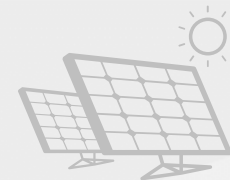


百兆瓦级光伏电站快速设计及优化

蒋华庆

案例1

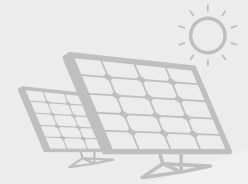


某300MW农光互补项目，采用**双面**组件，需要做以下多方案比选：

- * 组串型逆变器216kW，
集中型逆变器3125kW
- * 固定式、平单轴支架
- * 间距8/9/10/11米



方案优化比选常规方法



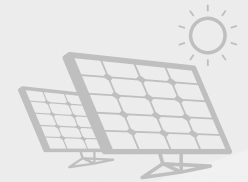
需要做：2X2X4=16次方案

每次：

- (1) 人工在CAD布置
- (2) 设法进行发电单元划分、汇流划分
- (3) 设法进行设备材料清单统计
- (4) 设法在PVsyst建模计算发电量

所需时间>7天

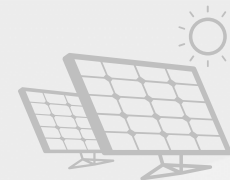
推荐一款软件 pvDesign



04	3125_11_1axis Huaqing Jiang	204.9 MWac	243.0 MWdc	1.19 DC/AC	1468.0 kWh/m2	15.1 °C	1695.2 kWh/kWp	87.53% PR	07/24/2020 14:54
03	3125_10_1axis Huaqing Jiang	226.4 MWac	268.6 MWdc	1.19 DC/AC	1468.0 kWh/m2	15.1 °C	1689.6 kWh/kWp	87.36% PR	07/24/2020 14:52
02	3125_9_1axis Huaqing Jiang	251.6 MWac	298.4 MWdc	1.19 DC/AC	1468.0 kWh/m2	15.1 °C	1682.7 kWh/kWp	87.16% PR	07/24/2020 14:49
01	3125_8_1axis Huaqing Jiang	283.9 MWac	336.8 MWdc	1.19 DC/AC	1468.0 kWh/m2	15.1 °C	1673.3 kWh/kWp	86.93% PR	07/24/2020 14:40

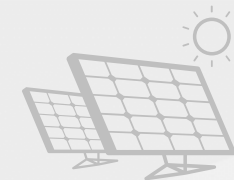
平单轴+双面+4种间距: 10min
16种方案可以在1小时之内完成

集中 VS 组串



06	216_11_1axis Huaqing Jiang	217.5 MWac	245.3 MWdc	1.13 DC/AC	1468.0 kWh/m2	15.1 °C	1645.1 kWh/kWp	84.94% PR	07/24/2020 15:05
05	3125_11_1axis Huaqing Jiang	204.9 MWac	243.0 MWdc	1.19 DC/AC	1468.0 kWh/m2	15.1 °C	1695.2 kWh/kWp	87.53% PR	07/24/2020 14:54

pvDesign软件



- 基于kml/kmz总平面图设计输入
- 气象、horizon输入
- 电气选型选择
- 土建及总图选择
- 发电量计算损耗设定

设计输入



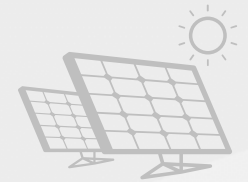
SAAS(software as a service)

- IEC/NEC设计规范
- 海外工程项目know how

设计输出

- 总报告
- 设计说明
- 项目主要设计成果一览表
- 发电量计算专项报告
- 发电量计算每小时数据、25年发电量数据
- 总平面图布置图
- 地形坡度分析图
- 光伏发电单元接线图
- 电气主接线图
- 电缆清册
- 设备、材料及工程量清单

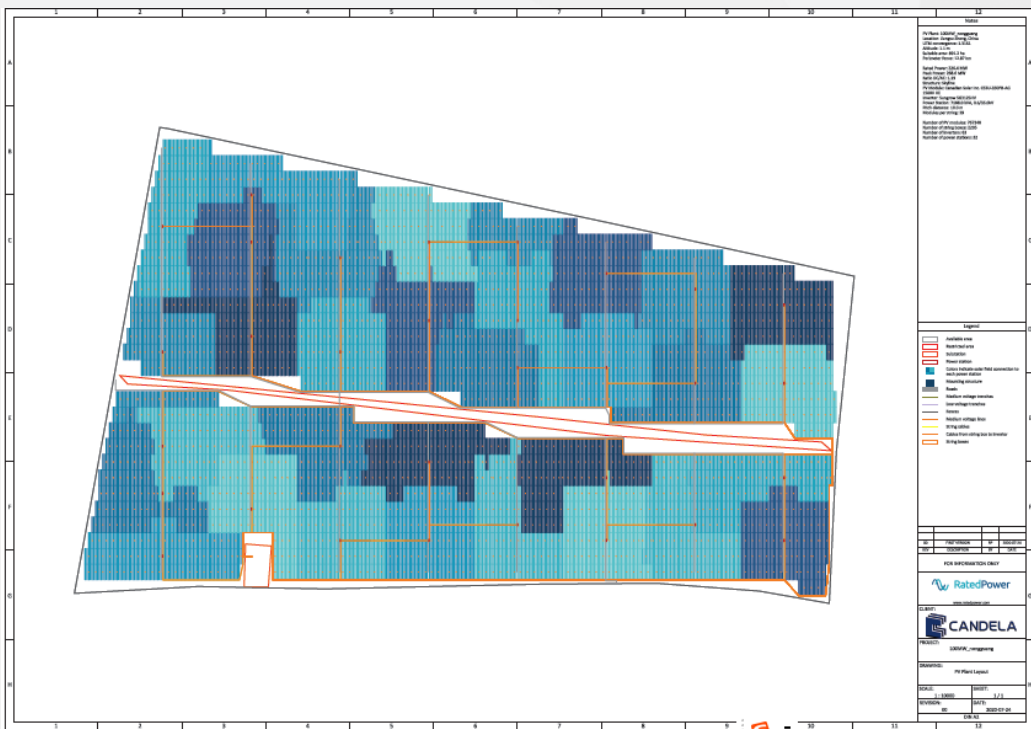
pvDesign生成的成品



- RatedPower-100MW_nongguang-03-BILL_OF_QUANTITIES.xlsx
- RatedPower-100MW_nongguang-03-DESIGN_REPORT.docx
- RatedPower-100MW_nongguang-03-DESIGN_REPORT.pdf
- RatedPower-100MW_nongguang-03-ENERGY_REPORT.docx
- RatedPower-100MW_nongguang-03-ENERGY_REPORT.pdf
- RatedPower-100MW_nongguang-03-ENERGY_RESULTS.xlsx
- RatedPower-100MW_nongguang-03-INTERCONNECTION_FACILITY_REPORT.docx
- RatedPower-100MW_nongguang-03-INTERCONNECTION_FACILITY_REPORT.pdf
- RatedPower-100MW_nongguang-03-INTERCONNECTION_FACILITY_SLD.dxf
- RatedPower-100MW_nongguang-03-INTERCONNECTION_FACILITY_SLD.pdf
- RatedPower-100MW_nongguang-03-LAYOUT.dxf
- RatedPower-100MW_nongguang-03-LAYOUT.kml
- RatedPower-100MW_nongguang-03-LAYOUT.pdf
- RatedPower-100MW_nongguang-03-LISTING_OF_CABLES.xlsx
- RatedPower-100MW_nongguang-03-PROJECT_SHEET.xlsx
- RatedPower-100MW_nongguang-03-SINGLE_LINE_DIAGRAM_LV.dxf
- RatedPower-100MW_nongguang-03-SINGLE_LINE_DIAGRAM_LV.pdf
- RatedPower-100MW_nongguang-03-SINGLE_LINE_DIAGRAM_MV.dxf
- RatedPower-100MW_nongguang-03-SINGLE_LINE_DIAGRAM_MV.pdf
- RatedPower-100MW_nongguang-03-TERRAIN_SLOPES.dxf
- RatedPower-100MW_nongguang-03-TERRAIN_SLOPES.kml
- RatedPower-100MW_nongguang-03-TERRAIN_SLOPES.pdf

