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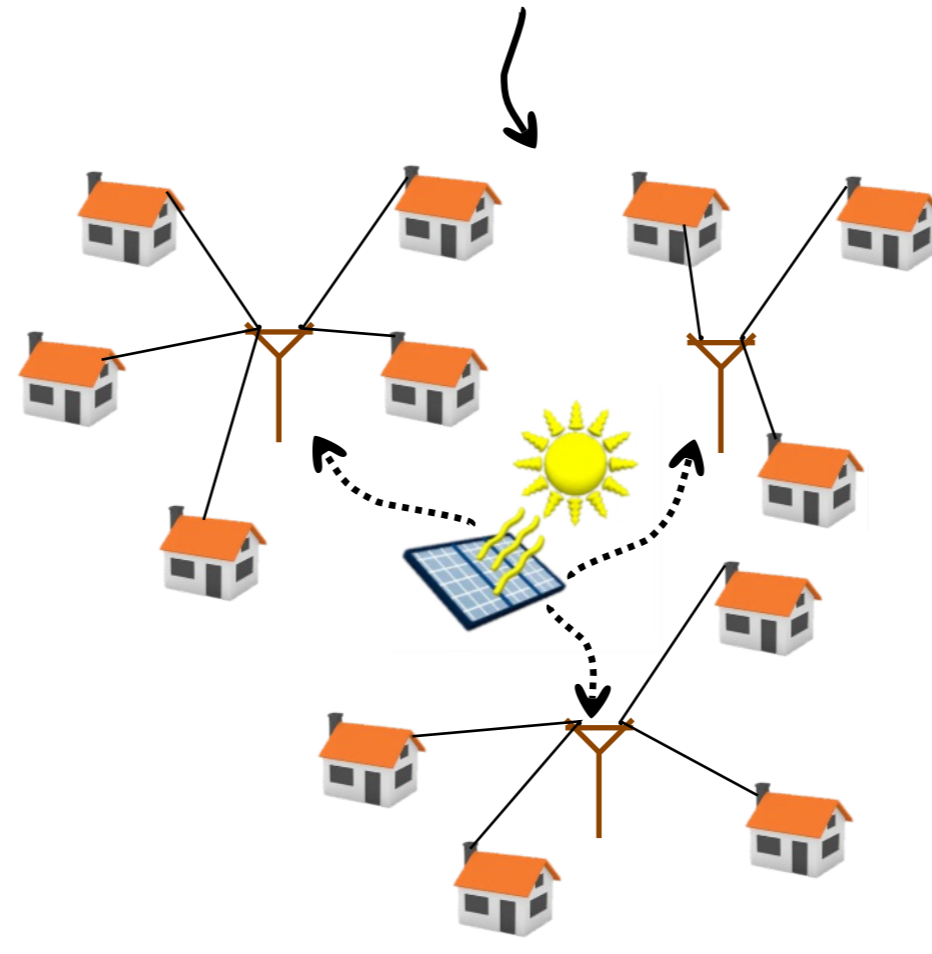
**THE SUPERVISORS:**  
 SCOTT STRACHAN  
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## THE AIM

THE TEAM ARE WORKING ALONGSIDE POWERGEN TO AUTOMATE THEIR MINI-GRID DESIGN PROCESS BY DEVELOPING A TOOL WHICH TAKES THE NECESSARY INPUTS REQUIRED AND OUTPUTS THE NETWORK LAYOUT FOR THE VILLAGE. IT IS THOUGHT THAT MINI-GRIDS WILL PROVIDE ELECTRICITY FOR 60%-70% OF PEOPLE WHO DO NOT CURRENTLY HAVE ACCESS AND BY 2030, 56% OF ALL INVESTMENT WILL GO TOWARDS MINI-GRIDS.

