Transient simulation of switching transmission lines

CRES Project by

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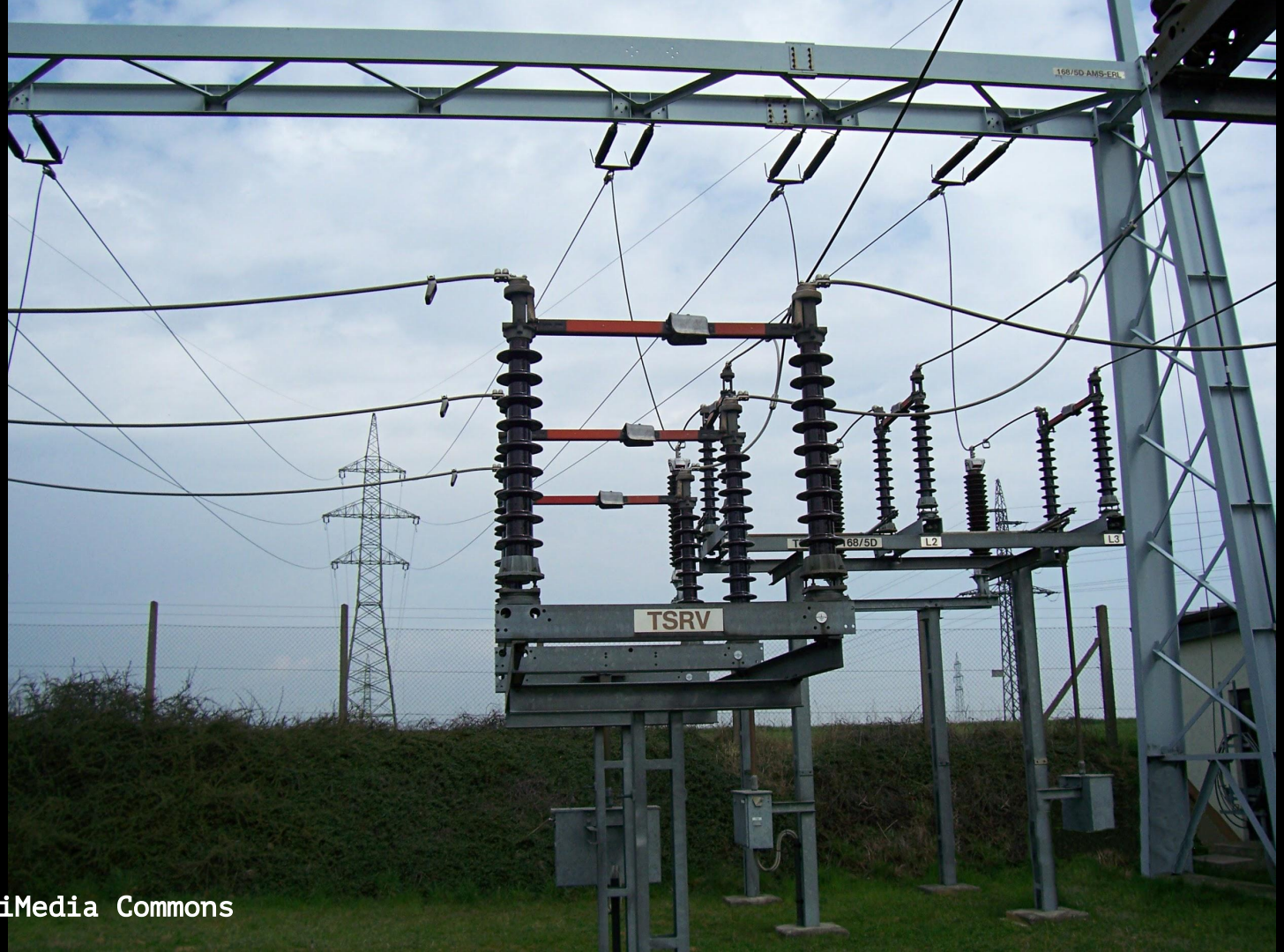

