

List of changes from v1.0 to v2.4

– 1577 removals

1964 lines

1 # CARDANO BLOCKCHAIN ECOSYSTEM
CONSTITUTION

2

3 ## PREAMBLE

4

5 Cardano is a decentralized
ecosystem of blockchain
technology, smart contracts,
6 and community governance,
committed to improving economic,
political, and
7 social systems for everyone,
everywhere.

8 By offering this foundational
infrastructure, Cardano empowers
individuals and
9 communities to manage their
identity, value and governance,
fostering the
10 emergence of decentralized
applications, businesses and
network states.

11

12 Through unbiased processing of
immutable data, we, the
participants of the
13 Cardano Community, consisting of
individuals, organizations,
contributors and
14 others, choose to follow in the
footsteps of the early Internet
and
15 cryptocurrency pioneers, who
first forged bonds of community
through digital

+ 1770 additions

1962 lines

1 **CARDANO BLOCKCHAIN ECOSYSTEM
CONSTITUTION**

2 =====
=====

3

4 **PREAMBLE**

5 -----

6

7 Cardano is a decentralized
ecosystem of blockchain
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11 communities to manage their
identity, value, and governance,
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12 the emergence of decentralized
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13 states.

14

15 Through unbiased processing of
immutable data, we, the
participants of
16 the Cardano Community, consisting
of individuals, organizations,
17 contributors, and others, choose
to follow in the footsteps of the
early
18 Internet and cryptocurrency
pioneers, who first forged bonds
of

16 technologies.
17 We are guided by our shared
18 principles and tenets as we
19 exercise our
20 self-governance by balancing
21 decentralized decision-making
22 with accountability
23 and safeguarding the security of
24 the Cardano Blockchain.

20

21 Recognizing the need for a more
22 robust and dynamic governance
23 framework, that
24 neither relies nor depends upon
25 traditional nation-state
26 governance systems,
27 but instead relies on self-
28 governance by the Cardano
29 Community, utilizing,
30 wherever possible and beneficial,
31 blockchain technology in the
32 governance
33 process, we hereby establish this
34 Cardano Constitution to govern
35 the Cardano
36 Blockchain ecosystem, ensure the
37 continuity of the Cardano
38 Blockchain, and
39 guard the rights of those who
40 utilize it.

28

29 With these purposes in mind, we,
30 the Cardano Community, affirm our
31 intention to
32 abide by this Constitution in
33 order to participate in the
34 governance of the
35 Cardano Blockchain ecosystem.
36 We invite all who share our
37 values to join us but stand not
38 in the way of any
39 who wish to take another path.

34

19 community through digital
20 technologies. We are guided by
21 our shared
22 principles and tenets as we
23 exercise our self-governance by
24 balancing
25 decentralized decision-making
26 with accountability and
27 safeguarding the
28 security of the Cardano
29 Blockchain.

23

24 Recognizing the need for a more
25 robust and dynamic governance
26 framework,
27 that neither relies nor depends
28 upon traditional nation-state
29 governance
30 systems, but instead relies on
31 self-governance by the Cardano
32 Community,
33 utilizing, wherever possible and
34 beneficial, blockchain technology
35 in
36 the governance process, we hereby
37 establish this Cardano
38 Constitution to
39 govern the Cardano Blockchain
40 ecosystem, ensure the continuity
41 of the
42 Cardano Blockchain, and guard the
43 rights of those who utilize it
44 and the
45 rights of ada owners.

32

33 With these purposes in mind, we,
34 the Cardano Community, affirm our
35 intention to abide by this
36 Constitution in order to
37 participate in the
38 governance of the Cardano
39 Blockchain ecosystem. We invite
40 all who share
41 our values to join us for as long
42 as they wish, while honoring the
43 freedom to take another path.

38

39 **DEFINED TERMS**

35 **## ARTICLE I. CARDANO BLOCKCHAIN**
36 **TENETS AND GUARDRAILS**

37 **### Section 1**

38
39 These below Tenets shall guide
40 all participants of the Cardano
41 Community,
42 including the Constitutional
43 Committee, and proposed
44 governance actions shall
45 be evaluated in accordance with
46 these Tenets.
47 The order in which the below
48 Tenets appear is not intended to
49 represent a
50 priority among Tenets.

51 ****TENET 1**** Transactions on the
52 Cardano Blockchain shall not be
53 slowed down or
54 censored and shall be expediently
55 served for their intended
56 purpose.

57 ****TENET 2**** The cost of
58 transactions on the Cardano
59 Blockchain shall be

40 -----

41
42 **1. Active Voting Stake.** The
43 total amount of lovelace that is
44 delegated
45 to active DReps or SP0s. This
46 stake is used as the basis for
47 calculating voting thresholds
48 and adjudicating proposed
49 Governance
50 action outcomes. It excludes
51 stake delegated to inactive
52 DReps, the
53 predefined abstain voting
54 option, unregistered stake, and
55 registered
56 undelegated stake.

57
58 **2. Cardano Community.** The
59 collective group of all
60 individuals and
61 organizations that, in
62 embracing the shared principles
63 and
64 objectives set forth in the
65 Cardano Blockchain Ecosystem
66 Constitution, own ada,
67 develop, build on, support,
68 maintain,
69 contribute to, and use the
70 Cardano Blockchain.

71
72 **3. Cardano Community Member.** Any
73 participant, individual or
74
75 organization in the Cardano
76 Community, including the CC.

77
78 **4. Constitutional Committee**
79 (CC). The governing body and its
80 component
81 elected seats charged with
82 ensuring that applicable
83 governance
84 actions take effect on the
85 Cardano Blockchain only if in

alignment

61 with the principles and
provisions set forth in the
Cardano

62 Blockchain Ecosystem
Constitution.

63
64 5. Constitutional Committee
member (CC member). A person,
whether an

65 individual or organization,
that serves as a member of the
66 Constitutional Committee.

67
68 6. Delegated Representative
(DRep). The individual or entity
registered

69 to vote with respect to on-
chain governance actions on its
own

70 behalf or on behalf of other
ada owners.

71
72 7. Net Change Limit. The maximum
allowed amount or percentage of
73 lovelace that may be removed
from the Cardano Treasury in a
given

74 period.

75
76 8. Stake Pool Operator (SPO). An
individual or entity that
controls

77 cold key(s) of a block-
producing node of a Stake Pool.

78
79 9. Stake Pool. A Stake Pool
Operator's block producing node,
identified

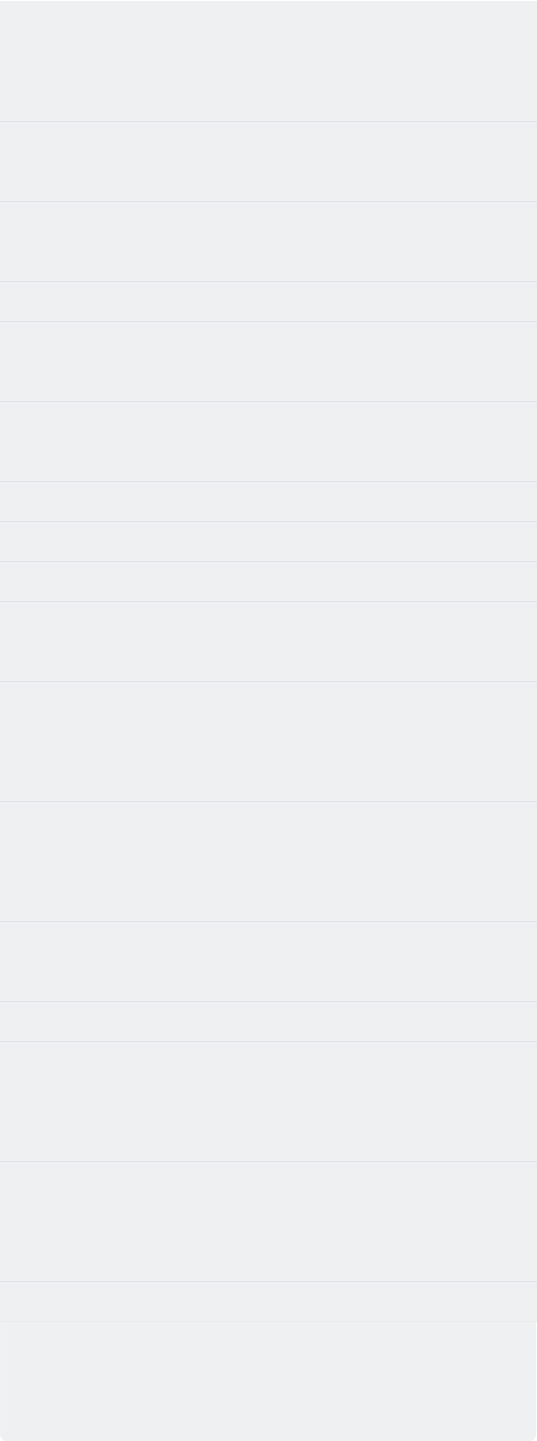
80 by a unique Stake Pool ID,
which aggregates applicable
Delegator

81 stake, forges and validates
Blocks, and facilitates
contributions of

82 the SPO to the Cardano
Blockchain's security,
decentralization,

83 consensus mechanism, and
governance process.

84



49 predictable and not unreasonable.
50

51 ****TENET 3**** Anyone desiring to
develop and deploy applications
on the Cardano
52 Blockchain shall not unreasonably
be prevented from developing and
53 deploying
such applications as intended.

54

55 ****TENET 4**** Contributions by the
Cardano Community on the Cardano
Blockchain

85 **10. Treasury Withdrawal**
Recipient. A person or entity who
is indicated as
86 the recipient of ada from the
Cardano Treasury in the relevant
87 "Treasury Withdrawals"
action.

88
89 ****ARTICLE I. CARDANO BLOCKCHAIN**
TENETS AND GUARDRAILS**
90
91

92 **### **Section 1 Guiding Tenets****
93
94 The following Tenets shall guide
all Cardano Community members and
95 proposed governance actions shall
be evaluated in accordance with
these
96 Tenets. The order in which the
Tenets below appear is not
intended to
97 represent a priority among
Tenets.

98
99 **TENET 1** Transactions on the
Cardano Blockchain shall not be
slowed down
100 or censored and shall be
expediently served for their
intended purpose.

101
102 **TENET 2** The cost of transactions
on the Cardano Blockchain shall
be

103 predictable and not unreasonable.
104

105 **TENET 3** Anyone desiring to
develop and deploy applications
on the
106 Cardano Blockchain shall not be
unreasonably prevented from
developing
107 and deploying such applications
as intended.

108

109 **TENET 4** Contributions by the
Cardano Community on the Cardano
Blockchain

56 shall be recognized, recorded and
assessed fairly through reward
sharing with
57 SPOs, potential compensation to
DReps and CC members, and
appropriate
58 tokenomics.

59

60 ****TENET 5**** The Cardano
Blockchain shall not lock in an
ada owner's value or
61 data without the owner's consent.

62

63 ****TENET 6**** The Cardano
Blockchain shall not unreasonably
impede

64 interoperability.

65

66 ****TENET 7**** The Cardano
Blockchain shall preserve in a
safe manner any value

67 and information stored on the
Cardano Blockchain.

68

69 ****TENET 8**** The Cardano
Blockchain shall not unreasonably
spend resources.

70

71 ****TENET 9**** All users of the
Cardano Blockchain shall be
treated fairly and

72 impartially, taking into account
the collective desires of the
Cardano

73 Blockchain Community, consistent
with the long-term sustainability
and

74 viability of the Cardano
Blockchain.

75

76 ****TENET 10**** Financial stability
shall be maintained and the total
supply of

77 ada shall not exceed
45,000,000,000

110 shall be recognized, recorded,
and assessed fairly through
reward sharing

111 with SPOs, potential compensation
to DReps and CC members, and

112 appropriate tokenomics.

113

114 **TENET 5** The Cardano Blockchain
shall not lock in an ada owner's
value

115 or data without the ada owner's
consent.

116

117 **TENET 6** The Cardano Blockchain
shall not unreasonably impede

118 interoperability.

119

120 **TENET 7** The Cardano Blockchain
shall preserve in a safe manner
any value

121 and information stored on the
Cardano Blockchain.

122

123 **TENET 8** The Cardano Blockchain
shall not unreasonably spend
resources.

124

125 **TENET 9** All users of the Cardano
Blockchain shall be treated
fairly and

126 impartially, taking into account
the collective desires of the
Cardano

127 Community, consistent with the
long-term sustainability and
viability of

(45,000,000,000,000,000
lovelace).

Section 2

The Cardano Blockchain shall
operate in accordance with the
Guardrails for the
Cardano Blockchain as set forth
in the Cardano Blockchain
Guardrails Appendix
to this Constitution.
The Cardano Community may from
time to time digitally codify
certain Guardrails
such that the Guardrails are
directly programmed and
implemented on the Cardano
Blockchain using on-chain
Guardrails Scripts or built-in
ledger rules.

In the event there are
inconsistencies between a
Guardrail as set forth in the
Cardano Blockchain Guardrails
Appendix and any such Guardrail
that has been
programmed and implemented on the
Cardano Blockchain, the version
of such
Guardrail that has been deployed
directly on the Cardano
Blockchain shall
prevail unless and until replaced
or revised pursuant to an on-
chain governance
action.

The Constitutional Committee
shall seek to reconcile such
inconsistencies
through the encouragement of an
appropriate on-chain governance
action.

ARTICLE II. THE CARDANO BLOCKCHAIN COMMUNITY

Section 1

No formal membership shall be
required to use, participate in

and benefit from

102 the Cardano Blockchain.

103 Instead, all owners of ada, all
104 developers of, all those building
105 on, and all
106 those otherwise supporting,
107 maintaining or using the Cardano
108 Blockchain are
109 considered to be participants in
110 the Cardano Community and are
111 therefore
112 recognized as beneficiaries of
113 the Cardano Blockchain ecosystem.
114 All participants in the Cardano
115 Community are accordingly
116 beneficiaries of this
117 Constitution, entitled to its
118 rights, privileges and
119 protections and, as such,
120 are expected to support and
121 uphold this Constitution.

110
111 ### Section 2
112

113 Participants in the Cardano
114 Community who own ada are
115 entitled to access and
116 participate in the on-chain
117 decision-making processes of the
118 Cardano Blockchain
119 ecosystem, including voting and
120 taking part in on-chain
121 governance actions
122 regarding the Cardano Blockchain.

117
118 ### Section 3
119

120 The Cardano Community has a
121 responsibility to maintain the
122 integrity of the
123 Cardano Blockchain ecosystem by
124 following this Constitution,
125 operating the
126 Cardano Blockchain, participating
127 in Cardano Blockchain governance
128 activities,
129 and resolving disputes in a fair
130 and transparent manner.

124

125 ### Section 4

128 the Cardano Blockchain.

129

126

127 The Cardano Community is entitled
and encouraged through the
provisions of this
128 Constitution to collaborate in
developing, maintaining and
building
129 applications for the Cardano
Blockchain, and to form temporary
and permanent
130 organizations, associations and
other entities as the Cardano
Community deems
131 desirable or appropriate in
support of the Cardano Blockchain
ecosystem.

132

133 ## ARTICLE III. PARTICIPATORY AND
DECENTRALIZED GOVERNANCE

134

135 ### Section 1

130 TENET 10 The Cardano Blockchain's
monetary system shall promote
131 financial stability. This shall
include seeking to preserve the
value
132 and utility of ada as a medium of
exchange, store of value, and
unit of
133 account. The total supply of ada
shall not exceed 45,000,000,000
134 (45,000,000,000,000,000
lovelace).

135

136 ### **Section 2 Implementation of
Guardrails**

137

138 1. The Cardano Blockchain shall
operate in accordance with the
Cardano
139 Blockchain Guardrails
Appendix to this Constitution.
The Cardano
140 Community may digitally
codify certain Guardrails such
that the
141 Guardrails are directly
programmed and implemented on the
Cardano
142 Blockchain using on-chain
Guardrails Script or built-in
ledger
143 rules.

144

145 2. In the event there are
inconsistencies between a
Guardrail as set

136

137 The Cardano Blockchain shall be
governed by a decentralized, on-
chain
138 governance model, utilizing, to
the extent possible and
beneficial, smart
139 contracts and other blockchain
based tools to facilitate
decision-making and
140 ensure transparency.
141 On-chain voting for governance
actions shall follow the process
outlined in
142 this Constitution, including the
Cardano Blockchain Guardrails
Appendix.
143 On-chain governance actions shall
be effected through a collective
144 decision-making process, with
specific consensus threshold
requirements, as
145 required by the Cardano
Blockchain Guardrails.

146

147 ### Section 2

148

149 Three independent governance
bodies shall participate in

146

forth in the Cardano
Blockchain Guardrails Appendix
and any such
147 Guardrail that has been
programmed and implemented on the
Cardano
148 Blockchain, the version of
such Guardrail that has been
deployed
149 directly on the Cardano
Blockchain shall prevail unless
and until
150 replaced or revised pursuant
to an on-chain governance action.
The
151 CC shall seek to reconcile
such inconsistencies through the
152 encouragement of an
appropriate on-chain governance
action.

153

154 **ARTICLE II. COMMUNITY AND
GOVERNANCE**

155

156

157 ### **Section 1 The Cardano
Community**

158

159 1. No formal membership shall be
required to use, participate in

voting for on-chain
150 governance actions to provide
checks and balances for the
Cardano Blockchain,
151 consisting of Delegated
Representatives (DReps), Stake
Pool Operators (SPOs)
152 and the Constitutional Committee
(CC).

153

154 ### Section 3

155

156 All owners of ada shall have the
right to vote in on-chain
governance
157 decision-making processes, as
provided for in this Constitution
and the Cardano
158 Blockchain Guardrails Appendix.
159 All owners of ada shall have the
right to propose changes to the
governance
160 structure of the Cardano
Blockchain ecosystem in
accordance with the Guardrails.
161 Owners of ada who use third-party
custodians or other designees to
hold their
162 ada, may authorize or may
withhold authorization for, such
third-parties to
163 vote on their behalf.

164

165 ### Section 4

and

160 benefit from the Cardano
Blockchain.

161 Cardano Community members are
entitled to the rights,
privileges,

162 and protections of this
Constitution, and are accordingly
expected

163 to support and uphold this
Constitution, maintain the
integrity of

164 the ecosystem, participate in
governance, and resolve disputes

165 transparently.

166

167 2. Cardano Community members are
encouraged to collaborate on

168 developing applications and
to form organizations that
support the

169 Cardano Blockchain and the
Cardano Community.

170

171 ### **Section 2 Participation
Rights of ada owners**

172

173 1. Ada owners are entitled to
access and participate in the on-
chain

166

167 A special form of on-chain
governance action, an "Info"
action, exists to allow
168 the Cardano Community to propose
potential future on-chain
governance actions
169 and to allow community sentiment
to be gauged without committing
to any
170 on-chain change to the Cardano
Blockchain.
171 Such "Info" actions have no on-
chain effect other than to record
such "Info"
172 actions on the Cardano
Blockchain.
173 In accordance with Article VII
Section 4, "Info" actions shall
also be used in
174 connection with proposed Cardano
Blockchain ecosystem budgets and
Cardano
175 Blockchain treasury withdrawals.

176

177 ### Section 5

178

179 In order to promote transparency
in the process of on-chain
governance, prior
180 to being recorded or enacted on-
chain, all proposed governance
actions are
181 expected to follow a standardized
and legible format including a
URL and hash

174 decision-making processes of
the Cardano Blockchain ecosystem,
175 including voting, proposing
changes to the governance
structure in
176 accordance with the
Guardrails, and otherwise taking
part in
177 on-chain governance actions.

178

179 2. Ada owners can directly
participate in governance actions
by
180 registering as DReps
themselves or by delegating their
voting
181 rights to other registered
DReps.

182

183 3. Any ada owner shall be
allowed to register as a DRep. A
DRep may
184 act in the interest of one or
more ada owners.

185

186 4. Any ada owner shall be
allowed to delegate their voting
stake to
187 one or more registered DReps,
including themselves.

182 of all documented off-chain
content to the Cardano
Blockchain.
183 Sufficient rationale shall be
provided to justify the requested
change to the
184 Cardano Blockchain.
185 The rationale shall include, at a
minimum, a title, abstract,
reason for the
186 proposal, and relevant supporting
materials.

187
188 The content of every on-chain
governance action must be
identical to the final
189 off-chain version of the proposed
action.

190
191 "Hard Fork Initiation" and
"Protocol Parameter Change"
governance actions shall
192 undergo sufficient technical
review and scrutiny as mandated
by the Guardrails
193 to ensure that the governance
action does not endanger the
security,
194 functionality, performance or
long-term sustainability of the
Cardano
195 Blockchain.
196 On-chain governance actions
should address their expected
impact on the Cardano
197 Blockchain ecosystem.

198
199 All owners of ada shall have the
right to ensure that the process
for
200 participating in, submitting and
voting on on-chain governance
actions is open
201 and transparent and is protected
from undue influence and
manipulation.

