDELY AVAILABLE UNTIL AFTER 2030-2035

CURRENTLY TOO EXPENSIVE BUT WILL EVOLVE TO BE COST COMPETITIVE SOONER?

COMPLEX TO DEPLOY TECHNOLOGY TO SIDS AND WILL REQUIRE SIGNIFICANT SAFETY ASSURANCES WHICH IS LENGTHY PROCESS

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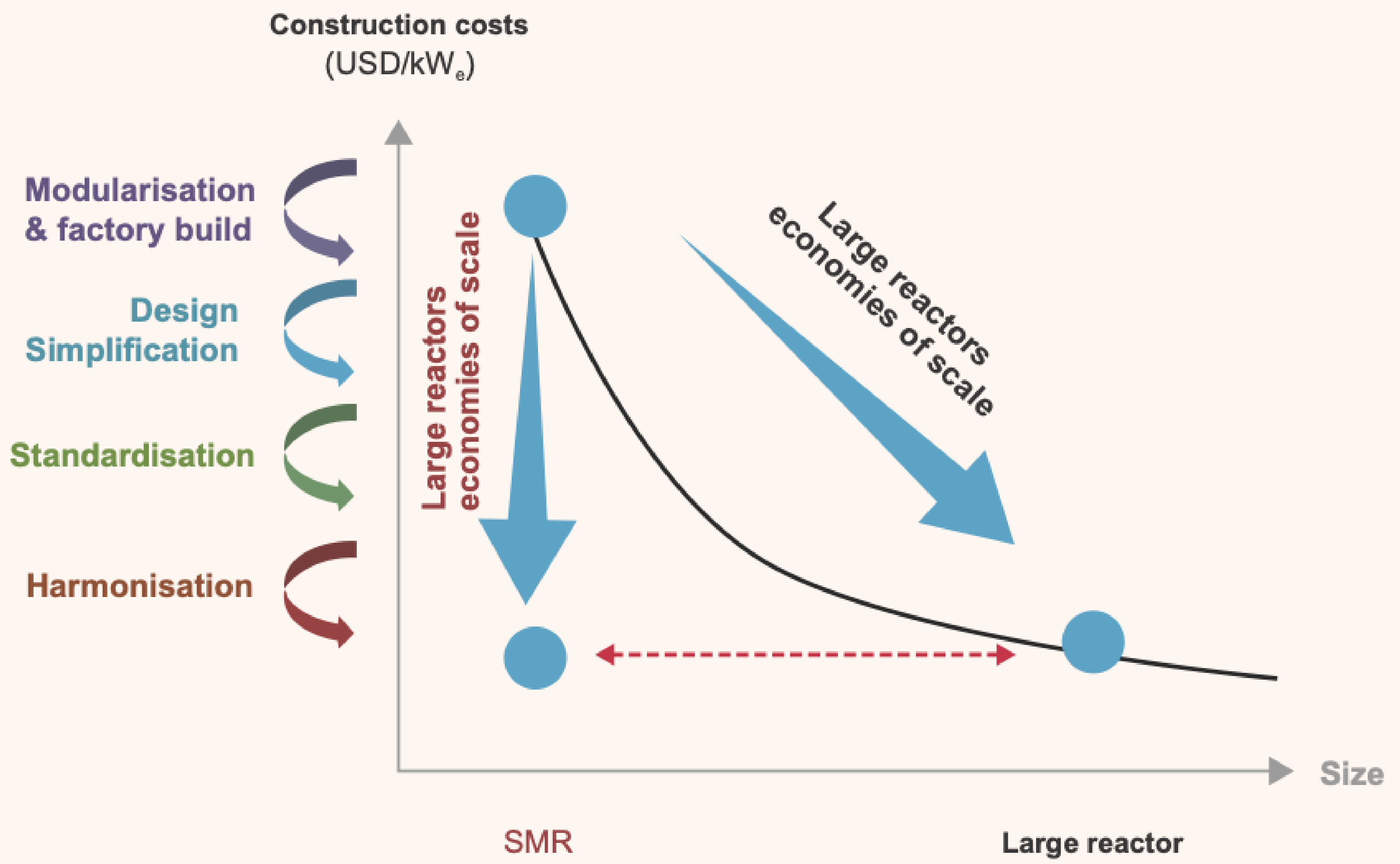
LONG TERM: SMALL MODULAR NUCLEAR REACTORS

SMALL MODULAR REACTORS (SMRs) ARE DEFINED AS NUCLEAR REACTORS WITH A POWER OUTPUT BETWEEN 10MWE AND 300MWE.

FACTORS DRIVING THE COST REDUCTION OF SMRS AS SHOW IN THE DIAGRAM BELOW



SMR
Large reactor

APPENDIX: LONG TERM

Option of Small Modular Nuclear Reactors (SMR) For Electrical Power Generation in the Caribbean

LONG TERM: SMALL MODULAR NUCLEAR REACTORS

THE LEVELIZED COST OF SMRs IS STILL NOTICEABLE ABOVE THAT OF NATURAL GAS FIRED POWER PLANTS AND THERE IS A GAP TO CLOSE. SEVERAL GEN III/III+ SMR FIRST OF A KIND (FOAK) PROJECTS WERE CHARACTERIZED BY EXCESSIVELY OPTIMISTIC INITIAL COST AND SCHEDULE ESTIMATES, WITH A FINAL "AS BUILT" PRICE TAG REPRESENTING MULTIPLES OF THE INITIAL ESTIMATE.

- CAPEX Costs – SMRs estimates are still in the range of 3,500- 4,500 USD/KWhr compared with natural gas thermal power plant costs of 1,000-1,500 USD/KWhr . Through the factors mentioned above the ambition is to get SMRs under 2,000/2,500 USD/KWhr by 2030.

- Levelized cost of electricity (LCOE) – SMRs that are not subsidized are expected to be in the range of 8-12 USc/KWh compared to natural gas fired thermal at ~ 5 USc/KWh (without carbon tax), wind at 4-5 USc /KWh and solar at 5-6 USc/KWh. Natural gas fired thermal increases to ~ 8 USc/KWh with a carbon tax of USD 60/ MT and to ~ 12 USc/KWh with a carbon tax of USD 170 /MT. Note that the assumed natural gas price is 5 USD/MMBTU

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OTHER FACTORS THAT ARE NOT COMMERCIAL THAT ARE VERY IMPORTANT ARE AS FOLLOWS:

- Approvals to deploy the technology in small island states (SIDs)
- Costs associated with all the necessary, specially trained resources, regulatory and other controls what would be required to own and operate a SMR

CONCLUSIONS

- SMRs are zero carbon emissions and have “green” energy intensity for heavy industrial downstream use
- SMRs technology likely will not be widely available until after 2030-2035. At that time, it is possible there would be sufficient improvements that make it cost competitive with other sources of electrical power. The current gap can also be significantly closed with the imposition of high carbon taxes
- However, deploying the technology to SIDS will be a complex process that will require significant safety assurances which could be quite lengthy, possibly years

REFERENCES

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