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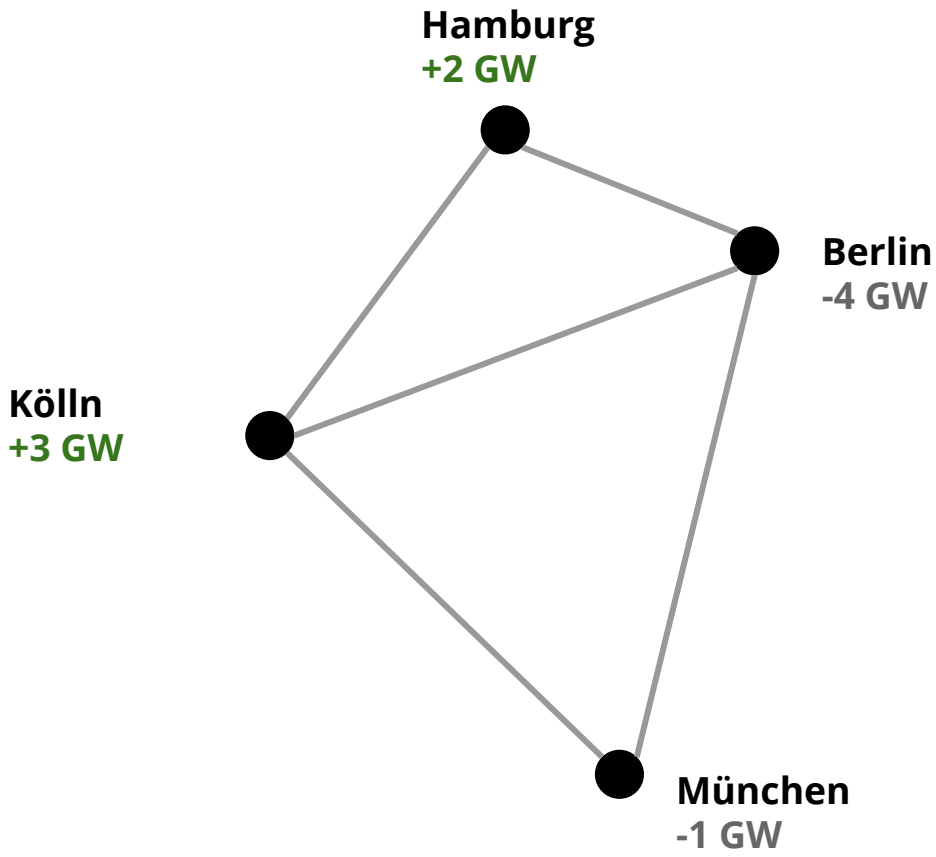