202

203 ### Section 6

188

189 5. Ada owners shall be allowed
to change the delegation of their
190 voting stake at any time.

191

192 6. Ada owners who use third-
party custodians or other
designees to
193 hold their ada may authorize,
or may withhold authorization
for,
194 such third-parties to vote on
their behalf, and to delegate the
195 voting rights of the ada
owner to registered DReps on the
owner's
196 behalf.

197

198 7. Ada owners have the right to
a process for participating in,
199 submitting and voting on on-
chain governance actions that is
200 open, transparent, and
protected from undue influence
and
201 manipulation.

202

204

205 The Cardano Community is expected
to support the creation,
maintenance and
206 ongoing administration of off-
chain governance processes as may
be necessary to
207 give effect to this Constitution
and to ensure that there is
awareness of and
208 an opportunity to debate and
shape all future governance
actions for the
209 Cardano Blockchain.

210

211 ## ARTICLE IV. THE CARDANO
BLOCKCHAIN ECOSYSTEM BUDGET

212

213 ### Section 1

214

215 Any participant in the Cardano
Community may propose a Cardano
Blockchain
216 ecosystem budget at any time.
217 The Cardano Community is expected
to periodically propose one or
more budgets
218 for the ongoing operation,
maintenance and future
development of the Cardano
219 Blockchain ecosystem and for
covering other costs related to
the
220 implementation, administration
and maintenance of the
decentralized, on-chain
221 governance processes provided for
in this Constitution.
222 The Cardano Community may propose
one aggregate budget or multiple

203 ### **Section 3 Decentralized
Governance Framework**

204

205 1. The Cardano Blockchain is
governed by a decentralized, on-
chain
206 model that, where beneficial,
uses smart contracts and other
207 blockchain tools to
facilitate decision-making and
ensure
208 transparency.

209

210 2. Three independent voting
bodies – DReps, SPOs, and the
211 CC – participate in on-chain
voting; anyone holding multiple
roles
212 must publicly disclose such
overlaps before engaging in any
213 on-chain governance actions.

214

215 ### **Section 4 Delegated
Representatives**

216

217 1. DReps have voting power equal
to the number of lovelace
delegated to
218 them.

budgets for
223 the Cardano Blockchain ecosystem.
224 Such budgets are expected to
cover not less than a period of
73 epochs
225 (approximately one calendar year)
but nothing shall prevent the
Cardano
226 Community from proposing budgets
for shorter or longer time
periods.
227 All owners of ada are expected to
periodically approve one or more
Cardano
228 Blockchain ecosystem budgets
through an on-chain "Info"
action.
229 As provided in Section 3 of this
Article IV, withdrawals may be
made from the
230 Cardano Blockchain treasury as
necessary from time to time to
give effect to
231 the Cardano Blockchain ecosystem
budget or budgets then in effect.
232 Existing budgets may be amended
following the same process as
provided in this
233 Section 1.

234

235 ### Section 2

236

237 Development of Cardano Blockchain
ecosystem budgets and the
administration of
238 such budgets shall utilize, to
the extent possible and
beneficial, smart
239 contracts and other blockchain
based tools to facilitate
decision-making and
240 ensure transparency.
241 Cardano Blockchain budgets shall
specify a process for overseeing
use of funds
242 from Cardano Blockchain treasury
withdrawals including designating
one or more

219

220 2. DReps may vote on all types
of governance actions.

221

222 3. DReps shall ensure that any
compensation received in
connection with
223 their activities as a DRep is
publicly disclosed in a timely
224 manner through relevant
governance communication
channels.

243 administrators who shall be
responsible for such oversight.

244

245 ### Section 3

246

247 Withdrawals from the Cardano
Blockchain treasury that would
cause the Cardano
248 Blockchain treasury balance to
violate the then applicable net
change limit
249 shall not be permitted.
250 No withdrawals from the Cardano
Blockchain treasury shall be
permitted unless
251 such withdrawals have been
authorized and are being made
pursuant to a budget
252 for the Cardano Blockchain that
is then in effect as required by
the Cardano
253 Blockchain Guardrails Appendix,
and which has not been determined
by the
254 Constitutional Committee to be
unconstitutional.

255

256 ### Section 4

257

258 Any governance action requesting
ada from the Cardano Blockchain
treasury shall
259 require an allocation of ada as a
part of such funding request to
cover the
260 cost of periodic independent
audits and the implementation of

225

226 4. DReps shall not offer or
provide compensation to an ada
owner in
227 exchange for being appointed
as a DRep or for voting on their
behalf.

228

229 ### **Section 5 Stake Pool
Operators**

230

231 1. SPOs shall vote on the
following governance actions: "No
Confidence",
232 "Update Committee", "Hard
Fork Initiation", "Parameter
Update" that
233 affect security-relevant
parameters, and "Info" actions.

234

235 ### **Section 6 Governance Action
Standards**

oversight metrics

261 as to the use of such ada.

262 Contractual obligations governing
the use of ada received from the
Cardano

263 Blockchain treasury pursuant to a
Cardano Blockchain ecosystem
budget shall

264 include dispute resolution
provisions.

265

266 ### Section 5

267

268 Any ada received from a Cardano
Blockchain treasury withdrawal,
so long as such

269 ada is being held directly or
indirectly by an administrator
prior to further

270 disbursement, must be kept in one
or more separate accounts that
can be audited

271 by the Cardano Community, and
such accounts shall not be
delegated to an SP0 but

236

237 1. To ensure transparency in on-
chain governance, proposed
governance

238 actions shall follow a
standardized and legible format
before

239 being recorded or enacted on-
chain. This format shall include
a

240 URL hosting a document that
outlines additional context for
the

241 proposed governance action,
and the hash of this document.
The

242 document hosted by such a URL
shall be immutable and incapable
of

243 being altered after
submission, and the content of
every on-chain

244 Governance Action must be
identical to the final off-chain
version

245 of the proposed action.

246

247 2. Each proposal shall provide
sufficient rationale, including
at

248 minimum: a title, abstract,
justification, and relevant
supporting

249 materials.

272 must be delegated to the
predefined auto abstain voting
option.

273

274 ## ARTICLE V. DELEGATED REPRESENTATIVES

275

276 ### Section 1

277

278 In order to participate in
governance actions, owners of ada
may register as
279 DReps and directly vote on such
governance actions or may
delegate their voting
280 rights to other registered DReps
who shall vote on their behalf.

281

282 ### Section 2

283

284 Any owner of ada shall have the
option to register as a DRep.

250

251 3. "Hard Fork Initiation" and
"Parameter Update" actions shall
252 undergo sufficient technical
review and scrutiny as mandated
by
253 the Guardrails to ensure that
the governance action does not
254 endanger the security,
functionality, performance, or
long-term
255 sustainability of the Cardano
Blockchain.

256

257 ### **Section 7 "Treasury Withdrawals" Action Standards**

258

259 A "Treasury Withdrawals" action
must, in addition to the
260 requirements at Section 6, meet
all of the following
requirements:

261

262 1. "Treasury Withdrawals"
actions must specify the terms of
263 the withdrawal. This shall
include: the purpose of the
withdrawal,
264 the period for delivery of
proposed activities which the
withdrawal
265 shall be used for, the
relevant costs and expenses of
the proposed
266 activities, circumstances
under which the withdrawal might
be
267 refunded to the Cardano
Treasury.

268

269 2. "Treasury Withdrawals"
actions shall disclose whether

285 Owners of ada shall be allowed to
delegate their voting stake to
one or more
286 registered DReps, including
themselves.
287 DReps may be individuals or
coordinated groups.
288 Owners of ada who use third-party
custodians or other designees to
hold their
289 ada, may authorize, or may
withhold authorization for, such
third-parties to
290 delegate the voting rights of the
ada owner to registered DReps on
the owner's
291 behalf.
292 DReps are entitled to cast votes
directly for on-chain governance
actions and
293 represent those ada owners
delegating their voting rights to
them.
294 DRep voting thresholds are set
forth in the Cardano Blockchain
Guardrails
295 Appendix.

296

297 This voting system shall enshrine
a liquid democracy model where
owners of ada
298 can seamlessly select among
DReps, register as a DRep, and
withdraw or change
299 their delegation at any time.

300

301 ### Section 3

302

303 DReps who are representing
delegators are expected to

the

270 prospective recipient of the
"Treasury Withdrawals" action
271 has received ada from the
Cardano Treasury within the last
24
272 months.

273

274 3. A Net Change Limit must be
set. "Treasury Withdrawals"
actions
275 must not exceed the Net
Change Limit for that period.

276

277 4. "Treasury Withdrawals"
actions shall require an
allocation of ada
278 as a part of such funding
request to cover the cost of
periodic independent audits and
the implementation of oversight
metrics as to the use of such
ada.

279

280 5. "Treasury Withdrawals"
actions shall designate one or

periodically adopt, and
304 update as they deem appropriate,
codes of conduct governing their
activities as
305 DReps and make such codes of
conduct publicly available.
306 DReps are encouraged to include
ethical guidelines in their codes
of conduct.

307

308 ### Section 4

309

310 The Cardano Community is expected
to support the creation,
maintenance and
311 ongoing administration of tools
to enable owners of ada to
explore and evaluate
312 DRep candidates, access and
evaluate DRep codes of conduct
and select DReps on
313 such criteria as they deem
relevant.

314

315 ### Section 5

316

317 DReps who are representing
delegators may be compensated for
their efforts.
318 DReps shall ensure that any
compensation received in
connection with their
319 activities as a DRep is
disclosed.

more

281 administrators responsible
for monitoring how the funds are
used,
282 and ensuring the deliverables
are achieved.

283

284 6. Any ada received from a
Cardano Blockchain treasury
withdrawal,
285 so long as such ada is being
held by an administrator prior to
286 further disbursement to the
Treasury Withdrawal Recipient,
287 must be kept in one or more
separate accounts that can be
288 audited by the Cardano
Community, and such accounts
shall not
289 be delegated to an SPO but
must be delegated to the
predefined
290 abstain voting option.

291

292 **ARTICLE III. CONSTITUTIONAL
COMMITTEE**

293 -----

294

295 ### **Section 1 Role and Scope**

296

297 1. A CC shall be established as
the branch of Cardano's on-chain
298 governance process that
ensures governance actions to be
enacted
299 on-chain are consistent with
this Constitution.

320

321 **### Section 6**

322

323 DReps shall not pay compensation
to an ada owner or to an owner's
designee in
324 exchange for being appointed a
DRep by such ada owner or by its
designee or for
325 voting on behalf of such ada
owner or its designee.

326

327 **## ARTICLE VI. STAKE POOL
OPERATORS**

328

329 **### Section 1**

330

331 SPOs shall have a specific role
in approving critical on-chain
governance
332 actions that require additional
oversight and independence,
voting separately
333 and independently from DReps as
set forth in the Cardano
Blockchain Guardrails
334 Appendix.
335 SPOs shall participate in hard
fork initiation processes as the
operators of
336 the nodes that participate in
Cardano Blockchain's consensus
mechanism.

337

338 **### Section 2**

339

300

301 2. Each CC member shall have one
vote.

302

303 3. No governance action – other
than a "No Confidence" or "Update
304 Committee" action – may be
implemented on-chain without
305 affirmation by a requisite
percentage of CC members.

306

307 4. The CC shall be limited to
voting on the constitutionality
of
308 governance actions, including
any proposed or contemplated
actions
309 contained within "Info"
actions.

310

311 **### **Section 2 Composition and
Terms****

312

313 1. The CC shall be composed of
such number of members and serve
such
314 term lengths as are
sufficient to assure the ongoing
integrity of
315 the Cardano Blockchain, as
determined from time to time by
Ada
316 owners.

317

318 2. To assure continuity in the
operation of the CC, the terms
for CC
319 members shall be staggered.

320

340 SP0s shall act as a check on the
power of the Constitutional
Committee under
341 exceptional circumstances by
separately voting on "Motion of
no confidence" and
342 "Update committee/threshold
and/or term" governance actions,
and on
343 "Parameter Update" governance
actions that affect security-
critical parameters
344 set forth under Parameters that
are Critical to the Operation of
the Blockchain
345 in Section 2.1 of the Cardano
Blockchain Guardrails Appendix.

346

347 ### Section 3

348

349 SP0s are encouraged to
periodically adopt, and update as
they deem appropriate,
350 codes of conduct governing their
activities as SP0s and make such
codes of
351 conduct publicly available.
352 SP0s are encouraged to include
ethical guidelines in their codes
of conduct.

353

354 ### Section 4

321 ### **Section 3 Election Process,
No Confidence and Removal**

322

323 1. The CC shall be considered to
be in one of the following two
states
324 at all times: a state of
confidence or a state of no
confidence.
325 In a state of no confidence,
members of the then-standing CC
must
326 be reinstated or replaced
using the "Update Committee"
action
327 before any other on-chain
governance action, other than
"Info"
328 actions, may go forward.

329

330 2. The Cardano Community shall
establish and make public a
process from
331 time to time for election of
members of the CC consistent with
the
332 requirements of the
Guardrails.

333

334 3. In the event of a vote of no
confidence or the removal of some
CC

355

356 Owners of ada who are both SP0s
and acting as DReps shall
publicly disclose
357 that they are participating in
on-chain governance actions in
both such
358 capacities prior to exercising
any on-chain governance rights.

359

360 ## ARTICLE VII. CONSTITUTIONAL
COMMITTEE

361

362 ### Section 1

363

364 A Constitutional Committee shall
be established as the branch of
Cardano's
365 on-chain governance process that
ensures governance actions to be
enacted
366 on-chain are consistent with this
Constitution.
367 The Constitutional Committee
shall comprise a set of owners of
ada that is
368 collectively responsible for
ensuring that on-chain governance
actions prior to
369 enactment on-chain, are
constitutional.

335 members by "Update Committee"
action, an election shall be held
as

336 soon as practical.

337

338 ### **Section 4 Transparency and
Conduct**

339

340 1. CC processes shall be
transparent, and the CC shall
publish each
341 decision.

342

343 2. When voting that a governance
action proposed to be executed
344 on-chain is unconstitutional,
each CC member casting such a
vote
345 shall set forth the basis for
its decision with reference to
346 specific Articles of this
Constitution or provisions of the
347 Cardano Blockchain Guardrails
Appendix that are in conflict
with a
348 given proposal.

349

350 3. CC members may be compensated
for their efforts as members and
shall
351 ensure that any compensation
received in connection with such
352 activities is disclosed in a
timely manner through relevant
353 governance communication
channels.

370 Except as otherwise provided in
Section 4 of this Article VII,
the
371 Constitutional Committee shall be
limited to voting on the
constitutionality of
372 governance actions to be enacted
on-chain.
373 Constitutional Committee members
are expected to have appropriate
expertise to
374 carry out their required
responsibilities, considering
their past contributions
375 and involvement in the Cardano
Blockchain ecosystem.

376

377 **### Section 2**

378

379 The Constitutional Committee
shall be composed of such number
of members
380 sufficient to assure the ongoing
integrity of the Cardano
Blockchain as
381 determined from time to time by
owners of ada.
382 The minimum and maximum number of
members of the Constitutional
Committee shall
383 be consistent with the minimum
and maximum number of members as
set forth in
384 the Cardano Blockchain Guardrails
Appendix.

385

386 Members of the Constitutional
Committee shall serve such term
lengths as shall
387 be determined from time to time
by owners of ada as consistent
with the minimum
388 and maximum term lengths as set
forth in the Cardano Blockchain
Guardrails
389 Appendix.

354

355 ****ARTICLE IV. AMENDMENT PROCESS****

356

357

358 **### **Section 1 Amendment Rules****

359

360 Amendments to this Constitution,
including the Cardano Blockchain
361 Guardrails Appendix, shall
require approval via an on-chain
governance
362 action supported by at least 65%
of the active voting stake at
that
363 time, unless a different
threshold is expressly provided
in the Cardano

390 To assure continuity in the
operation of the Constitutional
Committee, the
391 terms for Constitutional
Committee members shall be
staggered.

392

393 ### Section 3

394

395 The Cardano Community shall
establish and make public a
process from time to
396 time for election of members of
the Constitutional Committee
consistent with
397 the requirements of the
Guardrails.

398

399 ### Section 4

400

401 No governance action, other than
a "Motion of no confidence," or
"Update
402 Constitutional
Committee/threshold and/or term"
may be implemented on-chain
403 unless a requisite percentage of
the members of the Constitutional
Committee as
404 specified by the Guardrails shall
have first determined and
affirmed through an
405 on-chain action that such
proposal does not violate this
Constitution.
406 Each Constitutional Committee
member shall have one vote.

364 Blockchain Guardrails Appendix
for the amendment of a particular
365 Guardrail, in which case that
threshold shall apply.

366

367 **APPENDIX I. CARDANO BLOCKCHAIN
GUARDRAILS**

368

369

370 ### **1. Introduction**

371

Text moved from lines 538-540

372 To implement Cardano Blockchain
on-chain governance, it is
necessary to
373 establish sensible Guardrails
that will enable the Cardano
Blockchain to
374 continue to operate in a secure
and sustainable way.

375

376 This Appendix sets forth
Guardrails that must be applied
to Cardano
377 Blockchain on-chain governance
actions, including changes to the
378 protocol parameters and limits on
treasury withdrawals. These
Guardrails
379 cover both essential, intrinsic
limits on settings, and
recommendations
380 that are based on experience,
research, measurement, and
governance
381 objectives.

407

408 Because "Info" actions have no
on-chain effect and, accordingly,
are neither
409 constitutional nor
unconstitutional, Constitutional
Committee members may not
410 prevent "Info" actions from being
recorded on-chain.

411 Members of the Constitutional
Committee may nevertheless record
a vote on-chain
412 regarding an "Info" action in
order to express their view on
such "Info"
413 action, including whether the
suggested course of action
proposed in such
414 "Info" action, would be, in the
view of such member,
unconstitutional if it
415 were to be enforced by on-chain
mechanisms.

416

417 In the case of "Info" actions
that propose a Cardano Blockchain
ecosystem
418 budget, Constitutional Committee
members shall record a vote on-
chain that sets
419 forth their opinion as to whether
the proposed budget, if it were
to be
420 implemented in the form contained
in the "Info" action, would
violate this
421 Constitution.

422

423 In the case of "Info" actions
that propose a withdrawal from
the Cardano
424 Blockchain treasury pursuant to a
previously approved budget,
Constitutional
425 Committee members shall record a
vote on-chain that sets forth
their opinion as
426 to whether such proposed
withdrawal, if made in accordance

382

383 These Guardrails are designed to
avoid both unexpected and
foreseeable
384 problems with the operation of
the Cardano Blockchain. They are
intended
385 to guide the choice of sensible
parameter settings and avoid
potential
386 problems with security,
performance, functionality, or
long-term
387 sustainability. As described
below, some of these Guardrails
are
388 automatable and will be enforced
via an on-chain Guardrails Script
or
389 built-in ledger rules.

390

391 These Guardrails apply only to
the Cardano Blockchain Layer 1
mainnet
392 environment. They are not
intended to apply to test
environments or to
393 other blockchains that use
Cardano Blockchain software.

394

395 Not all parameters for the
Cardano Blockchain can be
considered
396 independently. Some parameters
interact with other settings in
an
397 intrinsic way. Where known, these
interactions are addressed in
this
398 Appendix.

with such "Info"
427 action, would violate this
Constitution.

428

429 ### Section 5

430

431 The Constitutional Committee
shall be considered to be in one
of the following
432 two states at all times: a state
of confidence or a state of no-
confidence.
433 In a state of no-confidence,
members of the then standing
Constitutional
434 Committee must be reinstated or
replaced using the "Update
committee/threshold"
435 governance action before any
other on-chain governance action,
other than
436 "Info" actions, may go forward.
437 During a state of no-confidence,
"Info" actions other than "Info"
actions
438 relating to budget proposals or
treasury withdrawal proposals,
may continue to
439 be recorded on-chain.

440

441 If a member of the Constitutional
Committee is not carrying out its
442 responsibilities as required by
this Constitution, as so
determined by a

399

400 While the Guardrails in this
Appendix presently reflect the
current
401 state of technical insight, this
Appendix should be treated as a
living
402 document. Implementation
improvements, new simulations or
performance
403 evaluation results for the
Cardano Blockchain may allow some
of the
404 restrictions contained in these
Guardrails to be relaxed or
tightened in
405 due course.

406

407 Additional Guardrails may also be
needed where, for example, new
408 protocol parameters are
introduced or existing ones are
removed.

409

410 #### **Amending, Adding or
Deprecating Guardrails**

443 requisite percentage as specified
by the Guardrails of SPOs and
DReps, voting
444 separately pursuant to an "Update
Constitutional
Committee/threshold and/or
445 term" governance action, such
member shall be removed from the
Constitutional
446 Committee upon the implementation
of the governance action.
447 Thereafter, an election shall be
held as soon as practical to
replace the
448 member so removed.