A mini-grid is a small scale electrical distribution network that provides power to a localised group of customers through a small generator



## WORLD WITHOUT ELECTRICITY

ONE BILLION PEOPLE IN THE

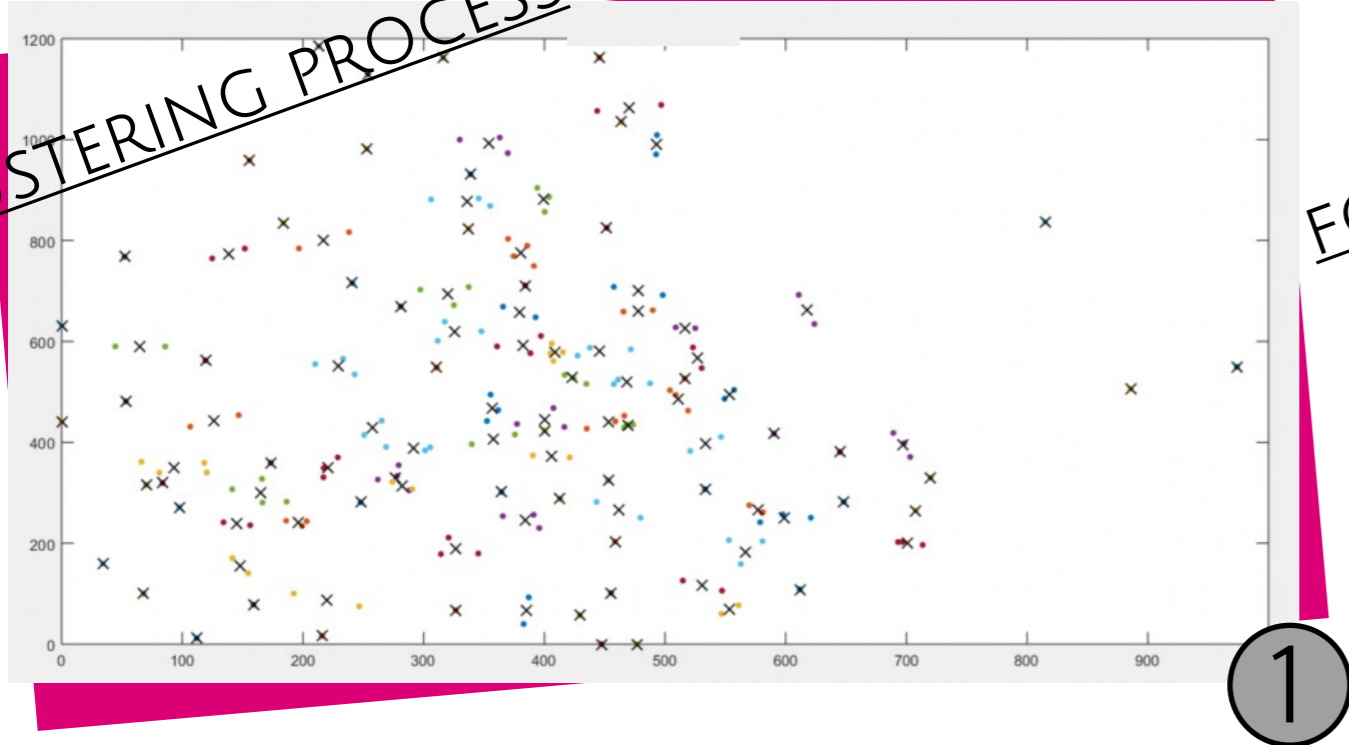
The project mainly focuses on this goal

## DESIGN STAGES

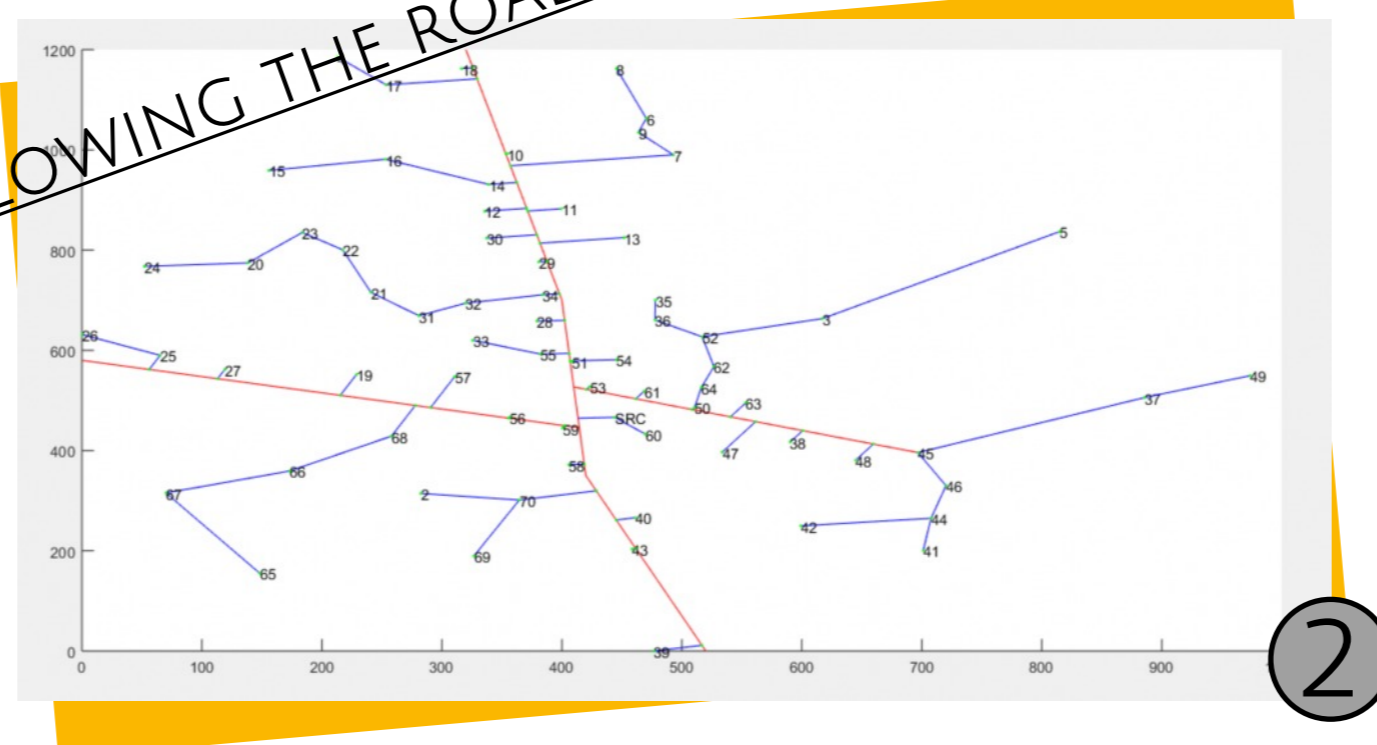
THIS YEAR, THE TEAM HAVE FOCUSED ON IMPROVING THREE MAIN FUNCTIONS IN THE PROGRAM

THE CUSTOMER COORDINATES ARE PLOTTED AND CLUSTERING TAKES PLACE TO IDENTIFY WHERE POLES AND STAYS CAN BE PLACED. CONNECTIONS ARE MADE WITH ALL CUSTOMERS BEING WITHIN 600-800M OF THE GENERATION SOURCE AND OBSTACLES ARE AVOIDED. FINALLY, ROADS ARE CONSIDERED TO AVOID THE NEED TO CROSS THE ROAD WITH WIRES AND THE ANGLES ARE OPTIMISED TO MAKE CONNECTIONS AT 90° OR 180° TO MINIMISE THE NUMBER OF STAYS REQUIRED.