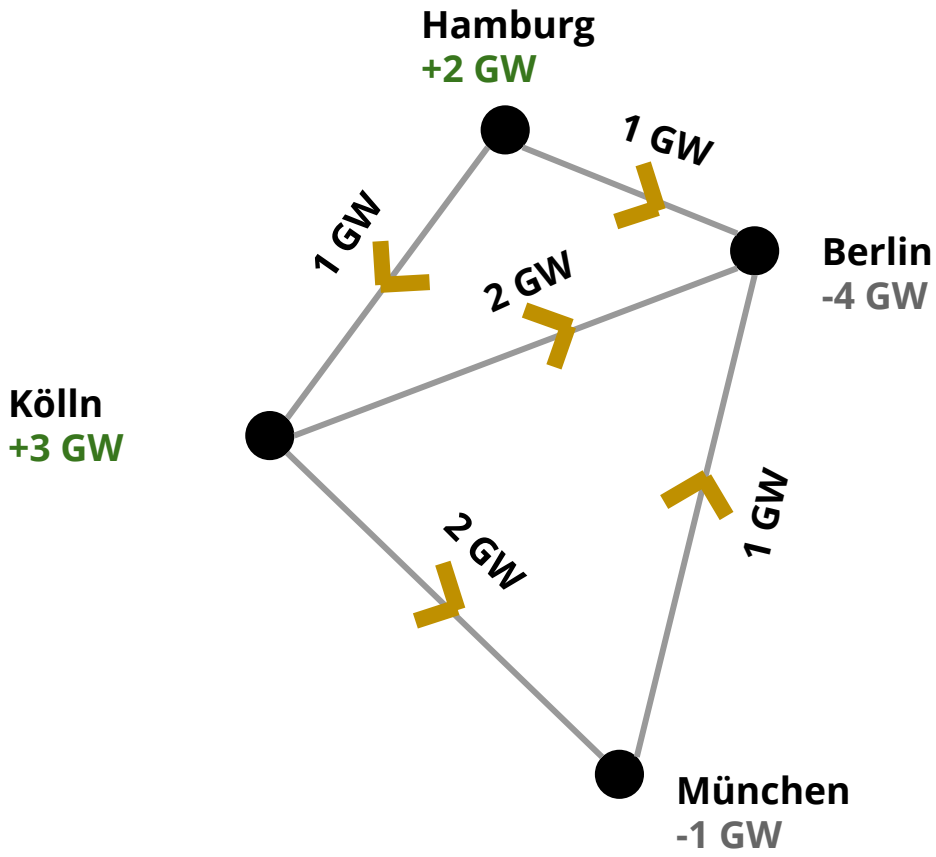
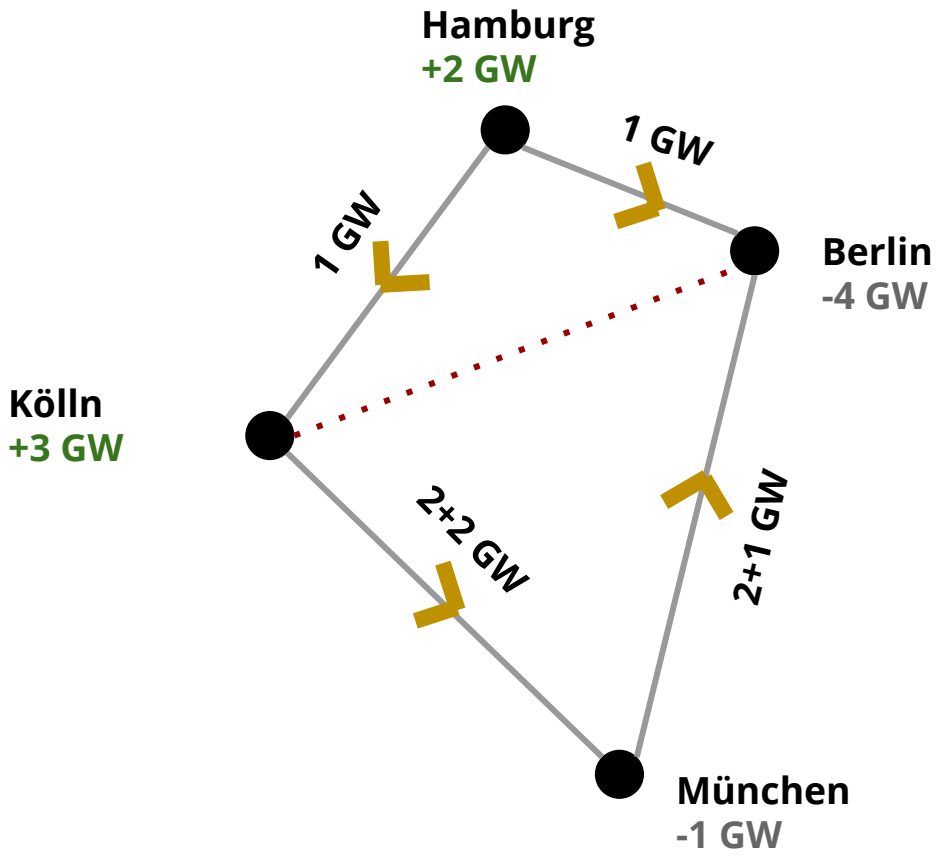
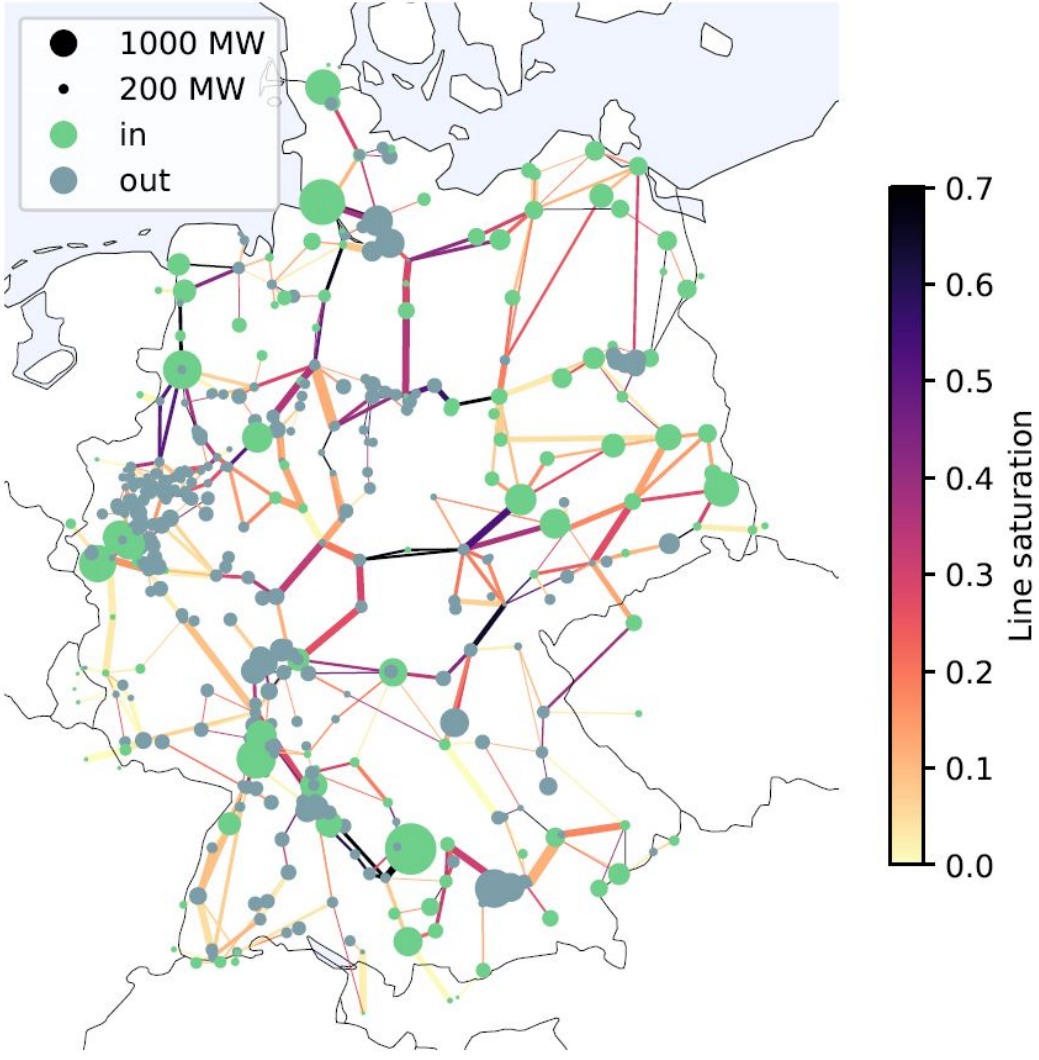