449
450 In the event of a "Motion of no
confidence" governance action to
remove all
451 members of the Constitutional
Committee at the same time, that
is approved by a
452 requisite percentage as specified
by the Guardrails of DReps and
SPOs, upon
453 implementation of the governance
action, the Constitutional
Committee shall be
454 considered to be a state of no-
confidence until such time as an
election has
455 been held either to reinstate the
existing Constitutional Committee
members in
456 whole or in part, or to elect new
Constitutional Committee members.

457

411

412 The Guardrails set forth in this
Appendix may be amended from time
to
413 time pursuant to an on-chain
governance action that satisfies
the
414 applicable voting threshold as
set forth in this Appendix. Any
such
415 amendment to any Guardrails shall
require and be deemed to be an
416 amendment to the Constitution
itself, including any new
Guardrails. Each
417 Guardrail has a unique label. If
the text of a Guardrail is
amended, the
418 existing Guardrail will be
deprecated and a new label will
be used in
419 this Appendix. Similarly, if a
Guardrail is deprecated, its
label will
420 never be reused in the future. In
all cases, the Guardrails that
apply
421 to a governance action will be
those in force at the time that
the
422 governance action is submitted
on-chain, regardless of any later
423 amendments.

424

458 ### Section 6

459

460 Constitutional Committee
processes shall be transparent.

461 The Constitutional Committee
shall publish each decision.

462 When voting that a governance
action proposed to be executed
on-chain is

463 unconstitutional, the
Constitutional Committee
collectively, or each member of
464 the Constitutional Committee
casting such a vote separately,
shall set forth the
465 basis for its decision with
reference to specific Articles of
this Constitution

466 or provisions of the Cardano
Blockchain Guardrails Appendix
that are in

467 conflict with a given proposal.

468 Internal deliberations among
members of the Constitutional
Committee, prior to

469 casting votes, are not required
to be publicly disclosed.

470

471 The Constitutional Committee
shall operate pursuant to a code
of conduct

472 periodically adopted and
published by the Constitutional
Committee.

473 The Constitutional Committee is
encouraged to include ethical
guidelines in its

474 code of conduct.

475 The Constitutional Committee
shall periodically adopt and
publish such policies

476 and procedures as the
Constitutional Committee shall
deem necessary in carrying

477 out its duties.

425 ##### **Terminology and Guidance**

426

427 This section provides
supplementary definitions and
interpretive

428 guidance for terms used
throughout this Constitution and
the Guardrails

429 Appendix.

430

431 Cardano Blockchain. The
decentralized, public, peer-to-
peer,

432 proof-of-stake distributed ledger
system, designed to securely
record,

433 verify, and synchronize
transactions and data across the
network while

434 enabling the execution of smart
contracts and decentralized

435 applications. This system,
powered by ada, is the longest
chain of

436 blocks with sufficient
confirmations to be considered
finalized starting

437 from block Hash

438 5f20df933584822601f9e3f8c024eb5eb
252fe8cefb24d1317dc3d432e940ebb,

478

479 **### Section 7**

480

481 The Cardano Community is expected
to support the creation,
maintenance and
482 ongoing administration of tools
as may be necessary and
appropriate for the
483 Constitutional Committee to
perform its required functions.

484

485 **### Section 8**

486

487 Constitutional Committee members
may be compensated for their
efforts as
488 members of the Constitutional
Committee.
489 Constitutional Committee members
shall ensure that any
compensation received in
490 connection with their activities
as a member is disclosed.
491 Budgets approved for the Cardano
Blockchain ecosystem may include
allocations
492 from the Cardano Blockchain
treasury sufficient to compensate
Constitutional
493 Committee members in such amounts
as may be approved from time to
time by ada
494 owners.

as

439 forged on 2017-09-23 21:44:51 UTC
on the Cardano Network.

440

441 Block. A container of data
produced by a Stake Pool that
includes, at
442 minimum, a header. Block
production and block forging are
used
443 interchangeably.

444

445 Protocol. The algorithms, rules,
and procedures that govern the
exchange
446 of information on the Cardano
Blockchain.

447

448 Protocol Parameters. Protocol
settings that define how the
Cardano
449 Blockchain functions; modifiable
through applicable governance
450 processes.

451

452 Slot. The smallest denomination
of time nested within an Epoch.

495 Cardano Blockchain ecosystem
budgets shall provide for
periodic administrative
496 costs of the Constitutional
Committee in such amounts as
requested from time to
497 time by the Constitutional
Committee and as approved by ada
owners.

498

499 ### Section 9

500

501 Constitutional Committee members
who are also acting as DReps, as
SPOs, or
502 both, shall publicly disclose
that they are participating in
on-chain
503 governance actions in more than
one such capacity prior to voting
with respect
504 to on-chain governance actions.

505

506 ## ARTICLE VIII. AMENDMENT
PROCESS

507

508 ### Section 1

453

454 Epoch. A Protocol-determined
interval characterized by a fixed
number of
455 Slots. Each Slot's duration and
sequence are governed by the
456 blockchain's consensus mechanisms
and are associated with a
universal
457 timestamp defined in UTC. It is
used for operations including
governance
458 voting, Block production
leadership determination, rewards
calculation,
459 and Hard Forks.

460

461 lovelace. The smallest unit of
value for the native
cryptocurrency of
462 the Cardano Blockchain, utilized
for the network's security and
463 governance. It is distinguished
from other native tokens by its
lack of
464 a policy ID and policy name.

465

466 ada. A superunit of lovelace,
with 1 ada equal to 1,000,000
lovelace.

467

468 Delegator. A private key holder
that delegates stake to a Stake
Pool for
469 block production and network
security, to a DRep for
participation in
470 on-chain governance, or both. In
doing so, the delegator

509

510 This Constitution should be
treated as a living document.

511 Technical advancements, changes
in the desires, needs and
expectations of the

512 Cardano Community, and unforeseen
circumstances may give rise to
the need in

513 the future to amend this
Constitution.

514 The Cardano Community is
encouraged to periodically review
and debate its

515 provisions, and when so desired,
come together in such forums as
the Cardano

516 Community may deem appropriate,
to propose amendments to this
Constitution.

517 Amendments may be made as
provided in this Article VIII.

518

519 ### Section 2

520

521 Except as otherwise so provided
in the Cardano Blockchain
Guardrails Appendix,

522 amendments to this Constitution,
including to the Cardano
Blockchain Guardrails

contributes to
471 the operation and governance of
the Cardano Blockchain.

472

473 Active Block Production Stake.
The cumulative amount of stake,
measured

474 in lovelace, that is actively
delegated to Stake Pools and
utilized for

475 block forging during the current
Epoch. This amount is determined
by a

476 snapshot of stake distribution
taken at the beginning of the
previous

477 Epoch, ensuring that it
accurately represents the
effective stake

478 available for securing and
maintaining the Cardano
Blockchain through

479 block forging.

480

481 On-chain. A classification for
actions, transactions, or
governance
482 activities that are executed,
recorded, or implemented directly
on the

483 Cardano Blockchain. These
actions, transactions, or
governance

484 activities are permanently
validated and stored through the
blockchain's

485 consensus mechanism, ensuring
their immutability and
transparency.

486

487 Off-Chain. A classification for
activities, proposals, or
governance

488 decisions that are either not yet
implemented on the Cardano
Blockchain,

523 Appendix, shall be approved by a
collective decision-making
process, requiring
524 an on-chain governance action by
owners of ada satisfying a
threshold of no
525 less than 65% of the then active
voting stake.

526

527 ### Section 3

528

529 If the Cardano Blockchain
Guardrails Appendix sets forth an
amendment threshold
530 for a Guardrail that is different
than the amendment threshold
contained in
531 Section 2 of this Article VIII,
then the threshold set forth in
the Cardano
532 Blockchain Guardrails Appendix
for such Guardrail shall apply.

533

534 ## APPENDIX I: CARDANO BLOCKCHAIN
GUARDRAILS

489 or not intended to be directly
recorded on the blockchain. These
may
490 include discussions, proposals,
or agreements that exist outside
the
491 blockchain and do not involve
direct consensus or on-chain
validation.

492

493 Governance Action. An on-chain
proposal enabling participation
in
494 shaping the future of the Cardano
Blockchain Ecosystem through
voting
495 transactions.

496

497 Hard Fork. A Protocol upgrade for
the Cardano Blockchain that
results in
498 a new Protocol version and
necessitates coordinated adoption
by network
499 participants.

500

501 Guardrails. A set of restrictions
on Governance Actions to prevent
502 undesirable outcomes and assist
voters in deciding whether the
proposed
503 action complies with the Cardano
Blockchain Ecosystem
Constitution. Some
504 guardrails are enforced using the
Guardrails Script or ledger rules
to
505 prevent submission of the action,
while others necessitate further
506 adjudication to determine if they
violate the Constitution in ways
the
507 Guardrails Script or ledger
cannot check. Guardrails may be
either

535

536 **### 1. Introduction**

537

Text moved to lines 372-374

538 To implement Cardano Blockchain
on-chain governance, it is
necessary to
539 establish sensible Guardrails
that will enable the Cardano
Blockchain to
540 continue to operate in a secure
and sustainable way.

541

542 This Appendix sets forth
Guardrails that must be applied
to Cardano Blockchain
543 on-chain governance actions,
including changes to the protocol
parameters and
544 limits on treasury withdrawals.

545 These Guardrails cover both
essential, intrinsic limits on
settings, and
546 recommendations that are based on
experience, measurement and
governance
547 objectives.

548

549 These Guardrails are designed to
avoid unexpected problems with
the operation

508 mandatory ("must"/"must not") or
advisory ("should"/"should not").
The
509 latter allows for interpretive
flexibility where necessary.

510

511 Guardrails Script. A smart
contract script that checks
specific proposed
512 Governance Actions, "Hard Fork
Initiation" and "Parameter
Update"
513 actions, against automatically
checkable Guardrails. The check
is applied
514 when the Governance Action is
proposed on-chain.

515

516 Motion of no confidence
governance action ("No
Confidence" action). A
517 motion to create a state of no
confidence in the current
constitutional
518 committee.

519

520 Update committee and/or threshold
and/or terms governance action
521 ("Update Committee" action).
Changes to the members of the
522 Constitutional Committee and/or
to its signature threshold and/or
terms.

523

524 New Constitution or Guardrails
Script governance action ("New

550 of the Cardano Blockchain.

551 They are intended to guide the
choice of sensible parameter
settings and avoid

552 potential problems with security,
performance, functionality or
long-term

553 sustainability.

554 As described below, some of these
Guardrails are automatable and
will be

555 enforced via an on-chain
Guardrails Script or built-in
ledger rules.

556

557 These Guardrails apply only to
the Cardano Blockchain Layer 1
mainnet

558 environment.

559 They are not intended to apply to
test environments or to other
blockchains

560 that use Cardano Blockchain
software.

561

562 Not all parameters for the
Cardano Blockchain can be
considered independently.

563 Some parameters interact with
other settings in an intrinsic
way.

564 Where known, these interactions
are addressed in this Appendix.

565

566 While the Guardrails in this
Appendix presently reflect the
current state of

567 technical insight, this Appendix
should be treated as a living
document.

568 Implementation improvements, new
simulations or performance
evaluation results

525 Constitution" action). A
modification to the Constitution
or Guardrails

526 Script, recorded as on-chain
hashes.

527

528 Hard Fork Initiation governance
action ("Hard Fork Initiation"
action).

529 Triggers a non-backwards
compatible upgrade of the
network; requires a

530 prior software upgrade.

531

532 Protocol Parameter Changes
governance action ("Parameter
Changes" action

533 or "Parameter Update" action).
Any change to one or more
updatable

534 protocol parameters, excluding
changes to major protocol
versions

535 ("hard forks").

536

537 Treasury Withdrawals governance
action ("Treasury Withdrawals"
action).

538 Withdrawals from the treasury.

569 for the Cardano Blockchain may
allow some of the restrictions
contained in
570 these Guardrails to be relaxed
(or, in some circumstances,
require them to be
571 tightened) in due course.

572

573 Additional Guardrails may also be
needed where, for example, new
protocol
574 parameters are introduced.

575

576 ##### Amending, Adding or
Deprecating Guardrails

577

578 The Guardrails set forth in this
Appendix may be amended from time
to time
579 pursuant to an on-chain
governance action that satisfies
the applicable voting
580 threshold as set forth in this
Appendix.

581 Any such amendment to any
Guardrails shall require and be
deemed to be an
582 amendment to the Constitution
itself, including any new
Guardrails.

583 Each Guardrail has a unique
label.

584 If the text of a Guardrail is
amended, the existing Guardrail
will be

539

540 Info action ("Info" action). An
action that has no effect on-
chain,
541 other than an on-chain record.

542

543 Cardano Blockchain Treasury,
Cardano Treasury, or Treasury. A
supply of
544 ada controlled by the Protocol of
the Cardano Blockchain; collected
from
545 transaction fees, reserves, and
other designated sources.
Withdrawals
546 from this supply of ada are
subject to the processes and
restrictions
547 set forth in the Cardano
Blockchain Ecosystem
Constitution.

548

549 Cardano Blockchain Ecosystem. The
collective ecosystem comprising
the
550 Cardano Blockchain, the Cardano
Community, and the tooling and
551 infrastructure utilized by the
Cardano Community to support the
Cardano
552 Blockchain in alignment with the
shared principles and objectives
set
553 forth in the Cardano Blockchain
Ecosystem Constitution.

585 deprecated and a new label will
be used in this Appendix.
586 Similarly, if a Guardrail is
completely deprecated, its label
will never be
587 reused in the future.
588 In all cases, the Guardrails that
apply to a governance action will
be those in
589 force at the time that the
governance action is submitted on
chain, regardless
590 of any later amendments.

591

592 ##### Terminology and Guidance

593

594 ****Should/Should not.**** Where this
Appendix says that a value
"should not" be
595 set below or above some value,
this means that the Guardrail is
a
596 recommendation or guideline, and
the specific value could be open
to discussion
597 or alteration by a suitably
expert group recognized by the
Cardano Community in
598 light of experience with the
Cardano Blockchain governance
system or the
599 operation of the Cardano
Blockchain.

600

601 ****Must/Must not.**** Where this
Appendix says that a value "must"
or "must not"
602 be set below or above some value,
this means that the Guardrail is
a requirement
603 that will be enforced by Cardano
Blockchain ledger rules, types or
other
604 built-in mechanisms where
possible, and that if not
followed could cause a

554

555 Expected. A reasonable
presumption that the identified
action, although
556 not mandatory, will occur.

557

558 **Should/Should not.** Where this
Appendix says that a value
"should not"
559 be set below or above some value,
this means that the Guardrail is
a
560 recommendation or guideline, and
the specific value could be open
to
561 discussion or alteration by a
suitably expert group recognized
by the
562 Cardano Community in light of
experience with the Cardano
Blockchain
563 governance system or the
operation of the Cardano
Blockchain.

564

565 **Must/Must not.** Where this
Appendix says that a value "must"
or "must
566 not" be set below or above some
value, this means that the
Guardrail is
567 a requirement that will be
enforced by Cardano Blockchain
ledger rules,
568 types or other built-in
mechanisms where possible, and
that if not

605 protocol failure, security breach
or other undesirable outcome.

606

607 ****Benchmarking.**** Benchmarking
refers to careful system level
608 evaluation that is designed to
show *a priori* that, for
example, 95% of blocks
609 will be diffused across a global
network of Cardano Blockchain
nodes within the
610 required 5s time interval in all
cases.
611 This may require construction of
specific test workflows and
execution on a
612 large test network of Cardano
Blockchain nodes, simulating a
global Cardano

613 Blockchain network.

614

615 ****Performance analysis.**** Performance analysis refers to
projecting theoretical
616 performance, empirical
benchmarking or simulation
results to predict actual
617 system behavior.
618 For example, performance results
obtained from tests in a
controlled test
619 environment (such as a collection
of data centers with known
networking
620 properties) may be extrapolated
to inform likely performance
behavior in a real
621 Cardano Blockchain network
environment.

622

623 ****Simulation.**** Simulation refers
to synthetic execution that is
designed to
624 inform performance/functionality
decisions in a repeatable way.

569 followed could cause a protocol
failure, security breach or other
570 undesirable outcome.

571

572 **Benchmarking.** Benchmarking refers
to careful system level
performance
573 evaluation that is designed to
show *a priori* that, for
example, 95% of
574 blocks will be diffused across a
global network of Cardano
Blockchain
575 nodes within the required 5s time
interval in all cases. This may
576 require construction of specific
test workflows and execution on a
large
577 test network of Cardano
Blockchain nodes, simulating a
global Cardano

578 Blockchain network.

579

580 **Performance analysis.** Performance
analysis refers to projecting
581 theoretical performance,
empirical benchmarking or
simulation results to
582 predict actual system behavior.
For example, performance results
583 obtained from tests in a
controlled test environment (such
as a
584 collection of data centers with
known networking properties) may
be
585 extrapolated to inform likely
performance behavior in a real
Cardano
586 Blockchain network environment.

587

588 **Simulation.** Simulation refers to
synthetic execution that is
designed to
589 inform performance/functionality
decisions in a repeatable way.
For

625 For example, the IOSim Cardano
Blockchain module allows the
operation of the
626 networking stack to be simulated
in a controlled and repeatable
way, allowing
627 issues to be detected before code
deployment.

628

629 ****Performance Monitoring.****
Performance monitoring involves
measuring the
630 actual behavior of the Cardano
Blockchain network, for example,
by using timing
631 probes to evaluate round-trip
times, or test blocks to assess
overall network
632 health.

633 It complements benchmarking and
performance analysis by providing
information
634 about actual system behavior that
cannot be obtained using
simulated workloads
635 or theoretical analysis.

636

637 ****Reverting Changes.**** Where
performance monitoring shows that
actual network
638 behavior following a change is
inconsistent with the performance
requirements
639 for the Cardano Blockchain, then
the change must be reverted to
its previous
640 state if that is possible.

641 For example, if the block size is
increased from 100KB to 120KB and
95% of
642 blocks are no longer diffused
within 5s, then a change must be
made to revert
643 the block size to 100KB.

590 example, the IOSim Cardano
Blockchain module allows the
operation of the
591 networking stack to be simulated
in a controlled and repeatable
way,
592 allowing issues to be detected
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Performance monitoring involves
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595 actual behavior of the Cardano
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597 overall network health. It
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performance
598 analysis by providing information
about actual system behavior that
599 cannot be obtained using
simulated workloads or
theoretical analysis.

600

601 **Reverting Changes.** Where
performance monitoring shows that
actual
602 network behavior following a
change is inconsistent with the
performance
603 requirements for the Cardano
Blockchain, then the change must
be
604 reverted to its previous state if
that is possible. For example, if the
605 block size is increased from
100KB to 120KB and 95% of blocks
are no
606 longer diffused within 5s, then a
change must be made to revert the
607 block size to 100KB. If this is
not possible, then one or more

644 If this is not possible, then one
or more alternative changes must
be made that
645 will ensure that the performance
requirements are met.

646

647 ****Severity Levels.**** Issues that
affect the Cardano Blockchain
network are

648 classified by severity level,
where:

649

650 – Severity 1 is a critical
incident or issue with very high
impact to the
651 security, performance,
functionality or long-term
sustainability of the Cardano
652 Blockchain network

653

654 – Severity 2 is a major incident
or issue with significant impact
to the
655 security, performance,
functionality or long-term
sustainability of the Cardano
656 Blockchain network

657

658 – Severity 3 is a minor incident
or issue with low impact to the
security,
659 performance, functionality or
long-term sustainability of the
Cardano
660 Blockchain network

661

662 ****Future Performance
Requirements.**** Planned
development such as new
mechanisms
663 for out of memory storage may
impact block diffusion or other
times.

664 When changing parameters, it is
necessary to consider these
future performance

665 requirements as well as the
current operation of the Cardano

608 alternative changes must be made
that will ensure that the
performance
609 requirements are met.

610

611 **Severity Levels.** Issues that
affect the Cardano Blockchain
network are

612 classified by severity level,
where:

613

614 – Severity 1 is a critical
incident or issue with very high
impact to
615 the security, performance,
functionality or sustainability
of the
616 Cardano Blockchain network

617

618 – Severity 2 is a major
incident or issue with
significant impact to
619 the security, performance,
functionality or sustainability
of the
620 Cardano Blockchain network

621

622 – Severity 3 is a minor
incident or issue with low impact
to the
623 security, performance,
functionality or sustainability
of the
624 Cardano Blockchain network

625

626 **Future Performance Requirements.**
Planned development such as new

627 mechanisms for out of memory
storage may impact block
diffusion or other

628 times. When changing parameters,
it is necessary to consider these

629 future performance requirements
as well as the current operation

Blockchain.

666 Until development is complete,
the requirements will be
conservative but may
667 then be relaxed to account for
actual timing behavior.

668

669 ##### Automated Checking
("Guardrails Script")

670

671 A script hash is associated with
the Constitution hash when a
672 ****New Constitution or Guardrails
Script**** governance action is
enacted.
673 It acts as an additional
safeguard to the ledger rules and
types, filtering

674 non-compliant governance actions.
675

676 The Guardrails Script only
affects two types of governance
actions:

677

678 – ****Parameter Update**** actions,
and

679

680 – ****Treasury Withdrawal****
actions.