- Doc
- Pdf
- Xlsx
- Dxf
- kml

pvDesign平面布置图CAD



当前图层: 0

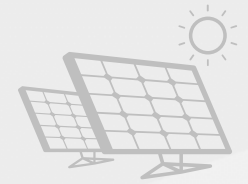
搜索图层

状态	名称	开	冻结	锁...	颜色	线型	线宽	透
✓	00-TitleBox	☑	☑	🔒	白	Continu...	默认	0
✓	00-WindowModel	☑	☑	🔒	140	Continu...	默认	0
✓	0	☑	☑	🔒	白	Continu...	默认	0
✓	Available area	☑	☑	🔒	13...	Continu...	默认	0
✓	Cable codes LV string	☑	*	🔒	0,...	Continu...	默认	0
✓	Cable codes LV string box	☑	*	🔒	0,...	Continu...	默认	0
✓	Cable codes MV System	☑	*	🔒	0,...	Continu...	默认	0
✓	CABLES LV string 4 mm2	☑	*	🔒	25...	Continu...	默认	0
✓	CABLES LV string 10 mm2	☑	*	🔒	25...	Continu...	默认	0
✓	CABLES LV string box 240 m...	☑	☑	🔒	25...	Continu...	默认	0
✓	CABLES LV string box 630 m...	☑	☑	🔒	25...	Continu...	默认	0
✓	CABLES MV system 300 mm2	☑	☑	🔒	25	Continu...	默认	0

图层特性管理器

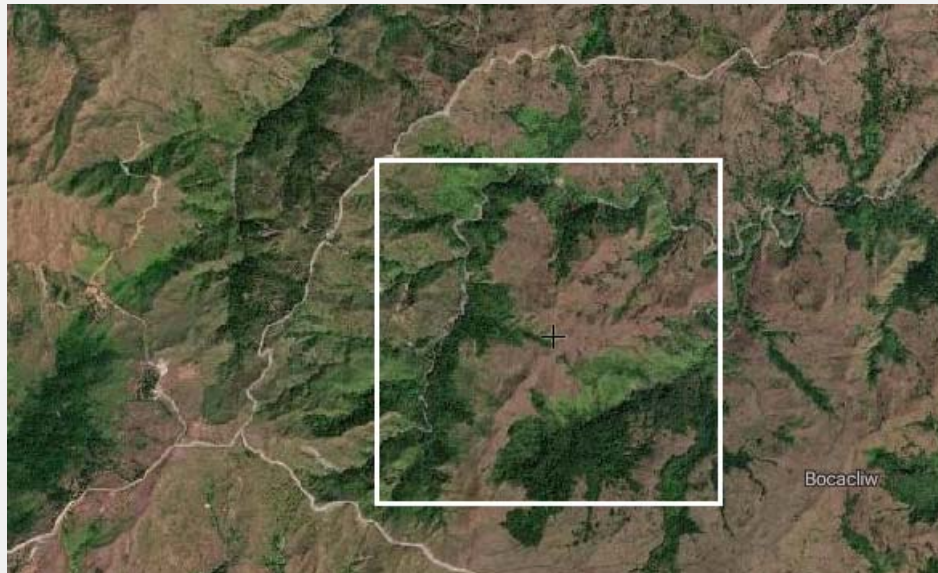
全部: 显示了 33 个图层, 共 33 个图层

案例2

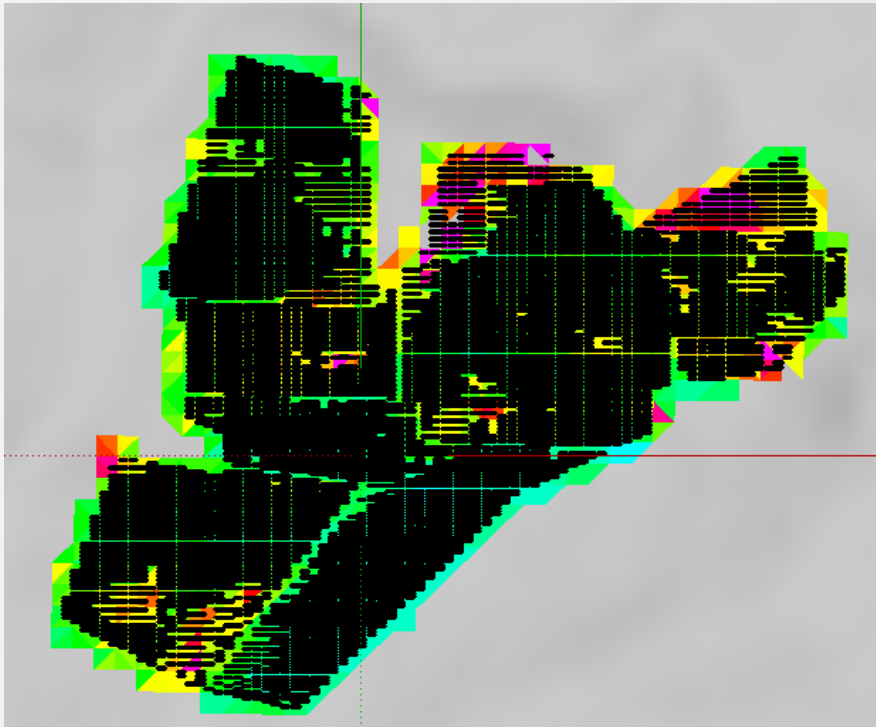
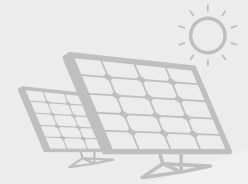


某100MW山地项目，需要对倾角进行多方案比选：

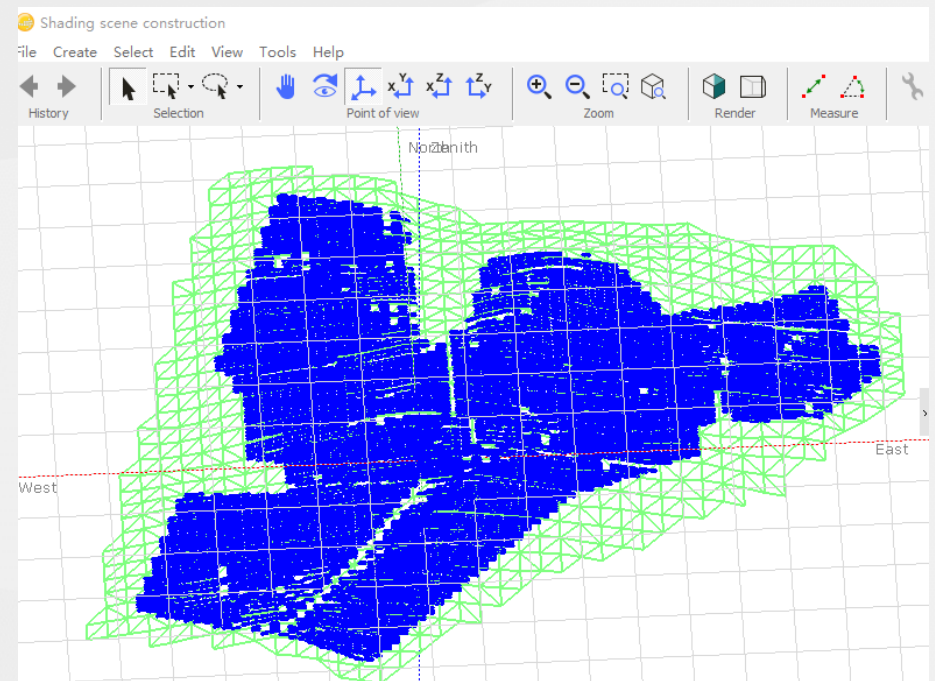
- * 如何对山地项目，进行PVsyst建模？
- * 如何对不同的倾角、方位角方案进行比选？