Hamburg
+2 GW
Berlin
-4 GW
Kölln
+3 GW
München
-1 GW


Hamburg
+2 GW
1 GW
1 GW
Berlin
-4 GW
2 GW
Kölln
+3 GW
2 GW
1 GW
München
-1 GW


Hamburg
+2 GW
1 GW
1 GW
Berlin
-4 GW
Kölln
+3 GW
2+2 GW
2+1 GW
München
-1 GW


1000 MW
200 MW
in
out
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Line saturation

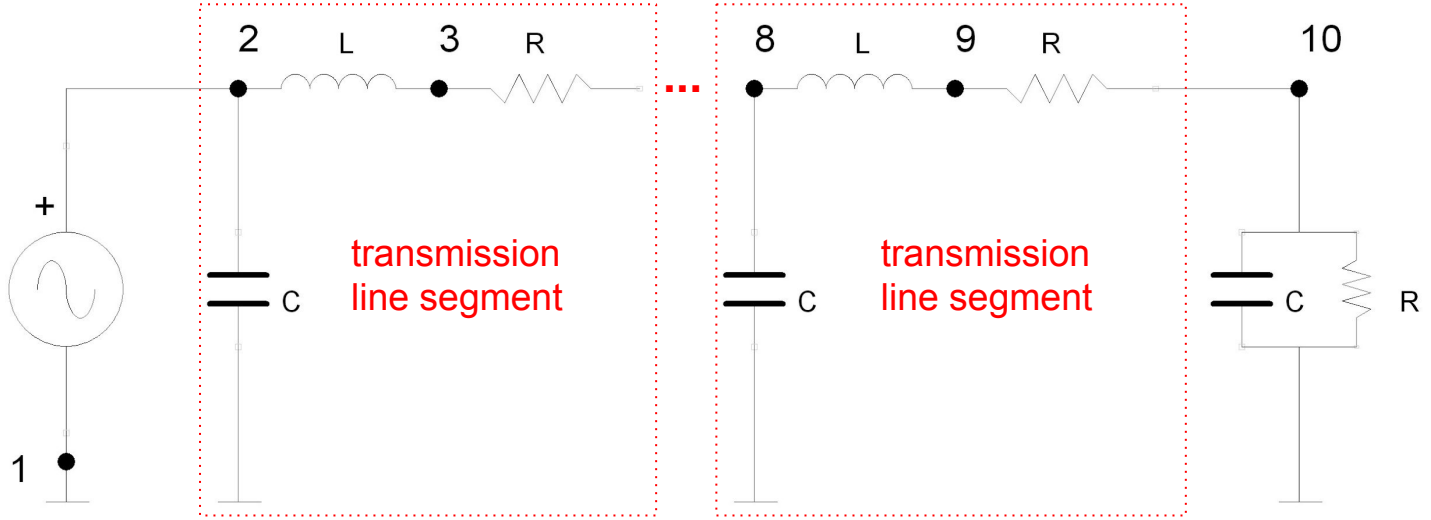
Idea

1. network model with **buses** and transmission **lines**

2. replace **linear model** model from lines with a passive, linear circuit

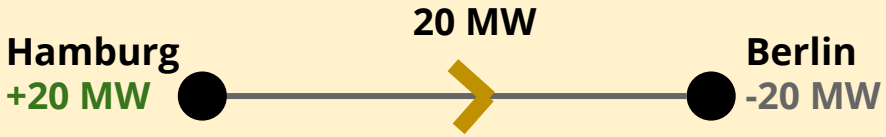
3. simulate!

