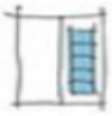
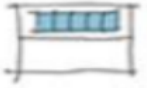
PERDA PERCENTUAL DEVIDO AO POSICIONAMENTO NÃO IDEAL DO PAINEL SOLAR EM TELHADOS

NORTE





ÂNGULO DO PAINEL	-90°	-75°	-60°	-45°	-30°	-15°	0°	15°	30°	45°	60°	75°	90°
0°	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%	4,5%
10°	5,6%	4,4%	3,3%	2,3%	1,6%	1,1%	1,0%	1,1%	1,6%	2,3%	3,3%	4,4%	5,6%
20°	8,7%	6,4%	4,3%	2,5%	1,2%	0,3%	0,0%	0,3%	1,2%	2,5%	4,3%	6,4%	8,7%
30°	13,1%	9,9%	7,2%	4,9%	3,0%	1,9%	1,5%	1,9%	3,0%	4,9%	7,2%	9,9%	13,1%
40°	18,5%	14,8%	11,6%	9,1%	7,1%	5,9%	5,5%	5,9%	7,1%	9,1%	11,6%	14,8%	18,5%
50°	24,7%	20,6%	17,5%	15,0%	13,2%	12,0%	11,7%	12,0%	13,2%	15,0%	17,4%	20,6%	24,7%
60°	31,4%	27,4%	24,3%	22,3%	20,9%	20,1%	20,0%	20,1%	20,9%	22,3%	24,4%	27,3%	31,4%
70°	38,4%	34,6%	32,2%	30,7%	30,0%	29,8%	29,9%	29,8%	30,0%	30,7%	32,1%	34,7%	38,4%
80°	45,6%	42,1%	40,3%	39,7%	39,9%	40,6%	41,1%	40,6%	39,9%	39,7%	40,3%	42,2%	45,6%
90°	52,4%	49,8%	48,5%	48,8%	50,0%	51,5%	52,1%	51,5%	50,0%	48,8%	48,6%	49,8%	52,4%

Obs.: Considerando posição da instalação latitude de -20° e longitude de -52°

CÓDIGO FONTE DA ANÁLISE

```
#!/usr/bin/env python3
# -*- coding: utf-8 -*-
"""
Created on Sat Oct 29 08:17:32 2022

@author: rburcon
"""

from tkinter import *
from tkinter import ttk
from tkinter import messagebox

import matplotlib.pyplot as plt
   :
    import seaborn as sns
    sns.set(rc={'figure.figsize':(12,6)})
       ImportError:


# built in python modules
import datetime

# python add-ons
import numpy as np
import pandas as pd

import pvlib


angulo_painel=[0,10,20,30,40,50,60,70,80,90]
angulo_azimute=[-90,-75,-60,-45,-30,-15,0,15,30,45,60,75,90]
valores=np.zeros((len(angulo_painel),len(angulo_azimute)), dtype=np.float64)
px=0
py=0

    angulo    angulo_painel:

        angulo_eixo    angulo_azimute:

        latitude_id=-20.0
        longitude_id=-52.0
        ang_painel_id=angulo
        azimute_id=angulo_eixo
        fuso='America/Bahia'



        tus = pvlib.location.Location(latitude_id, longitude_id, fuso, 600,
'Maringá')
        times = pd.date_range(start='2017-01-01', end='2018-01-01', freq='60min',
tz=tus.tz)
        ephem_data = tus.get_solarposition(times)
        irrad_data = tus.get_clearsky(times)


        surf_tilt = ang_painel_id
        surf_az = azimute_id # 0 Apontado para o norte 180 apontado para o sul

        iso_diffuse = pvlib.irradiance.isotropic(surf_tilt, irrad_data['dhi'])


        klucher_diffuse = pvlib.irradiance.klucher(surf_tilt, surf_az,
                                                   irrad_data['dhi'],
irrad_data['ghi'],
                                                   ephem_data['apparent_zenith'],
ephem_data['azimuth'])
```

```
        dni_et = pvlib.irradiance.get_extra_radiation(times.dayofyear)
        reindl_diffuse = pvlib.irradiance.reindl(surf_tilt, surf_az,
                                                 irrad_data['dhi'],
irrad_data['dni'], irrad_data['ghi'], dni_et,
                                                 ephem_data['apparent_zenith'],
ephem_data['azimuth'])


        sun_zen = ephem_data['apparent_zenith']
        AM = pvlib.atmosphere.get_relative_airmass(sun_zen)



        totals = {}
        model='isotropic'

        total = pvlib.irradiance.get_total_irradiance(abs(latitude_id), 0,
                                                 ephem_data['apparent_zenith'],
ephem_data['azimuth'],
                                                 dni=irrad_data['dni'],
ghi=irrad_data['ghi'], dhi=irrad_data['dhi'],
                                                 dni_extra=dni_et, airmass=AM,
                                                 model='isotropic',
                                                 surface_type='urban')
        totals[model] = total

        totals_cor = {}
        total_cor = pvlib.irradiance.get_total_irradiance(ang_painel_id, surf_az,
                                                 ephem_data['apparent_zenith'],
ephem_data['azimuth'],
                                                 dni=irrad_data['dni'],
ghi=irrad_data['ghi'], dhi=irrad_data['dhi'],
                                                 dni_extra=dni_et, airmass=AM,
                                                 model='isotropic',
                                                 surface_type='urban')
        totals_cor[model] = total_cor







        tota=(1-(((total_cor.poa_global.sum())/365)/((total.poa_global.sum())/
365)))
        #print("\nFor the panel angle of %.2f° and azimuth of %.2f°, we have a
loss of %.2f%%" %(ang_painel_id, surf_az, tota))
        valores[px,py]=tota
        py=py+1
    px=px+1
    py=0
```