倾角12°时



容量:89.919MW

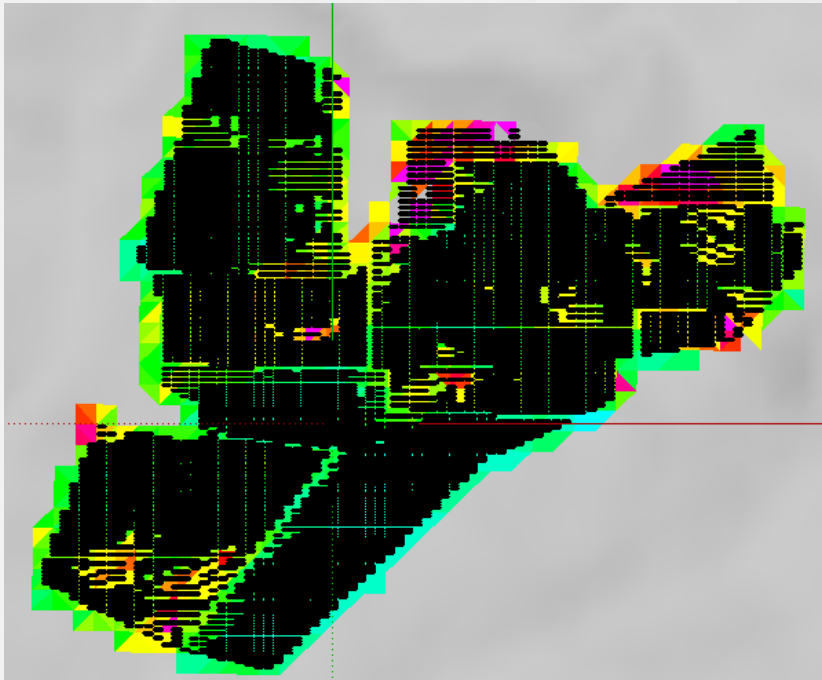
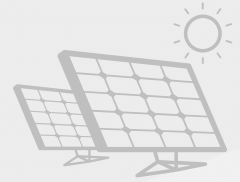


发电量: 161067MWh

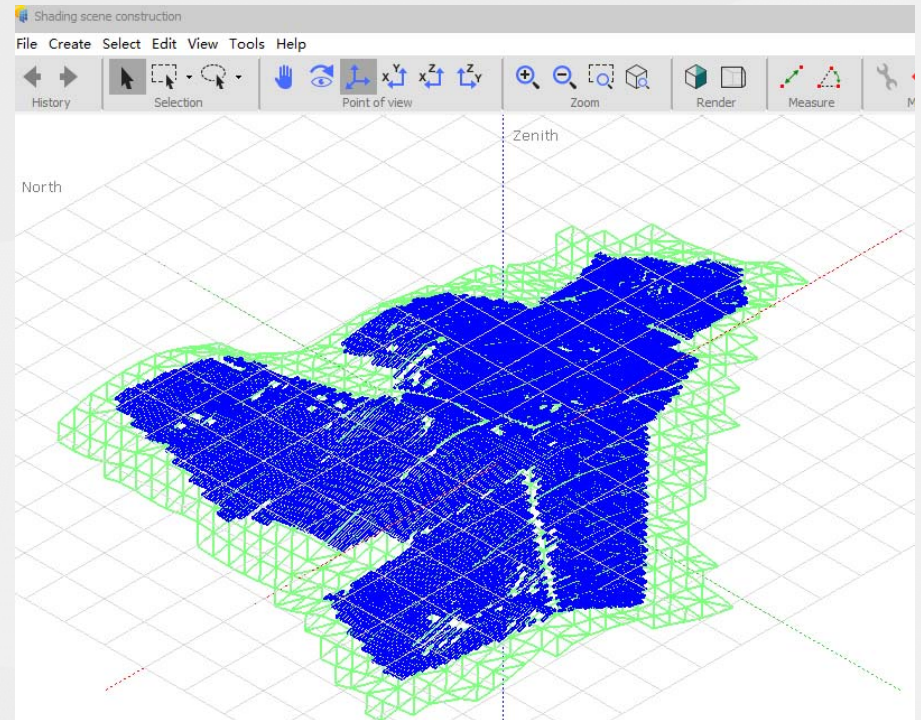
Main results	
System Production	161066 MWh/yr
Specific prod.	1803 kWh/kWp/yr
Performance Ratio	0.824



倾角10°时



容量:91.850MW

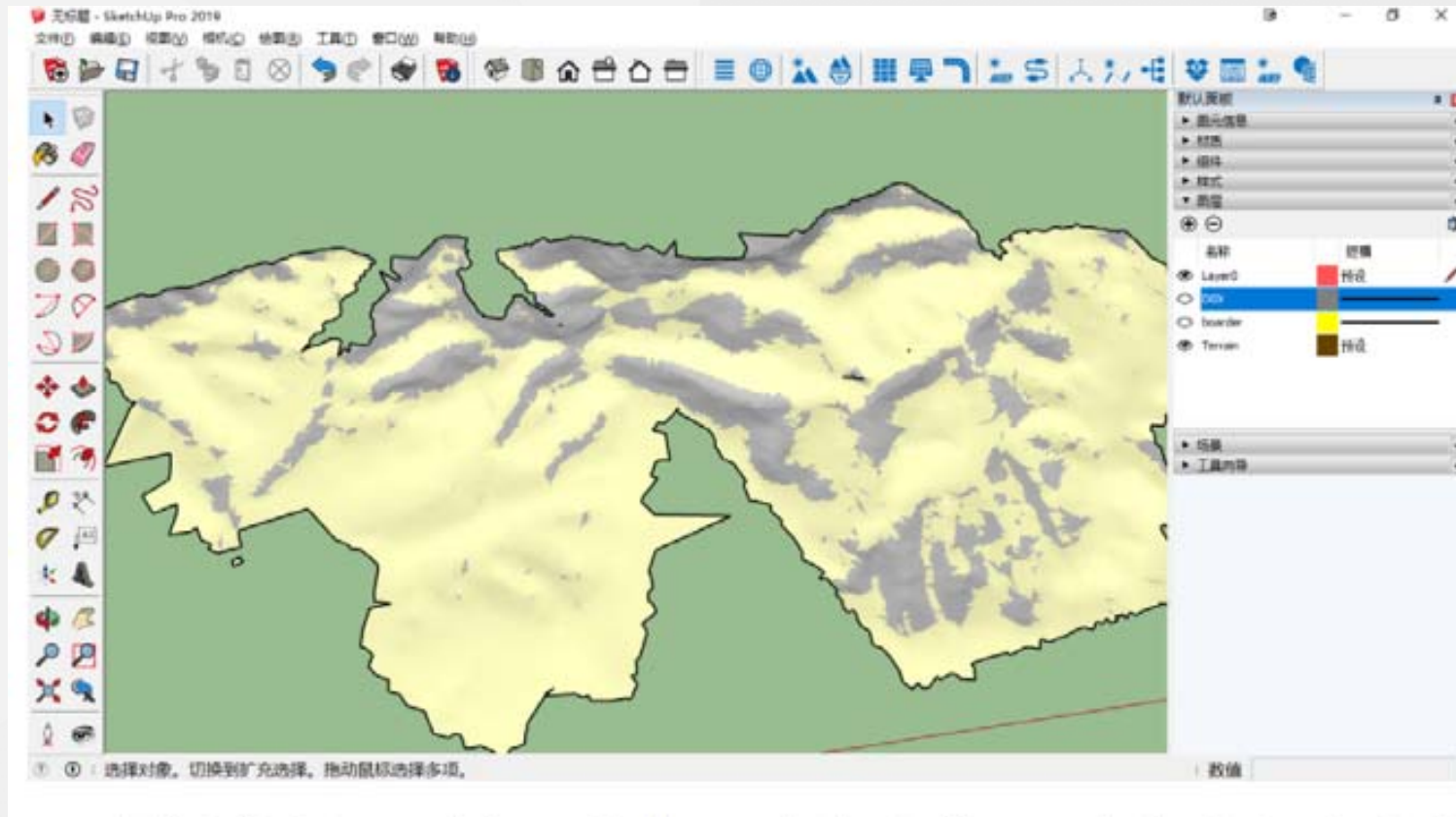
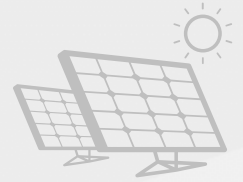