Line model

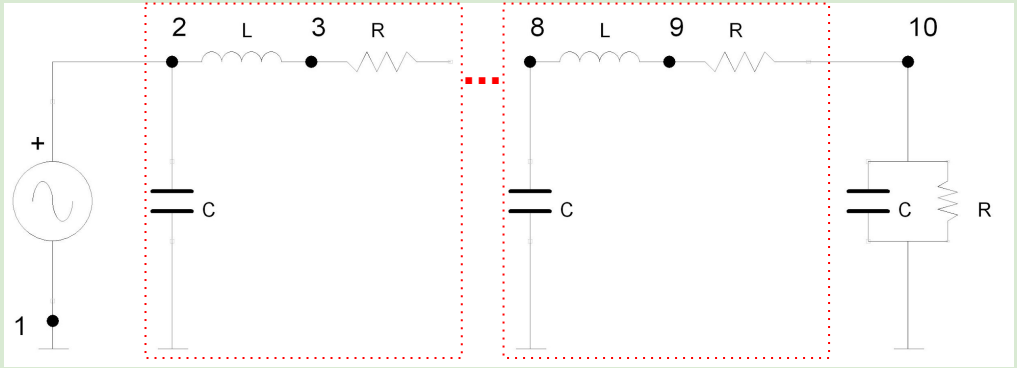

2
L
3
R
8
L
9
R
10
+
1
C
transmission
line segment
C
transmission
line segment
C
R

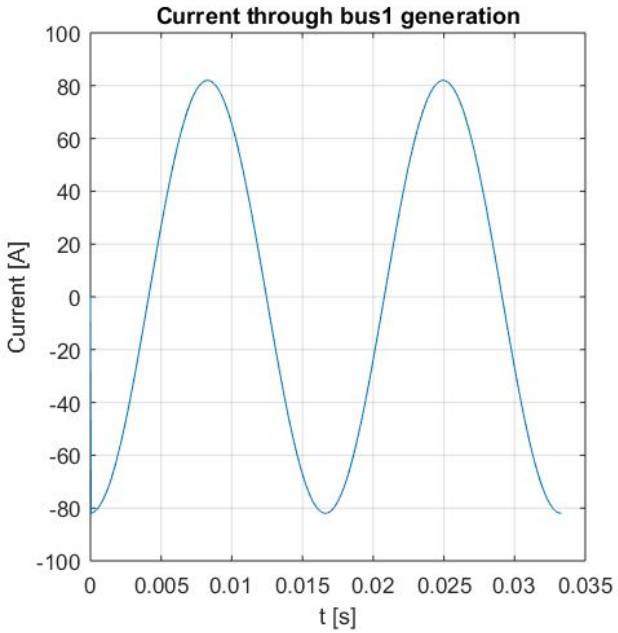
Results so far

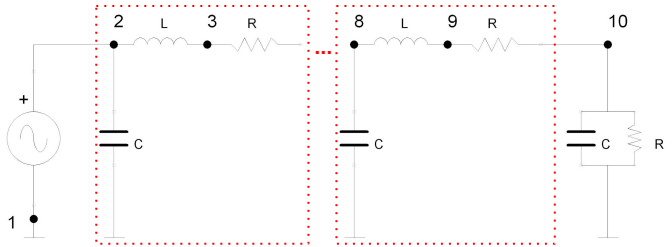
Linear line model

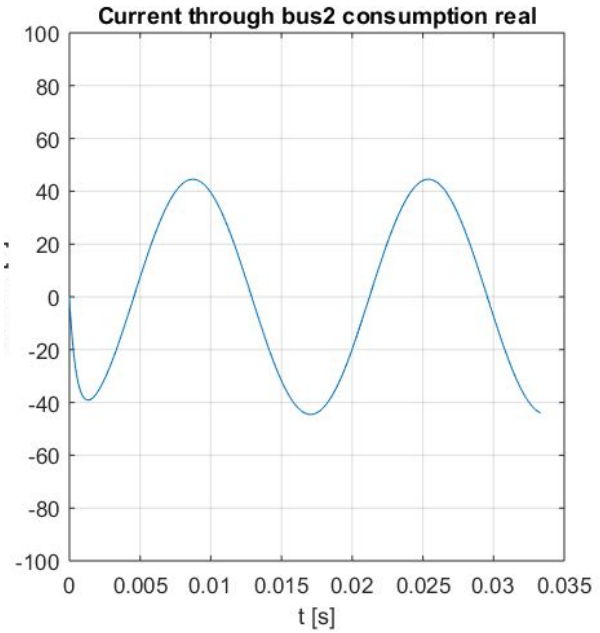


Non-linear line model

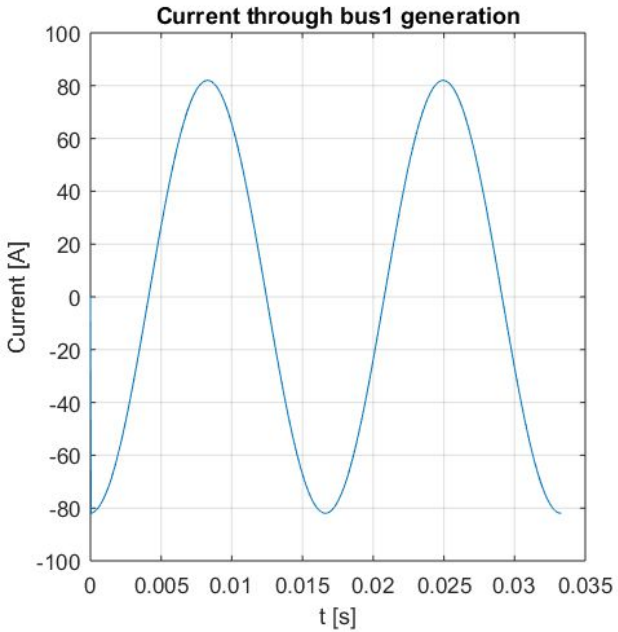


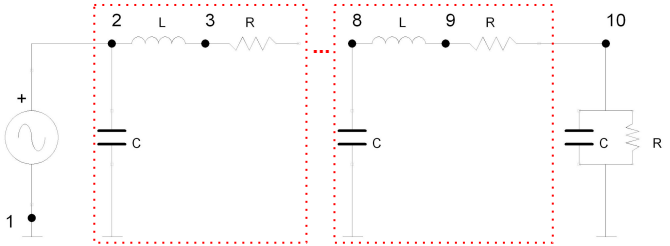