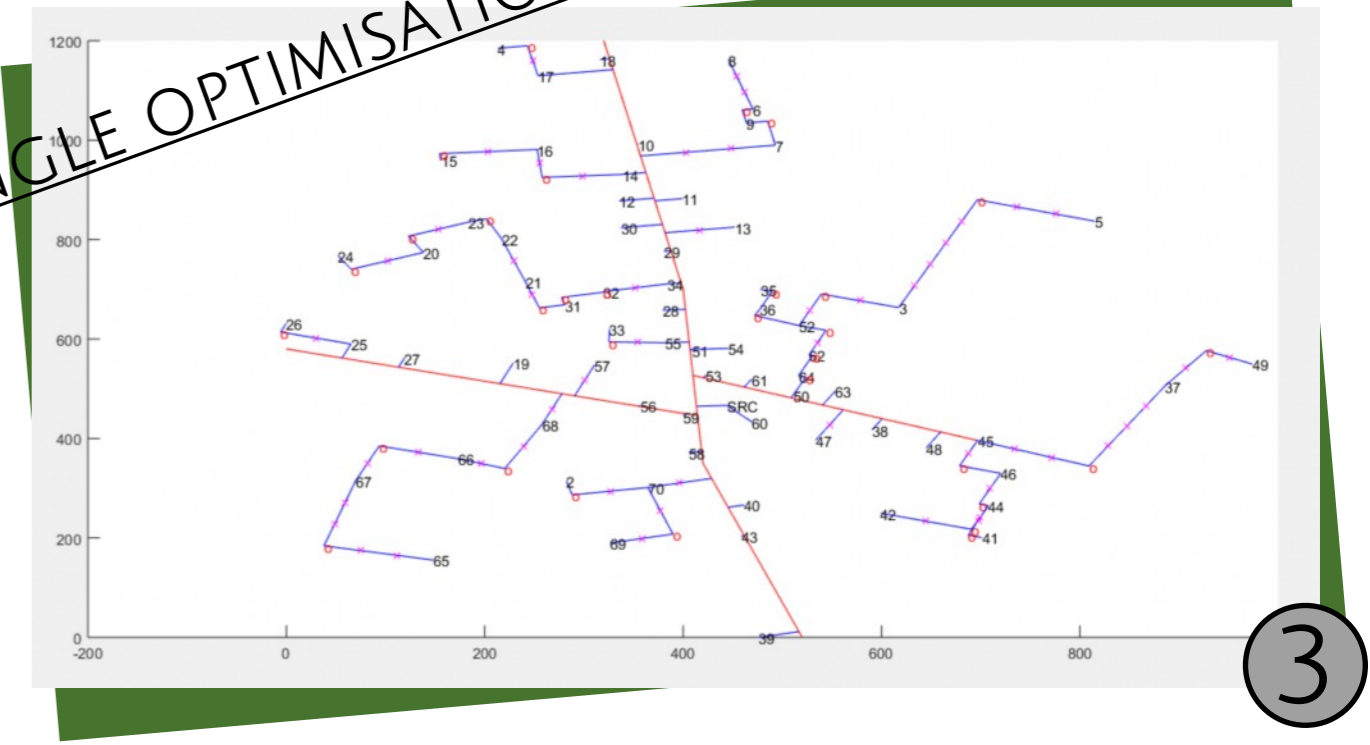
CLUSTERING PROCESS



FOLLOWING THE ROADS



ANGLE OPTIMISATION

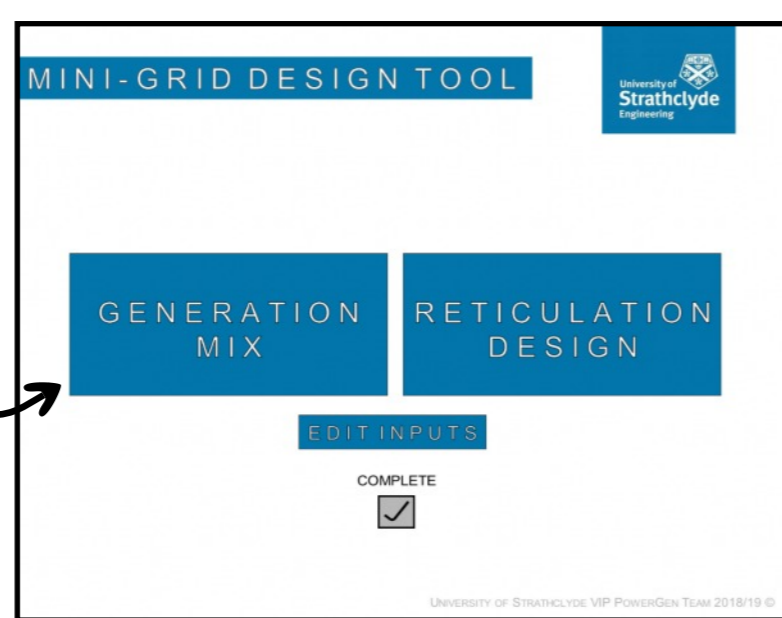


# MINI-GRID DESIGN TOOL



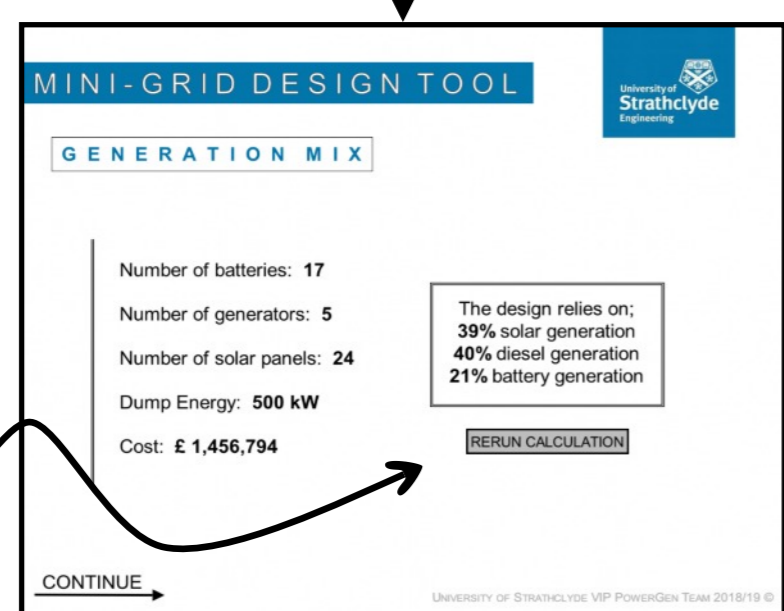
## GRAPHICAL USER INTERFACE

The main page has three buttons - generation