681

682 The Guardrails Script is executed
when either of these types of
governance
683 action is submitted on-chain.

684 This avoids scenarios where, for
example, an erroneous script
could prevent the

685 Cardano Blockchain from ever
enacting a Hard Fork action,
resulting in deadlock.

686 There are three different
situations that apply to
Guardrail Script usage.

of the

630 Cardano Blockchain. Until
development is complete, the
requirements will
631 be conservative but may then be
relaxed to account for actual
timing
632 behavior.

633

634 ##### ****Automated** Checking
("Guardrails Script")******

635

636 A script hash is associated with
the Constitution hash when a **New**
637 Constitution or Guardrails **Script**
governance action is enacted. It
acts

638 as an additional safeguard to the
ledger rules and types, filtering

639 non-compliant governance actions.
640

641 The Guardrails Script only
affects two types of governance
actions:

642

643 – **"Parameter Update"** actions,
and

644

645 – **"Treasury Withdrawals"**
action.

646

647 The Guardrails Script is executed
when either of these types of

648 **governance** action is submitted
on-chain. This avoids scenarios
where,

649 for example, an erroneous script
could prevent the Cardano
Blockchain

650 from ever enacting a Hard Fork
action, resulting in deadlock.
There are

651 three different situations that
apply to Guardrail Script usage.

687

688 ****Symbol and Explanation****

689

690 - (y) The Guardrail Script can be
used to enforce the Guardrail

691 - (x) The Guardrail Script cannot
be used to enforce the Guardrail

692 - (~ - reason) The Guardrail
Script cannot be used to enforce
the Guardrail for
693 the reason given, but future
ledger changes could enable this.

694

695 Guardrails may overlap: in this
case, the most restrictive set of
Guardrails
696 will apply.

697

698 Where a parameter is not
explicitly listed in this
document, then the Guardrail
699 Script ****must not**** permit any
changes to the parameter.

700

701 Conversely, where a parameter is
explicitly listed in this
document but no
702 checkable Guardrails are
specified, the Guardrail Script
****must not**** impose
703 any constraints on changes to the
parameter.

704

705 **### 2. Guardrails and Guidelines
on Protocol Parameter Update
Actions**

706

707 Below are Guardrails and
guidelines for changing updatable
protocol parameter
708 settings via the protocol
parameter update governance
action such that the

652

653 **Symbol and Explanation**

654

655 - (y) The Guardrail Script can
be used to enforce the Guardrail

656

657 - (x) The Guardrail Script
cannot be used to enforce the
Guardrail

658

659 - (~ - reason) The Guardrail
Script cannot be used to enforce
the
660 Guardrail for the reason
given, but future ledger changes
could
661 enable this.

662

663 Guardrails may overlap: in this
case, the most restrictive set of
664 Guardrails will apply.

665

666 Where a parameter is not
explicitly listed in this
document, then the
667 Guardrail Script must not permit
any changes to the parameter.

668

669 Conversely, where a parameter is
explicitly listed in this
document but
670 no checkable Guardrails are
specified, the Guardrail Script
must not

709 Cardano Blockchain is never in an
unrecoverable state as a result
of such
710 changes.

711

712 Note that, to avoid ambiguity,
this Appendix uses the parameter
name that is
713 used in protocol parameter update
governance actions rather than
any other

714 convention.

715

716 ##### GUARDRAILS

717

718 PARAM-01 (y) Any protocol
parameter that is not explicitly
named in this

719 document **must not** be changed
by a Parameter update governance
action

720

721 PARAM-02a (y) Where a protocol
parameter is explicitly listed in
this document

722 but no checkable Guardrails are
specified, the Guardrails Script
must not

723 impose any constraints on changes
to the parameter.

671 impose any constraints on changes
to the parameter.

672

673 ### ****2. Guardrails and
Guidelines on "Parameter Update"
actions****

674

675 Below are Guardrails and
guidelines for changing updatable
protocol

676 parameter settings via the
"Parameter Update" action such
that the

677 Cardano Blockchain is never in an
unrecoverable state as a result
of

678 such changes.

679

680 Note that, to avoid ambiguity,
this Appendix uses the parameter
name

681 that is used in "Parameter
Update" actions rather than any
other

682 convention.

683

684 ##### ****GUARDRAILS****

685

686 PARAM-01 (y) Any protocol
parameter that is not explicitly
named in this

687 document **must not** be changed by a
"Parameter Update" action

688

689 PARAM-02a (y) Where a protocol
parameter is explicitly listed in
this

690 document but no checkable
Guardrails are specified, the
Guardrails

691 Script **must not** impose any
constraints on changes to the
parameter.

724 Checkable Guardrails are shown by
a (y)

725

726 **### 2.1. Critical Protocol
Parameters**

727

728 The below protocol parameters are
critical from a security point of
view.

729

730 **#### Parameters** that are Critical
to the Operation of the
Blockchain

731

732 - *maximum block body size*
(*maxBlockBodySize*)

733

734 - *maximum transaction size*
(*maxTxSize*)

735

736 - *maximum block header size*
(*maxBlockHeaderSize*)

737

738 - *maximum size of a serialized
asset value* (*maxValueSize*)

739

740 - *maximum script
execution/memory units in a
single block*
741 (*maxBlockExecutionUnits[steps/me
mory]*)

742

743 - *minimum fee coefficient*
(*txFeePerByte*)

744

745 - *minimum fee constant*
(*txFeeFixed*)

746

747 - *minimum fee per byte for
reference scripts*
(*minFeeRefScriptCoinsPerByte*)

692 Checkable Guardrails are shown by
a (y)

693

694 **### **2.1. Critical Protocol
Parameters****

695

696 The below protocol parameters are
critical from a security point of
view.

698

699 **#### **Parameters** that are
Critical to the Operation of the
Blockchain**

700

701 - *maximum block body size*
(*maxBlockBodySize*)

702

703 - *maximum transaction size*
(*maxTxSize*)

704

705 - *maximum block header size*
(*maxBlockHeaderSize*)

706

707 - *maximum size of a serialized
asset value* (*maxValueSize*)

708

709 - *maximum script
execution/memory units in a
single block*
710 (*maxBlockExecutionUnits[steps/me
mory]*)

711

712 - *minimum fee coefficient*
(*txFeePerByte*)

713

714 - *minimum fee constant*
(*txFeeFixed*)

715

716 - *minimum fee per byte for
reference scripts*

748

749 – *minimum lovelace deposit per
byte of serialized UTxO*
(*utxoCostPerByte*)

750

751 – *governance action deposit*
(*govDeposit*)

752

753 ##### GUARDRAILS

754

755 PARAM-03a (y) Critical protocol
parameters require an SP0 vote in
addition to a
756 DRep vote: SP0s ****must**** say
"yes" with a collective support
of more than 50%
757 of all active block production
stake.

758 This is enforced by the
Guardrails on the stake pool
voting threshold.

759

760 PARAM-04a (x) At least 3 months
****should**** normally pass between
the
761 publication of an off-chain
proposal to change a critical
protocol parameter
762 and the submission of the
corresponding on-chain governance
action.
763 This Guardrail may be relaxed in
the event of a Severity 1 or
Severity 2
764 network issue following careful
technical discussion and
evaluation.

765

766 ##### Parameters that are Critical
to the Governance System

717

(*minFeeRefScriptCoinsPerByte*)

718

719 – *minimum lovelace deposit per
byte of serialized UTxO*

720 (*utxoCostPerByte*)

721

722 – *governance action deposit*
(*govDeposit*)

723

724 ##### ****GUARDRAILS****

725

726 PARAM-03a (y) A parameter that is
critical to the operation of the
727 blockchain requires an SP0 vote
in addition to a DRep vote: SP0s
must say
728 "yes" with a collective support
of more than 50% of all active
block
729 production stake. This is
enforced by the Guardrails on the
stake pool
730 voting threshold.

731

732 PARAM-04a (x) At least 90 days
should normally pass between the
733 publication of an off-chain
proposal to change a parameter
that is
734 critical to the operation of the
blockchain and the submission of
the
735 corresponding on-chain governance
action. This Guardrail may be
relaxed
736 in the event of a Severity 1 or
Severity 2 network issue
following
737 careful technical discussion and
evaluation.

738

739 ##### ****Parameters**** that are
Critical to the Governance

767

768 – *delegation key lovelace
deposit* (*stakeAddressDeposit*)

769

770 – *pool registration lovelace
deposit* (*stakePoolDeposit*)

771

772 – *minimum fixed rewards cut for
pools* (*minPoolCost*)

773

774 – *DRep deposit amount*
(*dRepDeposit*)

775

776 – *minimal Constitutional
Committee size*
(*committeeMinSize*)

777

778 – *maximum term length (in
epochs) for the Constitutional
Committee members*
779 (*committeeMaxTermLength*)

780

781 ##### GUARDRAILS

782

783 PARAM-05a (y) DReps ****must**** vote
"yes" with a collective support
of more **than**

784 50% of all active voting stake.

785 This is enforced by the
Guardrails on the DRep voting
thresholds.

786

787 PARAM-06a (x) At least **3 months**
****should**** normally pass between
the

788 publication of an off-chain
proposal to change a parameter
that is critical to

789 the governance system and the
submission of the corresponding
on-chain

System**

740

741 – *delegation key lovelace
deposit* (*stakeAddressDeposit*)

742

743 – *pool registration lovelace
deposit* (*stakePoolDeposit*)

744

745 – *minimum fixed rewards cut
for pools* (*minPoolCost*)

746

747 – *DRep deposit amount*
(*dRepDeposit*)

748

749 – *minimal Constitutional
Committee size*
(*committeeMinSize*)

750

751 – *maximum term length (in
epochs) for the Constitutional
Committee
752 members*
(*committeeMaxTermLength*)

753

754 ##### ****GUARDRAILS****

755

756 PARAM-05a (y) DReps **must** vote
"yes" with a collective support
of more

757 **than** 50% of all active voting
stake. This is enforced by the
Guardrails

758 on the DRep voting thresholds.

759

760 PARAM-06a (x) At least **90 days**
should normally pass between the

761 publication of an off-chain
proposal to change a parameter
that is

762 critical to the governance system
and the submission of the

790 governance action.

791 This Guardrail may be relaxed in
the event of a Severity 1 or
Severity 2

792 network issue following careful
technical discussion and
evaluation.

793

794 **### 2.2. Economic Parameters**

795

796 The overall goals when managing
economic parameters are to:

797

798 1. Enable long-term economic
sustainability for the Cardano
Blockchain;

799

800 2. Ensure that stake pools are
adequately rewarded for
maintaining the

801 Cardano Blockchain;

802

803 3. Ensure that ada owners are
adequately rewarded for using
stake in

804 constructive ways, including when
delegating ada for block
production; and

805

806 4. Balance economic incentives
for different Cardano Blockchain
ecosystem

807 stakeholders, including but not
limited to Stake Pool Operators,
ada owners,

808 DeFi users, infrastructure users,
developers (e.g. DApps) and
financial

809 intermediaries (e.g. exchanges)

810

811 **#### Triggers for Change**

812

763 corresponding on-chain governance
action. This Guardrail may be
relaxed

764 in the event of a Severity 1 or
Severity 2 network issue
following

765 careful technical discussion and
evaluation.

766

767 **### **2.2. Economic Parameters****

768

769 The overall goals when managing
economic parameters are to:

770

771 1. Enable long-term economic
sustainability for the Cardano
Blockchain;

772

773 2. Ensure that stake pools are
adequately rewarded for
maintaining the

774 Cardano Blockchain;

775

776 3. Ensure that ada owners are
adequately rewarded for using
stake in

777 constructive ways, including
when delegating ada for block

778 production; and

779

780 4. Balance economic incentives
for different Cardano Blockchain

781 ecosystem stakeholders,
including but not limited to
Stake Pool

782 Operators, ada owners, DeFi
users, infrastructure users,

783 developers (e.g. DApps) and
financial intermediaries (e.g.

784 exchanges)

785

786 **#### **Triggers for Change****

787

813 1. Significant changes in the
fiat value of ada resulting in
potential problems
814 with security, performance,
functionality or long-term
sustainability

815

816 2. Changes in transaction volumes
or types

817

818 3. Community requests or
suggestions

819

820 4. Emergency situations that
require changes to economic
parameters

821

822 #### Counter-indicators

823

824 Changes to the economic
parameters should not be made in
isolation.
825 They need to account for:

826

827 – External economic factors

828

829 – Network security concerns

830

831 #### Core Metrics

832

833 – Fiat value of ada resulting in
potential problems with security,
performance,
834 functionality or long-term
sustainability

835

836 – Transaction volumes and types

837

838 – Number and health of stake
pools

839

788 1. Significant changes in the
fiat value of ada resulting in
potential
789 problems with security,
performance, functionality, or
long-term
790 sustainability

791

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volumes or types

793

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suggestions

795

796 4. Emergency situations that
require changes to economic
parameters

797

798 #### **Counter-indicators**

799

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parameters should not be made in
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801 need to account for:

802

803 – External economic factors

804

805 – Network security concerns

806

807 #### **Core Metrics**

808

809 – Fiat value of ada resulting
in potential problems with
security,
810 performance, functionality,
or long-term sustainability

811

812 – Transaction volumes and types

813

814 – Number and health of stake
pools

815

840 – External economic factors

841

842 ##### Changes to Specific Economic Parameters

843

844 Transaction fee per byte (txFeePerByte) and fixed transaction fee (txFeeFixed)

845

846 Defines the cost for basic transactions in lovelace:

847

848 $\text{fee}(\text{tx}) = \text{txFeeFixed} + \text{txFeePerByte} \times \text{nBytes}(\text{tx})$

849

850 ##### GUARDRAILS

851

852 TFPB-01 (y) *txFeePerByte* **must not** be lower than 30 (0.000030 ada) This

853 protects against low-cost denial of service attacks

854

855 TFPB-02 (y) *txFeePerByte* **must not** exceed 1,000 (0.001 ada) This ensures

856 that transactions can be paid for

857

858 TFPB-03 (y) *txFeePerByte* **must not** be negative

859

860 TFF-01 (y) *txFeeFixed* **must not** be lower than 100,000 (0.1 ada) This

861 protects against low-cost denial of service attacks

862

863 TFF-02 (y) *txFeeFixed* **must not** exceed 10,000,000 (10 ada) This ensures

864 that transactions can be paid for

865

816 – External economic factors

817

818 ##### **Changes** to Specific Economic Parameters

819

820 Transaction fee per byte (txFeePerByte) and fixed transaction fee (txFeeFixed)

821

822

823 Defines the cost for basic transactions in lovelace:

824

825 $\text{fee}(\text{tx}) = \text{txFeeFixed} + \text{txFeePerByte} \times \text{nBytes}(\text{tx})$

826

827 ##### **GUARDRAILS**

828

829 TFPB-01 (y) *txFeePerByte* **must not** be lower than 30 (0.000030 ada) This

830 protects against low-cost denial of service attacks

831

832 TFPB-02 (y) *txFeePerByte* **must not** exceed 1,000 (0.001 ada) This ensures

833 that transactions can be paid for

834

835 TFPB-03 (y) *txFeePerByte* **must not** be negative

836

837 TFF-01 (y) *txFeeFixed* **must not** be lower than 100,000 (0.1 ada) This

838 protects against low-cost denial of service attacks

839

840 TFF-02 (y) *txFeeFixed* **must not** exceed 10,000,000 (10 ada) This ensures

841 that transactions can be paid for

842

866 TFF-03 (y) *txFeeFixed* ****must not**** be negative

867

868 TFGEN-01 (x - "should") To maintain a consistent level of protection **against**

869 denial-of-service attacks, *txFeeFixed* and ***txFeeFixed*** ****should**** be adjusted

870 whenever Plutus Execution prices are adjusted

871 (executionUnitPrices[steps/memory])

872

873 TFGEN-02 (x - **unquantifiable**) Any changes to *txFeeFixed* or ***txFeeFixed***

874 ****must**** consider the implications of reducing the cost of a **denial-of-service**

875 attack or increasing the maximum transaction fee so **that** it becomes impossible

876 to construct a transaction.

877

878 **#### UTx0** cost per byte (**utxoCostPerByte**)

879

880 Defines the deposit (in lovelace) that is charged for each byte of **storage** **tha**

881 is held in a UTx0.

882 This deposit is returned when the UTx0 **is** no longer active.

883

884 - Sets a minimum threshold on ada that is held within a single UTx0

885

886 - Provides protection against low-cost denial of service attack on UTx0 storage.

843 TFF-03 (y) *txFeeFixed* **must not** be negative

844

845 TFGEN-01 (x - "should") To maintain a consistent level of protection

846 **against** denial-of-service attacks, *txFeeFixed* and ***txFeePerByte***

847 **should** be adjusted **when**ever Plutus Execution prices are adjusted

848 (executionUnitPrices[steps/memory])

849

850 TFGEN-02 (x - **"unquantifiable"**) Any changes to *txFeeFixed* or

851 ***txFeePerByte*** **must** consider the implications of reducing the cost of a

852 **denial-of-service** attack or increasing the maximum transaction fee so

853 that it becomes impossible **to** construct a transaction.

854

855 **#### *UTx0*** cost per byte (**utxoCostPerByte***)

856

857 Defines the deposit (in lovelace) that is charged for each byte of

858 storage **that** is held in a UTx0. **This deposit is returned when the UTx0**

859 **is** no longer active.

860

861 - Sets a minimum threshold on ada that is held within a single UTx0

862

863 - Provides protection against low-cost denial of service attack on

887 DoS protection decreases in line
with the free node memory
(proportional to
888 UTx0 growth)

889

890 – Helps reduce long-term storage
costs for node users by providing
an incentive
891 to return UTx0s when no longer
needed, or to merge UTx0s.

892

893 ##### GUARDRAILS

894

895 UCPB-01 (y) *utxoCostPerByte*
must not be lower than 3,000
(0.003 ada)

896

897 UCPB-02 (y) *utxoCostPerByte*
must not exceed 6,500 (0.0065
ada)

898

899 UCPB-03 (y) *utxoCostPerByte*
must not be zero

900

901 UCPB-04 (y) *utxoCostPerByte*
must not be negative

902

903 UCPB-05a (x – "should") Changes
should account for

904

905 1. The acceptable cost of attack

906

907 2. The acceptable time for an
attack

908

909 3. The acceptable memory
configuration for full node users

910

911 4. The sizes of UTx0s and

912

864 UTx0 storage. DoS protection
decreases in line with the free
node
865 memory (proportional to UTx0
growth)

866

867 – Helps reduce long-term
storage costs for node users by
providing an
868 incentive to return UTx0s
when no longer needed, or to
merge
869 UTx0s.

870

871 ##### **GUARDRAILS**

872

873 UCPB-01 (y) *utxoCostPerByte*
must not be lower than 3,000
(0.003 ada)

874

875 UCPB-02 (y) *utxoCostPerByte*
must not exceed 6,500 (0.0065
ada)

876

877 UCPB-03 (y) *utxoCostPerByte*
must not be zero

878

879 UCPB-04 (y) *utxoCostPerByte*
must not be negative

880

881 UCPB-05a (x – "should") Changes
should account for

882

883 1. The acceptable cost of attack

884

885 2. The acceptable time for an
attack

886

887 3. The acceptable memory
configuration for full node users

888

889 4. The sizes of UTx0s and

890

913 5. The current total node memory
usage

914

915 ##### Stake address deposit
(stakeAddressDeposit)

916

917 Ensures that stake addresses are
retired when no longer needed

918

919 – Helps reduce long-term storage
costs

920

921 – Helps limit CPU and memory
costs in the ledger

922

923 The rationale for the deposit is
to incentivize that scarce memory
resources

924 are returned when they are no
longer required.

925 Reducing the number of active
stake addresses also reduces
processing and

926 memory costs at the epoch
boundary when calculating stake
snapshots.

927

928 ##### GUARDRAILS

929

930 SAD-01 (y) *stakeAddressDeposit*
must not be lower than
1,000,000 (1 ada)

931

932 SAD-02 (y) *stakeAddressDeposit*
must not exceed 5,000,000 (5
ada)

933

934 SAD-03 (y) *stakeAddressDeposit*
must not be negative

935

936 ##### Stake pool deposit
(stakePoolDeposit)

891 5. The current total node memory
usage

892

893 ##### **Stake address deposit
(stakeAddressDeposit)**

894

895 Ensures that stake addresses are
retired when no longer needed

896

897 – Helps reduce long-term
storage costs

898

899 – Helps limit CPU and memory
costs in the ledger

900

901 The rationale for the deposit is
to incentivize that scarce memory

902 resources are returned when they
are no longer required. Reducing the

903 number of active stake addresses
also reduces processing and

904 memory costs at the epoch boundary when
calculating stake snapshots.