Current through bus1 generation
Current [A]
t [s]
100
80
60
40
20
0
-20
-40
-60
-80
-100
0
0.005
0.01
0.015
0.02
0.025
0.03
0.035

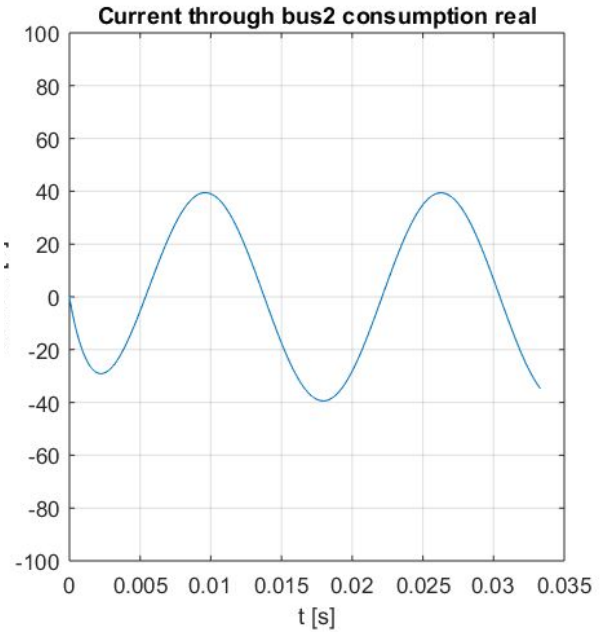

2
L
3
R
8
L
9
R
10
+
1
C
C
C
R

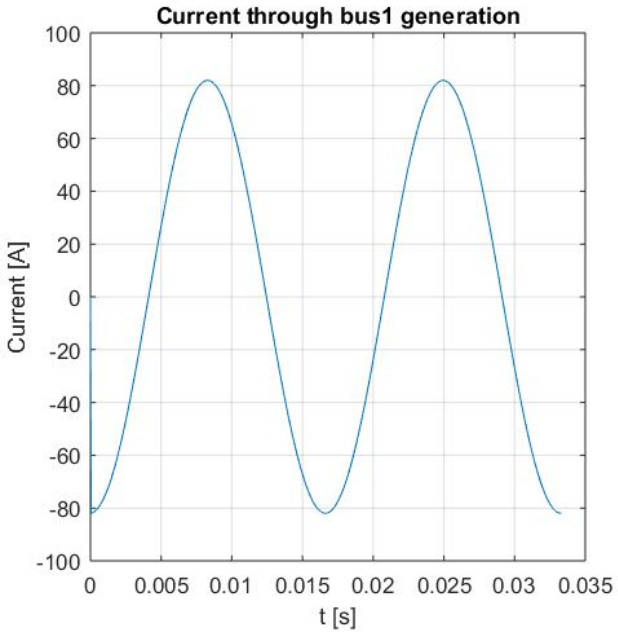

Current through bus2 consumption real
t [s]
100
80
60
40
20
0
-20
-40
-60
-80
-100
0
0.005
0.01
0.015
0.02
0.025
0.03
0.035