mix, reticulation design and edit inputs which the user can select in any order

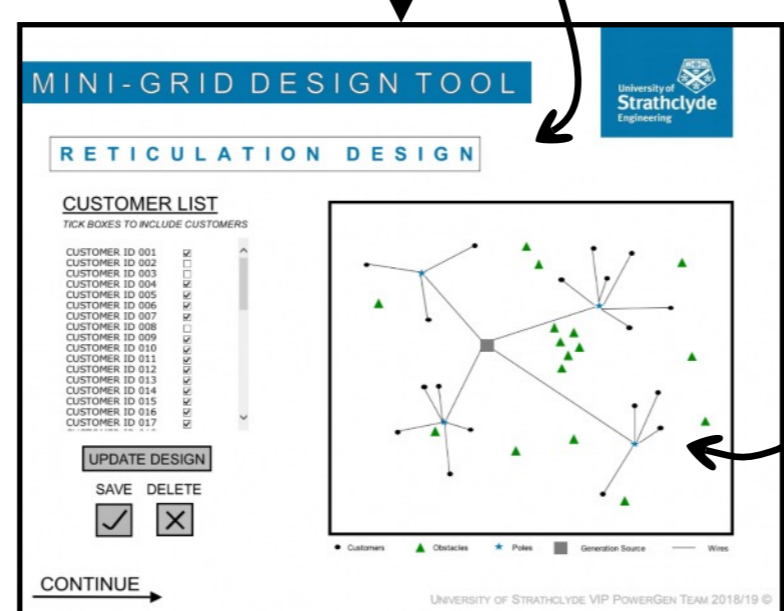


Option to select/deselect customers and update the design if necessary. The user can choose to save or delete new designs and can create multiple designs if they desire.