905

906 ##### **GUARDRAILS**

907

908 SAD-01 (y) *stakeAddressDeposit*
must not be lower than 1,000,000
(1
ada)

909

910

911 SAD-02 (y) *stakeAddressDeposit*
must not exceed 5,000,000 (5 ada)

912

913 SAD-03 (y) *stakeAddressDeposit*
must not be negative

914

915 ##### **Stake pool deposit
(stakePoolDeposit)**

937

938 Ensures that stake pools are
retired by the stake pool
operator when no longer
939 needed by them

940

941 – Helps reduce long-term storage
costs

942

943 The rationale for the deposit is
to incentivize that scarce memory
resources
944 are returned when they are no
longer required.

945 Rewards and stake snapshot
calculations are also impacted by
the number of
946 active stake pools.

947

948 ##### GUARDRAILS

949

950 SPD-01 (y) *stakePoolDeposit*
must not be lower than
250,000,000 (250 ada)

951

952 SPD-02 (y) *stakePoolDeposit*
must not exceed 500,000,000
(500 ada)

953

954 SPD-03 (y) *stakePoolDeposit*
must not be negative

955

956 ##### Minimum Pool Cost
(minPoolCost)

957

958 Part of the rewards mechanism
959

960 – The minimum pool cost is
transferred to the pool rewards
address before any
961 delegator rewards are paid

962

916

917 Ensures that stake pools are
retired by the stake pool
operator when no
918 longer needed by them

919

920 – Helps reduce long-term
storage costs

921

922 The rationale for the deposit is
to incentivize that scarce memory
resources are returned when they
are no longer required. Rewards
and

923 stake snapshot calculations are
also impacted by the number of
active
924 stake pools.

925

926 ##### **GUARDRAILS**

927

928 SPD-01 (y) *stakePoolDeposit*
must not be lower than
250,000,000 (250
929 ada)

930

931 SPD-02 (y) *stakePoolDeposit*
must not exceed 500,000,000 (500
932 ada)

933

934 SPD-03 (y) *stakePoolDeposit*
must not be negative

935

936 ##### **Minimum Pool Cost
(minPoolCost)**

937

938 Part of the rewards mechanism
939

940 – The minimum pool cost is
transferred to the pool rewards
address
941 before any delegator rewards
are paid

942

963 ##### GUARDRAILS

964

965 MPC-01 (y) *minPoolCost* **must not** be negative

966

967 MPC-02 (y) *minPoolCost* **must not** exceed 500,000,000 (500 ada)

968

969 MPC-03 (x - "should")
minPoolCost **should** be set in line with the economic cost for operating a pool

970

971

972 ##### Treasury Cut (treasuryCut)

973

974 Part of the rewards mechanism

975

976 - The treasury cut portion of the monetary expansion is transferred to the treasury before any pool rewards are paid

977

978

979 - Can be set in the range 0.0-1.0 (0%-100%)

980

981 ##### GUARDRAILS

982

983 TC-01 (y) *treasuryCut* **must not** be lower than 0.1 (10%)

984

985 TC-02 (y) *treasuryCut* **must not** exceed 0.3 (30%)

986

987 TC-03 (y) *treasuryCut* **must not** be negative

988

989 TC-04 (y) *treasuryCut* **must not** exceed 1.0 (100%)

943 ##### **GUARDRAILS**

944

945 MPC-01 (y) *minPoolCost* must not be negative

946

947 MPC-02 (y) *minPoolCost* must not exceed 500,000,000 (500 ada)

948

949 MPC-03 (x - "should")
minPoolCost should be set in line with the economic cost for operating a pool

950

951

952 ##### **Treasury Cut (treasuryCut)**

953

954 Part of the rewards mechanism

955

956 - The treasury cut portion of the monetary expansion is transferred to the treasury before any pool rewards are paid

957

958

959 - Can be set in the range 0.0-1.0 (0%-100%)

960

961 ##### **GUARDRAILS**

962

963 TC-01 (y) *treasuryCut* must not be lower than 0.1 (10%)

964

965 TC-02 (y) *treasuryCut* must not exceed 0.3 (30%)

966

967 TC-03 (y) *treasuryCut* must not be negative

968

969 TC-04 (y) *treasuryCut* must not exceed 1.0 (100%)

990

991 TC-05 (~ – no access to change
history) *treasuryCut* ****must
not** be changed**
992 more than once in any 36 epoch
period (approximately 6 months)

993

994 ##### Monetary Expansion Rate
(monetaryExpansion)

995

996 Part of the rewards mechanism
997

998 – The monetary expansion controls
the amount of reserves that is
used for
999 rewards each epoch

1000

1001 Governs the long-term
sustainability of the Cardano
Blockchain

1002

1003 – The reserves are gradually
depleted until no rewards are
supplied

1004

1005 ##### GUARDRAILS

1006

1007 ME-01 (y) *monetaryExpansion*
****must not**** exceed 0.005

1008

1009 ME-02 (y) *monetaryExpansion*
****must not**** be lower than 0.001

1010

1011 ME-03 (y) *monetaryExpansion*
****must not**** be negative

1012

1013 ME-04 (x – "should")
monetaryExpansion ****should
not**** be varied by more than
1014 +/- 10% in any 73-epoch period
(approximately 12 months)

1015

970

971 TC-05 (~ – no access to change
history) *treasuryCut* **must not
be
changed** more than once in any 36
epoch period (approximately 6
months)

973

974 ##### ****Monetary** Expansion Rate
(monetaryExpansion)******

975

976 Part of the rewards mechanism
977

978 – **The** monetary expansion
controls the amount of reserves
that is used
979 **for** rewards each epoch

980

981 Governs the long-term
sustainability of the Cardano
Blockchain

982

983 – **The** reserves are gradually
depleted until no rewards are
supplied

984

985 ##### ****GUARDRAILS****

986

987 ME-01 (y) *monetaryExpansion*
must not exceed 0.005

988

989 ME-02 (y) *monetaryExpansion*
must not be lower than 0.001

990

991 ME-03 (y) *monetaryExpansion*
must not be negative

992

993 ME-04 (x – "should")
monetaryExpansion **should not** be
varied by more
994 **than** +/- 10% in any 73-epoch
period (approximately 12 months)

995

1016 ME-05 (x - "should")
monetaryExpansion **should
not** be changed more than
1017 once in any 36-epoch period
(approximately 6 months)

1018

1019 ##### Plutus Script Execution
Prices
(executionUnitPrices[priceSteps/p
riceMemory])

1020

1021 Define the fees for executing
Plutus scripts

1022

1023 Gives an economic return for
Plutus script execution

1024

1025 Provides security against low-
cost DoS attacks

1026

1027 ##### GUARDRAILS

1028

1029 EIUP-PS-01 (y)
executionUnitPrices[priceSteps]
must not exceed 2,000 /
1030 10,000,000

1031

1032 EIUP-PS-02 (y)
executionUnitPrices[priceSteps]
must not be lower than 500

1033 / 10,000,000

1034

1035 EIUP-PM-01 (y)
*executionUnitPrices[priceMemory]
* **must not** exceed 2,000 /
1036 10,000

1037

1038 EIUP-PM-02 (y)
*executionUnitPrices[priceMemory]
* **must not** be lower than
1039 400 / 10,000

1040

1041 EIUP-GEN-01 (x - "similar to")
The execution prices **must** be
set so tha

996 ME-05 (x - "should")
monetaryExpansion should not be
changed more
997 than once in any 36-epoch period
(approximately 6 months)

998

999 ##### *Plutus Script Execution
Prices
(executionUnitPrices[priceSteps/p
riceMemory])**

1000

1001 Define the fees for executing
Plutus scripts

1002

1003 Gives an economic return for
Plutus script execution

1004

1005 Provides security against low-
cost DoS attacks

1006

1007 ##### **GUARDRAILS**

1008

1009 EIUP-PS-01 (y)
executionUnitPrices[priceSteps]
must not exceed 2,000

1010 / 10,000,000

1011

1012 EIUP-PS-02 (y)
executionUnitPrices[priceSteps]
must not be lower
1013 than 500 / 10,000,000

1014

1015 EIUP-PM-01 (y)
*executionUnitPrices[priceMemory]
* must not exceed
1016 2,000 / 10,000

1017

1018 EIUP-PM-02 (y)
*executionUnitPrices[priceMemory]
* must not be lower
1019 than 400 / 10,000

1020

1043 1. the cost of executing a
transaction with maximum CPU
steps is similar to the
1044 cost of a maximum sized non-
script transaction and

1045

1046 2. the cost of executing a
transaction with maximum memory
units is similar to
1047 the cost of a maximum sized non-
script transaction

1048

1049 EIUP-GEN-02 (x - "should") The
execution prices ****should**** be
adjusted whenever
1050 transaction fees are adjusted
(*txFeeFixed/txFeePerByte*).

1051 The goal is to ensure that the
processing delay is similar for
"full"

1052 transactions, regardless of their
type.

1053

1054 - This helps ensure that the
requirements on block
diffusion/propagation times
1055 are met.

1056

1057 ##### Transaction fee per byte for
a reference script
(minFeeRefScriptCoinsPerByte)

1058

1059 Defines the cost for using Plutus
reference scripts in lovelace

1060

1061 ##### GUARDRAILS

1021 EIUP-GEN-01 (x - "similar to")
The execution prices must be set
so
1022 that

1023

1024 1. the cost of executing a
transaction with maximum CPU
steps is
1025 similar to the cost of a
maximum sized non-script
transaction and

1026

1027 2. the cost of executing a
transaction with maximum memory
units is
1028 similar to the cost of a
maximum sized non-script
transaction

1029

1030 EIUP-GEN-02 (x - "should") The
execution prices should be
adjusted
1031 whenever transaction fees are
adjusted
(*txFeeFixed/txFeePerByte*). The
1032 goal is to ensure that the
processing delay is similar for
"full"

1033 transactions, regardless of their
type.

1034

1035 - This helps ensure that the
requirements on block

1036 diffusion/propagation times
are met.

1037

1038 ##### *Transaction fee per byte
for a reference script
(minFeeRefScriptCoinsPerByte)*

1039

1040 Defines the cost for using Plutus
reference scripts in lovelace

1041

1042 ##### *GUARDRAILS*

1062

1063 MFRS-01 (y)
minFeeRefScriptCoinsPerByte
must not exceed 1,000 (0.001
ada)

1064

1065 – This ensures that transactions
can be paid for

1066

1067 MFRS-02 (y)
minFeeRefScriptCoinsPerByte
must not be negative

1068

1069 MFRS-03 (x – "should") To
maintain a consistent level of
protection against
1070 denial-of-service attacks,
minFeeRefScriptCoinsPerByte
should be adjusted
1071 whenever Plutus Execution prices
are adjusted
1072 (*executionUnitPrices[steps/memor
y]*) and whenever *txFeeFixed* is
adjusted

1073

1074 MFRS-04 (x – unquantifiable) Any
changes to
minFeeRefScriptCoinsPerByte
1075 **must** consider the
implications of reducing the cost
of a denial-of-service
1076 attack or increasing the maximum
transaction fee

1077

1078 ### 2.3. Network Parameters

1079

1080 The overall goals when managing
the Cardano Blockchain network
parameters are
1081 to:

1082

1043

1044 MFRS-01 (y)
minFeeRefScriptCoinsPerByte
must not exceed 1,000 (0.001
1045 ada)

1046

1047 – This ensures that
transactions can be paid for

1048

1049 MFRS-02 (y)
minFeeRefScriptCoinsPerByte
must not be negative

1050

1051 MFRS-03 (x – "should") To
maintain a consistent level of
protection
1052 against denial-of-service
attacks,
minFeeRefScriptCoinsPerByte
should
1053 be adjusted whenever Plutus
Execution prices are adjusted
1054 (*executionUnitPrices[steps/memor
y]*) and whenever *txFeeFixed* is
1055 adjusted

1056

1057 MFRS-04 (x – "unquantifiable")
Any changes to
1058 *minFeeRefScriptCoinsPerByte*
must consider the implications of
reducing
1059 the cost of a denial-of-service
attack or increasing the maximum
1060 transaction fee

1061

1062 ### 2.3. Network Parameters

1063

1064 The overall goals when managing
the Cardano Blockchain network
parameters are to:

1066

1083 1. Match the available Cardano
Blockchain Layer 1 network
capacity to current or
1084 future traffic demands, including
payment transactions, layer 1
DApps,
1085 sidechain management and
governance needs

1086

1087 2. Balance traffic demands for
different user groups, including
payment
1088 transactions, minters of
Fungible/Non-Fungible Tokens,
Plutus scripts, DeFi
1089 developers, Stake Pool Operators
and voting transactions

1090

1091 ##### Triggers for Change

1092

1093 Changes to network parameters may
be triggered by:

1094

1095 1. Measured changes in traffic
demands over a 2-epoch period (10
days)

1096

1097 2. Anticipated changes in traffic
demands

1098

1099 3. Cardano Community requests

1100

1101 ##### Counter-indicators

1102

1103 Changes may need to be reversed
and/or should not be enacted in
the event of:

1104

1105 – Excessive block propagation
delays

1106

1107 – Stake pools being unable to
handle traffic volume

1067 1. Match the available Cardano
Blockchain Layer 1 network
capacity to

1068 current or future traffic
demands, including payment
transactions,

1069 layer 1 DApps, sidechain
management and governance needs

1070

1071 2. Balance traffic demands for
different user groups, including
payment

1072 transactions, minters of
Fungible/Non-Fungible Tokens,
Plutus

1073 scripts, DeFi developers,
Stake Pool Operators and voting

1074 transactions

1075

1076 ##### **Triggers for Change**

1077

1078 Changes to network parameters may
be triggered by:

1079

1080 1. Measured changes in traffic
demands over a 2-epoch period (10
days)

1081

1082 2. Anticipated changes in
traffic demands

1083

1084 3. Cardano Community requests

1085

1086 ##### **Counter-indicators**

1087

1088 Changes may need to be reversed
and/or should not be enacted in
the
1089 event of:

1090

1091 – Excessive block propagation
delays

1092

1093 – Stake pools being unable to
handle traffic volume

1108
1109 - Scripts being unable to
complete execution
1110
1111 ##### Core Metrics
1112
1113 All decisions on parameter
changes should be informed by:
1114
1115 - Block propagation delay profile
1116
1117 - Traffic volume (block size over
time)
1118
1119 - Script volume (size of scripts
and execution units)
1120
1121 - Script execution cost
benchmarks
1122
1123 - Block propagation
delay/diffusion benchmarks
1124
1125 Detailed benchmarking results are
required to confirm the effect of
any changes
1126 on mainnet performance or
behavior prior to enactment.
1127 The effects of different
transaction mixes must be
analyzed, including normal
1128 transactions, Plutus scripts, and
governance actions.
1129
1130 ##### GUARDRAILS
1131
1132 NETWORK-01 (x - "should") No
individual network parameter
should change
1133 more than once per two epochs
1134

1094
1095 - Scripts being unable to
complete execution
1096
1097 ##### **Core Metrics**
1098
1099 All decisions on parameter
changes should be informed by:
1100
1101 - Block propagation delay
profile
1102
1103 - Traffic volume (block size
over time)
1104
1105 - Script volume (size of
scripts and execution units)
1106
1107 - Script execution cost
benchmarks
1108
1109 - Block propagation
delay/diffusion benchmarks
1110
1111 Detailed benchmarking results are
required to confirm the effect of
any
1112 changes on mainnet performance or
behavior prior to enactment. The
1113 effects of different transaction
mixes must be analyzed, including
1114 normal transactions, Plutus
scripts, and governance actions.
1115
1116 ##### **GUARDRAILS**
1117
1118 NETWORK-01 (x - "should") No
individual network parameter
should
1119 change more than once per two
epochs
1120

1135 NETWORK-02 (x - "should") Only
one network parameter ****should****
be changed **per**
1136 epoch unless they are directly
correlated, e.g., per-transaction
and **per-block**
1137 memory unit limits

1138

1139 **#### Changes** to Specific Network
Parameters

1140

1141 **#### Block Size**
(maxBlockBodySize)

1142

1143 The maximum size of a block, in
Bytes.

1144

1145 **##### GUARDRAILS**

1146

1147 MBBS-01 (y) ***maxBlockBodySize***
****must not**** exceed 122,880 **Bytes**
(120KB)

1148

1149 MBBS-02 (y) ***maxBlockBodySize***
****must not**** be lower than 24,576
Bytes (24KB)

1150

1151 MBBS-03a (x - "exceptional
circumstances")
maxBlockBodySize ****must not****
be

1152 decreased, other than in
exceptional circumstances where
there are **potential**

1153 problems with security,
performance, functionality or
long-term sustainability

1154

1155 MBBS-04 (~ - no access to
existing parameter values)
maxBlockBodySize

1156 ****must**** be large enough to
include at least one transaction
(that is,

1121 NETWORK-02 (x - "should") Only
one network parameter **should** be
changed

1122 **per** epoch unless they are
directly correlated, e.g., per-
transaction and

1123 **per-block** memory unit limits

1124

1125 **#### **Changes** to Specific
Network Parameters******

1126

1127 **#### **Block Size**
(maxBlockBodySize)**

1128

1129 The maximum size of a block, in
bytes.

1130

1131 **##### **GUARDRAILS****

1132

1133 MBBS-01 (y) ***maxBlockBodySize***
must not exceed 122,880 **bytes**
(120KB)

1134

1135 MBBS-02 (y) ***maxBlockBodySize***
must not be lower than 24,576
bytes
1136 (24KB)

1137

1138 MBBS-03a (x - **exceptional**
circumstances) ***maxBlockBodySize***
must not

1139 **be** decreased, other than in
exceptional circumstances where
there are

1140 **potential** problems with security,
performance, functionality or

1141 long-term sustainability

1142

1143 MBBS-04 (~ - no access to
existing parameter values)
maxBlockBodySize

1144 **must** be large enough to include
at least one transaction (that
is,

1157 *maxBlockBodySize* ****must**** be at
least *maxTxSize*)

1158

1159 MBBS-05 (x - "should")
maxBlockBodySize ****should**** be
changed by at most
1160 10,240 Bytes (10KB) per epoch (5
days), and preferably by 8,192
Bytes (8KB) or
1161 less per epoch

1162

1163 MBBS-06 (x - "should") The block
size ****should not**** induce an
additional
1164 Transmission Control Protocol
(TCP) round trip.

1165 Any increase beyond this must be
backed by performance analysis,
simulation and
1166 benchmarking

1167

1168 MBBS-07 (x - "unquantifiable")
The impact of any change to
maxBlockBodySize
1169 ****must**** be confirmed by detailed
benchmarking/simulation and not
exceed the
1170 requirements of the block
diffusion/propagation time
budgets, as described
1171 below.

1172 Any increase to
maxBlockBodySize must also
consider future requirements for
1173 Plutus script execution
(*maxBlockExecutionUnits[steps]*)
against the total
1174 block diffusion target of 3s with
95% block propagation within 5s.

