Supplementary information

Detailed sequences of promoters and genes used in this study.

>P_{L03}-*gfp*

TCCCTATCAGTGATAGAGATTGACATCCCTATCAGTGATAGATATAATGGCCACATCAGGATTT
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CCTTAAATTTATTTGCACTACTGGAAAACTACCTGTTCCATGGCCAACACTTGTCACTACTTTC
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GACACGTGCTGAAGTCAAGTTTGAAGGTGATACCCTTGTTAATAGAATCGAGTTAAAAGGTATT
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GTCCTTTTACCAGACAACCATTACCTGTCCACACAATCTGCCCTTTCGAAAGATCCCAACGAAA
AGAGAGACCACATGGTCCTTCTTGAGTTTGTAACAGCTGCTGGGATTACACATGGCATGGATGA
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>P_{petE}-*tetR*

CAGTACTCAGAATTTTTTGCTGAGGTACTGAGTACACAGCTAATAAAATTGGGCAATCTCCGCG
CCTCTATGACTTGAAGGAGAGTGTAGGGGTATAGGGGAAAGATATCTTTTATCTACATCACATA
AATAAAAAATTTAATTTGTCGCTCTGGCTGCATATATTGATGTATTTTTAGCCATAAGTTTTTT
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AAGCTTAATAACCTTCCGTGATGGTAACTTCACGGTAACCAAGACGTGGAGTTACCACCCTTTT
TTTTT

>P_{nirA}-*tetR*
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acgctttagtagcttaataa
AAGCTTAATAACCTTCCGTGATGGTAACTTCACGGTAACCAAGACGTGGAGTTACCACCCTTTT
TTTTT

>P_{L03} *antisense RNA for* P_{nirA}-*tetR*
TCCCTATCAGTGATAGAGATTGACATCCCTATCAGTGATAGATATAATGGCCACATCAG
AATCTAGACATGAGCTGGTTCTCATA
CCGCCCGGACTACTGTTCGGGCGGTTCCTTATGTATTAC

>P_{L03} *antisense RNA for* P_{petE}*-tetR*

TCCCTATCAGTGATAGAGATTGACATCCCTATCAGTGATAGATATAATGGCCACATCAG
AATCTAGACATGGCGTTCTCCTAACC
CCGCCCGGACTACTGTTCGGGCGGTTCCTTATGTATTAC

>P_{L03}*-*$trxA_{ss}$

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ATGTCTGACAAAATCATCCATCTAACCGATGATAGCTTCGATACAGATGTCTTGAAAGCAGATG
GAGCAATACTTGTGGACTTTTGGGCTGAATGGTCTGGTCCTTCAAAGATGATTGCTCCGATATT
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CCTGGAACTGCACCCAAATATGGGATTCGTGGCATTCCAACGTTATTGCTGTTTAAGAATGGCG
AAGTTGCTGCAACCAAAGTTGGTGCCTTATCCAAAGGTCAGTTAAAGGAATTTCTGGATGCAAA
CTTAGCCTAA
GGGAATTTCATGTCGGGTGTCCAGTCGCTAAAAACTGGACGCCCGGCGTGAGTCATTTTT

>P_{L03}*-TetR aptamer*

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AAACCTTCCCTTTTCCCATACCCCTCGGGGCCTCTAAACGGGCCTTGAGGGGTTTTTTTTT

>P_{L03}*-TetR aptamer with tRNA scaffold*

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GCCCGGATAGCTCAGTCGGTAGAGCAGCGGCCG
CGCGTATCAAGCAGAATGTTATGGGTCATCACAGACCAGAGAAAAGCTTGATACGCG
CGGCCGCGGGTCCAGGGTTCAAGTCCCTGTTCGGGCGCCA
ATCCTTAGCGAAAGCTAAGGATTTTTTTT

>P_{nirA}*-xpt(C74U)/metE-tetR*

TAGCTACTCATTAGTTAAGTGTAATGCAGAAAACGCATATTCTCTATTAAACTTACGCATTAAT
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AACCTTAGAAGTA
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TTAGATGTGCTTTACTAAGTCATCGCGATGGAGCAAAAGTACATTTAGGTACACGGCCTACAGA