发电量: 161075MWh

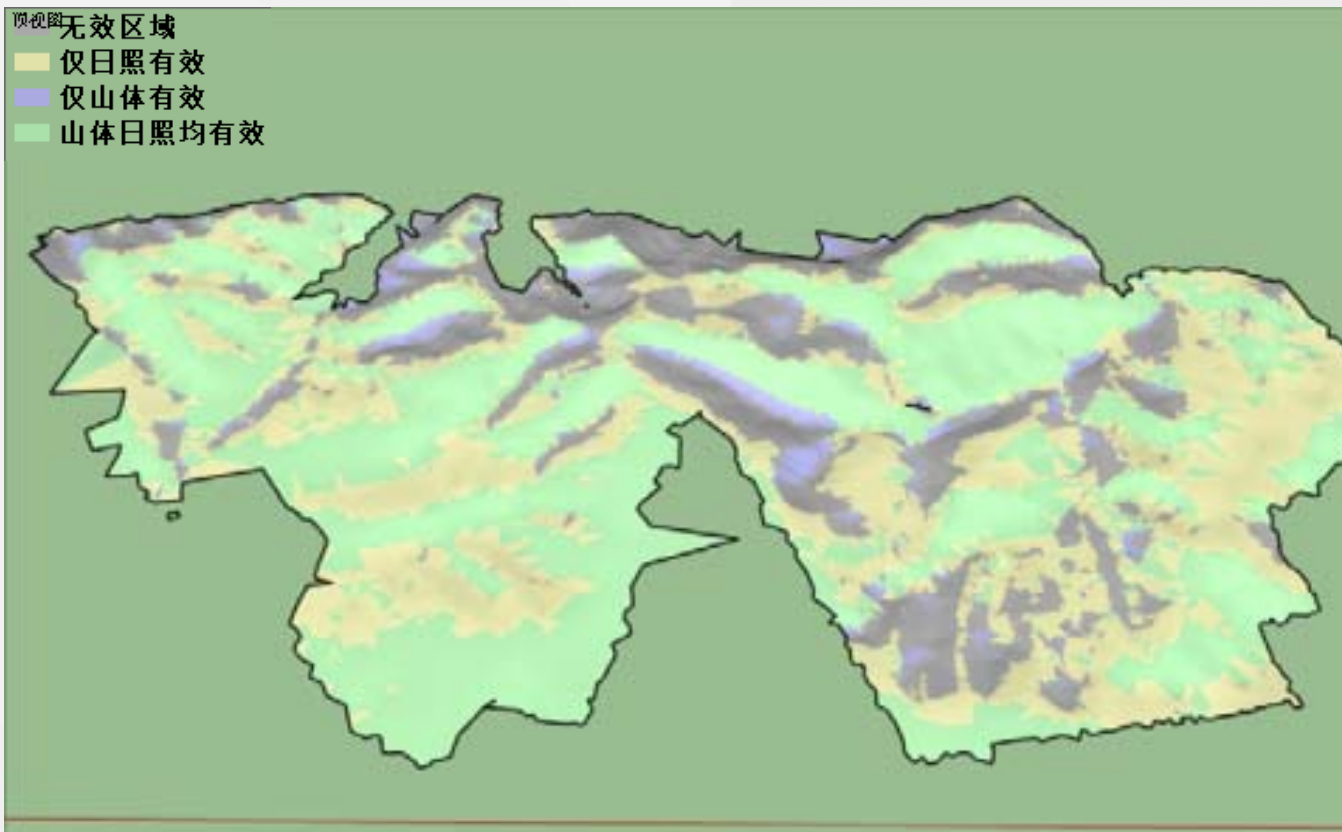
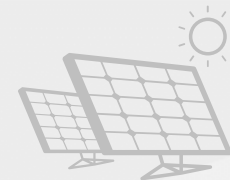
—Main results

System Production	161075 MWh/yr
Specific prod.	1803 kWh/kWp/yr
Performance Ratio	0.826

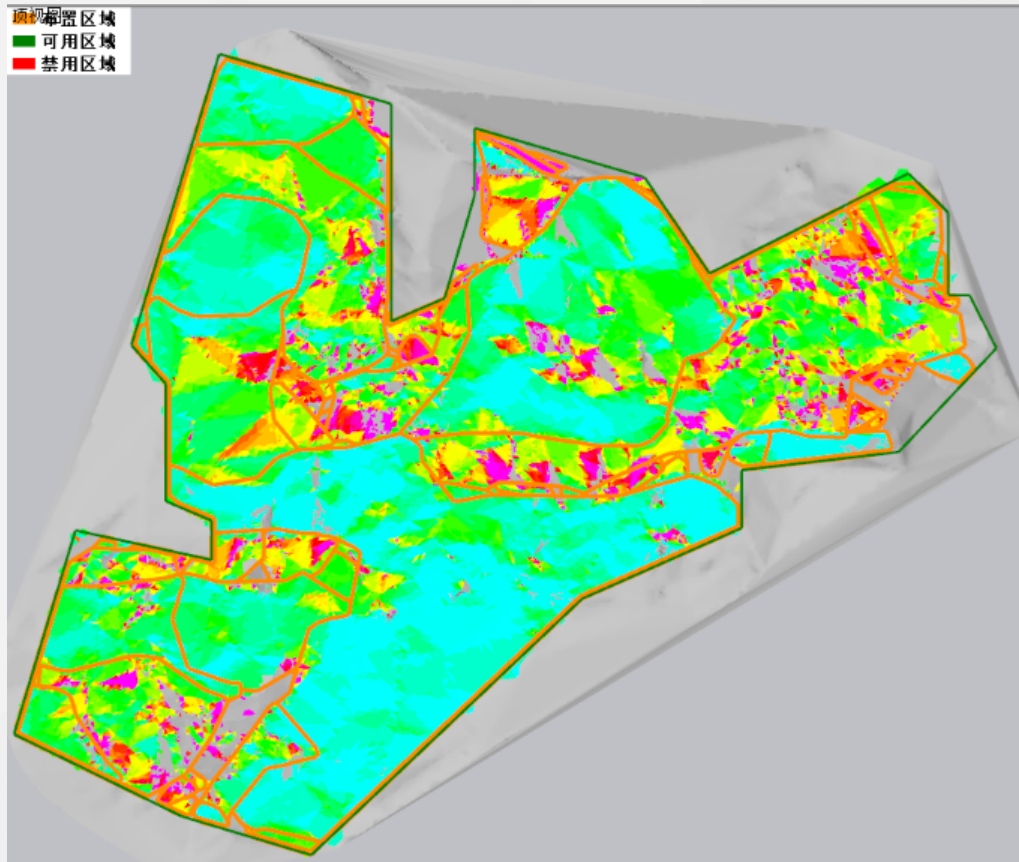
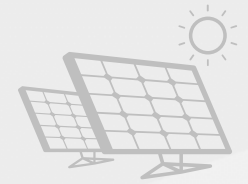
日照分析