1175 The limit on maximum block size
may be increased in the future if
this is
1176 supported by benchmarking and
monitoring results

1177

1145 *maxBlockBodySize* **must** be at
least *maxTxSize*)

1146

1147 MBBS-05 (x - "should")
maxBlockBodySize **should** be
changed by at most
1148 10,240 bytes (10KB) per epoch (5
days), and preferably by 8,192
bytes
1149 (8KB) or less per epoch

1150

1151 MBBS-06 (x - "should") The block
size **should not** induce an
additional

1152 Transmission Control Protocol
(TCP) round trip. Any increase
beyond this

1153 must be backed by performance
analysis, simulation and
benchmarking

1154

1155 MBBS-07 (x - "unquantifiable")
The impact of any change to

1156 *maxBlockBodySize* **must** be
confirmed by detailed
benchmarking/simulation

1157 and not exceed the requirements
of the block
diffusion/propagation time

1158 budgets, as described below. Any
increase to *maxBlockBodySize*
must

1159 also consider future requirements
for Plutus script execution

1160 (*maxBlockExecutionUnits[steps]*)
against the total block diffusion

1161 target of 3s with 95% block
propagation within 5s. The limit
on maximum

1162 block size may be increased in
the future if this is supported
by

1163 benchmarking and monitoring
results

1164

1178 ##### Transaction Size (maxTxSize)

1179

1180 The maximum size of a transaction, in Bytes.

1181

1182 ##### GUARDRAILS

1183

1184 MTS-01 (y) *maxTxSize* **must not** exceed 32,768 Bytes (32KB)

1185

1186 MTS-02 (y) *maxTxSize* **must not** be negative

1187

1188 MTS-03 (~ - no access to existing parameter values) *maxTxSize* **must not** be decreased

1189

1190

1191 MTS-04 (~ - no access to existing parameter values) *maxTxSize* **must not** exceed *maxBlockBodySize*

1192

1193

1194 MTS-05 (x - "should") *maxTxSize* **should not** be increased by more than 2,560 Bytes (2.5KB) in any epoch, and preferably **should** be increased by 2,048 Bytes (2KB) or less per epoch

1195

1196

1197

1198 MTS-06 (x - "should") *maxTxSize* **should not** exceed 1/4 of the block size

1199

1200 ##### Memory Unit Limits (maxBlockExecutionUnits[memory], maxTxExecutionUnits[memory])

1201

1202 The limit on the maximum number of memory units that can be used

1165 ##### **Transaction Size (maxTxSize)**

1166

1167 The maximum size of a transaction, in bytes.

1168

1169 ##### **GUARDRAILS**

1170

1171 MTS-01 (y) *maxTxSize* must not exceed 32,768 bytes (32KB)

1172

1173 MTS-02 (y) *maxTxSize* must not be negative

1174

1175 MTS-03 (~ - no access to existing parameter values) *maxTxSize* must not be decreased

1176

1177

1178 MTS-04 (~ - no access to existing parameter values) *maxTxSize* must not exceed *maxBlockBodySize*

1179

1180

1181 MTS-05 (x - "should") *maxTxSize* should not be increased by more than 2,560 bytes (2.5KB) in any epoch, and preferably should be increased by 2,048 bytes (2KB) or less per epoch

1182

1183

1184

1185 MTS-06 (x - "should") *maxTxSize* should not exceed 1/4 of the block size

1186

1187

1188 ##### **Memory Unit Limits (maxBlockExecutionUnits[memory], maxTxExecutionUnits[memory])**

1189

1190 The limit on the maximum number of memory units that can be used

by Plutus
1203 scripts, either per-transaction
or per-block.
1204
1205 ##### GUARDRAILS
1206
1207 MTEU-M-01 (y)
maxTxExecutionUnits[memory]
must not exceed 40,000,000
units
1208
1209 MTEU-M-02 (y)
maxTxExecutionUnits[memory]
must not be negative
1210
1211 MTEU-M-03 (~ - no access to
existing parameter values)
1212 *maxTxExecutionUnits[memory]*
must not be decreased
1213
1214 MTEU-M-04 (x - "should")
maxTxExecutionUnits[memory]
should not be
1215 increased by more than 2,500,000
units in any epoch
1216
1217 MBEU-M-01 (y)
maxBlockExecutionUnits[memory]
must not exceed 120,000,000
1218 units
1219
1220 MBEU-M-02 (y)
maxBlockExecutionUnits[memory]
must not be negative
1221
1222 MBEU-M-03 (x - "should")
maxBlockExecutionUnits[memory]
should not be
1223 changed (increased or decreased)
by more than 10,000,000 units in
ANY epoch
1224

by
1191 Plutus scripts, either per-
transaction or per-block.
1192
1193 ##### **GUARDRAILS**
1194
1195 MTEU-M-01 (y)
maxTxExecutionUnits[memory]
must not exceed 40,000,000
1196 units
1197
1198 MTEU-M-02 (y)
maxTxExecutionUnits[memory]
must not be negative
1199
1200 MTEU-M-03 (~ - no access to
existing parameter values)
1201 *maxTxExecutionUnits[memory]*
must not be decreased
1202
1203 MTEU-M-04 (x - "should")
maxTxExecutionUnits[memory]
should not be
1204 increased by more than 2,500,000
units in any epoch
1205
1206 MBEU-M-01 (y)
maxBlockExecutionUnits[memory]
must not exceed
1207 120,000,000 units
1208
1209 MBEU-M-02 (y)
maxBlockExecutionUnits[memory]
must not be negative
1210
1211 MBEU-M-03 (x - "should")
maxBlockExecutionUnits[memory]
should not
1212 be changed (increased or
decreased) by more than
10,000,000 units in ANY
1213 epoch
1214

1225 MBEU-M-04a (x - unquantifiable)
 The impact of any change to
 1226 *maxBlockExecutionUnits[memory]*
 must be confirmed by detailed
 1227 benchmarking/simulation and not
 exceed the requirements of the
 block
 1228 diffusion/propagation time
 budgets, as also impacted by
 1229 *maxBlockExecutionUnits[steps]*
 and *maxBlockBodySize*.
 1230 Any increase **must** also
 consider previously agreed future
 requirements for
 1231 the total block size
 (*maxBlockBodySize*) measured
 against the total block
 1232 diffusion target of 3s with 95%
 block propagation within 5s.
 1233 Future Plutus performance
 improvements may allow the per-
 block memory limit to
 1234 be increased, but must be
 balanced against the overall
 diffusion limits as
 1235 specified in the previous
 sentence, and future requirements
 1236
 1237 MEU-M-01 (~ - no access to
 existing parameter values)
 1238 *maxBlockExecutionUnits[memory]*
 must not be less than
 1239 *maxTxExecutionUnits[memory]*
 1240
 1241 #### CPU Unit Limits
 (maxBlockExecutionUnits[steps],
 maxTxExecutionUnits[steps])
 1242
 1243 The limit on the maximum number
 of CPU steps that can be used by
 Plutus
 1244 scripts, either per transaction
 or per-block.
 1245
 1246 ##### GUARDRAILS
 1247

1215 MBEU-M-04a (x - "unquantifiable")
 The impact of any change to
 1216 *maxBlockExecutionUnits[memory]*
 must be confirmed by detailed
 1217 benchmarking/simulation and not
 exceed the requirements of the
 block
 1218 diffusion/propagation time
 budgets, as also impacted by
 1219 *maxBlockExecutionUnits[steps]*
 and *maxBlockBodySize*. Any
 increase
 1220 must also consider previously
 agreed future requirements for
 the total
 1221 block size (*maxBlockBodySize*)
 measured against the total block
 1222 diffusion target of 3s with 95%
 block propagation within 5s.
 Future
 1223 Plutus performance improvements
 may allow the per-block memory
 limit to
 1224 be increased, but must be
 balanced against the overall
 diffusion limits
 1225 as specified in the previous
 sentence, and future requirements
 1226
 1227 MEU-M-01 (~ - no access to
 existing parameter values)
 1228 *maxBlockExecutionUnits[memory]*
 must not be less than
 1229 *maxTxExecutionUnits[memory]*
 1230
 1231 #### **CPU Unit Limits
 (maxBlockExecutionUnits[steps],
 maxTxExecutionUnits[steps])**
 1232
 1233 The limit on the maximum number
 of CPU steps that can be used by
 Plutus
 1234 scripts, either per transaction
 or per-block.
 1235
 1236 ##### **GUARDRAILS**
 1237

1248 MTEU-S-01 (y)
maxTxExecutionUnits[steps]
must not exceed
15,000,000,000
1249 (15Bn) units
1250
1251 MTEU-S-02 (y)
maxTxExecutionUnits[steps]
must not be negative
1252
1253 MTEU-S-03 (~ – no access to
existing parameter values)
1254 *maxTxExecutionUnits[steps]*
must not be decreased
1255
1256 MTEU-S-04 (x – "should")
maxTxExecutionUnits[steps]
should not be
1257 increased by more than
500,000,000 (500M) units in any
epoch (5 days)
1258
1259 MBEU-S-01 (y)
maxBlockExecutionUnits[steps]
must not exceed
1260 40,000,000,000 (40Bn) units
1261
1262 MBEU-S-02 (y)
maxBlockExecutionUnits[steps]
must not be negative
1263
1264 MBEU-S-03 (x – "should")
maxBlockExecutionUnits[steps]
should not be
1265 changed (increased or decreased)
by more than 2,000,000,000 (2Bn)
units in any
1266 epoch (5 days)
1267
1268 MBEU-S-04a (x – unquantifiable)
The impact of the change to
1269 *maxBlockExecutionUnits[steps]*
must be confirmed by detailed
1270 benchmarking/simulation and not
exceed the requirements of the
block

1238 MTEU-S-01 (y)
maxTxExecutionUnits[steps] must
not exceed
1239 15,000,000,000 (15Bn) units
1240
1241 MTEU-S-02 (y)
maxTxExecutionUnits[steps] must
not be negative
1242
1243 MTEU-S-03 (~ – no access to
existing parameter values)
1244 *maxTxExecutionUnits[steps]* must
not be decreased
1245
1246 MTEU-S-04 (x – "should")
maxTxExecutionUnits[steps]
should not be
1247 increased by more than
500,000,000 (500M) units in any
epoch (5 days)
1248
1249 MBEU-S-01 (y)
maxBlockExecutionUnits[steps]
must not exceed
1250 40,000,000,000 (40Bn) units
1251
1252 MBEU-S-02 (y)
maxBlockExecutionUnits[steps]
must not be negative
1253
1254 MBEU-S-03 (x – "should")
maxBlockExecutionUnits[steps]
should not
1255 be changed (increased or
decreased) by more than
2,000,000,000 (2Bn)
units in any epoch (5 days)
1256
1257
1258 MBEU-S-04a (x – "unquantifiable")
The impact of the change to
1259 *maxBlockExecutionUnits[steps]*
must be confirmed by detailed
1260 benchmarking/simulation and not
exceed the requirements of the
block

1271 diffusion/propagation time
budgets, as also impacted by

1272 `*maxBlockExecutionUnits[memory]*`
and `*maxBlockBodySize*`.

1273 Any increase ****must**** also
consider previously identified
future requirements

1274 for the total block size
(`*maxBlockBodySize*`) measured
against the total block

1275 diffusion target of 3s with 95%
block propagation within 5s.

1276 **Future** Plutus performance
improvements may allow the per-
block step limit to be

1277 increased, but ****must**** be
balanced against the overall
diffusion limits as

1278 specified in the previous
sentence, and future requirements

1279

1280 MEU-S-01 (~ – no access to
existing parameter values)

1281 `*maxBlockExecutionUnits[steps]*`
****must not**** be less than

1282 `*maxTxExecutionUnits[steps]*`

1283

1284 **#### Block Header Size**
(`maxBlockHeaderSize`)

1285

1286 The size of the block header.

1287

1288 **##### GUARDRAILS**

1289

1290 MBHS-01 (y) `*maxBlockHeaderSize*`
****must not**** exceed 5,000 Bytes

1291

1292 MBHS-02 (y) `*maxBlockHeaderSize*`
****must not**** be negative

1293

1294 MBHS-03 (x – "largest valid
header" is subject to change) `*maxBlockHeaderSize*`

1295 ****must**** be large enough for the
largest valid header

1261 diffusion/propagation time
budgets, as also impacted by

1262 `*maxBlockExecutionUnits[memory]*`
and `*maxBlockBodySize*`. Any
increase

1263 **must** also consider previously
identified future requirements
for the

1264 total block size
(`*maxBlockBodySize*`) measured
against the total block

1265 diffusion target of 3s with 95%
block propagation within 5s. **Future**

1266 Plutus performance improvements
may allow the per-block step
limit to be

1267 increased, but **must** be balanced
against the overall diffusion
limits as

1268 specified in the previous
sentence, and future requirements

1269

1270 MEU-S-01 (~ – no access to
existing parameter values)

1271 `*maxBlockExecutionUnits[steps]*`
must not be less than

1272 `*maxTxExecutionUnits[steps]*`

1273

1274 **#### `*Block` Header Size**
(`maxBlockHeaderSize`)******

1275

1276 The size of the block header.

1277

1278 **##### `*GUARDRAILS*`**

1279

1280 MBHS-01 (y) `*maxBlockHeaderSize*`
must not exceed 5,000 bytes

1281

1282 MBHS-02 (y) `*maxBlockHeaderSize*`
must not be negative

1283

1284 MBHS-03 (x – largest valid header
is subject to change)

1285 `*maxBlockHeaderSize*` **must** be
large enough for the largest

1296

1297 MBHS-04 (x - "should")
maxBlockHeaderSize ****should****
only normally be

1298 increased if the protocol changes

1299

1300 MBHS-05 (x - "should")
maxBlockHeaderSize ****should****
be within TCP's **initial**
1301 congestion window (3 or 10 MTUs)

1302

1303 **### 2.4. Technical/Security**
Parameters

1304

1305 The overall goals when managing
the technical/security parameters
are:

1306

1307 1. Ensure the security of the
Cardano Blockchain network in
terms of

1308 decentralization and protection
against adversarial actions

1309

1310 2. Enable changes to the Plutus
language

1311

1312 **#### Triggers for Change**

1313

1314 1. Changes in the number of
active SP0s

1315

1316 2. Changes to the Plutus language

1317

1318 3. Security threats

1319

1320 4. Cardano Community requests

1321

1322 **#### Counter-indicators**

valid header

1286

1287 MBHS-04 (x - "should")
maxBlockHeaderSize **should** only
normally be

1288 increased if the protocol changes

1289

1290 MBHS-05 (x - "should")
maxBlockHeaderSize **should** be
within TCP's
1291 **initial** congestion window (3 or
10 MTUs)

1292

1293 **### **2.4. Technical/Security**
Parameters**

1294

1295 The overall goals when managing
the technical/security parameters
are:

1296

1297 1. **1** Ensure the security of the
Cardano Blockchain network in
terms of

1298 **1** decentralization and
protection against adversarial
actions

1299

1300 2. **1** Enable changes to the Plutus
language

1301

1302 **#### **Triggers for Change****

1303

1304 1. **1** Changes in the number of
active SP0s

1305

1306 2. **1** Changes to the Plutus
language

1307

1308 3. **1** Security threats

1309

1310 4. **1** Cardano Community requests

1311

1312 **#### **Counter-indicators****

1323

1324 – Economic concerns, e.g. when
changing the number of stake
pools

1325

1326 ##### Core Metrics

1327

1328 – Number of stake pools

1329

1330 – Level of decentralization

1331

1332 ##### Changes to Specific
Technical/Security Parameters

1333

1334 ##### Target Number of Stake Pools
(stakePoolTargetNum)

1335

1336 Sets the target number of stake
pools

1337

1338 – The expected number of stake
pools when the network is in the
equilibrium

1339 state

1340

1341 – Primarily a security parameter,
ensuring decentralization by
stake pool

1342 division/replication

1343

1344 – Has an economic effect as well
as a security effect – economic
advice is also

1345 required when changing this
parameter

1346

1347 – Large changes in this parameter
will trigger mass redelegation
events

1348

1349 ##### GUARDRAILS

1313

1314 – Economic concerns, e.g. when
changing the number of stake
pools

1315

1316 ##### **Core Metrics**

1317

1318 – Number of stake pools

1319

1320 – Level of decentralization

1321

1322 ##### **Changes to Specific
Technical/Security Parameters**

1323

1324 ##### **Target Number of Stake
Pools (stakePoolTargetNum)**

1325

1326 Sets the target number of stake
pools

1327

1328 – The expected number of stake
pools when the network is in the

1329 equilibrium state

1330

1331 – Primarily a security
parameter, ensuring
decentralization by stake

1332 pool division/replication

1333

1334 – Has an economic effect as
well as a security effect –
economic

1335 advice based on analysis is
also required when changing this

1336 parameter

1337

1338 – Large changes in this
parameter will trigger mass
redelegation

1339 events

1340

1341 ##### **GUARDRAILS**

1350

1351 SPTN-01 (y) *stakePoolTargetNum*
must not be lower than 250

1352

1353 SPTN-02 (y) *stakePoolTargetNum*
must not exceed 2,000

1354

1355 SPTN-03 (y) *stakePoolTargetNum*
must not be negative

1356

1357 SPTN-04 (y) *stakePoolTargetNum*
must not be zero

1358

1359 ##### Pledge Influence Factor
(poolPledgeInfluence)

1360

1361 Enables the pledge protection
mechanism

1362

1363 Provides protection against Sybil
attack

1364

1365 – Higher values reward pools that
have more pledge and penalize
pools that have
1366 less pledge

1367

1368 Has an economic effect as well as
technical effect – economic
advice is also
1369 required

1370

1371 ##### GUARDRAILS

1372

1373 PPI-01 (y) *poolPledgeInfluence*
must not be lower than 0.1

1374

1375 PPI-02 (y) *poolPledgeInfluence*
must not exceed 1.0

1376

1377 PPI-03 (y) *poolPledgeInfluence*
must not be negative

1342

1343 SPTN-01 (y) *stakePoolTargetNum*
must not be lower than 250

1344

1345 SPTN-02 (y) *stakePoolTargetNum*
must not exceed 2,000

1346

1347 SPTN-03 (y) *stakePoolTargetNum*
must not be negative

1348

1349 SPTN-04 (y) *stakePoolTargetNum*
must not be zero

1350

1351 ##### *Pledge Influence Factor
(poolPledgeInfluence)*

1352

1353 Enables the pledge protection
mechanism

1354

1355 Provides protection against Sybil
attack

1356

1357 – Higher values reward pools
that have more pledge and
penalize pools
1358 that have less pledge

1359

1360 Has an economic effect as well as
technical effect – economic
advice
1361 based on analysis is also
required

1362

1363 ##### *GUARDRAILS*

1364

1365 PPI-01 (y) *poolPledgeInfluence*
must not be lower than 0.1

1366

1367 PPI-02 (y) *poolPledgeInfluence*
must not exceed 1.0

1368

1369 PPI-03 (y) *poolPledgeInfluence*
must not be negative

1378

1379 PPI-04 (x - "should")
poolPledgeInfluence ****should not**** vary by more than
1380 +/- 10% in any 18-epoch period
(approximately 3 months)

1381

1382 ##### Pool Retirement Window
(poolRetireMaxEpoch)

1383

1384 Defines the maximum number of
epochs notice that a pool can
give when planning
1385 to retire

1386

1387 ##### GUARDRAILS

1388

1389 PRME-01 (y) *poolRetireMaxEpoch*
****must not**** be negative

1390

1391 PRME-02 (x - "should")
poolRetireMaxEpoch ****should not**** be lower than 1

1392

1393 ##### Collateral Percentage
(collateralPercentage)

1394

1395 Defines how much collateral must
be provided when executing a
Plutus script as
1396 a percentage of the normal
execution cost

1397

1398 - Collateral is additional to fee
payments

1399

1400 - If a script fails to execute,
then the collateral is lost

1401

1402 - The collateral is never lost if
a script executes successfully

1403

1370

1371 PPI-04 (x - "should")
poolPledgeInfluence **should not**
vary by more
1372 **than** +/- 10% in any 18-epoch
period (approximately 3 months)

1373

1374 ##### ****Pool** Retirement Window
(poolRetireMaxEpoch)******

1375

1376 Defines the maximum number of
epochs notice that a pool can
give when
1377 **planning** to retire

1378

1379 ##### ****GUARDRAILS****

1380

1381 PRME-01 (y) *poolRetireMaxEpoch*
must not be negative

1382

1383 PRME-02 (x - "should")
poolRetireMaxEpoch **should not**
be lower than 1

1384

1385 ##### ****Collateral** Percentage
(collateralPercentage)******

1386

1387 Defines how much collateral must
be provided when executing a
Plutus
1388 script as a percentage of the
normal execution cost

1389

1390 - **Collateral** is additional to
fee payments

1391

1392 - **If** a script fails to execute,
then the collateral is lost

1393

1394 - **The** collateral is never lost
if a script executes successfully

1395

1404 Provides security against low-cost attacks by making it more expensive rather
1405 than less expensive to execute failed scripts
1406
1407 ##### GUARDRAILS
1408
1409 CP-01 (y) *collateralPercentage*
must not be lower than 100
1410
1411 CP-02 (y) *collateralPercentage*
must not exceed 200
1412
1413 CP-03 (y) *collateralPercentage*
must not be negative
1414
1415 CP-04 (y) *collateralPercentage*
must not be zero
1416
1417 ##### Maximum number of collateral
inputs (maxCollateralInputs)
1418
1419 Defines the maximum number of
inputs that can be used for
collateral when
1420 executing a Plutus script
1421
1422 ##### GUARDRAILS
1423
1424 MCI-01 (y) *maxCollateralInputs*
must not be lower than 1
1425
1426 ##### Maximum Value Size
(maxValueSize)
1427
1428 The limit on the serialized size
of the Value in each output.
1429
1430 ##### GUARDRAILS
1431

1396 Provides security against low-cost attacks by making it more expensive
1397 rather than less expensive to execute failed scripts
1398
1399 ##### **GUARDRAILS**
1400
1401 CP-01 (y) *collateralPercentage*
must not be lower than 100
1402
1403 CP-02 (y) *collateralPercentage*
must not exceed 200
1404
1405 CP-03 (y) *collateralPercentage*
must not be negative
1406
1407 CP-04 (y) *collateralPercentage*
must not be zero
1408
1409 ##### **Maximum** number of
collateral inputs
(maxCollateralInputs)**
1410
1411 Defines the maximum number of
inputs that can be used for
collateral
when executing a Plutus script
1412
1413
1414 ##### **GUARDRAILS**
1415
1416 MCI-01 (y) *maxCollateralInputs*
must not be lower than 1
1417
1418 ##### **Maximum** Value Size
(maxValueSize)**
1419
1420 The limit on the serialized size
of the Value in each output.
1421
1422 ##### **GUARDRAILS**
1423

1432 MVS-01 (y) *maxValueSize* ****must**
not** exceed 12,288 Bytes (12KB)

1433

1434 MVS-02 (y) *maxValueSize* ****must**
not** be negative

1435

1436 MVS-03 (~ - no access to existing
parameter values) *maxValueSize*
****must**** be

1437 less than *maxTxSize*

1438

1439 MVS-04 (~ - no access to existing
parameter values) *maxValueSize*
****must not****

1440 be reduced

1441

1442 MVS-05 (x - "sensible output" is
subject to interpretation) *****
maxValueSize

1443 ****must**** be large enough to allow
sensible outputs (e.g. any
existing on-chain