AAAACAGTATGAAACTCTCGAAAATCAATTAGCCTTTTTATGCCAACAAGGTTTTTCACTAGAG

AATGCATTATATGCACTCAGCGCTGTGGGGCATTTTACTTTAGGTTGCGTATTGGAAGATCAAG

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ACAAGCTATCGAATTATTTGATCACCAAGGTGCAGAGCCAGCCTTCTTATTCGGCCTTGAATTG

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acgctttagtagcttaataa

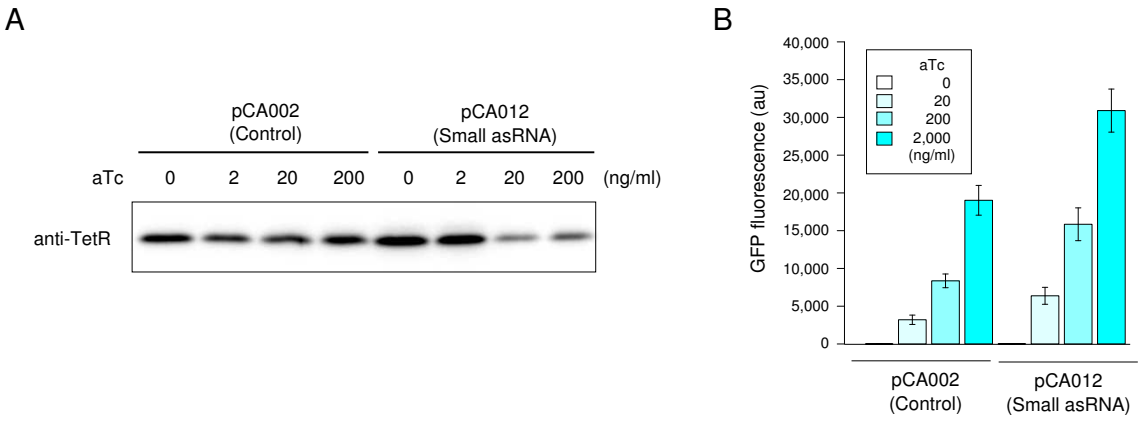
AAGCTTAATAACCTTCCGTGATGGTAACTTCACGGTAACCAAGACGTGGAGTTACCACCCTTTT

TTTTT

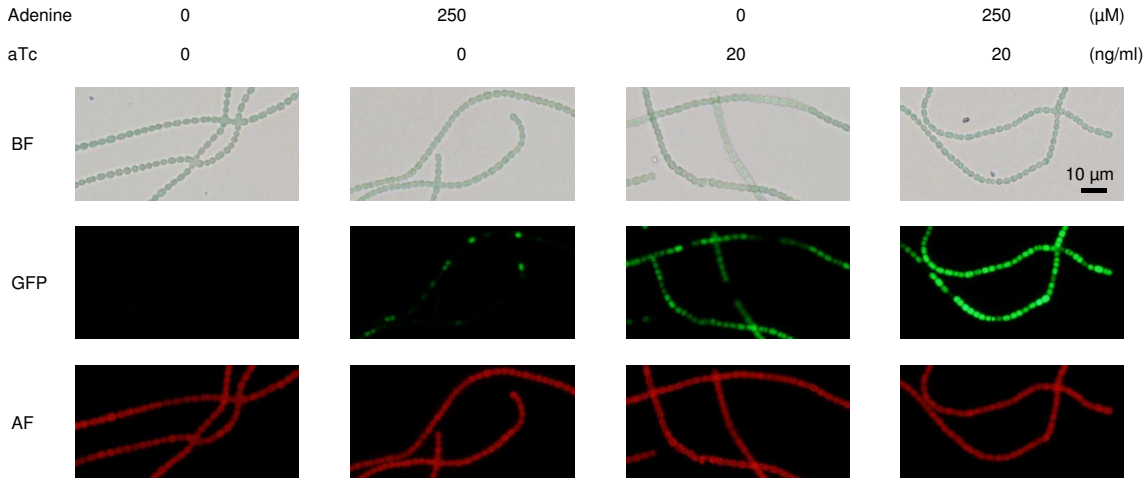
Supplemental Table S1. Summary of aTc-TetR induction systems used in this study.

Plasmid	Reference	TetR expression	Description	Induction		
				aTc	Adenine	Nitrate depletion
pCA004	13	P_{nirA}	-	+	-	+
pCA011	This study	P_{nirA}	Positive feedback with asRNA	+	-	+
pCA002	13	P_{petE}	-	+	-	-
pCA012	This study	P_{petE}	Positive feedback with asRNA	+	-	-
pCA013	This study	P_{nirA}	Positive feedback with TetR inducing peptide[a]	+	-	+
pCA014	This study	P_{nirA}	Positive feedback with TetR aptamer	+	-	+
pCA015	This study	P_{nirA}	Positive feedback with TetR aptamer[b]	+	-	+
pCA016	This study	$P_{nirA,}$ adenine riboswitch	Positive feedback with TetR aptamer[b]	+	+	+

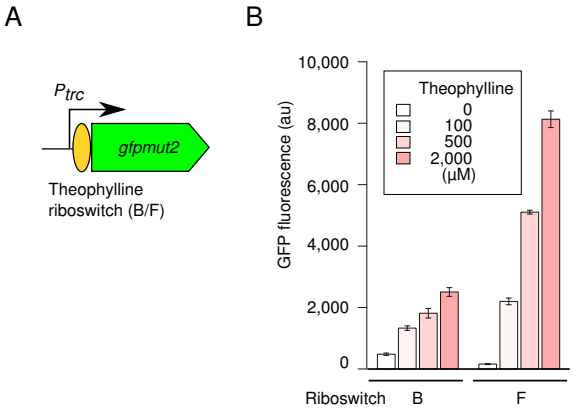
[a]with TrxAss scaffold
[b]with tRNA scaffold



Supplemental Figure S1. Repression of P_{petE}-*tetR* by small asRNA. (A) Dependence of TetR amount on aTc concentrations. Different concentrations of aTc were added to the cells grown under +N conditions. After 24 h, proteins from each strain were extracted, and TetR was detected by western blotting. (B) *Anabaena* strains were treated with different concentrations of aTc for 24 h under +N conditions. GFP fluorescence was measured and normalized (optical density at 750 nm). Data represent the mean ± SD (n = 3 from independent cultures).



Supplemental Figure S2. Bright field (BF), GFP fluorescence, and phycobiliprotein autofluorescence (AF) images of *Anabaena* cells harboring pCA016. The strain was grown in a nitrate medium in the absence and presence of 250 μM adenine for 48 h, and then, GFP was induced by 20 ng/ml aTc for 24 h.



Supplemental Figure S3. Induction of GFP fluorescence using theophylline riboswitch. (A) Design of plasmids: *trc* promoter, theophylline riboswitch B or F^{15}, and *gfpmut2* were used. (B) Induction of GFP expression by theophylline. *Anabaena* cells were treated with different concentrations of theophylline for 24 h under nitrate replete conditions. GFP fluorescence was then measured and normalized (optical density at 750 nm). Data represent the mean ± SD (n = 3 from independent cultures).