山体分析

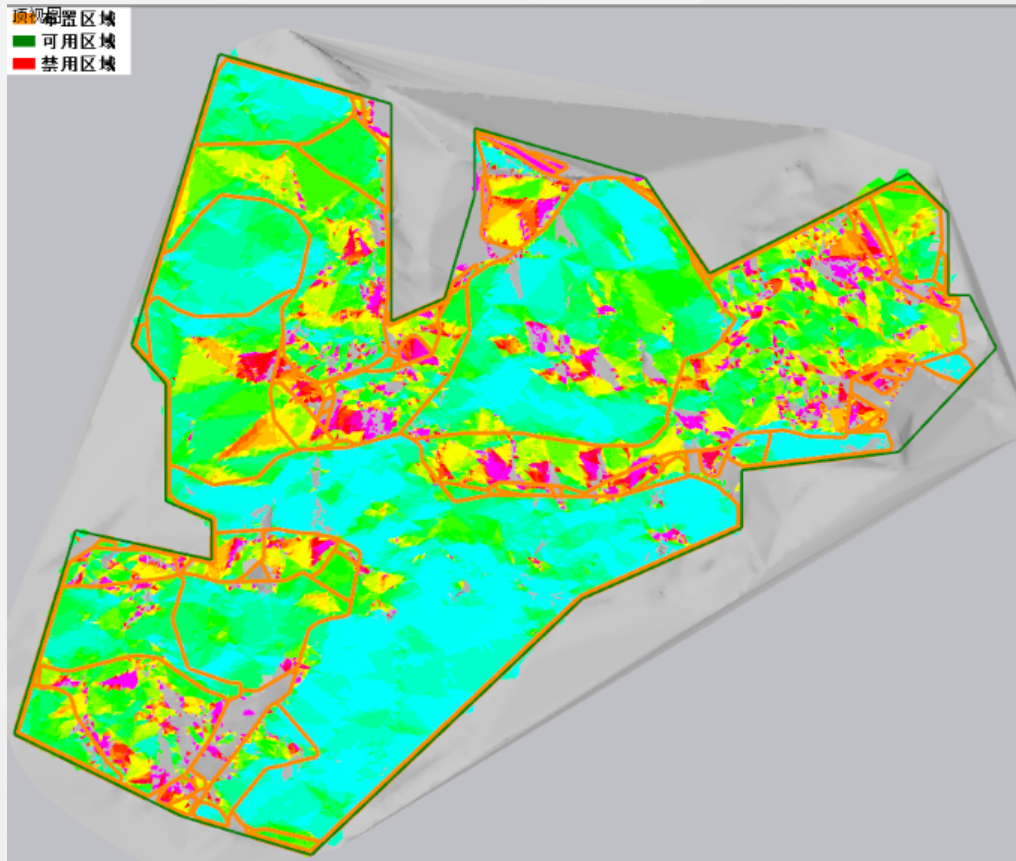
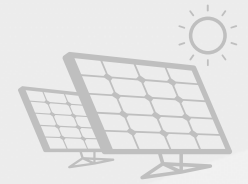


自主推导的复杂地形间距计算公式



间距(m)	颜色
16.34	
15.84	
15.34	
14.84	
14.34	
13.84	
13.34	
12.84	
12.34	
11.84	
11.34	
10.84	
10.34	
9.84	
9.34	
8.84	
8.34	
7.84	
7.34	
6.84	
6.34	

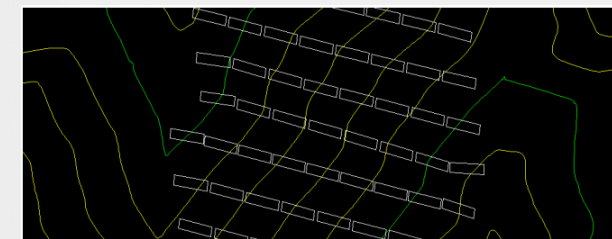
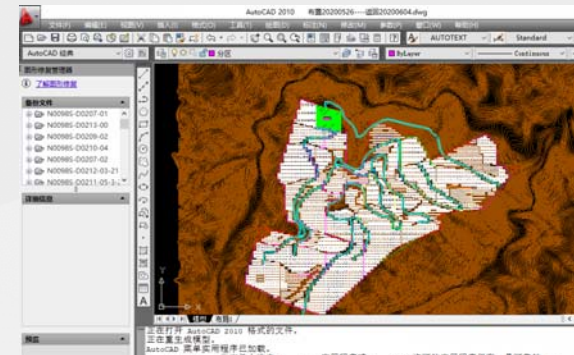
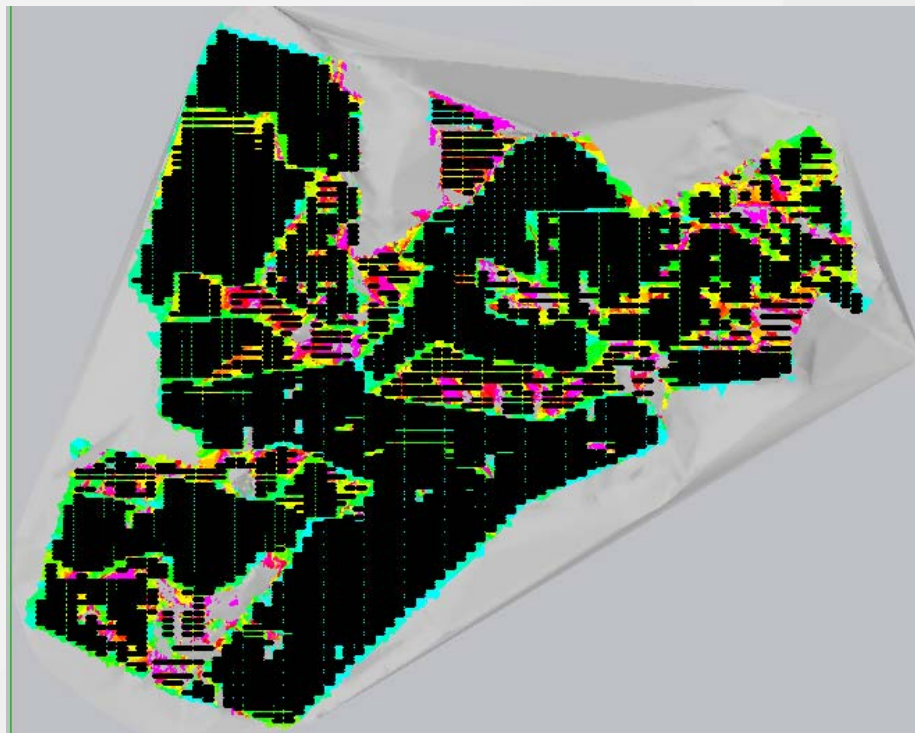
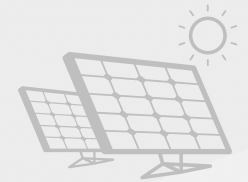
手动/自动分区