1444 output or anticipated outputs
that could be produced by new
ledger rules)

1445

1446 ##### Plutus Cost Models
(costModels)

1447

1448 Define the base costs for each
Plutus primitive in terms of CPU
and memory unit

1449

1450 A different cost model is
required for each Plutus version.

1451 Each cost model comprises many
distinct cost model values.

1452 Cost models are defined for each
Plutus language version.

1453 A new language version may
introduce additional cost model

1424 MVS-01 (y) *maxValueSize* **must**
not exceed 12,288 bytes (12KB)

1425

1426 MVS-02 (y) *maxValueSize* **must**
not be negative

1427

1428 MVS-03 (~ - no access to existing
parameter values) *maxValueSize*
must

1429 **be** less than *maxTxSize*

1430

1431 MVS-04 (~ - no access to existing
parameter values) *maxValueSize*
must

1432 **not** be reduced

1433

1434 MVS-05 (x - **sensible output** is
subject to interpretation)

1435 ***maxValueSize* must** be large
enough to allow sensible outputs
(e.g. any

1436 existing on-chain output or
anticipated outputs that could be
produced

1437 by new ledger rules)

1438

1439 ##### ****Plutus** Cost Models
(costModels)******

1440

1441 Define the base costs for each
Plutus primitive in terms of CPU
and

1442 memory units

1443

1444 A different cost model is
required for each Plutus version.
Each cost

1445 model comprises many distinct
cost model values. Cost models
are defined

1446 for each Plutus language version.
A new language version may
introduce

1447 additional cost model values or
remove existing cost model

values or remove
1454 existing cost model values.
1455
1456 ##### GUARDRAILS
1457
1458 PCM-01 (x - unquantifiable) *Cost
model* values ****must**** be set by
benchmarking
1459 on a reference architecture
1460
1461 PCM-02 (x - primitives and
language versions aren't
introduced in transactions)
1462 The *cost model* ****must**** be
updated if new primitives are
introduced or a new
1463 Plutus language version is added
1464
1465 PCM-03a (~ - no access to *Plutus
cost model* parameters) *Cost
model* values
1466 ****should not**** normally be
negative.
1467 Negative values must be justified
against the underlying cost model
for the
1468 associated primitives
1469
1470 PCM-04 (~ - no access to *Plutus
cost model* parameters) A *cost
model*
1471 ****must**** be supplied for each
Plutus language version that the
protocol supports
1472
1473 ### 2.5. Governance Parameters
1474
1475 The overall goals when managing
the governance parameters are to:
1476
1477 1. Ensure governance stability
1478

values.
1448
1449 ##### ****GUARDRAILS****
1450
1451 PCM-01 (x - "unquantifiable")
Cost model values **must** be set
by
1452 benchmarking on a reference
architecture
1453
1454 PCM-02 (x - primitives and
language versions aren't
introduced in
1455 transactions) The *cost model*
must be updated if new primitives
are
1456 introduced or a new Plutus
language version is added
1457
1458 PCM-03a (~ - no access to *Plutus
cost model* parameters) *Cost
model*
1459 values **should not** normally be
negative. Negative values must be
1460 justified against the underlying
cost model for the associated
1461 primitives
1462
1463 PCM-04 (~ - no access to *Plutus
cost model* parameters) A *cost
model*
1464 **must** be supplied for each Plutus
language version that the
1465 protocol
supports
1466
1467 ### ****2.5. Governance
Parameters****
1468
1469 The overall goals when managing
the governance parameters are to:
1470
1471 1. Ensure governance stability
1472

1479 2. Maintain a representative form
of governance

1480

1481 ##### Triggers for Change

1482

1483 Changes to governance parameters
may be triggered by:

1484

1485 1. Cardano Community requests

1486

1487 2. Regulatory requirements

1488

1489 3. Unexpected or unwanted
governance outcomes

1490

1491 4. Entering a state of no
confidence

1492

1493 ##### Counter-indicators

1494

1495 Changes may need to be reversed
and/or should not be enacted in
the event of:

1496

1497 – Unexpected effects on
governance

1498

1499 – Excessive Layer 1 load due to
on-chain voting or excessive
numbers of

1500 governance actions

1501

1502 ##### Core Metrics

1503

1504 All decisions on parameter
changes should be informed by:

1505

1506 – Governance participation levels

1507

1473 2. Maintain a representative
form of governance

1474

1475 ##### **Triggers for Change**

1476

1477 Changes to governance parameters
may be triggered by:

1478

1479 1. Cardano Community requests

1480

1481 2. Regulatory requirements

1482

1483 3. Unexpected or unwanted
governance outcomes

1484

1485 4. Entering a state of no
confidence

1486

1487 ##### **Counter-indicators**

1488

1489 Changes may need to be reversed
and/or should not be enacted in
the

1490 event of:

1491

1492 – Unexpected effects on
governance

1493

1494 – Excessive Layer 1 load due to
on-chain voting or excessive
numbers

1495 of governance actions

1496

1497 ##### **Core Metrics**

1498

1499 All decisions on parameter
changes should be informed by:

1500

1501 – Governance participation
levels

1502

1508 – Governance behaviors and patterns

1509

1510 – Regulatory considerations

1511

1512 – Confidence in the governance system

1513

1514 – The effectiveness of the governance system in managing necessary change

1515

1516 ##### Changes to Specific Governance Parameters

1517

1518 ##### Deposit for Governance Actions (govDeposit)

1519

1520 The deposit that is charged when submitting a governance action.

1521

1522 – Helps to limit the number of actions that are submitted

1523

1524 ##### GUARDRAILS

1525

1526 GD-01 (y) *govDeposit* ****must not**** be negative

1527

1528 GD-02 (y) *govDeposit* ****must not**** be lower than 1,000,000 (1 ada)

1529

1530 GD-03a (y) *govDeposit* ****must not**** exceed 10,000,000,000,000 (10 million ada)

1531

1532 GD-04 (x – "should") *govDeposit* ****should**** be adjusted in line with fiat

1533 changes

1503 – Governance behaviors and patterns

1504

1505 – Regulatory considerations

1506

1507 – Confidence in the governance system

1508

1509 – The effectiveness of the governance system in managing necessary change

1510 change

1511

1512 ##### ****Changes** to Specific Governance Parameters******

1513

1514 ##### ****Deposit** for Governance Actions (govDeposit)******

1515

1516 The deposit that is charged when submitting a governance action.

1517

1518 – Helps to limit the number of actions that are submitted

1519

1520 ##### ****GUARDRAILS****

1521

1522 GD-01 (y) *govDeposit* **must not** be negative

1523

1524 GD-02 (y) *govDeposit* **must not** be lower than 1,000,000 (1 ada)

1525

1526 GD-03a (y) *govDeposit* **must not** exceed 10,000,000,000,000 (10 million ada)

1527

1528

1529 GD-04 (x – "should") *govDeposit* **should** be adjusted in line with fiat

1530 changes

1534

1535 ##### Deposit for DReps
(dRepDeposit)

1536

1537 The deposit that is charged when
registering a DRep.

1538

1539 – Helps to limit the number of
active DReps

1540

1541 ##### GUARDRAILS

1542

1543 DRD-01 (y) *dRepDeposit* **must
not** be negative

1544

1545 DRD-02 (y) *dRepDeposit* **must
not** be lower than 1,000,000 (1
ada)

1546

1547 DRD-03 (y) *dRepDeposit* **must
not** exceed 100,000,000,000
(100,000 ada)

1548

1549 DRD-04 (x – "should")
dRepDeposit **should** be
adjusted in line with fiat
changes

1550

1551 ##### DRep Activity Period
(dRepActivity)

1552

1553 The period (as a whole number of
epochs) after which a DRep is
considered to be
1554 inactive for vote calculation
purposes, if they do not vote on
any proposal.

1555

1556 ##### GUARDRAILS

1557

1531

1532 ##### **Deposit for DReps
(dRepDeposit)**

1533

1534 The deposit that is charged when
registering a DRep.

1535

1536 – Helps to limit the number of
active DReps

1537

1538 ##### **GUARDRAILS**

1539

1540 DRD-01 (y) *dRepDeposit* must not
be negative

1541

1542 DRD-02 (y) *dRepDeposit* must not
be lower than 1,000,000 (1 ada)

1543

1544 DRD-03 (y) *dRepDeposit* must not
exceed 100,000,000,000 (100,000
ada)

1545

1546 DRD-04 (x – "should")
dRepDeposit should be adjusted
in line with
1547 fiat changes

1548

1549 ##### **DRep Activity Period
(dRepActivity)**

1550

1551 The period (as a whole number of
epochs) after which a DRep is
considered to be inactive for
1552 vote calculation purposes, if
they do not
1553 vote on any proposal.

1554

1555 ##### **GUARDRAILS**

1556

1559 DRA-01 (y) *dRepActivity* ****must not**** be lower than 13 epochs (2 months)

1560

1561 DRA-02 (y) *dRepActivity* ****must not**** exceed 37 epochs (6 months)

1562

1563 DRA-03 (y) *dRepActivity* ****must not**** be negative

1564

1565 DRA-04 (~ – no access to existing parameter values) *dRepActivity* ****must**** be greater than *govActionLifetime*

1566

1567

1568 DRA-05 (x – "should") *dRepActivity* ****should**** be calculated in human terms (2 months etc)

1569

1570

1571 ##### DRep and SPO Governance Action Thresholds (dRepVotingThresholds[...],poolVotingThresholds[...])

1572

1573 Thresholds on the active voting stake that is required to ratify a specific

1574 type of governance action by either DReps or SPOs.

1575

1576 – Ensures legitimacy of the action

1577

1578 The threshold parameters are listed below:

1579

1580 *dRepVotingThresholds*:

1581

1582 – *dvtCommitteeNoConfidence*

1583

1584 – *dvtCommitteeNormal*

1585

1557 DRA-01 (y) *dRepActivity* **must not** be lower than 13 epochs (65 days)

1558

1559 DRA-02 (y) *dRepActivity* **must not** exceed 37 epochs (185 days)

1560

1561 DRA-03 (y) *dRepActivity* **must not** be negative

1562

1563 DRA-04 (~ – no access to existing parameter values) *dRepActivity* **must** be greater than *govActionLifetime*

1564

1565

1566 DRA-05 (x – "should") *dRepActivity* **should** be calculated in human terms (60 days, etc.)

1567

1568

1569 ##### ****DRep** and SPO Governance Action Thresholds (dRepVotingThresholds[...],poolVotingThresholds[...])**

1570

1571 Thresholds on the active voting stake that is required to ratify a

1572 **specific** type of governance action by either DReps or SPOs.

1573

1574 – **Ensures** legitimacy of the action

1575

1576 The threshold parameters are listed below:

1577

1578 *dRepVotingThresholds*:

1579

1580 – **Ensures** *dvtCommitteeNoConfidence*

1581

1582 – **Ensures** *dvtCommitteeNormal*

1583

1586 – *dvtHardForkInitiation*
1587
1588 – *dvtMotionNoConfidence*
1589
1590 – *dvtPPEconomicGroup*
1591
1592 – *dvtPPGovGroup*
1593
1594 – *dvtPPNetworkGroup*
1595
1596 – *dvtPPTechnicalGroup*
1597
1598 – *dvtTreasuryWithdrawal*
1599
1600 – *dvtUpdateToConstitution*
1601
1602 *poolVotingThresholds*:
1603
1604 – *pvtCommitteeNoConfidence*
1605
1606 – *pvtCommitteeNormal*
1607
1608 – *pvtHardForkInitiation*
1609
1610 – *pvtMotionNoConfidence*
1611
1612 – *pvtPPSecurityGroup*
1613
1614 ##### GUARDRAILS
1615
1616 VT-GEN-01 (y) All thresholds
 must be greater than 50% and
 less than or
1617 equal to 100%
1618
1619 VT-GEN-02a (y) Economic, network
 and technical/security parameter
 thresholds
1620 **must** be in the range 51%–75%

1584 – *dvtHardForkInitiation*
1585
1586 – *dvtMotionNoConfidence*
1587
1588 – *dvtPPEconomicGroup*
1589
1590 – *dvtPPGovGroup*
1591
1592 – *dvtPPNetworkGroup*
1593
1594 – *dvtPPTechnicalGroup*
1595
1596 – *dvtTreasuryWithdrawal*
1597
1598 – *dvtUpdateToConstitution*
1599
1600 *poolVotingThresholds*:
1601
1602 – *pvtCommitteeNoConfidence*
1603
1604 – *pvtCommitteeNormal*
1605
1606 – *pvtHardForkInitiation*
1607
1608 – *pvtMotionNoConfidence*
1609
1610 – *pvtPPSecurityGroup*
1611
1612 ##### **GUARDRAILS**
1613
1614 VT-GEN-01 (y) All thresholds must
 be greater than 50% and less than
 or
1615 equal to 100%
1616
1617 VT-GEN-02a (y) Economic, network
 and technical/security parameter
 thresholds must be in the range
1618 51%–75%

1621

1622 VT-GEN-03 (y) Governance
parameter thresholds ****must**** be
in the range 75%-90%

1623

1624 VT-HF-01 (y) ****Hard fork**** action
thresholds ****must**** be in the
range 51%-80%

1625

1626 VT-CON-01 (y) ****New Constitution
or Guardrails Script action****
thresholds
1627 ****must**** be in the range 65%-90%

1628

1629 VT-CC-01 (y) ****Update
Constitutional Committee action****
thresholds ****must**** be
1630 in the range 51%-90%

1631

1632 VT-NC-01 (y) ****No confidence****
action thresholds ****must**** be in
the range

1633 51%-75%

1634

1635 ##### Governance Action Lifetime
(govActionLifetime)

1636

1637 The period after which a
governance action will expire if
it is not enacted –
1638 as a whole number of epochs

1639

1640 ##### GUARDRAILS

1641

1642 GAL-01 (y) *govActionLifetime*
****must not**** be lower than 1
epoch (5 days)

1643

1644 GAL-03 (x – "should")
govActionLifetime ****should
not**** be lower than 2 epochs

1619

1620 VT-GEN-03 (y) Governance
parameter thresholds **must** be in
the range
1621 75%-90%

1622

1623 VT-HF-01 (y) **"Hard Fork
Initiation"** action thresholds
must be in the
1624 range 51%-80%

1625

1626 VT-CON-01 (y) **"New Constitution"**
action thresholds **must** be in the
range
1627 65%-90%

1628

1629 VT-CC-01 (y) **"Update Committee"**
action thresholds **must** be in the
range
1630 51%-90%

1631

1632 VT-NC-01 (y) **"No Confidence"**
action thresholds **must** be in the
range

1633 51%-75%

1634

1635 ##### ****Governance** Action Lifetime
(govActionLifetime)******

1636

1637 The period after which a
governance action will expire if
it is not
1638 enacted – as a whole number of
epochs

1639

1640 ##### ****GUARDRAILS****

1641

1642 GAL-01 (y) *govActionLifetime*
must not be lower than 1 epoch (5
days)

1643

1644 GAL-03 (x – "should")
govActionLifetime **should not** be
lower than 2

1645 (10 days)

1646

1647 GAL-02 (y) *govActionLifetime*
must not exceed 15 epochs (75
days)

1648

1649 GAL-04 (x - "should")
govActionLifetime **should** be
calibrated in human
1650 terms (eg 30 days, two weeks), to
allow sufficient time for voting
etc.
1651 to take place

1652

1653 GAL-05 (~ - no access to existing
parameter values)
govActionLifetime

1654 **must** be less than
dRepActivity

1655

1656 ##### Maximum Constitutional
Committee Term
(committeeMaxTermLength)

1657

1658 The limit on the maximum term
length that a committee member
may serve

1659

1660 ##### GUARDRAILS

1661

1662 CMTL-01a (y)
committeeMaxTermLength **must
not** be zero

1663

1664 CMTL-02a (y)
committeeMaxTermLength **must
not** be negative

1665

1666 CMTL-03a (y)
committeeMaxTermLength **must
not** be lower than 18 epochs (90
1667 days, or approximately 3 months)

1668

1645 epochs (10 days)

1646

1647 GAL-02 (y) *govActionLifetime*
must not exceed 15 epochs (75
days)

1648

1649 GAL-04 (x - "should")
govActionLifetime should be
calibrated in
1650 human terms (e.g., 30 days, two
weeks), to allow sufficient time
for voting
1651 etc. to take place

1652

1653 GAL-05 (~ - no access to existing
parameter values)
govActionLifetime

1654 must be less than *dRepActivity*

1655

1656 ##### **Maximum Constitutional
Committee Term
(committeeMaxTermLength)**

1657

1658 The limit on the maximum term
length that a committee member
may serve

1659

1660 ##### **GUARDRAILS**

1661

1662 CMTL-01a (y)
committeeMaxTermLength must not
be zero

1663

1664 CMTL-02a (y)
committeeMaxTermLength must not
be negative

1665

1666 CMTL-03a (y)
committeeMaxTermLength must not
be lower than 18 epochs
1667 (90 days, or approximately 3
months)

1668

1669 CMTL-04a (y)
committeeMaxTermLength ****must not**** exceed 293 epochs

1670 (approximately 4 years)

1671

1672 CMTL-05a (x - "should")
committeeMaxTermLength ****should not**** exceed 220

1673 epochs (approximately 3 years)

1674

1675 ##### **The** minimum size of the
Constitutional Committee
(committeeMinSize)

1676

1677 The least number of members that
can be included in a
Constitutional **Committee**

1678 following a governance action to
change the Constitutional
Committee.

1679

1680 ##### **GUARDRAILS**

1681

1682 CMS-01 (y) *committeeMinSize*
****must not**** be negative

1683

1684 CMS-02 (y) *committeeMinSize*
****must not**** be lower than 3

1685

1686 CMS-03 (y) *committeeMinSize*
****must not**** exceed 10

1687

1688 **### 2.6. Monitoring and Reversion of Parameter Changes**

1689

1690 All network parameter changes
****must be**** monitored carefully
for no less **than**

1691 2 epochs (10 days)

1692

1693 – Changes ****must**** be reverted as
soon as possible if block
propagation

1669 CMTL-04a (y)
committeeMaxTermLength **must not** exceed 293 epochs

1670 (approximately 4 years)

1671

1672 CMTL-05a (x - "should")
committeeMaxTermLength **should not** exceed 220

1673 epochs (approximately 3 years)

1674

1675 ##### ****The** minimum size of the
Constitutional Committee
(committeeMinSize)******

1676

1677 The least number of members that
can be included in a
Constitutional

1678 **Committee** following a governance
action to change the
Constitutional

1679 Committee.

1680

1681 ##### ****GUARDRAILS****

1682

1683 CMS-01 (y) *committeeMinSize*
must not be negative

1684

1685 CMS-02 (y) *committeeMinSize*
must not be lower than 3

1686

1687 CMS-03 (y) *committeeMinSize*
must not exceed 10

1688

1689 **### **2.6. Monitoring and Reversion of Parameter Changes****

1690

1691 All network parameter changes
must be monitored carefully for
no less

1692 **than** 2 epochs (10 days)

1693

1694 – **Changes must** be reverted as
soon as possible if block
propagation

1694 delays exceed 4.5s for more than
5% of blocks over any 6 hour
rolling window

1695

1696 All other parameter changes
should be monitored

1697

1698 – The reversion plan ****should****
be implemented if the overall
effect on

1699 performance, security,
functionality or long-term
sustainability **is**

1700 **unacceptable.**

1701

1702 A specific reversion/recovery
plan ****must be**** produced for
each parameter

1703 change.

1704 This plan must include:

1705

1706 – Which parameters need to change
and in which ways in order to
return to the

1707 previous state (or a similar
state)

1708

1709 – How to recover the network in
the event of disastrous failure

1710

1711 This plan ****should**** be followed
if problems are observed
following the

1712 parameter change.

1713 Note that not all changes can be
reverted.

1714 Additional care must be taken
when making changes to these
parameters.

1715

1716 **### 2.7. Non-Updatable Protocol
Parameters**

1717

1718 Some fundamental protocol
parameters cannot be changed by

1695 delays exceed 4.5s for more
than 5% of blocks over any 6 hour

1696 rolling window

1697

1698 All other parameter changes
should be monitored

1699

1700 – The reversion plan **should** be
implemented if the overall effect
on

1701 performance, security,
functionality, or long-term
sustainability

1702 **is unacceptable.**

1703

1704 A specific reversion/recovery
plan **must be** produced for each
parameter

1705 change. This plan must include:

1706

1707 – Which parameters need to
change and in which ways in order
to return

1708 to the previous state (or a
similar state)

1709

1710 – How to recover the network in
the event of disastrous failure

the Protocol
1719 Parameter Update governance
action.
1720 These parameters can only be
changed in a new Genesis file as
part of a hard
1721 fork.
1722 It is not necessary to provide
specific guardrails on updating
these parameters.