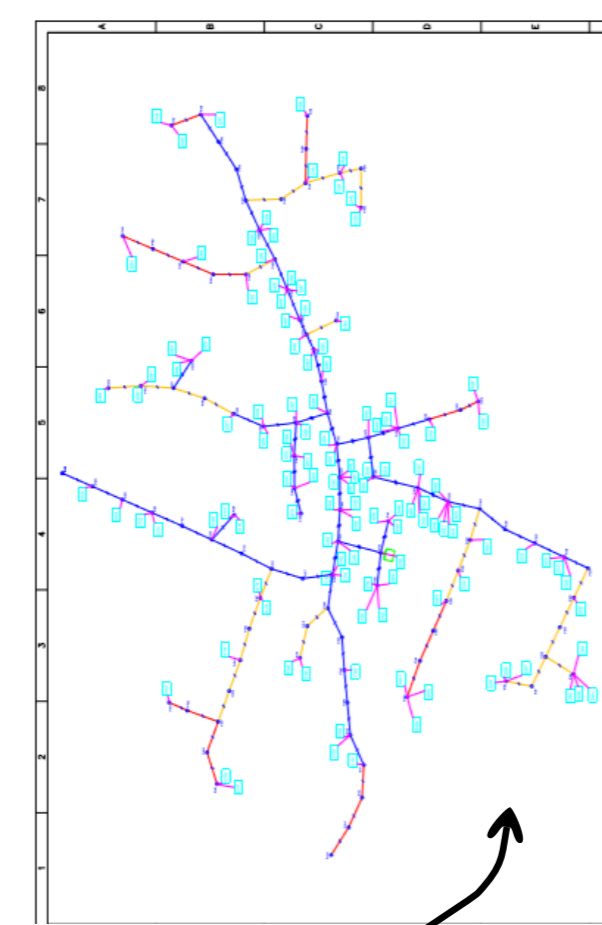
The generation mix is shown and the user can choose to rerun the calculation if they are unhappy