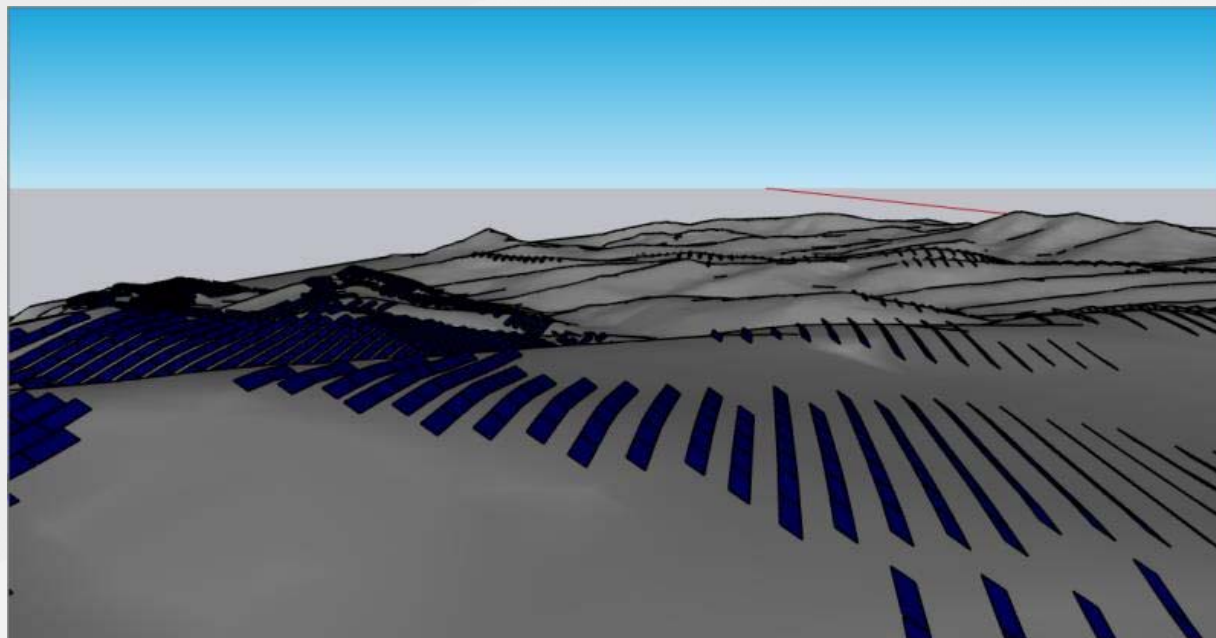
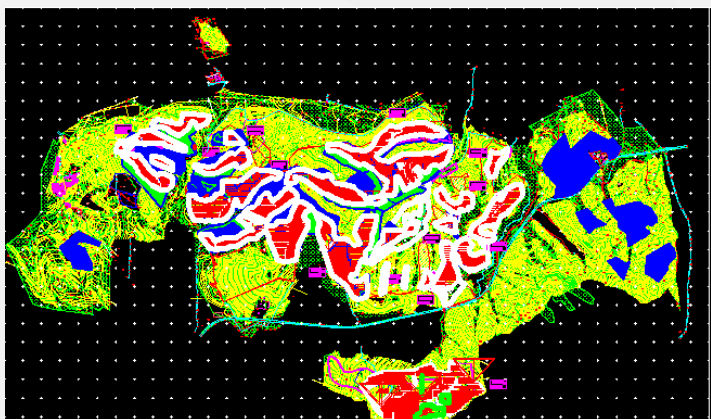
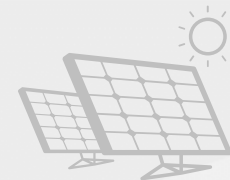
颜色/间距相近区域划分在一起

自动分区：快速预估
手动分区：详细设计

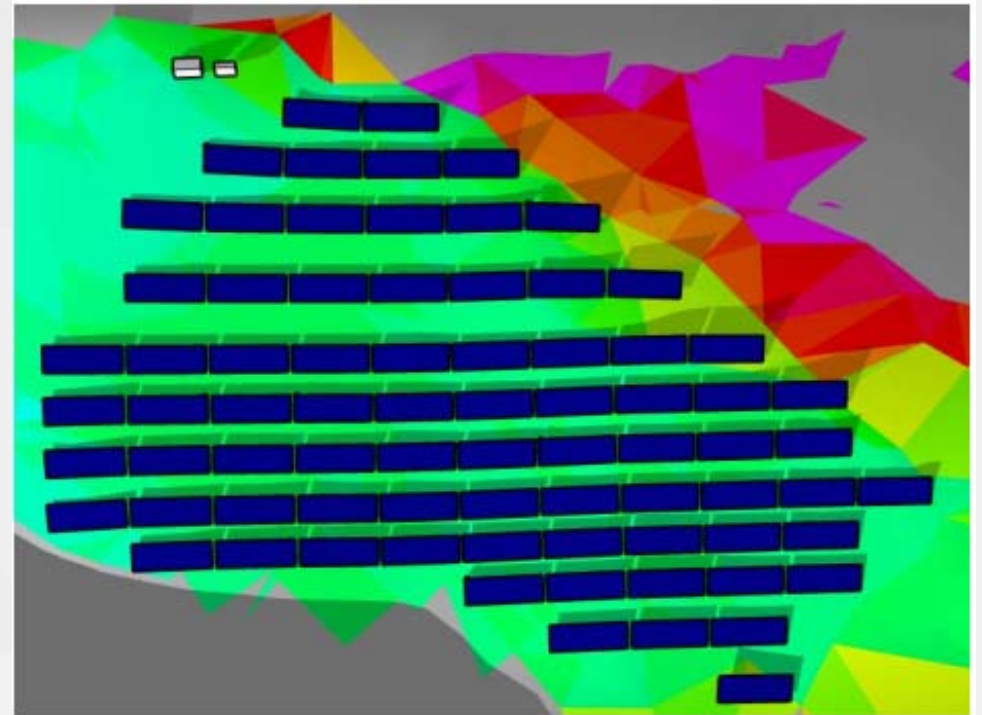
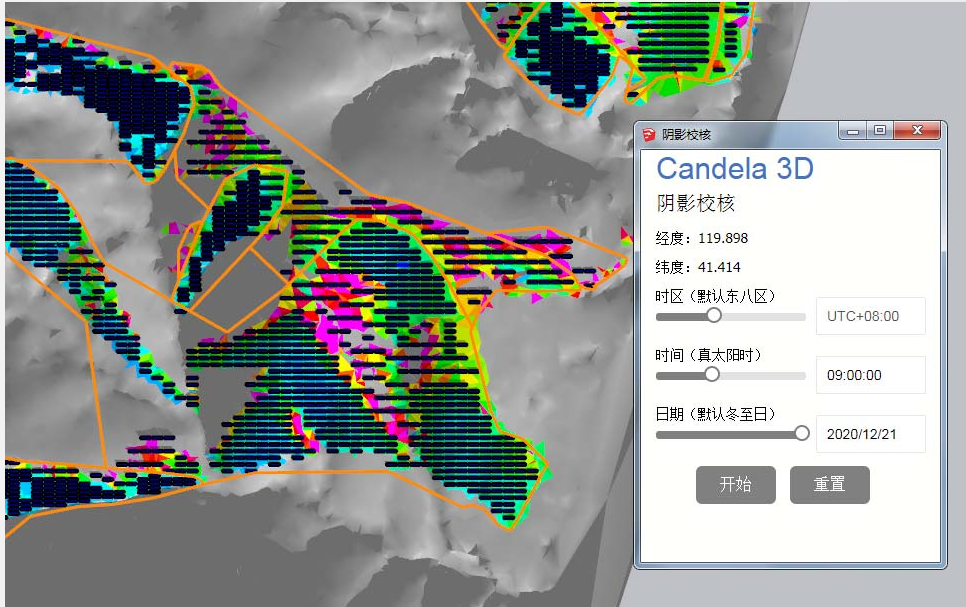
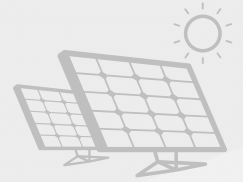
导出CAD图



