%runfile /Users/juanramonjimenezmogollon/Downloads/Improve\_Hornsrev1\_Layout\_JRJ\_14\_03\_2025V2.py --wdir

Enter Site to be used 1-IEA37, 2-Hornsrev1, 3-UniforSite: 1

Enter Iteration Lenght in meters: 10

Enter Number of Iterations on each Generation: 400

Enter Number of Genetic Generations: 20

Enter border aditional distance from actual laylout in m: 25

Original AEP: 715.702891 GWh

Best solution on reference layout randomized Generation 0:

([423972.0878433935, 424036.1752114944, 424113.09814155306, 424176.84603846417, 424242.6289480089, 424313.72780786507, 424380.29578341637, 424447.08339157124, 424536.45292724913, 424603.396576341, 424669.90278838377, 424742.8127313064, 424807.18584786996, 424879.63291611365, 424950.7133460985, 425010.0196338999, 425091.17057286337, 425166.5379491985, 425226.0611350996, 425297.03907929704, 425368.4508783924, 425432.79962261056, 425503.02722760447, 425574.87481277843, 425656.84980140196, 425716.83000006946, 425794.35349837143, 425858.23779085116, 425928.4631239047, 425997.4373885007, 426057.3838905922, 426126.88531407586, 426216.46944284934, 426275.39068234287, 426355.8425350757, 426417.1409819544, 426486.8999509128, 426560.5535933685, 426617.930949909, 426692.3064189486, 426775.8756898591, 426841.1578139523, 426908.46522354253, 426977.0375782972, 427051.0642114948, 427109.67019030656, 427177.8884148477, 427252.0816559049, 427328.6293989341, 427407.64357547, 427468.7501464081, 427540.41216888, 427602.43756254204, 427668.8934230925, 427741.0150911737, 427815.3582454184, 427889.24392634997, 427961.3357154445, 428034.55064997217, 428098.0766506702, 428168.1201220808, 428237.0537701293, 428299.14849599433, 428378.4520345567, 428456.8490831626, 428526.4184623741, 428597.7640425555, 428663.0065717591, 428729.35399553267, 428801.0942152569, 428863.2663355789, 428933.61005534045, 429016.0492294424, 429084.8073028217, 429157.08410723525, 429219.37092138303, 429291.1388248267, 429361.4694998413, 429423.38723439537, 429488.8401086493], [6151447.110467133, 6150888.119704896, 6150332.467619634, 6149775.652545474, 6149223.087021862, 6148661.272947416, 6148118.295226435, 6147557.159346263, 6151445.13269878, 6150897.743251174, 6150328.907440933, 6149776.609608267, 6149218.922353599, 6148662.173434752, 6148108.129824882, 6147554.711831546, 6151446.463530095, 6150884.901714764, 6150339.758792484, 6149779.4518665485, 6149219.971524216, 6148666.617860424, 6148110.596486533, 6147549.231728102, 6151448.175231345, 6150893.436542516, 6150331.780960714, 6149783.8670250205, 6149230.392485515, 6148662.149615693, 6148114.843952969, 6147553.230310287, 6151440.835059966, 6150891.243641524, 6150331.593437465, 6149779.63506927, 6149227.921428034, 6148661.857155464, 6148109.502459791, 6147549.833272382, 6151446.541292575, 6150894.052429219, 6150335.560930051, 6149780.019252981, 6149230.954879631, 6148670.370769961, 6148108.648400836, 6147556.38054987, 6151444.387840544, 6150889.3868761975, 6150329.246202261, 6149783.25812328, 6149223.154394106, 6148669.822997387, 6148111.712520218, 6147551.297635463, 6151449.765664708, 6150892.529846765, 6150334.714892022, 6149779.695371945, 6149230.843046537, 6148668.550654386, 6148111.807155011, 6147556.726996079, 6151445.65471563, 6150893.866758335, 6150337.3084825445, 6149777.521434028, 6149222.263909506, 6148663.483535295, 6148118.277980313, 6147550.280731366, 6151451.741586051, 6150885.834717765, 6150329.991389809, 6149780.744050243, 6149217.409842359, 6148667.556106443, 6148113.322326179, 6147555.064119856])

aep\_best\_sol on reference layout randomized Generation 0: 715.7342948425884

Iteration Length ... Fitness Function\_xy\_sol

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2 0 ... 714.972157

3 0 ... 714.983294

4 0 ... 715.020748

... ... ...

1195 2 ... 715.356714

1196 2 ... 715.359566

1197 2 ... 715.361184

1198 2 ... 715.400074

1199 2 ... 715.475270

[1200 rows x 4 columns]

Best solution on Genetic Generation 1:

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aep\_best\_sol on Genetic Generation 1: 715.7342948425884

Best solution on Genetic Generation 2:

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aep\_best\_sol on Genetic Generation 2: 715.7852131468876

Best solution on Genetic Generation 3:

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aep\_best\_sol on Genetic Generation 3: 715.8368369021294

Best solution on Genetic Generation 4:

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aep\_best\_sol on Genetic Generation 4: 715.8598846783303

Best solution on Genetic Generation 5:

([423952.8320301751, 424036.8580758439, 424103.8726590691, 424171.6691081677, 424233.6243279461, 424317.41545436525, 424382.5197315394, 424443.5026699014, 424546.437870396, 424605.65255247115, 424674.8854252503, 424739.400783742, 424796.9072268441, 424871.0288504298, 424941.65735936456, 425005.658513086, 425101.6177793793, 425170.7947957263, 425221.9455174649, 425301.4215406415, 425373.4325317081, 425433.14015365625, 425501.52378567617, 425583.23088496336, 425656.8629842617, 425724.3883752206, 425787.8827712657, 425861.05744228786, 425931.41235043533, 425993.8756133794, 426055.4138811654, 426132.51919407694, 426209.5342402644, 426267.75479383784, 426360.8686997082, 426421.84139787994, 426490.63298560644, 426559.5478455971, 426634.3631132467, 426703.8467729287, 426777.98258705833, 426845.30097861827, 426904.3084218748, 426968.7239359085, 427058.7184475119, 427127.64072219003, 427190.14257304405, 427254.9344615531, 427332.9740663809, 427411.2228111387, 427469.0388042154, 427532.3425750789, 427603.32213989255, 427673.6321384111, 427729.91449983534, 427812.22831268655, 427886.1298001148, 427945.4206873112, 428035.9582792077, 428114.03294162615, 428158.49747355375, 428240.0290959516, 428304.03456246055, 428368.5821919581, 428459.2795040528, 428527.7429480627, 428605.1167520039, 428666.87403839774, 428735.3778949372, 428801.55953120376, 428871.7224664582, 428943.5688416488, 429024.612429566, 429103.3760492212, 429165.723521394, 429237.2699083205, 429297.51213647414, 429366.9289140994, 429437.5340397381, 429495.4135211135], [6151453.905867376, 6150889.081351299, 6150341.026969015, 6149774.584906083, 6149230.353183411, 6148653.942699435, 6148113.3164084, 6147546.905699891, 6151456.699748797, 6150892.747859568, 6150337.716627803, 6149782.667740189, 6149225.0095024025, 6148645.203158759, 6148101.904981823, 6147555.361957031, 6151454.194755792, 6150888.613092855, 6150343.955927104, 6149783.849996075, 6149219.929210263, 6148659.436501409, 6148114.207802621, 6147545.017881726, 6151449.1240527285, 6150891.941360007, 6150334.633710509, 6149792.146249212, 6149234.422066107, 6148657.385008768, 6148119.941054159, 6147546.45839216, 6151446.667064611, 6150884.946929805, 6150314.324597141, 6149786.01805759, 6149219.444005287, 6148668.297298798, 6148101.824202244, 6147542.935696565, 6151448.818172558, 6150891.7029632265, 6150329.940542572, 6149781.170980529, 6149228.262794766, 6148671.251082226, 6148119.234043227, 6147547.519464469, 6151446.740978798, 6150889.665769327, 6150333.222600293, 6149788.504901317, 6149218.9184946995, 6148661.549472003, 6148103.205538739, 6147549.620076646, 6151451.373227914, 6150883.273933498, 6150330.310931931, 6149779.065574508, 6149220.102125173, 6148682.483287121, 6148119.6439624, 6147553.376908422, 6151456.869065773, 6150889.453403021, 6150339.376313309, 6149763.636213922, 6149217.405480636, 6148662.986092259, 6148104.315616205, 6147560.826059756, 6151453.481369404, 6150891.170380934, 6150339.570518018, 6149771.878421867, 6149214.376182875, 6148666.610937481, 6148106.607493812, 6147547.932576128])

aep\_best\_sol on Genetic Generation 5: 715.9248990847285

Best solution on Genetic Generation 6:

([423950.7673261556, 424035.0108615044, 424099.6071632091, 424170.6265319126, 424230.7959620354, 424311.8974984579, 424376.4132258646, 424439.8300706811, 424550.3679356639, 424609.6391529733, 424671.6857187385, 424739.1131018448, 424795.3115730263, 424867.37919596554, 424948.37093149143, 425010.95634981286, 425094.6879146487, 425164.56612698815, 425228.4637485323, 425304.7380583956, 425375.41768721526, 425435.57480141637, 425499.192194376, 425580.4604542856, 425657.50832247466, 425727.3188255998, 425793.8221372519, 425855.0225315842, 425936.3617109493, 425993.54849054164, 426056.80590916326, 426134.3758229157, 426204.1995088627, 426270.4049247597, 426367.0173043899, 426420.36741193995, 426494.3740569654, 426559.9560949936, 426640.59130994324, 426707.5429287126, 426776.03246039513, 426838.3437447256, 426906.74852430134, 426971.3907719077, 427064.1732269907, 427126.36952921696, 427192.14940974326, 427250.5106985113, 427334.82583046565, 427415.62475388235, 427468.1025842767, 427531.8385392039, 427597.08068448666, 427678.6780989934, 427732.0069165451, 427815.9955174452, 427891.8058852474, 427947.5617228967, 428030.809914112, 428112.11516698083, 428165.3931096754, 428239.1517454312, 428304.2198917213, 428363.124113351, 428456.5637573044, 428520.9954760699, 428608.6234108829, 428662.32282113924, 428735.00388968905, 428795.8059502375, 428873.2504373278, 428937.59446478257, 429029.0666465355, 429107.45053166547, 429163.09420346114, 429240.7831656945, 429297.47012843966, 429371.41168822884, 429440.5515414459, 429499.6555557813], [6151459.417556345, 6150892.830086199, 6150346.320714429, 6149772.457734659, 6149226.083156635, 6148652.7359203845, 6148114.86307995, 6147553.041123839, 6151457.007216555, 6150896.656636069, 6150336.503050395, 6149780.793551461, 6149226.536866609, 6148641.317724898, 6148107.530458139, 6147559.192431289, 6151451.428061069, 6150888.127705027, 6150344.693527789, 6149782.087429123, 6149226.196087676, 6148663.474337929, 6148117.820282685, 6147541.364039051, 6151451.765174041, 6150889.444493107, 6150337.3860448515, 6149789.310103039, 6149230.23548932, 6148661.243430929, 6148122.190368398, 6147542.292910602, 6151451.734886385, 6150882.3359072525, 6150309.003851279, 6149784.650721239, 6149217.522658869, 6148674.58769097, 6148097.415466548, 6147545.339819558, 6151453.449788794, 6150897.729789382, 6150324.447195297, 6149781.708426343, 6149226.681956782, 6148664.586054063, 6148113.882071094, 6147552.1989994515, 6151446.424134229, 6150884.653666321, 6150336.066424048, 6149782.860783708, 6149223.884901793, 6148656.92733384, 6148105.040725739, 6147543.776881694, 6151448.163031589, 6150882.739198041, 6150332.674967273, 6149783.144331978, 6149219.44038033, 6148676.915961495, 6148118.524437438, 6147546.538672172, 6151451.434722722, 6150887.914037173, 6150338.0471295435, 6149764.767933653, 6149216.183087219, 6148665.323359047, 6148109.440978391, 6147559.778356795, 6151459.519693071, 6150885.823353668, 6150336.850403799, 6149767.889813117, 6149215.384121635, 6148660.834664386, 6148102.542812834, 6147554.672168044])

aep\_best\_sol on Genetic Generation 6: 715.9965349583075

Best solution on Genetic Generation 7:

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aep\_best\_sol on Genetic Generation 7: 716.1232685064679

Best solution on Genetic Generation 8:

([423956.1913784449, 424036.8847437631, 424093.92966574675, 424167.8564972902, 424223.3723655104, 424303.85425023164, 424372.68181934464, 424432.7123317215, 424550.7369565036, 424615.0219831944, 424672.8137720647, 424731.3817876477, 424799.2417848937, 424869.2804495954, 424951.5364645202, 425008.59580427106, 425084.84352435585, 425166.57093597844, 425236.587708636, 425309.39880055527, 425382.5112530071, 425443.9538484472, 425505.7199239443, 425585.1209545978, 425653.2570833691, 425735.71180436003, 425784.3623114048, 425855.9630805869, 425933.1820484364, 425998.4089727649, 426060.11236282403, 426123.25527968735, 426208.48958623316, 426277.77820617537, 426361.293586327, 426428.70967324363, 426486.26775384805, 426552.35105158226, 426639.4308250883, 426702.6025327673, 426772.5304966555, 426840.29736561404, 426903.62713099807, 426971.74959561165, 427064.17441215593, 427125.43761399423, 427193.18794009846, 427259.96265233046, 427337.0381644385, 427415.27707996033, 427471.3465658764, 427531.9086871541, 427605.0004852245, 427677.4650738355, 427726.9410015432, 427812.2391163917, 427884.8121457586, 427946.9976791179, 428023.8747275001, 428107.33969705383, 428156.1643319296, 428245.1464470129, 428304.1907965186, 428368.6023997405, 428459.8731726898, 428517.6441106705, 428617.64199835766, 428661.9059714217, 428738.5106289277, 428799.26760835946, 428877.11493563437, 428938.9187005198, 429036.2297565434, 429109.13392974454, 429166.59103064507, 429244.9742479323, 429310.81371068204, 429366.9357817145, 429443.63077373186, 429509.52175868006], [6151453.083227735, 6150891.969014471, 6150345.987244627, 6149774.730825076, 6149231.248841442, 6148648.838723582, 6148117.691144959, 6147546.52117268, 6151459.809552844, 6150895.383053301, 6150338.484711522, 6149786.447621233, 6149235.108286989, 6148637.878083793, 6148104.048541003, 6147552.3373580165, 6151453.9570874255, 6150890.311322957, 6150348.355146108, 6149784.603666874, 6149228.309956632, 6148655.061718075, 6148122.902662211, 6147544.8945596395, 6151455.460160026, 6150878.579693647, 6150345.085431345, 6149787.710045378, 6149228.990545872, 6148653.319869833, 6148110.482678815, 6147541.820825551, 6151458.855707618, 6150885.217089972, 6150320.5079280585, 6149785.82138532, 6149211.686313105, 6148681.359999702, 6148095.792692387, 6147547.635526775, 6151454.19486094, 6150885.869970348, 6150317.130489043, 6149788.901262347, 6149224.196380622, 6148662.393639225, 6148110.26409874, 6147553.02183586, 6151448.953301324, 6150891.059700127, 6150328.02644702, 6149782.712715447, 6149229.460006854, 6148656.080309338, 6148108.577016605, 6147535.188229204, 6151459.663972314, 6150882.93924916, 6150325.963249436, 6149775.122361228, 6149221.851754481, 6148675.995896178, 6148117.999625682, 6147540.479450198, 6151457.279362867, 6150878.9615286095, 6150343.34801768, 6149761.829718255, 6149209.748618452, 6148675.211326249, 6148103.205949531, 6147557.264536008, 6151462.444297844, 6150886.463990911, 6150341.526269183, 6149769.916502322, 6149214.12044421, 6148662.862922923, 6148103.006002077, 6147548.932305037])

aep\_best\_sol on Genetic Generation 8: 716.1945136075558

Best solution on Genetic Generation 9:

([423952.12092558446, 424031.54223854025, 424098.94062937936, 424165.67361626786, 424222.20850026427, 424301.8849419626, 424375.77514766675, 424434.3314617802, 424547.5072034718, 424610.1279322533, 424679.5878338243, 424727.4430692056, 424805.2711471026, 424876.2618825709, 424945.9226700334, 425008.04414511664, 425090.3950989552, 425171.3096349205, 425236.5091784654, 425304.7902592294, 425379.6617544584, 425449.30491735425, 425501.7428290676, 425584.68092010875, 425649.63401506137, 425735.7433671931, 425790.1418662484, 425854.77603601676, 425937.3237257624, 425998.9483301518, 426059.6482806913, 426124.50422488275, 426206.94923419144, 426283.42548340076, 426356.22134445974, 426430.4655048308, 426479.5993684151, 426547.60822406877, 426633.02644789114, 426705.95472664596, 426775.48922135937, 426844.59939271066, 426899.1503726848, 426975.6517044234, 427060.72006715176, 427126.1945008217, 427198.7584610862, 427266.1737693255, 427337.99468167376, 427412.48494052334, 427465.0955370261, 427525.3047122363, 427606.54994622146, 427675.2946825515, 427732.8861856996, 427815.73884716793, 427888.7164828145, 427950.7483630367, 428017.84599302564, 428106.6965180443, 428158.5383417428, 428238.8216837903, 428300.00200001104, 428362.2808648803, 428463.56964493386, 428524.4876143393, 428614.13427088695, 428663.5578397819, 428735.0420308909, 428802.9218119883, 428874.79510399967, 428943.2084752581, 429029.85064724606, 429106.0755809034, 429162.39341578673, 429243.74615699786, 429306.1621078913, 429369.8588237558, 429447.32351337, 429513.1492848065], [6151455.102614462, 6150897.959036835, 6150344.294147572, 6149781.654535525, 6149224.251151473, 6148653.954591459, 6148112.408729856, 6147540.374729156, 6151460.340358264, 6150902.289413044, 6150335.402282228, 6149790.298462145, 6149241.262844331, 6148639.119189452, 6148099.305072576, 6147554.761575785, 6151456.372632775, 6150884.567228494, 6150347.836918556, 6149790.937887062, 6149225.137444417, 6148656.479056696, 6148126.614622819, 6147546.089108909, 6151454.921566092, 6150881.775095032, 6150340.789145875, 6149783.554100221, 6149232.590342104, 6148656.487474548, 6148114.269830175, 6147536.724810982, 6151459.9915839, 6150891.433865019, 6150325.095648599, 6149783.947608851, 6149218.017299677, 6148675.768283346, 6148097.729963765, 6147554.148698452, 6151455.320403305, 6150889.637238149, 6150315.774914097, 6149785.824296325, 6149217.773995747, 6148663.265072967, 6148103.7617229195, 6147548.502333753, 6151453.617430647, 6150887.107040979, 6150321.043689246, 6149779.047209067, 6149229.651165783, 6148660.59958857, 6148102.7068849495, 6147533.761570943, 6151465.761421647, 6150881.943827642, 6150319.313754461, 6149773.008161454, 6149227.608304594, 6148673.020157698, 6148114.60312677, 6147539.286793818, 6151462.743568856, 6150874.799485239, 6150336.676359256, 6149759.30490976, 6149215.416854155, 6148676.550236065, 6148099.853709166, 6147560.634717506, 6151459.182653676, 6150887.485313383, 6150338.179682468, 6149767.519081234, 6149220.6475602705, 6148657.659464376, 6148100.078596115, 6147546.404474554])