The network layout generated by the tool is shown here

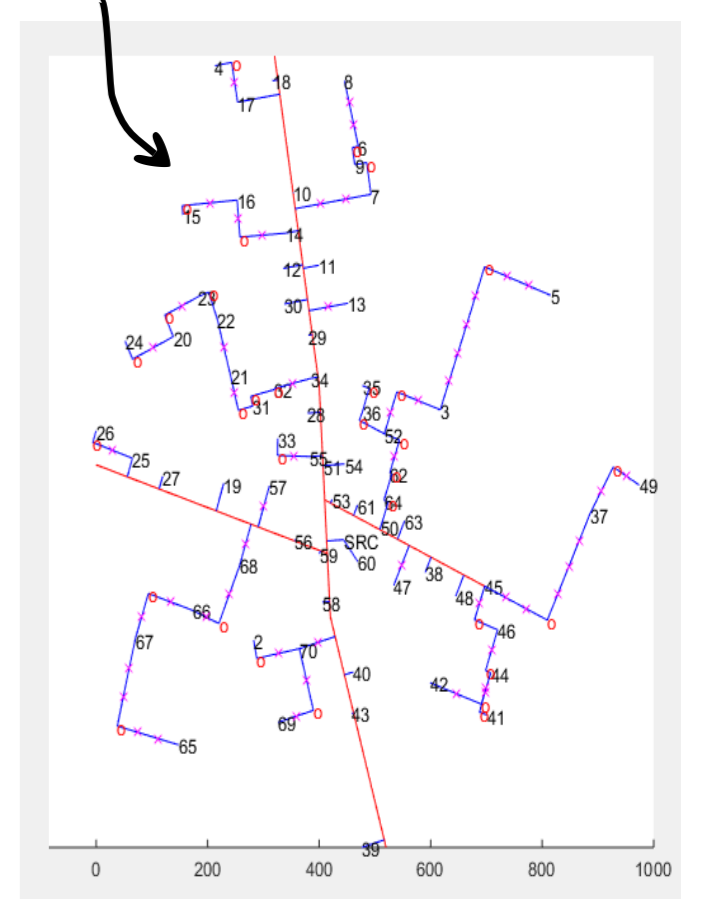


## DESIGN COMPARISON

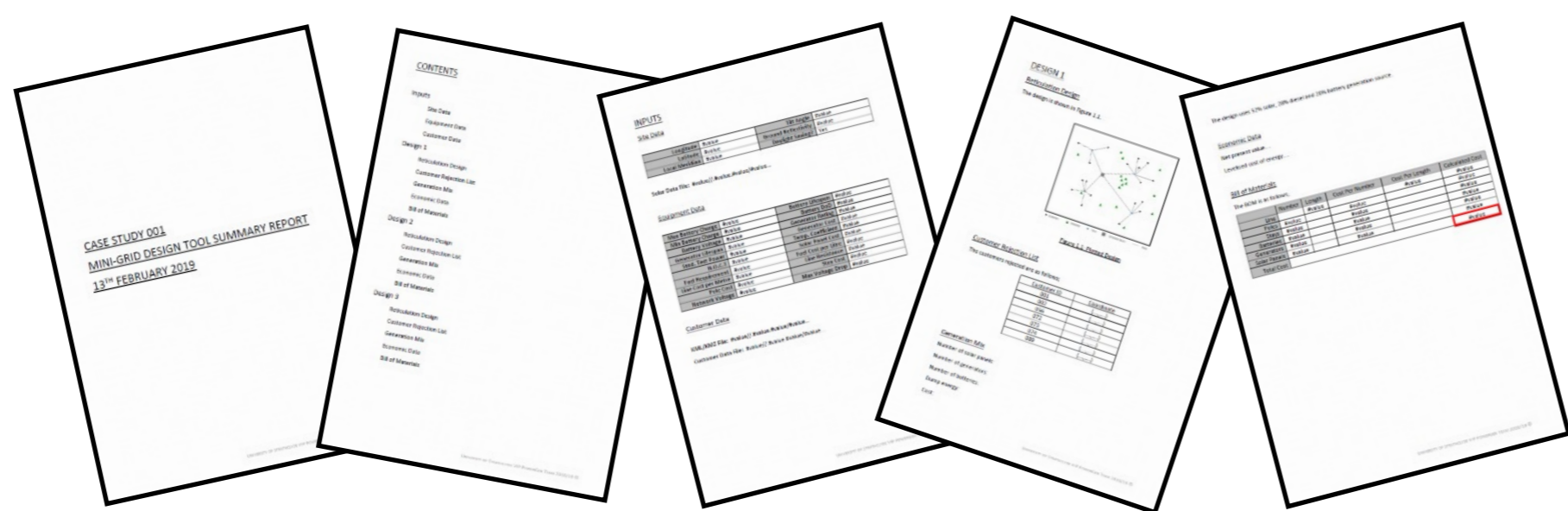


PowerGen's design is created manually using AutoCAD

Our design process plots the network layout automatically



THE TOOL OUTPUTS A SUMMARY REPORT CONTAINING ALL OF THE INFORMATION PRODUCED BY EACH STAGE.



## MATLAB TO C++ CONVERSION

THE PROTOTYPE MATLAB IMPLEMENTATION IS UNDERGOING CONVERSION INTO C++ TO MAKE A MORE ROBUST, EFFICIENT AND FULLY INTEGRATED PROGRAM.

## FUTURE WORK

- IMPLEMENTING THE GRAPHICAL USER INTERFACE TO WORK WITH THE TOOL
- USING MORE CASE STUDIES TO TEST THE TOOL FURTHER AND COMPARE OUR DESIGNS WITH POWERGEN'S DESIGNS
- INTEGRATING GOOGLE EARTH TO WORK WITH THE RETICULATION DESIGN
- EVALUATING THE NETWORK IN TERMS OF COST OF ADDITIONAL POLES, STAYS, CABLE AND LABOUR