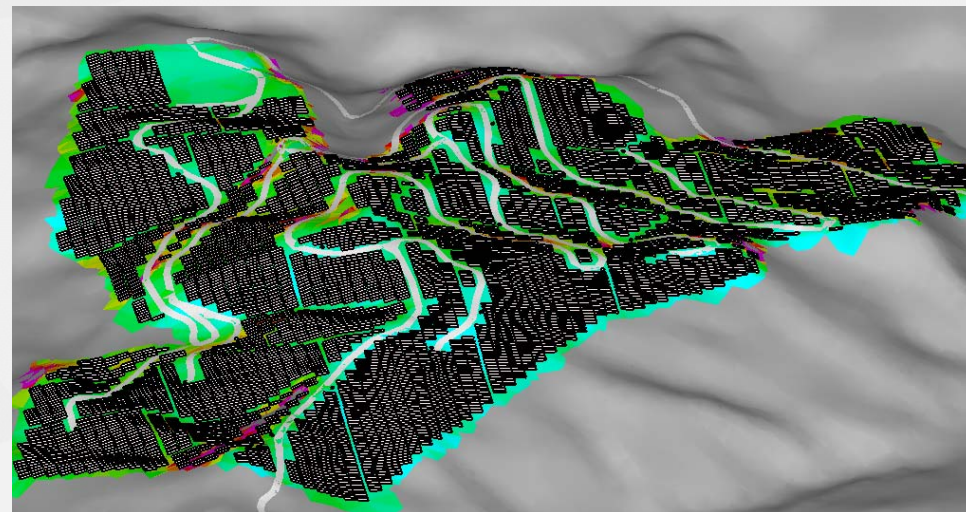
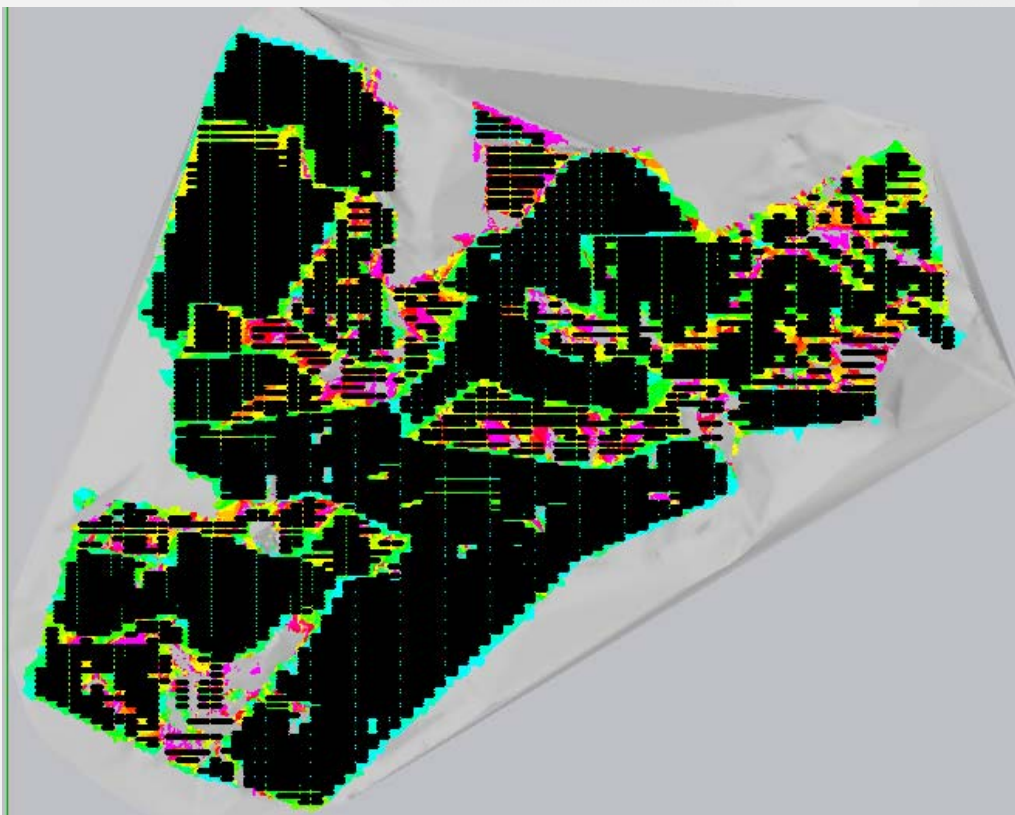
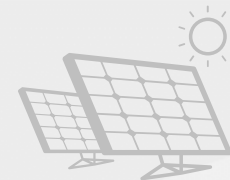
在CAD中修改之后导回SU



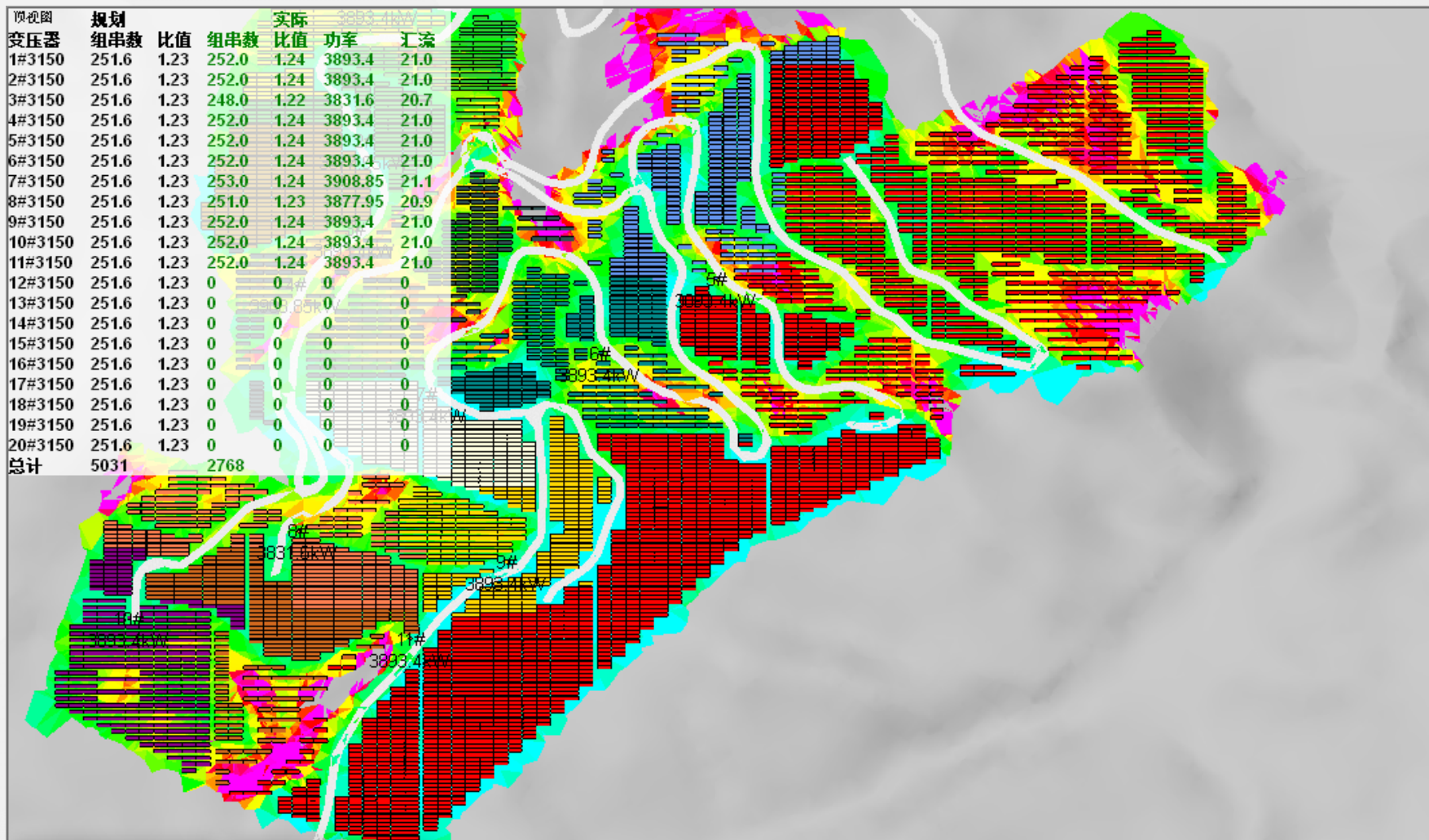
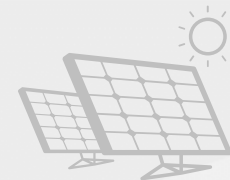
阴影校核



