

Supplementary Data

Table S1. Thermodynamic cycle parameters, values for the reference cycle and the Szewalski cycle are the same.

Parameter	Symbol	Unit	Value
Temperature of live steam at the boiler outlet	T_{01}	°C	653
Pressure of live steam at the boiler outlet	p_{01}	MPa	30.3
Temperature of live steam before the turbine	T_{02}	°C	650
Pressure of live steam before the turbine	p_{02}	MPa	30
Temperature of secondary steam at the boiler outlet	T_{04}	°C	672
Pressure of secondary steam at the boiler outlet	p_{04}	MPa	6
Temperature of secondary steam before the turbine	T_{05}	°C	670
Pressure in deaerator	p_{24}	MPa	1.15
Pressure after the condensate pump	p_{31}	MPa	2.2
Temperature of feeding water	T_{43}	°C	310
Internal efficiency of the HP turbine	$\eta_{int,HP}$	-	0.90
Internal efficiency of the IP turbine	$\eta_{int,IP}$	-	0.92
Internal efficiency of the LP turbine	$\eta_{int,LP}$	-	0.85
Internal efficiency of pumps	$\eta_{int,p}$	-	0.85
Efficiency of regenerative heat exchangers	$\eta_{HE1-HE7}$	-	0.995
Efficiency of vapor cooler	η_{HE8}	-	0.995
Efficiency of deaerator	η_D	-	1.00
Flow losses in vapor pipelines to regenerative heat exchangers and vapor cooler	$\xi_{HE1-HE8}$	-	0.02
Flow losses in vapor pipeline from the vapor cooler to regenerative heat exchanger HE5	ξ_{59-60}	-	0.01
Feed water flow losses through regenerative heat exchangers and vapor cooler	ξ_{loss}	-	0.01
Pressure loss of circulation fluid in the boiler	Δp_{43-01}	MPa	4.2
Vapor pressure loss in secondary superheater	Δp_{03-04}	MPa	0.3
Flow losses in superheated steam pipelines	ξ_{12-03}	-	0.017
	ξ_{04-05}	-	0.017
Flow losses between the IP and LP parts of the turbine	ξ_{06-07}	-	0.01
Boiler efficiency (hard coal)	η_B	-	0.945
Generator efficiency	η_g	-	0.988
Mechanical losses of the turbine	ΔN_m	MW	0.9

Table S2. Steam cycle reference model thermodynamic parameters at specific points.

Reference Cycle Point	Temperature	Pressure	Mass Stream	Enthalpy
-	°C	bar	kg/s	kJ/kg
01	653.00	303.00	618.97	3606.3
02	650.00	300.00	618.97	3599.7
03	392.70	63.00	522.53	3153.3
04	672.00	60.00	522.53	3828.2
05	670.00	58.98	522.53	3824.2
06	317.90	5.84	437.25	3099.7
07	317.90	5.78	437.25	3099.7
11	454.50	96.61	43.46	3259.8
12	393.50	64.09	575.51	3153.3
13	566.30	32.47	40.65	3604.1

Table S2. *Cont.*

Reference Cycle Point	Temperature	Pressure	Mass Stream	Enthalpy
14	410.60	11.74	21.48	3284.4
15	317.90	5.84	23.15	3099.7
16	228.80	2.52	23.03	2926.7
17	138.10	0.93	19.97	2753.5
18	67.50	0.28	22.24	2584.0
19	32.90	0.05	372.00	2390.9
21	453.40	94.67	43.46	3259.8
22	392.50	62.81	52.98	3153.3
23	566.00	31.82	40.65	3604.1
24	410.50	11.50	21.48	3284.4
25	317.80	5.72	23.15	3099.7
26	228.70	2.47	23.03	2926.7
27	138.10	0.91	19.97	2753.5
28	67.00	0.27	22.24	2584.0
30	32.90	0.05	394.25	137.8
31	33.00	22.00	394.25	140.4
32	64.00	21.78	394.25	269.7
33	94.00	21.56	394.25	395.4
34	94.30	21.56	437.25	396.7
35	124.00	21.35	437.25	522.1
36	154.00	21.13	437.25	650.5
37	154.20	21.13	460.40	651.2
38	186.10	11.50	618.97	790.0
39	192.70	359.15	618.97	836.4
40	234.60	355.56	618.97	1020.0
41	276.60	352.01	618.97	1212.9
42	305.00	348.49	618.97	1352.0
43	310.00	345.00	618.97	1377.6
50	67.00	0.27	22.24	280.5
51	97.00	0.91	43.00	406.4
52	97.20	22.00	43.00	409.0
53	127.00	2.47	23.03	533.6
54	157.00	5.72	23.15	662.5
55	157.30	22.00	23.15	664.7
56	202.70	31.51	13.,09	865.1
57	244.60	62.81	96.44	1059.6
58	286.60	94.67	43.46	1269.8
59	392.80	31.82	40.65	3211.8
60	392.50	31.51	40.65	3211.8