1723
1724 **### 3. Guardrails and Guidelines
on Treasury Withdrawal Actions**

1725
1726 ****Treasury withdrawal** actions**
specify the destination and
amount of a number
1727 of withdrawals from the Cardano
treasury.

1728
1729 **##### GUARDRAILS**

1730
1731 **TREASURY-01a (x)** A net change
limit for the Cardano treasury's
balance per
1732 period of time ****must**** be agreed
by the DReps via an on-chain
governance
1733 action with a threshold of
greater than 50% of the active
voting stake

1734

1711
1712 This plan should be followed if
problems are observed following
the
1713 parameter change. Note that not
all changes can be reverted.
Additional
1714 care must be taken when making
changes to these parameters.

1715
1716 **### **2.7. Non-Updatable Protocol
Parameters****

1717
1718 Some fundamental protocol
parameters cannot be changed by
the
1719 "Parameter Update" action. These
parameters can only be changed in
a
1720 new Genesis file as part of a
hard fork. It is not necessary to
provide
1721 specific guardrails on updating
these parameters.

1722
1723 **### **3. Guardrails and
Guidelines on "Treasury
Withdrawals" Actions****

1724

1735 TREASURY-02a (x) Withdrawals from
the Cardano Blockchain treasury
made pursuant
1736 to an approved Cardano Blockchain
ecosystem budget ****must not****
exceed the net
1737 change limit for the Cardano
Treasury's balance per period of
time

1738

1739 TREASURY-03a (x) Withdrawals from
the Cardano Blockchain treasury
****must**** be
1740 denominated in ada

1741

1742 TREASURY-04a (x) Withdrawals from
the Cardano Blockchain treasury
****must not****
1743 be ratified until there is a
Cardano Community approved
Cardano Blockchain
1744 ecosystem budget then in effect
pursuant to a previous on-chain
governance
1745 action agreed by the DReps with a
threshold of greater than 50% of
the active

1746 voting stake

1747

1748 **### 4. Guardrails and Guidelines
on Hard Fork Initiation Actions**

1749

1750 The ****hard fork initiation****
action requires both a new major
and a new minor
1751 protocol version to be specified.

1752

1753 - As positive integers

1725 "Treasury Withdrawals" actions
specify the destination and
amount of a
1726 number of withdrawals from the
Cardano Treasury.

1727

1728 **##### **GUARDRAILS****

1729

1730 TREASURY-01a (x) A Net Change
Limit for the Cardano Treasury's
balance
1731 per period of time must be agreed
by the DReps via an on-chain
1732 governance action with a
threshold of greater than 50% of
the active

1733 voting stake

1734

1735 TREASURY-02a (x) Withdrawals from
the Cardano Blockchain treasury
must
1736 not exceed the Net Change Limit
for the Cardano Treasury's
balance per
1737 period of time

1738

1739 TREASURY-03a (x) Withdrawals from
the Cardano Blockchain treasury
must
1740 be denominated in ada

1741

1742 **### **4. Guardrails and
Guidelines on "Hard Fork
Initiation" actions****
1743
1744 The "Hard Fork Initiation" action
requires both a new major and a

1754
1755 As the result of a hard fork, new
updatable protocol parameters may
be
1756 introduced.
1757 Guardrails may be defined for
these parameters, which will take
effect
1758 following the hard fork.
1759 Existing updatable protocol
parameters may also be deprecated
by the hard fork,
1760 in which case the guardrails
become obsolete for all future
changes.
1761
1762 ##### GUARDRAILS
1763
1764 HARDFORK-01 (~ – no access to
existing parameter values) The
major protocol
1765 version ****must**** be the same as
or one greater than the major
version that will
1766 be enacted immediately prior to
this change.
1767 If the major protocol version is
one greater, then the minor
protocol version
1768 ****must**** be zero
1769
1770 HARDFORK-02a (~ – no access to
existing parameter values) Unless
the major
1771 protocol version is also changed,
the minor protocol version
****must**** be
1772 greater than the minor version
that will be enacted immediately

new
1745 minor protocol version to be
specified.
1746
1747 – As positive integers
1748
1749 As the result of a hard fork, new
updatable protocol parameters may
be
1750 introduced. Guardrails may be
defined for these parameters,
which will
1751 take effect following the hard
fork. Existing updatable protocol
1752 parameters may also be deprecated
by the hard fork, in which case
the
1753 guardrails become obsolete for
all future changes.
1754
1755 ##### ****GUARDRAILS****
1756
1757 HARDFORK-01 (~ – no access to
existing parameter values) The
major
1758 protocol version **must** be the same
as or one greater than the major
1759 version that will be enacted
immediately prior to this change.
If the
1760 major protocol version is one
greater, then the minor protocol
version
1761 **must** be zero
1762
1763 HARDFORK-02a (~ – no access to
existing parameter values) Unless
the
1764 major protocol version is also
changed, the minor protocol
version **must**
1765 be greater than the minor version
that will be enacted immediately

1773 prior to this
change

1774

1775 HARDFORK-03 (~ – no access to
existing parameter values) At
least one of the
1776 protocol versions (major or minor
or both) ****must**** change

1777

1778 HARDFORK-04a (x) At least 85% of
stake pools by active stake
****should**** have
1779 upgraded to a Cardano Blockchain
node version that is capable of
processing the
1780 rules associated with the new
protocol version

1781

1782 HARDFORK-05 (x) Any new updatable
protocol parameters that are
introduced with
1783 a hard fork ****must**** be included
in this Appendix and suitable
guardrails
1784 defined for those parameters

1785

1786 HARDFORK-06 (x) Settings for any
new protocol parameters that are
introduced
1787 with a hard fork ****must**** be
included in the appropriate
Genesis file

1788

1789 HARDFORK-07 (x) Any deprecated
protocol parameters ****must**** be
indicated in
1790 this Appendix
1791

1792 HARDFORK-08 (~ – no access to
Plutus cost model parameters)
New Plutus
1793 versions ****must**** be supported by
a version-specific *Plutus cost
model* that

prior
1766 to this change

1767

1768 HARDFORK-03 (~ – no access to
existing parameter values) At
least one
1769 of the protocol versions (major
or minor or both) **must** change

1770

1771 HARDFORK-04a (x) At least 85% of
stake pools by active stake
should have
1772 upgraded to a Cardano Blockchain
node version that is capable of
processing the
1773 rules associated
with the new protocol version

1774

1775 HARDFORK-05 (x) Any new updatable
protocol parameters that are
introduced with a hard fork **must**
be included in this Appendix and
1777 suitable guardrails defined for
those parameters

1778

1779 HARDFORK-06 (x) Settings for any
new protocol parameters that are
introduced with a hard fork **must**
be included in the appropriate
Genesis
1781 file

1782

1783 HARDFORK-07 (x) Any deprecated
protocol parameters **must** be
indicated in
1784 this Appendix
1785

1786 HARDFORK-08 (~ – no access to
Plutus cost model parameters)
New
1787 **Plutus** versions **must** be supported
by a version-specific *Plutus
cost

1794 covers each primitive that is
available in the new Plutus
version

1795

1796 **### 5. Guardrails and Guidelines
on Update Constitutional
Committee or Threshold Actions**

1797

1798 ****Update Constitutional Committee
or Threshold**** governance actions
may change
1799 the size, composition or required
voting thresholds for the
Constitutional
1800 Committee.

1801

1802 **##### GUARDRAILS**

1803

1804 UPDATE-CC-01a (x) ****Update
Constitutional Committee and/or
threshold**** ****and/or**
1805 **term**** governance actions ****must
not**** be ratified until ada
holders have
1806 ratified through an on-chain
governance action this
Constitution

1807

1808 **### 6. Guardrails and Guidelines
on New Constitution or Guardrails
Script Actions**

1809

1810 **New constitution or Guardrails
Script** actions change the hash of
the on-chain
1811 **Constitution** and the associated
Guardrails Script.

1812

1813 **##### GUARDRAILS**

1814

1815 **NEW-CONSTITUTION-01a (x) A ****New
Constitution**** ****or** Guardrails
Script****

1816 governance action ****must**** be
submitted to define any required

1788 model* that covers each primitive
that is available in the new
Plutus
1789 version

1790

1791 **### **5. Guardrails and
Guidelines on "Update Committee"
actions****

1792

1793 **"Update Committee"** actions may
change the size, composition or
required
1794 voting thresholds for the
Constitutional Committee.

1795

1796 **##### **GUARDRAILS****

1797

1798 UPDATE-CC-01a (x) **"Update
Committee"** actions must not be
ratified until
1799 ada owners have ratified through
an on-chain governance action
this
1800 Constitution

1801

1802 **### **6. Guardrails and
Guidelines on "New Constitution"
actions****

1803

1804 **"New Constitution"** actions change
the hash of the on-chain
Constitution
1805 and the associated Guardrails
Script.

1806

1807 **##### **GUARDRAILS****

1808

1809 **NEW-CONSTITUTION-01a (x) A **New
Constitution or** Guardrails **Script****

1810 governance action **must** be
submitted to define any required

guardrails for
1817 new parameters that are
introduced via a Hard Fork
governance action

1818
1819 NEW-CONSTITUTION-02 (x) If
specified, the new Guardrails
Script must be
1820 consistent with this Constitution
1821

1822 ### 7. Guardrails and Guidelines
on No Confidence Actions

1823

1824 **No confidence** actions signal
a state of no confidence in the
governance
1825 system.

1826 No guardrails are imposed on **No
Confidence** actions.

1827

1828 ##### GUARDRAILS

1829

1830 – None

1831

1832 ### 8. GUARDRAILS AND GUIDELINES
ON INFO ACTIONS

1833

1834 **Info** actions are not enacted
on-chain.

1835 No guardrails are imposed on
Info actions.

1836

1837 ##### GUARDRAILS

1838

1839 – None

1840

1841 ### 9. List of Protocol Parameter
Groups

1842

guardrails
1811 for new parameters that are
introduced via a Hard Fork
governance action

1812
1813 NEW-CONSTITUTION-02 (x) If
specified, the new Guardrails
Script must be
1814 consistent with this Constitution
1815

1816 ### **7. Guardrails and
Guidelines on "No Confidence"
actions**

1817

1818 "No Confidence" actions signal a
state of no confidence in the
governance system. No guardrails
are imposed on "No Confidence"
actions.

1820

1821 ##### **GUARDRAILS**

1822

1823 – None

1824

1825 ### **8. Guardrails and
Guidelines on "Info" actions**

1826

1827 "Info" actions are not enacted
on-chain. No guardrails are
imposed on
1828 "Info" actions.

1829

1830 ##### **GUARDRAILS**

1831

1832 – None

1833

1834 ### **9. List of Protocol
Parameter Groups**

1835

1843 The protocol parameters are
grouped by type, allowing
different thresholds to
1844 be set for each group.

1845
1846 The network parameter group
consists of:

1847
1848 - *maximum block body size*
(*maxBlockBodySize*)

1849
1850 - *maximum transaction size*
(*maxTxSize*)

1851
1852 - *maximum block header size*
(*maxBlockHeaderSize*)

1853
1854 - *maximum size of a serialized
asset value* (*maxValueSize*)

1855
1856 - *maximum script execution units
in a single transaction*
1857 (maxTxExecutionUnits[steps])

1858
1859 - *maximum script execution units
in a single block*
1860 (*maxBlockExecutionUnits[steps]*)

1861
1862 - *maximum number of collateral
inputs* (*maxCollateralInputs*)

1863
1864 The economic parameter group
consists of:

1865
1866 - *minimum fee coefficient*
(*txFeePerByte*)

1867
1868 - *minimum fee constant*
(*txFeeFixed*)

1869
1870 - *minimum fee per byte for
reference scripts*

1836 The protocol parameters are
grouped by type, allowing
different
1837 thresholds to be set for each
group.

1838
1839 The network parameter group
consists of:

1840
1841 - *maximum block body size*
(*maxBlockBodySize*)

1842
1843 - *maximum transaction size*
(*maxTxSize*)

1844
1845 - *maximum block header size*
(*maxBlockHeaderSize*)

1846
1847 - *maximum size of a serialized
asset value* (*maxValueSize*)

1848
1849 - *maximum script execution
units in a single transaction*
1850 (maxTxExecutionUnits[steps])

1851
1852 - *maximum script execution
units in a single block*
1853 (*maxBlockExecutionUnits[steps]*)

1854
1855 - *maximum number of collateral
inputs* (*maxCollateralInputs*)

1856
1857 The economic parameter group
consists of:

1858
1859 - *minimum fee coefficient*
(*txFeePerByte*)

1860
1861 - *minimum fee constant*
(*txFeeFixed*)

1862
1863 - *minimum fee per byte for
reference scripts*

(**minFeeRefScriptCoinsPerByte**)

1871

1872 – **delegation key lovelace deposit* (*stakeAddressDeposit*)*

1873

1874 – **pool registration lovelace deposit* (*stakePoolDeposit*)*

1875

1876 – **monetary expansion* (*monetaryExpansion*)*

1877

1878 – **treasury expansion* (*treasuryCut*)*

1879

1880 – **minimum fixed rewards cut for pools* (*minPoolCost*)*

1881

1882 – **minimum lovelace deposit per byte of serialized UTx0* (*coinsPerUTx0Byte*)*

1883

1884 – **prices of Plutus execution units* (*executionUnitPrices[priceSteps/priceMemory]*)*

1885

1886

1887 The technical/security parameter group consists of:

1888

1889 – **pool pledge influence* (*poolPledgeInfluence*)*

1890

1891 – **pool retirement maximum epoch* (*poolRetireMaxEpoch*)*

1892

1893 – **desired number of pools* (*stakePoolTargetNum*)*

1894

1864 (**minFeeRefScriptCoinsPerByte**)

1865

1866 – **delegation key lovelace deposit* (*stakeAddressDeposit*)*

1867

1868 – **pool registration lovelace deposit* (*stakePoolDeposit*)*

1869

1870 – **monetary expansion* (*monetaryExpansion*)*

1871

1872 – **treasury expansion* (*treasuryCut*)*

1873

1874 – **minimum fixed rewards cut for pools* (*minPoolCost*)*

1875

1876 – **minimum lovelace deposit per byte of serialized UTx0* (*coinsPerUTx0Byte*)*

1877

1878

1879 – **prices of Plutus execution units* (*executionUnitPrices[priceSteps/priceMemory]*)*

1880

1881

1882 The technical/security parameter group consists of:

1883

1884 – **pool pledge influence* (*poolPledgeInfluence*)*

1885

1886 – **pool retirement maximum epoch* (*poolRetireMaxEpoch*)*

1887

1888 – **desired number of pools* (*stakePoolTargetNum*)*

1889

1895 - *Plutus execution cost models*
(*costModels*)

1896

1897 - *proportion of collateral
needed for scripts*
(*collateralPercentage*)

1898

1899 The governance parameter group
consists of:

1900

1901 - *governance voting thresholds*
(*dRepVotingThresholds[...],
1902 poolVotingThresholds[...]*)

1903

1904 - *governance action maximum
lifetime in epochs*
(*govActionLifetime*)

1905

1906 - **governance** action deposit*
(*govActionDeposit*)

1907

1908 - *DRep deposit amount*
(*dRepDeposit*)

1909

1910 - *DRep activity period in
epochs* (*dRepActivity*)

1911

1912 - *minimal constitutional
committee size*
(*committeeMinSize*)

1913

1914 - *maximum term length (in
epochs) for the **constitutional
committee** members*
1915 (*committeeMaxTermLength*)

1916

1917 **## APPENDIX II: SUPPORTING
GUIDANCE**

1918

1890 - ***Plutus execution cost
models* (*costModels*)**

1891

1892 - ***proportion of collateral
needed for scripts***

1893 **(*collateralPercentage*)**

1894

1895 The governance parameter group
consists of:

1896

1897 - ***governance voting
thresholds***
(*dRepVotingThresholds[...],
1898 **poolVotingThresholds[...]***)

1899

1900 - ***governance action maximum
lifetime in epochs***
(*govActionLifetime*)

1901

1902 - ***governance** action deposit*
(*govDeposit*)

1903

1904 - ***DRep deposit amount***
(*dRepDeposit*)

1905

1906 - ***DRep activity period in
epochs* (*dRepActivity*)**

1907

1908 - ***minimal Constitutional
Committee** size*
(*committeeMinSize*)

1909

1910 - ***maximum term length (in
epochs) for the Constitutional
Committee**
1911 **members***
(*committeeMaxTermLength*)

1912

1913 ****APPENDIX II. SUPPORTING
GUIDANCE****

1914 -----

1915

1919 This Appendix II is intended to provide guidance in interpreting the

1920 Constitution and the Constitutional Committee shall consider this Appendix II
1921 as it deems relevant and useful in carrying out its constitutional duties.

1922

1923 ### 1. Framing Notes

1924

1925 The Cardano Blockchain was established in 2017.

1926 In July 2020 the Cardano Blockchain was expanded to include independent block
1927 validators and in September 2024 an on-chain governance system was introduced.

1928 This Constitution outlines the rights and responsibilities of governance actors
1929 in the decentralized system who represent the owners of ada, the governance
1930 token of the Cardano Blockchain.

1931 The Cardano Blockchain is presently a decentralized ecosystem of blockchain
1932 technology, smart contracts, and community governance.

1933

1934 In approaching this Constitution, the Cardano Community recognizes that it must
1935 be remembered that this is not a constitution for only a blockchain but rather
1936 a constitution for a blockchain ecosystem – a much more ambitious endeavor.

1937 Accordingly, how governance actions are approved, while extremely important, is

1916 This Appendix II is intended to provide guidance in interpreting the

1917 Constitution and the Constitutional Committee shall consider this
1918 Appendix II as it deems relevant and useful in carrying out its
1919 constitutional duties.

1920

1921 ### **1. Framing Notes**

1922

1923 The Cardano Blockchain was established in 2017. In July 2020 the Cardano
1924 Blockchain was expanded to include independent block validators and in
1925 September 2024 an on-chain governance system was introduced. This

1926 Constitution outlines the rights and responsibilities of governance
1927 actors in the decentralized system who represent the ada owners; ada is
1928 the governance token of the Cardano Blockchain. The Cardano Blockchain
1929 is a decentralized ecosystem of blockchain technology, smart contracts,
1930 and community governance.

1931

1932 In approaching this Constitution, the Cardano Community recognizes that
1933 this is not a constitution for only a blockchain but rather a
1934 constitution for a blockchain ecosystem. Accordingly, how governance
1935 actions are approved, while extremely important, is not the sole focus

1938 not the sole focus of this Constitution.

1939 Rather, this Constitution provides the basis and fundamental framework through

1940 which all participants in the Cardano Community can come together to govern

1941 themselves and form radically new approaches to human interaction and

1942 collaboration.

1943

1944 By necessity, this Constitution recognizes the role of and empowers the

1945 Constitutional Committee, confirms the right of the Cardano Community to

1946 participate in collective bodies for collaboration, gives effect to on-chain

1947 governance, and empowers DReps to act as the voice of ada owners for on-chain

1948 voting.

1949

1950 The Constitution also recognizes the necessity of safeguarding access to and

1951 the use of funds of the Cardano Blockchain treasury through the inclusion of

1952 the Cardano Blockchain Guardrails in this Constitution.

1953

1954 ### 2. Other Guidance

1955

1956 The drafters of the Constitution, together with other participants from the

1957 Cardano Community, have published and in the future may publish guidance for

1936 of this Constitution. Rather, this Constitution provides the basis and

1937 fundamental framework through which all participants in the Cardano

1938 Community can come together to govern themselves and form new approaches

1939 to human interaction and collaboration.

1940

1941 By necessity, this Constitution recognizes the role of and empowers the

1942 Constitutional Committee, confirms the right of the Cardano Community to

1943 participate in collective bodies for collaboration, gives effect to

1944 on-chain governance, and empowers DReps – including ada owners acting

1945 directly as DReps – to act as the voice of ada owners for on-chain

1946 voting.

1947

1948 The Constitution also recognizes the necessity of safeguarding access to

1949 and the use of funds of the Cardano Blockchain treasury through the

1950 inclusion of the Cardano Blockchain Guardrails in this Constitution.

1951

1952 ### **2. Other Guidance**

1953

1954 The drafters of the Constitution, together with other participants from

1955 the Cardano Community, have published and in the future may publish

1958 interpreting the Constitution,
including, without limitation, a
definition
1959 booklet that has been released
contemporaneously with the on-
chain ratification
1960 of the Constitution.

1961 So long as any such published
guidance has been hashed to the
Cardano
1962 Blockchain pursuant to an "Info"
action, the Constitutional
Committee shall not
1963 be precluded from considering and
utilizing such guidance as it
deems
1964 appropriate.

1956 guidance for interpreting the
Constitution, including, without
1957 limitation, a definition booklet
that has been released
1958 contemporaneously with the on-
chain ratification of the
Constitution. So
1959 long as any such published
guidance has been hashed to the
Cardano
1960 Blockchain pursuant to an "Info"
action, the Constitutional
Committee
1961 shall not be precluded from
considering and utilizing such
guidance as
1962 it deems appropriate.