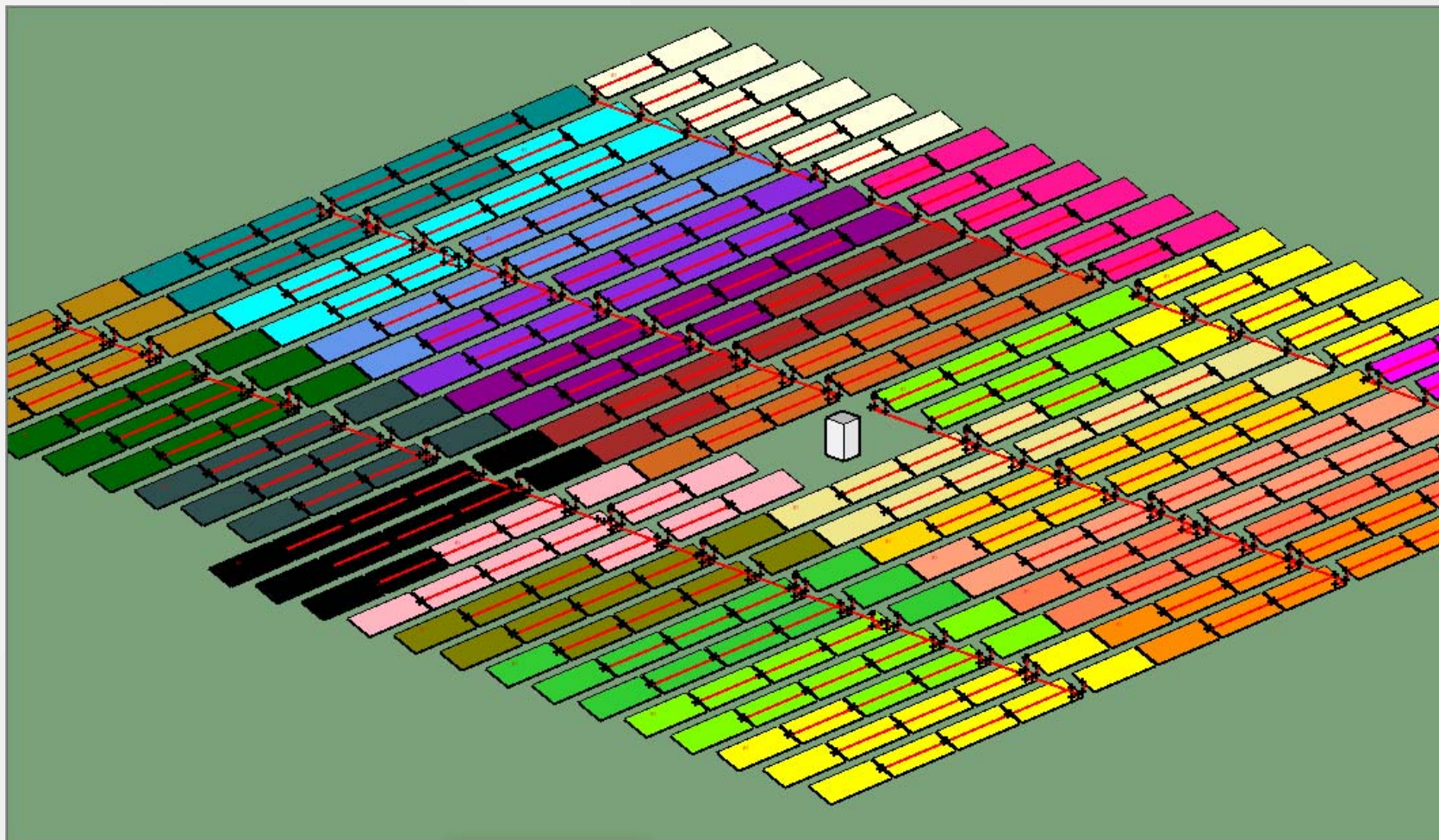
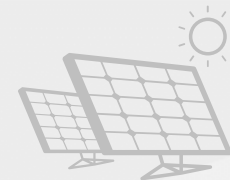
生成道路清除方阵效果



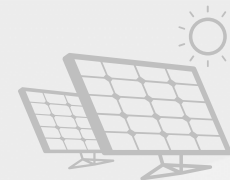
辅助划分发电单元



电气连接及汇流



树桩结构图



点击工具条中的“树状结构图”按钮，进入“树状结构图”界面。

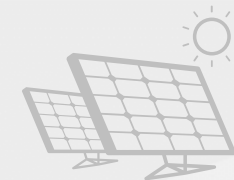
Candela 3D

树状结构图

项目内容	可接入数量	已接入数量	容量(kW)	编号	操作
合计			9026.160		导出
▶ 变压器01	/	5	2222.220	T01	查找 删除
▶ 变压器02	/	8	4796.220	T02	查找 删除
未划分发电单元方阵	/		2007.720		查找 删除

设备名称	容量(kW)	路数	数量
箱式变电站			2
箱式变电站	2222.22	/	1
箱式变电站	4796.22	/	1
集中逆变器			5
集中逆变器	291.72	5	1
集中逆变器	411.84	5	1
集中逆变器	686.4	5	1
集中逆变器	549.12	5	1
集中逆变器	283.14	5	1
组串式逆变器			39
组串式逆变器	137.28	16	32
组串式逆变器	8.58	16	2
组串式逆变器	68.64	16	4
组串式逆变器	111.54	16	1
直流汇流箱			25
直流汇流箱	137.28	16	10
直流汇流箱	8.58	16	3
直流汇流箱	68.64	16	12
交流汇流箱			8
交流汇流箱	686.4	5	6
交流汇流箱	394.68	5	1
交流汇流箱	283.14	5	1
组件			23034
组件	0.39	/	23034

生成图纸



点击工具条中的“导出图纸”按钮，弹出图纸类型选择界面，可选择“导出平面 CAD 文件”或“导出三维 CAD 文件”。

Candela 3D

导出图纸

导出平面CAD文件
* 导出文件为C2C文件，使用
Candela3D配套CAD插件生成
DWG文件

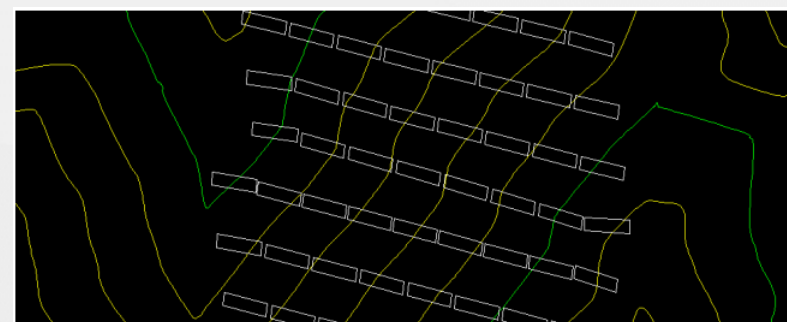
导出

导出三维CAD文件
* 导出文件为DWG文件，可直接
在CAD中打开

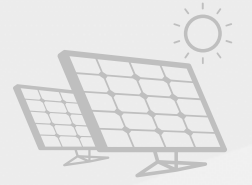
导出



定位编号



其他

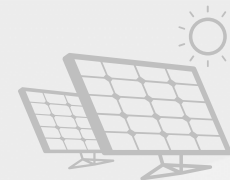


电缆清册

桩位坐标

导出到PVsyst等

应用案例



特变电工新疆新能源股份有限公司
浙江省电力设计院
河北省电力设计院
上海电力设计院
华北电力设计院
协和能源有限公司
中电建中南院
中电建昆明院
宁夏电力设计院
江西恒能电力工程有限公司



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