aep\_best\_sol on Genetic Generation 9: 716.2577457597266

Best solution on Genetic Generation 10:

([423952.64846814686, 424027.36662468564, 424092.36217477405, 424162.2963098508, 424225.2816568705, 424308.025696481, 424370.15982296126, 424439.6436137221, 424550.7439248456, 424609.91729111254, 424685.554588007, 424733.72374696017, 424804.2417928517, 424878.4796443471, 424946.4707390682, 425006.4052079191, 425097.1065995013, 425173.00999028847, 425232.26657803776, 425307.9429695921, 425377.480812724, 425445.0785489335, 425501.3820901723, 425587.6728867946, 425646.0594232595, 425734.30431843596, 425785.3161601142, 425851.130834104, 425939.15453047067, 425998.76905517257, 426064.60097760643, 426121.41542975017, 426212.5115038379, 426286.34326830314, 426353.2733987978, 426429.09574884723, 426480.6016289138, 426543.9014664117, 426628.9284290262, 426704.85692997416, 426778.606818848, 426847.3932610109, 426901.1390267334, 426977.5374992433, 427055.90628302895, 427124.061576397, 427199.6905037342, 427271.8079747937, 427336.07949271024, 427412.2172202091, 427465.50943463034, 427525.7844153285, 427606.4227394566, 427679.00893696107, 427739.80936339434, 427813.1673935825, 427893.79019271367, 427952.98596074025, 428021.69523634185, 428100.17868739186, 428158.975631785, 428238.2060304816, 428298.88756934606, 428363.32690990536, 428467.7590682292, 428530.9382828005, 428614.1292645121, 428666.39191085554, 428731.9450233834, 428799.8706096356, 428875.5799803136, 428948.5958722391, 429035.2849751485, 429104.57050761074, 429167.97219780384, 429244.7488349816, 429305.7410721661, 429363.7128359489, 429442.8309331141, 429508.33538235637], [6151459.347495874, 6150898.07176284, 6150339.261471155, 6149776.460828881, 6149227.5871500075, 6148649.871023554, 6148109.200901432, 6147545.806252035, 6151465.024369665, 6150907.366709617, 6150335.364925402, 6149783.663884417, 6149235.272990153, 6148640.257665562, 6148094.250204994, 6147551.492723615, 6151455.099577269, 6150882.03178545, 6150345.004760691, 6149795.464971057, 6149227.28710466, 6148653.553763553, 6148125.24764229, 6147544.423448619, 6151456.207132167, 6150885.562623188, 6150343.592373909, 6149779.114251767, 6149233.938032106, 6148654.289904339, 6148110.644263933, 6147534.3413721705, 6151454.302285844, 6150892.528616559, 6150329.299753391, 6149780.072301679, 6149213.708250457, 6148670.61240847, 6148094.058183938, 6147554.220858452, 6151453.3246119665, 6150892.2929892335, 6150312.23066861, 6149785.6860802695, 6149213.35579347, 6148659.597850045, 6148109.600552714, 6147552.874485618, 6151453.336296578, 6150886.246455675, 6150321.971181734, 6149781.564007487, 6149232.86297866, 6148661.110549415, 6148103.001863322, 6147532.34668178, 6151463.752868709, 6150875.942572706, 6150319.005175232, 6149770.714401416, 6149229.067876001, 6148672.253662223, 6148109.189516511, 6147533.015554647, 6151468.250428636, 6150878.203566622, 6150337.169698801, 6149762.961688252, 6149214.943134846, 6148671.008305658, 6148097.132968759, 6147554.5968570085, 6151461.545655823, 6150892.534648894, 6150343.747540344, 6149773.889399551, 6149215.094484811, 6148663.646178257, 6148093.138826779, 6147546.210858673])

aep\_best\_sol on Genetic Generation 10: 716.3189683568747

Best solution on Genetic Generation 11:

([423958.7169093496, 424022.31371903175, 424088.107829525, 424168.4040986182, 424221.01847983606, 424306.6048670497, 424364.61386858555, 424440.1060913381, 424544.60335977736, 424608.2499307799, 424683.77596895746, 424729.00077346474, 424804.98433130694, 424878.220373861, 424944.64083081746, 425010.52660387236, 425103.2893301935, 425173.2814633368, 425236.14042295405, 425303.8821713688, 425376.72616175405, 425449.6190324298, 425496.3147499564, 425594.1908396671, 425641.6556186051, 425732.2188581083, 425791.1759370954, 425854.2618476806, 425936.2210678604, 426003.84773092385, 426066.26696542994, 426123.4696514653, 426214.0051021741, 426285.04808797647, 426355.6568660242, 426430.43747221195, 426483.096448628, 426544.1661533702, 426630.6499630989, 426702.4700206841, 426775.6453322499, 426845.6996562807, 426900.09687146667, 426976.78400102415, 427052.2874407981, 427121.24391491385, 427202.1531730626, 427268.7936409038, 427337.4360773144, 427409.0935088334, 427469.1416302319, 427524.4743252697, 427612.17959647975, 427675.7876091407, 427738.56925630575, 427816.9510166487, 427891.9809486396, 427951.87753198587, 428026.4363071062, 428094.91814619885, 428160.9142334009, 428243.58256516384, 428304.55894503737, 428364.77277597005, 428461.56928824284, 428528.7217992852, 428616.6489666357, 428672.66483679146, 428728.67279538675, 428802.6266910886, 428880.54831436113, 428952.840437641, 429030.223982606, 429102.3306735995, 429165.90179558675, 429241.40636790876, 429308.0337786807, 429359.4981823457, 429442.7247784184, 429510.6182390287], [6151462.170945101, 6150903.624512524, 6150341.685840025, 6149773.496150474, 6149231.724431245, 6148643.4470892595, 6148110.728787857, 6147541.665199246, 6151468.344255518, 6150911.708890375, 6150330.675604294, 6149788.589408298, 6149233.324592706, 6148642.87957906, 6148091.686988791, 6147548.661615021, 6151457.856477983, 6150885.375894528, 6150341.969356656, 6149795.298450438, 6149228.272493389, 6148649.341846751, 6148129.112829513, 6147540.166600364, 6151460.357202965, 6150890.903921932, 6150337.043001883, 6149781.384510606, 6149232.112822853, 6148658.0147445835, 6148110.65914093, 6147538.572232061, 6151451.62929187, 6150890.6797586465, 6150322.839161258, 6149778.304674797, 6149212.1373441545, 6148665.437461437, 6148094.7543702535, 6147547.234377245, 6151455.027703829, 6150888.949182864, 6150315.777282915, 6149787.201870785, 6149207.606252682, 6148662.671086634, 6148110.978252657, 6147551.531713919, 6151458.393485221, 6150880.493049168, 6150317.895617079, 6149780.096176233, 6149226.63451243, 6148665.690701455, 6148097.945692084, 6147537.269620748, 6151459.6013699835, 6150876.835207989, 6150321.063487973, 6149767.418848447, 6149224.913371175, 6148673.569079358, 6148114.451870648, 6147538.843288066, 6151471.252861579, 6150881.5908148615, 6150330.918911448, 6149758.951113216, 6149213.121360782, 6148675.903355538, 6148093.2072113445, 6147548.090756141, 6151460.747344708, 6150899.322093233, 6150342.453297894, 6149771.400711599, 6149219.612965843, 6148668.082615835, 6148099.856705193, 6147548.002740693])

aep\_best\_sol on Genetic Generation 11: 716.3722106867054

Best solution on Genetic Generation 12:

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aep\_best\_sol on Genetic Generation 12: 716.4713594127336

Best solution on Genetic Generation 13:

([423950.9141278066, 424017.8313662135, 424085.8725117812, 424161.3468612741, 424224.37731962936, 424307.0034905929, 424362.7237124151, 424435.8141366688, 424533.46725272544, 424613.5905073617, 424676.48224872036, 424727.9216245423, 424804.95852023317, 424878.9067214425, 424940.0539028225, 425013.0660001151, 425099.8613108446, 425163.18598057947, 425232.6081125835, 425300.47042602516, 425375.9981926381, 425451.36505296093, 425503.1104508678, 425588.2954797878, 425649.8346320951, 425735.8139259967, 425796.2309445504, 425858.95011624496, 425944.0393861813, 426003.6775176479, 426062.99618044024, 426136.2225704982, 426218.32609619276, 426278.97643144836, 426364.1899494455, 426422.7429765307, 426483.61157899705, 426543.39776176785, 426626.7471961366, 426711.94100097375, 426773.6217392862, 426848.6400654563, 426903.7167097401, 426977.7576277011, 427049.2963169469, 427118.1853784743, 427202.9549114887, 427275.4636825059, 427342.80237076804, 427405.3430170823, 427462.187664867, 427531.86304832954, 427615.10981529654, 427681.5604619422, 427739.8054917759, 427817.24161332357, 427886.95168309216, 427957.557924362, 428022.53831145156, 428098.50322049914, 428164.75303870975, 428250.5847712283, 428299.7257771105, 428373.0138754198, 428456.9212883124, 428523.6710132891, 428620.03162638046, 428668.44027139636, 428735.84336190106, 428808.58665824676, 428890.969819911, 428960.7116473723, 429038.2570363443, 429101.0646190991, 429170.6514836682, 429244.2255705924, 429309.7080405809, 429365.2552099099, 429446.3034459522, 429507.25667722634], [6151466.674957895, 6150917.229341694, 6150352.488244596, 6149783.312474378, 6149232.65757669, 6148639.349091381, 6148107.973836998, 6147544.784723036, 6151462.525327506, 6150912.324564569, 6150324.116743266, 6149792.753344599, 6149239.005556674, 6148649.528859579, 6148099.612810503, 6147539.753312736, 6151458.31348748, 6150888.665871746, 6150338.035268822, 6149787.675074753, 6149221.775155907, 6148655.934287012, 6148122.120722759, 6147540.224736284, 6151455.003096653, 6150886.343338371, 6150336.386951057, 6149789.848858378, 6149230.6836530315, 6148656.854492283, 6148108.630874926, 6147538.174957216, 6151461.938122376, 6150891.748565848, 6150320.185647657, 6149789.641179448, 6149210.298909725, 6148660.388040383, 6148093.881087486, 6147546.76820372, 6151458.267844238, 6150898.420870595, 6150316.932687167, 6149787.963533827, 6149204.004139243, 6148658.105967222, 6148105.662208808, 6147542.158207064, 6151458.700250315, 6150881.456010597, 6150316.433524326, 6149780.712344938, 6149229.66930166, 6148661.617557094, 6148104.543847776, 6147531.011623287, 6151459.890461577, 6150889.754780305, 6150324.073001797, 6149770.764836564, 6149221.259051189, 6148682.349675121, 6148124.55713473, 6147547.619247146, 6151468.965780764, 6150872.583632105, 6150321.806128729, 6149763.2166022295, 6149211.315855697, 6148667.31464075, 6148097.152537996, 6147546.844687218, 6151461.318379848, 6150893.237173102, 6150343.943133945, 6149777.8474635035, 6149225.551288576, 6148658.723103373, 6148106.012006647, 6147551.221282347])

aep\_best\_sol on Genetic Generation 13: 716.5043241925182

Best solution on Genetic Generation 14:

([423951.51080289826, 424018.2877786659, 424089.1076847862, 424155.38389994815, 424226.56751790823, 424308.2681647716, 424365.4811821955, 424435.5994925228, 424531.8178739566, 424616.2689576029, 424680.3598272101, 424731.83102819585, 424799.55115563254, 424874.536018228, 424934.60451094486, 425016.32208535157, 425095.5385981465, 425159.28325585363, 425235.5380290034, 425302.352591387, 425375.04517272115, 425452.92690128135, 425507.67195607757, 425591.8655923704, 425656.7555867569, 425732.076080986, 425791.84070391307, 425852.6996541781, 425943.05498247675, 426005.1396085499, 426058.5023621496, 426137.14604642754, 426222.4622381051, 426277.383951518, 426366.31143433496, 426417.6835130121, 426482.9993183198, 426549.12529150833, 426622.95072245155, 426713.0841883499, 426778.66510864435, 426841.80634512875, 426908.24167746864, 426982.7929084275, 427054.86488158454, 427113.44049863616, 427197.26375195757, 427268.66359219345, 427345.3612376472, 427404.1155055397, 427456.779821121, 427531.3408029506, 427608.8659770764, 427684.5093393757, 427734.1165353238, 427814.3142217411, 427889.5602106109, 427964.08740472543, 428023.1098625499, 428105.1369538981, 428164.7132606605, 428251.0297671484, 428292.8728149863, 428375.0336884031, 428462.8582545671, 428524.6917961325, 428615.74669045676, 428661.4649778897, 428734.20313533087, 428815.56940813176, 428890.9910180712, 428956.22166850144, 429039.0859476599, 429103.0114781985, 429172.99915329117, 429238.1012171584, 429306.7478219107, 429365.6383917786, 429444.62680789095, 429507.4581290619], [6151459.705895964, 6150924.127002996, 6150353.107052222, 6149786.557936877, 6149236.781605794, 6148635.682556024, 6148104.9417858105, 6147545.214366995, 6151468.788106417, 6150907.120424051, 6150323.349071067, 6149786.572114046, 6149239.417205841, 6148647.047930935, 6148097.505722061, 6147534.398043447, 6151454.888231892, 6150894.015320543, 6150337.450266686, 6149780.954033979, 6149222.110691889, 6148655.349965504, 6148115.305043547, 6147537.489082425, 6151459.656810696, 6150888.588324801, 6150331.515891324, 6149784.625918433, 6149230.379828401, 6148663.218340865, 6148112.368075622, 6147535.853599662, 6151463.257848378, 6150886.261228474, 6150316.920183907, 6149790.611378418, 6149214.66784522, 6148658.871694893, 6148095.627618677, 6147546.223714553, 6151462.249101672, 6150892.844884579, 6150313.933932043, 6149785.825677636, 6149209.880795734, 6148664.290840876, 6148110.641867612, 6147545.5356875835, 6151461.890077691, 6150876.068685913, 6150319.564328837, 6149779.077760419, 6149232.648362742, 6148659.098792635, 6148102.138144599, 6147533.805660706, 6151458.460703403, 6150883.980146983, 6150328.62706673, 6149767.135640107, 6149225.362296961, 6148683.162644684, 6148118.253758271, 6147541.789098323, 6151469.2590713855, 6150877.705545767, 6150318.45866099, 6149768.717926043, 6149216.851697521, 6148663.542577233, 6148095.207008755, 6147553.496867491, 6151468.182995326, 6150897.599815844, 6150343.1469135145, 6149779.151377264, 6149229.877001358, 6148652.84863969, 6148099.952104466, 6147547.823273104])

aep\_best\_sol on Genetic Generation 14: 716.548709477817

Best solution on Genetic Generation 15:

([423954.6560626334, 424021.2148099323, 424088.139568338, 424156.72974785883, 424221.9917905934, 424304.7739163706, 424363.6799309121, 424428.82562677754, 424536.9188974955, 424610.3928647366, 424676.2797629901, 424726.6264353677, 424792.9242128571, 424869.9913472575, 424939.2519674579, 425020.0051434512, 425089.606526963, 425158.22748647, 425235.2701410818, 425306.48592975247, 425370.26615637064, 425450.86387220875, 425512.5544361822, 425591.4265740979, 425658.2269785329, 425728.2174809184, 425786.38431996515, 425845.73876184877, 425939.25347058824, 425999.3871908805, 426061.53683214774, 426132.9331467171, 426225.12501447136, 426278.94827675703, 426359.73841595446, 426413.78650675406, 426484.8644467173, 426553.8294228815, 426628.4608687623, 426716.1288075354, 426780.8971767142, 426840.47895240574, 426905.38670794567, 426982.5454783146, 427055.00459508604, 427118.6022321429, 427194.4049637668, 427265.2348143777, 427348.8068305966, 427408.8688638176, 427463.54365589336, 427533.482714538, 427610.36203744856, 427683.8141485894, 427733.1253926313, 427816.6076359132, 427894.2128613849, 427957.43272212986, 428027.5412100598, 428107.73571906117, 428165.4047243027, 428244.46947489545, 428287.4393069454, 428376.41266556806, 428468.46007609874, 428523.9385970783, 428608.9253436891, 428668.4446731595, 428737.14553069253, 428817.21458362247, 428884.0390549708, 428951.784455223, 429037.9532769406, 429096.3805592618, 429172.8289876804, 429231.3551787482, 429301.97347984347, 429370.9267538985, 429442.34126547474, 429511.2947416276], [6151461.496175298, 6150921.077295481, 6150349.032649086, 6149786.9517847905, 6149233.614105339, 6148635.506265846, 6148099.749715777, 6147541.85091938, 6151470.762996915, 6150905.423794118, 6150323.283418619, 6149782.652596146, 6149236.018749198, 6148643.38931323, 6148094.734355813, 6147533.039034119, 6151452.225819215, 6150887.300816328, 6150337.772374425, 6149785.200576539, 6149224.396053992, 6148654.343625985, 6148108.407258763, 6147535.578646304, 6151456.588380135, 6150893.572564854, 6150330.686103873, 6149786.081635376, 6149231.366430801, 6148666.005678579, 6148111.267094904, 6147542.060821119, 6151457.065977556, 6150884.906654841, 6150317.553695603, 6149793.492434016, 6149211.453762878, 6148659.402883375, 6148102.386337529, 6147541.173676989, 6151459.700451456, 6150886.175222761, 6150308.148006876, 6149786.404526492, 6149208.72476558, 6148661.44816475, 6148115.592653453, 6147551.973264367, 6151455.902020513, 6150876.047624501, 6150320.1649818625, 6149780.870018002, 6149228.8298581885, 6148659.279673033, 6148108.928555476, 6147539.608611701, 6151451.868837188, 6150884.442972775, 6150323.560028, 6149763.830610188, 6149229.912349039, 6148683.4258062495, 6148113.750347713, 6147539.889538555, 6151470.013110496, 6150882.285671755, 6150324.337090791, 6149770.396500325, 6149221.398511898, 6148663.478642872, 6148099.021628733, 6147554.023130283, 6151468.525471774, 6150902.726088803, 6150342.359129974, 6149779.176540448, 6149228.76881924, 6148652.174329169, 6148095.305780542, 6147547.917431983])