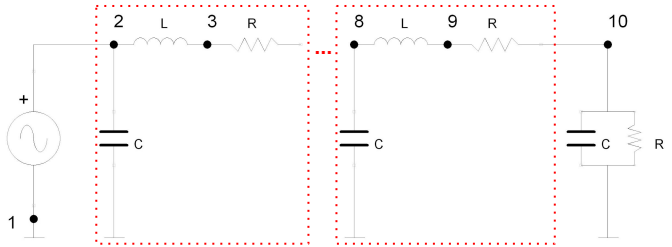
Higher load capacitance

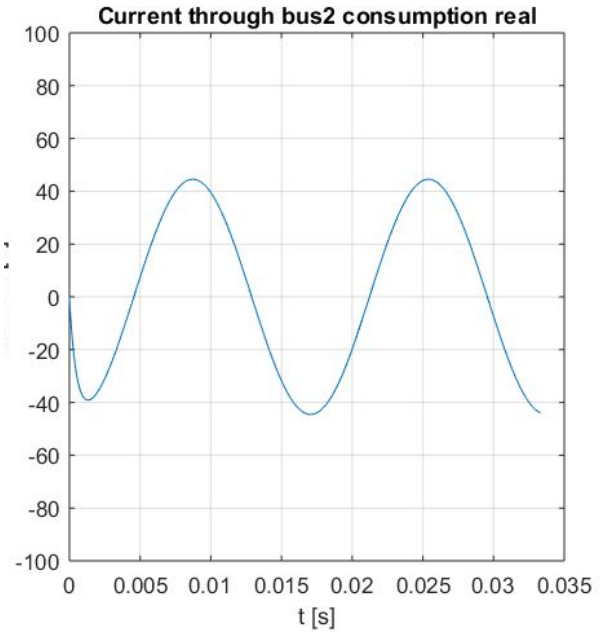




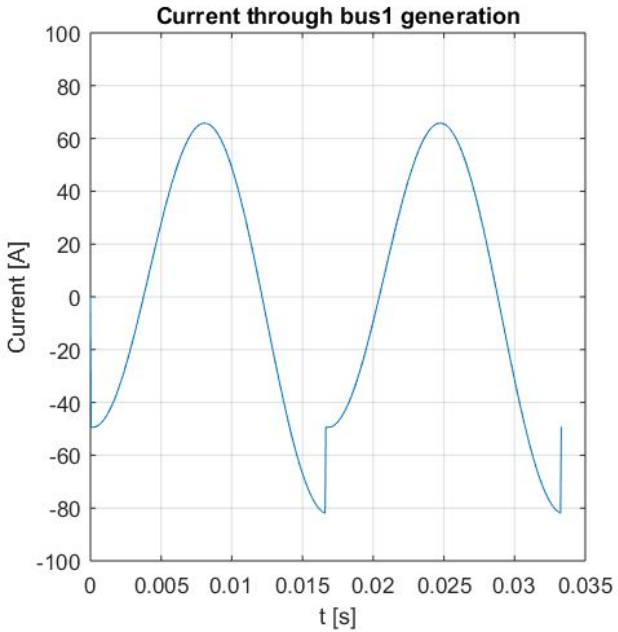


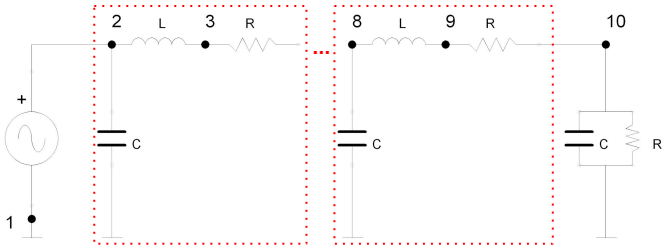

Current through bus1 generation
Current [A]
t [s]
100
80
60
40
20
0
-20
-40
-60
-80
-100
0
0.005
0.01
0.015
0.02
0.025
0.03
0.035

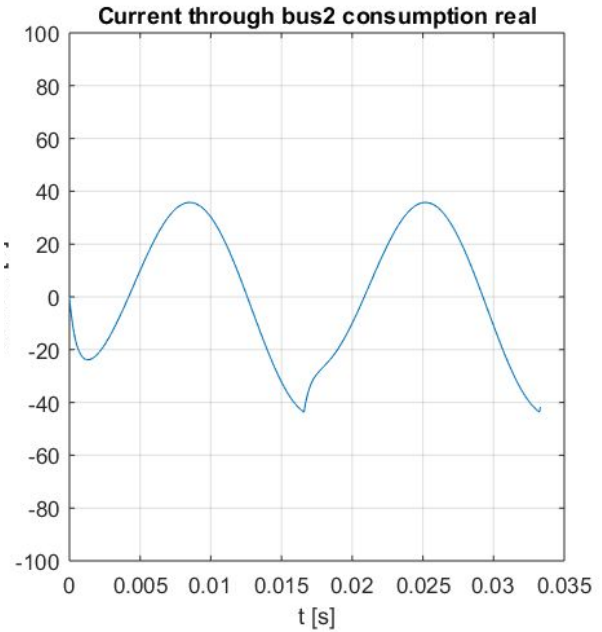

2
L
3
R
8
L
9
R
10
+
1
C
C
C
R

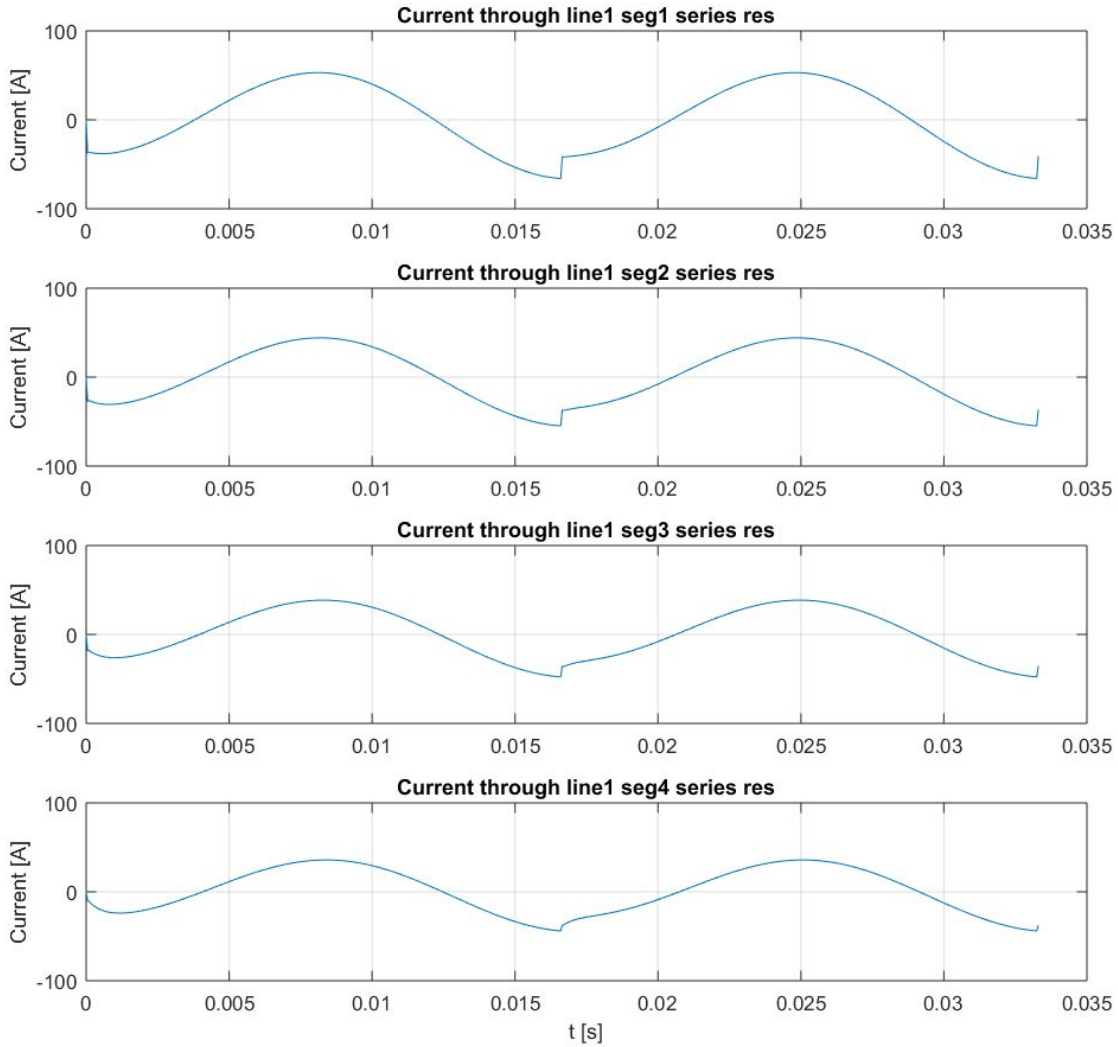

Current through bus2 consumption real
t [s]
100
80
60
40
20
0
-20
-40
-60
-80
-100
0
0.005
0.01
0.015
0.02
0.025
0.03
0.035

Discontinuous generation









Hamburg

Berlin

Future

- Apply to simple meshed network
- Run simulations
  - Effect of timestep, number of line segments, line properties, etc.?
  - Compare with literature
- If (run)time allows it:
  - SciGRID dataset of German grid