aep\_best\_sol on Genetic Generation 15: 716.6247788969345

Best solution on Genetic Generation 16:

([423957.3545980968, 424027.00921291154, 424089.15149066935, 424153.7175252239, 424225.7848647225, 424298.07763307216, 424370.2583800444, 424434.1764736282, 424530.5271552682, 424605.0313259126, 424670.6914413568, 424719.75419444503, 424789.0567944334, 424863.0547492177, 424935.20190248906, 425023.5336177763, 425093.83107358415, 425155.0155305291, 425233.2582129167, 425303.0698967271, 425369.2795838685, 425446.16069526726, 425516.52661157574, 425586.2313619188, 425662.2863755302, 425732.5990572576, 425783.93041815097, 425845.7968198073, 425942.3346728009, 426003.9179450048, 426058.98695271485, 426136.79585574334, 426222.84177704435, 426279.88955760485, 426364.07969833206, 426418.8120526141, 426488.5066907583, 426555.94493173965, 426621.81077821495, 426710.4044862284, 426775.7537388454, 426844.7611068118, 426900.6891665456, 426978.7470449918, 427053.5153022883, 427121.83762469265, 427191.5320154465, 427267.43105125596, 427353.80885968544, 427413.22869899235, 427458.9929655872, 427534.33244699286, 427607.72145737853, 427685.60531423596, 427729.8747304942, 427816.4450729365, 427892.4874782599, 427960.84861024993, 428028.50028644473, 428106.0823386448, 428164.38297842874, 428239.3623508494, 428285.93963091954, 428373.966970333, 428468.1608324758, 428527.0223604739, 428612.2960310046, 428666.92168310133, 428743.2695857065, 428810.34123740735, 428880.2053310735, 428954.66090671637, 429037.201307764, 429094.5080847139, 429175.9506819541, 429237.2585316164, 429302.94385444757, 429366.29027812055, 429445.1821834041, 429509.06054640835], [6151466.219471753, 6150917.637673728, 6150345.280879681, 6149793.165472639, 6149232.8101377245, 6148629.506166371, 6148100.712032627, 6147535.244435153, 6151466.95554609, 6150906.221814467, 6150325.625342702, 6149784.455473873, 6149232.015768542, 6148650.039309219, 6148098.733595312, 6147537.829265792, 6151453.612747209, 6150892.782299481, 6150331.1845134, 6149779.516493567, 6149219.83322702, 6148658.472331479, 6148110.707688724, 6147534.7304338785, 6151462.474755282, 6150891.743707998, 6150331.118176532, 6149784.704378801, 6149226.720910731, 6148661.143263622, 6148117.816180989, 6147536.124583318, 6151460.116025154, 6150885.490417485, 6150314.684695039, 6149798.951246971, 6149217.699409218, 6148660.7927836655, 6148106.906208753, 6147542.549182553, 6151453.944061441, 6150880.245137395, 6150314.152659525, 6149782.119444009, 6149207.0622146595, 6148659.436191306, 6148120.097398403, 6147556.560898948, 6151453.696200086, 6150877.755230551, 6150324.6379758725, 6149779.4496161705, 6149223.807720711, 6148662.911702261, 6148108.017518134, 6147543.905793535, 6151457.643618531, 6150882.897714417, 6150319.784996747, 6149770.535064486, 6149234.987443777, 6148681.646778463, 6148108.630883394, 6147543.7506376365, 6151463.921315391, 6150888.898018359, 6150327.168864266, 6149763.893756811, 6149222.130149825, 6148667.170840872, 6148096.437449349, 6147551.130516347, 6151465.346334933, 6150902.473505621, 6150336.334586187, 6149786.161120787, 6149233.813894498, 6148657.968932374, 6148099.678884424, 6147544.786521091])

aep\_best\_sol on Genetic Generation 16: 716.6328878088686

Best solution on Genetic Generation 17:

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aep\_best\_sol on Genetic Generation 17: 716.6441027171074

Best solution on Genetic Generation 18:

([423959.27314766374, 424027.88438019576, 424097.92189287033, 424156.41299648874, 424225.5986095469, 424295.28303270496, 424371.4711975475, 424436.82041581575, 424529.8008808138, 424605.0617176379, 424672.74587594974, 424718.14854658744, 424776.5476416432, 424861.75381709024, 424935.86163929343, 425027.0037962956, 425097.1264705769, 425149.06712311896, 425236.3855943477, 425301.06622009806, 425365.9121908339, 425450.44390227366, 425519.11365604313, 425584.5259551277, 425657.78314726293, 425734.19057864975, 425788.17144381936, 425856.7246337904, 425939.98460903903, 426005.3794722194, 426065.7606919427, 426142.2355664323, 426223.75806530594, 426289.5234429714, 426365.80430677347, 426424.2571297258, 426487.088133623, 426560.50411085616, 426629.1520927061, 426709.16025342426, 426788.0138740416, 426840.9554797907, 426892.4515391706, 426974.79759006563, 427053.29151566885, 427122.4327367462, 427189.8481093062, 427263.10978723597, 427359.823041634, 427407.836434422, 427466.98507697287, 427535.5654601508, 427614.56972470984, 427687.6920294504, 427740.9527493868, 427807.3562439657, 427888.308328604, 427962.28704850737, 428029.34970770555, 428101.7067522125, 428164.3073461737, 428231.4483733109, 428288.9752082173, 428381.40118065494, 428476.33036305656, 428535.86323659186, 428614.0320542077, 428670.6635503603, 428747.7511253646, 428810.2639488524, 428885.2941952495, 428950.6946057562, 429035.2433142598, 429098.3943811648, 429169.21739809937, 429233.1292873745, 429303.8582993712, 429363.7813956352, 429443.56725353096, 429515.7135996908], [6151453.883524622, 6150916.303935146, 6150341.166915938, 6149791.113689708, 6149234.718517183, 6148634.594883776, 6148107.48063339, 6147535.7721271645, 6151461.61802093, 6150896.12595779, 6150322.191456744, 6149785.224942633, 6149235.653711408, 6148646.489705469, 6148090.5648377435, 6147533.857894566, 6151462.368794578, 6150892.199928079, 6150322.114051974, 6149783.312659895, 6149223.425839171, 6148650.563006506, 6148105.065455216, 6147536.839650644, 6151470.545396154, 6150893.176913215, 6150328.899346242, 6149785.629953352, 6149228.5712639345, 6148660.587434565, 6148116.402285413, 6147544.648084894, 6151460.955438022, 6150880.31587149, 6150318.887375911, 6149789.081231517, 6149215.44498505, 6148665.476972795, 6148109.460531031, 6147536.488935973, 6151450.3849188, 6150881.394100303, 6150322.009423546, 6149786.682869286, 6149219.48821856, 6148667.382575276, 6148111.37385945, 6147548.377486256, 6151447.940848119, 6150878.691852139, 6150325.201019259, 6149777.441708598, 6149229.608943031, 6148666.182803404, 6148109.884944938, 6147536.411186706, 6151456.070941564, 6150885.4018241875, 6150316.789422818, 6149777.669493357, 6149236.819968941, 6148678.79787616, 6148102.039065714, 6147544.469512665, 6151470.334250166, 6150892.70381901, 6150322.925847134, 6149766.594813328, 6149215.560235934, 6148661.582317849, 6148103.419856727, 6147554.760927692, 6151462.463133308, 6150906.331297919, 6150341.997221019, 6149793.145760538, 6149234.774542224, 6148660.921638047, 6148099.4644254455, 6147534.846681269])

aep\_best\_sol on Genetic Generation 18: 716.6767134474248

Best solution on Genetic Generation 19:

([423955.6532847852, 424024.79548317107, 424091.55999283964, 424153.8716869174, 424224.05095391383, 424302.0409255139, 424367.3553317954, 424431.9135677215, 424527.4985119853, 424605.0015623802, 424674.0955464047, 424714.3372505584, 424774.18698333506, 424859.65402145626, 424941.8347376575, 425031.9912090652, 425098.0733777262, 425154.0979360661, 425235.5890949784, 425298.71741905273, 425362.28533373977, 425449.9431902227, 425514.51103737176, 425590.4054229864, 425657.0734927907, 425730.6123266815, 425784.8931004782, 425859.57539204473, 425934.5765532589, 426011.59899465385, 426066.03036912123, 426137.89078631817, 426223.9512469963, 426294.24592530524, 426360.33879316214, 426423.5993008019, 426483.6071801869, 426553.6876727146, 426628.53816829075, 426702.3787030202, 426793.42706395604, 426840.07269903837, 426893.3901892133, 426970.2966844024, 427050.829754204, 427123.1233836128, 427193.1376309345, 427258.7521826075, 427354.05084347446, 427409.2630546347, 427466.98579064535, 427540.17197201063, 427612.0239058005, 427693.4945820647, 427747.79292654706, 427807.8603012529, 427887.11092364404, 427963.15785199526, 428025.7819490014, 428103.7639014259, 428162.645372979, 428235.2751003854, 428295.83267223166, 428379.5382505018, 428482.73654233315, 428539.92135270813, 428611.9019823527, 428668.83214771026, 428744.18007913267, 428816.36418659915, 428891.0072715737, 428956.8626496, 429028.7341992582, 429100.72465035884, 429173.01993460435, 429239.63734671735, 429303.5006262169, 429362.3923989761, 429445.2913254738, 429509.1750888348], [6151454.795638724, 6150913.96784934, 6150347.791804305, 6149797.795538983, 6149236.8902662955, 6148638.181868012, 6148106.583270715, 6147533.043395089, 6151466.942418543, 6150891.732170907, 6150316.937954682, 6149789.4678255655, 6149240.957506895, 6148653.292957054, 6148085.642844362, 6147537.664575546, 6151469.120175608, 6150897.1092971405, 6150325.099399544, 6149788.009386655, 6149225.004443402, 6148649.852736763, 6148098.670869897, 6147543.57026824, 6151470.664093071, 6150891.80689617, 6150330.699003818, 6149790.602079451, 6149227.51989403, 6148661.457228789, 6148115.700770795, 6147541.94743625, 6151454.372618496, 6150886.082309573, 6150316.210403938, 6149795.083759545, 6149219.983968487, 6148666.102823277, 6148107.352318244, 6147534.279302918, 6151447.711483266, 6150882.833256913, 6150326.163835458, 6149785.496547069, 6149218.425285096, 6148668.965693486, 6148108.116632879, 6147545.996715934, 6151442.7496474115, 6150883.166468674, 6150331.302804388, 6149778.465264711, 6149236.463252972, 6148662.24719008, 6148111.081179626, 6147540.184313793, 6151458.53376635, 6150889.550200312, 6150323.591516345, 6149777.117000125, 6149239.061713563, 6148683.776757696, 6148101.899602912, 6147550.740487756, 6151465.0335802715, 6150897.333057332, 6150325.5215409715, 6149772.3266709205, 6149217.369108735, 6148659.0886365315, 6148107.992526381, 6147551.117658904, 6151465.781016023, 6150906.272384989, 6150337.48775377, 6149792.606903853, 6149239.620463373, 6148664.515723893, 6148104.909361212, 6147535.309413204])

aep\_best\_sol on Genetic Generation 19: 716.6992791285118

Best solution on Genetic Generation 20:

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aep\_best\_sol on Genetic Generation 20: 716.7447905480967

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aep\_ref: 715.7028905615057

aep\_max: 716.7447905480967









